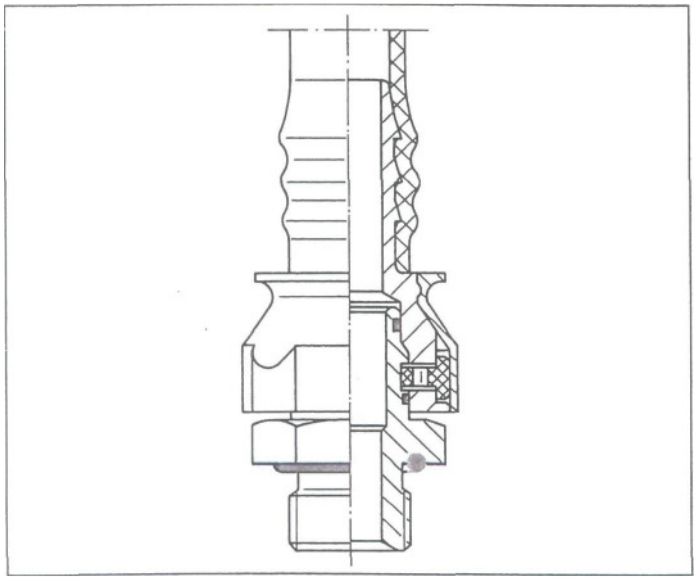
B24

Operating and assembly instructions

Quick connectors 240
for nylon tubes in commercial vehicles



1. Introduction

Nylon tubes are predominantly used in commercial vehicles with compressed air systems. Nylon tubes are resistant to corrosion, vibration and torsional stress. They can be processed easier than metal pipes and are easier to install in the vehicle. The following points are decisive for functional safety:

- correct material and proper processing of the nylon tubes
- selection of the correct connection fittings

2. Nylon tubes

DIN 74324 and the technical delivery conditions provide information on the properties of the nylon tubes and their use in vehicle construction. Here, we have compiled the most important data from these documents that is of importance when installing the nylon tubes with VOSS 240 quick connectors.

2.1 Standardization

The technical data with respect to polyamide tubes and their laying is based on the following norms:

DIN 73378
Polyamide tubes for motor vehicles

DIN 74324 Part 1
Polyamide tubes and lines for air brake systems, requirements and checks

DIN 74324 Part 2
Polyamide tubes and lines for air brake systems, installation data

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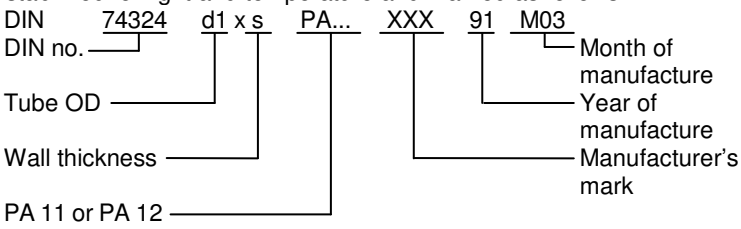
2.2 Material and marking

In accordance with DIN 74324 Part 1, only nylon tubes made from polyamide 11 or polyamide 12 may be used. They must be stabilized for light and temperature and marked as follows:



2.3 Thermal resistance

These tubes can be used in a temperature range of -40 °C to +100 °C. Brief periods of temperature loading when not pressurized – e.g. 3 h at +110 °C in a paint drying chamber – are permissible. For temperature reasons, nylon tubes may not be attached to metal pipes that are connected to the following components:

- Engine in general, turbocharger, compressor, heater, cooling circuit, hydraulics.

A minimum clearance of approx. 200 mm must be maintained from the exhaust system. In the event of welding work being carried out on the vehicle, nylon tubes in the area being welded must be removed or protected.

2.4 Dimensions and operating pressure

Table 1: Operating pressure in bar

Temperature range in °C	PA11/12 PHL					PA11/12 PHLY				
	Stress utilization factor	6x1 9x1.5	8x1 12x1.5 16x2	14x2	15x1.5	Stress utilization factor	6x1 9x1.5	8x1 12x1.5 16x2	14x2	15x1.5
-60 to +23	100%	27	19	22	15	100%	36	26	30	19
-60 to +30	87%	23.5	16.5	19.1	13.1	85%	30.6	22.1	25.5	16.2
-60 to +40	74%	20.0	14.1	16.3	11.1	73%	26.3	19.0	21.9	13.9
-60 to +50	64%	17.3	12.2	14.1	9.6	65%	23.4	16.9	19.5	12.4
-60 to +60	57%	15.4	10.8	12.5	8.6	59%	21.2	15.3	17.7	11.2
-60 to +70	52%	14.0	9.9	11.4	7.8	54%	19.4	14.0	16.2	10.3
-60 to +80	47%	12.7	8.9	10.3	7.1	50%	18.0	13.0	15.0	9.5
-60 to +90	44%	11.9	8.4	9.7	6.6	47%	16.9	12.2	14.1	8.9
-60 to +100	40%	10.8	7.6	8.8	6.0	43%	15.5	11.2	12.9	8.2

