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WOODWARD

Product Manual 26539
(Revision AC, 5/2025)
Original Instructions

Rotary Valve Platform (RVP-200)

Installation and Operation Manual

General Precautions

Read this entire manual and all other publications pertaining to the work to be performed before installing, operating, or servicing this equipment.

Practice all plant and safety instructions and precautions.

Failure to follow instructions can cause personal injury and/or property damage.

Revisions

This publication may have been revised or updated since this copy was produced. The latest version of most publications is available on the Woodward website.

Woodward Industrial Support: Get Help

If your publication is not there, please contact your customer service representative to get the latest copy.

Proper Use

Any unauthorized modifications to or use of this equipment outside its specified mechanical, electrical, or other operating limits may cause personal injury and/or property damage, including damage to the equipment. Any such unauthorized modifications: (i) constitute "misuse" and/or "negligence" within the meaning of the product warranty thereby excluding warranty coverage for any resulting damage, and (ii) invalidate product certifications or listings.

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If the cover of this publication states "Translation of the Original Instructions" please note:

The original source of this publication may have been updated since this translation was made. The latest version of most publications is available on the Woodward website.

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Always compare with the original for technical specifications and for proper and safe installation and operation procedures.

If your publication is not on the Woodward website, please contact your customer service representative to get the latest copy.

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Manual 26539

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Important Definitions

This is the safety alert symbol used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

- **DANGER** - Indicates a hazardous situation, which if not avoided, will result in death or serious injury.
- **WARNING** - Indicates a hazardous situation, which if not avoided, could result in death or serious injury.
- **CAUTION** - Indicates a hazardous situation, which if not avoided, could result in minor or moderate injury.
- **NOTICE** - Indicates a hazard that could result in property damage only (including damage to the control).
- **IMPORTANT** - Designates an operating tip or maintenance suggestion.

⚠WARNING

Overspeed / Overtemperature / Overpressure

The engine, turbine, or other type of prime mover should be equipped with an overspeed shutdown device to protect against runaway or damage to the prime mover with possible personal injury, loss of life, or property damage.

The overspeed shutdown device must be totally independent of the prime mover control system. An overtemperature or overpressure shutdown device may also be needed for safety, as appropriate.

⚠WARNING

Personal Protective Equipment

The products described in this publication may present risks that could lead to personal injury, loss of life, or property damage. Always wear the appropriate personal protective equipment (PPE) for the job at hand. Equipment that should be considered includes but is not limited to:

- **Eye Protection**
- **Hearing Protection**
- **Hard Hat**
- **Gloves**
- **Safety Boots**
- **Respirator**

Always read the proper Material Safety Data Sheet (MSDS) for any working fluid(s) and comply with recommended safety equipment.

⚠WARNING

Start-up

Be prepared to make an emergency shutdown when starting the engine, turbine, or other type of prime mover, to protect against runaway or overspeed with possible personal injury, loss of life, or property damage.

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Electrostatic Discharge Awareness

NOTICE

Electrostatic Precautions

Electronic controls contain static-sensitive parts. Observe the following precautions to prevent damage to these parts:

- **Discharge body static before handling the control (with power to the control turned off, contact a grounded surface, and maintain contact while handling the control).**
- **Avoid all plastic, vinyl, and Styrofoam (except antistatic versions) around printed circuit boards.**
- **Do not touch the components or conductors on a printed circuit board with your hands or with conductive devices.**

To prevent damage to electronic components caused by improper handling, read and observe the precautions in Woodward manual *82715*, *Guide for Handling and Protection of Electronic Controls, Printed Circuit Boards, and Modules*.

All electronic equipment is static-sensitive, some components more than others. To protect these components from static damage, you must take special precautions to minimize or eliminate electrostatic discharges.

Follow these precautions when working with or near the RVP-200:

1. Prior to making any connections to the product, personnel should ensure that they are free of electrostatic build-up in order to protect the integrity of the device's circuitry. The simplest method for dissipating electrostatic build-up is to contact an adjacent, grounded metal object before contacting the product.

2. Avoid the build-up of static electricity on your body by not wearing clothing made of synthetic materials. Wear cotton or cotton-blend materials as much as possible as these do not store static electric charges as much as synthetics.

3. Keep plastic, vinyl, and Styrofoam materials (such as plastic or Styrofoam cups, cup holders, cigarette packages, cellophane wrappers, vinyl books or folders, plastic bottles, and plastic ash trays) away from the control, the modules, and the work area as much as possible.

4. Do not remove the printed circuit boards (PCB's) from the RVP-200.

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Regulatory Compliance

European Compliance for CE Marking:
These listings are limited only to those units bearing the CE Marking.

EMC Directive: Declared to Directive 2014/30/EU of the European Parliament and of the Council of 26 February 2014 on the harmonization of the laws of the Member States relating to electromagnetic compatibility (EMC).

Pressure Equipment Directive (Valve Portion): Directive 2014/68/EU on the harmonisation of the laws of the Member States relating to the making available on the market of pressure equipment.
3", 4": PED Category II
6": PED Category III
PED Module H - Full Quality Assurance

ATEX – Potentially Explosive Atmospheres Directive: Directive 2014/34/EU on the harmonization of the laws of the Member States relating to equipment and protective systems intended for use in potentially explosive atmospheres.
II 3 G, Ex nA nC IIC T4 Gc

Other European Compliance:
Compliance with the following European Directives or standards does not qualify this product for application of the CE Marking:

ATEX Directive: Exempt from the non-electrical portion of the ATEX Directive 2014/34/EU due to no potential ignition sources per EN ISO 80079-36:2016 for Zone 2 installation

Machinery Directive: Compliant as partly completed machinery with Directive 2006/42/EC of the European Parliament and the Council of 17 May 2006 on machinery.

RoHS Directive: Restriction of Hazardous Substances 2011/65/EU: Woodward Turbomachinery Systems products are intended exclusively for sale and use only as a part of Large Scale Fixed Installations per the meaning of Art.2.4(e) of directive 2011/65/EU. This fulfills the requirements stated in Art.2.4(c) and as such the product is excluded from the scope of RoHS2.

North American Compliance:
These listings are limited only to those units bearing the CSA identification.

CSA: CSA Certified for Class I, Division 2, Groups A, B, C, & D, T4 at 82 °C Ambient. For use in Canada and the United States. Certificate 2333644

Other International Compliance

IECEx: Certified for use in explosive atmospheres per Certificate:
IECEx CSA 15.0022X
Ex nA nC IIC T4 Gc

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EAC Customs Union:
These listings are limited only to those units with labels, marking, and manuals in Russian language to comply with their certificates and declaration.

EAC Customs Union (Marked):	Certified to Technical Regulation CU 012/2011 for use in potentially explosive atmospheres and marked 2Ex nA nC IIC T4 Gc X for electrical and II Gc c TX for non-electrical portions of the valve.
EAC Customs Union (Marked):	Certified to Technical Regulation CU 032/2013 on the safety of equipment operating under excessive pressure for 6-inch valves.
EAC Customs Union:	Declared to Technical Regulation CU 032/2013 on the safety of equipment operating under excessive pressure for 2, 3, and 4-inch valves.
EAC Customs Union:	Declared to Technical Regulation CU 010/2011 on the safety of machinery and equipment. Declared to Technical Regulation CU 020/2011 on Electromagnetic Compatibility of Technical Equipment.

Special Conditions for Safe Use

Field Wiring must be suitable for at least 120 °C.

Connect the ground terminal of the RVP-200 to the ground for proper safety and EMC performance.

Protective earth grounding is required, using the PE Terminal.

Compliance with the Machinery Directive 2006/42/EC noise measurement and mitigation requirements is the responsibility of the manufacturer of the machinery into which this product is incorporated.

Wiring must be in accordance with North American Class I, Division 2, or European Zone 2, Category 3 wiring methods as applicable, and in accordance with the authority having jurisdiction.

T4 reflects conditions without process fluid. The surface temperature of this valve approaches the maximum temperature of the applied process media. It is the responsibility of the user to ensure that the external environment does not contain hazardous gases capable of ignition in the range of the process media temperatures.

A fixed wiring installation is required, and a switch or circuit breaker shall be included in the building installation that is near the equipment and within easy reach of the operator. The switch or circuit breaker shall be clearly marked as the disconnecting device for the equipment. The switch or circuit breaker shall not interrupt the protective earth (PE) conductor.

The Service Port (RS-232 communication) is not designed to remain connected during operation except at servicing intervals.

The upper portion of the valve stem is used to isolate the electronic actuator from the temperature of the process fluids. It is important that this isolation section not be insulated.

Transient protection shall limit transients up to a maximum of 140% of the peak voltage values.

For equipment marked with CE mark, but not with IECEx, the visual position indicator must be protected from impact to maintain IP56 protection under ATEX standard EN60079-0:2012. Impact to the indicator may result in damage to the cover components, allowing dust and water ingress into the equipment.

IMPORTANT **This equipment is considered indicator equipment and is not to be used as metrology equipment. All measurements must be verified using calibrated equipment.**

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⚠WARNING

EXPLOSION HAZARD—Do not remove covers or connect/disconnect electrical connectors unless power has been switched off.

Substitution of components may impair suitability for Class I, Division 2, or Zone 2 applications.

⚠AVERTISSEMENT

RISQUE D'EXPLOSION—Ne pas enlever les couvercles, ni raccorder / débrancher les prises électriques, sans vous en assurez auparavant que le système a bien été mis hors tension.

La substitution de composants peut rendre ce matériel inacceptable pour les emplacements de Classe I, applications Division 2 ou Zone 2.

⚠WARNING

High-voltage: Before performing maintenance, always disconnect power and any hazardous voltages that may be connected. Follow all appropriate lockout/lockdown procedures.

⚠WARNING

ELECTRIC SHOCK HAZARD—To reduce the risk of electrical shock, Protective Earth (PE) must be connected to the termination point on the enclosure identified with the ⏚ symbol.

The conductor providing the connection must have a properly sized ring lug and wire gauge larger than or equal to 12 AWG (4 mm²). The ring lug should be placed between the screw head and star washer on the PE Connection on the housing of the control.

The calibration and checkout procedure should only be performed by authorized personnel. To be authorized, personnel must be knowledgeable of the risks posed by live electrical equipment.

