SCHUCK GROUP

SCHUCK INSTALLATION/OPERATION MANUAL

Insulating joint SHD, SHDF, SHDFS, SHD-K, SHM

Translation of the original German Operation Manual

Keep for future use!

Introduction

This manual is written for installation, operating, maintenance and supervisory personnel.

This manual also describes components and auxiliary units that are not included or are only partially included in the scope of supply.

The manual must be read, understood and observed by the user. We emphasize that Franz Schuck GmbH assumes no liability for damage or malfunctions arising from non-compliance with this manual.

With regard to the illustrations and information in this manual, we reserve the right to make technical modifications.

Copyright

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As of: 2017-06-26 (Release 1.6)
Revision: –

Author: Franz Schuck GmbH
Editor: bitplant.de GmbH

Codeword: STANDARD
Created with: TeXML v.schuck-latex-170131

Table of Contents

1 Preliminary remarks

CAUTION

Danger of consequential damage due to incorrect operation, maintenance and/or handling!

We explicitly emphasize that we assume no liability for damage or malfunctions arising from non-compliance with this manual.

⇨ Therefore it is important to comply with all instructions in this manual!

This manual is to provide technicians and users with the necessary information for assembly and adjustment work and to help in performing work quickly and correctly.

For your own safety, read this manual carefully and pay particular attention to the highlighted tips. In any case, keep this manual to hand.

Pay special attention to all safety instructions in this manual. You will find the safety instructions in Chapter 2, in the introductions to chapters and before practical instructions. The General Terms and Conditions of the company apply exclusively to all deliveries and performances made by Franz Schuck GmbH, including any future transactions.

1.1 Legal notes

The component may only be installed by skilled staff.

Please check parts upon receipt for any possible damage that may have occurred during transport. Only undamaged parts may be fitted or used.

No warranty can be claimed if maintenance work is neglected or carried out incorrectly. Only original spare parts guarantee quality, reliability and exchangeability.

Any modification(s) of the component are in general prohibited by Franz Schuck GmbH. The manufacturer guarantee becomes void if this prohibition is not complied with!

1.2 Application range

This operation manual applies to the Franz Schuck GmbH product described in this manual.

The appropriate operation manuals for optional accessories must also be observed.

These operation manuals are included in the overall documentation if the accessories belong to the scope of supply from Franz Schuck GmbH.

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2 Safety

CAUTION

Dangers to the health and safety of operating and maintenance staff as well as to the functioning capacity of the component. Dangers to the environment due to escaping gaseous or liquid media.
Danger to life due to escaping steam or hot water!

Non-compliance with these instructions jeopardizes the obligation by Franz Schuck GmbH to follow through on the warranty/guarantee.

⇨ The instructions in the “Safety” Chapter must be unconditionally observed!

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2.1 Fundamental safety instructions

2.1.1 General

Modifications on the component which could affect safety may not be carried out without written permission from the manufacturer.
The guarantee becomes void if this prohibition is not complied with!

- This product has been manufactured according to the recognized rules of technology and according to internal Schuck quality standards; the product is shipped from the factory in a perfect technical condition
- Nevertheless, components can cause hazards to people, material goods and the environment if installation personnel use them improperly or in a manner that is contrary to their intended use
- Any person dealing with assembly, commissioning or maintenance of the component must have read and understand this entire manual, and must be able to prove they possess professional qualifications for implementing the work
- Please observe the valid accident prevention regulations when installing the component
- Suitable protective gear must be worn when carrying out the works
- The manual must be kept safe and accessible at all times at the place where the component is in use
- If malfunctions occur, take appropriate measures immediately and notify Franz Schuck GmbH
- Work on components (such as inspection work, servicing and/or maintenance work) may only be carried out in a depressurized state
- Components must be effectively covered and/or protected when work is being carried out that could lead to contamination of or damage to the component, the assembled parts and/or the anti-corrosion protection

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2.1.2 Intended use

The component supplied is designed exclusively to block completely the metal conductivity in a pipeline or a cathodic corrosion protection system.

It is not designed to absorb occurring forces and torques. If this is required, this must be specified in the order or the enclosed specification.

The component can be designed for gas and liquid media.

Any other media and/or applications outside the permissible pressure and temperature range can lead to damage and/or leaks.

Intended use includes observing the instructions in this operating manual and adhering to the operating conditions on the component, the final inspection certification and drawings, as well as observing the locally applicable accident prevention guidelines and regulations for protecting the environment.

