

ISOflanges GmbH – Winsen (Aller)

Analysis of risks and hazards / operating and instruction manual

Insulating flange connection Type ISO-KonneX



Figure 1

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1. Analysis of hazards and risks

1.1. General information

The hazards and risks analysed in this document must be observed, and the instructions must be followed before using or assembling the product.

1.2. Risk analysis

If the product is used properly, it does not pose a hazard.

Risk analysis HP2 insulated flange connection

Endangerment	Possibility	Explanation	Measure
1. Exceeding the maximum permissible internal or external pressure	Yes	The maximum operating pressure is specified on the type plate; note in the operating instructions	The operator is responsible for ensuring that the maximum permissible pressure is not exceeded.
2. Exceeding the maximum or minimum permissible temperature or temperature gradient	Yes	Indication of max./min. operating temperature is specified on the type plate; note in the operating instructions	The operator is responsible for ensuring that the specified permissible temperature ranges are not exceeded.
3. Exceeding the design characteristics relevant to the service life of the device with regard to creep effects, fatigue and corrosion	No	HP2 insulating flanges are permanently sealed and require no mechanical maintenance.	/
4. Hazards due to static pressure and device contents under operating and test conditions	No	HP2 insulating flanges are permanently sealed and require no mechanical maintenance.	/
5. Exceeding the dynamic load as well as traffic, wind, snow or earthquake loads	Not applicable	/	/
6. Exceeding reaction forces and moments resulting from supports, attachments, pipes, etc.	Not applicable	/	/
7. Decomposition of unstable fluids	Not applicable	/	/
8. Instability aspects	Not applicable	/	/
9. Incorrect handling of closures and openings.	No	Note in the operating instructions; to be installed only by suitable personnel	/
10. Dangerous relief of pressure relief valves	Not applicable	/	/
11. Incorrect handling of devices designed to prevent physical access in the event of overpressure or vacuum	Not applicable	/	/
12. Surface temperature, taking into account the intended use	No	The maximum operating temperature is specified on the type plate; note in the operating instructions	/
13. Incorrect handling of unstable fluids, leading to their decomposition	Not applicable	/	/
14. Inadequate drainage and ventilation with the following possible consequences:			
14.1. Water hammer, implosion, corrosion and chemical reactions;	Not applicable	/	/
14.2. Obstruction of safe cleaning, inspection and maintenance	Not applicable	/	/

Risk analysis HP2 insulated flange connection

Endangerment	Possibility	Explanation	Measure
15. Excessive wear	No	HP2 insulating flanges are permanently sealed and require no mechanical maintenance.	/
16. Incorrect assembly of components	Yes	Note in the operating instructions; to be installed only by suitable personnel	The operator must employ suitable personnel and adhere to the operating instructions.
17. Incorrect filling and emptying:			
17.1. Overfilling or exceeding the permissible pressure	Yes	The maximum operating pressure is specified on the type plate; note in the operating instructions	The operator is responsible for ensuring that the maximum permissible pressure is not exceeded.
17.2. Instability of the pressure equipment	No	HP2 insulating flanges are permanently sealed and require no mechanical maintenance.	/
17.3. Uncontrolled outflow of fluid under pressure	No	HP2 insulating flanges are permanently sealed and require no mechanical maintenance.	/
17.4. Insecure connection and disconnection	Yes	Note in the operating instructions; only to be dismantled by suitable personnel	The operator must employ suitable personnel and adhere to the operating instructions.
18. Inappropriate failure of equipment parts with a safety function, pressure limiting devices or temperature monitoring devices. For example, with regard to:			
18.1. Reliability for the intended use	No	HP2 insulating flanges are permanently sealed and require no mechanical maintenance.	/
18.2. Maintenance and inspection requirements	No	HP2 insulating flanges are permanently sealed and require no mechanical maintenance.	/
18.3. Independence from other functions	No	HP2 insulating flanges are permanently sealed and require no mechanical maintenance.	/
19. Inappropriate failure of measures against external fire exposure.	Yes	HP2 insulating flanges are not resistant to external fire exposure.	Measures must be specified by the operator in the fire protection/safety concept.