The installation location must include the following:

- **The Power Supply Mains should be properly protected against overcurrent according to the installation instructions and the appropriate wiring requirements.**
- **A switch or circuit breaker must be included in the installation. It must be in close proximity to the equipment, within easy reach of the operator, and clearly marked as the disconnecting device for the equipment power. The switch or circuit breaker will only remove power to the unit and not interrupt the protective earth conductor. Since hazardous voltages may still be connected to other terminals on the unit, appropriate actions must be taken for other voltages.**

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Safety Symbols


Direct current


Alternating current


Both alternating and direct current


Caution, risk of electrical shock


Caution, refer to accompanying documents


Protective conductor terminal


Frame or chassis terminal

Released

Chapter 1.
General Information

Introduction

The RVP-200 is an electrically actuated rotary control valve designed for a wide variety of applications and service conditions. The design incorporates a zero-offset butterfly disk-sealing element that seats in a hard-surfaced tube encased in an ANSI Class 300 or Class 600 flow body. When fully open, the structure that supports the butterfly disk is positioned outside the flow path, allowing for high valve-flow coefficients (low-pressure drop). It is suitable for both forward and reverse pressure and flow. The RVP-200 accepts discrete input for open/close or manual control applications and optionally accepts analog input (4 mA to 20 mA) for modulating service. The actuator design incorporates a return spring for fail-safe operation. The fail-safe configuration is factory set to fail-open or fail-close.

Purpose and Scope

The purpose of this manual is to provide the necessary background information for installing and operating the RVP-200 appropriately. Topics covered include mechanical installation, electrical wiring, software configuration (using the Service Tool), as well as troubleshooting information on the RVP-200.

IMPORTANT

Ensure that you have downloaded and are using the latest revision of this manual. Updates are available on the Woodward website at www.woodward.com/publications.

RVP-200 Control Modes

The RVP-200 System is available in the following configurations. All four configurations can be provided with fail-close or fail-open. Note that the fail direction (open or close) is factory set and cannot be changed in the field, whereas the control mode can be manipulated with the appropriate Service Tool.

- 2-wire open/close
- 4-wire open/close
- 4-wire modulating
- 4–20 mA modulating (only available with Analog Expansion Module option)

In addition, each system is equipped with four discrete outputs, each of which is factory pre-configured to be either a Position Indicator or a System Status Annunciator.

Reference Documents

These Woodward publications may also prove useful:

- 03369, *RVP-200 Product Specification*
- 26354, *RVP Repair Manual*

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Table 1-1. RVP Valve Functional Characteristics

Valve Type	Quarter-turn Butterfly
Fluid Ports	ASME B16.5-2003 and ASME 16.34-2004 Class 300 and Class 600 flanges Size 3, 4, 6 inch (75, 100, 150 mm)
Process Fluid	Natural gas, air
Valve Proof Pressure Level	Both Class 300 and Class 600 flanges: 7757 kPa / 1125 psig (carbon steel [SA216 WCC] material), 7584 kPa / 1100 psig (stainless steel [SA351 CF8M] material)
Minimum Valve Burst Pressure	12 411 kPa / 1800 psig for Class 300 and Class 600 flanges
Ambient Temperature	(–29 to +82) °C / (–20 to +180) °F
Shut-off Classification	Class IV per ASME B16.104/FCI 70-2 (0.01 % of rated valve capacity at full travel measured with air at 345 kPa / 50 psid)
Overboard Vent Drain (O.B.V.D.)	Max 5 cm^3/min
Opening Slew Time	Factory pre-configured from 3.8 to 70 s
Closing Slew Time	Factory pre-configured from 3.8 to 70 s
Unpowered Slew Time	Factory pre-configured from 3.8 to 30 s
Fail Direction	User specified fail open or fail closed
Input Power	Low Voltage RVP-200 Version: 125 Vdc or 120 Vac High Voltage RVP-200 Version: 220 Vdc
Analog Input	(4 to 20) mA (with Analog Option board) (Qty 3)
Analog Outputs	(4 to 20) mA (with Analog Option board) (Qty 3)
Discrete Inputs	24 Vdc or 125 Vdc, 5 mA, externally powered (Qty 3)
Discrete Outputs	24 Vdc or 125 Vdc, 500 mA max load current, externally powered (Qty 4)
Discrete On-board I/O Power	24 Vdc, 200 mA
Mechanical Limit Switches	Fully open and fully closed positions 125 Vdc, 0.5 A; or 120 Vac, 4 A; resistive circuit only; externally powered (Qty 2)
PE Ground	Provided via ground lugs inside and outside electronics enclosure
EMC Ground	Provided via ground lug outside electronics enclosure
Vibration Test Level	0.5 g 5 Hz to 100 Hz sine wave Random 0.01500 gr^2/Hz from 10 Hz to 40 Hz ramping down to 0.00015 gr^2/Hz at 500 Hz
Design Availability Objective	Better than 99.5 % over an 8760 hour period
Allowable Operating Process Fluid Pressure	Class 300 (WCC) flanges: See ASME B16.34, Table VII-2-1.2 Class 300 (CF8M) flanges: See ASME B16.34, Table VII-2-2.2 Max differential pressure: 500 psig at 72 °F (3447 kPa at 22 °C), and 250 psig at 810 °F (1724 kPa at 432 °C)[2] Class 600 (WCC) flanges: Follow Class 300 limits[1] Class 600 (CF8M) flanges: Follow Class 300 limits[1] Max differential pressure: 500 psig at 72 °F (3447 kPa at 22 °C), 400 psig at 400 °F (2758 kPa at 204 °C), and 285 psig at 775 °F (1965 kPa at 413 °C)[2]
Max & Min Process Fluid Temperature	Carbon steel (WCC) valve body: (–29 to +427) °C / (–20 to +800) °F Stainless steel (CF8M) valve body: (–40 to +482) °C / (–40 to +900) °F
Valve Port Sizes	3-inch Cv=173 4-inch Cv=375 6-inch Cv=797

[1] Certain Class 600 part numbers have been qualified for pressure containment above Class 300 limits. Contact Woodward for information regarding the specific capabilities of a part number if operating requirements are in excess of Class 300 limits.

[2] Certain part numbers have been qualified at differential pressure and temperature combinations not listed herein. Contact Woodward for information regarding specific capabilities of a part number if operating requirements are in excess of those listed.

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Table 1-2. RVP Valve Cv Table

		Degrees of Open Rotation (forward flow)								
	Valve Size	**10**	**20**	**30**	**40**	**50**	**60**	**70**	**80**	**90**
Cv	**3 inch**	6	18	37	58	79	103	130	165	173
	4 inch	8	28	59	97	143	198	265	330	375
	6 inch	16	46	101	165	234	330	498	717	797

