

Roxar Chemical Injection and Sampling System



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1 Introduction

This manual provides general information and procedures for using the Roxar Chemical Injection and Sampling System, and is intended for use by qualified personnel. The information presented in this manual is not specific to a particular application, installation, or process, and must be evaluated on a case-by-case basis by the operator. Contact Emerson for more information.

1.1 Conformity to standards

This document has been issued in compliance with the most common international standards for user manual documentation.

1.2 Warnings

The instructions and procedures described in this document may require special precautions to ensure the safety of the personnel performing the operations. Information that potentially raises safety issues are indicated by a safety symbol followed by a safety message.

 **WARNING**

Messages identified as 'Warning' contain information regarding the personal safety of individuals involved in the installation, operation or service of this product.

 **CAUTION**

Messages identified as 'Caution' contain information regarding potential damage to the product or other ancillary products.

 **DANGER**

Messages identified as 'Danger' contain information regarding safety of personnel or damage to equipment.

1.3 Acronyms and definitions

Acronym	Definition
PPE	Personal Protective Equipment
MSDS	Material Safety Data Sheet
PTFE	Polytetrafluoroethylene
NPT	National Pipe Thread

1.4 Personnel qualifications and safety

You must read and follow all instructions, warnings and cautions to avoid personal injury or damage to property during system operation. Emerson is not responsible for damage or injury resulting from unsafe use of the product, lack of maintenance, incorrect installation of equipment, or system operation. Contact Emerson if you have questions about any applications and safety precautions described in this manual.

Ensure that operators working on the equipment are following the procedures on the use of protective equipment including, but not limited to the following:

- Safety helmet/hard hat
- Steel-toed shoes
- Safety glasses
- Working gloves (suitable for mechanical operations)
- Chemical resistant latex gloves, or equivalent
- Long sleeved fire-retardant shirt and fire-retardant trousers, or full-length fire-retardant coveralls

Additional Personal Protective Equipment (PPE) may be required depending on facility requirements and Material Safety Data Sheet (MSDS) requirements. Failure to do so can result in injury to personnel.

1.5 Warranty restrictions

You must visually inspect all components for shipping damage and notify the carrier, if you find any shipping damage. Shipping damage is not covered by the warranty. The carrier is responsible for all repair and replacement costs resulting from shipment damage.

1.6 Additional documentation and resources

- *Roxar Mechanical Retriever Tool User Manual*
- *Roxar Hydraulic Retriever Tool User Manual*

1.7 Assistance

The Roxar Global Service Center is organized through a network of service centers worldwide, and supports all service requirements or technical queries.

For the Product Support Help Desk, contact Roxar.GSC@Emerson.com.

2 Technical description

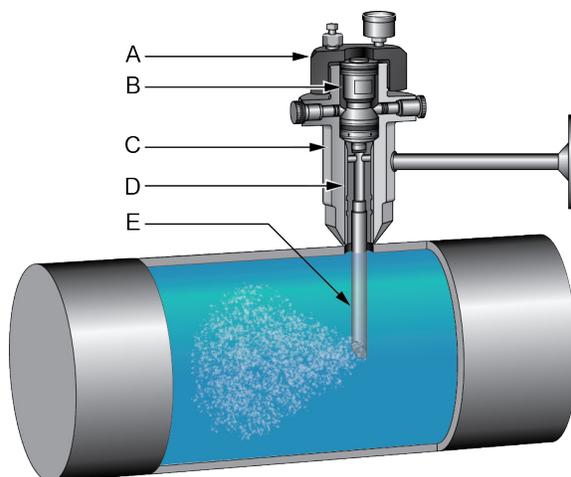
This section provides an overview of the different components in the Roxar Chemical Injection and Sampling System, and recommendations for use of the equipment.

