

DANIEL™ SERIES 1200 TURBINE METER

1" THROUGH 2" SIZES

OPERATING AND MAINTENANCE INSTRUCTIONS

**DANIEL MEASUREMENT AND CONTROL, INC.
AN EMERSON PROCESS MANAGEMENT COMPANY
HOUSTON, TEXAS**

**Part Number 3-9008-512
Revision D**

NOVEMBER 2011

DANIEL™


EMERSON™
Process Management

WARNING AND CAUTION STATEMENTS

General Safety Information and Symbols

Pay special attention to the following signal words, safety alert symbols and statements:



indicates a hazardous situation which, if not avoided, will result in death or serious injury.



indicates a hazardous situation which, if not avoided, could result in death or serious injury.



indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.



is used to address practices associated with possible equipment damage and not related to personal injury.



is used to address miscellaneous practices not related to personal injury.

IMPORTANT INSTRUCTIONS

Daniel Measurement and Control, Inc. (Daniel) designs, manufactures and tests products to function within specific conditions. Because these products are sophisticated technical instruments, it is important that the owner and operation personnel must strictly adhere both to the information printed on the product nameplate and to all instructions provided in this manual prior to installation, operation, and maintenance.



Installing, operating or maintaining a Daniel Product improperly could lead to serious injury or death from explosion or exposure to dangerous substances. Comply with all information on the product, in this manual, and in any local and national codes that apply to the product. Do not allow untrained personnel to work with this product. Use Daniel parts and work procedures specified in this manual.

Daniel also urges you to integrate this manual into your training and safety program.

**BE SURE ALL PERSONNEL READ AND FOLLOW THE INSTRUCTIONS
IN THIS MANUAL AND ALL PRODUCT WARNINGS.**

Product Owners (Purchasers):

1. Select the correct product for the environment and pressures present. If you are unsure, discuss your needs with your Daniel representative.
2. Inform and educate all personnel in the proper installation, operation, and maintenance of this product.
3. To ensure proper performance, only informed and trained personnel should install, operate, repair and maintain this product.
4. Save this instruction manual for future reference.
5. If you resell or transfer this product, it is your responsibility to forward this instruction manual along with the product to the new owner or transferee.
6. A Return Material Authorization (RMA) number must be obtained prior to returning any equipment for any reason.
7. Download the RMA form on the Daniel Measurement and Control, Inc. Support Services web page by selecting the link below.

<http://www2.emersonprocess.com/EN-US/BRANDS/DANIEL/SUPPORT-SERVICES/Pages/Support-Services.aspx>

Product Operation Personnel (Personnel):

1. Read and understand all instructions and operating procedures for this product.
2. Install this product as specified in the Installation section of this manual per applicable local and national codes.
3. Follow all warnings, cautions, and notices marked on, and supplied with, this product.
4. Follow all instructions during the installation, operation, and maintenance of this product.
5. To prevent personal injury, ensure that all components are in place prior to and during operation of the product.
6. Connect all products to the proper electrical and pressure sources when and where applicable.
7. If you do not understand an instruction, or do not feel comfortable following the instructions, contact your Daniel representative for clarification or assistance.
8. If this instruction manual is not the correct manual for your Daniel product, telephone Daniel at 1-713-827-6314 and Daniel will provide you with the requested manual. You may also download the correct manual from <http://www.daniel.com>.
9. Use only replacement parts specified by Daniel. Unauthorized parts and procedures can affect this product's performance, safety, and invalidate the warranty. "Look-a-like" substitutions may result in deadly fire, explosion, release of toxic substances or improper operation.
10. Save this instruction manual for future reference.

CAUTION

DAMAGE TO ELECTRONIC COMPONENTS

Proper handling procedures must be observed during the removal, installation or other handling of internal circuit boards or devices.

Failure to properly handle the instrument can damage electronic components that are susceptible to static electricity.

Handling Procedure:

1. Power to the unit must be removed.
2. Personnel must be grounded, via a wrist strap or other safe, suitable means before any printed circuit card or other internal device is installed, removed or adjusted.
3. Printed circuit cards must be transported in a conductive bag or other conductive container. Boards must not be removed from protective enclosure until immediately before installation. Removed boards must immediately be placed in a protective container for transport, storage or return to the factory.

CAUTION

DAMAGE TO ELECTRONIC COMPONENTS

This instrument is not unique in its content of ESD (electrostatic discharge) sensitive components. Most modern electronic designs contain components that utilize metal oxide technology (NMOS, CMOS, etc.).

Failure to properly handle the instrument can damage or destroy electronic components that are susceptible to even small amounts of static electricity. The components will exhibit early failure even though they appear to function properly.

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DANIEL™ SERIES 1200 TURBINE METER
OPERATING AND MAINTENANCE INSTRUCTIONS**

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1.0 INTRODUCTION

1.1 General

This manual is designed to assist in the installation and operation of the Daniel™ Series 1200 Turbine Flowmeter. To assure proper installation and startup it is important to read this manual in its entirety.

1.2 Description

The Series 1200 Turbine Flowmeter is a volumetric flow metering and transmitting device used extensively in the petroleum industry for the accurate measurement of liquid hydrocarbons. The meter's simple configuration assures higher flow rates, extended flow range and sustained performance capability. This meter is specifically designed for pipeline and loading rack service where a vital characteristic is repeatability.



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2.0 SPECIFICATIONS

This meter is designed for use within the guidelines of API Standards, Chapter 5.3, formerly Standard 2534 (The Measurement of Liquid Hydrocarbons by Turbine Meter Systems) and the test procedures of API Standards, Chapter 4 (Prover Systems).

**PERSONAL INJURY AND/OR EQUIPMENT DAMAGE**

Do not exceed specifications listed below.

Failure to heed this warning could result in serious injury and/or damage to the equipment.