2. Operating and instruction manual

2.1. Introduction

The insulating flange connection type HP2 is used for the safe electrical separation of steel pipes in conjunction with a CCS (cathodic corrosion protection system) and in “black and white connections” used to protect against bimetallic corrosion. The insulating flange connection is suitable for gaseous (including gases in accordance with G 260) and liquid media, and is designed so that it can easily withstand normal operating loads and perform its function completely (when installed correctly). It is not necessary to disassemble the insulating flange connection during pressure testing (test pressure max. 1.5xDP) of the pipeline; the insulating flange connection can remain in the pipeline. Unlike conventional insulating flange systems, the HP2 system is state-of-the-art, requires no mechanical maintenance, is permanently technically tight in accordance with TRBS 2141-3 and TRBS 2152-2, is mechanically resistant to additional pipe forces and allows the maximum permissible utilisation of the screw bolts (> 70% R_{p0.2}).

2.2. Information on the type plate

The label on the insulating flange connection consists of a weather-resistant, permanent type plate that is adhered to the circumference of the laminated fabric flange. The type plate is covered in UV-resistant laminate that is protected against external influences, such as liquid and moisture, for additional protection.

When assembling the insulating flange connection, ensure that the insulating flange is positioned so that the type plate is clearly visible and easy to read. The insulating flange connection is labelled as follows (example):

	Type HP PN100 PS 100 bar TS -20°C/+60°C 2023	Serial No.: I0991.004
	ISO screw connection 12 mm Tightening torque 47 Nm	Item no.: 81100309

Analysis of hazards and risks

The type plate must be treated carefully and protected against damage and external mechanical forces that could make the type plate illegible.

Failure to do so could make it possible to identify the component or allocate it to the acceptance test certificate; this may result in a loss of certification.

2.3. Setup and installation/assembly

2.3.1. Assembly preparations at the setup location

- Compare the planning documents with the actual situation on site
- Inspect the parts intended for installation
- Choose suitable tools

Analysis of hazards and risks

If these requirements are not observed, or if dirty or damaged components are used in the assembly, it will not be possible to ensure the electrically insulating function of the insulating flange connection. This poses a hazard to people and the environment.

2.3.2. Assembly instructions

- A flange connection can only reliably fulfil its function if the elements of the flange connection are dimensioned correctly for the application and assembled properly.
- Seals must be visually inspected before use, and may not be reused after installation.
- Sealing surfaces must be clean, free of residue, undamaged, and grease-free. This also applies to the groove of the insulating flange.
- Flanges must be able to be assembled flush and smooth, without applying force.
- In general, assembly must be carried out using suitable, torque-monitored tools. These tightening torques apply only on condition that the threads of the screw bolts and the contact surfaces of the nuts have been treated with lubricants suitable for this purpose (lubrication of force-transmitting components). This is achieved in the case of the screw bolts used by means of the self-lubricating zinc flake coating. No additional lubricant is required.
- Overloaded or overextended screw bolts must be replaced.
- Replacement parts may only be purchased from the manufacturer.

2.3.3. Assembling flange connections

- The screw bolts are coated with a self-lubricating coating – no lubrication or greasing is required.
- If the operator has applied an additional lubricant, then the operator must ensure that the coefficient of friction of $\mu_{ges} = 0.12$ is maintained. Better or worse friction coefficients can lead to failure of the flange connection and are therefore the responsibility of the operator.
- The addition of lubricant can impair the insulating properties of the materials used, resulting in inadequate insulation values.
- No greases or screw pastes may be applied to the seal or sealing surface.
- The components may not be installed if they are dirty. The insulating flange connections and their individual components must be dry and clean before assembly.
- Screw connections on flanges may not be tightened under operating pressure. Leaking flange connections must be re-assembled, and new seals must be used to do so.
- Seals, screw bolts and nuts are safety-relevant components, and must be treated accordingly.
- The insulated screw bolts must be installed so that the bolt insulation is in the centre of the flange connection, and the bolts protrude the same distance on both sides of the welding neck flange. The bolt insulation protrudes from the pre-welded flange plate so that the insulation ring still to be installed covers the protruding bolt insulation. The screw bolt protrusion is measured with a maximum protrusion of one thread pitch ($1 \times p$) plus the thread run-out ($1 \times z_1$). The smallest possible screw bolt protrusion corresponds to the thread run-out. We use nuts $H=D$ in accordance with DIN 2510 NF for all insulated flange connections. The specified bolt protrusion corresponds to the state of the art.
- To ensure that the flange is flush, the self-lubricating screw bolts must be used in the lower area of vertically aligned flanges.
- The correct sequence of steps must be planned/defined before beginning work, to ensure professional, tension-free assembly of the flange connections. The insulating flange connection must be assembled without tension in order to function properly.

