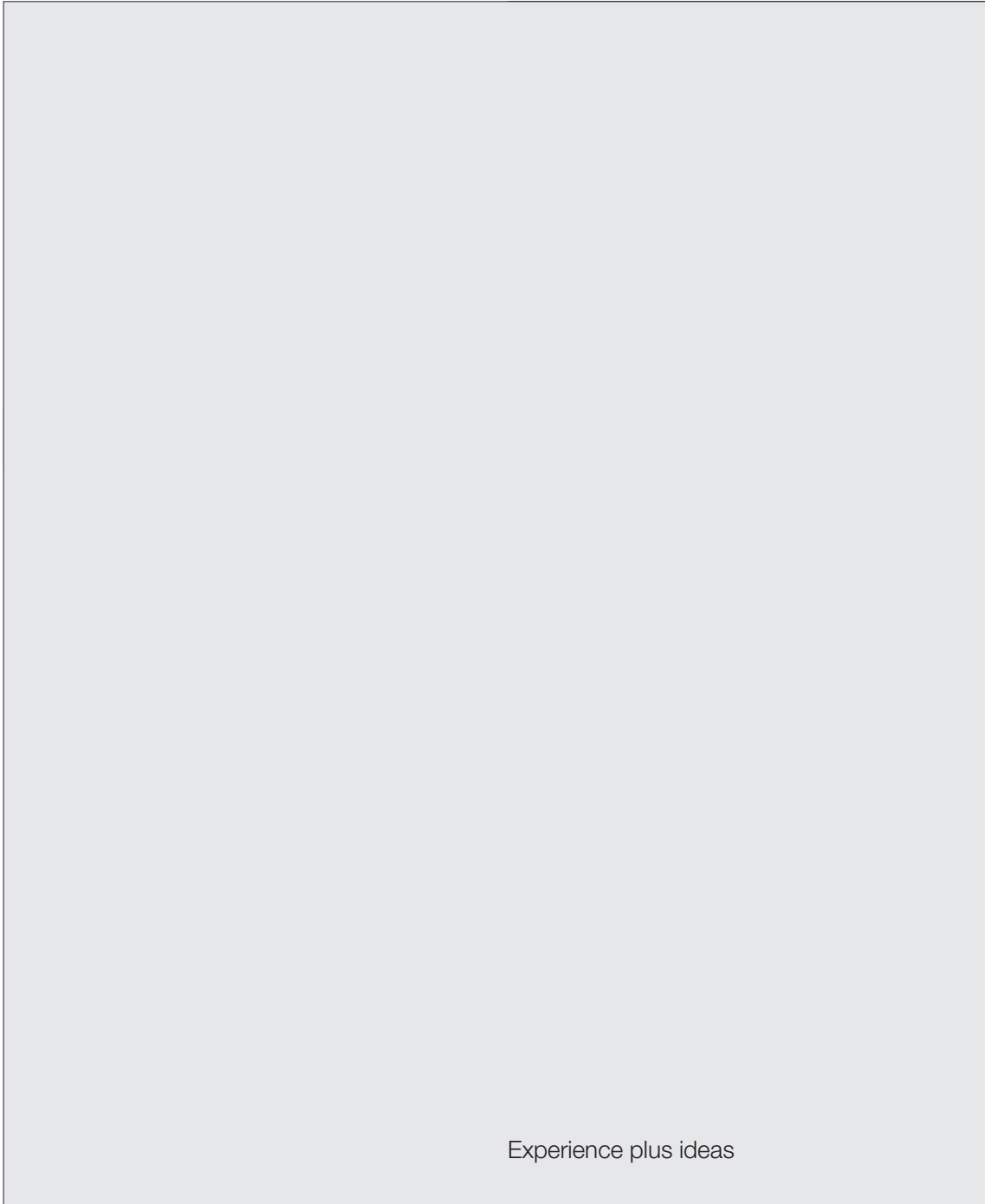


## Assembly Instructions



Experience plus ideas



## Contents Page

Assembly Instructions 2S tube couplings	Pg. 320-323
Assembly Instructions 2SVA tube couplings	Pg. 324-327
Assembly Instructions 2S <i>plus</i> tube couplings	Pg. 328-331
Assembly Instructions ES-4 tube couplings	Pg. 332-335
Assembly Instructions ES-4VA tube couplings	Pg. 336-339
Assembly Instructions VOSSForm <sup>SOP</sup> tube couplings	Pg. 340-345
Assembly Instructions VOSSForm <sup>SOP</sup> VA tube couplings	Pg. 346-351
Assembly Instructions BV-10 flared couplings	Pg. 352-355
Assembly Instructions Taper (DKO) and weld nipple	Pg. 356-357
Assembly Instructions ZAKO flange couplings	Pg. 358-361
Assembly Instructions Flange couplings with cutting- ring and welding connection	Pg. 362-363
Assembly Instructions Screw-in connecting piece according to ISO 6149/11926-1	Pg. 364-365

# Assembly Instructions for 2S Tube Couplings

## 1. Notes

These assembly instructions describe the two assembly options provided for in the German standard DIN 3859 Part 2:

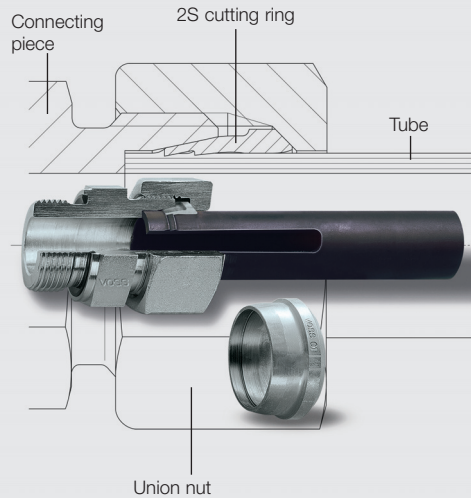
- Direct assembly in the coupling connecting piece.
- Pre-assembly in hardened pre-assembly mandrel.

All the data below were determined under the following preconditions:

- Seamless steel tubes for precision applications to EN 10305-1.
- Tube material 1.0255+N to DIN 1630.
- Corrosion protection VOSS Zink-Nickel.

We recommend the use of VOSS pre-assembly devices for series-production assembly. The specifications in the respective operating instructions apply to the assembly procedures here.

Compliance with the assembly instructions is extremely important for fulfilling the functions of the 2S cutting ring couplings. Improper handling leads to risks with regard to safety and freedom from leaks, which can also result in the complete failure of the coupling under certain conditions.



### Caution!

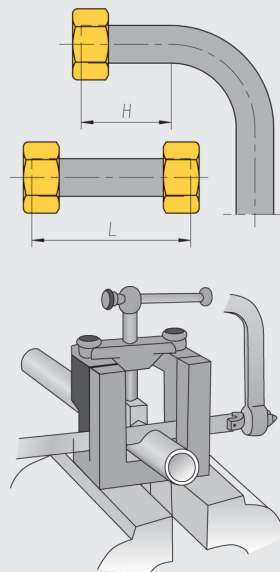
Please observe the safety instructions for installation and the recommendation on the use of tube supports (see page 374).

## 2. Tube preparation

2.1 Minimum dimensions of the straight tube ends must be taken into account for determining the tube lengths.

With machine pre-assembly, the minimum lengths are contained in the respective operating instructions of the pre-assembly devices.

Series	Tube-OD	H	L
L	6/ 8	31	39
L	10/12	33	42
L	15	36	45
L	18	38	48
L	22/28	42	53
L	35/42	48	60
S	6/ 8	35	44
S	10/12	37	47
S	14/16	43	54
S	20	50	63
S	25	54	68
S	30	58	72
S	38	65	82



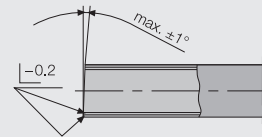
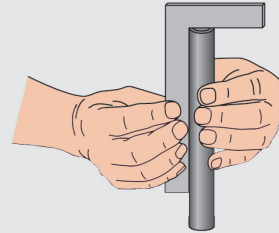
2.2 Saw off tube at a right angle. An angular tolerance of  $\pm 1^\circ$  is permissible. Do not use tube cutters or abrasive cutting machines.

2.3 Slightly deburr tube ends inside and outside. Clean tube.



**Caution!**

- Tubes cut crooked or improperly deburred reduce the service life and freedom from leaks of the coupling.
- With thin-walled steel tubes or soft tubes of non-ferrous metals, reinforcing sleeves should be used (see page 374).



### 3. Assembly preparation

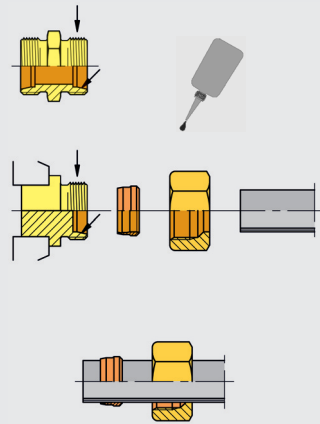
3.1 To simplify assembly, we recommend lubricating the mating pieces of the coupling or the manual pre-assembly mandrel.

3.2 Push the union nut and the 2S cutting ring onto the tube end consecutively. The cutting edges of the 2S cutting ring face the tube end.



**Caution!**

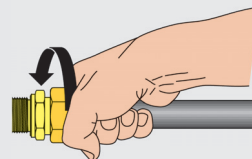
Ensure the proper position of the 2S cutting ring, or otherwise incorrect assembly will result.



### 4. Direct assembly in coupling connecting piece

4.1 Insert the tube end into the coupling connecting piece as far as possible and press on. During the assembly process the tube must be held on the stop to prevent incorrect assembly.

4.2 Screw on the union nut by hand until the coupling connecting piece, the 2S cutting ring and the union nut are felt to make contact.



4.3 Tighten the union nut with the open-end spanner.

- up to a tube OD of 18 mm 1 1/2 turns
- from a tube OD of 20 mm 1 1/4 turns

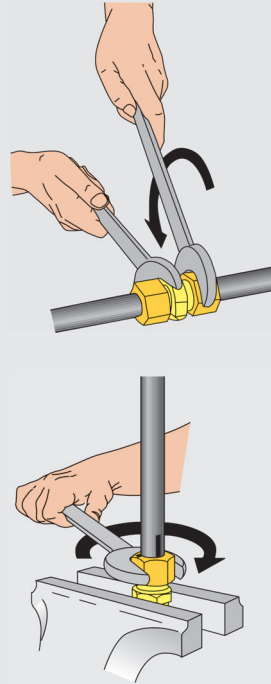
**Notes:**

- For assembly within the tube, tighten the coupling connecting piece with a spanner.
- To comply with the specified number of turns, it is recommended that marking lines be applied to the union nut and the tube.
- The assembly specification in 4.3 also applies to pre-assembly in a vice.

**Caution!**



- Each coupling body may only be used once for initial assembly. In the case of multiple use, malfunctions can occur.
- Following assembly a visual inspection including checking of the correct assembly is absolutely necessary (see point 6. Checking).



## 5. Pre-assembly in hardened pre-assembly mandrel

The hardened pre-assembly mandrel is wear-resistant and enable uniform assembly results, as they are more closely toleranced. They should be checked for trueness to gauge size after approx. every 50 pre-assemblies.

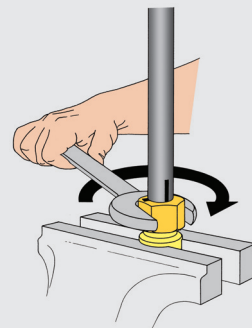
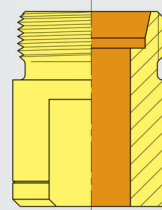
Replace pre-assembly mandrels which are not true to gauge size or are damaged in the cone area to prevent incorrect assembly.

- 5.1 Insert the tube end into the pre-assembly mandrel as far as possible and press on. During the assembly process the tube must be held on the stop to prevent incorrect assembly.
- 5.2 Screw on the union nut by hand until the pre-assembly mandrel, the 2S cutting ring and the union nut are felt to make contact.
- 5.3 Tighten the union nut with the open-end spanner.
  - up to a tube OD of 18 mm 1 1/2 turns
  - from a tube OD of 20 mm 1 1/4 turns

**Caution!**



Following each pre-assembly a visual inspection including checking of the correct assembly is absolutely necessary (see point 6. Checking).



## 6. Checking

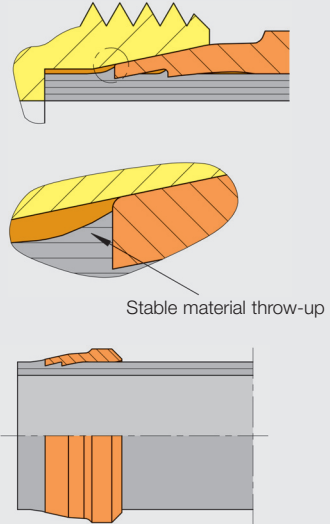
Unscrew union nut and check the shoulder throw-up. The shoulder throw-up must cover at least 80% of the cutting-edge face surface.

It may be possible to turn the cutting ring on the tube in this position. Possible soiling must be removed.



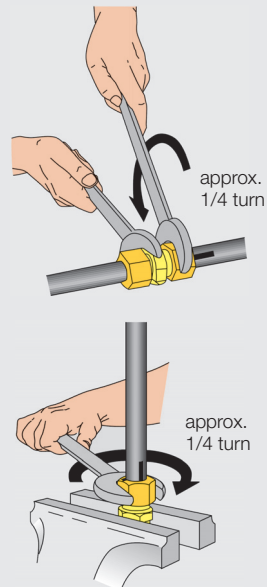
### Caution!

If the shoulder throw-up is insufficient, repeat assembly with application of increased force. The result must be checked again.



## 7. Finish assembly

- 7.1 Carefully reinsert the **tube end mounted** in the coupling connecting piece in which it was assembled. Then tighten the union nut hand-tight and stress-free.
  - 7.1.1 Tighten union nut with spanner (without extension) up to noticeable increase in force.
  - 7.1.2 Then tighten another 1/4 turn.
- 7.2 Carefully insert the **tube end pre-assembled** in the hardened pre-assembly mandrel or machine pre-assembled in a (new) coupling connecting piece not yet used for assembly and tighten the union nut hand-tight and stress-free.
  - 7.2.1 Tighten union nut with spanner (without extension) up to noticeable increase in force.
  - 7.2.2 Then tighten another 1/4 turn.



## 8. Repeat assembly

Repeated installations can be carried out on the tube coupling. When doing so, the union nut is tightened again with the same amount of force as during the initial assembly.

# Assembly Instructions for 2SVA Tube Couplings

## 1. Notes

2SVA cutting rings **must** be pre-assembled in hardened tools.

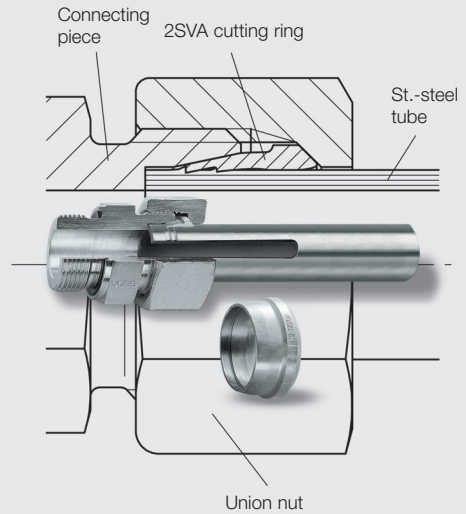
These assembly instructions describe the pre-assembly in the hardened manual pre-assembly connecting piece.