Meter Performance

Linearity: $\pm 0.25\%$ (Linearity of $\pm 0.15\%$ optional on 1-1/2" and 2" sizes)

Repeatability: $\pm 0.02\%$

Pickoff Type

Single or dual, non-wetted, reluctance pickoffs

Preamplifier Type

Dual Channel preamplifier

Preamplifier Performance**Inputs**

Supply voltage: 10-30 Vdc

Sensor Type: Reluctance

Type: Sine Wave

Amplitude: 40 mV peak to peak minimum

Outputs

Powered Pulse Output

Type: Square Wave

Frequency Range: 0 to 5 kHz

Amplitude: 0 to 5 V

1000 Ohm internal pull-ups, 20 mA, max.

Variable Voltage Output

Type: Square Wave

Frequency Range: 0 to 5 kHz

Amplitude: 0 to Supply Voltage

1000 Ohm internal pull-ups, 70 mA, max.

Open Collector Output (Per Channel)

Type: Square Wave

Frequency Range: 0 to 5 kHz

Max. Voltage: 30 Vdc

Max. Current: 125 mA

Max. Power: 0.5 Watts

Transmission Distance

Pickoff Only (without preamp): Belden 88442 or equivalent up to 20 ft. (6.1 meters)

With Preamp: 3,000 ft. (914 meters)

Materials of Construction

Meter Body: SS

Internal Components: Aluminum/SS

Bearings: Stainless Steel

UMB Housing: Aluminum

Ratings

The maximum working pressure for the Series 1200 Turbine Meter is based on the temperature/pressure rating of the ANSI B16.5 flanges. The following chart lists the maximum working pressure of both 304 stainless steel and carbon steel flanges at 100° and 180° Fahrenheit (the maximum operating temperature for the standard meter). For maximum working pressures at intermediate temperatures, and for other materials, refer to ANSI B16.5.

Pressure/Temperature	Stainless Steel
150# ANSI / -20 to 100°F	275 psig WP
150# ANSI / 180°F	239 psig WP
300# ANSI / -20 to 100°F	720 psig WP
300# ANSI / 180°F	624 psig WP

Ratings:

Pressure	ANSI pressure/temperature rating corresponding to flanges used. 150# ANSI: 285 PSI 300# ANSI: 740 PSI
Ambient Temperature	-40 to 140°F (-40 to 60°C) (T _{amb} is an electrical specification) CS flange minimum temperature is -20°F (-29°C)
Process Temperature	-20 to 180°F (-29 to 82°C)
Pressure Drop	three psi (20.7 kPa) at maximum flow rate (based on gasoline, meter only)

Mechanical Connections

Standard: 150 or 300 # ANSI R.F. flanges

Approvals:

Electrical: UL and ULC: Class I, Division 1, Groups C & D
 DEMKO 03 ATEX 130946X
 IECEX UL 11.0031X


Environmental: NEMA 4

Metrology: NTEP 90-118
 NMi TC7573

Standard Temperature:

CE 0539  **II 2G**
DEMKO 03 ATEX 130946X
Ex d IIB T6 Gb

Brazil Certification Nameplate
 (Standard Temperature Range):

○	MODELO	<input type="text"/>	○
	SERIE	<input type="text"/>	
	RANGE VAZAO	<input type="text"/>	
	FATOR K	<input type="text"/>	
	PULSOS POR	<input type="text"/>	
	TAG	<input type="text"/>	
Segurança			
Todas as entradas roscadas do UMB sao 3/4 NPT		 INMETRO	 © 2011 INMETRO
○	PARAMETROS ELECTRICOS : 10 to 30 VDC TEMP. DE PROCESO. : -29°C to 82°C; TEMP. AMBIENTE : -40°C to 60°C		○

3.0 INSTALLATION

3.1 General

This section contains specific instructions for receipt and installation of the meter.

3.2 Flow Considerations

A properly designed flow system will do two basic things towards maintaining the linearity of the turbine meter. It will properly condition the incoming flow such that it is homogeneous throughout its cross section and it will provide proper back pressure so that cavitation will not originate inside the meter.

Linearity can be defined as the total range of deviation of accuracy, expressed as a curve, between minimum and maximum flow rates. The ideal accuracy curve of a volumetric meter, such as the turbine, is a straight line denoting a constant meter factor.

Cavitation is the formation and collapse of vapor-filled cavities that result from a sudden decrease and increase in pressure.

CAUTION

MECHANICAL EQUIPMENT DAMAGE

Provide unobstructed upstream piping.

Turbine meter performance depends on the incoming fluid being devoid of swirls and excessive turbulence. These conditions can be avoided by providing unobstructed piping upstream of the meter. Pipe fittings such as elbows and tees, and piping components such as valves and strainers should be located far enough upstream to allow dissipation of any flow disturbance before it reaches the meter. Use of flow straighteners greatly influence meter performance.

Specific Gravity

Turbine meter performance is affected by specific gravity and may influence performance. The effect of specific gravity on the turbine meter may be evidenced when specific gravity drops below 0.70. As specific gravity decreases, the lift forces on the turbine blade decreases. Likewise as velocity decreases, lift forces decrease. These reduced lift forces are overtaken by bearing friction as low rates are approached. Subsequently, linearity deteriorates at low flow rates while measuring low density fluids.

To compensate for separate meter factors at low flow rates electronic monitoring equipment is used. This has been proven to enhance the overall measuring accuracy at the load rack. As low flow startup and shutoff flow rate is encountered, an established meter factor for that rate is applied. During the time that the high flow rate is used to load the bulk of the measured volume, a meter factor established for high flow rate is applied.

Viscosity

Turbine meters are viscosity sensitive in that as the metered fluid increases in viscosity, meter linearity begins to suffer. This effect on linearity is primarily due to a change in the fluid's velocity profile and skin friction between the fluid and the rotor blades.

Seasonal Changes

For optimal performance in loading rack applications, where fuel oils are metered and where there is a large temperature swing from summer to winter, it is recommended that a new meter factor be established as seasons change. This is recommended since temperature affects the viscosity of fuel oil and viscosity affects turbine meter performance.

Generally speaking, viscosities of 3 centipoise or less give no cause for concern. Above this viscosity, all influential factors should be considered. By properly anticipating the flow system's viscosity, maximum flow rate, flow range and desired linearity, the user can properly apply the turbine meter to the required application.

3.3 Installation and Equipment

Figure 3-1, Typical Installation has been provided as a guide in establishing optimum performance of the meter. Prior to installation consider the general information listed below.