Emerson's Roxar Access Fitting Assembly is the key to the concept of "Access under pressure – any time, any place." The Roxar Access Fitting Assembly also functions as preventive maintenance devices for the injection inhibitor, or for sampling, by selecting specific tubes for the required process. The injection and sampling can be performed while under full operational pressure.

The Roxar Access Fitting Assembly consists of three major parts:

- Body
- Plug assembly
- Protective cover

Figure 2-1: Roxar Chemical Injection System



- A. *Pressure-proof cover*
- B. *Solid plug*
- C. *Hydraulic access fitting, tee-type*
- D. *Injection nut*
- E. *Injection tube*

Note

The injection tube can be replaced by a sampling tube for sampling purposes.

2.1 Detailed description of the Roxar Chemical Injection and Sampling System

Chemical injection systems are essential to corrosion control and process optimization programs, and are commonly used in the petroleum, chemical, and water treatment industries. Injection systems are used to inject a wide range of chemicals into processes. These chemicals include biocides, demulsifiers, corrosion inhibitors, oxygen scavengers, glycol and mono-ethylene glycol, dewaxers, methanol, odorizers, and product additives.

The Roxar Chemical Injection system consists of the following parts:

Tee-type access fitting

The tee-type access fittings are designed for use in applications that require inlet or outlet of fluids under pressure. Examples of applications using tee-type access fittings include chemical injection systems and systems for the sampling of process fluid and monitoring using sacrificial probes. In addition, with the tee sealed off, the body can also be used for all the applications of non-tee bodies such as corrosion coupons, electrical resistance probes and linear polarization probes.

The recommended sealing of the tee is accomplished with a nipple and shut-off valve, or with a flanged shut-off valve connected to the Flangeolet. This maintains the hydrostatic integrity of the system during connection and removal of ancillary equipment used with the tee fitting.

Figure 2-2: Tee-type access fitting



Plug assembly

The plug assembly fits within the access fitting body and provides a complete pressure seal. It also acts as a retrievable carrier for the monitoring devices. Two basic plug assemblies are offered as standard offerings: solid or hollow. A solid plug is required for the Roxar Chemical Injection and Sampling system.

Figure 2-3: Examples of Hydraulic solid plug and Mechanical solid plug



Protective cover

The heavy protective mechanical steel covers have an Acme ID thread to mate with the access fitting body. They provide thread protection, and help prevent damage caused by weather, tampering, or vandalism. The hydraulic cover also holds the plug towards the sealing surface for the hydraulic access system.

The mechanical and hydraulic protective covers are available in two versions:

- Cover without hole
- Cover with bleed and pressure gauge

Figure 2-4: Hydraulic heavy duty covers



Figure 2-5: Mechanical heavy duty covers



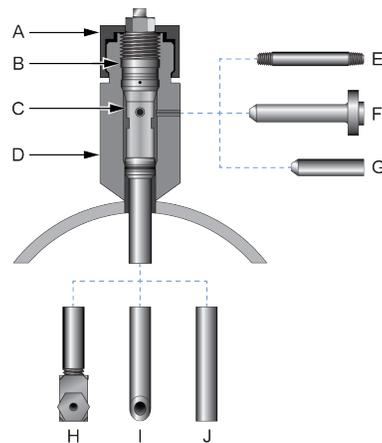
2.2 Main components of the Roxar Chemical Injection and Sampling System

A typical assembly for the Roxar Chemical Injection and Sampling System for the high-pressure access fittings comprises of the following parts:

- Access fitting body: contains a side tee through which the fluid transfer takes place. The tee may be threaded or welded. The welded tees are either flanged or buttweld nipples. The threaded tees are based on an NPT tapped hole in the fitting body. The tee size is rated according to the injection rate, and the viscosity of the injected chemical.
- Cover: selected according to the design and material of the access fitting.
- Solid plug assembly: resides inside the fitting body, and is used to carry an injection nut that has the injection tube assembly screwed into its base.
- Injection nut: directs the injected product to the injection tube device and is used as an injection tube holder. The injection tube allows the injection point to be on the most effective position, usually at the center of the line.

