

ASSEMBLY INSTRUCTIONS

u2-Lok Twin Ferrule Fittings



MA-u2
10.2024 Rev. 7

Focus in details®

schwer
fittings



Character

The u2-Lok Twin Ferrule Fittings are delivered assembled and ready to use. High safety levels are guaranteed even when working at high pressure, in a vacuum or with vibration. Superior quality is ensured by these four efficient construction details:

1. **Deforming in a spring like manner**, the back ferrule dampens the tube line vibrations. It also prevents the transference of tightening torque from the nut to the front ferrule.
2. The front ferrule **seals around the surface** between the coupling and the tube. The conical shape of the body presses the tapered ring on the tube and grips the tube pressure-tight.
3. The nut threads are **silver plated**, preventing seizing (cold welding) of the coupling. Allowing repeated use of the same coupling.
4. A **deep pipe** bore and entry taper helps ensure accurate seating and centring of the tube.

Harmonized tolerances and **surface finish** ensure a safe and leak free connection not only in high pressure applications but also for the use in vacuums. The superior design and outstanding quality, ensure that these couplings offer a varied range of application in industry, laboratories and instrumentation.

The use of high-grade stainless steel raw material guarantees a long maintenance-free life including use in the chemical industry.



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Safety instructions

■ General safety regulations

Please pay attention to **general safety regulations** when working with tools and machines. Wear protective clothing!

■ Pipeline and medium

Before assembly or disassembly make sure, the tube or pipeline **is not under pressure**. Take care **not to apply any additional tension or stress** to the coupling, when setting up the pipeline. Do not exceed any **temperature or pressure limits**. Pay attention when using dangerous or harmful mediums. Respect the **temperature at the pipeline**.

■ Danger of explosion

For the **use of oxygen** in your pipeline all parts, including the tubes, must be free of oil and grease. For these cases we offer articles with the suffix -off meaning, **“oil free and degreased”**.

Example: Um12-4L-off.

■ Workplace

Keep your workplace clean. Make sure you have the all necessary material available before starting the assembly.

■ Wear Safety glasses

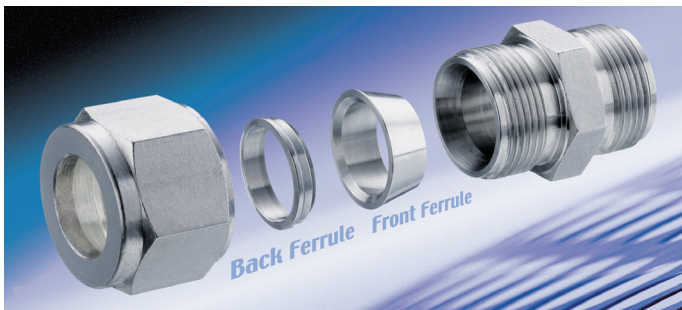
Some workers just remove chips from the tubes by using pressurized air. Dust and chips can harm your eyes, therefore **wear safety glasses**.

■ Foreign particles

Take care that the coupling is **free of dirt and foreign particles** before assembly. Contaminated parts may cause leakages.



General instructions



Couplings may have to cope with major forces such as vibrations and uncontrolled pressure peaks, therefore only use original Schwer-Fittings couplings and components assembled according to the sf-assembly instructions. Failure to do this may breach warranty and effect the functional reliability.

■ In General

Check before assembly **if any part is missing or visibly damaged**. Only complete and undamaged parts can guarantee full and safe operation.

u2-Lok twin-ferrule fittings are delivered assembled, **clean and packed dust-free**.



■ Mix of different couplings-elements

When using different types and sorts of couplings, materials or sealants within one installation **the lowest pressure and temperature range** of an individual component, determines the pressure rating of the system.



Tube selection - safety notification

We recommend the use of Schwer IT-tubes (u2-IT) in material 1.4435 as listed in our catalogue or in our eShop with tolerances exactly adjusted to our u2-couplings.



When using other tubes please note the following:

- The **tubes hardness** always should be lower than the hardness of the parts of our u2-couplings.
- Only use **annealed high-quality seamless tubes** with a Rockwell hardness of max. 80 HRB.
- For **imperial sized** tubes only use tubes with **tolerances** according ASTM A213/269. For outside diameters less than 6 mm according ASTM A 632.
For **metric tubes** use tolerances according EN ISO 1127, D4/T3.
- The **minimum wall thickness** is recommended to ensure enough resistance for the rings to set. The tube diameter is reduced at this position and a thinner wall risks that the rings will not clamp/grip to seal completely.