RVP Valve Cv Table in Graph Form

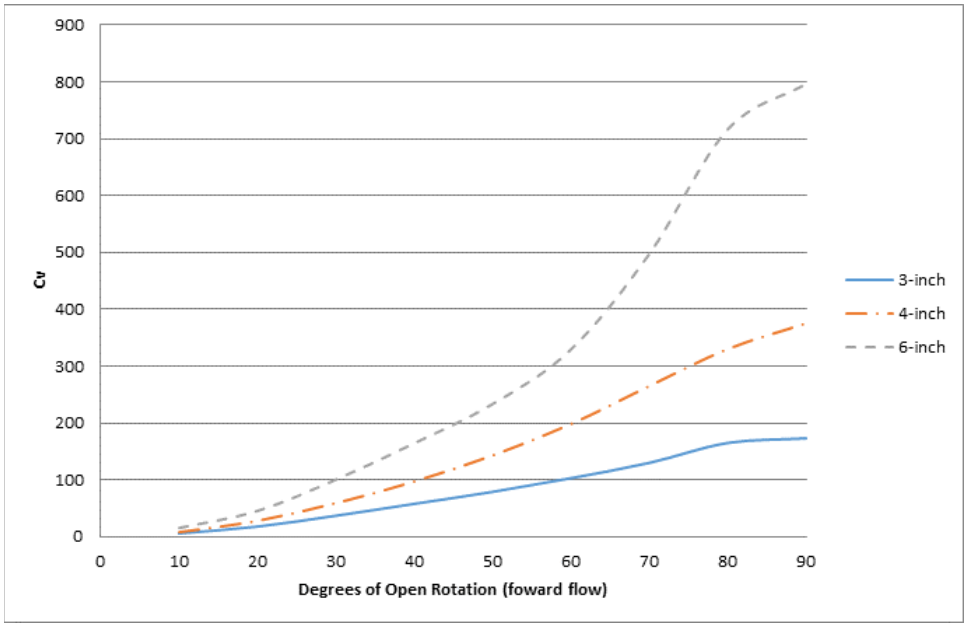

Figure 1-1. RVP Valve Cv Table in Graph Form

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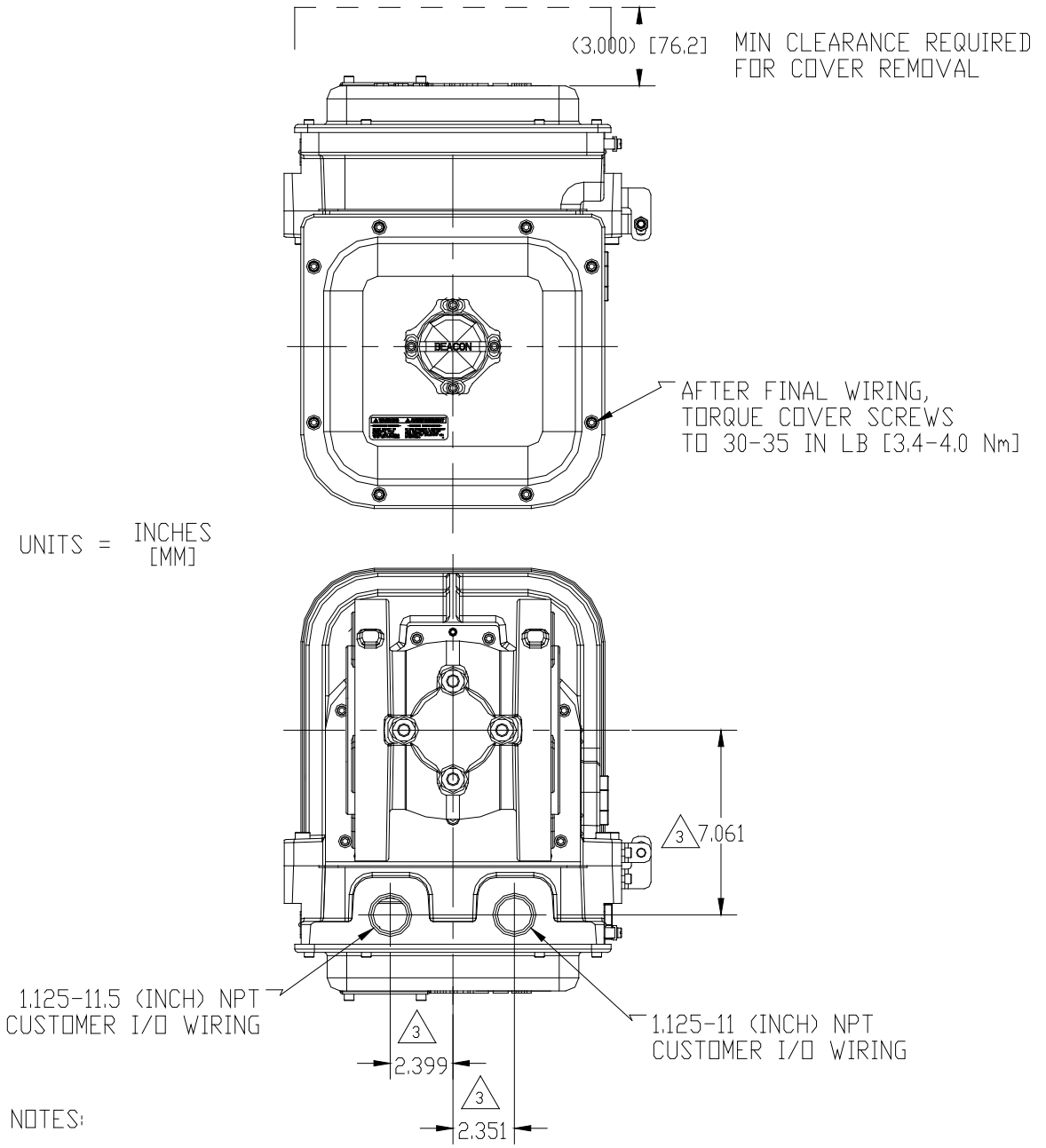

NOTES:

1. THIS IS AN OUTLINE DRAWING OF THE LOW-DUTY ON/OFF PURGE VALVE.
2. APPROXIMATE WEIGHT: SEE OPTIONS CHART.
3. FOR FIRST ARTICLE INSPECTION (FAI) REQUIREMENTS, SEE 4-09-2704.
4. FLANGE HOLES ON 3-INCH VERSIONS ARE .750-10 (INCH) UNC-2B THREADS THRU THE FLANGE. 4-INCH AND 6-INCH VERSIONS ARE Ø.870-.890 THRU.
5. ALL VIEWS SHOWN WITHOUT SHIPPING COVERS/HARDWARE.

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(9999-1295 sh.1)
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Figure 1-2a. RVP-200 Outline Drawing, Non IECEx Marked

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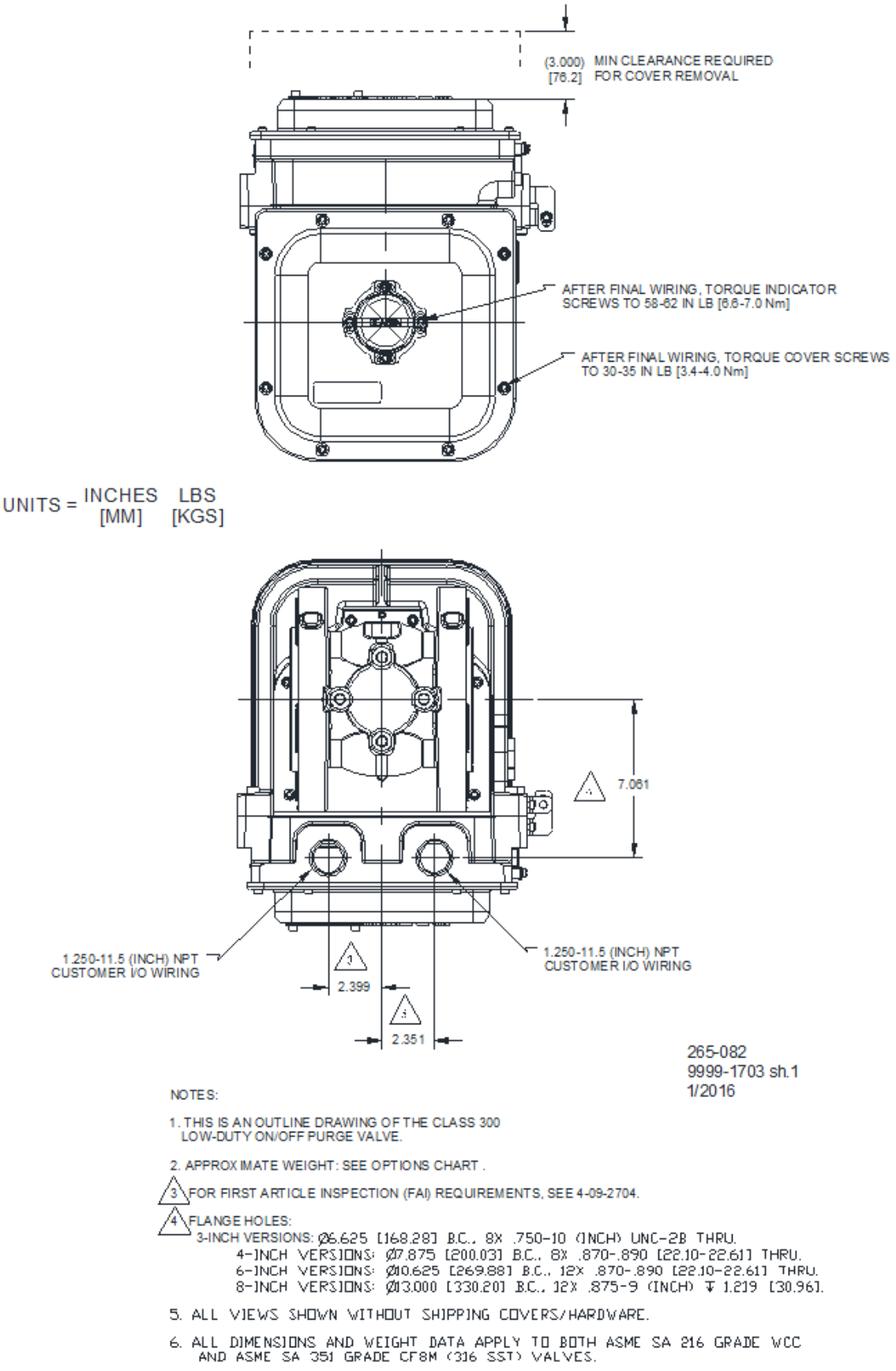

Figure 1-2b. RVP-200 Outline Drawing with IECEx Marking

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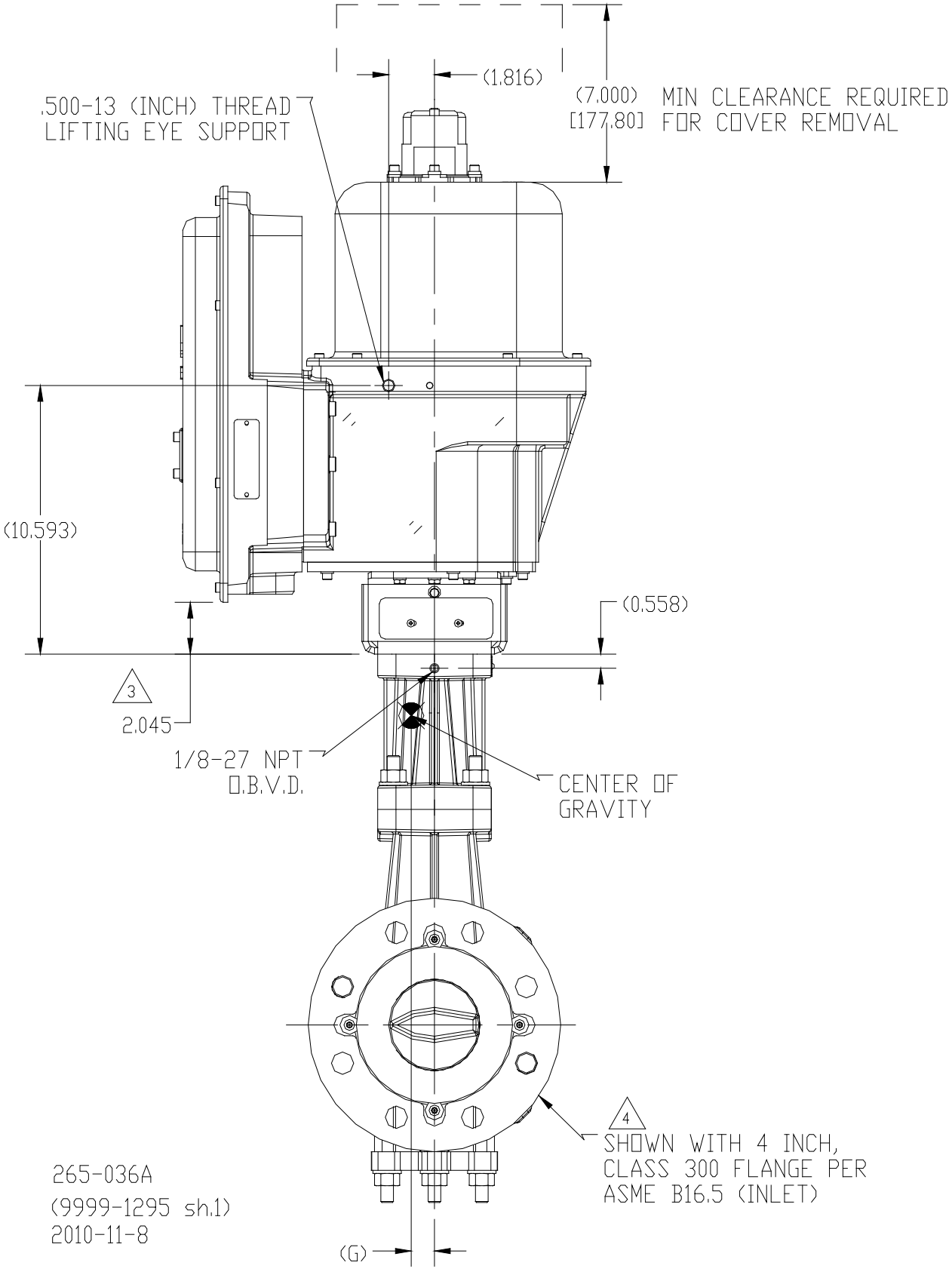

