Instruction Manual
LIQ-MAN-242
Rev. F
June 2017

Rosemount™ 242

Toroidal Flow-Through Conductivity Sensor

EMERSON™

ESSENTIAL INSTRUCTIONS

READ THIS PAGE BEFORE PROCEEDING!

Rosemount designs, manufactures, and tests its products to meet many national and international standards. Because these instruments are sophisticated technical products, you must properly install, use, and maintain them to ensure they continue to operate within their normal specifications. The following instructions must be adhered to and integrated into your safety program when installing, using, and maintaining Rosemount products. Failure to follow the proper/ instructions may cause any one of the following situations to occur: Loss of life; personal injury; property damage; damage to this instrument; and warranty invalidation.

- Read all instructions prior to installing, operating, and servicing the product. If this Instruction Manual is not the correct manual, telephone 1-800-654-7768 and the requested manual will be provided. Save this Instruction Manual for future reference.
- If you do not understand any of the instructions, contact your Rosemount representative for clarification.
- Follow all warnings, cautions, and instructions marked on and supplied with the product.
- Inform and educate your personnel in the proper installation, operation, and maintenance of the product.
- Install your equipment as specified in the Installation Instructions of the appropriate Instruction Manual and per applicable local and national codes, for example, ANSI B16.5. Connect all products to the proper electrical and pressure sources.
- To ensure proper performance, qualified personnel should install, operate, and maintain the product.
- When replacement parts are required, ensure that qualified people use replacement parts specified by Rosemount. Replacement of original components with those constructed from alternative materials will void any CSA, FM, and BASEEFA/CEN- ELEC agency approvals that were applicable to the original device. Furthermore, replacement of original components with those constructed from alternative materials might change the pressure, temperature, and/or performance specifications from those of the original configuration. Ensure replacement parts are compatible with process requirements. Unauthorized parts and procedures can affect the product's performance, place the safe operation of your process at risk, and may result in fire, electrical hazards, or improper operation.
- Ensure that all equipment doors are closed and protective covers are in place, except when maintenance is being performed by qualified persons, to prevent electrical shock and personal injury.

DANGER

HAZARDOUS AREA INSTALLATION

Installations near flammable liquids or in hazardous area locations must be carefully evaluated by qualified on site safety personnel. This sensor is not Intrinsically Safe or Explosion Proof.

To secure and maintain an intrinsically safe installation, the certified safety barrier, transmitter, and sensor combination must be used. The installation system must comply with the governing approval agency (FM, CSA, BASEEFA/CENELEC, or ATEX) hazardous area classification requirements. Consult your analyzer/transmitter instruction manual for details.

Replacement of original components with those constructed from alternative materials will void any CSA, FM, and BASEEFA/CENELEC agency approvals that were applicable to the original device.

Proper installation, operation and servicing of this sensor in a Hazardous Area Installation is entirely the responsibility of the user.

CAUTION

SENSOR/PROCESS APPLICATION COMPATIBILITY

The wetted sensor materials may not be compatible with process composition and operating conditions. Replacement of original components with those constructed from alternative materials might change the pressure, temperature, and/or performance specifications from those of the original sensor configuration. Application compatibility is entirely the responsibility of the user.

Rosemount 242
TOROIDAL CONDUCTIVITY SENSOR

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TOROIDAL CONDUCTIVITY SENSOR

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About This Document

This manual contains instructions for installation and operation of the Model 242 Flow-Through Toroidal Conductivity Sensor. The following list provides notes concerning all revisions of this document.

Rev. Level	Date	Notes
A	11/02	This is the initial release of the product manual. The manual has been reformatted to reflect the Emerson documentation style and updated to reflect any changes in the product offering.
B	8/03	Corrected wiring references in text and drawings. Added information regarding ATEX approvals with Model 5081T.
C	5/04	Added information regarding the alumina liner, and updated wiring diagrams.
D		
E	03/12	Update addresses pages 22 and 24

SECTION 1.0
242 SENSOR

- FLOW THROUGH DESIGN is ideal for use with viscous, abrasive, or fibrous process liquids.
- OVER 250 CONFIGURATIONS to meet customers' needs.
- REPLACEABLE LINER in glass-filled PEEK, TEFLON, or ALUMINA reduces long-term operating costs.
- DIN and ANSI FLANGES compatible with all piping installations.
- LINE SIZES of 1 through 4 inches (DN 25, 40, 50, 80 and 100).
- IN-LINE CALIBRATION saves money by reducing labor and down-time.
- TEMPERATURE SENSOR and JUNCTION-BOX included.

1.1 FEATURES AND APPLICATIONS

Rosemount Toroidal Conductivity Sensors are ideal for use in processes where contacting sen- sors -- those with electrodes exposed to the measured solution -- would corrode or become fouled.

The 242 Flow Through Toroidal conductivity sensor consists of two toroids surrounding a pipe through which the process liquid flows. One toroid acts as a transmitter and the other as a receiver. Energizing the transmitter toroid induces an electric current in the process solution which induces an electric current in the receiver toroid. The strength of the induced current is directly proportional to the conductivity of the solution.

The 242 sensor is available in over two hundred fifty configurations to meet the needs of many applications and installations. Line sizes of 1, 1.5, 2, 3, and 4 inches (25, 40, 50, 80, and 100 mm) are available with both ANSI and DIN compatible flanges. A variety of liner materials and O-rings are available to ensure compatibility with most process liquids.

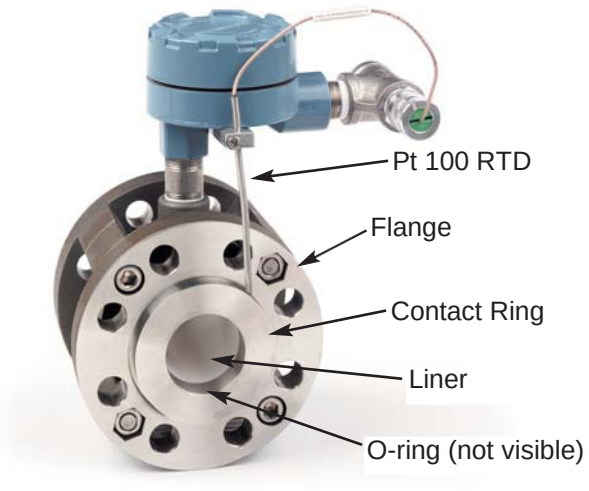
The 242 sensor is easy to install. It fits in the process piping between mounting flanges. Special grounding rings are not needed because the sensor has contact rings built into it. Recessed bolts hold the sensor together to ensure all internal parts stay in perfect alignment. A junction box and a Pt 100 RTD are included. The RTD slips easily into one of the sensor contact rings. There is no need to install a separate thermowell, and temperature measurements are made at the same point as the conductivity measurements.

The sensor is not sensitive to flow rate or direction. It does not obstruct the process flow. The sensor is rugged and constructed from chemically resistant materials. All these features make the sensor ideal for applications in mining and metals processing, pulp and paper processing, and the chemical processing industry.

The 242 Flow Through Conductivity Sensor is compatible with instrument instumentsL 54eC, 1055, 3081T, 4081T, 5081-T, and Xmt-T.

1.2 SPECIFICATIONS

The Model 242 Flow Through Sensor comprises a toroid housing constructed from 316 stainless steel and polyethyleneterephthalate, process connection flanges of 316 stainless steel, two metal contact rings (available in choice of three materials), an insulating liner (choice of three materials), O-rings (choice of three materials), a Pt 100 RTD, and a sensor-mounted junction box. Only the liner, contact rings, and O-rings are wetted by the process. The Pt 100 RTD is designed for insertion into one pre-drilled contact ring. The NEMA 7D junction box is constructed of heavy duty epoxy-painted cast aluminum. The conductivity range is user-selectable with the tapped toroid windings. In-line calibration can be performed with resistors connect- ed to an integral wire around the toroids that is terminated in the junction box.



Liners are available in Teflon, glass-filled Polyetheretherketone (PEEK), and alumina. These materials provide excellent chemical resistance. PEEK is recommended for high pressure or high temperature applications. Teflon is recommended when the process solution contains hydrofluoric acid or other strong oxidizing agents. Alumina is recommended if the process solution is abrasive, such as in alumina/caustic ratio applications.

Installation Type	Flow Through
Conductivity Range	100 µS/cm to 2 S/cm
Process Connections	150# ANSI, 300# ANSI, PN16 DIN 2501 compatible flanges
Maximum Temperature	Depends on configuration. For plastic-lined sensors, see charts on facing page. For alumina-lined sensors, see charts on page 4.
Maximum Pressure	Depends on configuration. For plastic-lined sensors, see charts on facing page. For alumina-lined sensors, see charts on page 4.
Wetted Materials: ***Liner***	Teflon® (PTFE), glass-filled PEEK, or alumina
Contact Rings	316 SST, Carpenter 20Cb-3® SST, or Hastelloy® C-276
O-rings	EPDM, Viton® (FKM), or Chemraz® (FFKM)
Shipping Weight	1” to 2”: 22 lbs. (10kg) 3” to 4”: 86 lbs. (39 kg)

Teflon is a registered trademark of E.I. du Pont de Nemours & Co.

Viton is a registered trademark of Du Pont Dow Elastomers.

Carpenter 20Cb-3 is a registered trademark of Carpenter Technologies.

Hastelloy is a registered trademark of Haynes International.

Chemraz is a registered trademark of Greene, Tweed, & Co.