2.5 Routing and clipping

In general, pre-assembled lines are installed. Especially in the case of repair and maintenance work, and also with small production run installations, assembly of connectors to the tubes can also take place after they are installed in the vehicle.

2.5.1 Basic rules for installation

The procedure is essentially as described in DIN standard 74324 Part 2. In particular, the nylon tubes are to be kept away from sources of heat and must be installed

- free of abrasion
- free of torsion
- free of tensile stress
- free of kinks

Nylon tubes shrink when cold. Hence due to the possible utilization at -40 °C, a length supplement of approx. 1 % must be allowed, i.e. 10 mm extra per 1 m of line length.

2.5.2 Tube attachment

Nylon tubes must be attached with tube fixation. For example, metal clamps with rubber or plastic inserts, plastic clamps or cable ties are permissible. The fixation must allow temperature-related changes in length. The distance between fixations is approx. 500 mm, wherein among other things, tube external diameter and tube wall thickness must be taken into account. Nylon tubes can be cost-effectively laid as tube bundles, especially in large production run assembly. The bundles are connected together and held with cable ties.

Distributors, valves, etc. may not be connected so that they are freely suspended in tube lines. They must be securely fixed to the vehicle frame using the attachment holes provided for this purpose.

2.5.3 Bending radii

Nylon tubes can be laid in a curve without problem. It is not permitted to heat the tubes when laying. A tube fixation, or a cable tie in the case of tube bundles, must be attached each to the start and end of the curve.

Table 2: Smallest allowable bending radius r acc. to DIN 743242

Tube	6x1	8x1	9x1.5	12x1.5	14x2	15x1.5	16x2
r (mm)	30	40	45	60	75	90	95

2.6 Nylon tubes instead of brake hoses

In most cases, cheaper nylon tubes can completely replace hoses such as e.g. in the case of tilting cabs. VOSS customer service will be happy to advise you if you require concrete information for your specific installation. If hose lines are required, VOSS supplies ready-to-install lines that are equipped with the corresponding quick connectors.

3. VOSS 240 quick connectors

VOSS 240 quick connectors allow rapid connection and release of connectors without using tools.

3.1. Field of application

The individual parts of the VOSS 240 quick connectors are designed for use in a temperature range of -40 °C to +100 °C. Where applicable, corresponding information from the respective manufacturer should be observed when connecting components with deviating utilization temperature.

The permissible operating pressure is 12.5 bar but is restricted by the pressure resistance of the nylon tube.

3.2 Individual parts

The VOSS 240 quick connector generally comprises the following parts: male connector, female coupling with fir-tree profile, O-rings, locking clamp and cap.

The male connector (usually with threaded part) is screwed firmly into the brake unit. The screw-in thread is sealed using an O-ring.

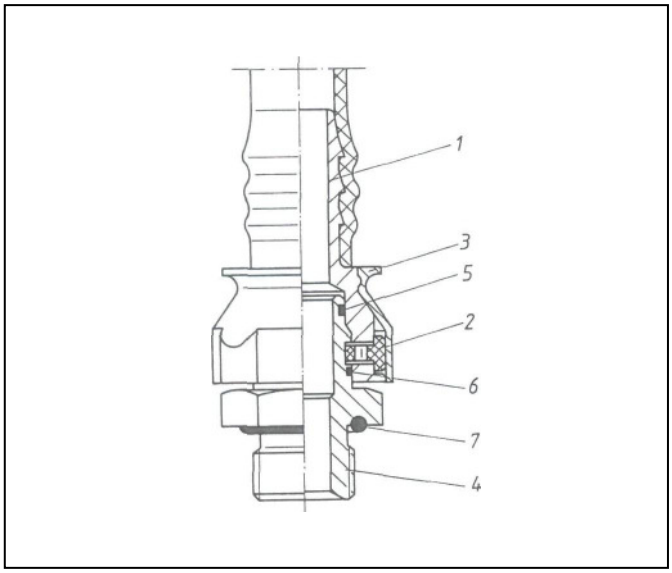
Two sealing O-rings are fitted on the plug spigot, wherein one sealing ring protects from contamination and the other seals the medium. In the female coupling there is a clamp that secures the connection after the male connector and the coupling have been fitted together. The cap is pushed over the quick connection.