Any operating conditions or applications which differ from those prescribed are only valid with the agreement of Franz Schuck GmbH!

CAUTION

⇨ Observe the following **specifics** regarding operation with oxygen.

- Oxygen pressure surges during operation are not permissible
- Maximum permissible pressure increase = 20 bar / min. (0.33 bar / s)
- Maximum permissible flow speed at pressures ≤ 40 bar: 25 m/s
- Maximum permissible flow speed at pressures > 40 bar: 8 m/s
- The oxygen flow must be free from inflammable particles
- The influence of electrical discharge on the insulating sealing ring must be eliminated
- Keep insulating joint free from oil and grease!
- Installation must be completely free of grease
- The insulating joint must be free of water and cleaning agent residue

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2.1.3 Organizational measures

2.1.3.1 Special hazard points

There is no immediate danger from a component that is installed according to instructions.

Life hazard in the case of escaping steam or hot water!

- Danger from escaping media
  - depending on the working medium, fire or explosion hazards can arise from electrical contact, naked flames, light and/or smoking
  - there is a risk of poisoning, chemical burns, scolding and environmental pollution
  - hazardous materials must be collected or sucked up, if necessary, and disposed of properly

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2.1.3.2 Workplace and personal protective gear

Sufficient space is required for carrying out assembly and maintenance work safely. The operator must ensure that the workplace is clean and clearly arranged.

If media (including residues) can escape in case the component experiences operational faults or malfunctions, then the endangered persons must use suitable personal protective gear, as far as this is necessary.

Only use components in a technically undamaged condition; use them according to specifications in a safety and risk conscious manner while complying with the operating manual! Remedy faults in particular that could impair safety (or have them remedied)!

The operating manual must be supplemented by instructions which take into account supervisory and reporting duties with regard to work related particularities, e. g. in respect of how work is organized, working procedures and the personnel employed.

Staff commissioned to work on a component must have read the chapter on safety in this operating manual **before starting work**. Staff must already be aware of potential hazard sources when working to be in a position to react quickly and correctly. This applies in particular to staff who are only employed occasionally to work on a component, e.g. when setting up or servicing.

Observe all safety and hazard instructions for the equipment/the component!

Make sure all safety and hazard signs are complete and legible!

No modifications, attachments or conversions which could impair safety may be implemented without authorization from Franz Schuck GmbH!

Adhere to the prescribed deadlines, or the deadlines stated in the manual, for recurring tests/inspections!

Make sure the location or fire extinguishers is clearly indicated and operating instructions are available!
Make sure to observe the fire alarm and fire fighting instructions!

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3 Description

3.1 Types

Type	Connection
SHD, SHD-K	with welded connection on both sides
SHDF	with flanged connection on both sides
SHDFS	on one side with welded connection and on the other side with flange connection
SHM	two-sided socket screw thread

Tab. 3-1 Characteristics

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3.2 Task, function and components

The insulating joint is a fully welded construction (monobloc).

Task

Insulating joints are used for interrupting the metal conductivity of a pipeline or a cathodic corrosion protection system.

Function

In the event of an excess voltage (higher than 5 kV), it is deviated via the annular spark gap. The insulating joint remains fully functional.