All the data below were determined under the following preconditions:

- Seamless cold-drawn stainless steel tubes with tolerances to EN 10305-1.
- Heat treated scale-free (heat treatment methods to DIN 17458), of material 1.4571+m.
- Use of assembly paste MPE.

With series-production assembly and from the cutting ring sizes L 15 or S 16, we recommend the use of VOSS pre-assembly devices for pre-assembling the 2SVA cutting rings. The specifications in the respective operating instructions apply to the assembly procedures here.

Compliance with the assembly instructions is extremely important for fulfilling the functions of the 2SVA cutting ring couplings. Improper handling leads to risks with regard to safety and freedom from leaks, which can also result in the complete failure of the coupling under certain conditions.



### Caution!

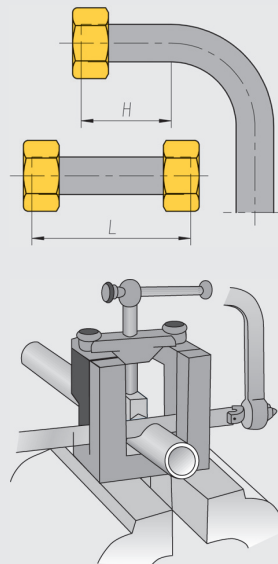
Please observe the safety instructions for installation and the recommendation on the use of tube supports (see page 374).

## 2. Tube preparation

2.1 Minimum dimensions of the straight tube ends must be taken into account for determining the tube lengths.

With machine pre-assembly, the minimum lengths are contained in the respective operating instructions of the pre-assembly devices.

Series	Tube-OD	H	L
L	6/ 8	31	39
L	10/12	33	41
L	15	36	45
L	18	38	48
L	22/28	42	53
L	35/42	48	60
S	6/ 8	35	44
S	10/12	37	47
S	14/16	43	54
S	20	50	63
S	25	54	68
S	30	58	72
S	38	65	82





- 2.2 Saw off tube at a right angle. An angular tolerance of  $\pm 1^\circ$  is permissible.  
Do not use tube cutters or abrasive cutting machines.
- 2.3 Slightly deburr tube ends inside and outside. Clean tube.



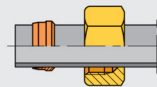
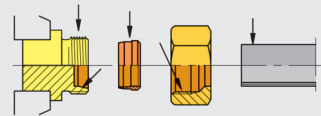
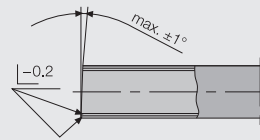
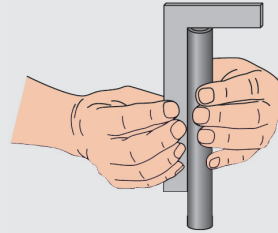
**Caution!**

- Tubes sawed off crooked or improperly deburred reduce the service life and freedom from leaks of the coupling.
- With thin-walled stainless-steel tubes, reinforcing sleeves should be used (see page 374).

2.4 Assembly paste

Lubricate the taper and the thread of the pre-assembly connecting piece, and the cutting ring and the thread of the union nut with assembly paste (e.g. MPE assembly paste).

- 2.5 Push the union nut and the 2SVA cutting ring onto the tube end consecutively. The cutting edges of the 2SVA cutting ring face the tube end.



### 3. Pre-assembly in hardened pre-assembly connecting piece

The hardened pre-assembly connecting pieces are wear-resistant and enable uniform assembly results, as they are more closely tolerated.

They should be checked for trueness to gauge size after approx. every 50 pre-assemblies.

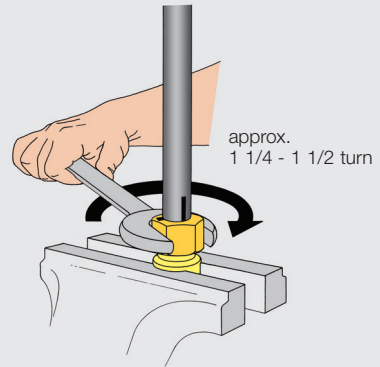
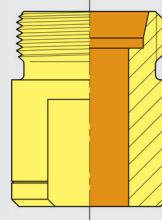
Replace pre-assembly connecting pieces which are not true to gauge size or are damaged in the cone area to prevent incorrect assembly.

- 3.1 Insert the tube end into the pre-assembly connecting piece as far as possible and press on. During the assembly process the tube must be held on the stop to prevent incorrect assembly.
- 3.2 Screw on the union nut by hand until the pre-assembly connecting piece, the 2SVA cutting ring and the union nut are felt to make contact.
- 3.3 Tighten the union nut approx. 1 1/4 - 1 1/2 rotation. The cutting edges penetrate into the tube jacket and produce a visible material throw-up in front of the first cutting edge.



#### Caution!

After every pre-assembly a visual inspection including checking of the correct assembly results is absolutely necessary (see point 4. Checking).

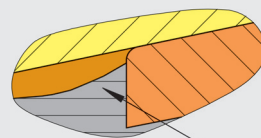
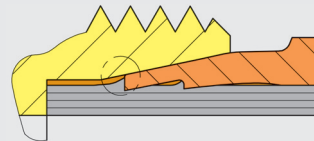


### 4. Checking

- 4.1 Unscrew union nut and check shoulder throw-up.

The shoulder throw-up must cover approx. 70% of the cutting-edge face surface.

It may be possible to turn the cutting ring in this position. Remove possible soiling.

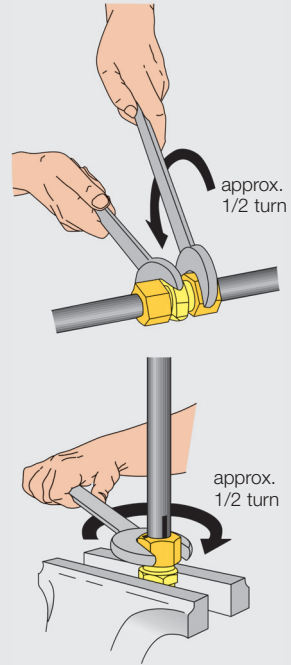


#### Caution!

With an insufficient shoulder throw-up, repeat assembly with increased force and check again.

## 5. Finish assembly

- 5.1 Carefully insert the tube end pre-assembled in the hardened manual pre-assembly connecting piece or machine pre-assembled in a new coupling connecting piece and tighten the union nut hand-tight and stress-free.
- 5.2 Tighten union nut with spanner (without extension) up to noticeable increase in force.
- 5.3 Then tighten another 1/2 turn.



## 6. Repeat assembly

- 6.1 Repeated installations can be carried out on the tube coupling.
- 6.2 During the new finish assembly, tighten the union nut until a noticeable increase in force is felt.
- 6.3 Then tighten another 1/2 turn.



### Caution!

The assembly result, such as shoulder throw-up etc., must be checked (see 4. Checking).

# Assembly Instructions 2S plus Tube Couplings

## 1. Notes

These assembly instructions describe the two assembly methods provided for under DIN 3859, Part 2:

- Direct assembly in the coupling connecting piece.
- Preassembly in the hardened pre-assembly support.

All the following data were determined on the basis of the following preconditions:

- Seamless steel tubes for precision applications to EN 10305-1.
- Corrosion protection VOSS Zink-Nickel.

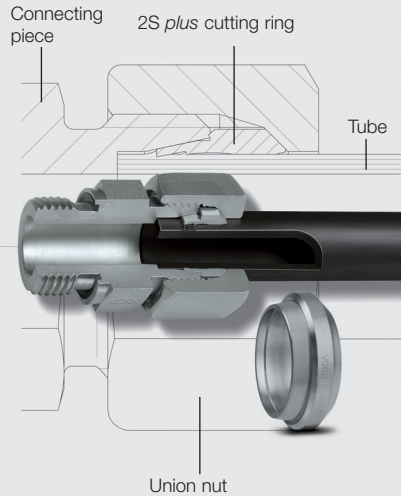
For series assemblies we recommend the use of VOSS pre-assembly equipment. The information in the respective assembly instructions apply for the assembly procedures here.

In order for the 2S plus cutting ring couplings to fulfil their function, observance of the assembly instructions is of the greatest importance. Incorrect handling can result in risks with respect to safety and leak tightness that can under certain circumstances result in the complete failure of the coupling.



### Caution!

Please observe the safety instructions for installation and the recommendation on the use of tube supports (see page 374).

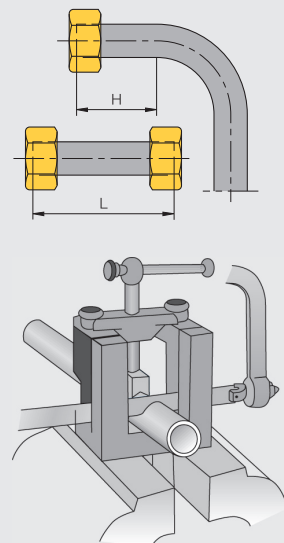


## 2. Tube preparation

2.1 Minimum lengths of the straight pipe ends must be taken into consideration when determining the tube lengths.

With machine pre-assembly, the minimum lengths can be found in the operating instructions of the respective pre-assembly equipment.

Series	Tube-OD	H	L
L	6/ 8	31	39
L	10/12	33	42
L	15	36	45
L	18	38	48
L	22/28	42	53
L	35/42	48	60
S	6/ 8	35	44
S	10/12	37	47
S	14/16	43	54
S	20	50	63
S	25	54	68
S	30	58	72
S	38	65	82

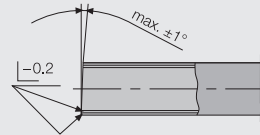
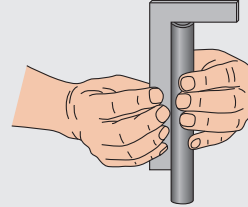


- 2.2 Saw off the tube at right angles. An angle tolerance of  $\pm 1^\circ$  is admissible. Do not use tube cutters or angle grinders.
- 2.3 Deburr the tube ends lightly on the inside and outside. Clean the tube.



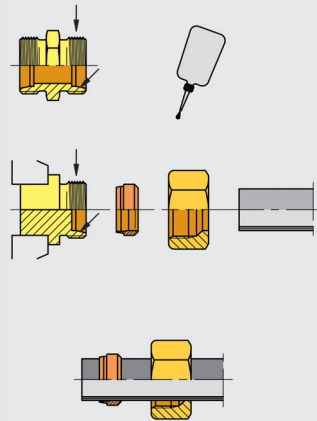
**Caution!**

- Tubes sawn off crooked or incorrectly deburred tubes reduce the service life and leak tightness of the connection.
- Use reinforcement sleeves with thin-walled steel tubes or soft tubes of NF metals (see page 374).



### 3. Assembly preparation

- 3.1 To simplify assembly, we recommend that the thread and the taper of the coupling connecting piece of the manual pre-assembly support are coated with lubricant.
- 3.2 Push the union nut and the 2S *plus* cutting ring onto the tube end. The cutting edges of the 2S *plus* cutting ring face towards the tube end.

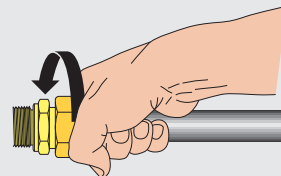


**Caution!**

Ensure that the 2S *plus* cutting ring is positioned correctly, otherwise assembly will not be correct.

### 4. Direct assembly in the coupling connecting piece

- 4.1 Insert the tube end into the coupling connecting piece and push in completely. During the assembly process, the tube must be held fully inserted to prevent incorrect assembly.
- 4.2 Screw on the union nut until there is tangible contact between the coupling connecting piece, 2S *plus* cutting ring and union nut.



4.3 Tighten the union nut with an open-end wrench.

- Up to tube OD 18 mm 1 1/2 turns
- Up to tube OD 20 mm 1 1/4 turns

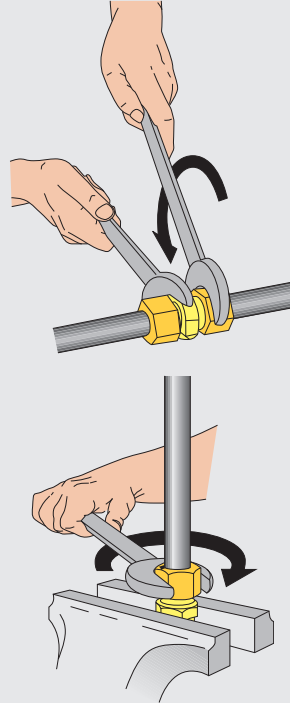
**Notes:**

- When installing in the pipeline, hold the coupling connecting piece with a wrench.
- In order to ensure the prescribed number of turns, we recommend that marks are made on the union nut and tube.
- The assembly procedure described under 4.3 also applies to pre-assembly in a vice.



**Caution!**

- Each coupling connecting piece may only be used once for an initial assembly. If it is used several times, functional impairments are possible.
- After assembly, a visual inspection to check the correct assembly result is absolutely crucial (see under point 6. checking).



## 5. Pre-assembly in hardened pre-assembly mandrel

The hardened pre-assembly supports are wear-resistant and permit uniform assembly results as they have closer tolerances.

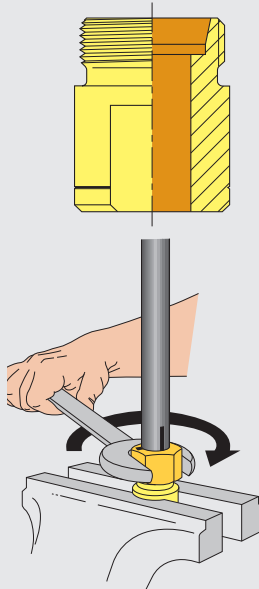
They should, however, be inspected for correct dimensions after approx. 50 pre-assemblies.

- 5.1 Replace pre-assembly supports that are no longer within the tolerances or are damaged in the taper area to prevent incorrect assembly.
- 5.2 Screw on the union nut until there is tangible contact between the pre-assembly support, 2S plus cutting ring and union nut.
- 5.3 Tighten the union nut with an open-end wrench.
  - Up to tube OD 18 mm 1 1/2 turns
  - Up to tube OD 20 mm 1 1/4 turns



**Caution!**

After each pre-assembly, a visual inspection to check the correct assembly result is absolutely crucial (see under point 6. checking).



## 6. Checking

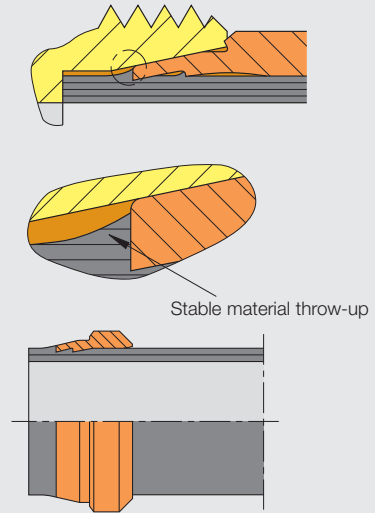
Loosen the union nut and inspect the material discharge. The material discharge must cover at least 80% of the cutting edge face.