The cap

- prevents incorrect assembly as it can only be pushed over the connection with its protrusions if the clamp fits perfectly into the plug spigot groove.
- secures the clamp. The coupling can only be opened if the cap has been pushed back first.
- protects the connection from dirt.

To mark the lines, caps can be used in the following colors:

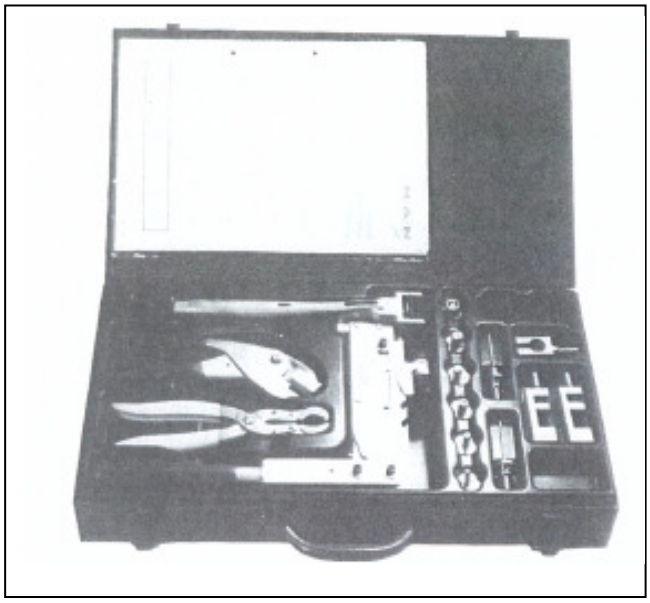
- red for supply lines
- blue for all other lines



1 Female coupling with fir-tree profile (brass)
2 Clamp (plastic)
3 Cap (plastic)
4 Male connector (brass)
5 O-ring (NBR) for main seal
6 O-ring (NBR) for dirt seal
7 O-ring (NBR) for thread seal

VOSS 240 quick connectors are available in nominal sizes 9 and 13 for nylon tubes with a tube internal diameter of 4-12 mm.

Catalog 240 contains the complete program of VOSS 240 quick connectors.



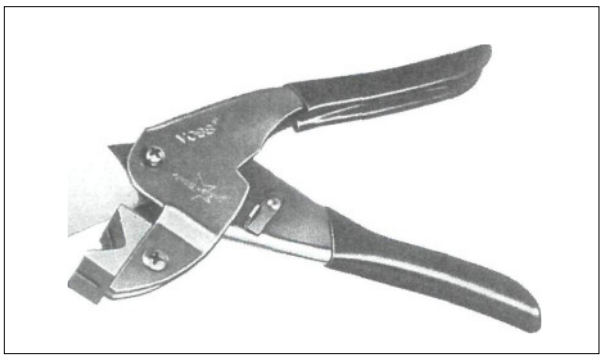
3.3 Installation aids

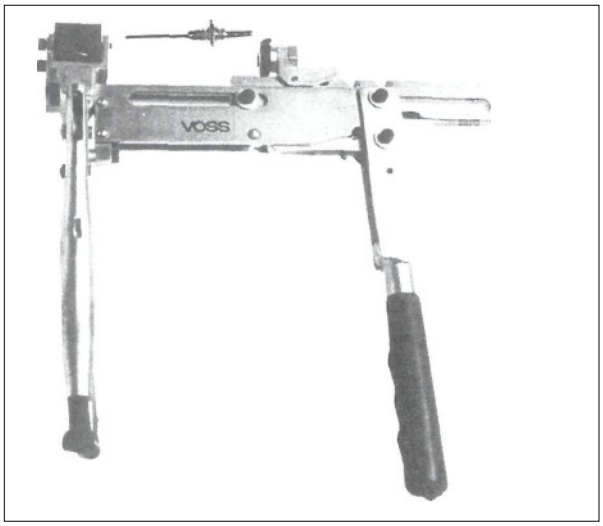
The VOSS mounting box is available for installation of the 240 quick connectors.