Components

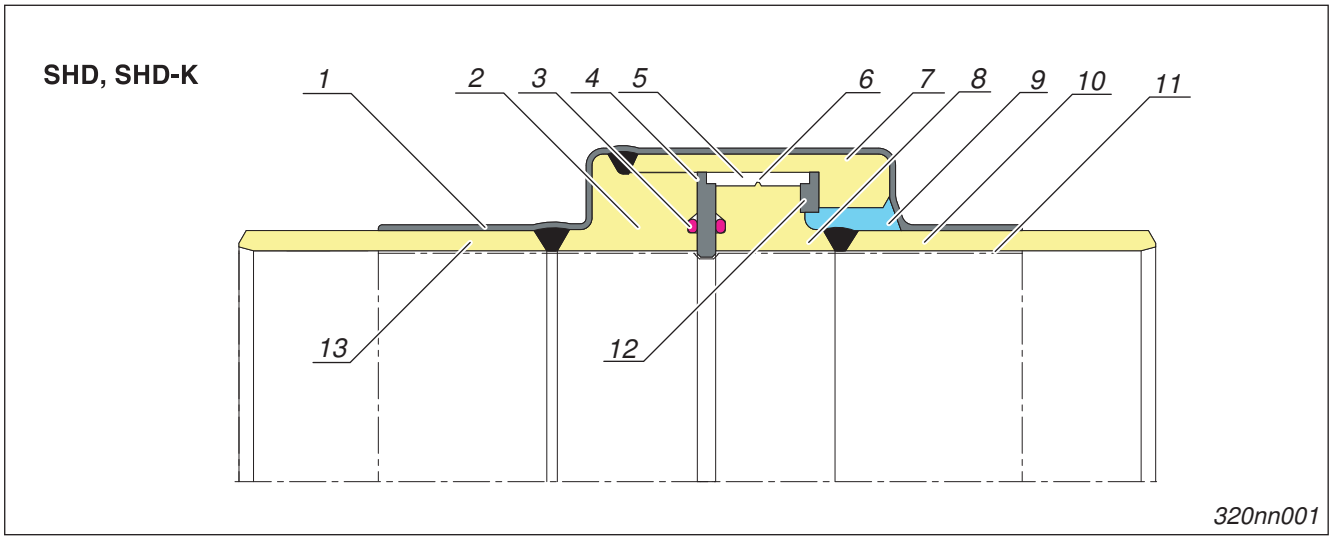

Fig. 3-1 System overview insulating joint SHD

1 Outer coating
2 Collar 1
3 Seal ring
4 Insulation ring
5 Annular space
6 Annular spark gap
7 Forged collar ring
8 Collar 2
9 Filling compound
10 Pipe connecting socket
11 Inner coating (optional)
12 Insulation ring
13 Pipe connecting socket

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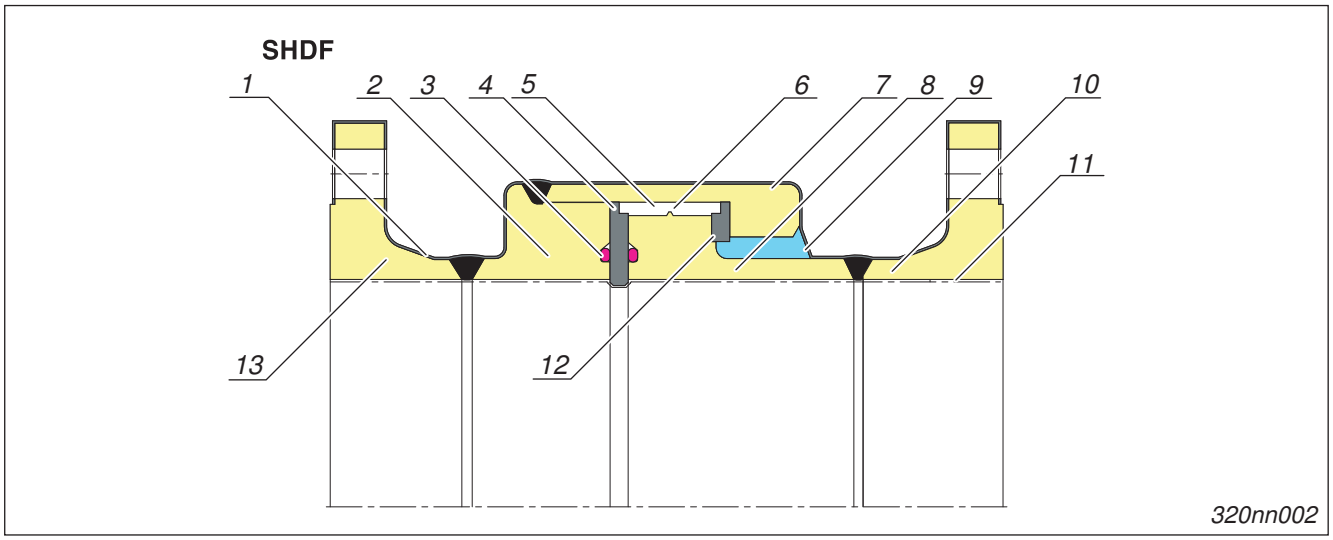

Fig. 3-2 System overview insulating joint SHDF

1 Outer coating
2 Collar 1
3 Seal ring
4 Insulation ring
5 Annular space
6 Annular spark gap
7 Forged collar ring
8 Collar 2
9 Filling compound
10 Flange
11 Inner coating (optional)
12 Insulation ring
13 Flange

