Integral Fittings

Operation & Maintenance Manual

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Integral Forged Fittings | Multi-Directional Connection | High-Pressure Manifold Service

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SM-SJ-MAN-005	2026 Edition	English / EN

Applicable standards: API Spec 6A / API Spec 16C / NACE MR0175

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WARNING: Before use, verify that the product model, pressure rating, connection type and field service conditions match the operating requirements.

CAUTION: Do not exceed rated pressure, disassemble under pressure, strike damaged connection components, or mix components with different pressure ratings.

CAUTION: Stop operation and isolate the product immediately if cracks, deformation, thread damage, seal failure, abnormal raceway wear, or unclear markings are found.

1. Application and Scope

Integral fittings are used for direction change, flow splitting, flow combining, size transition, and instrument port connection in high-pressure manifolds and flowlines. They are commonly used in fracturing, cementing, pressure testing, acidizing, drilling fluid manifolds and manifold truck systems.

Products include 90° elbows, long-radius 90° elbows, integral tees, integral Y tees, integral 45° lateral tees, integral crosses, double 45° lateral tees, fittings with pressure gauge ports and crossover adapters.

2. Construction and Working Principle

Integral fittings consist of a pressure-containing body, end connections, seals, and necessary fastening and locating parts. Matched connection and sealing structures provide pressure containment, flow transfer, direction change, or combined layout functions in high-pressure fluid systems.

• The pressure-containing body is manufactured as an integral structure to reduce welds and leakage risk.

• Flow passage transitions shall be smooth to reduce local erosion and pressure loss.

• Ends may be configured with F × M, F × F, M × M and other hammer union connection types according to Fig rating.

• For fittings with a pressure gauge port, confirm port specification, orientation and protection requirements.

3. Model, Pressure Rating and Connection Type

Model designation is recommended as: nominal size + Fig rating + pressure rating + connection type + fitting type + service condition. Example: 3" Fig 1502, 105 MPa, F × M, Integral Tee.

Term	Description
Fig Rating	**Indicates the hammer union or end-connection rating; it shall match adjacent equipment and flowlines.**
F / M	**F denotes the female-threaded end; M denotes the spherical male end.**
NACE	**Indicates suitability for H_2S sour service.**
Length / Lay Length	**Indicates the ordered length or installation lay length; confirm it based on field layout requirements.**

4. Main Technical Parameters

The following values are typical supply ranges. Final dimensions, weight, materials, seals, color coding, and inspection requirements shall be governed by the purchase order, approved drawings, and valid product documents.

Item	Common Range

Product Type	**90° elbow, long-radius elbow, integral tee, integral Y tee, 45° lateral tee, integral cross, double 45° lateral tee, fittings with pressure gauge ports and crossover adapters.**
Nominal Size	**2" to 5", subject to product type and project requirements.**
Working Pressure	**42 MPa, 70 MPa, 105 MPa, 140 MPa.**
Connection Rating	**Fig 602, Fig 1002, Fig 1502, Fig 2002, etc.**
Connection Type	**F × M, F × F, M × M, and crossover connection combinations.**
Service Condition	**Standard service, NACE sour service and special media service.**

Select the product type first. Example fitting type: Integral Tee. Representative Model Examples:

Representative Model	Fitting Type	Size	Pressure	Connection Type	Service Condition
2" Fig 602, 42 MPa, F × M	**90° Elbow**	**2"**	**42 MPa**	**Fig 602 (F×M)**	**Standard**
3" Fig 1502, 105 MPa, F × M	**Integral Tee**	**3"**	**105 MPa**	**Fig 1502 (F×M)**	**Standard**
3" Fig 1502, 105 MPa, M × M	**Integral Cross**	**3"**	**105 MPa**	**Fig 1502 (M×M)**	**Standard**
2" Fig 602, 42 MPa, F, NACE		**2"**	**42 MPa**	**F End**	**NACE**

5. Pre-Installation Inspection

• Verify model, size, pressure rating, connection type, length / direction and service condition.

• Check the pressure-containing body, end connections, sealing faces, threads, union nuts or flange faces. They shall be free from cracks, severe wear, deformation, pitting or obvious corrosion.

• Check seals, protective caps and cleanliness of connection ends. Treat aging, scratches, missing parts or foreign matter before installation.

• Confirm that the system flowline is depressurized and safe for operation.

• NACE, low-temperature or special-media products shall not be mixed with standard service products.

6. Installation and Operation Requirements

• Confirm complete system depressurization before installation, removal, maintenance or seal replacement.

• Do not mix components of different pressure ratings, Fig ratings or incompatible connection types.

• Use proper tools when tightening union nuts or connections to avoid damage to nuts, threads or sealing faces.

• The product shall not be subjected to external load, bending moment or impact load beyond design limits. Flowlines shall be properly supported.

• Raise pressure slowly. Check connections and sealing areas carefully during first pressurization and reuse after maintenance.

7. Maintenance

• Flush the bore thoroughly after each operation to remove mud, cement, acid, fracturing fluid, sand and other residues.

• Clean external surfaces. Apply rust preventive oil to exposed threads and sealing faces and fit protective caps.

• Regularly inspect wall thickness, seals, sealing faces and connection threads. Stop use if erosion, corrosion or wear exceeds company rejection criteria.

• Repair damaged coating promptly. Store long-term inventory in a dry, ventilated place away from rain and corrosive media.

• Before reuse after repair, perform pressure test and visual inspection as required.

8. Common Faults and Corrective Actions

Fault	Possible Cause	Corrective Action
Connection Leakage	**Damaged seals, scratched sealing faces, insufficient make-up or specification mismatch.**	**Depressurize, disassemble and inspect; replace seals and check sealing faces and connection specifications.**
Thread or Connection End Damage	**Foreign matter, forced assembly, impact damage or insufficient protection.**	**Clean, repair and reinspect; replace parts if damage is severe.**
Body Erosion or Corrosion	**Sand-laden medium, acid residue, insufficient cleaning or improper selection.**	**Stop use, inspect wall thickness and surface condition, replace if necessary and reconfirm service condition.**
Difficult Make-Up / Break-Out	**Thread corrosion, contaminated sealing face, connection deformation or insufficient lubrication or rust prevention.**	**Clean, protect against rust and inspect connections. Do not hammer pressure-containing parts forcibly.**

9. Ordering and Technical Confirmation

When ordering integral fittings, provide the following information to confirm model, material, seals, inspection and delivery requirements:

• Product type, bore size, pressure rating, connection type and service condition.

• Length, lay length, direction, end combination or interface position requirements.

• Whether used for NACE sour, low-temperature, sand-laden, acidizing or other special media.

• Certificate requirements, pressure test requirements, NDT, third-party inspection, packaging, and transportation requirements.

• Whether spare parts, seals, manuals, tool kits, or matching manifold assemblies are required.

This manual is a general operation and maintenance document for integral fittings. Field operation shall also comply with owner safety rules, equipment nameplates, product drawings, project technical agreements and applicable standards.

Customer Feedback / After-Sales Service Information

Customer Feedback Form

Product Name		**Model / Specification**	
Product No.		**Date of Manufacture**	
User / Customer		**Contact Person**	
Telephone		**Email**	
Service Condition		**Date of Use**	
Issue Type	□ Operation □ Maintenance □ Quality □ Transportation □ Other	**Urgency**	□ General □ Important □ Urgent
Issue Description			
Field Description			
Suggestions			
Signature		**Date**	

Manufacturer and Technical Support

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Scan to view product details