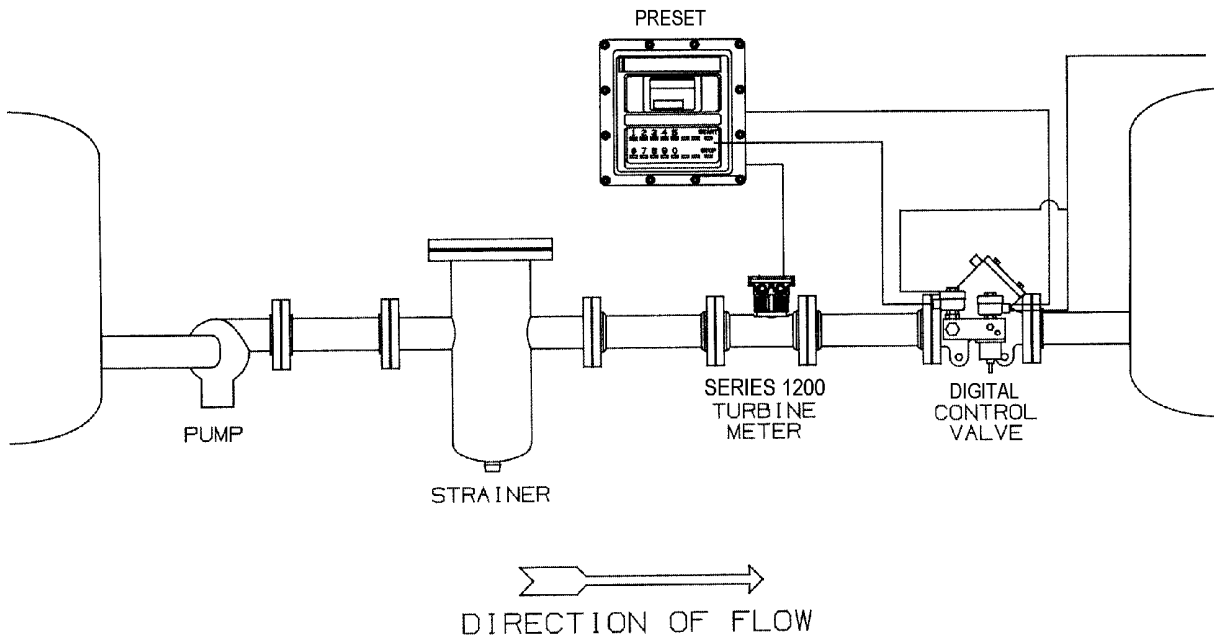


Figure 3-1. Typical Installation

1. Note the direction of flow indicated on the plate near the inlet flange and install accordingly.
2. New Installations - Lines should be flushed thoroughly to rid piping of potentially damaging foreign material such as welding bead, pipe scale, etc. before the meter is placed into service.

NOTICE

A spool piece installed in place of the meter is recommended for this procedure.

When installing this equipment, bolting must conform to the requirements of ASME B16.5 paragraph 5.3 and to the material requirements of ASME B16.5 Table 1B. Gaskets must conform to the requirements of ASME B16.20.

It is the customer's responsibility to ensure that piping or other attachments connected to the Product do not place adverse stresses on the Product.

The design of the Product has not been assessed for the effects of traffic, wind or earthquake loading.

It is the customer's responsibility to provide fire prevention measures and equipment per local regulations.

**WARNING****PERSONAL INJURY AND/OR EQUIPMENT DAMAGE**

Install and use the Daniel Series 1200 Turbine Meter only per noted instructions and specifications.

Use of this equipment for any purpose other than its intended purpose may result in property damage and/or serious personal injury or death.

The Product has been designed with a minimum of 1.5mm (.059 inches) corrosion allowance. The customer should implement a periodic inspection and maintenance program to ensure that no part of the Product's pressure-retaining components has corrosion or erosion exceeding this amount. (The design engineer may choose to select a different corrosion allowance, but it should be identified and published.)

3. Products to be measured.

**CAUTION****MECHANICAL EQUIPMENT DAMAGE**

Always use a flushing medium that is compatible with the metallurgy of the meter and its internal components and similar to the product for which the meter is intended.

Using water as a flushing medium may result in damage to the internal components of the turbine meter.

4. Always install the meter downstream of pumps

Valves

The metering system should have a flow rate control valve located at a convenient distance downstream of all measurement equipment. The function of the control valve is to limit and maintain system pressure on the meter. This avoids cavitation.

When a loading rack meter is being calibrated with a displacer type prover (using a piston or sphere) a back pressure valve should also be used downstream of the proving device. This valve can be a simple manual valve that is partially closed. A minimum pressure of 12 to 15 PSI (83 to 103 kPa) should be maintained downstream of the prover.

1. Valves should be capable of rapid, smooth opening and closing with positive shut-off.
2. When used for intermittent flow, valves should be fast acting and shock-free.
3. Bypass lines should be equipped with blind or positive shut-off devices.
4. Shut-off or control valves should be located downstream of the meter.

Flow Straightening

The Series 1200 Turbine Meter in sizes one and a half inches through four inches is supplied with an integral flow conditioning plate as standard. For best performance it is recommended that an upstream and downstream spool equal to a minimum of five pipe diameters be utilized. The Series 1200 one-inch meter is not installed with an integral flow conditioning plate and it is recommended that an upstream spool equal to a minimum of twenty pipe diameters and a downstream spool equal to a minimum of five pipe diameters be used for best performance.

Strainers

A strainer of proper size should be installed upstream of the meter to protect it from the introduction of foreign material which might damage the meter. Recommended mesh size: 80 mesh.

Strainer Monitoring:

1. Recommended procedures dictate that regular, scheduled cleaning of the strainer basket should be conducted to prevent filling and rupturing of the screen.
2. Pressure gauges installed on both sides of the strainer will indicate differential pressure across the strainer. High-pressure differential caused by filling of the basket with foreign material can cause strainer basket rupture resulting in possible meter damage.

3.4 Pickoff Coils And Electrical Connections

A. Pickoff Coils

The Series 1200 Turbine has the capacity for single or dual pickoff coils mounted 90° electrically out of phase. Each pickoff produces a low level sine wave signal, which varies in amplitude (V) and frequency (Hz) proportional to the velocity of the turbine blades. This signal information is coupled to the input terminals of the preamplifier.

B. Electrical Connections

Pickoff input signal connections are made at terminal strip connection TB2 for Channel A and TB3 for Channel B. Power supply and output signal connections are made at terminal strip TB1. Reference Figure 3-2.

C. Induced Interference

The Turbine meter should be located as far as possible from any electrical equipment such as motors, solenoids or relays which could induce an interference signal into the turbine meter pickoff coil. High amplitude interference introduced into the preamplifier can result in interference with the flow signal.

Interference Check - Upon installation of the turbine meter and preamplifier, the presence of an interference signal can be detected by performing the following check.

1. Connect a suitable readout device to the preamp output terminal strip TB1 (number 3 for channel A or number 5 for channel B).
2. Apply +12 Vdc power to the preamp at terminal strip TB1 (number 1).
3. If an output is indicated on the readout at a no-flow condition, induced interference is present.
4. Duplicate the checking process if dual pickoffs are being used. Use output terminal strip TB1 number 3 or 5 as selected for pickoff output.