Figure 1-2c. RVP-200 Outline Drawing

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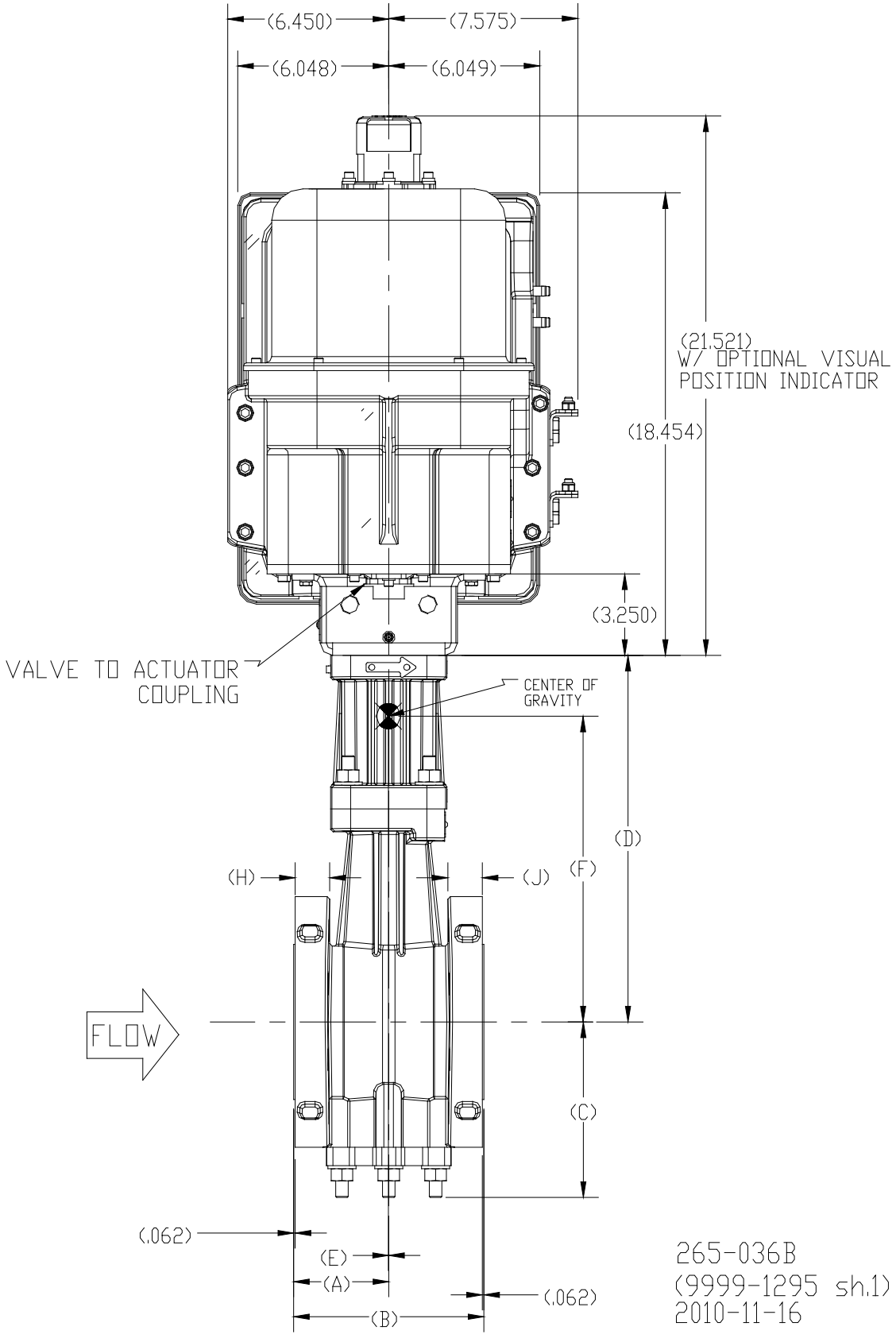

Figure 1-2d. RVP-200 Outline Drawing

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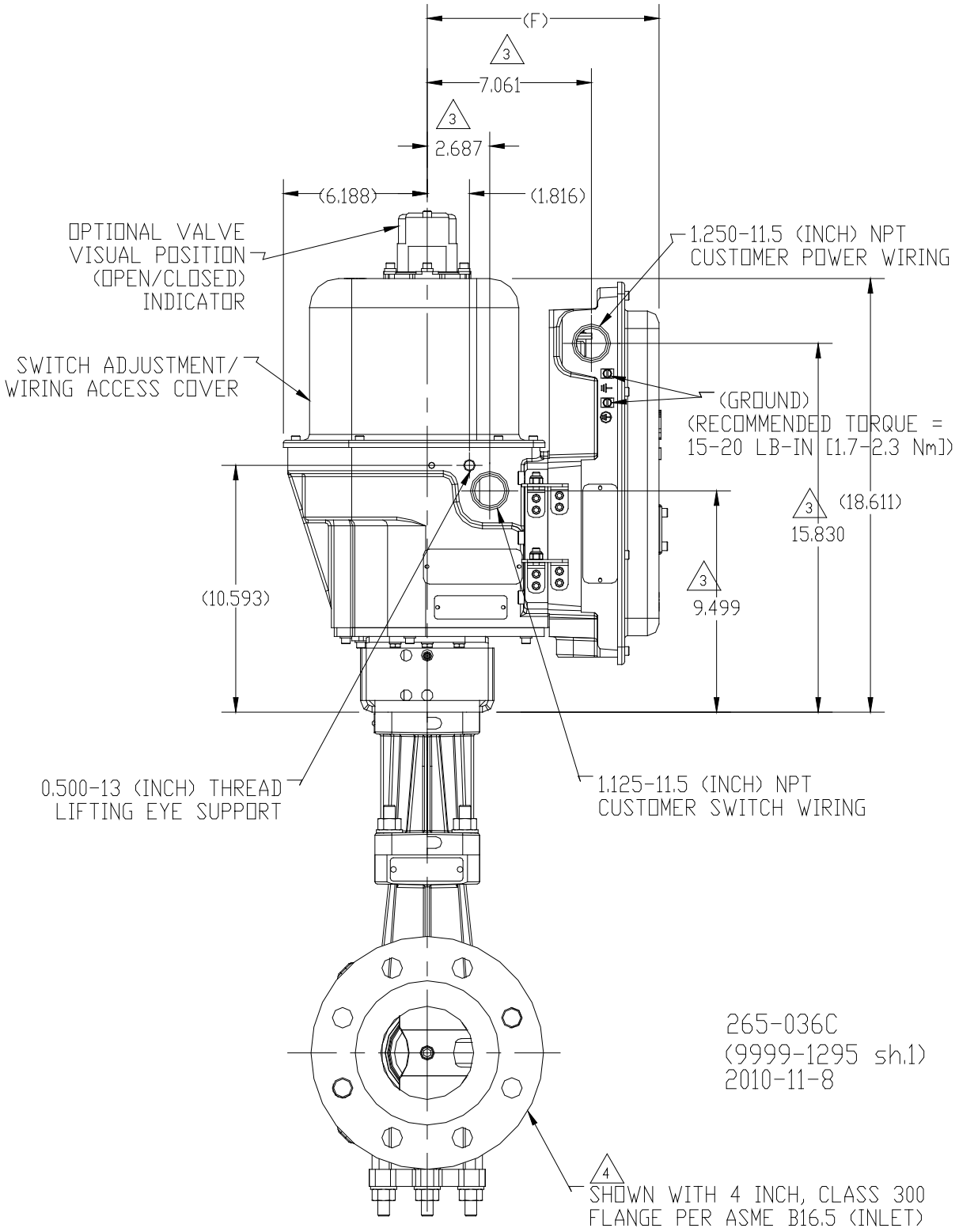

Figure 1-2e. RVP-200 Outline Drawing

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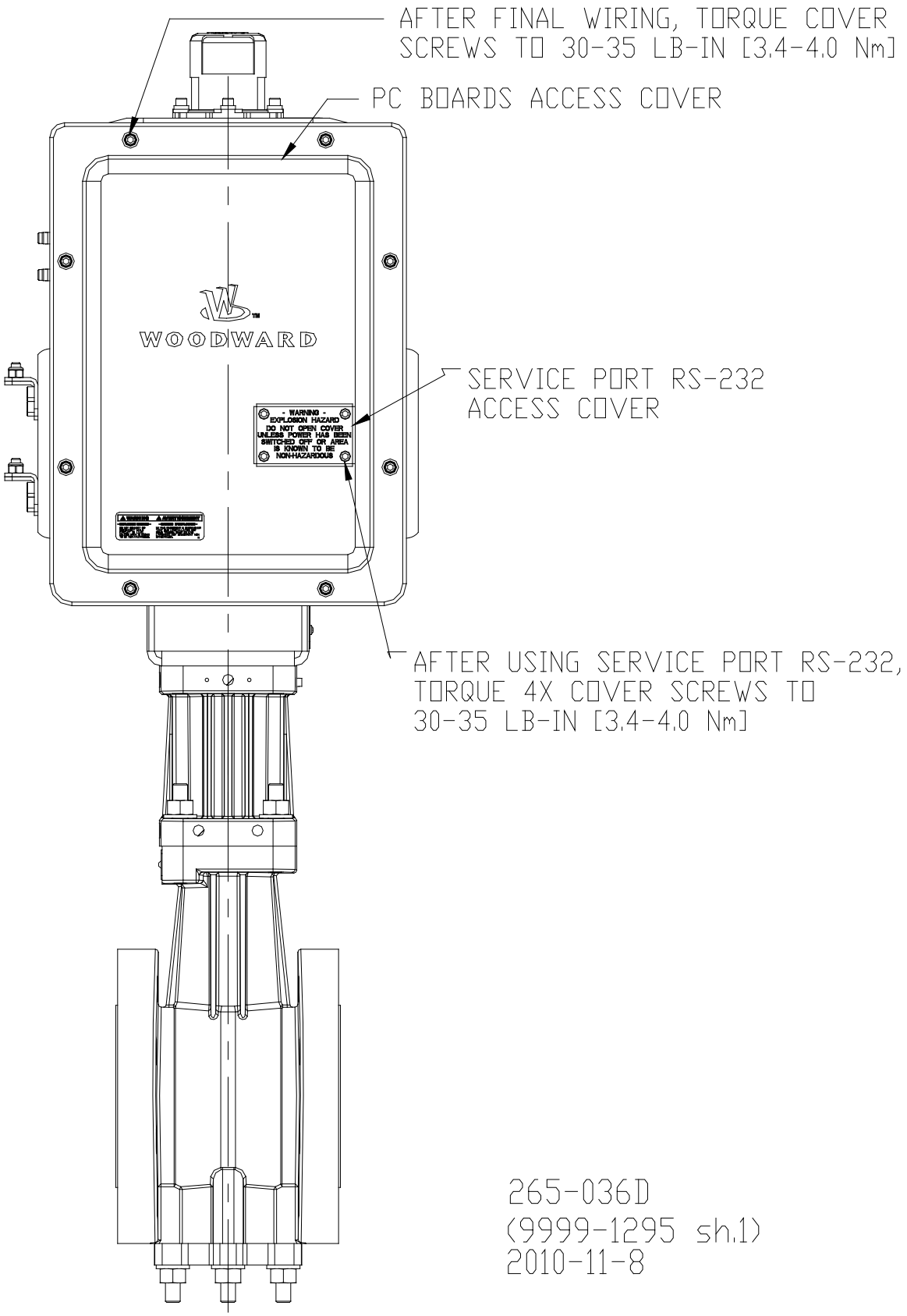