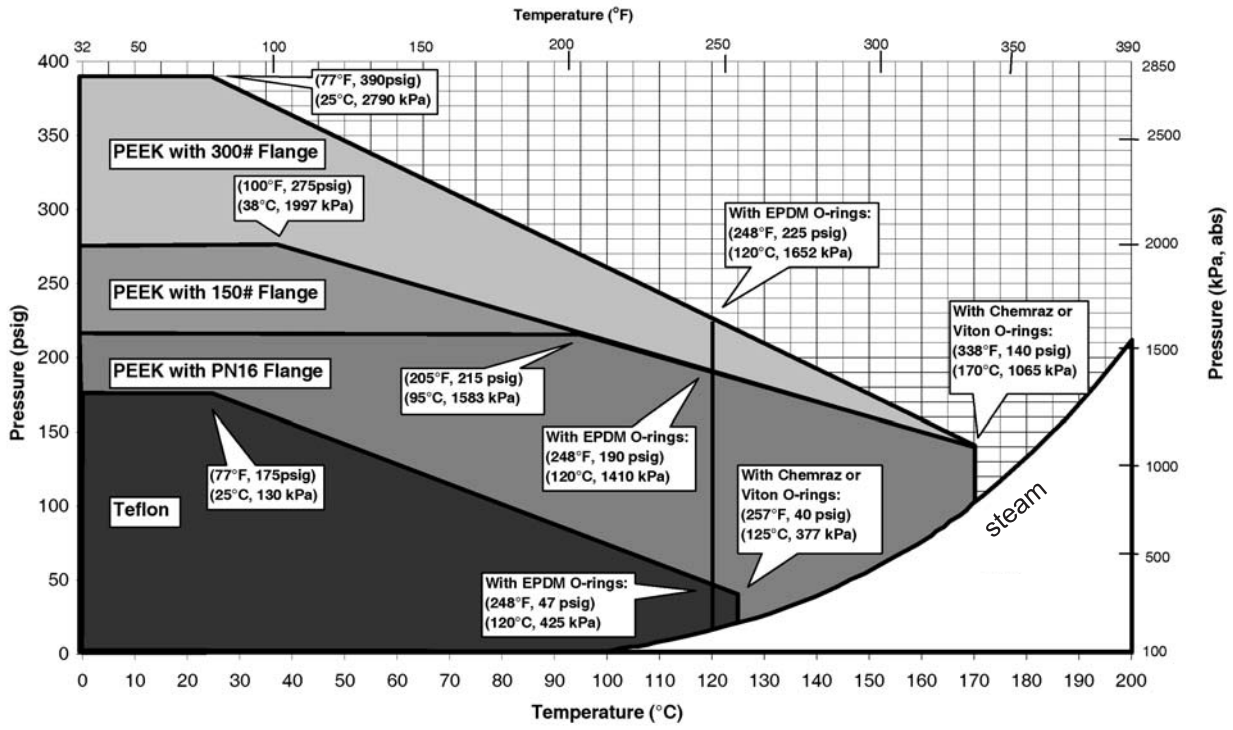


FIGURE 1-1. Pressure - Temperature Specifications for 1", 1.5", and 2" (25, 40, and 50 mm) Sensors: Models 242-02, 242-03, and 242-04

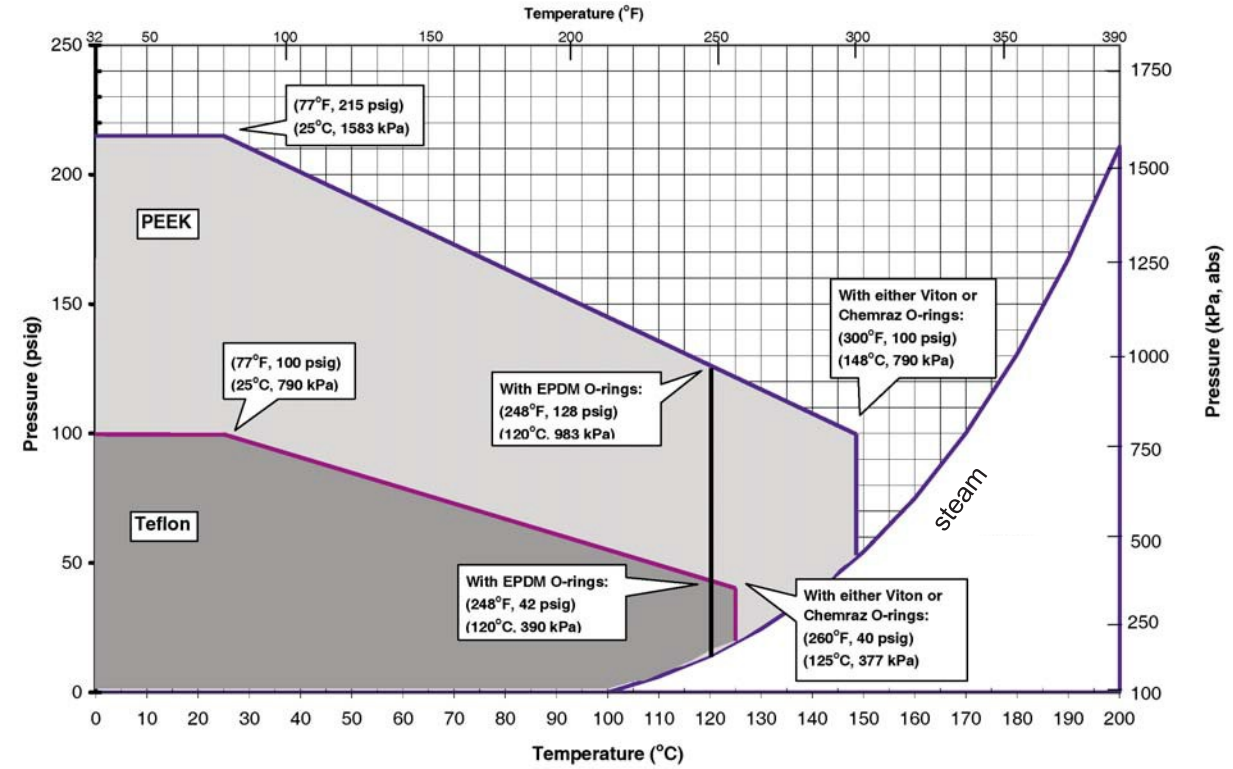


FIGURE 1-2. Pressure - Temperature Specifications for 3" and 4" (80 and 100 mm) Sensors: Models 242-06 and 242-08

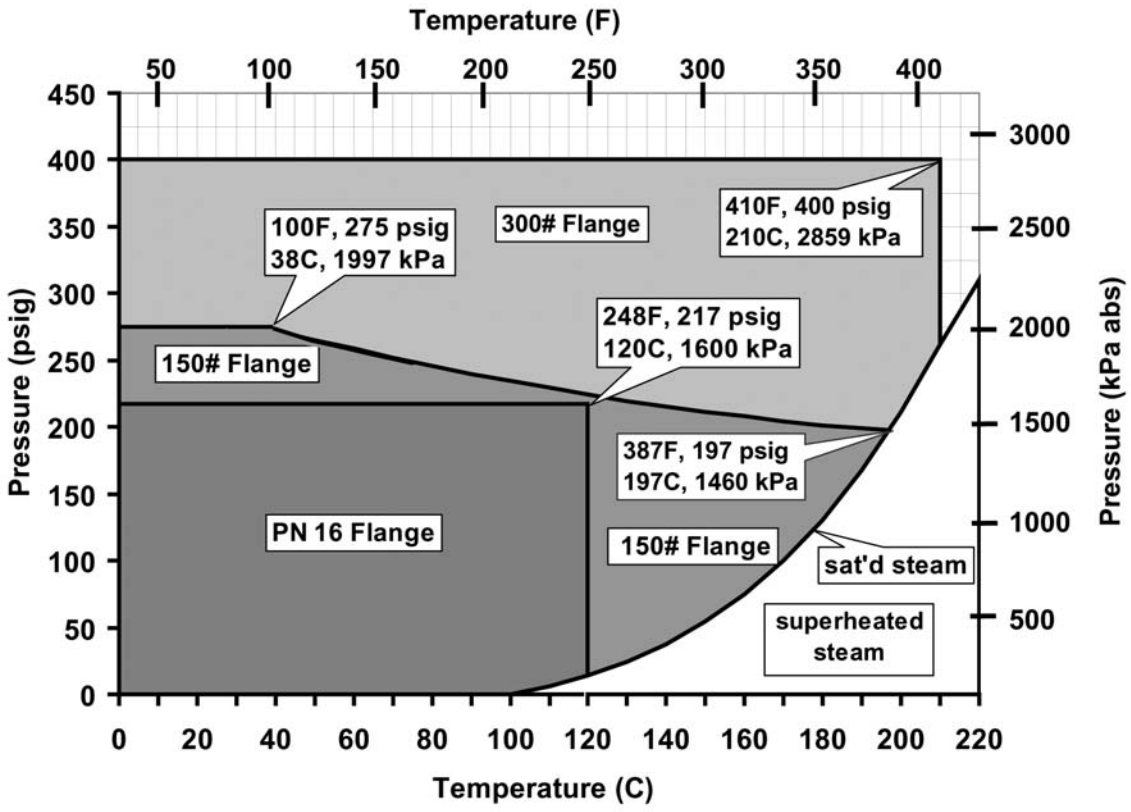


FIGURE 1-3. Pressure - Temperature Specifications for 1” and 2” Sensors: Alumina Liner

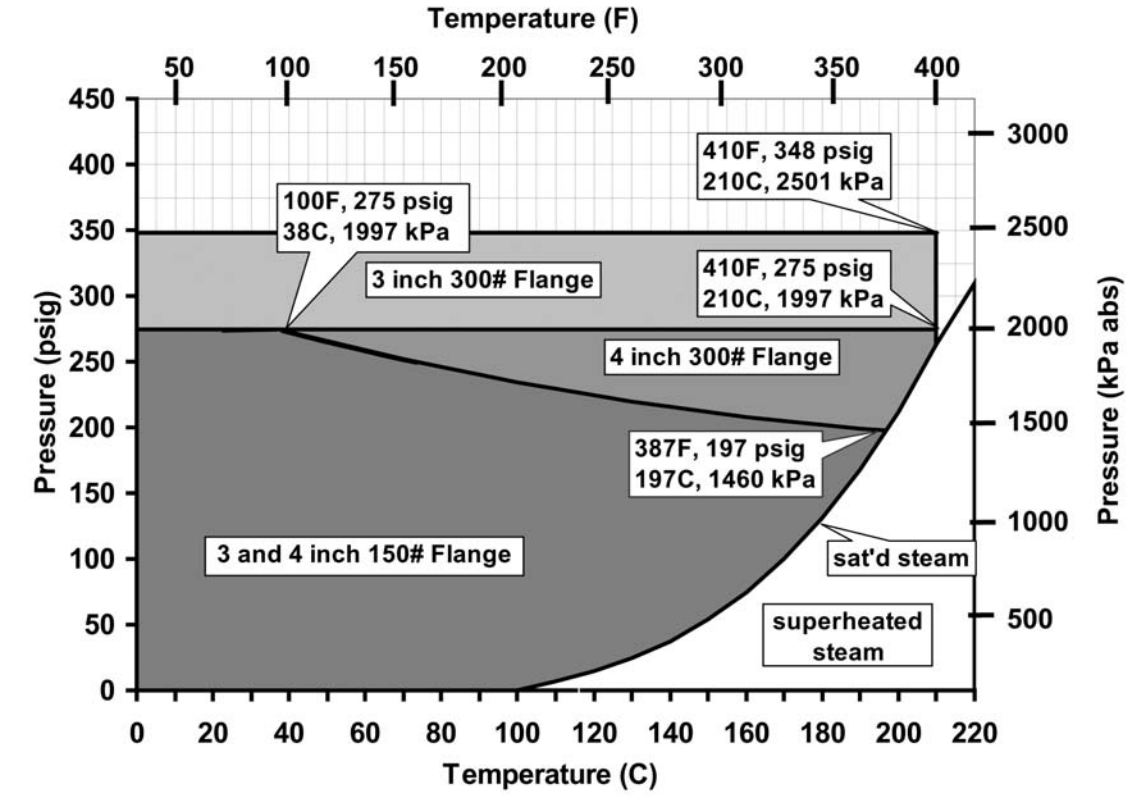


FIGURE 1-4. Pressure - Temperature Specifications for 3” and 4” Sensors: Alumina Liner