Figure 2-6 shows the typical assembly for a Roxar Chemical Injection and Sampling System.

Figure 2-6: Typical assembly for Roxar Chemical Injection and Sampling System



- A. Protective cover
- B. Solid plug
- C. Injection nut
- D. Access fitting (mechanical design)
- E. NPT
- F. Nipple flange
- G. Nipoled
- H. Spray nozzle
- I. Quill
- J. Open tube

Figure 2-7: Complete Hydraulic Chemical Injection and Sampling System

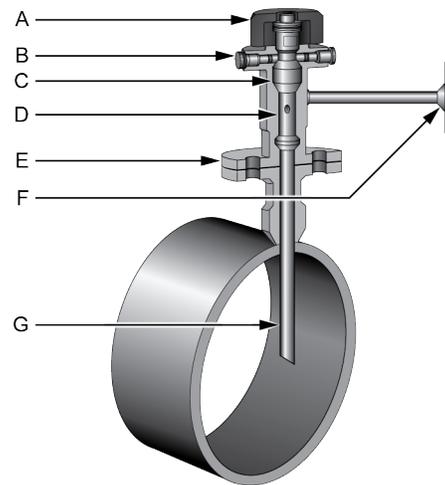


Figure 2-7 shows the parts for the Roxar Chemical Injection and Sampling System in a tee-type hydraulic flanged access fitting.

- A. Cover
- B. Locking pins
- C. Solid plug
- D. Injection nut
- E. Flanged access fitting
- F. Nipple flanged tee
- G. Quill

Figure 2-8: Complete Mechanical Chemical Injection and Sampling System

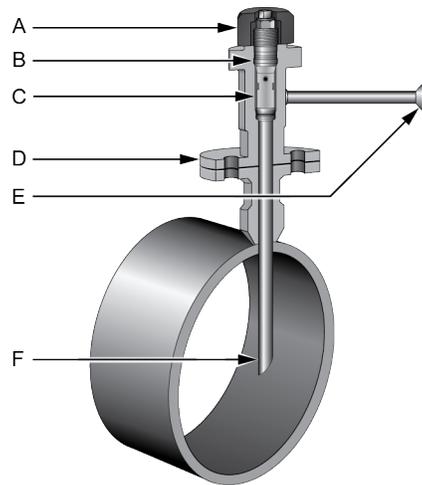


Figure 2-8 shows the parts for the Roxar Chemical Injection and Sampling System in a tee-type mechanical flanged access fitting.

- A. Cover
- B. Solid plug
- C. Injection nut
- D. Flanged access fitting
- E. Nipple flanged tee
- F. Quill

2.3 Types of injection tubes and sampling tips

Emerson provides a range of injection and sampling tips using an open tube, spray nozzle and quills. Each one is described in this section.

- Open tube: contains a plain tube that is cut at 90°. The natural turbulence within the pipeline ensures an even distribution, and there is no pressure differential experienced at the orifice. Therefore, it is necessary to control the injection rate at the injection pump. This design is also commonly used for sampling points.
- Spray nozzle: attaches to the dispersion end of the injection tube. The spray nozzle provides atomization of the fluid as it is injected into the product line. The assembly contains a strainer that can be replaced, if a change on injection pattern is required.
- Quill: contains an open-ended tube cut either at 45° or 60° angle with a slot. The quill utilizes the turbulence created by its design to achieve distribution of the injected chemical into the product flow. The injection tube quills are clog-proof, and provide a good dispersion of the inhibitor. As with the open tube, the injection rate must be controlled at the injection pump.

For more information on injection tube interfaces, see [Additional documentation and resources](#).

3 Preparation

This section describes all the necessary preparations that you need to do before installing the different parts of the equipment, including checklists and observations for the following:

- Injection tube
- Injection nut
- Solid plug

You can install the equipment in two different ways.

