Installation Operation and Maintenance Manual

Inspection Opening ExPR600

For installation in tanks pressure vessels ducts and similar process equipment

This manual provides requirements for receiving, installing, welding, operating and maintaining the ExPR600 inspection opening. Correct installation is necessary to preserve the geometry of the frame, the sealing function and the hygienic finish. Welding shall be carried out only to an approved welding procedure by qualified personnel.

Important This manual does not replace the tank or pressure vessel design, the approved drawing, the applicable construction code, the welding procedure specification or statutory requirements. If documents conflict, stop work and obtain written clarification from the responsible designer or Leopold Parts.

Document information	Value
Document number	LP-ExPR600-001
Revision	2
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Product	Inspection opening ExPR600
Scope	Installation and welding into tanks pressure vessels ducts and similar process equipment
Manufacturer	Leopold Parts ApS Industrivej 7 6580 Vamdrup Denmark

1 Product identification

The inspection opening is marked on the body in a visible position. Verify the marking against the order documents before installation. The marking identifies the manufacturer, year of manufacture, serial number, allowable pressure and temperature, test pressure and product type.

Type code element	Meaning
ExPRXXX	Nominal opening size. ExPR600 identifies size 600.
PNYY	Pressure rating stated on the product marking and order documentation.
Z	Frame form. S identifies a normal shell neck and C identifies a cone neck.
QQQ	Mounting arrangement. SIM identifies side mounting and TOM identifies top mounting.
SG	Added when the inspection opening is supplied with a sight glass.

2 Intended use

The ExPR600 provides access to the interior of tanks, pressure vessels, ducts and similar process equipment for inspection, cleaning, maintenance and servicing. Product suitability depends on the ordered material, gasket, pressure rating, temperature range, orientation and process conditions.

For food and pharmaceutical applications, the completed installation must be drainable and cleanable as required by the process. Internal surfaces, welds and transitions must not create product traps, cracks, sharp steps or inaccessible areas.

3 Responsibilities and limitations

The tank or equipment manufacturer is responsible for the opening reinforcement, local stresses, weld design, material compatibility and conformity assessment of the completed equipment. The installer is responsible for following the approved drawings and WPS, controlling distortion and documenting inspection and testing.

Leopold Parts accepts no liability for use outside the product specification, installation contrary to this manual or damage caused by unsuitable materials, incorrect welding, inadequate maintenance or unsafe operation.

4 Safety requirements

- Only trained and authorised personnel may install, weld, inspect, operate or service the inspection opening.
- Before opening, isolate the equipment and verify zero pressure, safe temperature and absence of hazardous vapours or product.
- Use site-required personal protective equipment and controls for welding fumes, hot work, confined spaces and chemical exposure.
- Never exceed the pressure and temperature shown on the product marking and documentation.
- Never stand in the opening path of the lid or loosen fasteners while pressure may be present.

5 Components

The delivered configuration depends on the order. Typical components include the frame, lid, operating gasket, swing bolts or screws, nuts or handles, hinge or swivelling device, locking components and optional equipment such as a sight glass, spring assistance, limit switch, safety grid or safety valve.

Before installation Record the serial number and photograph the marking. Check that the frame, sealing face, lid, hinge and fasteners are undamaged and that all loose parts are accounted for.

6 Installation planning

6.1 Required documents

- Approved vessel or equipment drawing showing position, orientation, reinforcement and weld detail.
- Material certificates and product documentation for the supplied inspection opening.
- Approved WPS supported by a valid qualification record for the actual material group, thickness range, joint type and welding position.
- Inspection and test plan defining visual examination, NDT, leak or pressure testing and acceptance criteria.
- Surface finish and hygienic requirements for product-contact areas.

6.2 Installation conditions

Install the opening only in the location and orientation specified by the responsible designer. Confirm that the lid can open fully, fasteners can be operated safely, accessories have clearance and the frame is accessible for welding, grinding, cleaning and inspection.

The equipment shell and frame must be compatible for welding. Do not install through coatings, scale, grease, chloride contamination, adhesive, marker residue or other contaminants. Use tools reserved for stainless steel to prevent embedded iron contamination.

6.3 Cutting the opening

1. Transfer the approved opening contour and reference axes to the shell. Check the position twice before cutting.
2. Support the shell as needed to prevent movement. Cut without damaging adjacent material or required reinforcement.
3. Deburr the cut edge and prepare the joint exactly as shown on the approved drawing and WPS.
4. Clean and degrease the frame and shell on both sides of the weld zone. Keep the sealing face protected from grinding dust and spatter.

Do not Change the opening size, reduce the frame thickness, grind the sealing face or alter pressure-retaining parts without written approval.