1.3 ORDERING INFORMATION

The 242 Flow-Through Sensor is configurable to meet the needs of many applications and installations (both ANSI and DIN). After specifying line size and flange type, the customer selects the wetted materials most compatible with the process stream. A NEMA 7D junction box and Pt 100 RTD are also included. Compatible instruments include Rosemount Models 54eC, 1055, 3081T, 4081T, 5081-T, and Xmt-T.

The extension cable required for wiring from the junction box to the instrument must be ordered separately. The customer supplies the gaskets, mating flanges, and flange bolts.

242	FLOW THROUGH TOROIDAL CONDUCTIVITY SENSOR		
CODE	LINE SIZE (Required Selection)		
02	1”	DN 25	
03	1-1/2”	DN 40	
04	2”	DN 50	
06	3”	DN 80	(no ATEX approval with 5081T)
08	4”	DN 100	(no ATEX approval with 5081T)

CODE	PROCESS CONNECTION (Required Selection)
10	150# ANSI Flange (Line sizes 1", 1-1/2", 2”, 3”, 4”)
11	300# ANSI Flange (Line sizes 1", 1-1/2", 2”, 3”, 4”)
14	PN 16 Metric Flange (Line sizes DN 25, 40, 50, 80, 100)

CODE	CONTACT RING MATERIAL (Required Selection)
SS	316 Stainless Steel
H4	Hastelloy C-276 (Line Sizes 1", 1-1/2", 2”, 25mm, 40mm, 50mm)
H8	Hastelloy C-276 (Line Sizes 3", 4", 80mm, 100mm)
C4	Carpenter 20-Cb3 (Line Sizes 1", 1-1/2", 2”, 25mm, 40mm, 50mm)
C8	Carpenter 20-Cb3 (Line Sizes 3", 4", 80mm, 100mm)

CODE	LINER MATERIAL (Required Selection)
TE	PTFE (Teflon®)
G4	PEEK, 30% Glass-Filled (Line Sizes 1", 1-1/2", 2”, 25mm, 40mm, 50mm)
G8	PEEK, 30% Glass-Filled (Line Sizes 3", 4", 80mm, 100mm)
A4	Alumina (Line sizes 1”, 2”, 25 mm, 50 mm); available only with option F4
A8	Alumina (Line sizes 3”, 4”, 80 mm, 100 mm); available only with option F8

CODE	PROCESS O-RING MATERIAL (Required Selection)
EP	Ethylene Propylene Rubber
VT	Fluorocarbon Rubber (Viton®)
F4	High Temp. Perfluoroelastomer (Chemraz®) (Line Sizes 1", 1-1/2", 2”, 25mm, 40mm, 50mm)
F8	High Temp. Perfluoroelastomer (Chemraz®) (Line Sizes 3", 4", 80mm, 100mm)

242 -0611SSG8VT EXAMPLE

ACCESSORIES

PART NUMBER	DESCRIPTION	
23909-00	Extension cable, Pre-prepped, for connection to Instrument Models 54eC, 1055, 3081T, 4081T, 5081-T, and Xmt-T *(Specify length)*	
KIT PN	**DESCRIPTION**	**FOR SENSOR MODELS**
24005-00	Kit, Liner, 1” DN 25, Teflon PTFE	242-02[ ]TE[ ]
24005-01	Kit, Liner, 1” DN 25, glass-filled PEEK	242-02[ ]G4[ ]
24005-02	Kit, Liner, 1” DN 25, Alumina	242-02[ ]A4[ ]
24006-00	Kit, Liner, 1-1/2” DN 40, Teflon PTFE	242-03[ ]TE[ ]
24006-01	Kit, Liner, 1-1/2” DN 40, glass-filled PEEK	242-03[ ]G4[ ]
24007-00	Kit, Liner, 2” DN 50, Teflon PTFE	242-04[ ]TE[ ]
24007-01	Kit, Liner, 2” DN 50, glass-filled PEEK	242-04[ ]G4[ ]
24007-02	Kit, Liner, 2” DN 50, Alumina	242-04[ ]A4[ ]
24008-00	Kit, Liner, 3” DN 80, Teflon PTFE	242-06[ ]TE[ ]
24008-01	Kit, Liner, 3” DN 80, glass-filled PEEK	242-06[ ]G8[ ]
24008-02	Kit, Liner, 3” DN 80, Alumina	242-06[ ]A8[ ]
24009-00	Kit, Liner, 4” DN 100, Teflon PTFE	242-08[ ]TE[ ]
24009-01	Kit, Liner, 4” DN 100, glass-filled PEEK	242-08[ ]G8[ ]
24009-02	Kit, Liner, 4” DN 100, Alumina	242-08[ ]A8[ ]
KIT PN	**DESCRIPTION**	**FOR SENSOR MODELS**
24010-00	Kit, O-Ring, 1” DN 25, EPDM	242-02[ ]EP[ ]
24010-01	Kit, O-Ring, 1” DN 25, Viton	242-02[ ]VT[ ]
24010-02	Kit, O-Ring, 1” DN 25, Chemraz	242-02[ ]F4[ ]
24010-03	Kit, O-Ring, 1” DN 25, Chemraz for use with Alumina liner	242-02[ ]A4-F4
24011-00	Kit, O-Ring, 1-1/2” DN 40, EPDM	242-03[ ]EP[ ]
24011-01	Kit, O-Ring, 1-1/2” DN 40, Viton	242-03[ ]VT[ ]
24011-02	Kit, O-Ring, 1-1/2” DN 40, Chemraz	242-03[ ]F4[ ]
24012-00	Kit, O-Ring, 2” DN 50, EPDM	242-04[ ]EP[ ]
24012-01	Kit, O-Ring, 2” DN 50, Viton	242-04[ ]VT[ ]
24012-02	Kit, O-Ring, 2” DN 50, Chemraz	242-04[ ]F4[ ]
24012-03	Kit, O-Ring, 2” DN 50, Chemraz for use with Alumina liner	242-04[ ]A4-F4
24013-00	Kit, O-Ring, 3” DN 80, EPDM	242-06[ ]EP[ ]
24013-01	Kit, O-Ring, 3” DN 80, Viton	242-06[ ]VT[ ]
24013-02	Kit, O-Ring, 3” DN 80, Chemraz	242-06[ ]F8[ ]
24013-03	Kit, O-Ring, 3” DN 80, Chemraz for use with Alumina liner	242-06[ ]A8-F8
24014-00	Kit, O-Ring, 4” DN 100, EPDM	242-08[ ]EP[ ]
24014-01	Kit, O-Ring, 4” DN 100, Viton	242-08[ ]VT[ ]
24014-02	Kit, O-Ring, 4” DN 100, Chemraz	242-08[ ]F8[ ]
24014-03	Kit, O-Ring, 4” DN 100, Chemraz for use with Alumina liner	242-08[ ]A8-F8

1.4 INSTALLATION

In the instructions below, the Junction Box is installed after the sensor is bolted into the process line. If appropriate for the site and final mounting configuration, the Junction Box can be installed prior to bolting the sensor into the process line.

⚠ CAUTION

The liner of the Model 242 sensor can be damaged if mishandled. Do NOT place any object through the liner for the purpose of lifting the Model 242 sensor.

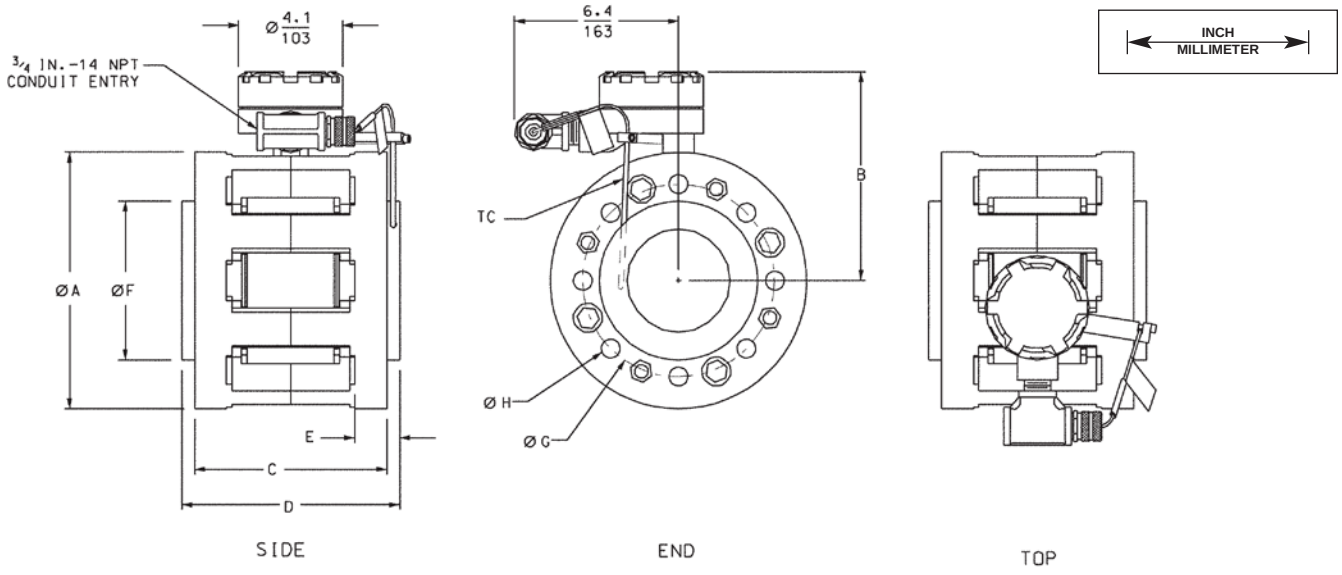
⚠ CAUTION

Support structures should be installed as appropriate on or around process pipes and sensor location to sufficiently support the weight of the sensor during installation and minimize strain on adjacent process pipes during the operational life of the sensor.