In this position it must still be possible to turn the cutting ring on the tube. Remove any impurities.



### Caution!

If the collar is not raised sufficient, repeat the assembly with greater force. Check the result again.



## 7. Final Assembly

7.1 Carefully insert the tube end installed in the **coupling connecting piece** again into the coupling connecting piece in which it was installed. Then tighten the union nut strain-free by hand.

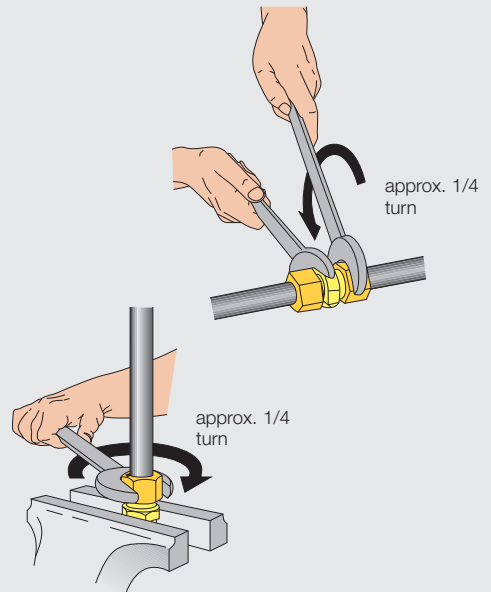
7.1.1 Tighten the union nut with a wrench (without extension) until a noticeable increase in force is felt.

7.1.2 Then tighten by a further 1/4 turn.

7.2 Carefully insert the tube end installed in the **hardened pre-assembly support** or machine pre-assembled pipe end into a (new) coupling connecting piece that has not yet been used for assembly and tighten the union nut strain-free by hand.

7.2.1 Tighten the union nut with a wrench (without extension) until a noticeable increase in force is felt.

7.2.2 Then tighten by a further 1/4 turn.



## 8. Repeat Assembly

Repeat assemblies can be carried out on the tube coupling. Tighten the union nut with the same force as for the original installation.

# Assembly Instructions for ES-4 Tube Couplings

## 1. Notes

These assembly instructions describe the two assembly options provided for in the German standard DIN 3859 Part 2:

- Direct assembly in the coupling connecting piece.
- Pre-assembly in hardened pre-assembly mandrel.

All the data below were determined under the following preconditions:

- Seamless steel tubes for precision applications to EN 10305-1.
- Tube material 1.0255+N to DIN 1630.
- Corrosion protection VOSS Zink-Nickel.

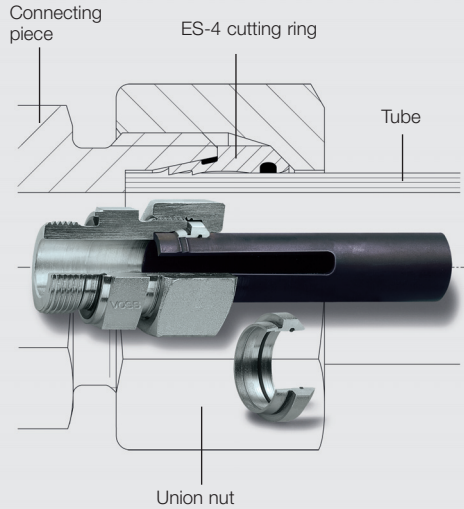
We recommend the use of VOSS pre-assembly devices for series-production assembly. The specifications in the respective operating instructions apply to the assembly procedures here.

Compliance with the assembly instructions is extremely important for fulfilling the functions of the ES-4 cutting ring couplings. Improper handling leads to risks with regard to safety and freedom from leaks, which can also result in the complete failure of the coupling under certain conditions.



### Caution!

Please observe the safety instructions for installation and recommendation on the use of tube support (see page 374).

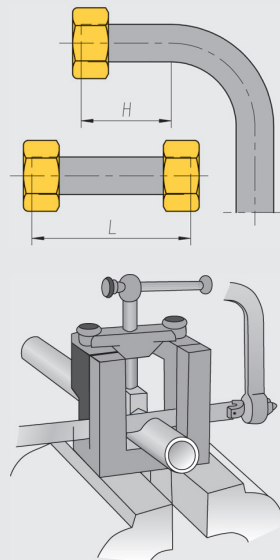


## 2. Tube preparation

2.1 Minimum dimensions of the straight tube ends must be taken into account for determining the tube lengths.

With machine pre-assembly, the minimum lengths are contained in the respective operating instructions of the pre-assembly devices.

Series	Tube-OD	H	L
L	6/ 8	31	39
L	10/12	33	42
L	15	36	45
L	18	38	48
L	22/28	42	53
L	35/42	48	60
S	6/ 8	35	44
S	10/12	37	47
S	14/16	43	54
S	20	50	63
S	25	54	68
S	30	58	72
S	38	65	82





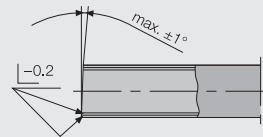
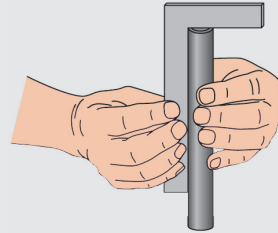
2.2 Saw off tube at a right angle. An angular tolerance of  $\pm 1^\circ$  is permissible. Do not use tube cutters or abrasive cutting machines.

2.3 Slightly deburr tube ends inside and outside. Clean tube.



**Caution!**

- Burrs on the outside tube diameter can damage the inner O-ring.
- Tubes cut crooked or improperly deburred reduce the service life and freedom from leaks of the coupling.
- With thin-walled steel tubes or soft tubes of non-ferrous metals, reinforcing sleeves should be used (see page 374).



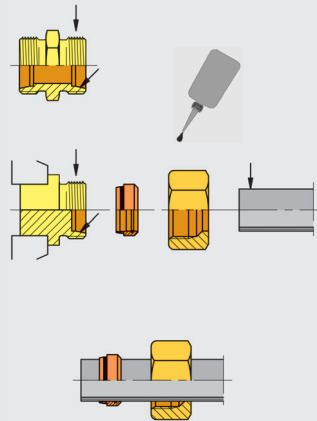
### 3. Assembly preparation

- 3.1 To simplify assembly, we recommend lubricating the thread and the taper of the coupling connecting piece or the manual pre-assembly mandrel.
- 3.2 Wetting of the tube end with lubricant makes it easier to push the ES-4 cutting ring onto the tube.
- 3.3 Push the union nut and the ES-4 cutting ring onto the tube end consecutively. The cutting edges of the ES-4 cutting ring face the tube end.



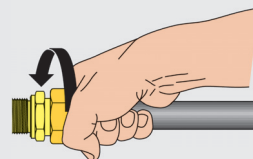
**Caution!**

Ensure that the ES-4 cutting ring is positioned correctly, otherwise assembly will not be correct.



### 4. Direct assembly in coupling connecting piece

- 4.1 Insert the tube end into the coupling connecting piece as far as possible and press on. During the assembly process the tube must be held on the stop to prevent incorrect assembly.
- 4.2 Screw on the union nut by hand until the coupling connecting piece, the ES-4 cutting ring and the union nut are felt to make contact.



4.3 Tighten the union nut with approx. 1 1/4 turns (at least 1 to a maximum of 1 1/2 turns). When doing so, the ES-4 cutting ring contacts the connecting piece face.

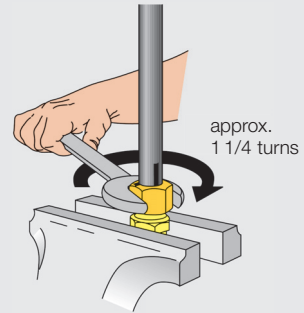
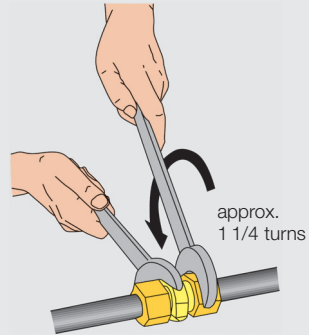
**Notes:**

- For assembly within the tube, tighten the coupling connecting piece with a spanner.
- To comply with the specified number of turns, it is recommended that marking lines be applied to the union nut and the tube.



**Caution!**

- Each coupling connecting piece may only be used once for initial assembly. In the case of multiple use, malfunctions can occur.
- Following assembly a visual inspection including checking of the correct assembly results is absolutely necessary (see point 6. Checking).



## 5. Pre-assembly in hardened pre-assembly mandrel

The hardened pre-assembly mandrels are wear-resistant and enable uniform assembly results, as they are more closely toleranced. They should be checked for trueness to gauge size after approx. every 50 pre-assemblies.

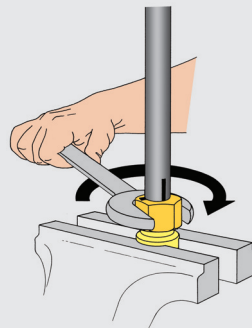
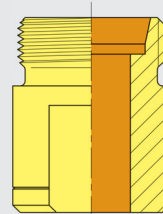
Replace pre-assembly mandrels which are not true to gauge size or are damaged in the cone area to prevent incorrect assembly.

- 5.1 Insert the tube end into the pre-assembly mandrel as far as possible and press on. During the assembly process the tube must be held on the stop to prevent incorrect assembly.
- 5.2 Screw on the union nut by hand until the pre-assembly mandrel, the ES-4 cutting ring and the union nut are felt to make contact.
- 5.3 Tighten the union nut with approx. 1 1/4 turns (at least 1 to a maximum of 1 1/2 turns). When doing so, the ES-4 cutting ring contacts the preassembly mandrel face.



**Caution!**

Following each pre-assembly a visual inspection including checking of the correct assembly results is absolutely necessary (see point 6. Checking).



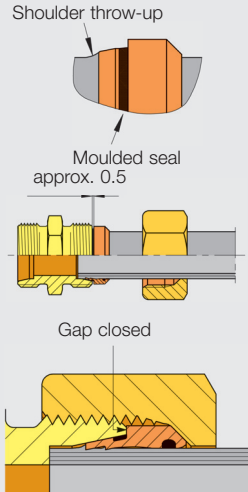
## 6. Checking

- 6.1 Unscrew the union nut and check the shoulder throw-up, gap width and the moulded seal.  
The shoulder throw-up must cover at least 80% of the cutting-edge face surface.  
The moulded seal must not be damaged. Remove possible soiling and replace the moulded seal if necessary.
- 6.2 Due to slight springing back during disassembly of the tube coupling, a gap of approx. 0.5 mm results between the ES-4 cutting ring and the coupling face (or pre-assembly coupling piece face).  
This gap is closed again during finish assembly.



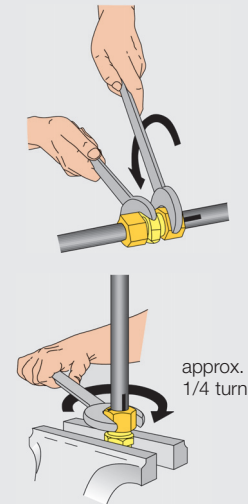
### Caution!

- With a different gap width or an insufficient shoulder throw-up, repeat assembly with increased force and check again.
- It may still be possible to turn the ES-4 cutting ring on the tube.



## 7. Finish assembly

- 7.1 **Carefully reinsert the tube end mounted in the coupling connecting piece** in which it was assembled. When inserting, make sure that the moulded seal is not damaged and lies properly in the seal groove. Then tighten the union nut hand-tight and stress-free.
- 7.1.1 Tighten the union nut with the spanner with the same amount of force as during initial assembly. When doing so, the ES-4 cutting ring firmly contacts the connecting piece face.
- 7.2 **Carefully insert the tube end pre-assembled in the hardened pre-assembly mandrel** or machine pre-assembled in a (new) coupling connecting piece not yet used for assembly and tighten the union nut hand-tight and stress-free. When inserting, make sure that the moulded seal is not damaged and lies properly in the seal groove.
- 7.2.1 Tighten union nut with spanner (without extension) up to noticeable increase in force.
- 7.2.2 Then tighten another 1/4 turn. When doing so, the ES-4 cutting ring contacts the connecting piece face gap-free again.



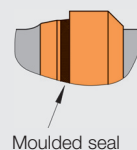
## 8. Repeat assembly

- 8.1 Each time the tube coupling is unscrewed, the moulded seal must be checked for damage and replaced if necessary.
- 8.2 In case of repeat finish mounting, the union nut must be tightened again with the same amount of force as during initial assembly.



### Caution!

The assembly result, such as the shoulder throw-up, moulded seal and gap, must be checked (see 6. Checking).



# Assembly Instructions for ES-4VA Tube Couplings

## 1. Notes

ES-4VA cutting rings **must** be pre-assembled in hardened tools.

These assembly instructions describe the pre-assembly in the hardened manual preassembly mandrel.

All the data below were determined under the following preconditions:

- Seamless cold-drawn stainless steel tubes with tolerances to EN 10305-1.
- Heat treated scale-free (heat treatment methods to DIN 17458), of material 1.4571+m.
- Use of assembly paste MPE.

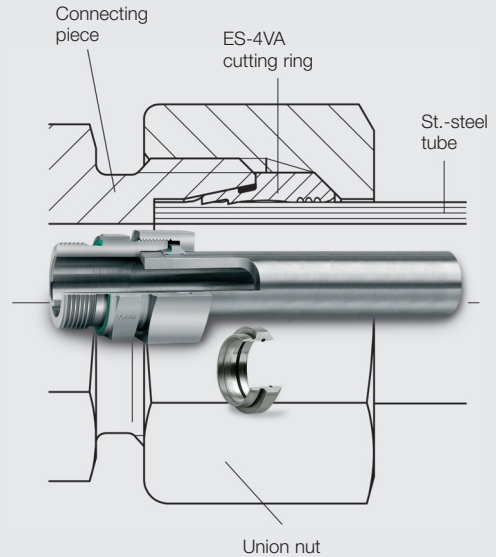
With series-production assembly and from the cutting ring sizes L 15 or S 16, we recommend the use of VOSS pre-assembly devices for pre-assembling the ES-4VA cutting rings. The specifications in the respective operating instructions apply to the assembly procedures here.

Compliance with the assembly instructions is extremely important for fulfilling the functions of the ES-4VA cutting ring couplings. Incorrect handling will lead to risks with regard to safety and leaking of the connection.



### Caution!

Please observe the safety instructions for installation and the recommendation on the use of tube supports (see page 374).

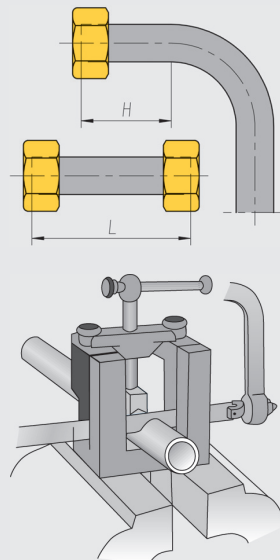


## 2. Tube preparation

2.1. Minimum dimensions of the straight tube ends must be taken into account for determining the tube lengths.

With machine pre-assembly, the minimum lengths are contained in the respective operating instructions of the pre-assembly devices.