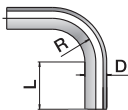
Tube with too thick a wall may not constrict enough and could therefore be released from the fitting.

- We can only recommend **welded tubes** according ASTM when they **show no visible welding seam** both inside and outside. The tube can be out-of-center on the welding seam as well as it may have a higher hardness. This can lead to leakage. Please consider to reduce the pressure rate explicitly (factor 0,8).
- Many Tube manufacturer show a high **out-of-center tolerance** (eccentricity) which is not recommended for a guaranteed leak-free connection.

Notice:

Please consult us for any questions you may have, also for the use with **other materials**. (Tel. +49 (0)7424 / 9825-0).

Bending of tubes



Minimum straight Tube length before bending:

D mm	3	6	8	10	12	16	18	25
L recommended	18	21	22	23	28	30	32	35
L minimum	15	17	18	19	25	27	28	33

D Inch	1/16	1/8	3/16	1/4	5/16	3/8	1/2	5/8	3/4	7/8	1
L recommended	1/2	23/32	3/4	13/16	7/8	15/16	1 3/16	1 1/4	1 1/4	1 5/16	1 1/2
L minimum	13/32	19/32	5/8	11/16	23/32	3/4	31/32	1 1/32	1 1/32	1 3/32	1 9/32
R	Bending radius as recommended by the tube manufacturer.										



Handling of the tube

For assembly it is necessary, that the tubes are cut and deburred professionally. Otherwise the tube may not fully rest in the seat of the coupling. The cutting can be done by hand or with electric operated machines.

Cutting of the tubes

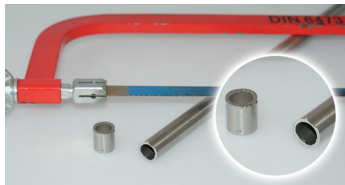
We recommend to cut the tube **at a right angle in a cutting vice** (MO-AV6-62) with a **hacksaw** (MO-MSB300). If you don't have a fixture use protective jaws (attention: don't deform the tube).



You can also cut the tube with a sharp **tube cutter** (MO-RAS) - (not be recommended for thick walled tubes). **Don't put too much pressure** on the cutting wheel or the jaws of the vice otherwise you will deform the tube.



Note: due to the material displacement the tube inside diameter gets smaller. This cannot be removed even by deburring.



*Result with a hacksaw
(inside and outside burr)*



*Result tube cutter
(inside burr)*

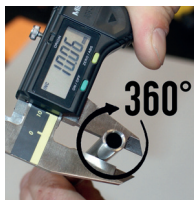
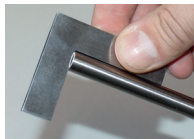
■ Deburring of the tube ends

- 1 Visible burrs must be removed with a **pipe-deburrer** - inside and outside. If you don't have one you can also use a flat file for the outside and a round file or deburring tool for the inside. A small, burr-free bevel is recommended.
- 2 Immediately remove **chips and dirt** after deburring. Your work place should always be clean.



■ Control of the tube endings

- 3 Make sure the cut is at a **right-angle** to the tube by using an angle tool.
- 4 Check the **circularity and the diameter** of the tube with a calliper (respect the tube-tolerances).



*Hint:
our ready-to-use tube sections
in several lengths (Tu2-IT).*



Assembly in a pre-assembly stud

The nuts and ferrules don't need to be removed for assembly. The nuts are assembled fingertight to the body and an instant assembly is guaranteed.

Make sure that the **tube cleaned and free of dirt.**

We recommend to use a vice for assembly:

■ Assembly in a vise

- 1 Fix **the body** to the vice, the nut must be free.
- 2 Enter **the tube** to the coupling. The tube must fully fit into the seat of the body (audible sound). If you can't fully fit the tube we recommend to slightly bevel the tube.
- 3 Tighten the **nut** clockwise until **fingertight**. That's your **starting point**.
- 4 **Mark** this point visibly, we recommend marking at the **6 o'clock** position.
- 5 Turn the nut with a suitable spanner **approx. 1 1/4 turns**, your mark should now be at **9 o'clock**.



The coupling is now assembled tight and sealed.