Installation of the Model 242 Flow Through Sensor is similar to installation of a section of pipe. Consequently, be prepared to use tools, supplies, equipment, and techniques similar to those used to install process pipes. Use common piping practices to minimize torque and bending loads on process connections. Observe all applicable safety standards. Dimensional information is shown in Figure 1-5 below. Refer to Figures 1-6 to 1-8 for assembly and installation diagrams.

NOTES

1. Allow at least four pipe diameters of straight pipe run on either side of the sensor.
2. Install the sensor so that it is filled with process liquid at all times when measurements are being made. Avoid downward flow as such a configuration might leave the sensor partially empty.
3. Use a sling and hoist to lift and position the sensor.

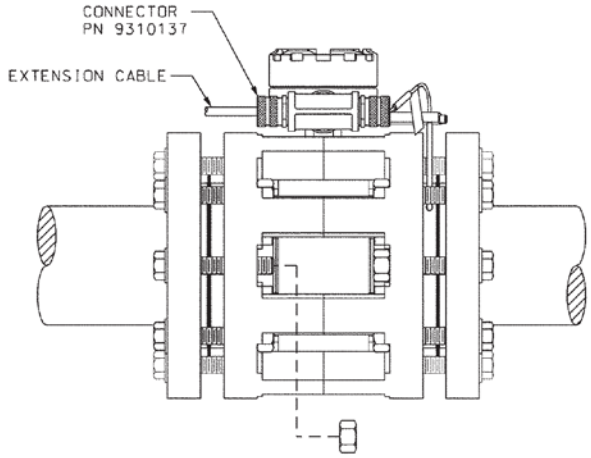


MODEL 242 OPTIONS	-0210	-0211	-0214	-0310	-0311	-0314	-0410	-0411	-0414	-0610	-0611	-0614	-0810	-0811	-0814
LINE SIZE AND PROCESS CONNECTION	1" 150#	1" 300#	DN 25 PN16	1½" 150#	1½" 300#	DN 40 PN16	2" 150#	2" 300#	DN 50 PN16	3" 150#	3" 300#	DN 80 PN16	4" 150#	4" 300#	DN 100 PN16
A: OUTSIDE DIAMETER. in. (mm)	6.00	6.00	(152)	6.00	6.50	(152)	6.00	6.50	(165)	10.00	10.00	(254)	10.00	10.00	(254)
B: HEIGHT. in. (mm)	7.90	7.90	(201)	7.90	7.90	(201)	7.90	7.90	(201)	9.00	9.00	(229)	9.00	9.00	(229)
C: FLANGE TO FLANGE. in. (mm)	4.70	4.70	(120)	4.70	4.70	(120)	4.70	4.70	(120)	7.50	7.50	(191)	7.50	7.50	(191)
D: RAISED FACE TO RAISED FACE. in. (mm)	5.70	5.70	(145)	5.70	5.70	(145)	5.70	5.70	(145)	8.50	8.50	(216)	8.50	8.50	(216)
E: FLANGE BOLTING THICKNESS. in. (mm)	1.25	1.25	(32)	1.25	1.40	(32)	1.25	1.40	(35.5)	1.80	1.80	(45.7)	1.80	1.80	(45.7)
F: RAISED FACE DIAMETER. in. (mm)	2.00	2.00	(68)	2.88	2.88	(88)	3.62	3.62	(102)	5.00	5.00	(138)	6.19	6.19	(158)
G: BOLT HOLE CIRCLE DIAMETER. in. (mm)	3.12	3.50	(85)	3.88	4.50	(110)	4.75	5.00	(125)	6.00	6.62	(160)	7.50	7.88	(180)
H: HOLE DIAMETER. MTG. BOLTS. in. (mm)	0.62	0.75	(14)	0.62	0.88	(18)	0.75	0.75	(18)	0.75	0.88	(18)	0.75	0.88	(18)
MOUNTING BOLT HOLES PER FLANGE	4	4	4	4	4	4	4	8	4	4	8	8	8	8	8
SENSOR MASS. lb. (kg)	22	22	(10)	22	22	(10)	22	22	(10)	86	86	(39)	86	86	(39)

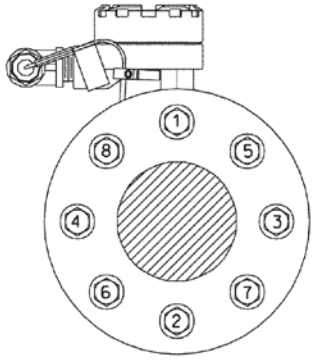
FIGURE 1-5. DIMENSIONAL DRAWING

INSTALLING THE SENSOR IN THE PROCESS LINE

1. Install process flanges in accordance with applicable instructions, standards, and local regulations.
2. Position the sensor between the process mating flanges with flange gaskets inserted between each set of flanges. Ensure that the locations of the junction box connection and the RTD hole in the contact ring are in the correct position for easy wiring and use.
3. Align the bolt holes in the sensor and process flanges.
4. Lubricate the bolt threads. Using a torque wrench, bolt the sensor into place. Tighten the bolts in 1/3 increments of the final desired torque. Follow the bolt-tightening sequence and torque suggestions provided in Figure 1-6.
5. Re-torque the bolts 12 to 24 hours after installation. Make a final check of torque values by moving consecutively from bolt to bolt.



SIDE VIEW
MOUNTING SENSOR
TO FLANGED PIPE

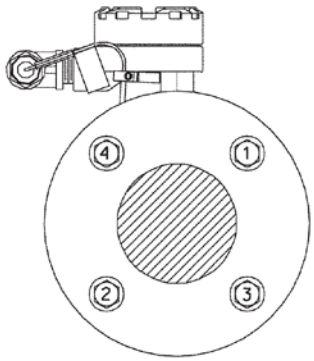


END VIEW
TORQUING SEQUENCE
FOR 8-BOLT FLANGES

FLANGE BOLT TORQUE

TORQUE VALUES WITH ASTM A193 GRADE B7 BOLTS
FOR COMPRESSED SHEET AND GYLON® GASKETS. SEE NOTE 5.

OPTION (SIZE)	FLANGE OPTION									
	-10 (ANSI CLASS 150)					-11 (ANSI CLASS 300)				
	NO. OF BOLTS	MINIMUM TORQUE		PREFERRED TORQUE		NO. OF BOLTS	MINIMUM TORQUE		PREFERRED TORQUE	
		ft-lb	N-m	ft-lb	N-m		ft-lb	N-m	ft-lb	N-m
-02 (1 in)	4	17	23	53	72	4	28	38	67	91
-03 (1-1/2 in)	4	35	47	60	81	4	64	87	151	205
-04 (2 in)	4	69	94	120	163	8	46	62	108	146
-06 (3 in)	4	119	161	120	163	8	88	119	200	271
-08 (4 in)	8	84	114	120	163	8	125	169	200	271



END VIEW
TORQUING SEQUENCE
FOR 4-BOLT FLANGES

Torque values in the table above are from Garlock Sealing Technologies. Other values might apply when using different bolt and gasket materials.

Gylon® is a registered Trademark of Garlock Sealing Technologies.

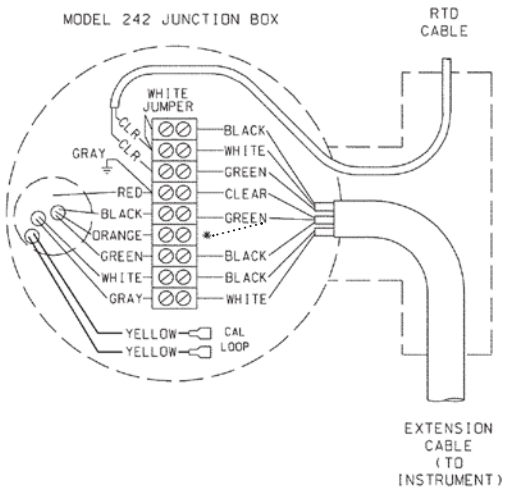
FIGURE 1-6. Installation and Torque Guidelines

ATTACHING THE JUNCTION BOX

1. Pull the sensor wires up into the junction box.
2. Screw the junction box onto the threaded male connection on the sensor. Use of pipe sealing tape or other compound is at the discretion of the customer.
3. Connect the sensor wires to the junction box terminal as indicated in Figure 1-7.