Interference may be reduced or eliminated by changing the location of the meter or by rotating the meter in the pipeline in progressive steps while simultaneously checking the output for the lowest possible signal reading.

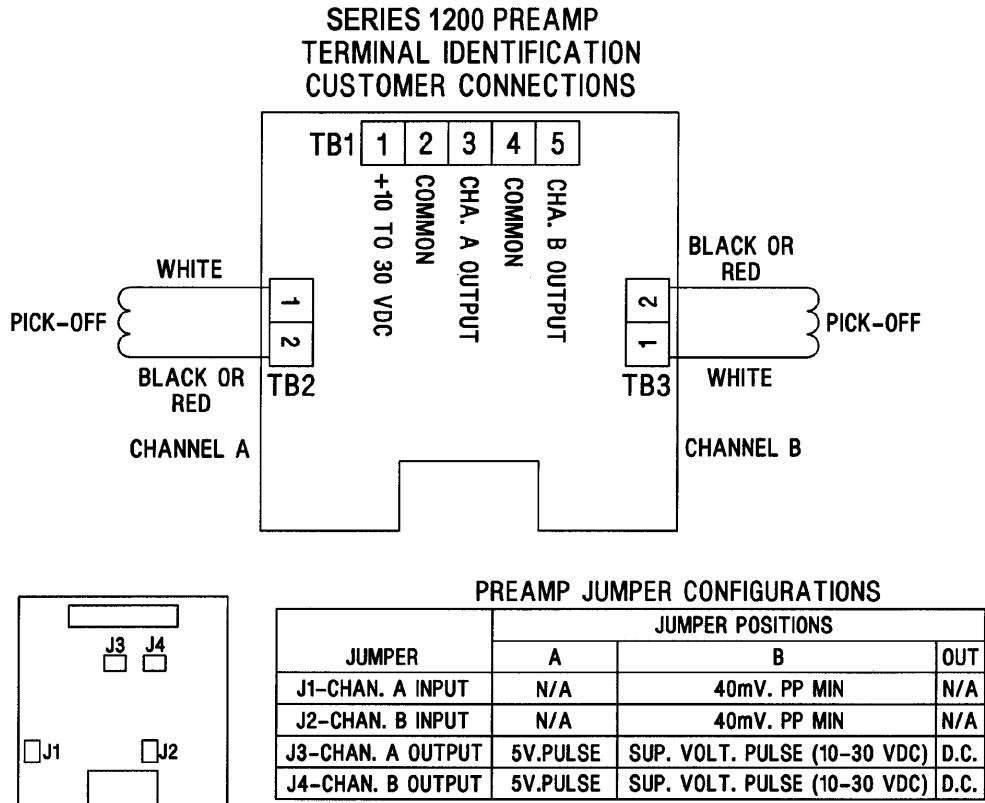


Figure 3-2. UMB Wiring

D. Accessory Hookup

General considerations: It is important that the appropriate service manual be referenced before attempting to use accessories or instrumentation with the Series 1200 Turbine. If service manuals for instrumentation were not received at the time of purchase or delivery, please contact the factory or nearest Daniel Measurement and Control Sales and Service Office.

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4.0 OPERATION

4.1 General

This section contains the operating procedures for the Series 1200 Turbine Meter. Reference Section 3.4 for general flow considerations that may effect meter performance. The Series 1200 Turbine Meter is a volumetric flow measuring and transmitting device that produces an output signal proportional to the rate-of-flow of the liquid being measured. The primary output is a single or dual high resolution signal that is amplified and shaped by an integral amplifier mounted within an explosion proof housing. This square-wave pulse can be fed directly to remote totalizing counters, digital readout devices or control instrumentation, or a locally mounted electronic register.

4.2 Pre-start Checks

Inspect all electrical connections to assure compliance to electrical codes and safety regulations.

All bolts used to secure the meter in line should be inspected to assure that proper mounting procedures have been followed and that flange connections are leak free.

Evaluate the system setup to assure that all components are in the proper sequence for accurate product measurement: isolation valve, strainer, flow straightener, meter, downstream section, control valve, etc.

4.3 Operation

Flow and pressure information is stamped on the nameplate located on the outside of the meter.



PERSONAL INJURY AND/OR EQUIPMENT DAMAGE

Never subject the meter to flow or pressure ranges above those specified in Section 2 Specifications, or those stamped on the meter.

Exceeding the meter specifications could result in serious injury and/or damage to the equipment.

1. Back pressure at the outlet of the meter must be sufficient for proper operation. Consider the following equation when determining back pressure for the meter.

2. $P_b = 2 \Delta p + 1.25 p_e$

Where

P_b = minimum back pressure, pounds per square inch gauge (psig)

Δp = pressure drop through the meter at the maximum operating flow rate for the liquid being measured, pounds per square inch (psi)

p_e = equilibrium vapor pressure of the liquid at the operating temperature, pounds per square inch absolute (psia), gauge pressure plus atmospheric pressure

3. Care should be taken to protect the Series 1200 housing and components from external impact of any kind. Note temperature limitations in Section 2 when selecting meter location.

5.0 MAINTENANCE

Reference Figure 7-2 and 7-3 Exploded Parts Drawings.

NOTICE

Item numbers reference actual engineering drawings and are not meant to be consecutively numbered.

5.1 General

The Series 1200 Turbine is designed to operate for extended periods of time without evidence of wear or loss of precision. All meter adjustments were completed at the factory during liquid calibration and should not require field setup. However, should inspection of internal components be required or should field requirements change, information contained in this document must be read and understood before attempting any maintenance procedure.

If the Series 1200 Turbine is found to be in need of repair, it is recommended the user contact the nearest Daniel Measurement and Control Sales or Service Office. It is important that servicing be performed by trained and qualified service personnel.

5.2 Maintenance Considerations

1. Label all parts or place parts in labeled containers during disassembly.
2. Use no metal clamping devices in direct contact with any meter part or surface.
3. Rotor blades determine proper flow measurement and should be handled with extreme care. Bending or altering the blades in any way can effect meter accuracy.

5.3 Disassembly Procedure - Internal Components

All Sizes

Before removing the meter from the system the following precautions must be taken:

Disconnect all power to the meter.



PERSONAL INJURY AND/OR EQUIPMENT DAMAGE

Disconnect power to the meter.

Failure to disconnect power to the meter could result in serious personal injury and/or damage to the equipment.

Relieve all line pressure.



PERSONAL INJURY AND/OR EQUIPMENT DAMAGE

Relieve all pressure at this time.