Attention:

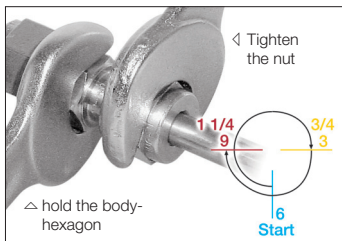
For Couplings in the sizes **1/16", 1/8", 3/16" or 2 mm, 3 mm, 4 mm** only move a **3/4 turn from the starting point.**

For Couplings in sizes of **more than 25 mm or 1"** we recommend to use a **hydraulic pre-assembly tool**. If such tool is not available use an extension for the spanner.

■ Direct assembly in the installation

The assembly is the same as on the previous page.

You just have to hold the body with a **second spanner**.





Pre-Assembly in a pre-assembly stud

For applications with limited space you may pre-assemble in a hardened pre-assembly stud (u2-AS).

- 1 Fix the **pre-assembly** stud to a vice.
- 2 The pre-assembly stud has **a bore on the side**. Put the tube into the bore until it stops and mark it with a pen all around (simply turn the tube). This **mark** will show you later if the tube fully sits in the body. It should only be **visible after the complete assembly**.
- 3 Make sure all single items are in **the right order**: 1. Nut, 2. Back ferrule, 3. Front ferrule (NBF). The cutting edges towards the cone of the stud. The bigger diameters of the rings towards the direction of the nut.
- 4 Now **put the tube into the stud** until you can hear it has reached the stop.
- 5 **The assembly** is now carried on as described on the previous pages.

We recommend to make 1/4 turn less, so only tighten **1 turn** or for smaller dimensions 1/2 a turn. The missing 1/4 turn will now be made on the **final assembly in the body**.





Assembly in the body

- 1 **Loosen the nut** from the pre-assembly stud with a spanner.
- 2 **Check the ferrules** for damage on the cone - inside and outside. The ferrules may be able to rotate (only radial).
- 3 Fix **the body** to a vice or use a corresponding second spanner to hold the body.
- 4 Insert **the pre-assembled tube with the ferrules** and nut into the body until the front ferrule fully fits into the cone of the body. **Tighten the nut by hand.**
- 5 Tighten the nut with a spanner and make a **1/4 or max. 1/2 turn**. You will realise a considerable increase in force is needed. Attention: **don't over-tighten!**

Note:

thick-walled tubes:

Body damaged

The coupling is now assembled tight and sealed.

Note:

Torque spanners do not guarantee a correct assembly. Correct assembly is only guaranteed when the nut **is turned as described** above. A Gap Gauge can be used as a "go/no-go" gauge on initial make-up of the fitting



Dismantling and reassembling

The couplings can be dismantled and reassembled several times. Make sure the sealing surfaces are free of dirt and remain undamaged to have a guaranteed non-leaking sealing.

- 1 We recommend to **mark** the nut and the tube at a suitable position.
- 2 The coupling is **not assembled**.
- 3 Fix **the body** to a vice or use a second spanner to hold the body.
- 4 Insert **the pre-assembled tube with nut and ferrules** into the body until the front ferrule fully fits into the cone of the body.
- 5 Tighten the nut by hand **finger-tight**.
- 6 Tighten **the nut** with a spanner a little bit more that it has been in the **original assembled condition**, without using excessive torque. You can feel higher resistance when tightening. Too high force can lead to damage. Short impulse tightening with deliberate force is sufficient (**approx. 1/8 turn** with the spanner after finger-tight).
- 7 We always recommend **leak tests**.

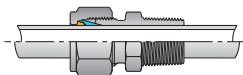




Assembly of Thermo-Element-couplings

These are couplings where the tube can be fitted through the complete body. Their bore therefore is normally minimum 0.1 up to 0.15 mm bigger than the highest tube tolerance.

The tube fitted through the body does not have any seat and can therefore move during the assembly process.



■ Assembly of the coupling

When using metal rings, proceed as described under "Assembly into a body". The assembly with PTFE-rings is also carried out up to point 3 as in "Assembly into a body".

From point 3, follow the procedure below:

3. Tighten the nut by hand until the thermocouple holds in the body.
The starting point is thus reached.
4. Mark the nut at a position that is visible to you.
The 6 o'clock position is recommended.
5. Now tighten the nut with a suitable standard spanner by 1 turn (< 6 mm, 1/4") or 1 1/4 turns (> 6 mm, 1/4").