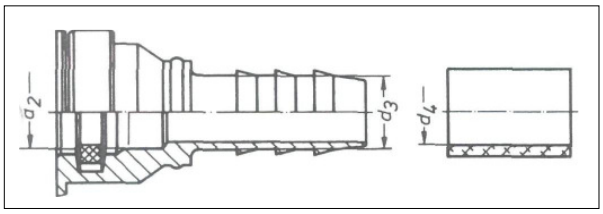
Table 3: Contents of the VOSS mounting box

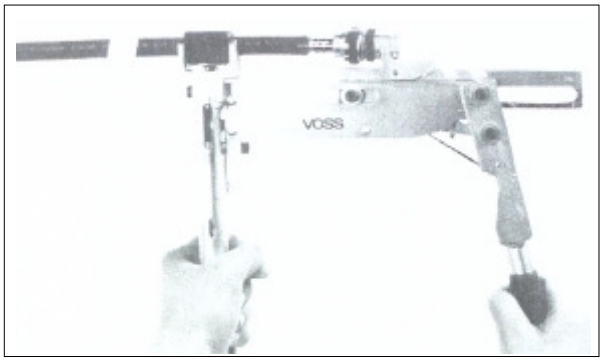
Qty	Designation	Article no.
1	Assembly tool for nylon tubes[1)]	5 9 94 51 30 00
	Clamping jaws	
1 set	Ø 6,9,11,14 mm	5 9 94 67 80 50
1 set	Ø 8,12,13,16 mm	5 9 94 67 70 50
	Tool insert for male coupling system 240 and multiple coupling inserts	
1	Connection size 9 mm	5 9 94 51 60 00
1	Connection size 13 mm	5 9 94 51 70 00
	Tool insert for fir-tree with taper seal (DKO)	
1	Ø 2.5 mm	5 9 94 64 90 00
1	Ø 4.5 mm	5 9 94 65 00 00
1	Ø 6.5 mm	5 9 94 65 10 00
1	Ø 8.0 mm	5 9 94 67 92 00
1	Ø 8.5 mm	5 9 94 65 20 00
1	Ø 10.5 mm	5 9 94 67 30 00
1	95° tube bend	5 9 94 67 42 00
	Tool insert for banjo fitting (fuel line)	
1	Ø 14 mm	5 9 94 68 12 49
1	Ø 16 mm	5 9 94 68 32 49
1	Cutting pliers for nylon tubes	5 9 94 55 00 00
1	Opening pliers for caps of the 240 quick connector	5 9 94 53 00 00

[1)] Clamping jaw set 5 9 94 67 80 50 is a component of assembly tool 5 9 94 51 30 00.







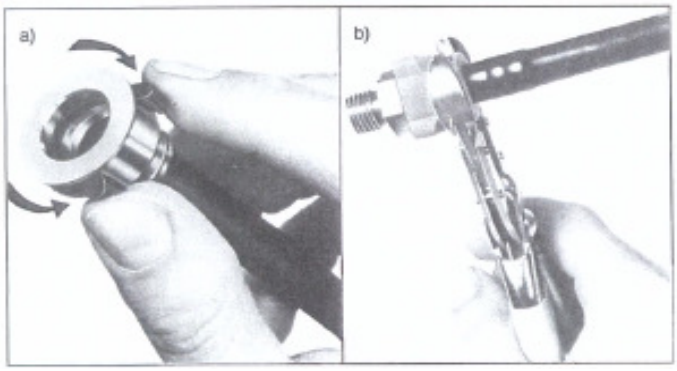


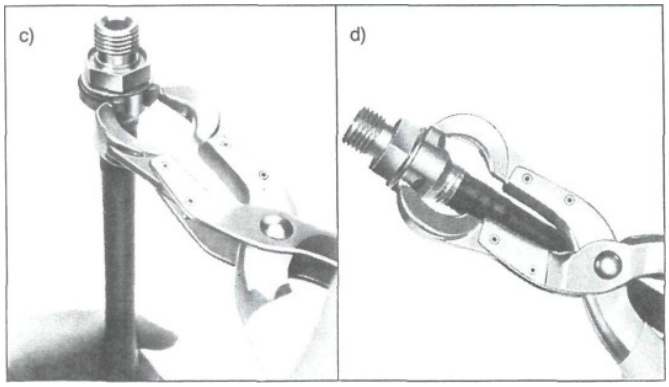
3.4 Installation

- Cut the tube to length, tube length = extended length + 1 %. Use the tube cutting pliers to guarantee a clean cut edge.
- Place a set of clamping jaws corresponding to the size of the tube that is to be installed into the tube assembly tool and turn into the suitable position.
- Place tool insert with connection size 9 or 13 – corresponding to the coupling head size that is to be installed – into the pliers.
- Assemble the appropriate cap over the tube – protrusions to the quick connector side. Ensure correct pairing of fir-tree profile external diameter (d_3) and tube internal diameter (d_4) (see table 4 below).