Series	Tube-OD	H	L
L	6/ 8	31	39
L	10/12	33	42
L	15	36	45
L	18	38	48
L	22/28	42	53
L	35/42	48	60
S	6/ 8	35	44
S	10/12	37	47
S	14/16	43	54
S	20	50	63
S	25	54	68
S	30	58	72
S	38	65	82



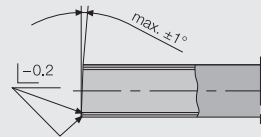
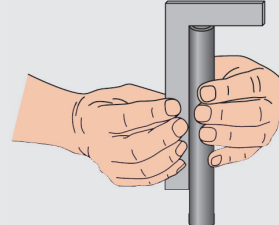
2.2 Saw off tube at a right angle. An angular tolerance of  $\pm 1^\circ$  is permissible. Do not use tube cutters or abrasive cutting machines.

2.3 Slightly deburr tube ends inside and outside. Clean tube.



**Caution!**

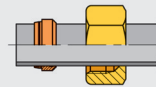
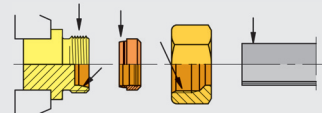
- Tubes cut crooked or improperly deburred reduce the service life and freedom from leaks of the coupling.
- With thin-walled stainless-steel tubes, reinforcing sleeves of the material 1.4571 must be used (see page 374).



### 3. Preparing pre-assembly

3.1 To properly carry out pre-assembly, the threads of the assembly mandrel and the union nut, as well as the taper surfaces must be lubricated with assembly paste (e.g. MPE assembly paste).

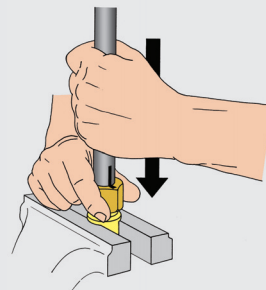
3.2 In the next step the union nut and ES-4VA cutting ring must be pushed onto the tube end. Ensure proper positioning when doing so (see illustration).



### 4. Pre-assembly in hardened pre-assembly mandrel

The hardened pre-assembly mandrels are wear-resistant and enable uniform assembly results, as they are more closely tolerated. They should be checked for trueness to gauge size after approx. every 50 pre-assemblies.

Replace pre-assembly mandrels which are not true to gauge size or are damaged in the cone area to prevent incorrect assembly.

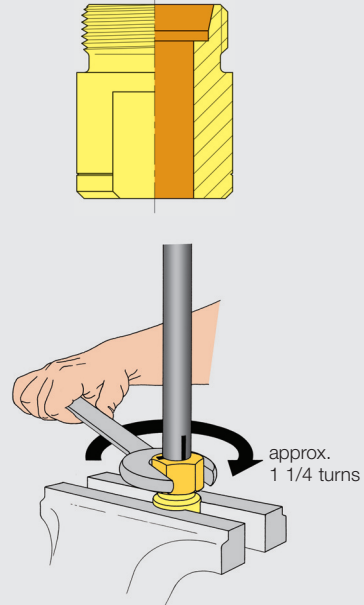


- 4.1 Insert the tube end into the manual pre-assembly mandrel as far as possible and press on. During the assembly process the tube must be held on the stop to prevent incorrect assembly.
- 4.2 Screw on the union nut by hand until the manual pre-assembly mandrel, the ES-4VA cutting ring and the union nut are felt to make contact.
- 4.3 Tighten the union nut with approx. 1 1/4 turns (at least 1 to a maximum of 1 1/2 turns). When doing so, the ES-4VA cutting ring contacts the manual pre-assembly mandrel face. A marking line on the union nut and tube simplifies observance of the specified number of turns.



**Caution!**

Following pre-assembly a visual inspection including checking of the correct assembly results is absolutely necessary (see point 5. Checking).



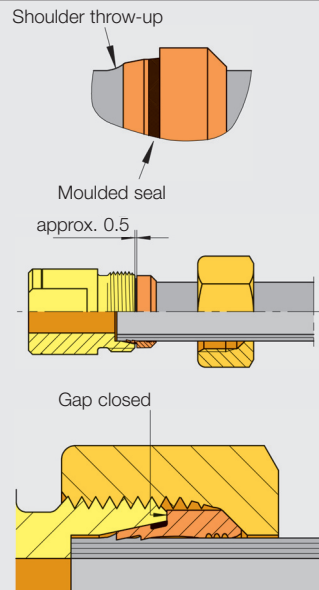
**5. Checking**

- 5.1 Unscrew the union nut and check the shoulder throw-up, gap width and the moulded seal. The shoulder throw-up must cover at least 70% of the cutting-edge face surface. The moulded seal must not be damaged. Remove possible soiling and replace the moulded seal if necessary.
- 5.2 Due to slight springing back during disassembly of the tube coupling, a gap of approx. 0.5 mm results between the ES-4VA cutting ring and the manual pre-assembly mandrel face. This gap is closed again during finish assembly.



**Caution!**

- With a different gap width or an insufficient shoulder throw-up, repeat assembly with increased force and check again.
- It may still be possible to turn the ES-4VA cutting ring on the tube.



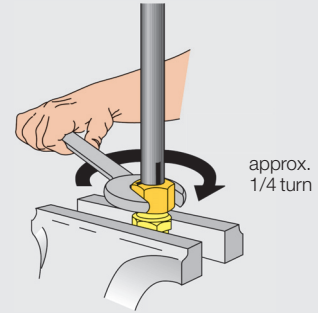
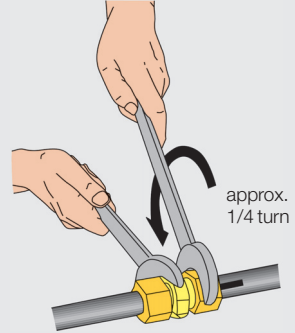
## 6. Finish assembly

- 6.1 Join the tube end pre-assembled by machine or in the hardened pre-assembly mandrel into a new coupling connecting piece. When inserting, make sure that the moulded seal is not damaged and lies properly in the seal groove.
- 6.2 Tighten union nut hand-tight.
- 6.3 Tighten the union nut with a spanner (without extension) up to a noticeable increase in force.
- 6.4 Tighten another 1/4 turn. When doing so, the ES-4VA cutting ring firmly contacts the connecting piece face.



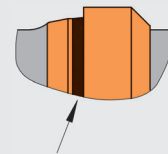
### Caution!

During final tightening, always tighten the coupling connecting piece with a spanner or clamp in a vice.



## 7. Repeat assembly

- 7.1 Each time the tube coupling is unscrewed, the moulded seal must be checked for damage and replaced if necessary.
- 7.2 In case of repeat finish mounting, the union nut must be tightened again with the same amount of force as during initial assembly. Tighten the coupling connecting piece with a spanner.



Moulded seal

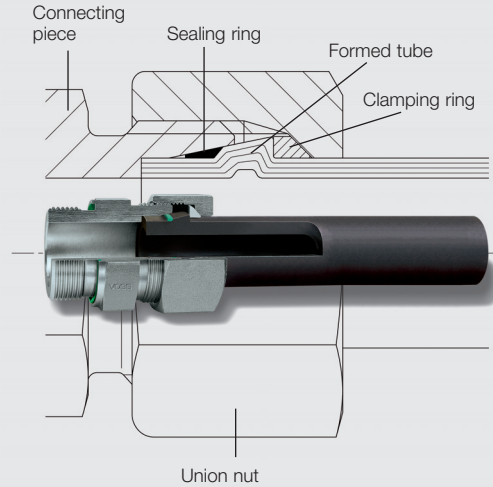
# Assembly Instructions for VOSSForm<sup>SQR</sup> Tube Couplings

## 1. Notes

These assembly instructions describe the tube forming and final assembly of VOSSForm<sup>SQR</sup>.

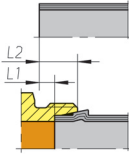
Compliance with the assembly instructions is extremely important for fulfilling the functions of the VOSSForm<sup>SQR</sup> tube coupling.

Improper handling leads to risks with regard to safety and freedom from leaks, which can also result in the complete failure of the coupling under certain conditions.

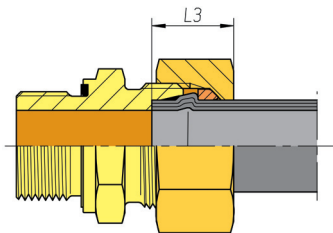


## 2. Tube preparation

2.1 When determining the tube lengths, the upsetting lengths L1/L2 must be taken into consideration. The tube is shortened by this distance during the forming process.



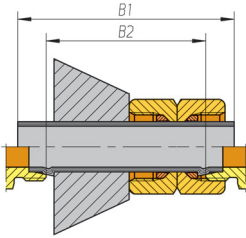
Furthermore, minimum lengths for clamping of the tube ends have to be taken into consideration.



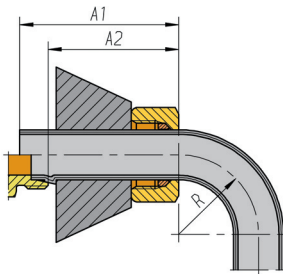
Height of completely assembled VOSSForm<sup>SQR</sup> connection.

Series	Tube-OD	s	L1	L2	L3 approx.	A1	A2	B1	B2
L	6	1	5.1	12.1	15.8	69	56	91	65
		1.5	5.6	12.6	16.5				
		2	4.9	11.9	16.5				
L	8	1	5.1	12.1	15.8	64	51	86	60
		1.5	5.1	12.1	16.5				
		2	4.4	11.4	16.5				
		2.5	3.8	10.8	16.5				
L	10	1	5.2	12.2	15.8	59	46	81	55
		1.5	5.2	12.2	16.5				
		2	4.5	11.5	16.5				
L	12	1	5.2	12.2	15.8	58	45	80	54
		1.5	5.1	12.1	16.5				
		2	4.3	11.3	16.5				
L	15	1.5	5.6	12.6	18.0	68	54	91	64
		2	4.7	11.7	18.0				
		2.5	4.5	11.5	18.0				
L	18	1.5	5.8	13.3	19.0	73	59	98	70
		2	4.7	12.2	19.0				
		2.5	4.5	12.0	19.0				
		3	4.5	12.0	19.0				
L	22	1.5	6.6	14.1	20.3	82	68	108	79
		2	5.5	13.0	20.3				
		2.5	4.9	12.4	20.3				
		3	4.8	12.3	20.3				
L	28	2	5.5	13.0	20.2	91	77	116	88
		2.5	4.9	12.4	20.2				
		3	5.0	12.5	20.2				
L	35	2	7.7	18.2	24.7	115	97	145	109
		2.5	6.7	17.2	24.7				
		3	7.2	17.7	25.7				
		4	6.9	17.4	25.7				
L	42	2	7.5	18.5	25.2	116	97	146	109
		2.5	6.9	17.9	25.2				
		3	7.0	18.0	26.2				
		4	6.7	17.7	26.2				
S	6	1	5.1	12.1	16.3	69	56	91	65
		1.5	5.6	12.6	17.0				
		2	4.9	11.9	17.0				
S	8	1	5.1	12.1	16.3	64	51	86	60
		1.5	5.1	12.1	17.0				
		2	4.4	11.4	17.0				
		2.5	3.8	10.8	17.0				



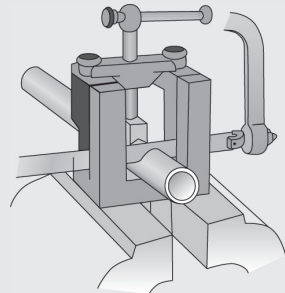


Minimum lengths for clamping in straight tubes



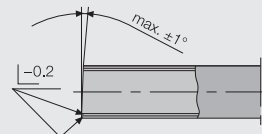
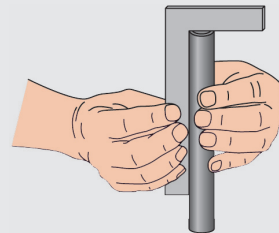
Minimum lengths for clamping in curved tubes  
(for  $R \geq 3x$  Tube-OD)

Series	Tube-OD	s	L1	L2	L3 ca.	A1	A2	B1	B2
S	10	1.5	6.1	13.6	19.0	62	48	87	59
		2	5.1	12.6	19.0				
		2.5	4.5	12.0	19.0				
S	12	1.5	5.7	13.2	19.0	62	48	87	59
		2	4.9	12.4	19.0				
		2.5	4.4	11.9	19.0				
S	14	1.5	6.0	14.0	21.0	70	55	97	67
		2	5.3	13.3	21.0				
		2.5	4.8	12.8	21.0				
S	16	1.5	6.2	14.7	21.5	73	58	100	69
		2	5.2	13.7	21.5				
		2.5	4.8	13.3	21.5				
S	20	2	7.8	18.3	25.6	86	67	118	80
		2.5	6.4	16.9	25.6				
		3	6.0	16.5	25.6				
S	25	3.5	5.8	16.3	25.6	100	80	135	94
		4	5.6	16.1	25.6				
		2	7.7	19.7	28.7				
S	30	2.5	6.7	18.7	28.7	123	102	160	118
		3	6.3	18.3	28.7				
		4	6.0	18.0	28.7				
S	38	2	7.7	21.2	31.2	134	108	178	125
		2.5	6.9	20.4	31.2				
		3	7.4	20.9	32.2				
S	38	4	6.9	20.4	32.2	134	108	178	125
		5	6.7	20.2	32.2				
		2.5	10.5	26.5	35.1				
		3	8.8	24.8	35.1				
S	38	4	8.8	24.8	36.1	134	108	178	125
		5	8.1	24.1	36.1				
		6	7.8	23.8	36.1				



2.2 Saw off tube at a right angle. An angular tolerance of  $\pm 1^\circ$  is permissible. Do not use tube cutters or abrasive cutting machines.

2.3 Slightly deburr tube ends inside and outside, and clean tubing.



**Caution!**

- Burrs on the outside and inside tube diameter can negatively affect the forming process.
- Tubes sawed off crooked or improperly deburred reduce the service life and freedom from leaks of the coupling.

### 3. Oiling of the tools and steel tubes

#### 3.1 Oiling of the tools

##### Clamping jaws:

At every tool change or after 100 forming operations, the outer taper of the clamping jaws must be oiled lightly with hydraulic oil or a non-gumming MoS<sub>2</sub>-based lubricant.



##### Caution!

Take care to ensure that no oil is applied to the clamping jaw splines to prevent the holding function from being impaired.

##### Forming head:

The forming head is coated with corrosion inhibitor on delivery. This coating must be removed before the first use of the tool for forming.

As the tubes are always oiled (see point 2), additional oiling of the forming head is not necessary.

#### 3.2 Oiling of the steel tubes

##### Oiling of phosphated steel tubes:

In order to reduce tool wear, roughly every 10th tube should be coated with a thin film of hydraulic oil on the inside and outside in the forming area.