Figure 1-2f. RVP-200 Outline Drawing

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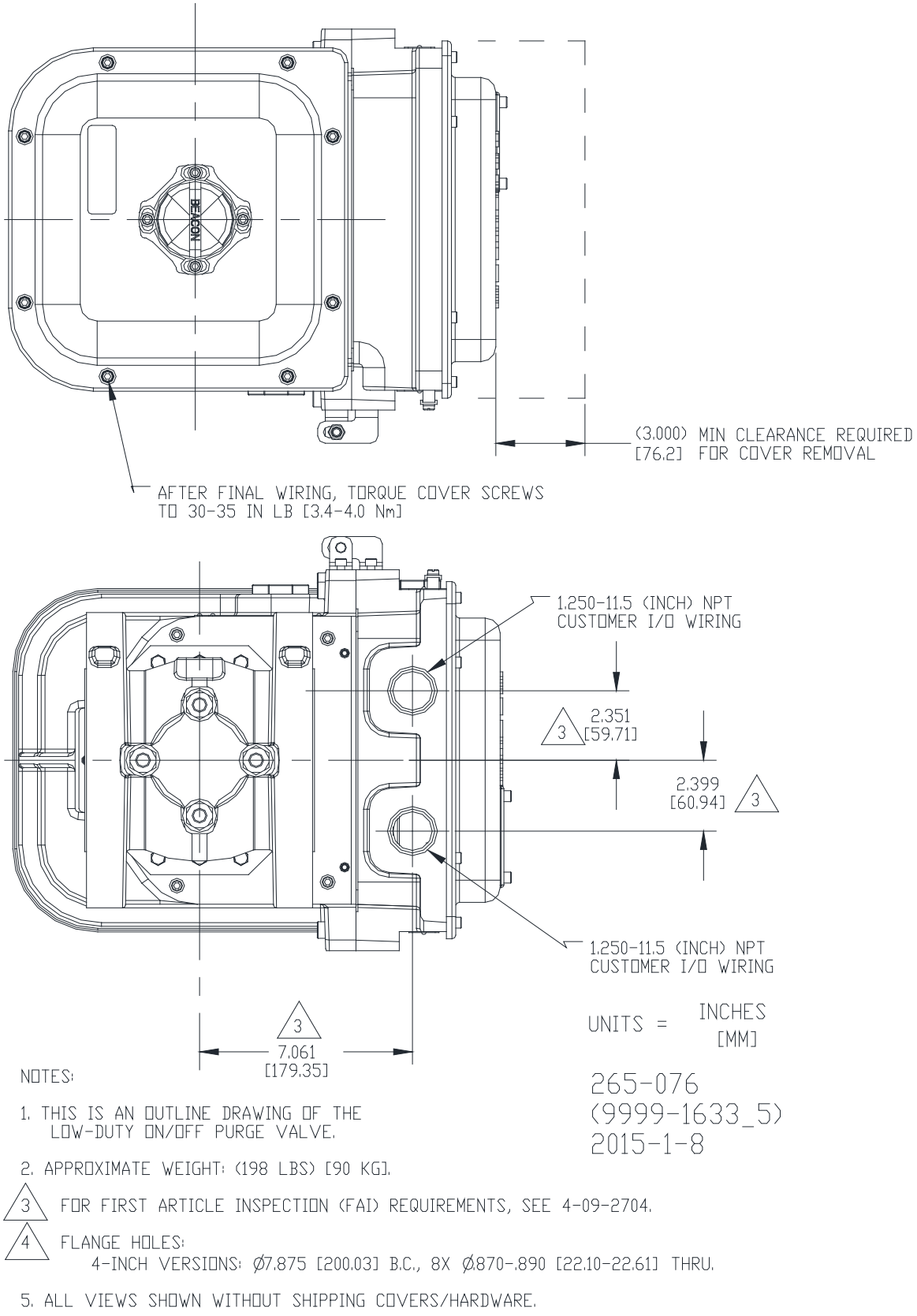

Figure 1-2g. RVP-200 Outline Drawing (90-degree Clockwise Configuration)
Non IECEx Marked

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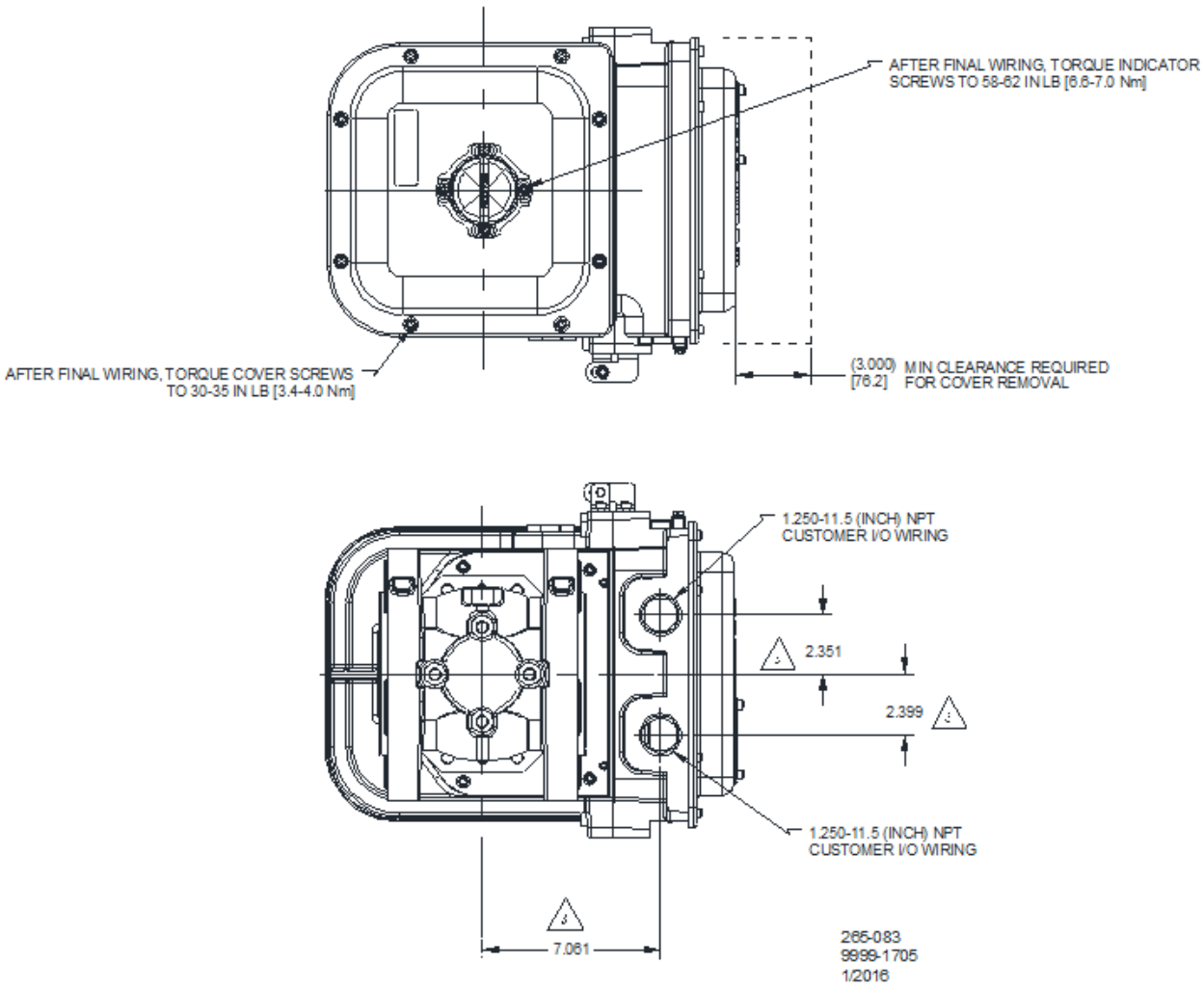

NOTES:

1. THIS IS AN OUTLINE DRAWING OF THE LOW-DUTY ON/OFF PURGE VALVE WITH A 90 DEG CW ACTUATOR.
2. APPROXIMATE WEIGHT: (198 LBS) [90 KG].
3. FOR FIRST ARTICLE INSPECTION (FAI) REQUIREMENTS, SEE 4-09-2704.
4. FLANGE HOLES:
   4-INCH VERSIONS: Ø7.875 [200.03] B.C., 8X Ø.870-.890 [22.10-22.61] THRU.
5. ALL VIEWS SHOWN WITHOUT SHIPPING COVERS/HARDWARE.