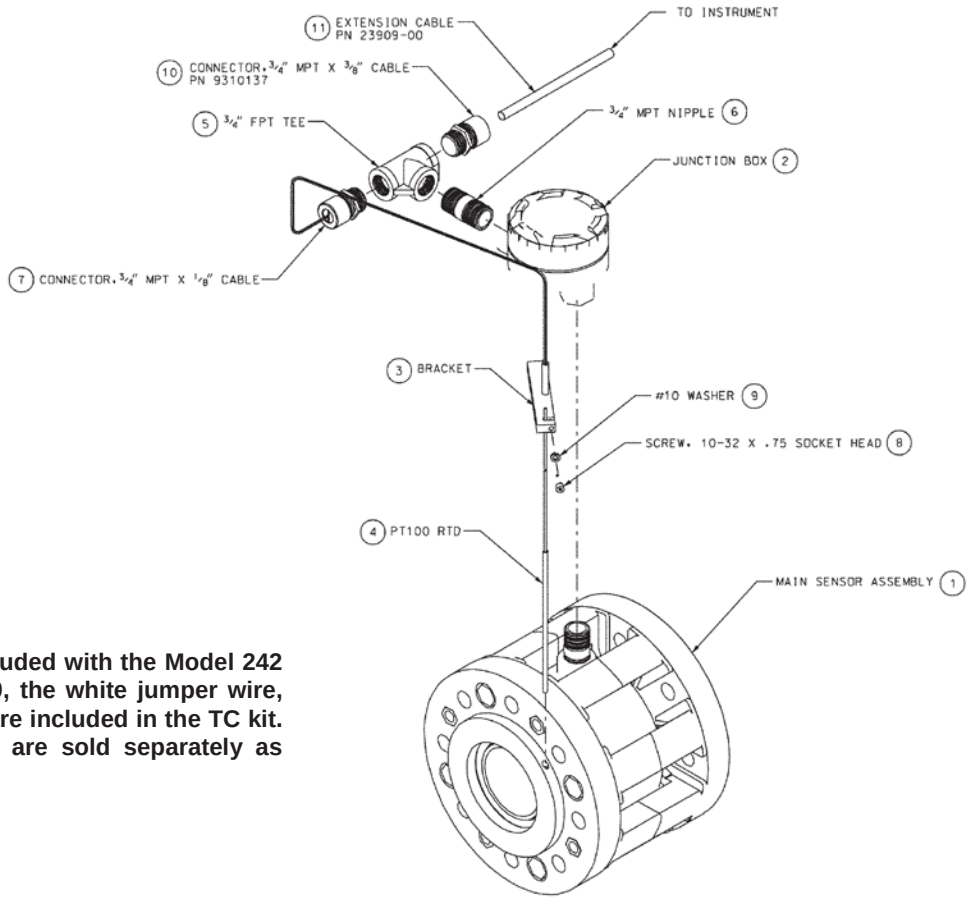
INSTALLING THE Pt100 RTD

1. Use of the included Pt100 RTD is recommended. Use of a customer-supplied Pt100 or Pt1000 TC mounted in a separate thermowell is also acceptable. The accuracy specifications provided by Rosemount apply only to situations wherein the Pt100 RTD supplied with the sensor is used.
2. Refer to Figure 1-8. Screw the threaded nipple onto the conduit connector of the junction box. Screw the tee onto the nipple, and screw the RTD cable connector onto the tee.
3. Attach the bracket to the shaft of the RTD using the #10 washer and small screw enclosed in the RTD kit. The purpose of the bracket is to retain the RTD in the contact ring after installation.
4. Slide the Pt100 RTD into the pre-drilled hole in the contact ring. Rotate the bracket to a position beneath the junction box, and tighten the set screw.
5. Thread the RTD wires through cable connector, tee, nipple, and into junction box. Wire the RTD to the junction box terminals as indicated in Figure 1-7. Install the white jumper wire between terminals 1 and 2.



***For optimal performance below 10,000 µS/cm, connect green wire from extension cable to terminal indicated by ***

FIGURE 1-7. Sensor to Junction Box Wiring



Items 1-9 are included with the Model 242 sensor. Items 3-9, the white jumper wire, and Teflon tape are included in the TC kit. Items 10 and 11 are sold separately as accessories.

FIGURE 1-8. Sensor/J-box/RTD Assembly

EXTENSION CABLE HOOK UP

1. Do not run sensor cable in conduit or open trays with A.C. power wiring. Do not route sensor cable near heavy electrical equipment.
2. For best sensor/instrument loop performance, use factory-terminated extension cable (PN 23909-00). (Using a different cable can introduce noise into the signal and/or reduce loop accuracy.)
3. One end of extension cable (PN 23909-00) has 8 wires, and the other end has 11 wires. Refer to Figure 1-9. The end with 8 wires goes into the junction box. The end with 11 wires goes to the instrument. The extension cable enters the junction box through the open side of the female threaded tee. Use of conduit, the optional cable connector (PN 9310137), or other strain relief device to protect the cable is at the discretion of the customer and should comply with applicable agency guidelines.

NOTE

If starting with unprepped cable (PN 9200276), remove only as much insulation as is necessary. The instrument end needs 11 leads: four leads from the green-white-black-drain bundle, three from each of the two coaxial cable bundles (the inner conductor, the insulating braid, and the drain wire), and one from the outermost overall braided-copper shield. For the junction box end, only 8 leads are used: the white coaxial conductor, its braided shield, the green coaxial conductor, its braided shield, its drain wire, and the green, white, and black conductors from the green-white-black-drain bundle. The remaining shields and drain wires are not used on the junction box end and should be removed -- they should NOT be connected.

4. Connect the 8 wires of the extension cable to the terminal block inside the sensor junction box as indicated in Figure 1-7. Note: If all process measurements will be less than 10,000 µS/cm, connect the green wire from the black-green-clear wire bundle of the extension cable to the terminal receiving the orange sensor wire. See Figure 1-7.
5. Connect the 11 wires of the instrument-end of the extension cable according to the applicable diagram from Figures 1-10 through 1-15.

1.5 CALIBRATION

After sensor and transmitter/analyzer wiring is completed, calibrate the sensor.

NOTE

Most analyzers require the input of the approximate sensor cell constant before the analyzer calculates the true cell constant. The nominal cell constant of the Model 242 sensor depends on the size of the sensor and the terminal to which the receive wire of the interconnecting cable is attached. Refer to Table 1-1 for the appropriate nominal cell constant value.

TABLE 1-1: Nominal Cell Constants for 242 Sensors

Sensor Size	Cell Constant (/cm)*	
	Black	Orange
1", DN 25	20	2.0
1.5", DN 40	9.0	0.90
2", DN 50	5.0	0.50
3", DN 80	4.0	0.40
4", DN 100	2.3	0.23

** The table gives the cell constant when the **green** receive wire (from black-green-clear bundle) of the interconnecting cable is attached to either the **black** wire terminal or the **orange** wire terminal in the sensor junction box. See Figures 1-7 and 2-1.*