- Manually, by use of hand tools before the system starts up, or during shut down, when the line or vessel is empty and depressurized.
- Using a retrieval tool during full operational conditions of the system.

The following additional details are important.

The fittings are made to fit existing lines on pipes and vessels. The flanged access fittings are delivered in a standard 2 in (51 mm) size, with the same flange type and pressure rating as the pipe or vessel. A ring type seal flange requires a metal ring gasket between the flange connections. The material for the metallic seal must comply with the project specifications.

3.1 Assembling the injection tube, injection nut, and solid plug

The fitting is connected into the line when the line is unpressurized. Once the fitting has been connected to the counter flange, the solid plug with the injection nut and injection tube are inserted inside the access fitting body, or welded in place, in the case of a flareweld fitting. The protective cover is screwed on the access fitting body and tightened. It is important to lubricate the fitting threads with high temperature graphite grease.

After you have connected the fitting to the counter flange, or welded in place for a flareweld fitting, you can assemble and install the injection tube, injection nut and the solid plug.

Procedure

1. Check, and if necessary, replace the o-ring on the solid plug.
2. Loosen the set screw on the packing nut, and remove the packing nut. Note the left hand threads.
3. Check the primary packing. Replace, if necessary. Check that the packing is correctly mounted.
4. Mount the injection nut on the solid plug.
5. Tighten it as much as necessary in order to hold the primary packing in a fixed position. Once tightened, you should not be able to rotate the primary packing.
6. Next, tighten the set screw on the injection nut.

7. Wind the PTFE around the NPT threads of the injection tube. Do this only if it is allowed by field specification. You can skip steps 7 and 8 if you are using an integral quill. Also, note that this step is not applicable for tube and welded interface.
8. Screw the injection tube into the injection nut and tighten it using a pipe wrench.
9. If the injection tube is a quill type, or carries a nozzle that needs to be aligned with the flow direction in the pipe, mark the top of the solid plug to indicate the required orientation of the plug.
10. Check the o-ring and the support ring on the injection nut. Replace, if required.

Post-requisites

The solid plug and the injection nut and tube are now assembled. If the pipeline where the equipment is installed is pressurized, the installation and operations instructions for the retriever must be followed.

3.2 Installing the solid plug, injection nut and tube on an unpressurized pipeline

Perform the steps stated in the previous procedure, and the following additional steps, if the pipeline is not pressurized.

1. If you are using a mechanical plug, lubricate the threads and body on the solid plug with a suitable lubricant.
2. Screw the mechanical plug, or insert the hydraulic plug with injection nut or tube into the access fitting. Snug up the plug until the primary packing meets the seal surface inside the access fitting.
3. If the injection nut requires alignment to the flow direction, check the orientation of the marking made on top of solid plug.
 - If a mechanical access fitting is used, continue tightening the solid plug until the marking shows that the orientation is correct. Tighten the plug another full rotation, if needed, to ensure that no leaks occur. This adjustment must also be done if the solid plug and injection nut have been installed by use of a retrieval tool, after the retrieval tool and service valve has been removed.
 - Tighten the locking pins, if a hydraulic fitting and plug are used.
4. Lubricate the external threads on the access fitting.
5. Next, put on the protective cover.

Note

Different guidelines are given depending on which hydraulic or mechanical system is being operated. If you are using a retrievable system, make sure you read and follow the instructions on the user manual of your system, including the recommendations for spare parts.

3.3 Tools

The section describes the tools needed for the Roxar Chemical Injection and Sampling System.

Nozzle and quill with tee-type access fitting system

In addition to the tools listed in the user manuals for the applicable retriever tool (mechanical or hydraulic), a 23 mm spanner is required to assemble the nozzle into the injection nut.

 **CAUTION**

POTENTIAL RISK TO PERSONNEL AND EQUIPMENT. Make sure length of retriever tool available for the operation is compatible with the length of the nozzle.