Figure 1-2h. RVP-200 Outline Drawing (90-degree Clockwise Configuration) with IECEx Marking

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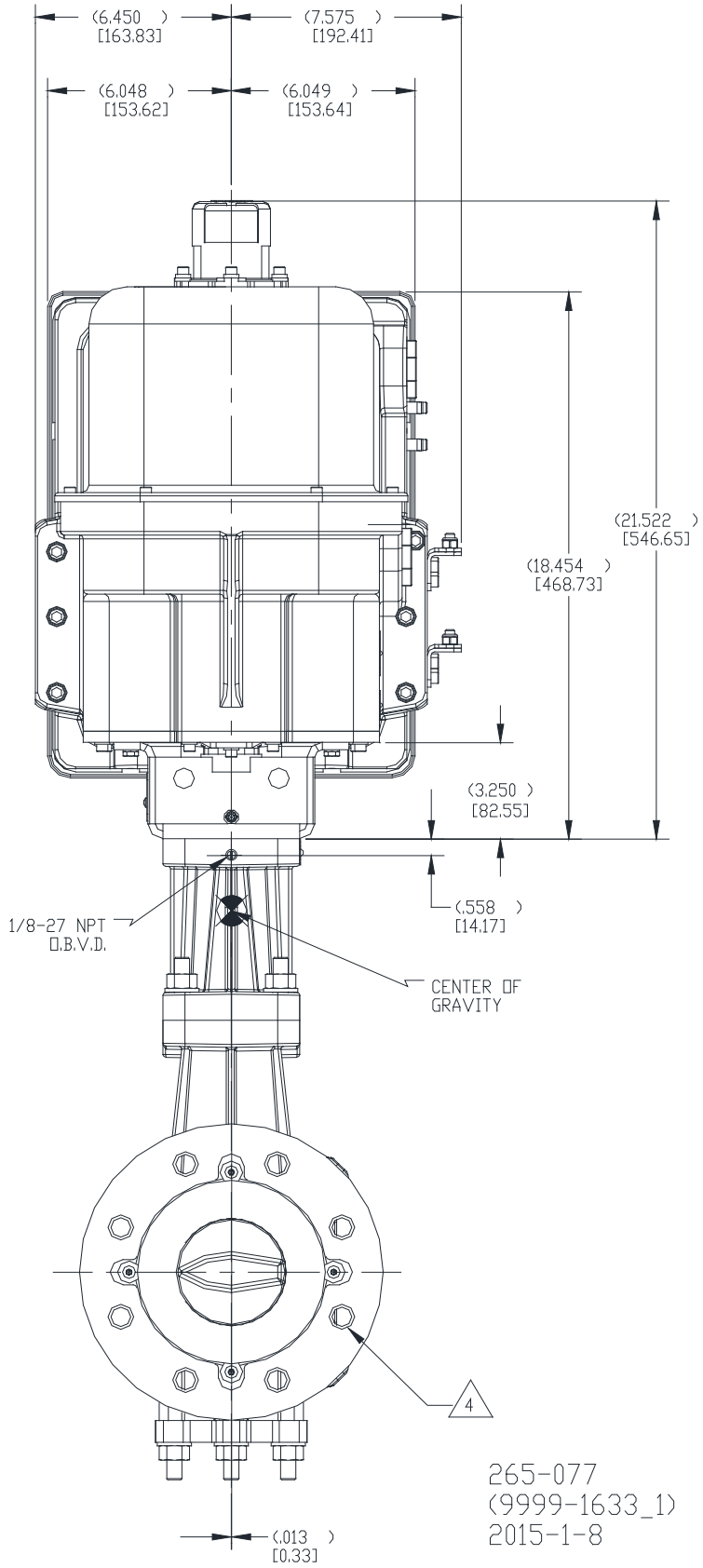

Figure 1-2i. RVP-200 Outline Drawing (90-degree Clockwise Configuration)

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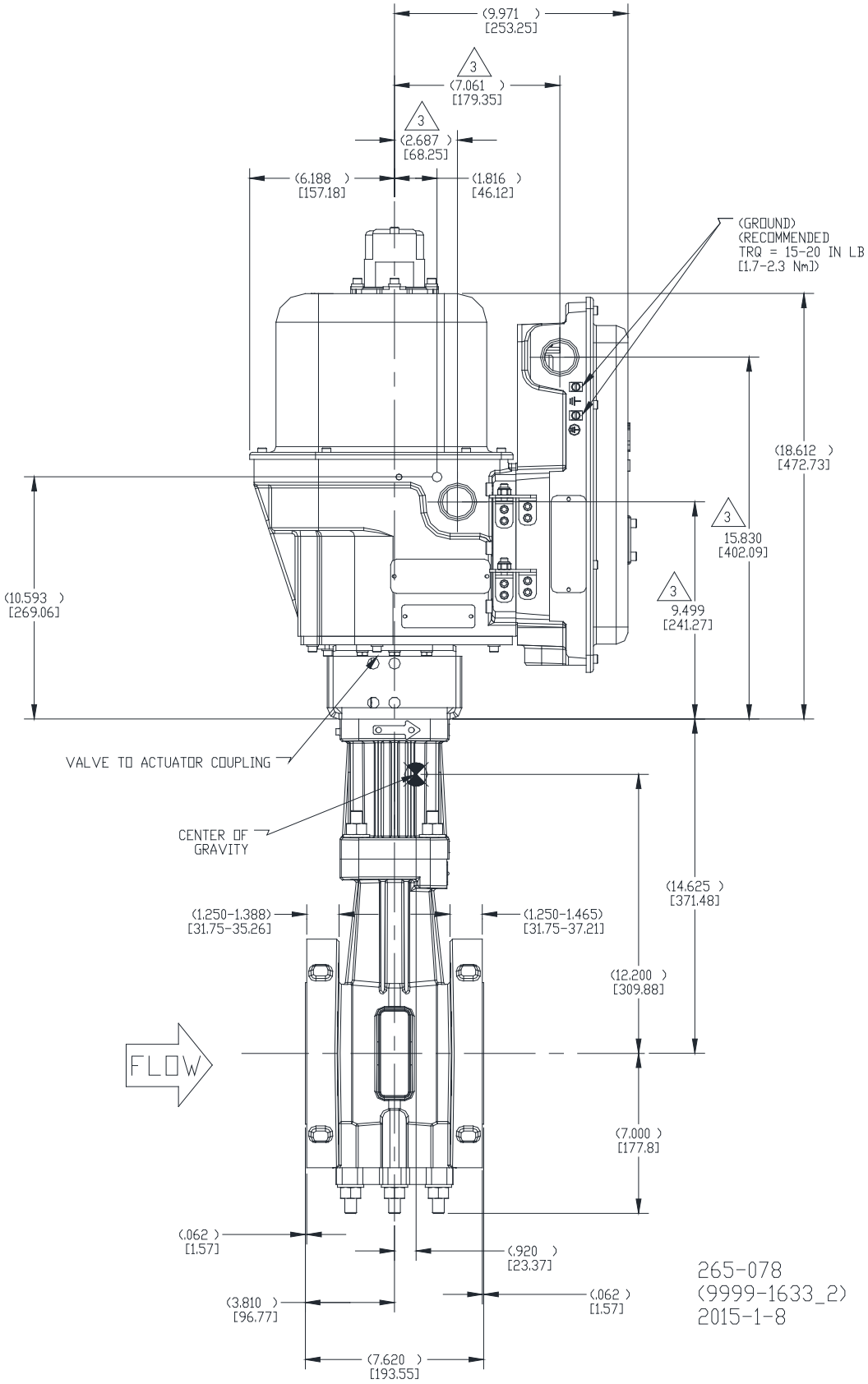

Figure 1-2j. RVP-200 Outline Drawing (90-degree Clockwise Configuration)

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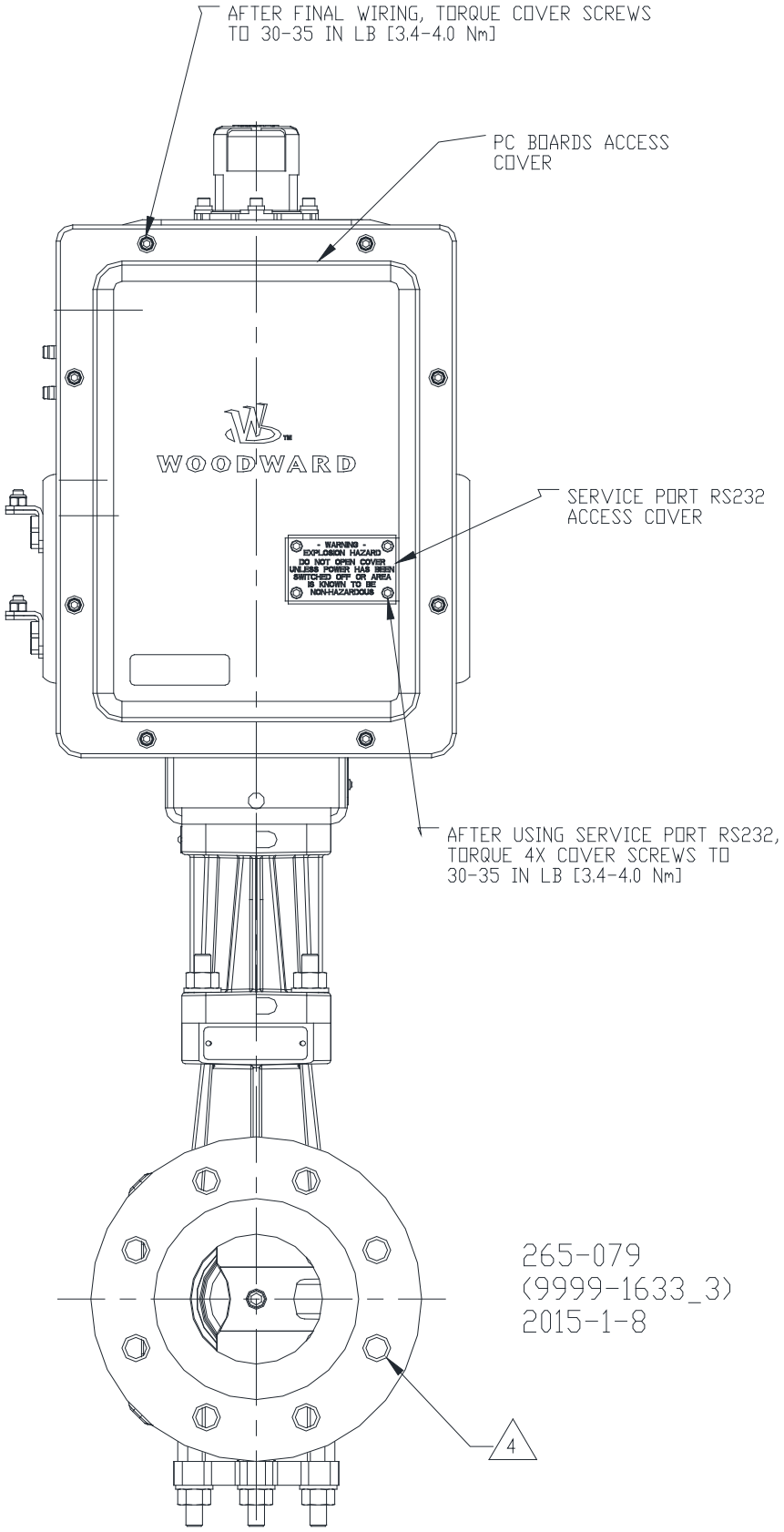