7 Welding the frame into position

7.1 Set up and alignment

5. Remove the operating gasket and all heat-sensitive accessories from the weld area. Store them clean and protected.
6. Fit a clean temporary spacer or purpose-made stiffening fixture where required. The fixture must support the frame without marking the sealing surfaces.
7. Place the frame in the opening and align it with the approved reference axes. For a hygienic installation, set the internal transition to the specified flush condition or weld profile.
8. Check that the frame is not twisted and that the lid closes centrally without force. Measure the sealing face for flatness and the opening for shape before tacking. Record the values.
9. Secure the assembly so that it cannot move during tacking. Do not pull a poorly fitting shell opening into position with the frame or the fasteners.

7.2 Tack welding

Use small, evenly spaced tacks made to the approved WPS. Start at opposing reference positions and continue symmetrically around the frame. Closely spaced tacks and a small, uniform root gap help prevent local movement, but the WPS and joint drawing govern the actual gap and tack size.

- Check alignment, lid centring and sealing-face flatness after the first four opposing tacks.
- Continue with opposing tacks until the frame is stable. Correct alignment before full welding begins.
- Remove cracked, porous or contaminated tacks completely. Sound tacks incorporated into the weld must meet the WPS requirements.

7.3 Welding sequence

Weld in short, balanced segments distributed around the circumference. Alternate to the opposite side after each segment and allow natural cooling between segments. Do not complete one side before the opposite side. The objective is to distribute shrinkage and keep the sealing face flat.

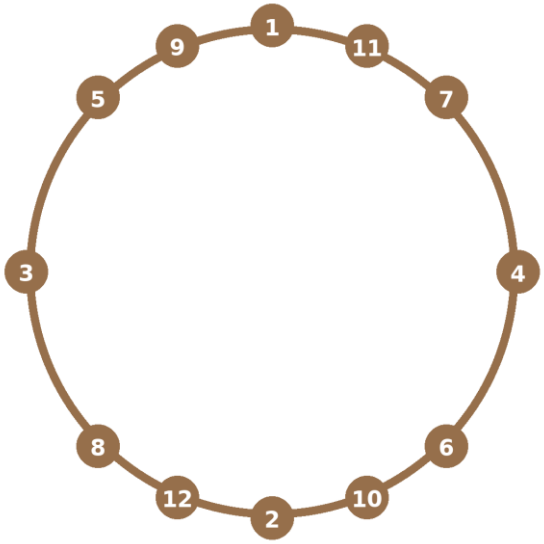


Figure 1 Example only of an opposing segment sequence

Sequence requirement Figure 1 illustrates the principle only. The approved WPS and fabrication drawing determine the actual passes, segment lengths, direction, interpass temperature and whether welding is performed from one or both sides.

7.4 Welding controls

Control	Requirement
Personnel	Welders and welding operators shall hold valid qualifications for the applicable process, material and position.
Procedure	Use an approved WPS covering the joint, base materials, thicknesses, filler, shielding and backing gas, heat input and interpass temperature.
Distortion	Use a rigid but non-damaging fixture where required. Recheck geometry frequently and maintain the opposing segment sequence.
Temperature	Measure and record interpass temperature when required. Allow natural cooling. Do not quench with water, compressed air or wet cloths.
Shielding	Maintain adequate shielding and, where specified, root purging until the weld is protected against oxidation.
Contamination	Use clean stainless-steel tools and suitable consumables. Prevent carbon steel contact, chlorides, oil, moisture and weld spatter on sealing faces.
Acceptance	Unless the design specification states otherwise, pressure-retaining weld quality should be specified and assessed to the applicable construction code. EN ISO 5817 quality level B may be used only when required by the project documentation.

7.5 Hygienic weld finish

In product-contact areas, produce a continuous, fully fused weld with the profile and surface finish stated on the drawing. Remove unacceptable undercut, crevices, sharp edges, excessive reinforcement, incomplete fusion and areas that cannot be cleaned. Grinding and polishing must not reduce the wall or frame below the specified minimum thickness.

After mechanical finishing, remove heat tint and contamination by the approved cleaning and passivation process. Rinse residues completely. Verify the finished surface visually and, where specified, measure roughness.

8 Inspection after welding

10. Allow the assembly to cool to ambient temperature before final dimensional inspection.
11. Remove the temporary fixture or spacer without damaging the frame.
12. Clean the sealing face and check it for scratches, weld spatter, distortion and embedded contamination.
13. Measure the sealing-face flatness and opening geometry using a documented method. Compare the readings with the approved drawing and pre-weld measurements.
14. Fit the correct clean operating gasket and verify that the lid centres and closes uniformly without force or metal-to-metal contact.
15. Perform visual examination and any specified penetrant testing, radiographic or ultrasonic examination, leak test or pressure test in accordance with the inspection and test plan.

16. Record the WPS, welder identification, consumables, inspection results, dimensional readings and test results in the equipment manufacturing documentation.

Acceptance If sealing-face deviation exceeds 1 mm, or if the lid does not seat evenly, stop. Do not force the frame straight, machine the sealing face or place the equipment in service. Contact Leopold Parts and the responsible designer for an approved corrective action.