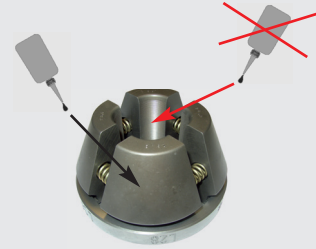
##### Oiling of galvanised steel tubes:

In order to reduce tool wear, every tube should be coated with a thin film of hydraulic oil on the inside and outside in the forming area.



##### Caution!

An excessively thick oil film on the outside of the tube will be trapped between forming head and tube during forming and this falsifies the precision of the contours.



### 4. Pre-assembly tube forming

#### Process-reliable pre-assembly

Forming with the VOSSForm100 pre-assembly device is extremely simple. The simple pushing in of the tube end against the stop and the monitored forming allows no errors to occur.

The inner mandrel on the forming head prevents a constriction of the tube in the formed area. The inside tube diameter is completely retained, preventing pressure losses due to inward arching.

The operating instructions of the pre-assembly device must always be observed.

- 4.1 Slide union nut with integrated clamping ring onto tube end so that inner thread side faces forming side.



## 4.2 Forming process

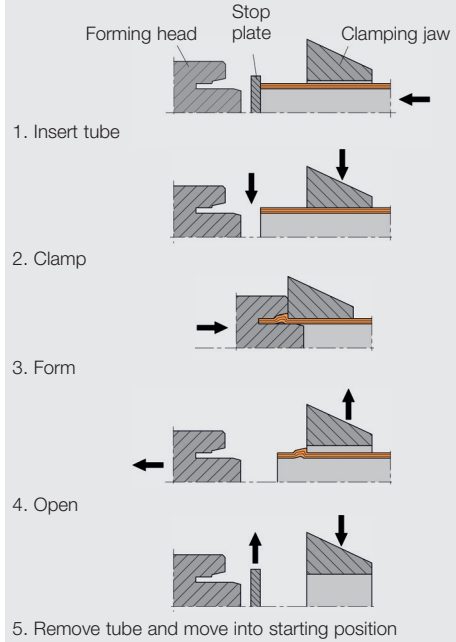
Forming begins with the tube being pushed into the pre-assembly machine against the stop plate. Pressing the Start button triggers the process (1.).

The clamping jaws close and clamp the tube in place. The stop plate swivels out of the forming area (2.).

The forming head moves forward and forms the VOSS contour plastically on the tube (3.).

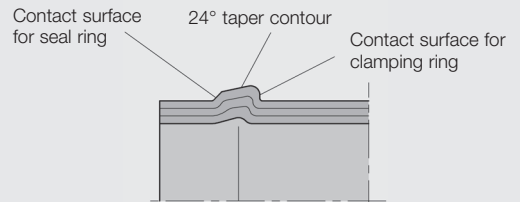
The forming head moves back and the clamping jaws open (4.).

Removal of the tube is monitored. As a result, the device can automatically move into the starting position again and begin the next tube forming process without the necessity of manual resetting (5.).



## 5. Checking

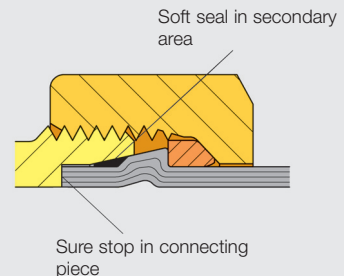
- A visual inspection of the quality of the three characteristic features is sufficient.



## 6. Assembly safety

Assembly safety with sure stop

Safe assemblies mean safe connections. With the VOSSForm<sup>SOFT</sup> System the face of the tube end strikes against the bottom of the standard DIN/ISO connecting piece during assembly. When the nut is tightened, the end of assembly becomes clear from a noticeable increase in force. Under and over-tightening can be virtually eliminated. In addition, the assembly distance is reduced, and with it the mounting time. The formed-on contour is deeply inserted into the 24° taper, ensuring stable seating.



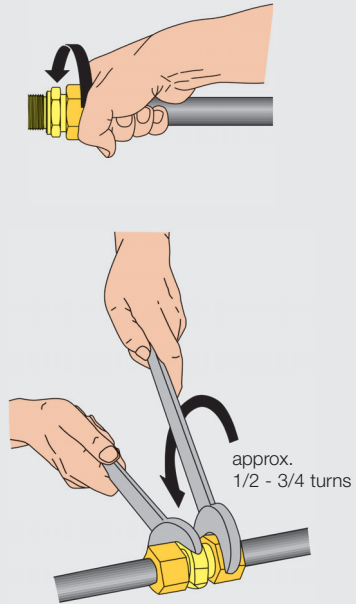
## 7. Final assembly

- 7.1 Fit seal ring.
- 7.2 Oil coupling parts and tube.
- 7.3 Screw on union nut by hand until all coupling components contact the block, i.e. are tightened hand-tight.

The final tightening (distance-dependent assembly) must be carried out with approx. 1/2 - 3/4 turn of the union nut.

For assembly within a tube, brace the coupling connecting piece with a spanner.

A marking line on the union nut and tube simplifies observance of the tightening distance.



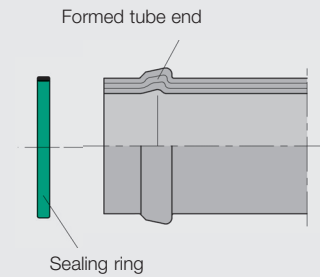
## 8. Repeat assemblies

- 8.1 Each time the tube coupling is unscrewed, the moulded seal must be checked for damage and replaced if necessary.
- 8.2 During a repeated finish assembly, the union nut must only be tightened by 1/4-1/2 turn after hand tightening.



### Caution!

The forming result, such as a 24° taper contour, the contact surface for the moulded seal and the clamping ring must be checked (see 5. Checking).



## 9. Tightening torques

9.1 Distance-dependent assembly can be checked by checking the torque applied. The tightening torques are approximate values. They were determined under the following conditions:

- Seamless precision steel tubes according to EN 10305-1.
- Tube material 1.0255+N according to DIN 1630.
- Corrosion protection for the fitting components of VOSS Zink-Nickel.  
Union nut additionally waxed.

Series	Tube-OD	Tightening torque Nm ± 5 %	Series	Tube-OD	Tightening torque Nm ± 5 %
L	6	20	S	6	25
L	8	30	S	8	40
L	10	40	S	10	50
L	12	50	S	12	60
L	15	70	S	14	75
L	18	90	S	16	85
L	22	120	S	20	140
L	28	160	S	25	190
L	35	250	S	30	270
L	42	380	S	38	400

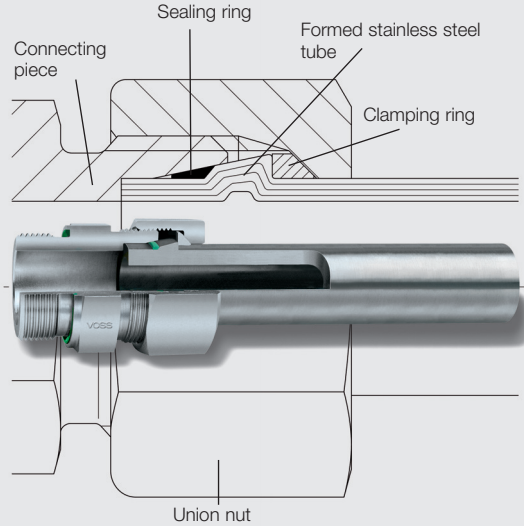
# Assembly Instructions for VOSSForm<sup>SQR</sup> VA Tube Couplings

## 1. Notes

These assembly instructions describe the tube forming and final assembly of VOSSForm<sup>SQR</sup> VA.

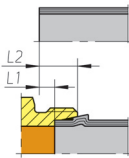
Compliance with the assembly instructions is extremely important for fulfilling the functions of the VOSSForm<sup>SQR</sup> VA tube coupling.

Improper handling leads to risks with regard to safety and freedom from leaks, which can also result in the complete failure of the coupling under certain conditions.

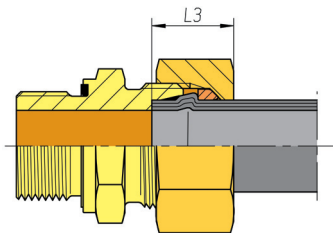


## 2. Tube preparation

2.1 When determining the tube lengths, the upsetting lengths L1/L2 must be taken into consideration. The tube is shortened by this distance during the forming process.

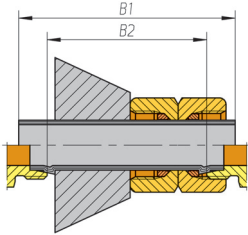


Furthermore, minimum lengths for clamping of the tube ends have to be taken into consideration.

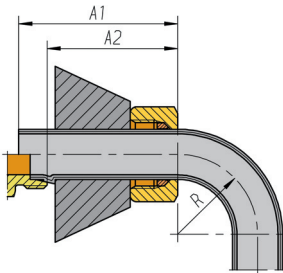


Height of completely assembled VOSSForm<sup>SQR</sup> VA connection.

Series	Tube-OD	s	L1	L2	L3 approx.	A1	A2	B1	B2
L 6	6	1	5.1	12.1	15.6	68	56	90	65
		1.5	5.4	12.4	16.3				
		2	4.9	11.9	16.3				
L 8	8	1	5.4	12.4	15.6	63	51	84	60
		1.5	5.2	12.2	16.3				
		2	4.6	11.6	16.3				
		2.5	4.1	11.1	16.3				
L 10	10	1	5.4	12.4	15.6	59	46	81	55
		1.5	5.8	12.8	16.3				
		2	4.9	11.9	16.3				
L 12	12	1	5.6	12.6	15.6	58	45	79	54
		1.5	5.5	12.5	16.3				
		2	4.9	11.9	16.3				
L 15	15	1.5	5.8	12.8	17.8	67	54	90	64
		2	5.1	12.1	17.8				
		2.5	4.7	11.7	17.8				
L 18	18	1.5	5.7	13.2	18.8	72	59	96	70
		2	5	12.5	18.8				
		2.5	4.5	12.0	18.8				
		3	4.8	12.3	18.8				
L 22	22	1.5	6.5	14.0	19.7	82	68	107	79
		2	5.9	13.4	19.7				
L 28	28	2	5.5	13.0	19.3	90	77	114	88
		2.5	5.5	13.0	19.3				
		3	5.7	13.2	19.3				
L 35	35	2	8.1	18.6	24.4	115	97	145	109
		2.5	7.7	18.2	24.4				
		3	7.5	18.0	25.4				
L 42	42	2	7.9	18.9	24.9	116	97	148	109
		3	8.4	19.4	25.9				



Minimum lengths for clamping in straight tubes



Minimum lengths for clamping in curved tubes  
(for  $R \geq 3x$  tube-OD)

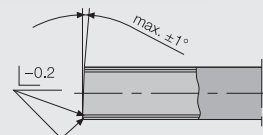
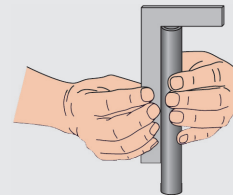
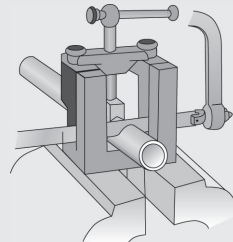
Series	Tube-AD	s	L1	L2	L3 approx.	A1	A2	B1	B2
S	6	1	5.1	12.1	16.1	68	56	90	65
		1.5	5.4	12.4	16.8				
		2	4.9	11.9	16.8				
S	8	1	5.4	12.4	16.1	63	51	84	60
		1.5	5.2	12.2	16.8				
		2	4.6	11.6	16.8				
		2.5	4.1	11.1	16.8				
S	10	1.5	6.4	13.9	18.8	62	48	87	59
		2	5.6	13.1	18.8				
		2.5	5	12.5	18.8				
S	12	1.5	5.5	13.0	18.8	61	48	85	59
		2	5.3	12.8	18.8				
		2.5	5.1	12.6	18.8				
		3	4.6	12.1	18.8				
S	14	1.5	6.2	14.2	20.8	69	55	95	67
		2	5.5	13.5	20.8				
		2.5	4.9	12.9	20.8				
		3	5	13.0	20.8				
S	16	1.5	6.6	15.1	20.8	73	58	99	69
		2	5.4	13.9	20.8				
		2.5	4.7	13.2	20.8				
		3	4.7	13.2	20.8				
S	20	2	7	17.5	25.3	85	67	115	80
		2.5	6.9	17.4	25.3				
		3	6.2	16.7	25.3				
S	25	2	7.9	19.9	28.3	100	80	134	94
		2.5	6.9	18.9	28.3				
		3	6.7	18.7	28.3				
		4	6.8	18.8	28.3				
S	30	2.5	7.5	21.0	30.8	123	102	161	118
		3	7.9	21.4	31.8				
		4	7.8	21.3	31.8				
		5	7.8	21.3	31.8				
S	38	3	10	26.0	36.9	134	108	176	125
		4	9.7	25.7	37.9				
		5	9.1	25.1	37.9				
		5	9.1	25.1	37.9				

## 2.2 Tube specification:

- Seamless cold-drawn stainless steel tubes with tolerances to EN 10305-1.
- Heat treated scale-free (heat treatment methods to DIN 17458), of material 1.4571+m.

2.3 Saw off the stainless steel tube at right angles. An angle tolerance of  $\pm 1^\circ$  is admissible. Do not use tube cutters or angle grinders.

2.4 Slightly deburr tube ends inside and outside, and clean tubing.



### Caution!

- Burrs on the outside and inside tube diameter can negatively affect the forming process.
- Tubes sawed off crooked or improperly deburred reduce the service life and freedom from leaks of the coupling.

### 3. Oiling of the tools and stainless steel tubes

#### 3.1 Oiling of the tools

##### Clamping jaws:

At every tool change or after 100 forming operations, the outer taper of the clamping jaws must be oiled lightly with hydraulic oil or a non-gumming MoS<sub>2</sub>-based lubricant.

##### Caution!



Take care to ensure that no oil is applied to the clamping jaw splines to prevent the holding function from being impaired.

##### Forming Head:

The forming head is coated with corrosion inhibitor on delivery. This coating must be removed before the first use of the tool for forming.

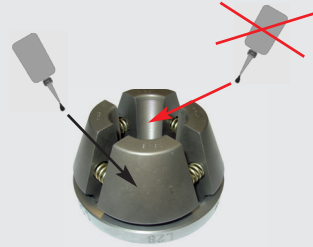
#### 3.2 Oiling of the stainless steel tubes

To ensure flawless forming, each tube must be coated on the inside and outside in the forming area with a thin film of oil.

##### Caution!



An excessively thick oil film on the outside of the tube will be trapped between upsetting tool and tube during forming and this falsifies the precision of the contours. The VOSS forming oil FOE must always be used (normal hydraulic oil is not admissible).



### 4. Pre-assembly tube forming

#### Process-reliable pre-assembly

Forming with the VOSSForm100 pre-assembly device is extremely simple. The simple pushing in of the tube end against the stop and the monitored forming allows no errors to occur.

The inner mandrel on the forming head prevents a constriction of the tube in the formed area. The inside tube diameter is completely retained, preventing pressure losses due to inward arching.