Failure to relieve line pressure at this time could result in serious personal injury and/or damage to the equipment.

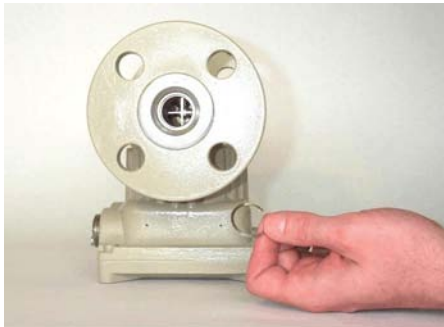
Disassembly Internal Components Size 1"

The internals of the 1" Series 1200 turbine meter are secured by means of a sleeve and C-ring. The internals are supported by both up-and downstream hangers, which locate against a lip in the turbine body.

The up and downstream hangers are identical. Each hanger has two hanger blades. When assembled these hold between them a short shaft supporting the rotor assembly. The rotor includes two small ball-bearing assemblies and a spacer. The ball bearing assemblies are a loose fit in recesses in the rotor.

NOTICE

During disassembly it is possible to separate the rotor, bearings, spacer and shaft. These parts are **VERY SMALL** and care should be taken not to lose any item.



Remove the C-clip at the inlet flange using pliers.



Remove the sleeve. You may need to **GENTLY** tap the internals from the downstream end using a soft punch to start the process.



Carefully remove the upstream stator. This is a one-piece assembly. NOTE: The shaft and rotor assembly may come with this. The bearings, shaft and rotor will fall out of the meter body if tipped.



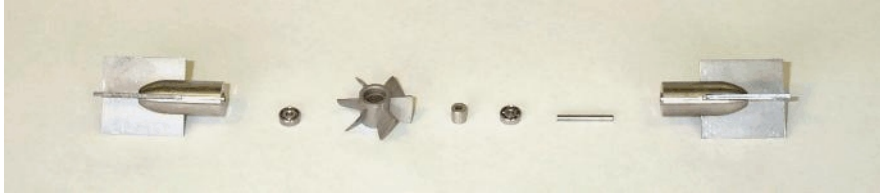
View of the upstream stator, upstream bearing, spacer and shaft as an assembly.

CAUTION

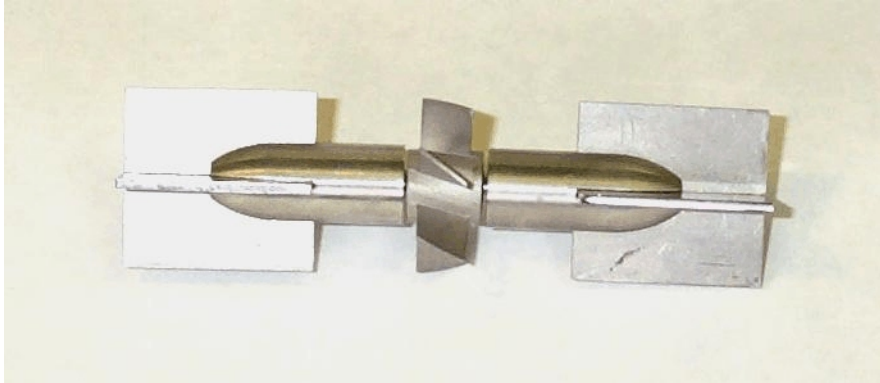
METER PERFORMANCE CAN BE AFFECTED

Handle the rotor with care.

Improper handling of the rotor assembly may cause distortion to the rotor blades.



The complete internals of the meter without the sleeve and C-clip.



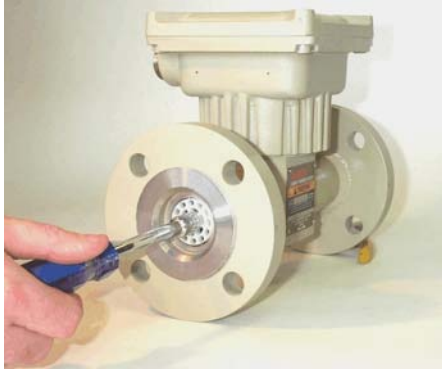
Meter internals assembled ready for re-assembly. It is recommended that the re-assembly of the meter is accomplished by inserting the internals as a single assembly as shown.

NOTICE

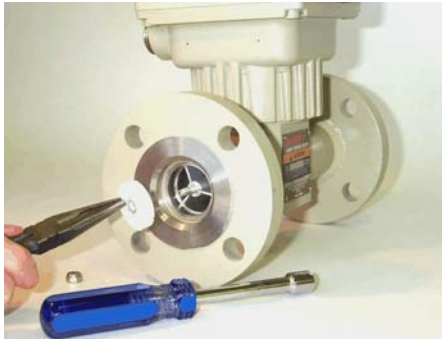
The rotor has a “U” etched on the upstream side of the rotor. Be sure to re-assemble the internal assembly with the rotor correctly oriented.

Disassembly Internal Components Size 1-1/2" and 2"

The internals of the Series 1200 turbine meter (sizes 1-1/2" and above) are retained by means of patented self-centering support fins, which are engaged by the compression of the flow conditioning plate against the support fins.



Series 1200 turbine meter shown with nut driver in place to begin disassembly.



Remove the nut, washer and flow conditioning plate from the center bolt.



Lightly tap the center bolt on the end with a soft-faced mallet to loosen the compression on the support fins. Push the shaft in approximately flush with the support fins and lift the fins slightly to remove them from their engagement in the groove in the flowtube.



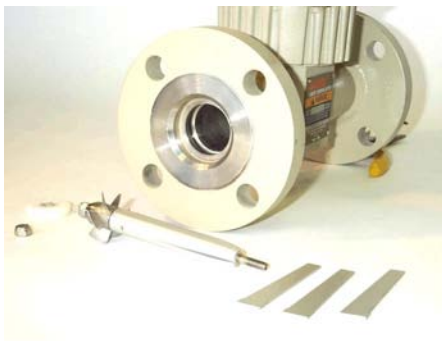
Gently remove the internals from the flowtube.

CAUTION

METER PERFORMANCE CAN BE AFFECTED

Handle the rotor with care.

Improper handling of the rotor assembly may cause distortion to the rotor blades.



This figure shows the internals after the initial disassembly.



After laying the support fins aside, remove the nut from the downstream (rotor) end of the internal bullet.



The rotor assembly includes the rotor, two stainless steel ball bearing assemblies and a spacer between the ball races. The ball races are a loose fit in recesses on the rotor hub and may fall out. Be careful not to lose any small parts!