Attention:

When using PTFE-rings, reduced operating pressures must be expected depending on the diameter and application of the fitting. For applications in the high or low temperature range, please contact our technicians.

Metric	Pressure (bar) at 20° C	Imperial	Pressure (bar) at 20° C
3	21	1/16"	25
4	20	1/8"	23
6	19	1/4"	19
8	14	3/8"	12
10	12		
12	11		
18	5		

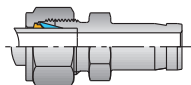


Assembly of bodies with shaft

Pieces equipped with a groove and a machined stich are much easier to assemble and guarantee a higher level of security.



- 1 Fix the body to a vice or use a corresponding second spanner to hold the body.
- 2 Insert **the shaft** part in the u2-Lok-coupling. Make sure the shaft is fully fitted.



- 3 Tighten **the nut** that is holding the ferrules finger-tight.
- 4 **Mark** the nut with a water proof pen. We recommend the **6 o'clock** position.
- 5 Tighten the nut with a spanner by **1 1/4 turns**, until your mark is on the **9 o'clock** position (pre-assembly-stud: 1 turn plus 1/4 turn with the final assembly).



The coupling is now assembled and sealed.

Attention:

For the connections of **D2, D3 and D4 mm** as well as for **D 1/16", D1/8" and 3/16"** only move the nut to a **3/4 turn**, your mark then points to the **3 o'clock position**.



Assembly of adaptors

- 1 **Remove** the ferrules from the coupling.
- 2 Insert the machined u2-cone to the inside cone of the body until it seats and then tighten the nut **finger-tight**.
- 3 Tighten the nut with a spanner by **1/4 turn**.



Attention:

For the connections of **D2, D3 and D4 mm** as well as for **D 1/16", D1/8" and 3/16"** only move the nut to a 1/8 turn, that means up to the **3 o'clock position**.



Re-assembly

Plugs and cone adapters can be assembled and disassembled **several times** with a spanner when all safety instructions are followed.

Too much force can cause damages. Short impulse tightening with deliberate force is sufficient (**approx. 1/8 turn** with the spanner after finger-tight).

We always recommend **leak tests**.



Assembly of thread connections

There are many different types of threaded connections in international industries. These are being harmonized by the EN or ISO.

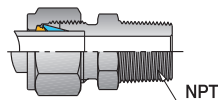


The differences between **supporting and sealing** threads.

■ Sealing threads

Sealing threads are mainly conical, with at least a conical outside-thread.

NPT is an American conical thread according ANSI/ ASME B1.20.1.1983. The R-inch-thread is according ISO 7/1, what is usually called British-tapered-inch-thread (former DIN2999), see also our technical information.

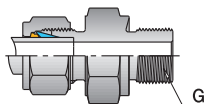


Between the inside and outside threads there are always differences in the tolerance that need to be compensated with a **sealant** to ensure a leak-proof connection. We recommend the use of **PTFE-tapes** (ZUS-HDST-P) for this purpose. It is usually wrapped around the outside thread. Temperatures around 232° C.

On demand, we can also supply the conical outside threads coated with an **anaerobic, bonded sealant TFE**. Please just ask if you need it. Your advantage: Eliminates a preparation step and saves time on the assembly.

■ Supporting threads

Supporting threads have to bring two bodies together where two plane surfaces are pressed together. There different sealing systems:



CS (Corner Seal) conical sealing edge on a plane surface (metal on metal).



RS (Ring Seal) the plane surface of the body is sealed with a metal ring that can also be equipped with a vulcanised elastomer (metal on metal or metal on metal and elastomer), e.g. Viton. Ring seals have to be ordered separately.



ES (Elastomer Seal) elastomer sealing material Viton or Buna ESB, groove in the flat face of the hexagon with convex metal seal (e.g. for G 1/4" ISO 228 use u2-ESB-G14-4).



DOR (Disk O-Ring)

Supporting disk, sealing disk and o-ring are mainly used for extended, cylindrical SAE or MS threads. Swivel elbow-, T- or L-couplings.