9 Assembly after surface treatment

After grinding, pickling, passivation, polishing or blasting has been completed and all residues have been removed, assemble the components carefully. Fit all securing clips, sleeves, washers, nuts, handles, hinge parts, locking devices and optional equipment in their correct positions.

- Use only the specified gasket and replacement parts.
- Do not lubricate product-contact parts unless the lubricant is approved for the process and gasket material.
- Operate the hinge, lid, fasteners and safety devices through their full movement before commissioning.

10 Closing the inspection opening

17. Confirm that no person, tool or foreign object remains inside the equipment.
18. Clean and inspect the gasket, sealing face and lid groove. Replace damaged, hardened, swollen or permanently deformed gaskets.
19. Close the lid carefully and centre it without force. The lid and frame must not have unintended metal-to-metal contact at the seal.
20. Position all swing bolts or screws correctly. Ensure each sleeve or contact face bears as designed.
21. Tighten gradually in a cross pattern at approximately 50 percent, 80 percent and then the specified final torque. Repeat the pattern until loading is even.

Torque Use the torque stated in the product documentation or approved operating procedure. Where the supplied ExPR600 configuration uses the original standard fasteners and no project-specific value is stated, the existing product instruction gives a maximum of 40 Nm for M12 and 60 Nm for M16 or M20. Confirm the fastener size and configuration before applying these limits.

11 Opening the inspection opening

22. Isolate the equipment. Drain and vent it, then verify zero pressure and a safe temperature.
23. Assess residual product, chemical vapour and confined-space hazards. Use the required protective equipment.
24. Loosen fasteners gradually and symmetrically in a cross pattern. Stop immediately if pressure, vapour or liquid is released.
25. Support and secure the lid as it opens. Use the locking device where supplied and prevent the lid from falling or swinging unexpectedly.

12 Cleaning

Clean the inspection opening as part of the validated equipment cleaning procedure. Cleaning agents, concentration, contact time and temperature must be compatible with the frame, lid, gasket and accessories. Remove all cleaning residues before production.

- Open or position the lid as required so that all surfaces receive adequate cleaning and rinsing.
- Inspect crevices, hinge areas, threads and gasket contact surfaces for retained product.

- Do not exceed the permitted temperature of the inspection opening or gasket during cleaning in place.
- Do not use carbon-steel brushes, contaminated abrasives or tools that scratch the sealing face.

13 Maintenance and inspection

Inspect the assembly at intervals based on use, cleaning conditions, pressure cycles and the risk assessment. As a minimum, Leopold Parts recommends a documented inspection at least once per year and more often where service is severe.

Item	Check	Action if unacceptable
Gasket	Cuts, swelling, hardening, flattening, chemical attack and cleanliness	Replace with the specified gasket.
Sealing surfaces	Scratches, dents, corrosion, distortion and product deposits	Remove deposits safely. Obtain an approved repair for damage.
Fasteners and swing parts	Thread damage, wear, deformation, corrosion and missing retainers	Replace affected parts before use.
Hinge and lid support	Free movement, wear, alignment and secure locking	Repair or replace; do not operate an unsupported lid.
Frame and weld	Cracks, corrosion, leakage, deformation and discolouration	Remove from service and arrange qualified inspection.
Safety accessories	Function of guards, switches, pins, valves and spring assistance	Restore correct function before operation.

14 Material and gasket compatibility

The operator must confirm that the ordered frame, lid, gasket and accessories resist the product, cleaning chemicals, temperature, pressure and environmental conditions. Material selection by the customer does not by itself confirm suitability for every process.

15 Records and spare parts

Keep the product marking, order number, serial number, material certificates, approved drawings, WPS, welder qualifications, inspection results, pressure-test records and maintenance history with the equipment file. State the Leopold Parts order number and serial number when ordering spare parts.

16 Applicable documents and standards

Apply the latest project-specified editions and any national requirements. Typical references include:

- EN 13445-4 for fabrication of unfired pressure vessels where applicable.
- EN ISO 15614-1 for qualification of welding procedures for metallic materials where applicable.
- EN ISO 9606-1 for qualification testing of welders for steels where applicable.
- EN ISO 5817 for weld imperfection quality levels when specified by the project.
- EN 1672-2 and applicable EHEDG guidance for hygienic design and cleanability where required.

- The approved vessel drawing, WPS, inspection and test plan, surface-finish specification and local pressure-equipment requirements.

17 Commissioning checklist

Verification	Complete
Product identity and rating match the approved documentation	☐
Frame orientation and opening clearance are correct	☐
Welding records and required NDT are accepted	☐
Sealing face and geometry are accepted	☐
Surface treatment and cleaning are complete	☐
Correct gasket and all securing parts are fitted	☐
Lid, hinge, fasteners and safety devices function correctly	☐
Leak or pressure test is accepted where required	☐
Operating personnel have received the manual and site instructions	☐