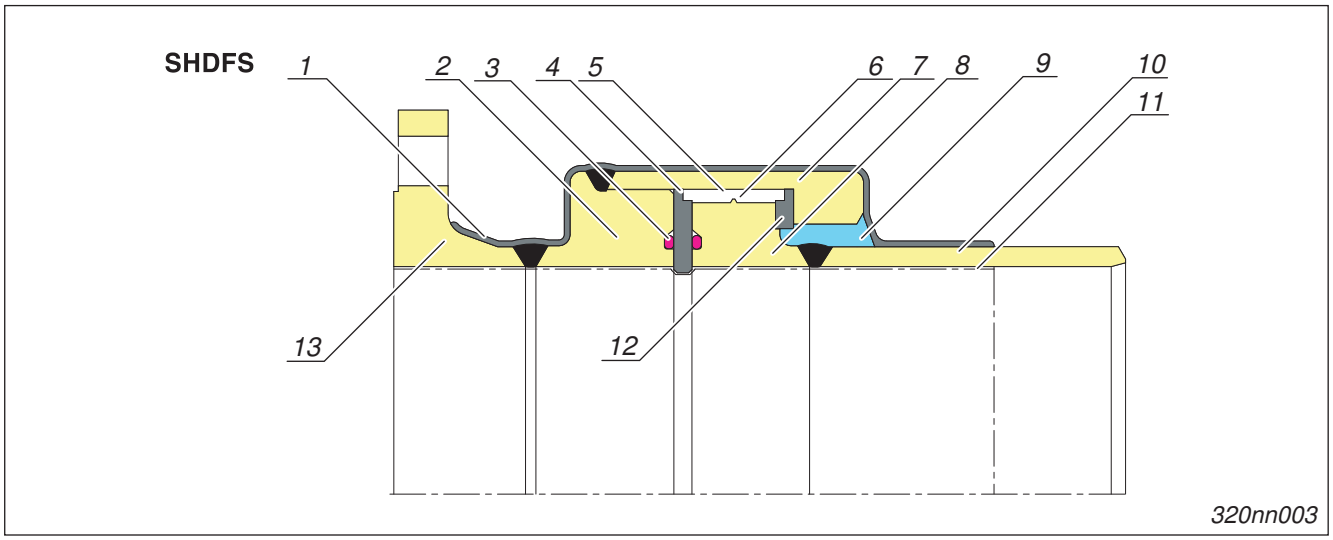

Fig. 3-3 System overview insulating joint SHDFS

1 Outer coating
2 Collar 1
3 Seal ring
4 Insulation ring
5 Annular space
6 Annular spark gap
7 Forged collar ring
8 Collar 2
9 Filling compound
10 Pipe connecting socket
11 Inner coating (optional)
12 Insulation ring
13 Flange