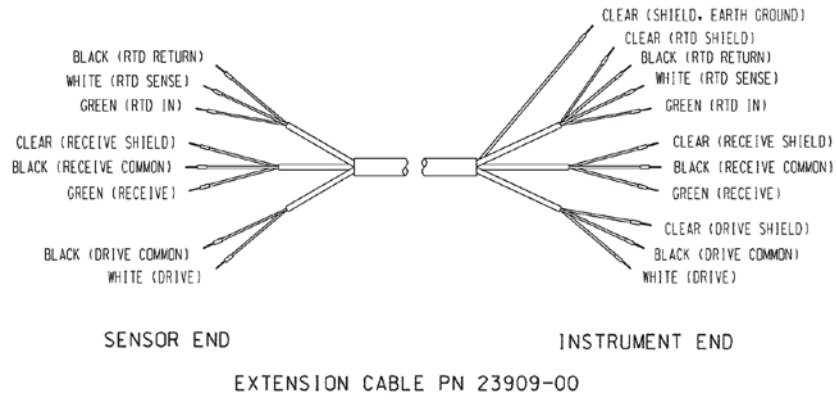


FIGURE 1-9. Extension Cable

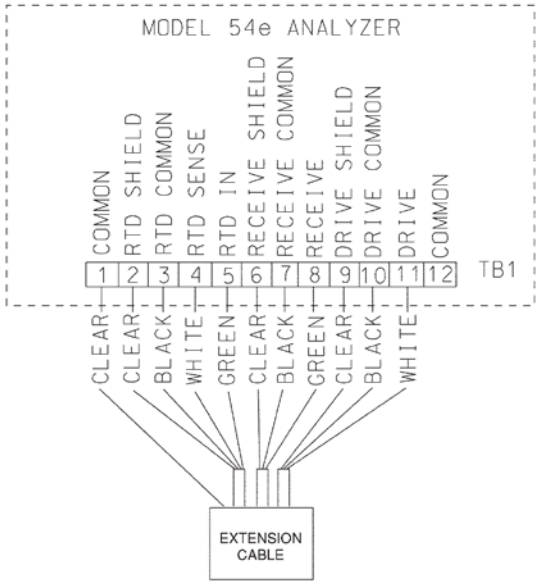


FIGURE 1-10. Extension Cable to Model 54eC Wiring

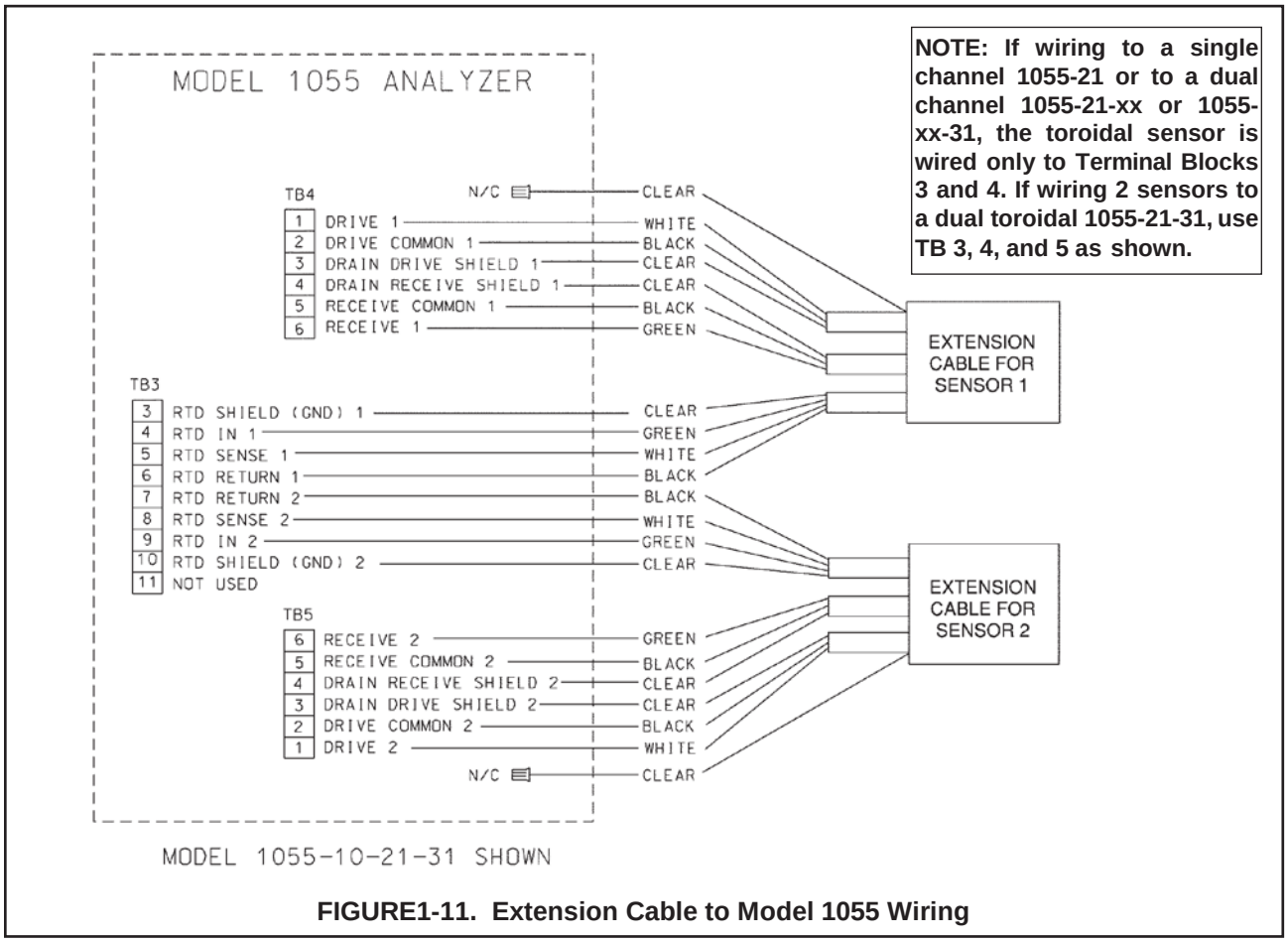


FIGURE1-11. Extension Cable to Model 1055 Wiring

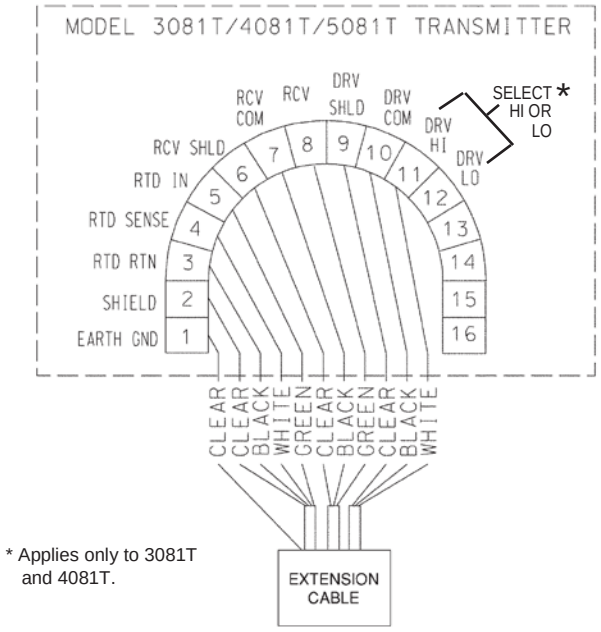


FIGURE 1-12. Extension Cable to Models 3081T, 4081T, and 5081T Wiring

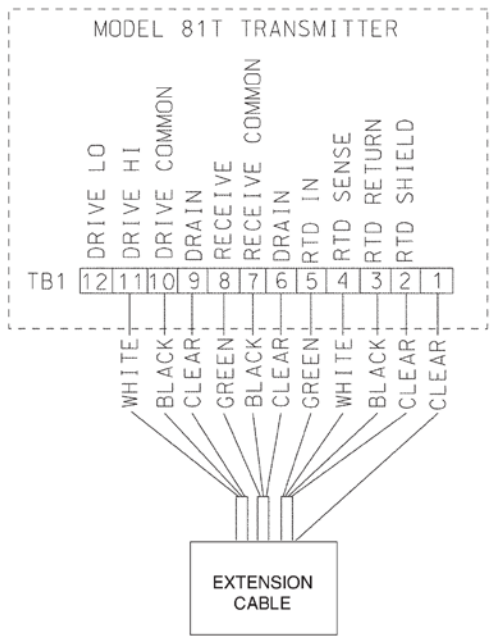


FIGURE 1-13. Extension Cable to Model 81T Wiring

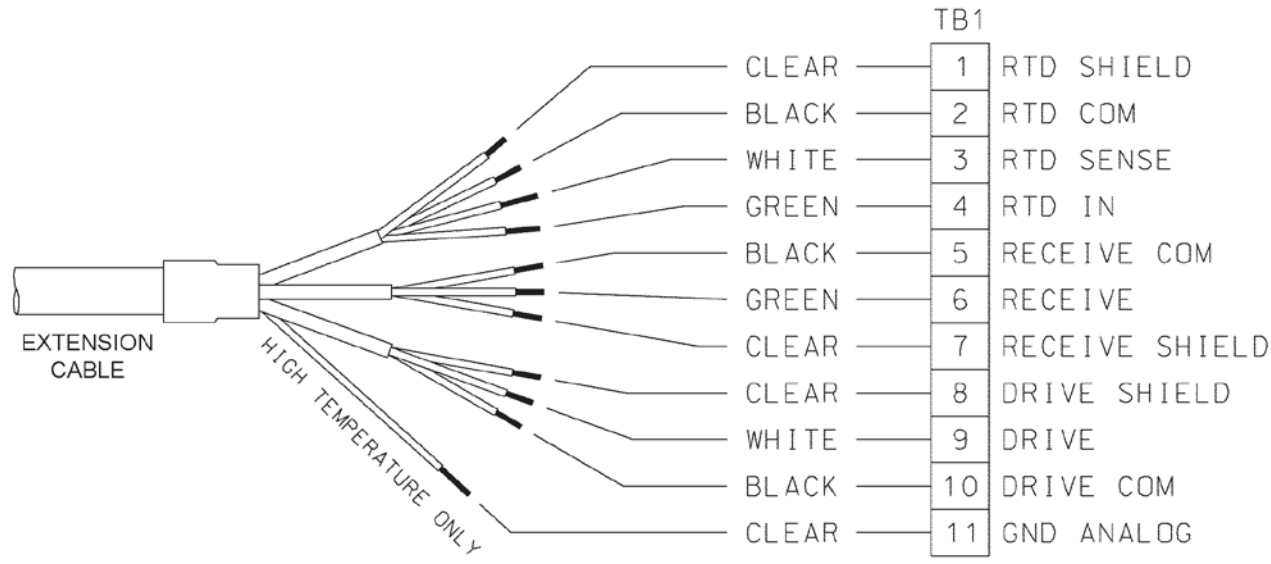


FIGURE 1-14. Extension Cable to Model Xmt Pipe/Wall Mount Enclosure

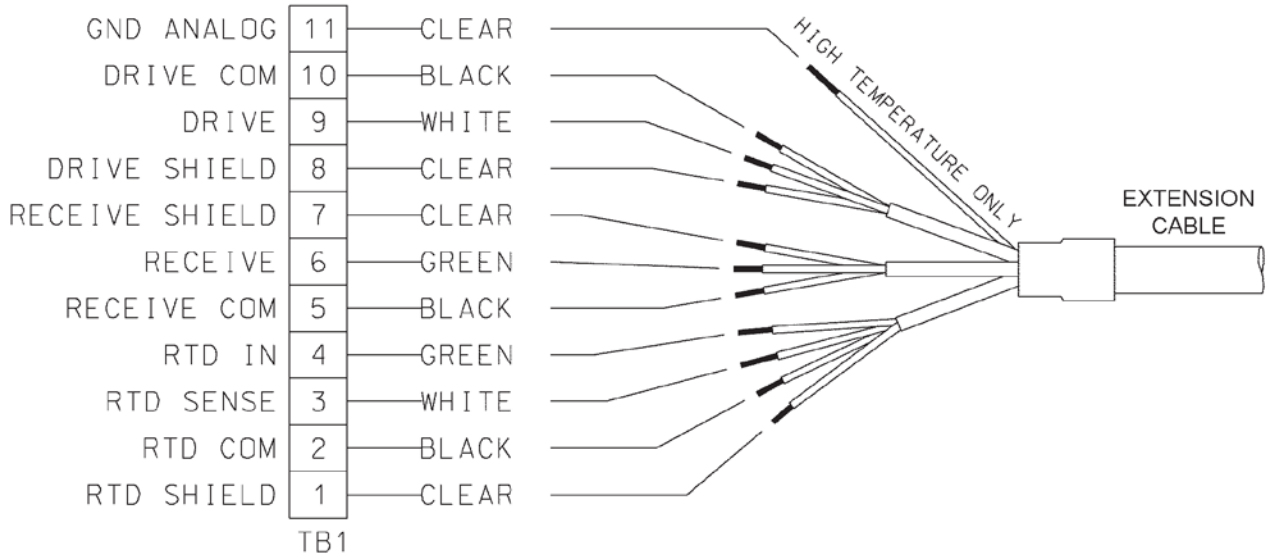


FIGURE 1-15. Extension Cable to Model Xmt Panel Mount Enclosure

A. To perform liquid calibration prior to installing the sensor in the process line, first seal one end of the sensor, and then proceed with the following steps.

1. Stand the sensor on the sealed end.
2. Fill the sensor completely with a standard conductivity solution.
3. Insert the Pt100 RTD into the contact ring.
4. Adjust the analyzer reading so that it matches the conductivity of the standard solution at the solution temperature. Refer to the analyzer/ transmitter instruction manual for complete calibration procedures.

B. Use of the Integral Calibration Loop Wire: This internal wire can be used to facilitate future in-process loop calibration and to perform a quick verification that the loop is functioning properly. Performing this additional (but optional) step is highly recommended.

1. The sensor must be empty of all fluids, reasonably clean, and preferably completely dry.
2. Attach a variable resistance decade box to the sensor yellow “Cal Loop” wires (in the junction box).
3. Adjust the applied resistance until the instrument reads the same conductivity value that it did during the liquid calibration process. Record the conductivity, applied resistance value, and temperature for future reference.
4. To recalibrate the loop at a later date, optimal results will be achieved if the sensor is returned to a condition approximating its condition during the initial performance of steps C.1 to C.3 above. If this is not possible, the sensor must at least be empty of process fluids. Reapply the same resistance to the Cal Loop and adjust the instrument reading.

1.6 MAINTENANCE

The only routine maintenance required during the operational life of the sensor is to ensure that there are no deposits plugging the sensor or coating the inside of the contact rings. Some customers find it advantageous to periodically replace process gaskets and/or re-tighten the flange bolts to ensure adequate process seals. Refer to Figure 1-6 for flange bolting sequence and torque recommendations.

SECTION 2.0
TROUBLESHOOTING

2.1 TROUBLESHOOTING. The simplest method of troubleshooting is to run a resistance test on the inductive sensing device. It is also recommended to check the resistance of the RTD and resistance between various pairs of the sensor wires.