The operating instructions of the pre-assembly device must always be observed.

- 4.1 Slide union nut with integrated clamping ring onto tube end so that inner thread side faces forming side.





## 4.2 Forming process

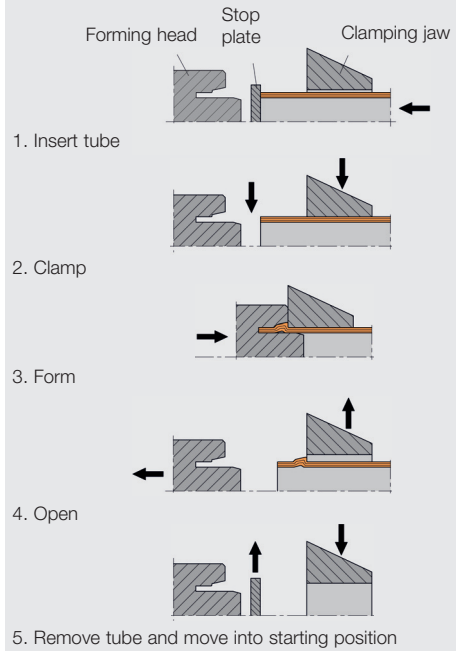
Forming begins with the tube being pushed into the pre-assembly machine against the stop plate. Pressing the Start button triggers the process (1.).

The clamping jaws close and clamp the tube in place. The stop plate swivels out of the forming area (2.).

The forming head moves forward and forms the VOSS contour plastically on the tube (3.).

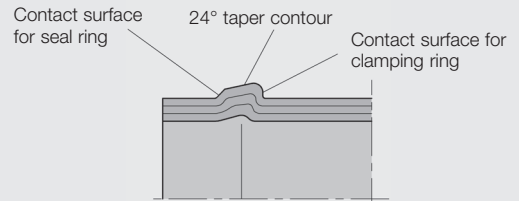
The forming head moves back and the clamping jaws open (4.).

Removal of the tube is monitored. As a result, the device can automatically move into the starting position again and begin the next tube forming process without the necessity of manual resetting (5.).



## 5. Checking

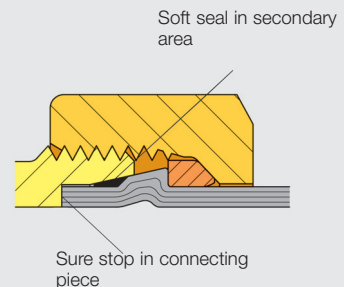
- A visual inspection of the quality of the three characteristic features is sufficient.



## 6. Assembly safety

Assembly safety with sure stop

Safe assemblies mean safe connections. With the VOSSForm<sup>SGR</sup> VA System the face of the tube end strikes against the bottom of the standard DIN/ISO St.-steel connecting piece during assembly. When the st.-steel nut is tightened, the end of assembly becomes clear from a the noticeable increase in force. Under and over-tightening can be virtually eliminated. In addition, the assembly distance is reduced, and with it the mounting time. The formed-on contour is deeply inserted into the 24° taper, ensuring stable seating.



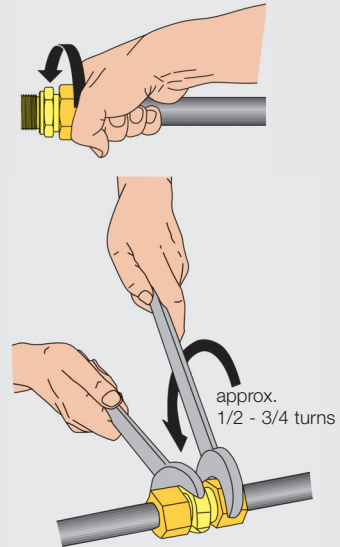
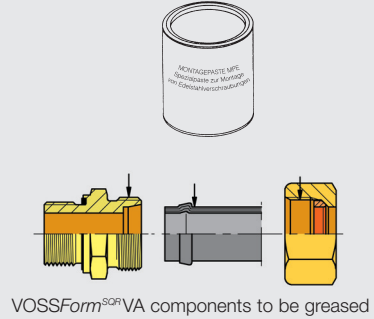
## 7. Final assembly

- 7.1 Fit seal ring.
- 7.2 Coat support thread, union nut and contact surfaces of clamping ring and tube with assembly paste MPE.
- 7.3 Screw on union nut by hand until all coupling components contact the block, i.e. are tightened hand-tight.

The final tightening (distance-dependent assembly) must be carried out with approx. 1/2 - 3/4 turn of the union nut.

For assembly within a tube, brace the coupling connecting piece with a spanner.

A marking line on the union nut and tube simplifies observance of the tightening distance.



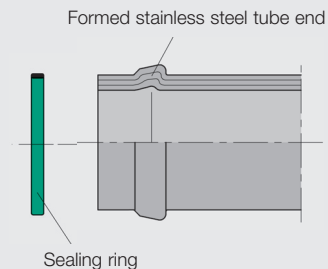
## 8. Repeat assemblies

- 8.1 Each time the tube coupling is unscrewed, the moulded seal must be checked for damage and replaced if necessary.
- 8.2 During a repeated finish assembly, the union nut must only be tightened by 1/4-1/2 turn after hand tightening.



### Caution!

The forming result, such as a 24° taper contour, the contact surface for the moulded seal and the clamping ring must be checked (see 5. Checking).



## 9. Tightening torques

Distance-dependent assembly can be checked by checking the torque applied. The tightening torques are approximate values. They were determined using assembly paste MPE.

Series	Tube-OD	Tightening torque Nm ± 5 %	Series	Tube-OD	Tightening torque Nm ± 5 %
L	6	25	S	6	30
L	8	35	S	8	50
L	10	55	S	10	65
L	12	65	S	12	85
L	15	90	S	14	115
L	18	125	S	16	125
L	22	150	S	20	220
L	28	220	S	25	300
L	35	380	S	30	430
L	42	580	S	38	640

# Assembly Instructions for BV-10 Flared Couplings

## 1. Notes

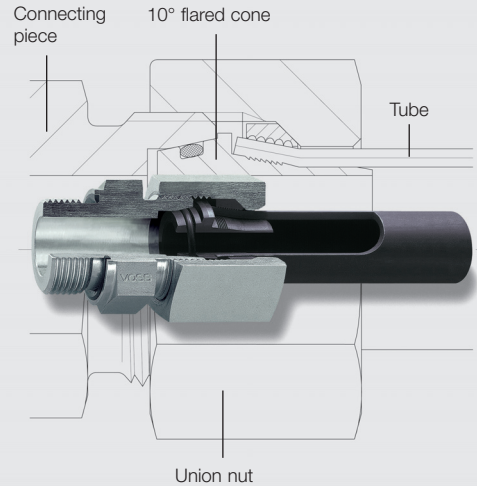
These assembly instructions describe the pre-assembly and final assembly of BV-10 flared couplings.

All the data below were determined under the following preconditions:

- Seamless steel tubes for precision applications to EN 10305-1.
- Tube material 1.0255+N to DIN 1630.
- Fitting components oiled as described in these assembly instructions.

Various VOSS pre-assembly devices are available for pre-assembly of the flared cone. The specifications in the respective operating instructions apply to the assembly procedures here.

Compliance with the assembly instructions is extremely important for fulfilling the functions of the BV-10 flared couplings. Improper handling leads to risks with regard to safety and freedom from leaks, which can also result in the complete failure of the coupling under certain conditions.



## 2. Tube preparation

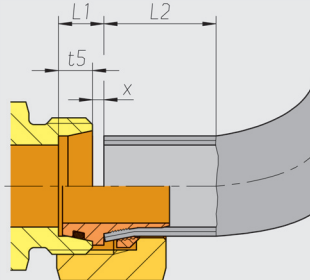
2.1 Determine the tubing dimensions using the following table of dimensions.

Series	Tube-OD	t5 DIN 3861	x appr.	L1 appr.	L2 appr.
L	6	7.0	0.8	7.8	55
L	8	7.0	1.1	8.1	55
L	10	7.0	0.5	7.5	60
L	12	7.0	0.5	7.5	62
L	15	7.0	0.5	7.5	62
L	18	7.5	1.5	9.0	63
L	22	7.5	1.5	9.0	65
L	28	7.5	1.5	9.0	72
L	35	10.5	2.8	13.3	75
L	42	11.0	3.0	14.0	75
S	8	7.0	2.4	9.4	55
S	10	7.5	2.4	9.9	60
S	12	7.5	2.4	9.9	60
S	14	8.0	3.4	11.4	65
S	16	8.5	2.5	11.0	65
S	20	10.5	3.5	14.0	70
S	25	12.0	3.5	15.5	75
S	30	13.5	4.5	18.0	75
S	38	16.0	5.0	21.0	78

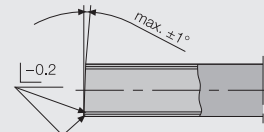
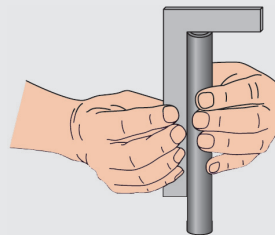
2.2 Saw off tube at a right angle. An angular tolerance of  $\pm 1^\circ$  is permissible.

Do not use tube cutters or abrasive cutting machines.

Slightly deburr tube end inside and outside. Clean tubing.



The illustration shows a 10° flared cone with an outer supporting stop.



## 3. Pre-assembly devices

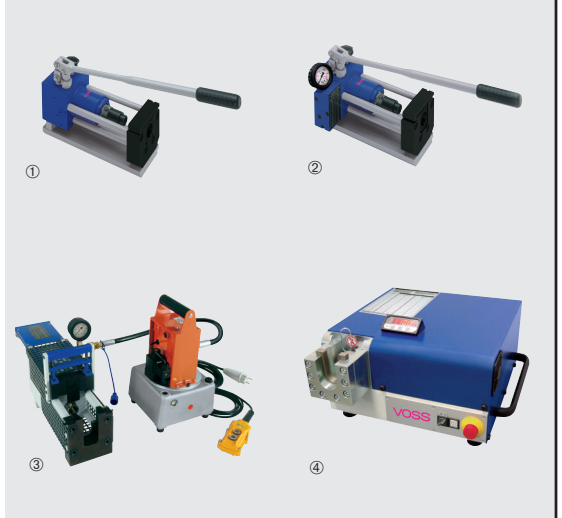
The following pre-assembly devices are available for assembling the 10° flared cone:

- ① Type 80 N
- ② Type 80 N2
- ③ Type 86 E/P
- ④ Type 90 Basic



### Caution!

Be sure to follow the operating instructions of the pre-assembly device used at all times.



## 4. Pre-assembly

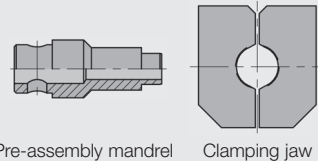
4.1 When using the pre-assembly devices Type 86 and Type 90 Basic, set the assembly pressure (approximate value) to match the outside diameter and wall thickness of the tube as specified in the Pressure Table mounted on the device. Be sure to observe the operating instructions.

4.2 Place the flared-cone pre-assembly mandrel and the clamping jaw that match the outside tube diameter and wall thickness to be assembled in the assembly chamber.

Insert locking pin! The locking plate must also be in place, see operating instructions.

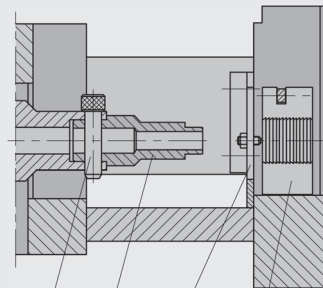
4.3 Slide the union nut and clamping ring onto the tube as shown.

Flared cone  
Pre-assembly tools



Pre-assembly mandrel

Clamping jaw

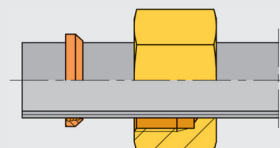


Locking pin

Locking plate

Pre assembly mandrel

Clamping jaw



4.4 Always oil the teeth and cylindrical collar of the 10° flared cone and slide them onto the neck of the pre-assembly mandrel.

4.5 Slide the tube fitted with the union nut and clamping ring through the hole in the clamping jaw from the outside until it meets the centre of the 10° flared cone.

The union nut and clamping ring remain outside the assembly chamber!

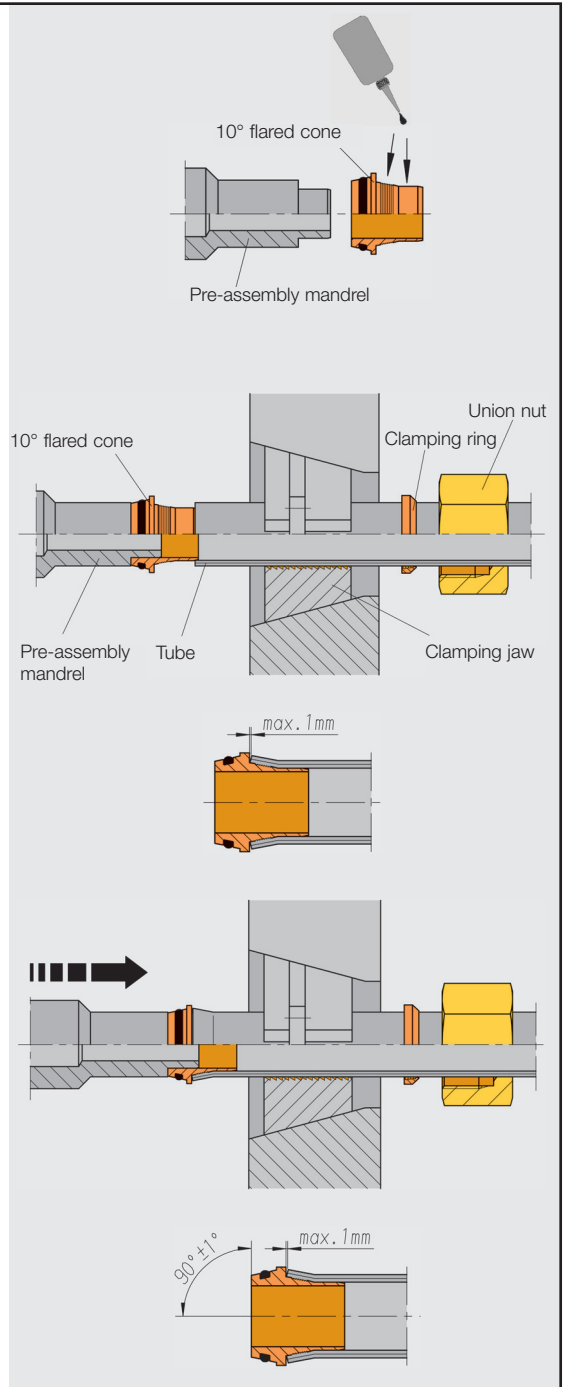
Ensure correct clamping jaw pretension (see operating instructions). The tube may not slip through when the assembly process is started.

4.6 Press the 10° flared cone into the tube. See the operating instructions for instructions on triggering the press-in process.

The flared cone is ideally mounted when a gap of  $> 0$  to a maximum of 1 mm remains.