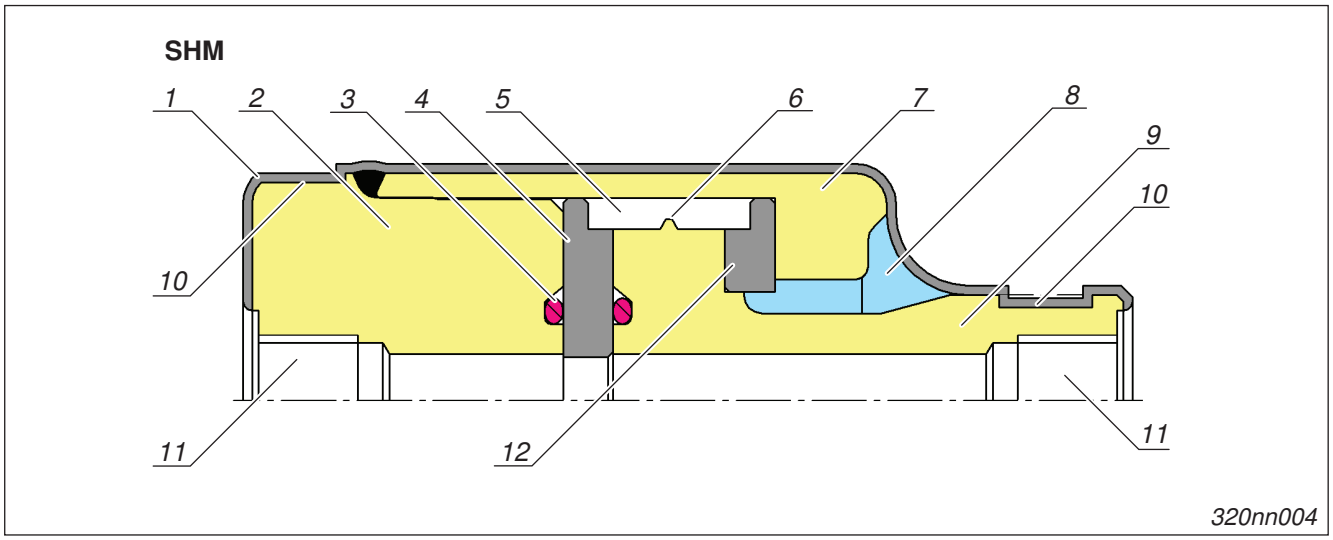

Fig. 3-4 System overview insulating joint SHM

1 Outer coating
2 Collar 1
3 Seal ring
4 Insulation ring
5 Annular space
6 Annular spark gap
7 Forged collar ring
8 Filling compound
9 Collar 2
10 Wrench size
11 Socket screw thread*
12 Insulation ring

* also available with additional male connector ➔type SHM-EO

3.3 Designation

The stamped name plate contains the following data:

- Schuck logo
- Type
- Nominal pressure
- Material
- Ident. no.
- Part no.

Additional identifiers must be specified in the order or the specification respectively.

3.4 Accessories and connections

Depending on the order, the insulating joint can be equipped with optional accessories or with interfaces for other accessories:

- Welded-on lugs for external spark gap
- External spark gap
- Connections for measuring instruments or similar

4 Installation

For questions regarding installation, please contact:

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DANGER

Dangers to the health and safety of operating and maintenance staff as well as to the functioning capacity of the component! Dangers to the environment due to escaping gaseous or liquid media!

Risk of bursting components and danger caused by the operating medium due to incorrect assembly/disassembly!

⇨ Comply with all instructions specified in this manual!

DANGER

Danger of electric shock!

⇨ Do not connect the system to power before the earth resistance and the earthing connection has been tested, examined and approved by the customer.

DANGER

Risk of injury from bursting components/system parts!

If the permissible limit values are exceeded, the component/system can be destroyed, and as a consequence of this persons can be injured or killed!

⇨ Always operate components/system parts within the permissible limit values!

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CAUTION

Risk of shorter service life of the component due to incorrect assembly and use!

- ⇨ Remove any rust or deposits from the weld-on ends before welding.
- ⇨ Ensure that the component is stress-free during assembly (no flexion, torsion, traction or stress).
- ⇨ Observe the thermal load limits of the seals and the lining of the component if applicable.
- ⇨ Protect internal lining and coating from damage during welding works (e. g. from welding spatters).
- ⇨ Make sure that no override voltages can occur during the welding process.

CAUTION

Danger of hardness increase of the steel when welding without pre-heating the weld junction at temperatures exceeding 80 °C!

- ⇨ Pre-heat the weld-on ends depending on the carbon equivalent (CEV) before starting the welding process.
- ⇨ Observe the notes on CEV (➔ Page 7-3, Chapter 7.3).
- ⇨ Make sure to monitor the temperature when pre-heating and welding! Suitable measures (such as cooling, extending the weld-on ends without coating, dismantling, etc.) must be taken to avoid elevated temperatures in areas with coated surfaces.
  Temperatures of up to 100 °C are permissible for a short time.

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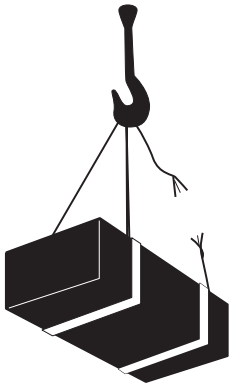
4.1 Preparing the installation

4.1.1 As-delivered condition



DANGER

Life hazard from dropped loads or shifting of loads!

Risk of injury and/or material damage due to incorrect installation or inappropriate equipment and devices for lifting or moving the load.

⇨ Load-carrying equipment, lifting devices and industrial trucks must comply with the current regulations!

⇨ It is forbidden to stay under suspended loads.

⇨ Make sure to observe the country-specific regulations during transport.

If no other contractual agreements have been made, the components are supplied for transport under the following conditions:

- weld-on ends are coated with an anti-corrosive product
- the components are packed on wooden pallets, lattice boxes or boxes

Procedure

1. Only use the original packaging for transporting the component to its place of installation.
   The component can be damaged by incorrect handling.
2. Only use lifting devices that are appropriate to the weight being moved.
3. Use appropriate protective materials when using steel cables or chains in order to protect the outer coating.
4. Ensure the load does not tip sideways.