Figure 1-2k. RVP-200 Outline Drawing (90-degree Clockwise Configuration)

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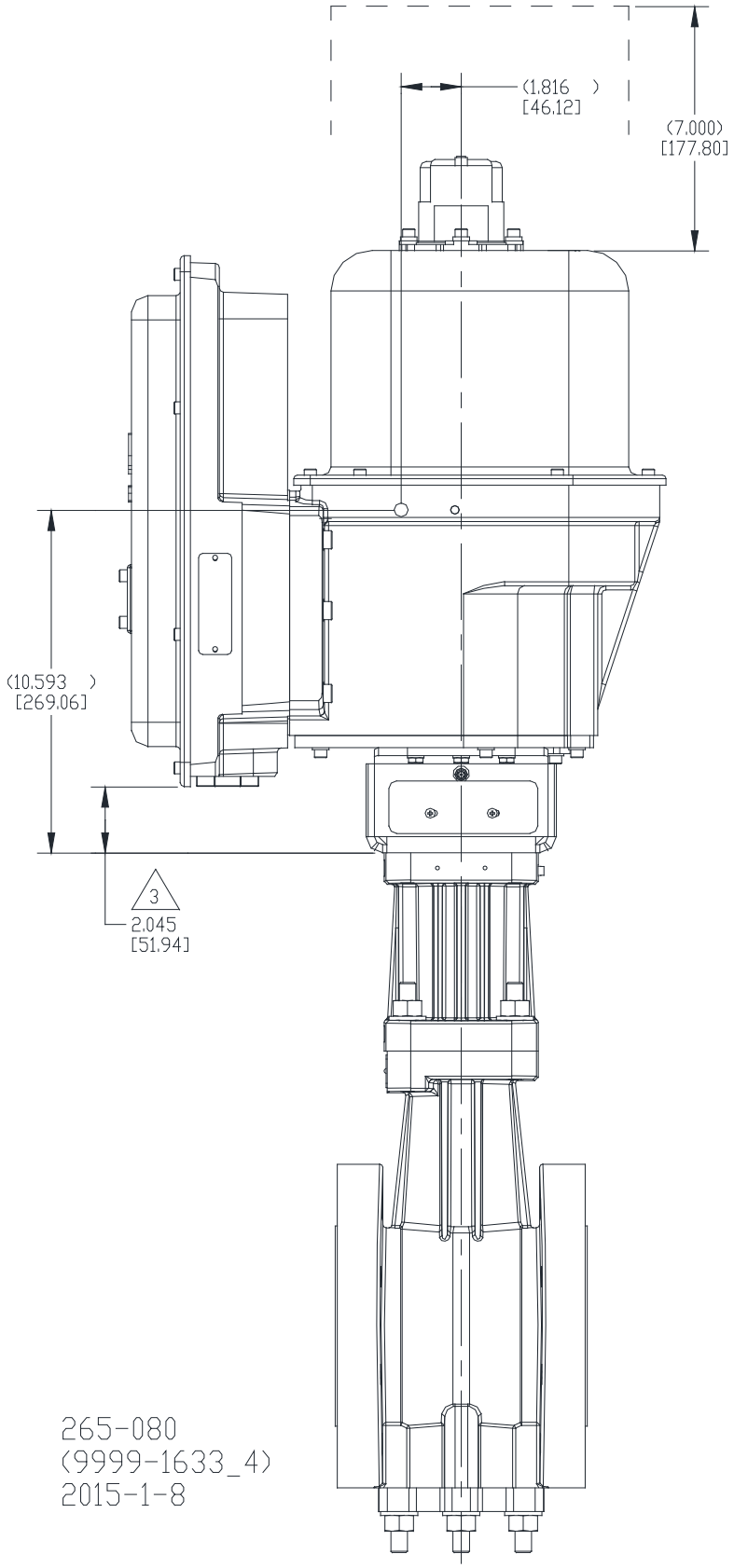

Figure 1-2l. RVP-200 Outline Drawing (90-degree Clockwise Configuration)

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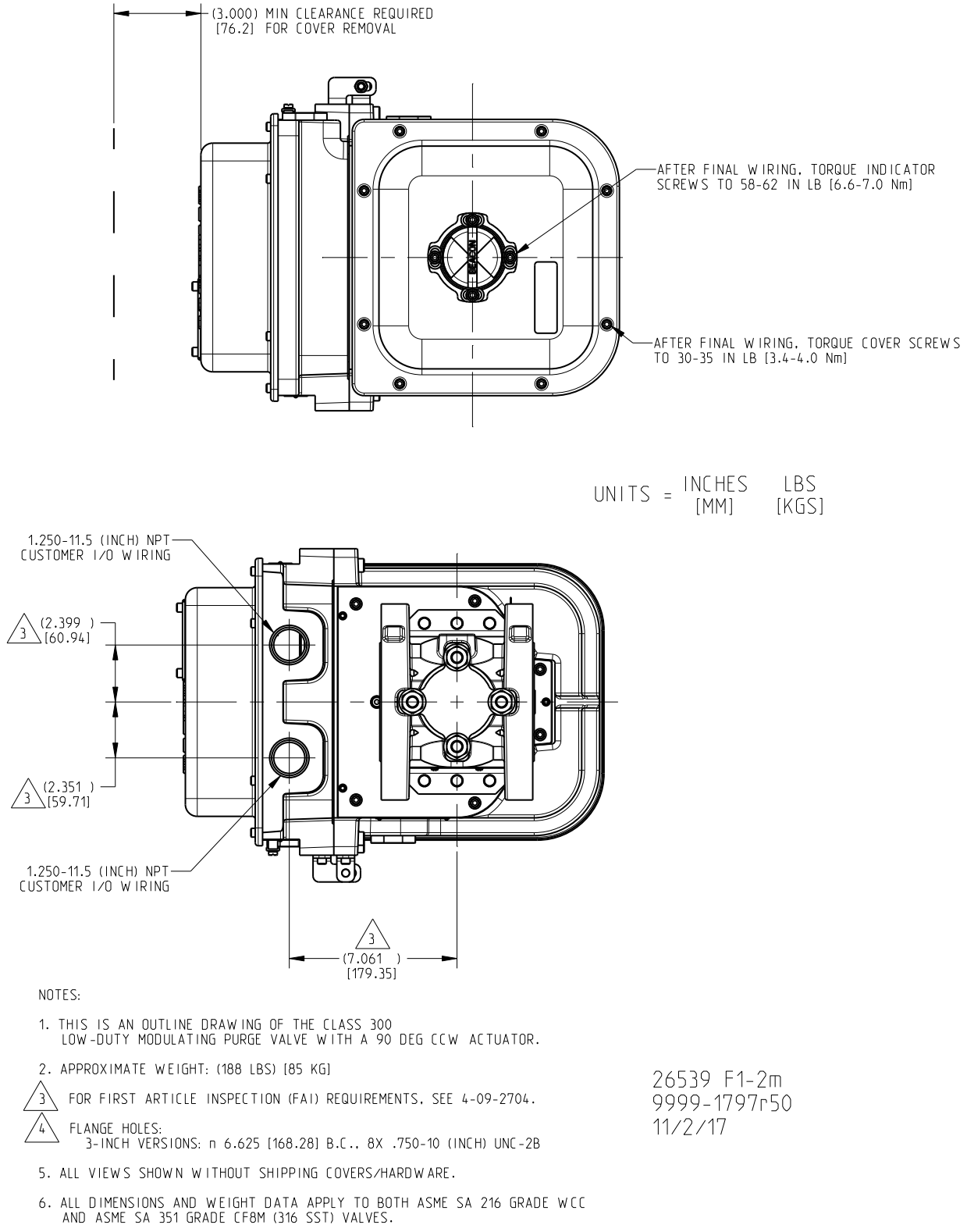

Figure 1-2m. RVP-200 Outline Drawing (90-degree Counter-Clockwise Configuration) with IECEx Marking