- The screw bolts must be tightened in at least 5 steps, as follows:
 - Step 1: approx. 10 - 20% of the assembly tightening torque (cross-wise);
 - Step 2: check to ensure that the flange connection is assembled flat and flush, so that the sealing surfaces lay evenly against the seal.
 - Step 3: approx. 50 - 70% of the assembly tightening torque (cross-wise)
 - Step 4: 100% of the assembly tightening torque (cross-wise)
 - Step 5: 100% of the assembly tightening torque (all round).
- Alternative processes to tighten the screw bolts may be permitted in some cases.

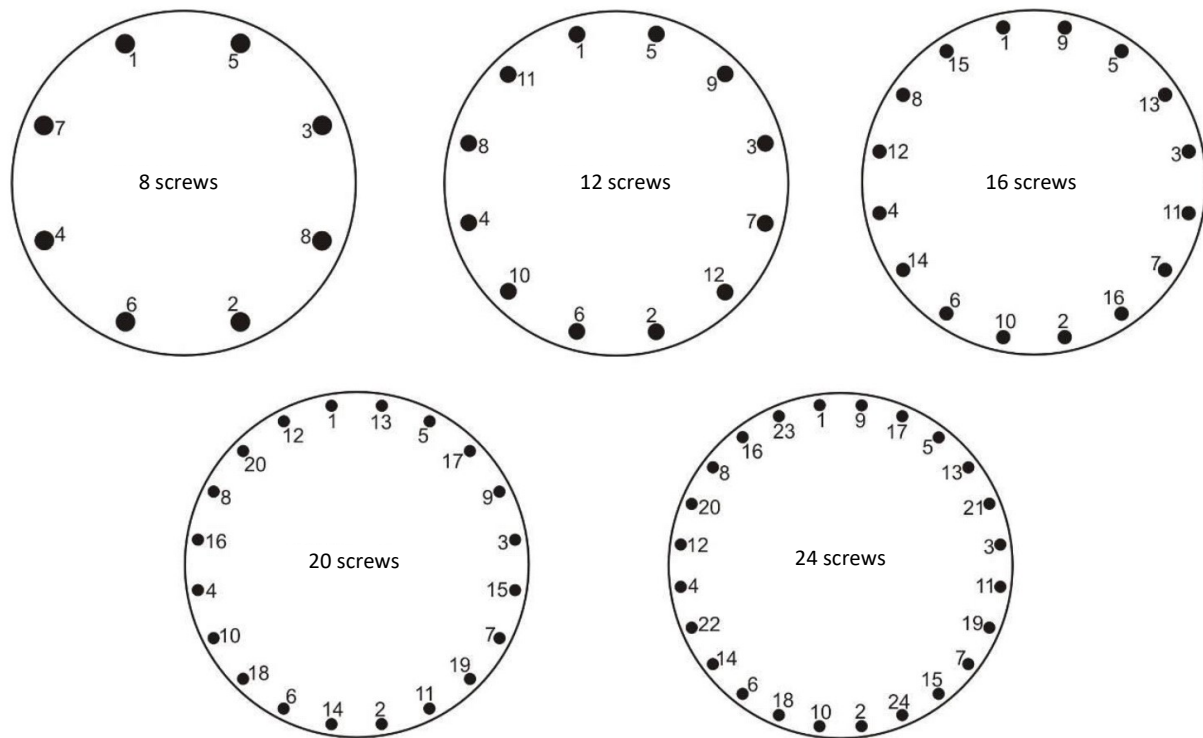


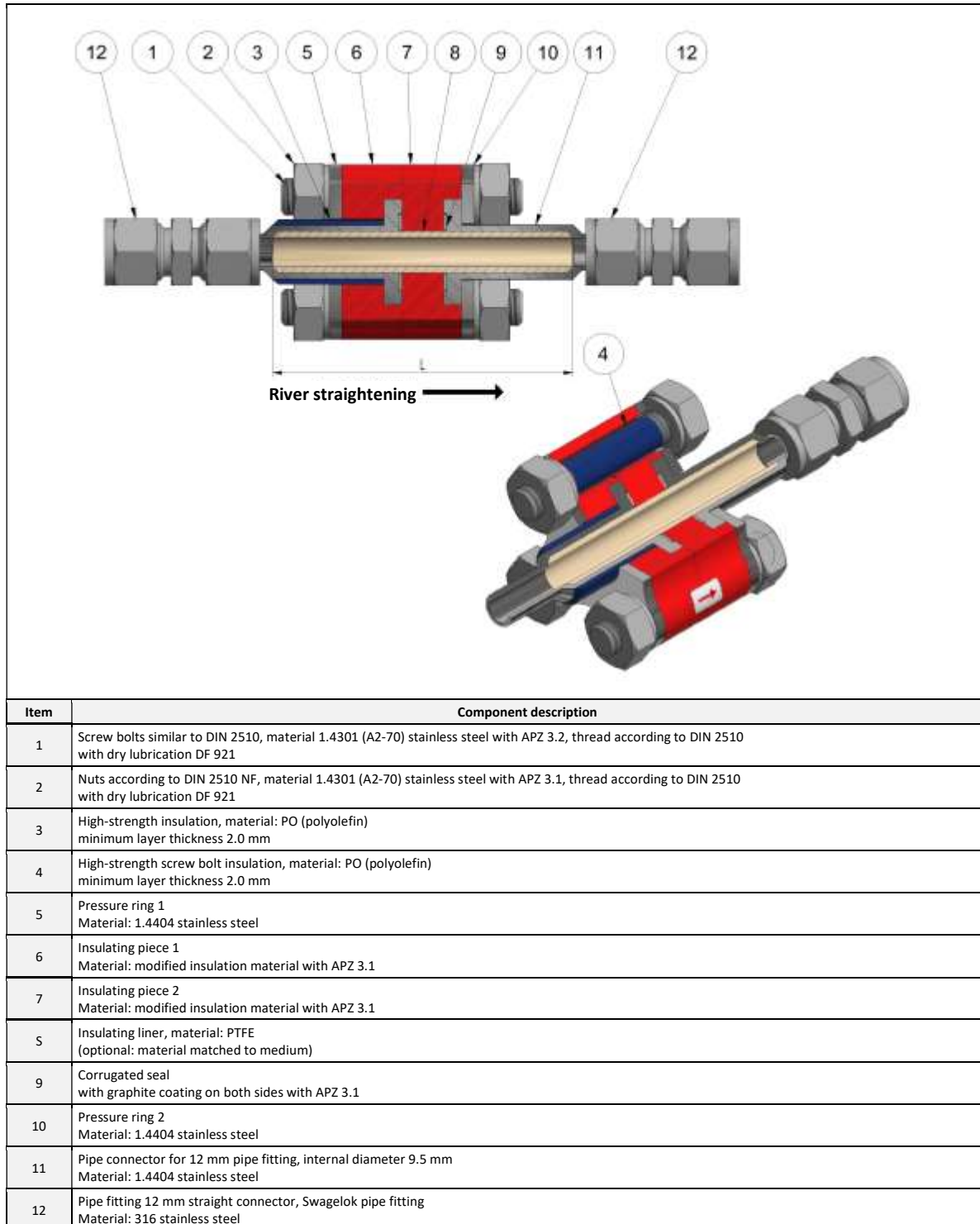
Figure 2

2.3.4. Installing cable anchors and ex transmission separation channels

Not applicable to this model. The customer must ensure that sparks cannot be generated in potentially explosive areas.

2.3.5 Fitting compensation rings/pressure rings/insulating rings

The compensating rings are not required in this design. The pressure rings and insulating rings are assembled according to the drawing.



2.4. Use and operation

2.4.1. Operating conditions for the insulating flange connections

- This document applies to the assembly of insulating flange connections, type HP2, from ISOflanges GmbH at ambient temperatures from -20°C to +60°C which are depressurised.
- The manual must be applied during assembly and disassembly of metal flange connections on pipelines and pressure equipment. A flange connection is a detachable connection between devices, pressure equipment, machines or pipeline elements.
- The pipelines to be connected may only be mounted and operated free from force or torque.
- The maximum permitted operating pressure is indicated in the enclosed acceptance test certificate, and may not be exceeded.
- Before assembly, the components must be inspected to ensure they are in proper condition. Only undamaged components may be installed.
- The components of the insulating flange connection and the tools to be used must be stored appropriately, and must be suitable and calibrated.
- The operator is responsible for ensuring that the insulating flange connection and sealing material are compatible with the medium used.

Analysis of hazards and risks

If the sealing strip is lower than the spacing ring, then it must be adjusted. Assembly without adjustment is not permitted, as it will not be possible to ensure a proper seal. Failure to observe this operating and instruction manual will result in hazards for people and the environment. We will accept no liability for damages of any kind resulting from failure to observe this document.