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4.1.2 Inspection

Procedure

1. Check the delivery notes to make sure that the delivery is complete.
2. If there are any discrepancies, contact Franz Schuck GmbH immediately.
3. Check the delivery immediately on receipt for damage incurred during transport.
   In the event of damage occurring, observe the stipulations of the insurance company which, among other things, prescribe that evidence of damage is confirmed immediately by the forwarding agent.
4. If applicable, photograph damage to proof evidence.

4.1.3 Storage

Store the component in its original packaging.
Take suitable measures to protect the component against external influences, dirt and moisture.

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4.2 Installation

CAUTION

Damage to the component in the case of mechanical overloading!
The component is not designed as fixed point/support of the pipeline.

⇨ Extra support on the pipeline is required.

⇨ In the case of liquid media where deposits may accumulate in the insulation ring area (e. g. oil, condensates, etc.), install the component in a tilted position (≥ 30°).

4.2.1 General installation instructions

Prerequisite

- Check parts on receipt for any possible damage that may have occurred during transport. Only flawless parts may be installed.
- The component may only be installed by skilled staff.
- Carefully remove the anti-corrosion protection on the weld-on ends using appropriate means.

The insulating joint must be clean and dry on the inside.
Prior to installation, an electrical resistance test must be carried out using 500 V direct current.
The resistance measured must not fall below 0.1 MΩ.

- Prior to installation, check the pipelines for dirt and foreign particles, clean if necessary
- Ensure that no dirt or foreign particles can get into pipeline or component during installation
- Ensure that inner and outer coating are not damaged during installation
- Ensure that the component is installed into the pipeline stress-free. It is not designed to absorb occurring forces and torques

4.2.2 Installation

Procedure

Insulating joint – version with weld ends

1. The insulating joint is installed in the same way as the ones in the pipeline that is to be installed or welded.
2. In the case of insulating joints with both-sided weld-on ends, it is recommended to install the forged collar ring facing towards the side that is to be protected cathodically. In the case of insulating joints with one-sided internal coating, the coated side must face towards the side that is to be protected cathodically. The side facing towards the cathodic protection is marked with a label.
3. In case the insulating joint must be cut to length for proper installation, it must be ensured that the remaining distance of the respective welding seam between pipeline and insulating joint to the dielectric is generally at least 1x the nominal diameter of the insulating joint.
4. The welding can either be carried out in vertical up position (PF) or vertical down position (PG) by approved welders.
5. The selection of the welding technique and the electrodes depends on the material of the insulating flange connection pipes and of the pipelines.
6. After checking the weld seams and the pipeline (pressure test), the weld seams must be provided with an electrically insulating covering that complies with the requirements of protective insulations.
7. Due to the spark gap integrated in place, an additional spark gap is not necessary.
8. Following a final inspection of the pipeline, the insulating joint must be embedded correctly, i. e. the back-fill material must not contain any sharp-edged objects and it must be compressed properly.

Insulating joint – version with flanges

1. The flange seals and bolts must be suited for sealing strip shape, pressure, temperature and medium.
2. The pipeline counter flanges must be aligned plane-parallel and concentrically.
3. Tighten the screw connections crosswise and evenly with the appropriate tightening torque.

Insulating joint – version with socket screw threads

1. When installing insulating joints with socket screw threads, the pipeline counter pieces must be aligned concentrically.
2. An additional spark gap is not required due to the spark gap integrated here.
3. If male connectors are screwed in the socket screw threads by the customer, it is essential to ensure that when screwing in the respective connector, the insulating joint is fixed on the same side using a wrench with the appropriate wrench size.
4. The maximum permissible torsional moments for insulating joints with socket screw threads are specified in the annex (➔ Page 7-4, Chapter 7.4). Ensure that these moments are not exceeded, both during installation and in installed condition. This prevents potential twisting of the insulating joint.

For type SHM-EO with additional male connectors, the following issues must be observed additionally:

1. When installing insulating joints with additional male connectors, the pipe recommendations of the connecting element manufacturer must be observed.
2. In addition, the manufacturer's mounting instructions must be observed. Tighten the male connectors with the tightening torque appropriate for this application.
3. Pipes must be cut to length and deflashed carefully, minimum lengths for pipe ends must be observed. Ensure that cap nuts can be screwed easily over the entire thread length.
4. Every time a connection is undone, the cap nut must be tightened with the same effort applied during initial installation. Once assembled, pipe connection and screwing element belong together.
5. Retightening and venting of pressurized connections is dangerous to life.