DOR Safety Instructions:

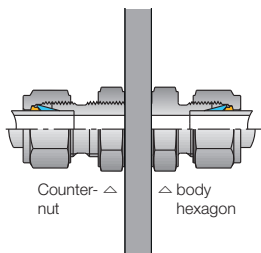
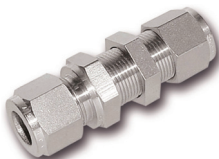
- ① Lubricate the o-ring with a grease that is suitable for your fluid.
- ② Screw the thread into the plug hole until the supporting disk touches the flat face. The o-ring is being pressed into the inside cone of the inside thread.
- ③ By unscrewing the coupling you will point the thread to the right direction. The o-ring is being inserted into the cone of the hole. Now hold the body with a spanner and tighten the locking nut until the supporting disc is fixed on the side of the hole. The o-ring is being pressed into the inside-cone.



Assembly of bulkhead couplings

For the assembly of a bulkhead coupling through a wall you generally need two people.

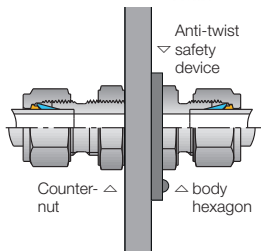
- 1 The **first person** fixes the coupling with a spanner on the **hexagon**.
- 2 The **second person** tightens the **counter-nut** with a spanner on the other side of the wall.
- 3 The **assembly of the tube** is carried out as described on the previous pages. During the assembly of the side with the counter nut, a **second person** must fix the hexagon on the other side of the wall.



■ Use of an anti-twist safety device

When using an anti-twist safety device (u2-BHR) you don't need a second person.

This device **fixes the body hexagon to the wall** and the tightening of the counter-nut as well as the assembly can be carried out by one person.





Information

■ Technical Information





Working Pressure for stainless steel

Attention: The system maximum working pressure in bar is obtained from the lowest of that for the stainless steel tubes, the type of thread connections and the temperatures used in each application.

For couplings with inside or outside threads, **compare** the **maximum working pressure of the thread** with that of the **tube** used. The lowest value is the maximum working pressure of the system.

The **safety factor** for couplings is on the tube connection side 4:1, for the thread connections 2.5:1 and for the tubes 1.5:1. Due to the greater wall thickness, threaded connections with outside threads offer a higher maximum working pressure than those with the equivalent inside thread.

Couplings with JIC-connection, o-ring sealing or SAE/ MS connections only offer a lower maximum working pressure. **For applications at the extremes** of the recommended working pressures / temperature, it is recommended to consult our technical department before designing or assembling an installation.

■ Strength reductions at elevated temperatures according to DIN EN 10088-3: 2014

We cannot accept guarantee for the use in **extreme temperatures**. Maximum working pressure highly depends on the **individual use and fluid**.

Please contact our technical department to get an analyses of the maximum possible working pressure in your special application.

Temp.	Discount in %
	1.4404
20° C	0
100° C	18
150° C	25
200° C	32
250° C	37
300° C	41
350° C	44
400° C	46
450° C	49
500° C	50
550° C	51



Working Pressure for stainless steel

u2-Lok: Pipe connection of the coupling

run	Tube OD	-54°C +20°C bar	psi	Tube OD	-54°C +20°C bar	psi
1	1/16"	810	11.745	2 mm	510	7.395
2	1/8"	750	10.875	3 mm	660	9.750
3	3/16"	710	10.295	4 mm	650	9.425
4	1/4"	710	10.295	6 mm	700	10.150
5	5/16"	540	7.830	8 mm	520	7.540
6	3/8"	440	6.380	10 mm	450	6.525
8	1/2"	440	6.380	12 mm	390	5.655
10	5/8"	400	5.800	14 mm	390	5.655
12	3/4"	380	5.510	15 mm	390	5.655
14	7/8"	270	3.915	16 mm	360	5.220
16	1"	270	3.915	18 mm	360	5.220
20	1 1/4"	320	4.640	20 mm	360	5.220
24	1 1/2"	320	4.640	22 mm	270	3.915
32	2"	230	3.335	25 mm	270	3.915
				28 mm	320	4.928
				30 mm	300	4.350
				32 mm	320	4.928
				38 mm	300	4.350

Attention:

Please note the **maximum operating pressures for pipes, hoses and shaft parts**.

For pressures for **threaded connections**, please refer to our catalogs, the applicable standards (Norm) or contact our technical department.



Materials

Materials

-4	= 1.4401 / AISI 316
-4L	= 1.4404 / AISI 316L
-5	= 1.4435
-7	= 1.4571 / AISI 316Ti
-A	= Aluminium
-B	= Brass

Further Materials on request.