Tool insert	d2	d3	d4
NS 9	9.5	4.6	4.0
NS 9	9.5	6.8	6.0
NS 9	9.5	9.0	8.0
NS 9	9.5	10.1	9.0
NS 13	13.5	4.6	4.0
NS 13	13.5	6.8	6.0
NS 13	13.5	9.0	8.0
NS 13	13.5	10.1	9.0
NS 13	13.5	11.2	10.0
NS 13	13.5	13.2	12.0

- Press on the tube at room temperature. Do not heat the tube! The mandrel must be clean and free of grease.
- Push the fir-tree profile of the female coupling about 2 mm into the nylon tube.
- Push the coupling head onto the tool insert of the pliers.
- Fix the tube with clamping jaws by operating the tensioner lever, then use the pressure lever to press the fir-tree profile into the nylon tube as far as it will go.
- Under no circumstances should you attach additional tube clamps or clamping sleeves.





radial axial

3.4.1 Connecting female coupling and male connector

- Push coupling head over plug spigot.
- The clamp of the female coupling engages in the corresponding groove of the plug spigot.
- The clamp is correctly closed when the gap is not larger than 2 mm.
- Push the cap over the coupling head.
- Ensure that the grip lobes of the clamp can be gently pushed into the protrusions of the cap and are tightly surrounded by the cap after attachment.
- In the event of repeated installation of quick connectors and O-rings, lubricate these with silicon grease.

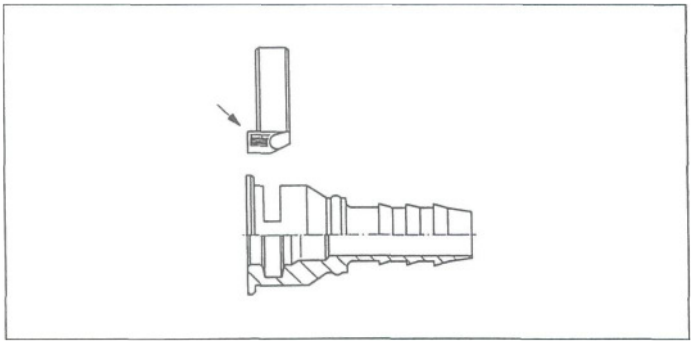
3.4.2 Releasing the connection

- Depressurize the line
- Release without tool (a)
  - Push back the cap,
  - compress the clamp at the grip lobes,
  - remove the female coupling.

Note:

The clamp is difficult to compress by hand. For this reason, it is recommended that the tool is used in accordance with the following description.

- Release with clamp opening pliers (b)
  - Remove the cap by placing the pliers legs in the groove of the cap and squeezing the handles together. The cap then moves 2 to 3 mm to the rear and can be easily removed.
- Open the clamps
  - radial (c)
  - axial (d)



3.5 Repairs

Damaged nylon tubes

- Completely replace short lines. In the case of longer lines: cut out the damaged section, place a female coupling in each tube end and connect using a dual side male connector. Dual side male connectors are enclosed in catalog 240.

Damaged clamps

- With the connection released, pull the damaged clamp – starting from the slot in the clamp – upwards from the coupling, perpendicular to the tube axis. Insert the new clamp in such a way that the projecting necks (see arrow) of the grip lobes points towards the flange of the coupling head.

Damaged cap

- It is not possible to replace a damaged cap without removing the tube from the fir-tree profile of the coupling piece. Where applicable, replace short sections of tube entirely; otherwise, cut the tube and press in again after replacing the cap. If the tube is too short (minimum specified length + 1 %), replace the tube.

Damaged sealing O-rings

- Remove damaged sealing O-rings, clean the groove, lightly lubricate a new sealing O-ring with silicon grease and insert it. Take care that the O-ring is not damaged or overstretched.

Caution!

A visual, functional and efficiency test must be carried out after repair work that necessitates release of connections or replacement of parts.

Circuit distribution is to be checked, especially in the event of parts being replaced where connections can be mixed up without a fault in the braking system being immediately noticeable – e.g. multiple circuit protection valve or foot brake valve.

VOSS customer service

VOSS is available at any time to provide informal consultancy and to answer all questions relating to quick connectors, nylon tubes, laying, etc