Remove the downstream stator and rotor from the bolt.



The internals fully disassembled.

5.4 Reassembly of Internal Components

In all cases reassembly is the reverse of disassembly. Caution must be taken at all times to protect the rotor blades from rough handling as blade position is critical to meter performance.

NOTICE

The rotor has a “U” etched on the upstream side of the rotor. Be sure to reassemble the internal assembly with the rotor correctly oriented.

Torque the retaining nuts to 25 in. lbs.

5.5 Field Retrofittable Dual Pickoff

(Reference Figure 7-1)

In the event that a second pickoff is required for equipment originally supplied with a single pickoff, or should field service or replacement of existing pickoffs be necessary, the following procedure is recommended.

All Sizes

1. Disconnect all power to the meter.

**PERSONAL INJURY AND/OR EQUIPMENT DAMAGE****Disconnect power to the meter.**

Failure to disconnect power to the meter could result in serious personal injury and/or damage to the equipment.

2. Remove retaining screws (item 16) and cover (item 22) of the UMB housing assembly.
3. Disconnect terminal connects at TB1, TB2, and TB3.
4. Loosen retaining screws of preamplifier board (item 19) and lift out.
5. Care should be taken not to jar or disrupt terminal board components.
6. Remove retaining plate (item 26) and screw, (item 16).
7. Insert second pickoff (item 24) into the pickoff cavity of the UMB and secure with retaining plate (item 26) and screw, (item 16).
8. Mount the preamplifier board in its original position and secure using spring loaded retaining screws.
9. Attach electrical output wiring from both pickoffs to terminal connection TB2 and TB3.
10. Attach electrical output wiring from electrical accessories (conduit wiring) to terminal connection TB1, number 3 for channel A, and number 5 for channel B.
11. Secure all electrical wiring.
12. Return UMB cover and secure using original retaining screws.

6.0 TROUBLESHOOTING

6.1 General

This information has been provided as an aid in basic troubleshooting. Disassembly procedures have been outlined in Section 5.3 of this manual. If the Series 1200 Turbine is found to be in need of repair, it is recommended the user contact the nearest Daniel Measurement and Control Sales or Service Office. It is important that servicing be performed by trained and qualified service personnel.

Table 6-1. Troubleshooting

Condition	Probable Cause	Correction
No output pulses from amplifier module	Input voltage to amplifier below minimum required for operation	Apply correct voltage (10 - 30 VDC)
	Damaged or shorted pickoff (Resistance across leads should be 600-900 Ohm)	Replace pickoff
	Damaged amplifier module	Replace amplifier module
	Receiver unit not operating	Refer to instruction manual on defective unit
	Meter rotor not turning	Troubleshoot internal assembly
Turbine meter rotor not turning	Defective rotor bearing	Return rotor assembly to factory for replacement or repair
	Rotor damaged by foreign material passing through meter	Return rotor assembly to factory for replacement or repair
Inaccurate readout	Foreign material on rotor blades	Check and clean blades
	Rotor blades are bent	Return to factory for replacement or repair
	Defective accessory equipment	Troubleshoot equipment

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7.0 PARTS LIST

This section contains the necessary parts required to make up any standard unit covered in this manual. Recommended spare or replacement parts have been denoted by an asterisk.

NOTICE

Item numbers reference actual engineering drawings and are not meant to be consecutively numbered.

When ordering, the following information must be supplied.

- Serial number
- Part number
- Part description
- Quantity required.

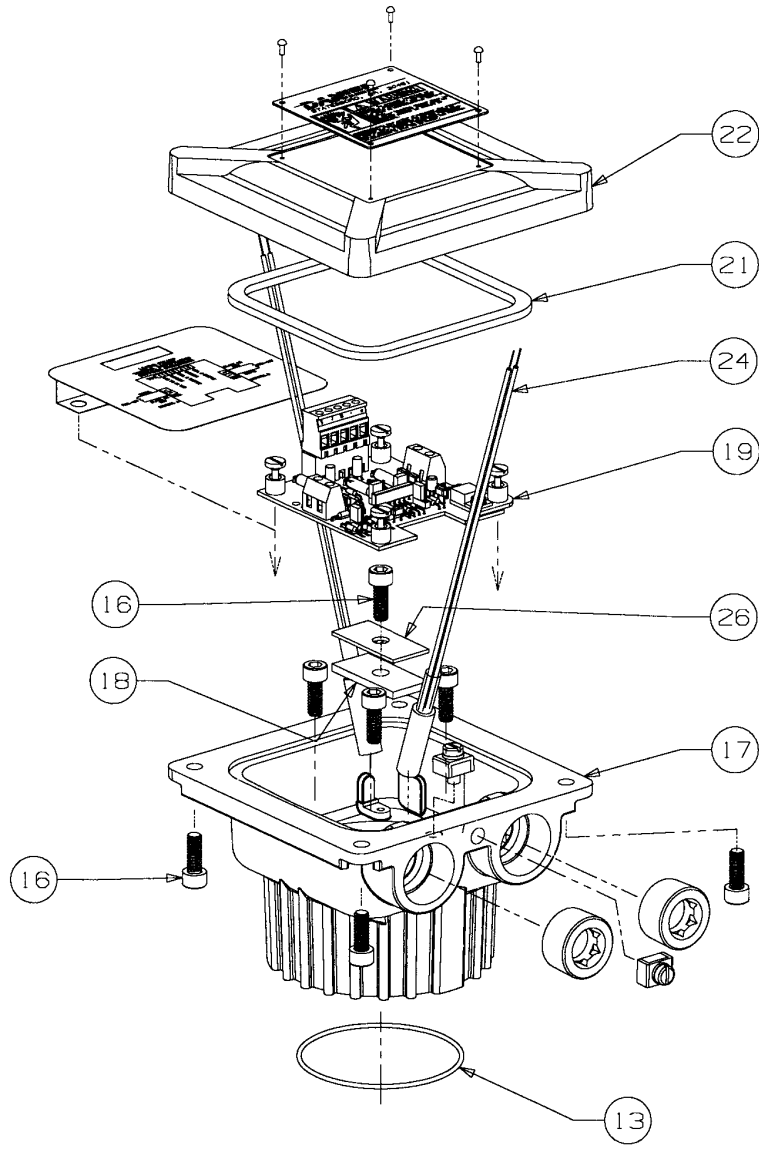


Figure 7-1. UMB Assembly (All Sizes) (Reference Table 7-1)

Table 7-1. UMB Assembly (All Sizes) (Reference Figure 7-1)

Item Number	Description	Part Number	Quantity Required
13*	O-ring (Viton®-A)	1500093-022	1
16**	Screw (Hex Socket Head)	151496	9
17	UMB Housing	899-00-100-00	1
18	Insulator	799-00-424-01	1
19*	Dual Channel Preamp	230-00-300-00	1
21*	Gasket	CA-375Z-259-XXA	1
22	UMB Cover	899-00-101-00	1
24*	Pickoff	899-00-201-00	1 or 2
26	Clamp	799-00-424-00	1

* Recommended Spare Parts

** All item 16 - Torque 55 in. lbs., min.

Viton® is a registered trademark of E.I. du Pont de Nemours and Company.