Figure 3-1: Injection nut, plug and quill (hydraulic on the left; mechanical on the right)

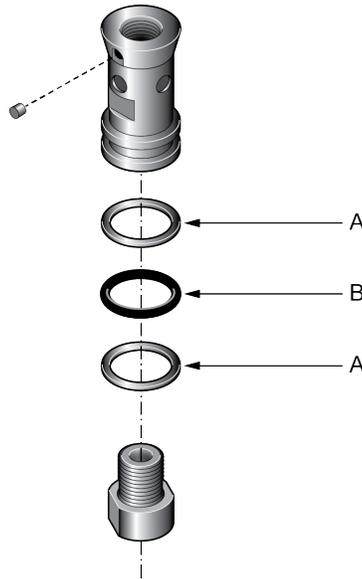


3.4 Consumables

When the nozzle or quill and injection nut are installed in the retrievable type access fitting, the spare parts shown in Figure 3-2 are available.

For more information, see the operational instructions for the applicable retriever tool (mechanical or hydraulic) in the *Roxar Mechanical Retrieval Tool User Manual* and the *Roxar Hydraulic Retrieval Tool User Manual*.

Figure 3-2: Consumables for Chemical injection and Sampling System



A. Back up ring

B. O-ring

3.5 Part numbers for consumables

Position	Description	Material	Part number
A	Backup ring	PTFE	ROX000323092
B	O-ring	VITON® 75	ROX000278467
		FKM938	ROX000323093
		HNBR90	ROX000342560
		ELAST-O-LION®	ROXA20035755
		FR25/90	ROX000339898
		FKM 75	ROXA20035756

4 Operating instructions

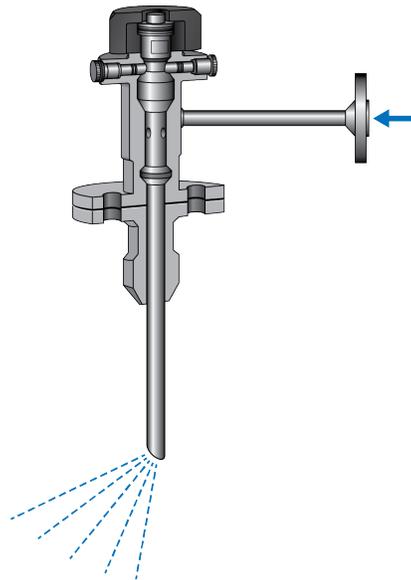
The injection tubes in the system enable the injection point to be on the most effective position, which is usually at the center of the line, where velocities are higher. Different designs on the end of the injection tube ensure the even distribution of the injected chemical, and play an important role in the atomization of the product being injected.

The same system may be used to sample media from the pipe, like a sampling system. By adopting the access fittings that are used on corrosion monitoring, the user has the option to maintain, clean, or replace an injection tube without stopping the flow on the line.

When injecting chemicals in the main line, a differential pressure between the injection pump and the process line is required. Although this is a complex science with many variables, such as temperature, viscosity, and specific gravity that affect the final injected rate, it is commonly accepted that 100 psi is a minimum value of differential pressure between chemical line and process line.

Once the range of variables are defined, the design of the injection tube can be selected to ensure proper dispersion and atomization of the chemical.