4.7 Check the gap width and make sure the flared cone fits squarely.

4.8 The pre-assembled tube with the 10° flared cone is now ready for final assembly.



## 5. Final assembly

- 5.1 Make sure the O-ring is correctly inserted in the groove of the flared cone.

Thoroughly oil the thread and taper surfaces on the union nut, flared cone and coupling connecting piece to better overcome frictional resistance.

- 5.2 Insert the pre-assembled tube end into the cone of the coupling connecting piece at a straight angle.

Make sure the O-ring is not damaged.

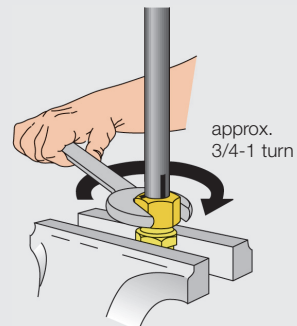
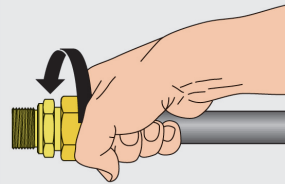
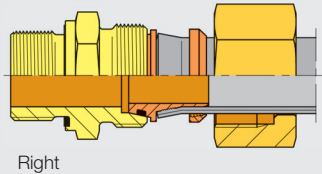
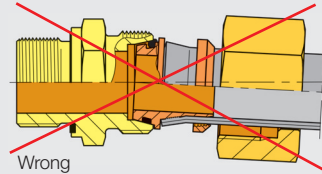
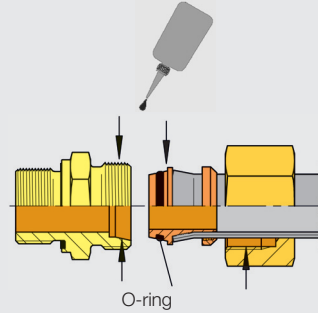
Ensure a tension-free connection of the pre-assembled tube end and the coupling connecting piece!

- 5.3 Screw on union nut by hand until all coupling components contact the block, i.e. are tightened hand-tight.

- 5.4 The final tightening (distance-dependent assembly) must be carried out with 3/4 - 1 turn of the union nut.

For assembly within a tube, tighten the coupling connecting piece with a spanner.

A marking line on the union nut and tube simplifies observance of the tightening distance.



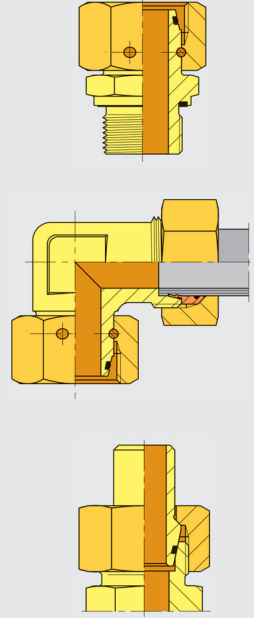
# Assembly instructions for taper (DKO) and weld nipple

## 1. Notes

These assembly instructions describe the assembly of VOSS couplings and coupling parts with taper coupling (DKO) according to DIN 3865.

- The pre-assembly and assembly of the tubes are illustrated under the respective coupling systems (see corresponding coupling variant).
- Welded coupling preparation for weld nipple is described in detail in 4.

Compliance with the corresponding assembly instructions is extremely important for fulfilling the functions of the taper couplings. Improper handling leads to risks with regard to safety and freedom from leaks, which can also result in the complete failure of the coupling under certain conditions.



## 2. Assembly of taper coupling

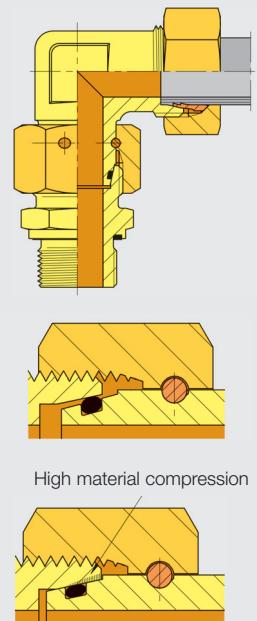
Assembly procedure

1. Checking whether O-ring is seated in groove of taper.
2. Oil or grease thread, cone surface and O-ring.
3. Guide taper into cone and press on firmly. Tighten union nut hand tight.
4. Then tighten the union nut with a wrench to the specified turn angle, or finally tighten the union nut to the torque shown in the table opposite.



### Caution!

Be sure to observe the manufacturer's instructions when assembling hose fittings.





### 3. Assembly instructions

Tightening torques with VOSS Zink-Nickel surface protection agent, union nut waxed, thread oiled.

Series	Thread of the union nut	Stroke-dependent initial assembly	Stroke-dependent repeat assembly	Tightening torque Nm $\pm$ 5 %	Series	Thread of the union nut	Stroke-dependent initial assembly	Stroke-dependent repeat assembly	Tightening torque Nm $\pm$ 5 %
L 6	M 12 x 1,5	approx. 2/3	approx. 1/3	20	S 6	M 14 x 1,5	approx. 2/3	approx. 1/3	25
L 8	M 14 x 1,5	approx. 2/3	approx. 1/3	30	S 8	M 16 x 1,5	approx. 2/3	approx. 1/3	40
L 10	M 16 x 1,5	approx. 2/3	approx. 1/3	40	S 10	M 18 x 1,5	approx. 2/3	approx. 1/3	50
L 12	M 18 x 1,5	approx. 2/3	approx. 1/3	50	S 12	M 20 x 1,5	approx. 2/3	approx. 1/3	60
L 15	M 22 x 1,5	approx. 2/3	approx. 1/3	70	S 16	M 24 x 1,5	approx. 1/2	approx. 1/3	85
L 18	M 26 x 1,5	approx. 1/2	approx. 1/3	90	S 20	M 30 x 2,0	approx. 1/2	approx. 1/3	140
L 22	M 30 x 2,0	approx. 1/2	approx. 1/3	120	S 25	M 36 x 2,0	approx. 1/3	approx. 1/4	190
L 28	M 36 x 2,0	approx. 1/3	approx. 1/3	160	S 30	M 42 x 2,0	approx. 1/3	approx. 1/4	270
L 35	M 45 x 2,0	approx. 1/3	approx. 1/3	250	S 38	M 52 x 2,0	approx. 1/3	approx. 1/4	400
L 42	M 52 x 2,0	approx. 1/3	approx. 1/4	380					

### 4. Assembly of weld nipple couplings

#### 4.1 Assembly procedure

- The weld nipples are bare metal (oiled) and designed with a V-seam when delivered.
- The weld nipples are welded onto the prepared tube end without an O-ring.
- Special guidelines with regard to the welding process including checking and documentation must be observed for the pre-treatment of the tube end.
- Weld nipples can be used in any tube coupling in accordance with DIN 2353/ISO 8434-1.

#### 4.2 Tube length determination

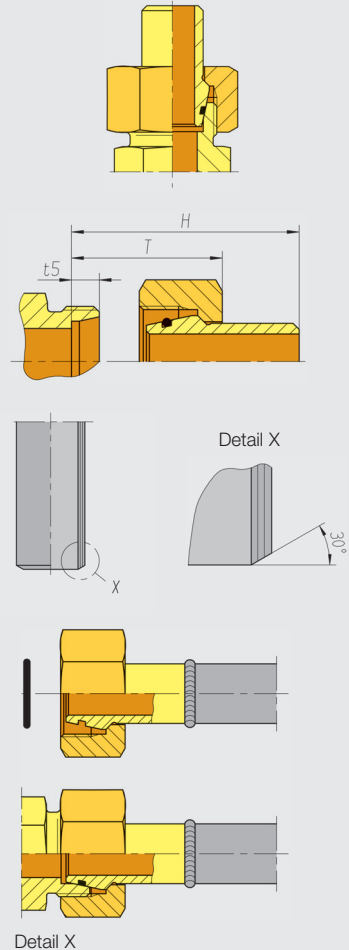
Dimensions				
Series	Tube-OD	H approx.	T approx.	t5
S	8	32.0	15.5	7.0
	10	33.5	17.0	7.5
	12	33.5	17.0	7.5
	14	40.0	18.5	8.0
	16	40.5	17.5	8.5
	20	47.0	22.5	10.5
	25	53.5	25.0	12.0
	30	57.5	28.0	13.5
	38	64.5	32.0	16.0

#### 4.3 Tube preparation

Welding seam preparation of the tube  
Welding edge form 21 according to DIN 2559

4.4 Final assembly of weld nipple fittings is performed on the same principle as for the conical nipple fittings

1. Fit O-ring.
2. Oil thread, cone surface and O-ring.
3. Tighten union nut hand tight.
4. Tighten union nut until noticeable increase in force is felt.
5. Carry out final assembly of nut with approx. 1/4 turn.



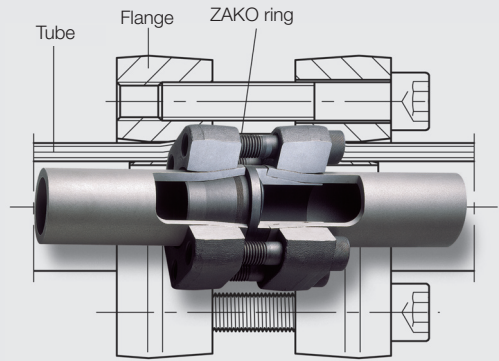
# Assembly Instructions for ZAKO Flange Couplings

## 1. Notes

The ZAKO programme of flange couplings caters to piping systems with outside diameters of between 16 and 120 mm. It is used in the versions with an SAE hole pattern and as a square flange.

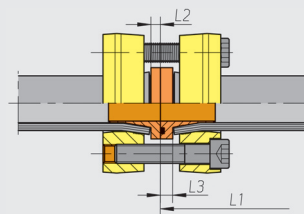
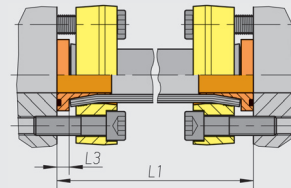
- The same assembly principle generally applies to the entire ZAKO flange programme.
- Various pre-assembly devices are available for pre-assembling the ZAKO rings, depending on the tube dimensions. The specifications in the respective operating instructions apply to the assembly procedures here.

Compliance with the assembly instructions is extremely important for fulfilling the functions of the ZAKO flange couplings. Incorrect handling will lead to risks with regard to safety and leaking of the connection.



## 2. Tube preparation

- 2.1 Tube lengths for coupling flanges: To determine the tube lengths, first the theoretical total tube length  $L_1$  is determined. Then the dimension  $L_3$  must be subtracted from the total tube length for each tube coupling. (See table for dimension  $L_3$ .)
- 2.2 Tube lengths for tube-to-port flange couplings: To determine the tube lengths for tube-to-port flange couplings, the dimension  $L_3$  applies for the connection surface of the ZAKO ring with O-ring. For the connection surface ZAKO ring without O-ring, the dimension  $L_2$  must be taken into account.

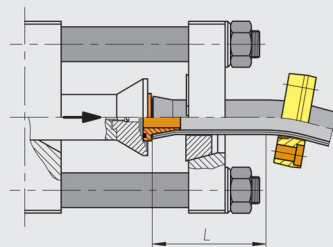


Tube-OD mm	Coupling flange L3 mm
16	8.0
20	8.0
25	8.5
30	8.5
38/42	9.0
50	10.0
60	15.0
65	11.0
75	16.0
80	16.0
88	20.0
101.6	20.0
114.3	20.0
120	20.0

Tube-OD mm	Coupling flange L3 mm	L2 mm
16	8.0	5.5
20	8.0	5.5
25	8.5	5.5
30	8.5	6.0
38	9.0	7.0
50	10.0	7.0
60	15.0	12.0
65	11.0	8.0
75	16.0	12.0
80	16.0	13.0
88	20.0	16.0
101,6	20.0	16.0
114,3	20.0	16.0
120	20.0	16.0

- 2.3 Compliance with straight tube length:  
To assembly the ZAKO rings, a minimum tube length of the straight tube end must be taken into account with curved tubing.

The minimum tube length is dependent on the respective assembly conditions of the assembly device used. Please observe the specifications listed here.



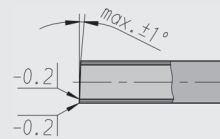
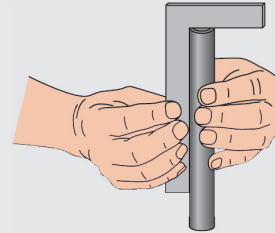
## 2.4 Preparing tube end:

Saw off tube at a right angle. An angular tolerance of  $\pm 1^\circ$  is permissible.

Do not use tube cutters or abrasive cutting machines.

Deburr tube ends inside and outside. To ensure optimum grip, it is recommended that only slight deburring be carried out on the outside and more thoroughly on the inside.

The tube ends must not be damaged on the inside and outside, and must be free of chips, dirt, rust and other soiling.



## 3. Pre-assembly of ZAKO ring

The illustrated pre-assembly refers to the pre-assembly device type 85.

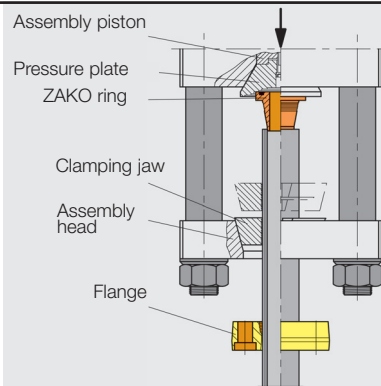
The procedures are similar for the pre-assembly devices type 80 N2, type 84 and type 90 Basic.

With the pre-assembly device type 120, the procedure differs considerably.

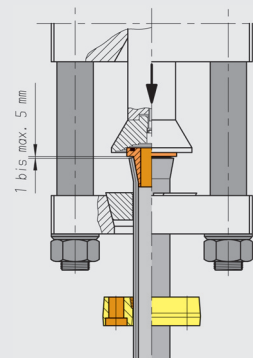
The assembly procedure is shown in simplified form here.

- 3.1 Thoroughly oil the conical and straight section of the ZAKO ring to reduce friction during assembly.
- 3.2 Slide the ZAKO flange onto the tube so that the toothed, conical bore section faces the tube end.
- 3.3 Guide in the tube through the opening in the yoke plate of the pre-assembly device while pressing the ZAKO ring against the pressure plate. Then place the clamping jaw around the tube. To ensure that the pre-assembly procedure functions properly, the clamping jaw must be positioned in the conical opening of the yoke plate by sliding it on the tube.
- 3.4 Trigger the assembly process as described in the operating instructions of the pre-assembly device. The piston stroke drives the ZAKO ring into the tube until a gap of 1 to 5 mm remains (see table). This does not affect the coupling.