ATEX REPAIR NOTE:

Special Conditions for Safe Use: The joint between the Universal Mounting Box cover and housing is a flat joint and has a flame path of 9.52mm in length and clearance of less than .0381mm. The joint between the Universal Mounting Box housing and Sensor housing is a spigot joint which has a radial length of 3.18mm, a axial length of 13.61mm and a clearance of .059mm.

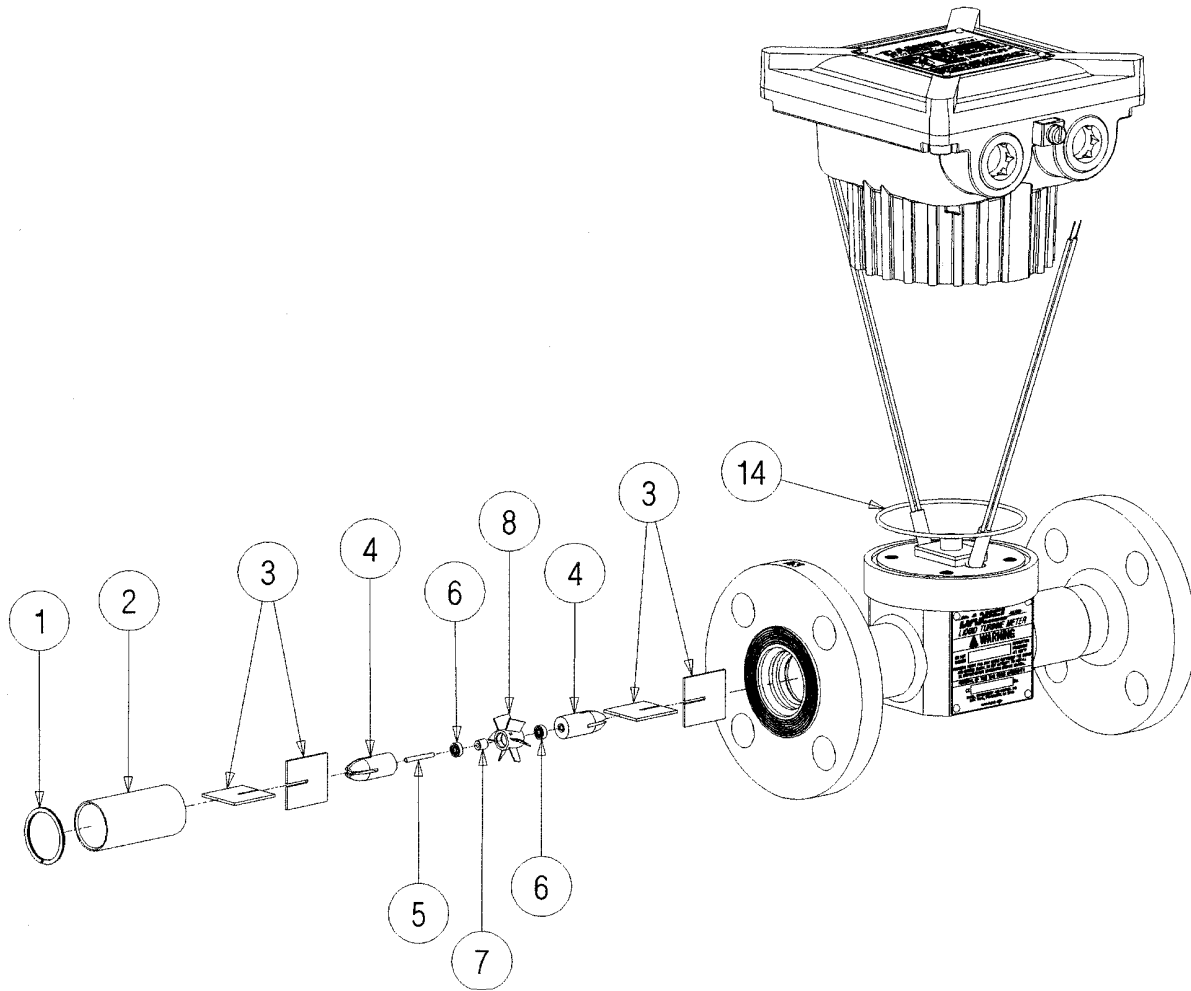


Figure 7-2. Meter Assembly (1") - Stainless Steel Bearing Internals (Reference Table 7-2)

Table 7-2. Part Numbers (1") - Stainless Steel Bearing Internals (Reference Figure 7-2)

Item Number	Description	1" Part Number	Quantity Required
1	Clip	1-504-05-520	1
2	Sleeve	797-10-500-60	1
3	Hanger Blade	798-10-080-00	4
4	Hanger Hub	798-10-008-00	2
5	Shaft	798-10-018-00	1
6	Bearing	1505024	2
7	Spacer	798-10-073-00	1
8	Rotor	798-10-019-00	1
14	O-Ring	1500093-022	1