Electrode and autogenous gas welding techniques are possible during installation. For autogenous gas welding the Franz Schuck GmbH recommends to cool the insulating flange construction (e. g. by means of a damp cloth) to prevent the seal and insulating material from damage if the temperature exceeds 80 °C.

4.2.3 Function test

When welding is finished, a pressure test in the pipeline must be scheduled.

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Water-bearing insulating joints

Minimize the thermal load to avoid damage of the internal lining!

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5 Operation

The component is a passive component. To this effect, operation only takes place in the form of maintenance works (➔ Page 6-1, Chapter 6).

In either case, comply with the safety instructions and protective measures specified in chapter 2 as well as the applicable legal regulations.

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6 Maintenance

For support in maintenance and optimization work, we recommend you contact the Franz Schuck GmbH service department.

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The Franz Schuck GmbH recommends regular visual inspections (where possible).

The inspection of the electrical separation is operator-dependant.

It is mandatory to inspect the component following excess voltages (e. g. due to lightning).

6.1 Faults and troubleshooting

Fault	Cause	Remedy
Leakage in the area of the electrical separation	Insulation defective	⇨ Remove the insulating joint and send to Franz Schuck GmbH for inspection
	Filling compound defective	
Loss of electrical separation	Damage due to excess voltage	
	Moisture penetration in annular space	

Tab. 6-1 Faults and troubleshooting

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6.2 Repairs

In principle, repair work may only be carried out by the Franz Schuck GmbH service team or by personnel trained by Franz Schuck GmbH.
This ensures that repairs are carried out properly and that original spare parts are used. This will maintain the validity of the warranty.

Observe the following instructions:

- Should any faults occur, immediately notify the Schuck service personnel in charge and take appropriate measures
- Do not carry out work on pressurized systems, do not open the equipment
  - De-pressurize system before starting work
- Do not remove any components during operation
  - Turn off control pressure, control voltage and electricity
- Display warning signs that refer to the risks involved if the system is started up unintentionally or if the electricity or line pressure is switched on
- If there is damage or a defect, switch off the affected equipment and systems
- In the case of damage of any kind, stop work on the affected equipment and systems
- After completion of work, check for correct function and if appropriate fulfill and comply with all technical guidelines
- Check that the optionally mounted accessories are functioning correctly

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7 Appendix

7.1 Tightening sequence for flange bolts

The bolt numbers represent the order in which they should be tightened.