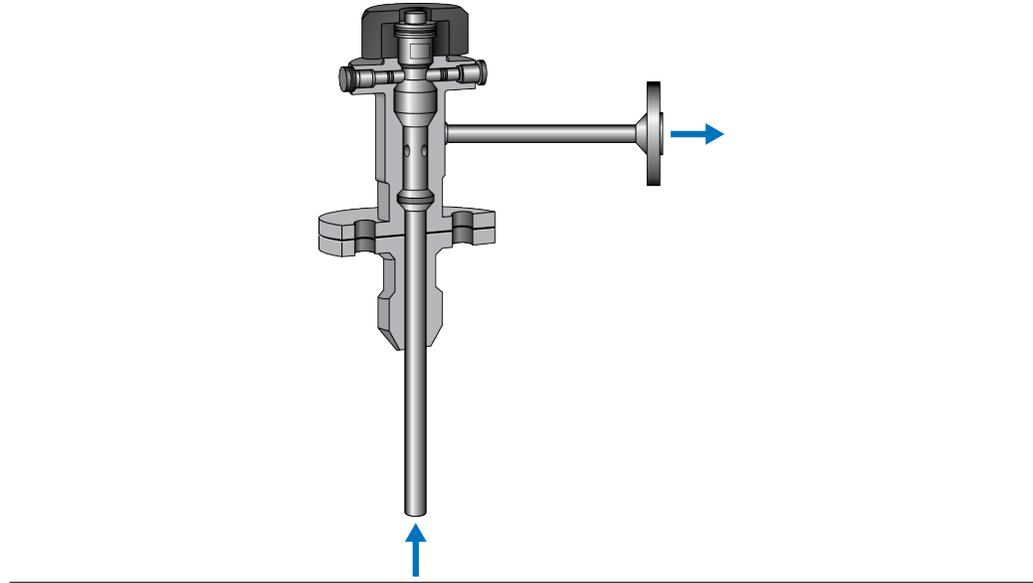
Figure 4-1: Injection of chemicals



4.1 Sampling system

The same set of equipment is used to take samples of the process fluid, and for further evaluation in the laboratory for inhibitor concentration levels, oxygen levels, scale forming compounds, and a wide range of process parameters. The principle is opposite to injection, and in external pressure is lower than pressure in the main line.

Figure 4-2: Sampling of fluids



5 Maintenance

The Roxar Chemical Injection and Sampling System requires limited maintenance during normal operational conditions. The maintenance of equipment other than access fitting and protective cover is not applicable during operation conditions.

The access fitting needs the following maintenance tasks after installation, and prior to start-up of the system.

- Lubrication of access fitting and cover
- Painting of access fitting and cover

Emerson recommends painting and lubrication of the access fitting and cover as a routine maintenance task during operational conditions. The painting and lubrication of the access fitting and protective cover should adhere to customer procedure for this type of maintenance.

Proper maintenance and preservation of the access fitting, including protective cover, is very important, and should start soon after the access fitting has been installed on the pipe. To keep the access fitting in good operational condition for several years, it is especially important to protect the most vulnerable parts of the fitting (all threads and packing surfaces) by proper lubrication. Emerson recommends maintenance of access fittings at a minimum of every two years. This is specially important for hydraulic access systems to avoid seized locking pins.

General guidelines for maintenance

Perform the following tasks for maintenance:

- All access fittings in carbon steel must be painted externally up to the threads after they are installed to the pipe.

 **DANGER**

DANGER TO PERSONNEL AND EQUIPMENT. Do not paint on or above the external threads of the access fitting.

- The access fitting must be lubricated all over internally, and on external unpainted surfaces in order to prevent rust damage. For a mechanical access fitting, this refers to lubricating the internal threads. For a hydraulic access fitting, this refers to lubricating the locking pins and external threads. You must use an approved type of lubricant.
- If the access fitting is to be left open in a depressurized or drained pipe, the internal lubrication is a requirement for adequate preservation and protection.

 **DANGER**

DANGER TO PERSONNEL AND EQUIPMENT. If the plug is missing, it must be replaced by another plug of the same type only. Any other object might damage an internal part of the access fitting, for example, the packing surface.

- The carbon steel covers should be painted externally as part of periodic maintenance.

 **DANGER**

DANGER TO PERSONNEL AND EQUIPMENT. All other periodic maintenance should be carried out during exchange or service of the monitoring equipment.

- Perform limited routine inspection to ensure that there are no visual damages on pressure gauges, covers, shutoff valves, and access points.



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