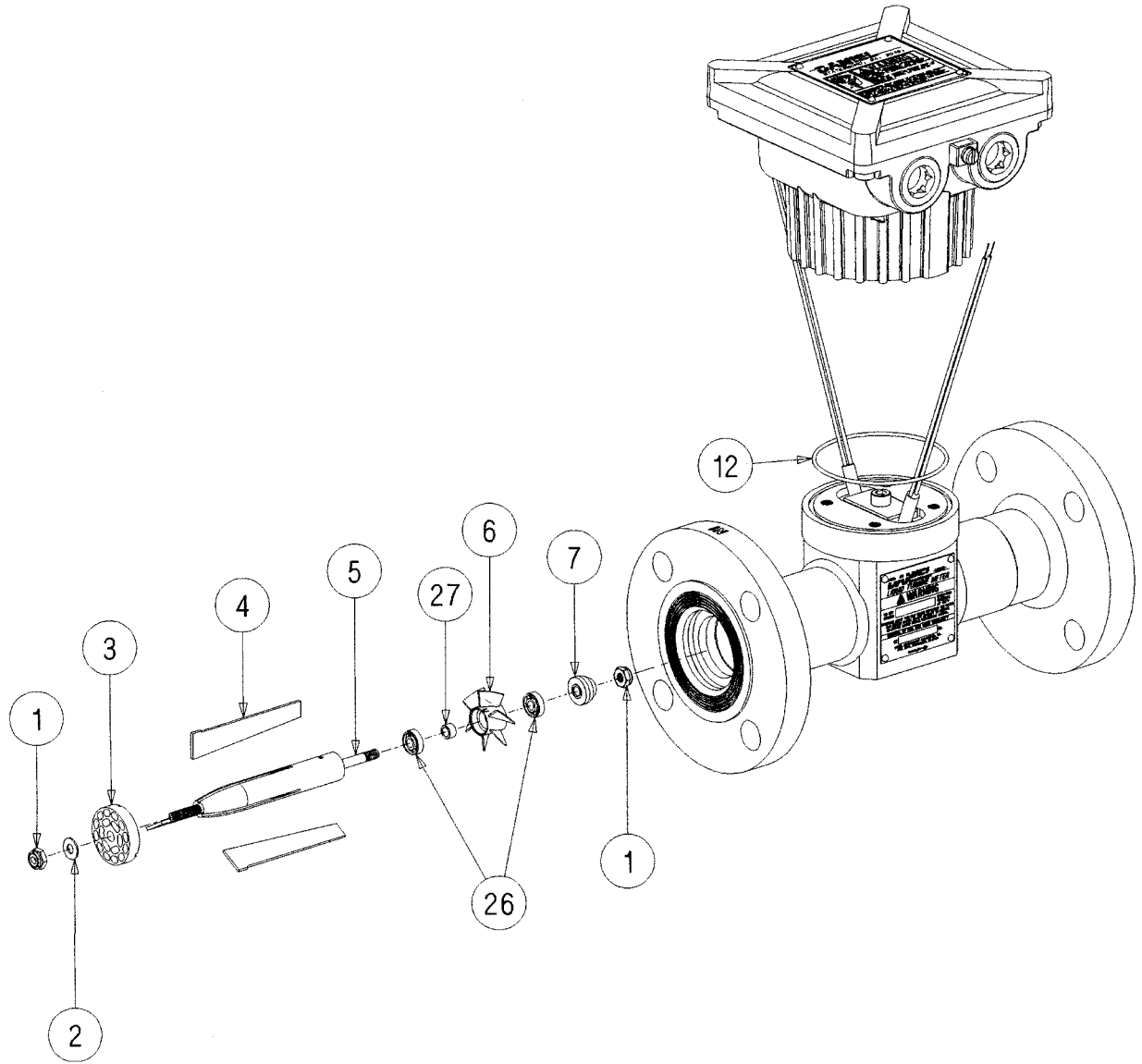


Figure 7-3. Meter Assembly (1-1/2" and 2") - Stainless Steel Bearing Internals
(Reference Table 7-3)

Table 7-3. Part Numbers (1-1/2" and 2") - Stainless Steel Bearing Internals
(Reference Figure 7-3)

Item Number	Description	1-1/2" Part Number	2" Part Number	Quantity Required
1	Nut	151687	151687	1
2	Washer	151891	151891	1
3	Flow Conditioning Plate	798-14-301-01	798-16-301-01	1
4	Hanger Blade	798-14-070-00	798-16-070-00	3
5	Hanger Hub	798-14-308-00	798-16-308-00	1
6	Rotor	798-14-019-00	798-16-019-00	1
7	Down-Stream Cone	798-14-013-00	798-16-013-00	1
12	O-Ring	1500093-022	1500093-022	1
26	Bearing	155195	155195	2
27	Spacer	798-14-073-00	798-14-073-00	1

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NOTES

NOTES

Daniel Measurement and Control, Inc.

Returned Material Authorization

Repair Form for Used Equipment Including Decontamination/Cleaning Statement

A Return Material Authorization (RMA) number must be obtained prior to returning any equipment for any reason. Download the RMA form on the Daniel Measurement and Control, Inc. Support Services web page by selecting the link below.

<http://www2.emersonprocess.com/EN-US/BRANDS/DANIEL/SUPPORT-SERVICES/Pages/Support-Services.aspx>

1. Return Material Authorization (RMA) Number _____

2. Equipment to be returned:
 Model Number _____ Serial Number _____

3. Reason for return: _____

Decontamination/Cleaning Fluids Process			
A. List each substance in which the equipment was exposed. Attach additional documents if necessary.			
Common Name	CAS# if available	Used for Hazardous Waste (20 CFR 261)	EPA Waste Code if used for hazardous waste
		[] Yes [] No	
		[] Yes [] No	
		[] Yes [] No	
		[] Yes [] No	
		[] Yes [] No	
		[] Yes [] No	
B. Circle any hazards and/or process fluid types that apply:			
Infectious Cyanides Carcinogen	Radioactive Sulfides Peroxide	Explosive Corrosive/Oxidizer Reactive-Air	Pyrophoric Flammable Reactive-Water
		Poison Gas Poison Reactive-Other (list)	
Other hazard category (list):			
C. Describe decontamination/cleaning process. Include MSDS description for substances used in decontamination and cleaning processes. Attach additional documents if necessary.			

Shipping Requirements

Failure to comply with this procedure will result in the shipment being refused.

1. Write the RMA number on the shipping package.
2. Inside the package include one copy of this document and all required Material Safety Data Sheets (MSDS)
3. Outside of the package attach one copy of this document and all required Material Safety Data Sheets (MSDS).

THIS EQUIPMENT, BEING RETURNED “FOR REPAIR,” HAS BEEN COMPLETELY DECONTAMINATED AND CLEANED. ALL FOREIGN SUBSTANCES HAVE BEEN DOCUMENTED ABOVE AND MSDS SHEETS ARE ATTACHED.

By:

(Signature)

(Print name)

Title:

Date: _____

Company: _____

Phone: _____

Fax: _____

The sales and service offices of Daniel Measurement and Control are located throughout the United States and in major countries overseas.
Please contact Daniel Measurement Services at 11100 Brittmooore Park Drive, Houston, Texas 77041, or phone (713) 827-6314 for the location of the sales or service office nearest you.
Daniel Measurement Services offers both on-call and contract maintenance service designed to provide single-source responsibility for all Daniel products.

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