To perform a quick resistance check of the sensor, recall the data obtained during Part C of the Calibration Process (Refer to Section 1.5) With the sensor empty of process fluids (preferably also clean and dry), reapply the resistance to the sensor yellow Cal Loop wires in the junction box. The reading should be with ±20% of the original value.

To check the RTD, measure the resistance across the RTD wires. See Figure 1-4. The resistance value should be close to the value shown in Table 2-1.

Refer to Figure 2-1 for a circuit diagram of the sensor to use as an aid when performing the resistance checks. Use Table 2-2 to determine the resistance values that should be found across various pairs of sensor wires.

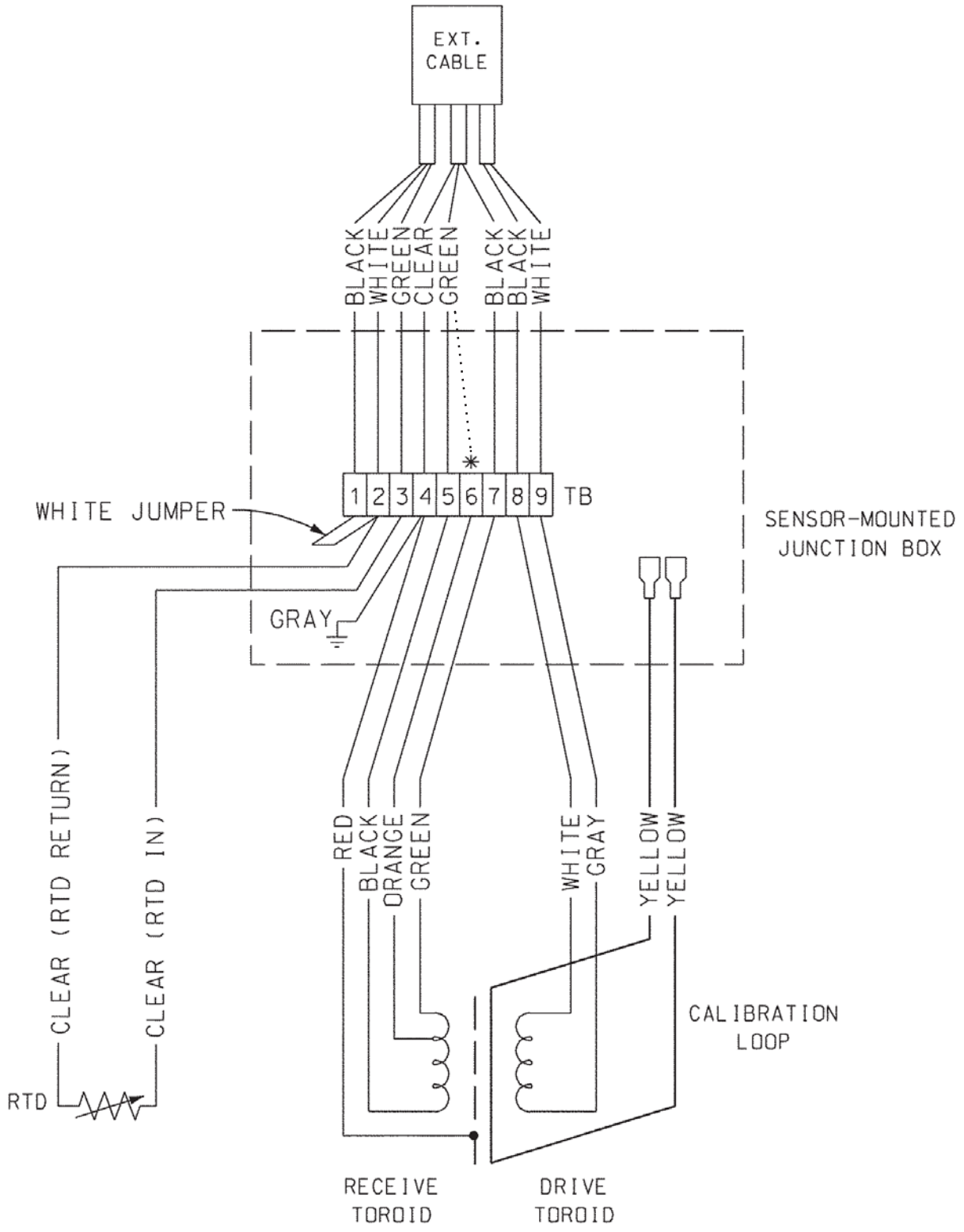
TABLE 2-1 Resistance Values for Pt100 RTD

Temperature (°C/°F)	Resistance (Ohms)
18 / 64.4	106.9
19 / 66.2	107.3
20 / 68.0	107.7
21 / 69.8	108.1
22 / 71.6	108.4
23 / 73.4	108.9
24 / 75.2	109.2
25 / 77.0	109.6
26 / 78.8	110.0
27 / 80.6	110.4

C = Celsius / F = Fahrenheit

TABLE 2-2 Sensor Wire Resistance Values

Connection (Wire colors are for sensor wires unless indicated)	Resistance
GREEN to ORANGE	< 1 Ohm
GREEN to BLACK	1 to 5 Ohms
GREEN to GROUND screw in J-box (GRAY wire)	> 20 MegOhms
GREEN to WHITE	> 20 MegOhms
GREEN to YELLOW	> 20 MegOhms
WHITE to GRAY	< 1 Ohm
WHITE to GROUND screw in J-box (GRAY wire)	> 20 MegOhms
WHITE to YELLOW	> 20 MegOhms
WHITE to RED	> 20 MegOhms
YELLOW to YELLOW	< 1 Ohm
YELLOW to GROUND screw in J-box (GRAY wire)	> 20 MegOhms



**The green wire from the extension cable's black-green-clear bundle might be connected opposite the sensor's orange wire, as indicated by * to utilize the sensor's alternative cell constant.*

FIGURE 2-1. Sensor Circuit for Troubleshooting

SECTION 3.0
REPLACEMENT PARTS

3.1 GENERAL

When replacement parts are required, ensure that qualified people install the parts specified by Rosemount. Replacement of original components with those constructed from alternative materials might change the temperature, pressure, and/or performance specifications from those of the original configuration and will void any CSA, FM, and BASEEFA/CENELEC agency approvals that were applicable to the original device. Table 3-1 lists the replacement parts kits for the Model 242 Sensor. An instruction manual is included with each kit.

3.2 REMOVE THE SENSOR

⚠ CAUTION

Before removing the sensor from the process piping, ensure that the process has been shut down and liquid drained from the sensor line. For personal safety,

The RTD can be removed either before or after the sensor is removed from the process. The junction box should be left attached to the toroid subassembly. After ensuring that it is safe to remove the sensor from the process line, loosen the flange bolts in 1/3 increments in the same order in which they were tightened as shown in Figure1-4. Remove the bolts and sensor.

3.3 DISASSEMBLE THE SENSOR

Using the tool indicated in Table 3-2, remove the Sensor Bolts (Item 2). Note that these bolts were installed using a thread-locking adhesive. Any use of heat to loosen the adhesive should not exceed the temperature ratings of the sensor. Figure 3-1 is an exploded view of the all the parts of the Model 242 sensor.

NOTE REGARDING O-RINGS

There are two pairs of O-rings inside the sensor: process O-rings (item 6) and secondary or backup O-rings (item 7). Refer to Figure 3-1 to identify these items. The two pairs of O-rings are not interchangeable.

Older O-ring replacement kits contained only the pair of process O-rings. New O-ring replacement kits con- tain both pairs of O-rings. To distinguish the process O-ring from the backup O-ring:

For sensors with plastic liners:

1. The process O-ring has a much smaller cross sectional area than the secondary O-ring. The cross-section diameter of the process O-ring is 0.07 in. The cross-section diameter of the secondary O-ring is 0.139 in.
2. The diameter of the process O-ring is less than the secondary O-ring. The size difference is immediately obvious when the two O-rings are allowed to dangle from a pencil.

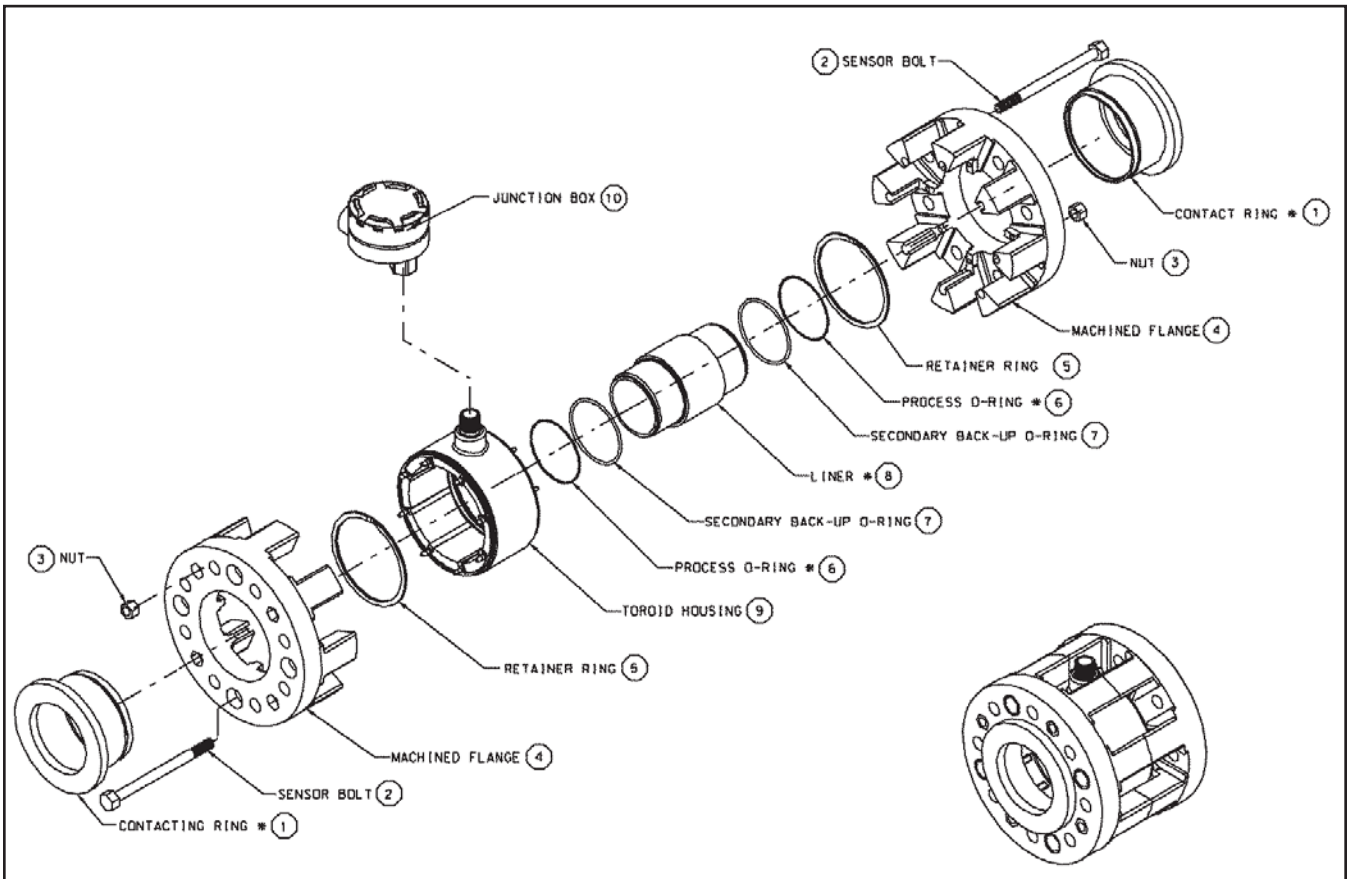
For sensors with alumina liners:

1. The process and secondary O-rings have the same cross sectional area. (0.139 in).
2. The diameter of the process O-ring is less than the secondary O-ring. The size difference is immediately obvious when the two O-rings are allowed to dangle from a pencil.

TABLE 3-1. Replacement Parts and Accessories		
PART NUMBER	**DESCRIPTION**	
23909-00	Extension cable, Pre-prepped, for connection to Instrument Models 54eC, 1055, 3081T, 4081T, 5081-T, and Xmt-T *(Specify length)*	
KIT PN	**DESCRIPTION**	**FOR SENSOR MODELS**
24005-00	Kit, Liner, 1” DN 25, Teflon PTFE	242-02[ ]TE[ ]
24005-01	Kit, Liner, 1” DN 25, glass-filled PEEK	242-02[ ]G4[ ]
24005-02	Kit, Liner, 1” DN 25, Alumina	242-02[ ]A4[ ]
24006-00	Kit, Liner, 1-1/2” DN 40, Teflon PTFE	242-03[ ]TE[ ]
24006-01	Kit, Liner, 1-1/2” DN 40, glass-filled PEEK	242-03[ ]G4[ ]
24007-00	Kit, Liner, 2” DN 50, Teflon PTFE	242-04[ ]TE[ ]
24007-01	Kit, Liner, 2” DN 50, glass-filled PEEK	242-04[ ]G4[ ]
24007-02	Kit, Liner, 2” DN 50, Alumina	242-04[ ]A4[ ]
24008-00	Kit, Liner, 3” DN 80, Teflon PTFE	242-06[ ]TE[ ]
24008-01	Kit, Liner, 3” DN 80, glass-filled PEEK	242-06[ ]G8[ ]
24008-02	Kit, Liner, 3” DN 80, Alumina	242-06[ ]A8[ ]
24009-00	Kit, Liner, 4” DN 100, Teflon PTFE	242-08[ ]TE[ ]
24009-01	Kit, Liner, 4” DN 100, glass-filled PEEK	242-08[ ]G8[ ]
24009-02	Kit, Liner, 4” DN 100, Alumina	242-08[ ]A8[ ]
KIT PN	**DESCRIPTION**	**FOR SENSOR MODELS**
24010-00	Kit, O-Ring, 1” DN 25, EPDM	242-02[ ]EP[ ]
24010-01	Kit, O-Ring, 1” DN 25, Viton	242-02[ ]VT[ ]
24010-02	Kit, O-Ring, 1” DN 25, Chemraz	242-02[ ]F4[ ]
24010-03	Kit, O-Ring, 1” DN 25, Chemraz for use with Alumina liner	242-02[ ]A4-F4
24011-00	Kit, O-Ring, 1-1/2” DN 40, EPDM	242-03[ ]EP[ ]
24011-01	Kit, O-Ring, 1-1/2” DN 40, Viton	242-03[ ]VT[ ]
24011-02	Kit, O-Ring, 1-1/2” DN 40, Chemraz	242-03[ ]F4[ ]
24012-00	Kit, O-Ring, 2” DN 50, EPDM	242-04[ ]EP[ ]
24012-01	Kit, O-Ring, 2” DN 50, Viton	242-04[ ]VT[ ]
24012-02	Kit, O-Ring, 2” DN 50, Chemraz	242-04[ ]F4[ ]
24012-03	Kit, O-Ring, 2” DN 50, Chemraz for use with Alumina liner	242-04[ ]A4-F4
24013-00	Kit, O-Ring, 3” DN 80, EPDM	242-06[ ]EP[ ]
24013-01	Kit, O-Ring, 3” DN 80, Viton	242-06[ ]VT[ ]
24013-02	Kit, O-Ring, 3” DN 80, Chemraz	242-06[ ]F8[ ]
24013-03	Kit, O-Ring, 3” DN 80, Chemraz for use with Alumina liner	242-06[ ]A8-F8
24014-00	Kit, O-Ring, 4” DN 100, EPDM	242-08[ ]EP[ ]
24014-01	Kit, O-Ring, 4” DN 100, Viton	242-08[ ]VT[ ]
24014-02	Kit, O-Ring, 4” DN 100, Chemraz	242-08[ ]F8[ ]
24014-03	Kit, O-Ring, 4” DN 100, Chemraz for use with Alumina liner	242-08[ ]A8-F8

Table 3-2. Sensor Bolt Removal & Installation Guide

Sensor Type	Model	Wrench	Torque (ft-lbs)	Torque (N-m)
1", 150# flange	242-02-10	5/16" Hex Allen	18 ft-lbs	24 Nm
1", 300# flange	242-02-11	5/16" Hex Allen	18 ft-lbs	24 Nm
DN 25, PN 16	242-02-14	5/16" Hex Allen	18 ft-lbs	24 Nm
1.5", 150# flange	242-03-10	5/16" Hex Allen	18 ft-lbs	24 Nm
1.5", 300# flange	242-03-11	3/8" Hex Allen	42 ft-lbs	57 Nm
DN 40, PN 16	242-03-14	5/16" Hex Allen	18 ft-lbs	24 Nm
2", 150# flange	242-04-10	5/16" Hex Allen	18 ft-lbs	24 Nm
2", 300 # flange	242-04-11	3/8" Hex Allen	42 ft-lbs	57 Nm
DN 50, PN 16	242-04-14	3/8" Hex Allen	42 ft-lbs	57 Nm
3", 150# flange	242-06-10	3/4" Socket	42 ft-lbs	57 Nm
3", 300 # flange	242-06-11	3/4" Socket	42 ft-lbs	57 Nm
DN 80, PN 16	242-06-14	3/4" Socket	42 ft-lbs	57 Nm
4", 150# flange	242-08-10	3/4" Socket	42 ft-lbs	57 Nm
4", 300 # flange	242-08-11	3/4" Socket	42 ft-lbs	57 Nm
DN 100, PN 16	242-08-14	3/4" Socket	42 ft-lbs	57 Nm



* REPLACEMENT PARTS AVAILABLE.

FIGURE 3-1. Exploded View of Model 242

3.4 RE-ASSEMBLE THE SENSOR

It is recommended that a press be used during the assembly process to ensure tight seals between components.

Locate the part to be changed on the diagram and substitute the new part from the kit. Complete disassembly of the sensor might not be necessary and in that case is not recommended. If new O-rings are to be used, they should be lubricated prior to installation.

Assuming the sensor has been completely disassembled, begin by placing both Contact Rings (Item 1) side by side on their flat faces. Set a Flange (Item 4) on each Contact Ring (Item 1). Install a Retainer Ring (Item 5) onto the step on the outside of each Contact Ring (Item 1). Insert a lubricated Process O-ring (Item 6) in the lower groove (closest to the flat face) located inside each Contact Ring (Item 1). Place a lubricated Secondary Back-up O-ring (Item 7) on the upper step inside each Contact Ring (Item 1). The flange-assembly should look like Figure 3-2.

Place one of these flange-assemblies onto a press and install the Liner (Item 8). It is advisable to place a flat surface between the press and the liner to protect the liner from damage during pressing. Be careful to ensure O-rings do not slip or twist. Slip the Toroid Housing (Item 9) over the Liner (Item 8) to nest inside the flange-assembly. The pins on the toroid housing must seat into the small holes in the flanges. Place the second flange-assembly on top of the first flange assembly with the Liner (Item 8) and Toroid Housing (Item 9) in between. Check for pin alignment, pinched O-rings, and straight, even insertion. The Sensor Bolts (Item 2) can be temporarily preplaced in the bolt holes to align the two Flanges. Press the entire sensor together to begin assembly of all the components. Install and tighten the Sensor Bolts and Nuts (Items 2 and 3), using thread-locking compound. Using the torquing sequence shown in Figure 1-6, tighten the bolts in 1/3 increments of their final torque values as listed in Table 3-2.

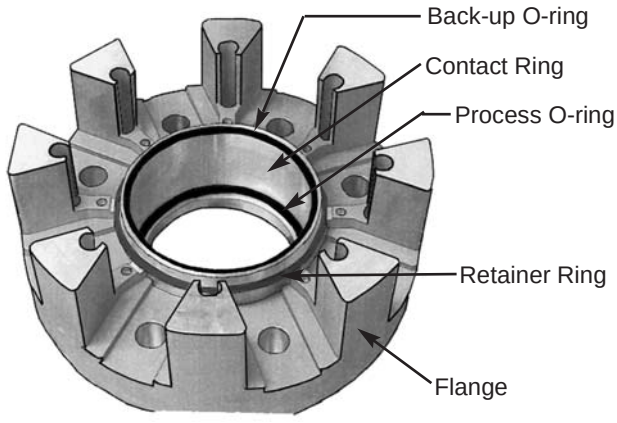


FIGURE 3-2. Flange Assembly: Contact Ring, Flange, and O-rings.

3.5 RE-INSTALL THE SENSOR INTO THE PROCESS

Please see Section 1.4 of this manual for instructions.

LIQ-MAN-242
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