2.4.2. Coating the insulating flange connections

Upon delivery, the insulating flange is coated in a signal colour (orange) so that it is clearly recognisable as an insulating point, as well as to protect the material against the influences of weather.

The coating consists of a 2K polyurethane acrylic paint, with the following properties:

- High UV and weather resistance
- Very good water resistance
- Resistant to solvents
- Continuous temperature resistance: 150 °C

The insulating flange connection may not be painted over in any way. This would result in the loss of function and would void the warranty.

2.4.3. Screw bolt insulation

Ensure that the insulation is not damaged. There may be no spalling, cracks or other damage present. The screw bolts must be protected carefully against damage. If damage is present, the screw bolts may not be used. Replacement parts may only be purchased from the manufacturer.

The flanges must be joined flush and flat. The flange sheets must be parallel with one another and flush without centre offset in order to ensure correct assembly. Ensure that the screw bolts can be inserted properly through the screw holes on the flange without the insulation being damaged by the edges of the holes. No torsional forces may be acting on the screw bolts. The screw bolts may not be screwed into the screw holes.

Analysis of hazards and risks

Failure to observe these requirements may result in damage to the electrically insulating screw bolt insulation, and it may no longer be possible to ensure the function of the insulating flange connection.

2.4.4. Screw bolt coating/corrosion protection

The self-lubricating coating on the screw bolts and nuts is made of a base zinc flake coating and a top coat which contains solvents. Defined friction coefficient range of $\mu_{ges} = 0.12$.

If the operator has applied an additional lubricant, then the operator must ensure that the coefficient of friction of $\mu_{ges} = 0.12$ is maintained. Better or worse friction coefficients can lead to failure of the flange connection and are therefore the responsibility of the operator. The addition of lubricant can impair the insulating properties of the materials used, resulting in inadequate insulation values.

To ensure that the properties of the coating are not negatively impacted, the surface may never come into contact with cleaners, thinners, or other agents that would interfere with a surface containing solvents.

The zinc flake coating process is described in standards DIN EN ISO 10683 and DIN EN ISO 13858.

Corrosion resistance DIN EN ISO 9227 / ASTM B117

Guarantees cathodic corrosion resistance as required in DIN EN ISO 10683

Fulfills the salt spray testing DIN EN ISO 9227, as required in DIN EN ISO 10683

Analysis of hazards and risks

Ensure that the coating does not come into contact with cleaning agents, thinners or other agents (that would interfere with a surface containing solvents). Failure to do so may damage the coating, and could result in corrosion.

2.4.5. Torque calculation

The flange connection must fulfil certain defined sealing requirements based on its application. A mathematical proof of tightness and strength for the system is provided in accordance with DIN EN 1591-1. The torque to be applied is supplied by ISOflanges and is noted on the documentation drawing.

The insulating flange connection may only be tightened with this torque. The assembly information provided must be observed during assembly and when applying the torque.

The torque is calculated based on a coefficient of friction of 0.12, and applies to the components delivered by ISOflanges.

2.5. Maintenance and inspections

ISOflanges' HP2 insulated flange connections are mechanically maintenance-free.

2.6. Documentation

ISOflanges GmbH issues the associated documentation, which is considered part of the insulated flange. The insulated flange may not be operated without documentation.

- EU Declaration of conformity in accordance with the Pressure Equipment Directive
- APZ 3.1 in accordance with DIN EN 10204
- Documentation drawing
- Analysis of risks and hazards / operating and instruction manual

The certificates for the individual components are documented and archived by the manufacturer, but are not included in the scope of delivery. The manufacturer certifies that the overall component conforms to the Pressure Equipment Directive via a declaration of conformity.

2.7. Disassembly/disposal

In general, all lines and system parts may be opened only when they are empty and have been depressurised. To do so, the system must be properly decommissioned before disassembly.

If the flange is clean, the insulating flange connection can be installed using a new seal. Seals may generally only be used once. Check the screw bolts and nuts intended for re-installation, and replace them if needed. The screw bolt insulation must be undamaged.

Replacement parts may only be purchased from the manufacturer.

After disassembly, components must be checked/assessed for contamination and disposed of accordingly/properly.

Analysis of hazards and risks

If the operating manual and instructions are not observed, it will not be possible to ensure the electrically insulating and mechanical function of the insulating flange connection. We will accept no liability or guarantee for damages of any kind.

ISOflanges is certified in accordance with the Pressure Equipment Directive in category 2, module A2.

ISOflanges is certified in accordance with: ISO 9001:2015, design and distribution of technical components for gas technology systems.

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