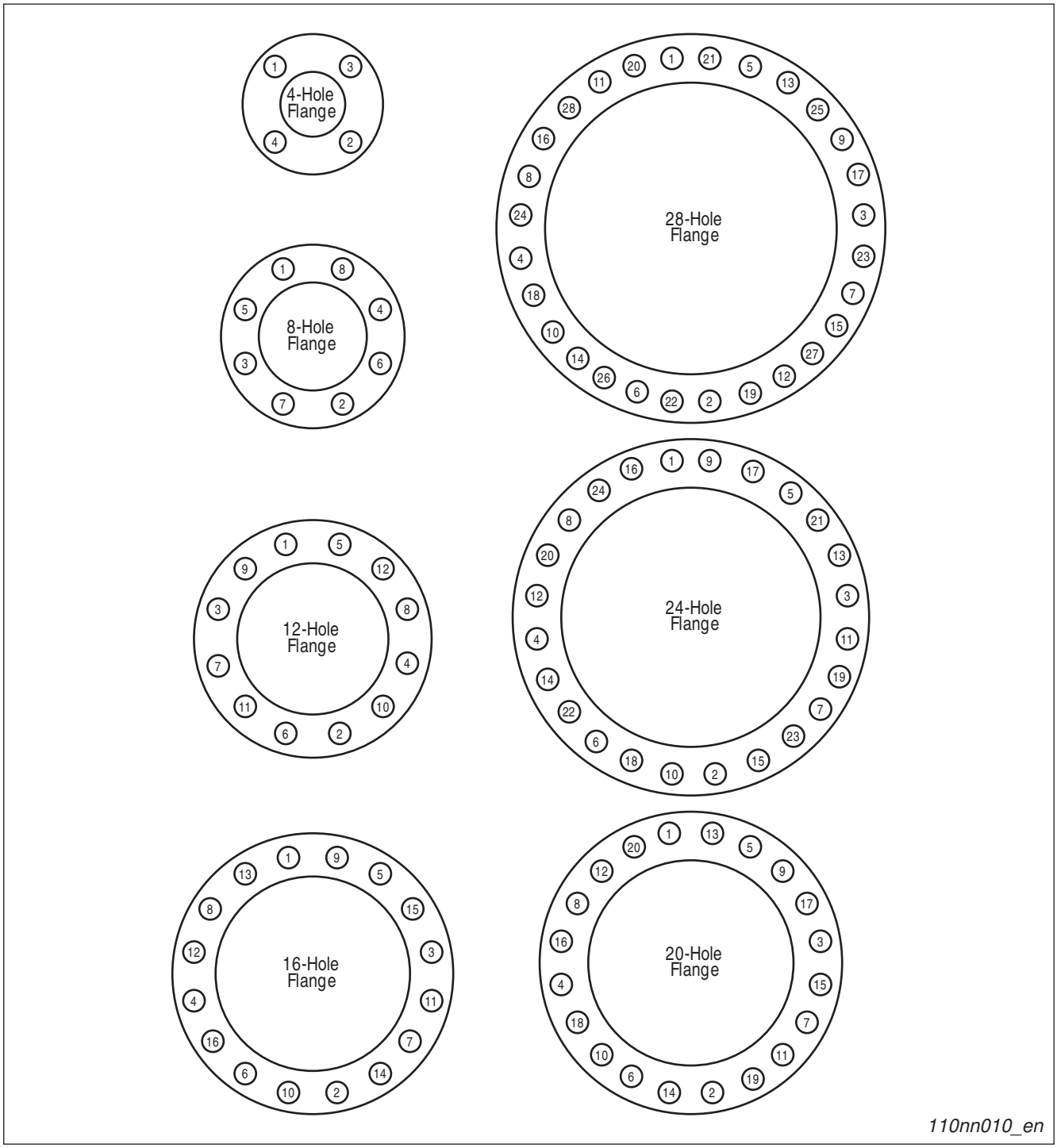

Fig. 7-1 Tightening sequence for flange bolts

7.2 Conversion factors

Value	Unit	Conversion unit	Factor
Length	mm	in	0.03934
	in	mm	25.4
	m	ft	3.28084
	ft	m	0.3048
Weight	kg	lb	2.204622
	lb	kg	0.453592
Pressure	bar	psi	14.5035
	psi	bar	0.06895
	MPa	psi	145.035
	psi	MPa	0.006895
	bar	MPa	0.1
	MPa	bar	10
Temperature	°C	°F	1.8 °C + 32
	°F	°C	(°F – 32) × 0.5556
Volume	cm^3	in^3 (cubic inch)	0.06102
	in^3 (cubic inch)	cm^3	16.387

Tab. 7-1 Conversion factors

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7.3 Calculation formula to determine the carbon equivalent (CEV)

To avoid an increased hardness in the weld junctions during welding, it is required to pre-heat the weld-on ends depending among others on the carbon equivalent.

7.3.1 Calculation formula (standard)

The calculation formula applies for steels of the following consistency:

- Carbon **C**: up to 0.22%
- Manganese **Mn**: up to 1.6%
- Chromium **Cr**: up to 1.0%
- Nickel **Ni**: up to 3.5%
- Molybdenum **Mo**: up to 0.6%
- Copper **Cu**: up to 1.0%

The calculation formula for steels of the above-mentioned consistency is:

$$CEV = C + \frac{\%\,Mo}{4} + \frac{\%\,Cr}{5} + \frac{\%\,Mn}{6} + \frac{\%\,Ni}{15} + \frac{\%\,P}{2} + \frac{\%\,Si}{4} + \frac{\%\,V}{5} + \frac{\%\,Cu}{13}\ \%$$

Carbon Equivalent

Fig. 7-2 Steel consistency and the resulting calculation formula

Adjust the pre-heat temperature on an individual basis depending on carbon equivalent, welding consumable, product gauge, hydrogen content and heat input in compliance with the welding supervisor.

The following temperature is recommended after determining the CEV value:

CEV [%]	Recommended temperature for pre-heating [°C]
≤ 0.45	up to 100 °C
0.45 – 0.60	150 – 250 °C

Tab. 7-2 Recommended temperature for pre-heating

7.3.2 Calculation formula for steels with different consistencies

When using steels outside the above-mentioned consistency, adjust the heat input in compliance with the welding supervisor on an individual basis.

7.4 Maximum permissible torsional moments for insulating joints with socket screw threads

Insulating joint	Maximum permissible torsional moment [Nm]
DN 15	180
DN 25	410
DN 32	650

Tab. 7-3 Maximum permissible torsional moments for insulating joints with socket screw threads

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Room for your notes

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