Tube wall thickness	Gap width
< 8 mm	max. 1 mm
≥ 8 mm < 16 mm	max. 3 mm
≥ 16 mm	max. 5 mm



Before assembly

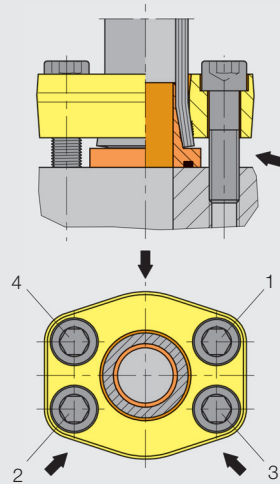


After assembly

#### 4. Final assembly of flange coupling

- 4.1 Oil threads of securing screws to reduce friction during assembly.
- 4.2 Position the flange connection with its pre-mounted ZAKO ring on the screw-on surface and manually tighten the securing screws. The tube must be stress-free and at right angles to the screw-on surface.
- 4.3 Then carefully tighten the securing screws diagonally and evenly in several steps using a spanner; do not use a pneumatic driver.
- 4.4 To complete the assembly process, tighten all 4 screws in the sequence 1, 2, 3, 4 (see illustration). When tighten the screws, make sure that the permissible tightening torques for the screws are not exceeded (see table).
- 4.5 After final tightening, the flange must be parallel to the connection surface. Should the deviation from parallel during checking (measure at all 3 points) be greater than 0.5 mm, a correction must be made with reassembly.

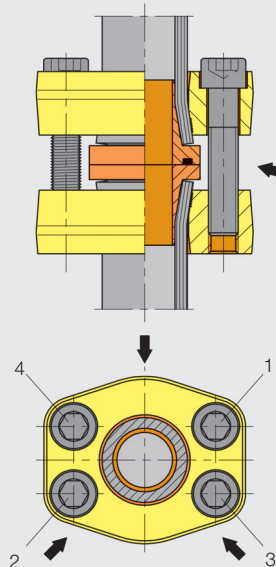
Dimension mm	Tightening torque for screws 10.9 (Nm max.) *
M 8	35
M10	69
M12	120
M14	190
M16	295
M20	580
M24	800
M30	1500



#### 5. Final assembly of tube-to-port flange coupling

It must be ensured that one of the ZAKO rings used is "without groove".

- 5.1 Oil threads of securing screws to reduce friction during assembly.
- 5.2 Align the tube couplings flush with the pre-mounted ZAKO rings, join and tighten the securing screws manually. The tubes must be stress-free and at right angles to each other.
- 5.3 Then carefully tighten the securing screws diagonally and evenly in several steps using a spanner; do not use a pneumatic driver.
- 5.4 To complete the assembly process, tighten all 4 screws in the sequence 1, 2, 3, 4 (see illustration). When tighten the screws, make sure that the permissible tightening torques for the screws are not exceeded (see table in 4.)
- 5.5 After final tightening, the flange must be parallel to the connection surface. Should the deviation from parallel during checking (measure at all 3 points) be greater than 1 mm, a correction must be made with reassembly.



\* Nm = Recommended tightening torques for M8 – M 30 cap screws with friction coefficient  $\mu$  tot. 0.14

## 6. Using pre-assembly devices

The following pre-assembly devices are available for pre-assembling the 10° ZAKO rings:

- Type 80 N (not shown)
- Type 80 N2 (not shown)
- Type 86 E (not shown)
- Type 90 Basic ①

With these 4 device types, not only all cutting rings and the VOSS 10° flared cone rings, but also the ZAKO rings from an outside tube diameter of 16 to 38 (42) mm can be pre-mounted. The required tools are contained in this catalogue.

- Type 82 (not shown)
- Type 85 ②

With this device series the ZAKO rings from an outside tube diameter of 16 to 120 mm can be pre-mounted.

- The device type 82 is operated with a hand pump and is designed for the tube range from 16 to 50 mm outside diameter (OD).
- The device type 85 covers the tube range from 38 to 120 mm OD.

- Type 120 ③

This pre-assembly device covers the tube range from 50 to 120 mm OD. The pre-assembly process is carried out with extreme precision and the procedure remains simple even with tube dimensions of 120 x 20 mm.



### Caution!

Be sure to follow the operating instructions of the respective pre-assembly device used at all times.

## 7. Repeat assembly

ZAKO flanges can be dismantled and reassembled as often as required. Always follow the instructions for the final assembly of ZAKO couplings during reassembly.

- The O-ring must not be damaged and must be correctly seated in the groove.
- During final tightening, retighten the screws diagonally and evenly in several steps.
- Only tighten the screws until the maximum torque is reached.

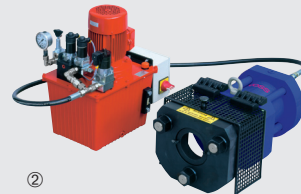
The same instructions also apply to the ZAKO flange coupling for SAE hose couplings (see illustration).

## 8. Note of checking

Following initial assembly the distance between the ZAKO ring and the flange plate should be at least 3 mm. Should settling make it necessary to retighten the screws, the flange plate can be pulled up to 1 mm before the ZAKO ring while taking the parallelism into account.



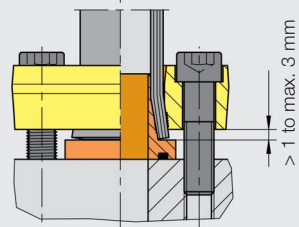
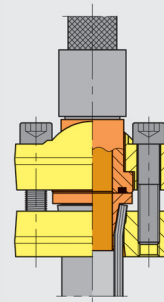
①



②



③



# Assembly instructions for flange couplings with cutting-ring and welding connection

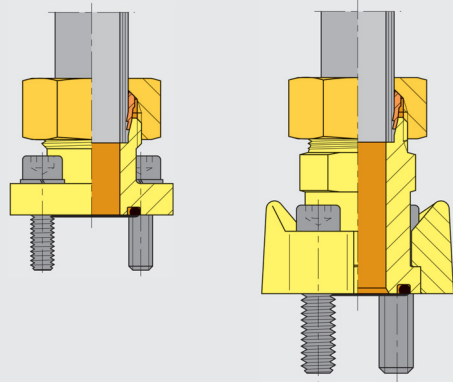
## 1. Notes

These assembly instructions describe the assembly of the flange connecting piece.

The tube is pre-assembled and assembled with cutting ring couplings in the same manner illustrated in the assembly instructions for tube couplings (see corresponding coupling variants).

Welding coupling preparation is described in detail in 4.

Compliance with the corresponding assembly instructions is extremely important for fulfilling the functions of the flanged couplings. Improper handling leads to risks with regard to safety and freedom from leaks, which can also result in the complete failure of the coupling under certain conditions.



## 2. Assembly of square flanged coupling with cutting ring or flared coupling

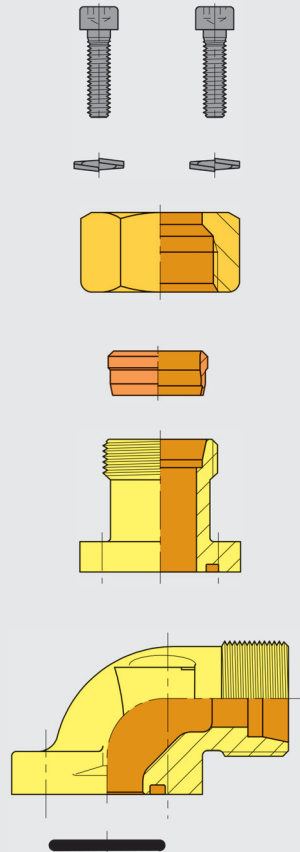
- Assembly of tubing as described in 1.
- Assembly of flange connecting piece.

Carefully lay the round seal ring (O-ring) in the groove of the flange connecting piece previously cleaned and tighten the flange coupling piece evenly and diagonally on the coupling surface with the 4 cheese head screws (DIN 912-8.8) while observing the tightening torque.

- Tightening torques

Cheese head screw DIN 912-8.8	Tightening torque Nm*
M 6	10
M 8	25

\* Nm = Recommended tightening torques for cheese head screws M6/8 with friction value  $\mu$  total: 0.14



### 3. Assembly of SAE flanged couplings with cutting ring or flared coupling

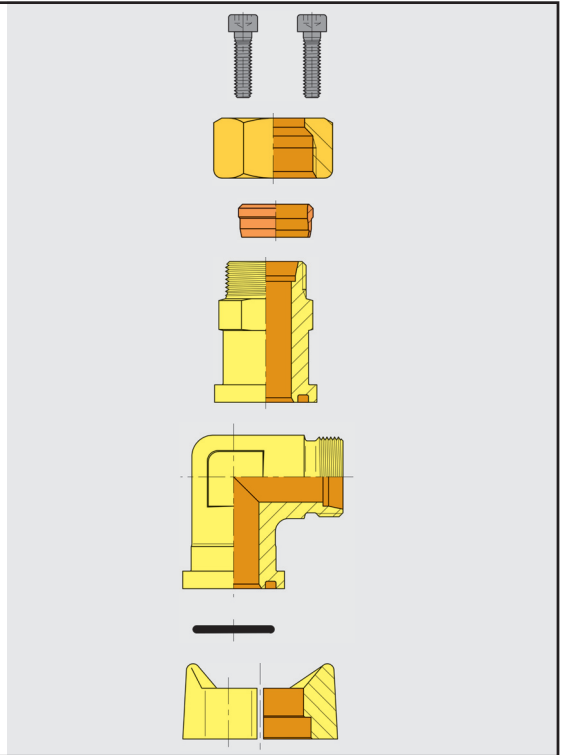
- Assembly of tubing as described in 1.
- Assembly of flange connecting piece.

Carefully lay the round seal ring (O-ring) in the groove of the flange connecting piece previously cleaned and tighten the flange coupling piece evenly and diagonally on the coupling surface with the 4 cheese head screws (DIN 912-8.8) and the flange halves while observing the tightening torque.

- Tightening torques

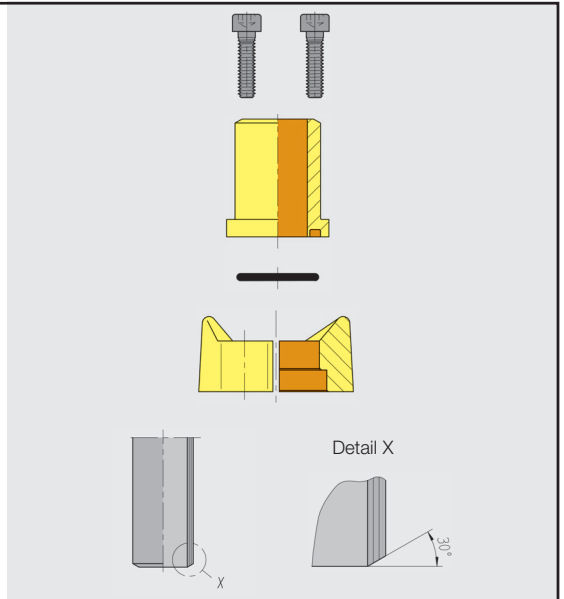
Cheese head screw DIN 912-8.8	Tightening torque (Nm* max.)
M 8	25
M 10	50
M 12	85
M 14	135
M 16	210

\* Nm = Recommended tightening torques for cheese head screws M 8 – M 16 with friction value  $\mu$  total: 0.14



### 4. Assembly of SAE flanged coupling with welding coupling

- Screw flanged coupling without round seal ring hand-tight at coupling surface.
- Cut off tube at a right angle and chamfer tube ends inside and outside for welding on.
- Tack on tube at three points distributed around circumference of weld nipple coupling.
- Detach flanged coupling again and properly weld flange connecting piece to tube.
- Clean welding area thoroughly inside and outside. Clean groove for round seal ring (O-ring) if necessary.
- Before making flanged coupling, lay O-ring in previously cleaned groove of flange connecting piece. Joint tubing with flange connecting piece at coupling surface and secure using SAE flange halves. Tighten 4 cheese head screws (DIN 912-8.8) evenly and diagonally while observing tightening torque.
- Welding seam preparation tube, attach welding edge form 21 according to DIN 2559.
- Tightening torque (see 3.)



# Assembly instructions for screw-in connecting piece according to ISO 6149/11926-1

## 1. Notes

These assembly instructions describe the assembly of adjustable couplings with a lock nut for threaded bores according to:

- ISO 6149-1 metric fine thread
- ISO 11926-1 UN/UNF thread

Compliance with the assembly instructions is extremely important for fulfilling the functions of the screw-in couplings. Improper handling leads to risks with regard to safety and freedom from leaks, which can also result in the complete failure of the coupling under certain conditions.

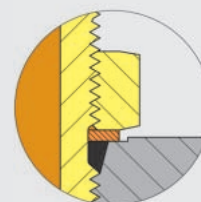
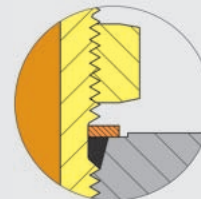
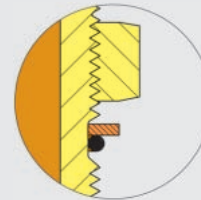
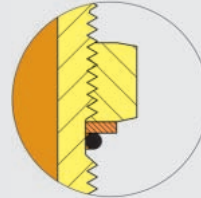
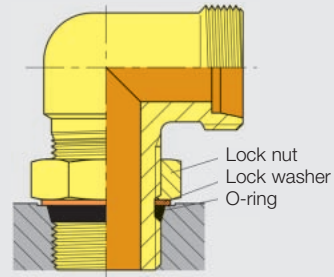


### Caution!

Inspect the thread before use.

## 2. Assembly sequence

- The assembly sequence is identical for metric fine threads and UN/UNF threads.
- Distinguishing characteristic: The thread type can be determined by measuring the outside thread diameter and the thread pitch.
- Screw back lock nut.
- Push O-ring and lock washer up to upper undercut end.
- Grease O-ring.
- Screw coupling into threaded bore by hand until lock washer is in place.
- Set desired direction.
- Tighten lock nut.  
Hold coupling body in place.





### 3. Tightening torques

Series	Thread	Tightening torque Nm -10%*	Series	Thread	Tightening torque Nm -10%*
L	M 10 x 1	15	L	7/16-20 UNF-2A	18
	M 12 x 1.5	25		1/ 2-20 UNF-2A	28
	M 14 x 1.5	35		9/16-18 UNF-2A	30
	M 16 x 1.5	40		3/ 4-16 UNF-2A	50
	M 18 x 1.5	45		7/ 8-14 UNF-2A	60
	M 22 x 1.5	60		1 1/16-12 UN -2A	95
	M 27 x 2	100		1 3/16-12 UN -2A	120
	M 33 x 2	160		1 5/16-12 UN -2A	150
	M 42 x 2	210		1 5/ 8-12 UN -2A	200
	M 48 x 2	260		1 7/ 8-12 UN -2A	260
S	M 12 x 1.5	35	S	7/16-20 UNF-2A	20
	M 14 x 1.5	45		1/ 2-20 UNF-2A	30
	M 16 x 1.5	55		9/16-18 UNF-2A	35
	M 18 x 1.5	70		3/ 4-16 UNF-2A	70
	M 22 x 1.5	100		7/ 8-14 UNF-2A	100
	M 27 x 2	170		1 1/16-12 UN -2A	170
	M 33 x 2	310		1 5/16-12 UN -2A	270
	M 42 x 2	330		1 5/ 8-12 UN -2A	285
	M 48 x 2	420		1 7/ 8-12 UN -2A	325

\* The tightening torques indicated are based on the combination steel /steel