Gaskets:

The following charts show the abbreviations according to ISO 1629 and ASTM 1418, the temperature range, the chemical description, some trade names, essential qualities of those gaskets materials normally used, as well as the compatibility with several media.

Abbreviation	Temperature range	Chemical description
NBR	-30° C to 100° C	Acrylonitrile-Butadiene-Elastomer
EPDM	-50° C to 150° C	Ethylene-Propylene-Diene-Elastomer
VMQ (MVQ)	-40° C to 200° C	Silicone-Elastomer
FKM	-20° C to 200° C	Fluoro-Elastomer
PTFE	-200° C to 230° C	Polytetrafluoroethylene

Materials

Abbreviation	Trade names
NBR	Perbunan® , Buna , Baypren, Hycar, Breon, Butakon
EPDM	EPDM, Dutral, Keltan, Vistalon, Nordel, Epsyn
VMQ (MVQ)	Silicone, Silastic, Silopren, Rhodorsil
FKM	Viton® , Fluorel, Tecnoflon, Noxtite, Dai El
PTFE	Teflon® , Halon, Hostaflon, Algoflon, Fluon

Material properties:

Grading: 1 = very good, 2 = good, 3 = satisfying, 4 = sufficient, 5 = deficient, 6 = insufficient

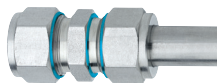
	NBR	EPDM	VMQ	FKM	PTFE
Aging resistance	3	1	1	1	1
Ozone resistance	3	1	1	1	1
Petrol resistance	1	5	5	1	1
Oil and fat resistance	1	4	1	1	1
Acid resistance	4	1	5	1	1
Alkali resistance	3	2	5	1	1
High temp. water res.	3	2	5	2	1
Steam resistance	6	1	4	6	2
Gas impermeability	3	2	2	2	5
Abrasion resistance	2	3	5	4	3
Electric resistance	4	2	1	4	1



Information

■ Identification metric-inch

Metric sized tube connections are identified with a machined shoulder on nut and body.

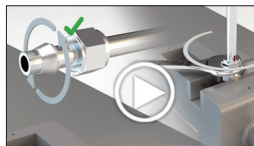


■ Environment protection

The u2-Lok Twin-Ferrule Fittings are delivered clean and packed in a recyclable dust free wrap. Therefore no additional thread protection is needed. Another contribution to save our environment.

■ Installation Videos

Our installation videos can be found at: www.schwer.com



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Information

Focus in details®



Focus in details®

- **High Surface Hardness,**
to HV 1.000
- **Rolled smooth inner cone**
Ra 0.4 max.
- **Threads rolled**
- **Traceability**
through test and batch number
- **Silver plated inner thread**
on the nut allows for easier removal
and prevents cold welding

Internet

☰
🔍
🌐

sf
👤
🛒

schwer
Fittings

Gerade Verschraubung

μ2-Um10-4

ANSCHLUSS 1 D 10 mm

WERKSTOFF 1.4401/1.4404

AUSWAHL ZURÜCKSETZEN

Ihr Netto-Preis Ihr Preis €

Pro Stk / exkl. MwSt.

1

Stk

IN WARENKORB LEGEN

✔
2500 auf Lager

≡
in Einkaufsliste

📄
Lieferzeiten

📄
PDF generieren

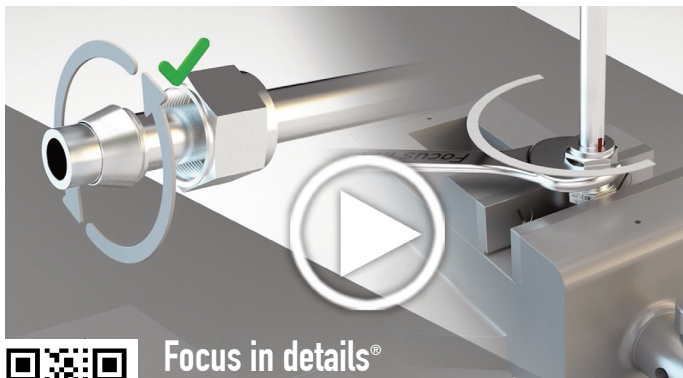


Installation Videos

■ Installation Videos

Our installation videos can be found at:

www.schwer.com



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