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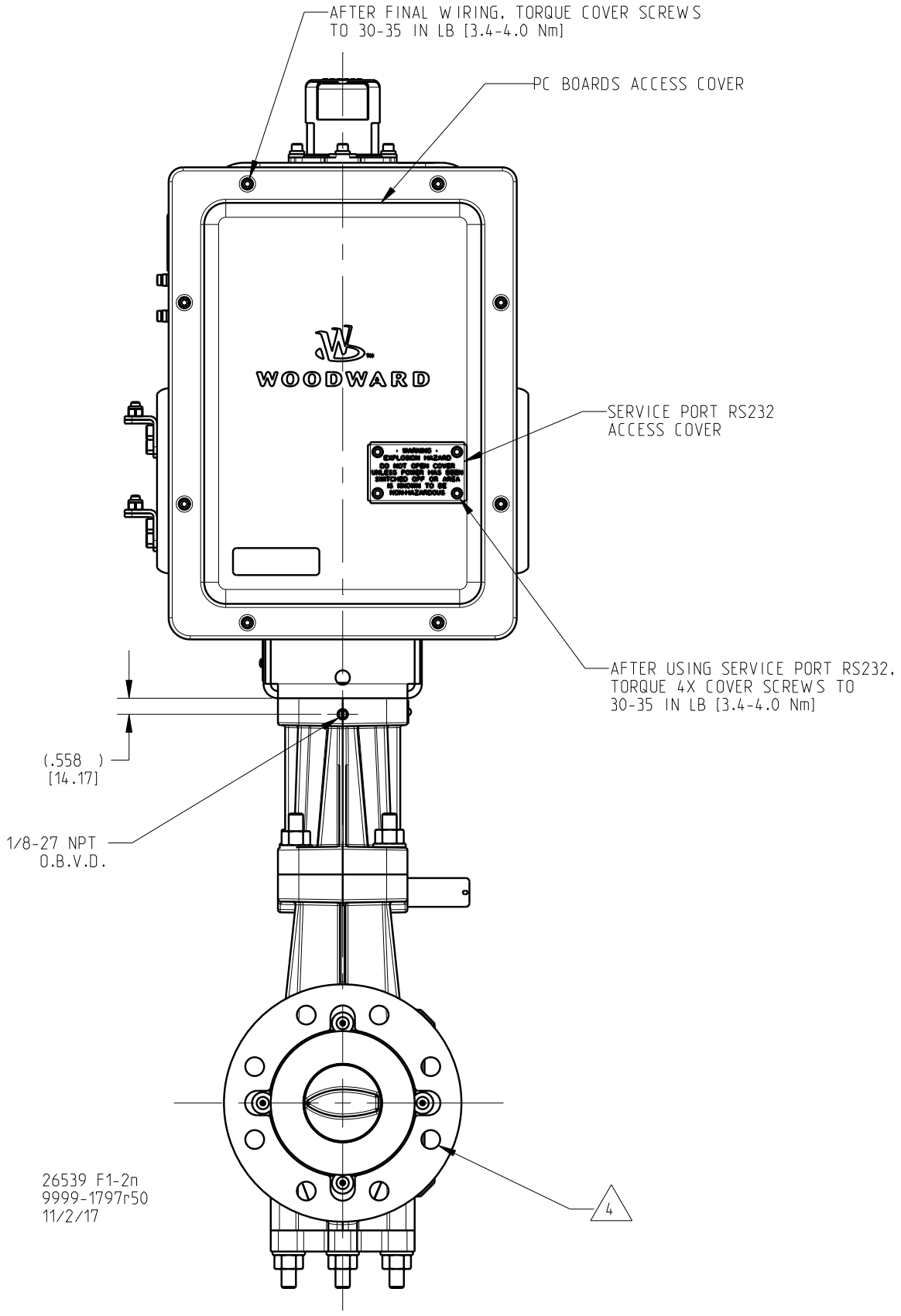

Figure 1-2n. RVP-200 Outline Drawing (90-degree Counter-Clockwise Configuration)

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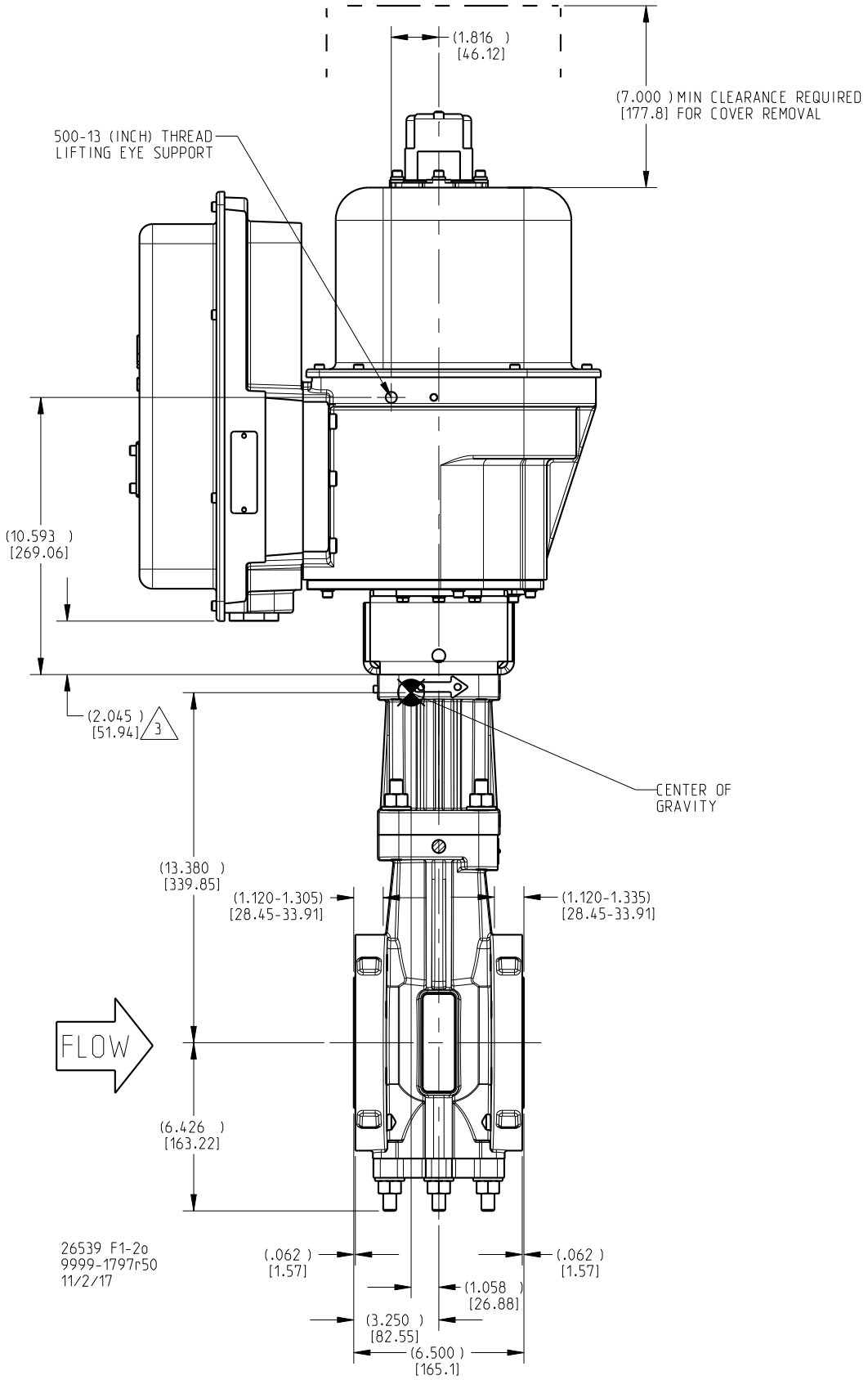

Figure 1-2o. RVP-200 Outline Drawing (90-degree Counter-Clockwise Configuration)

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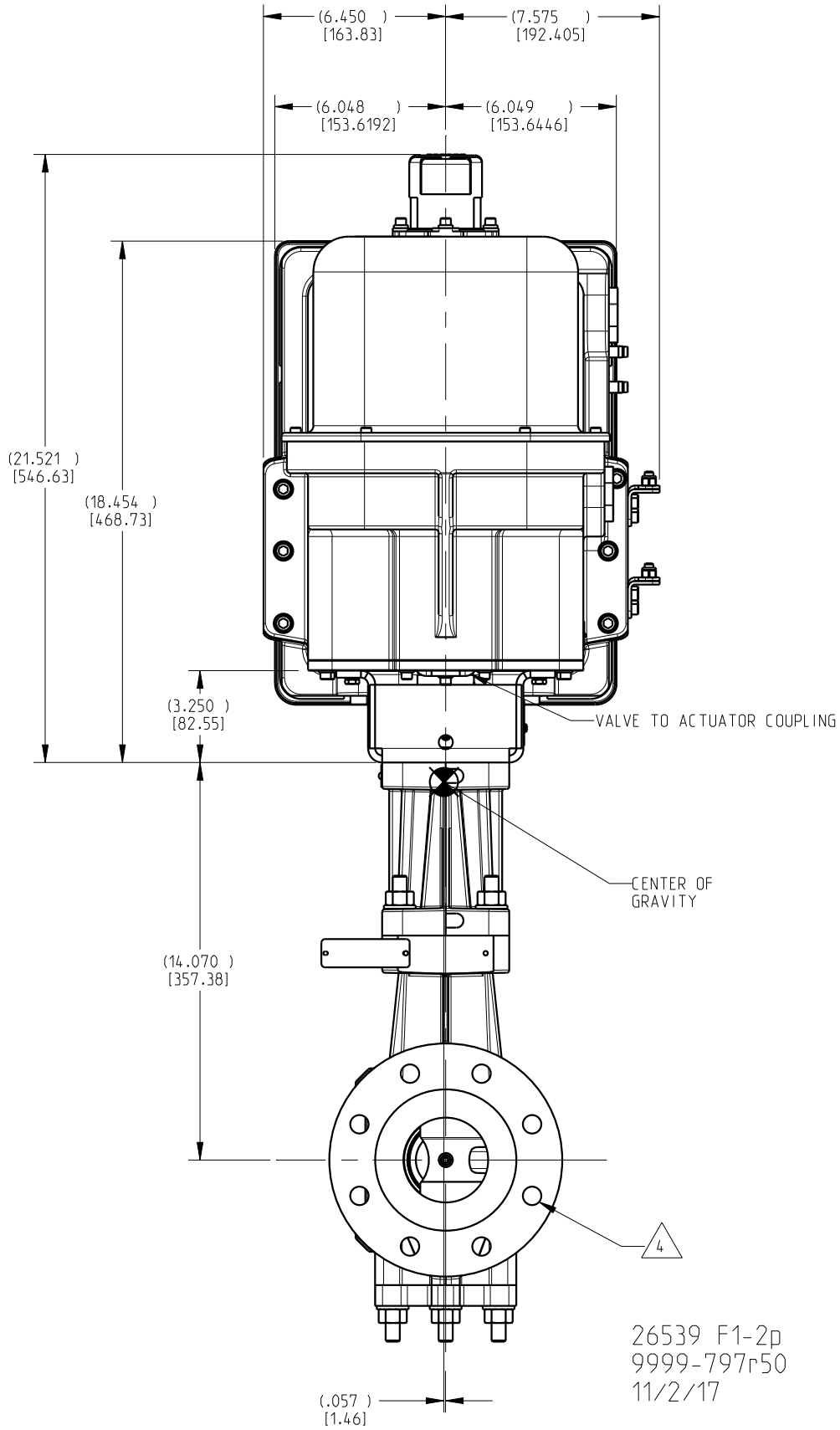

Figure 1-2p. RVP-200 Outline Drawing (90-degree Counter-Clockwise Configuration)

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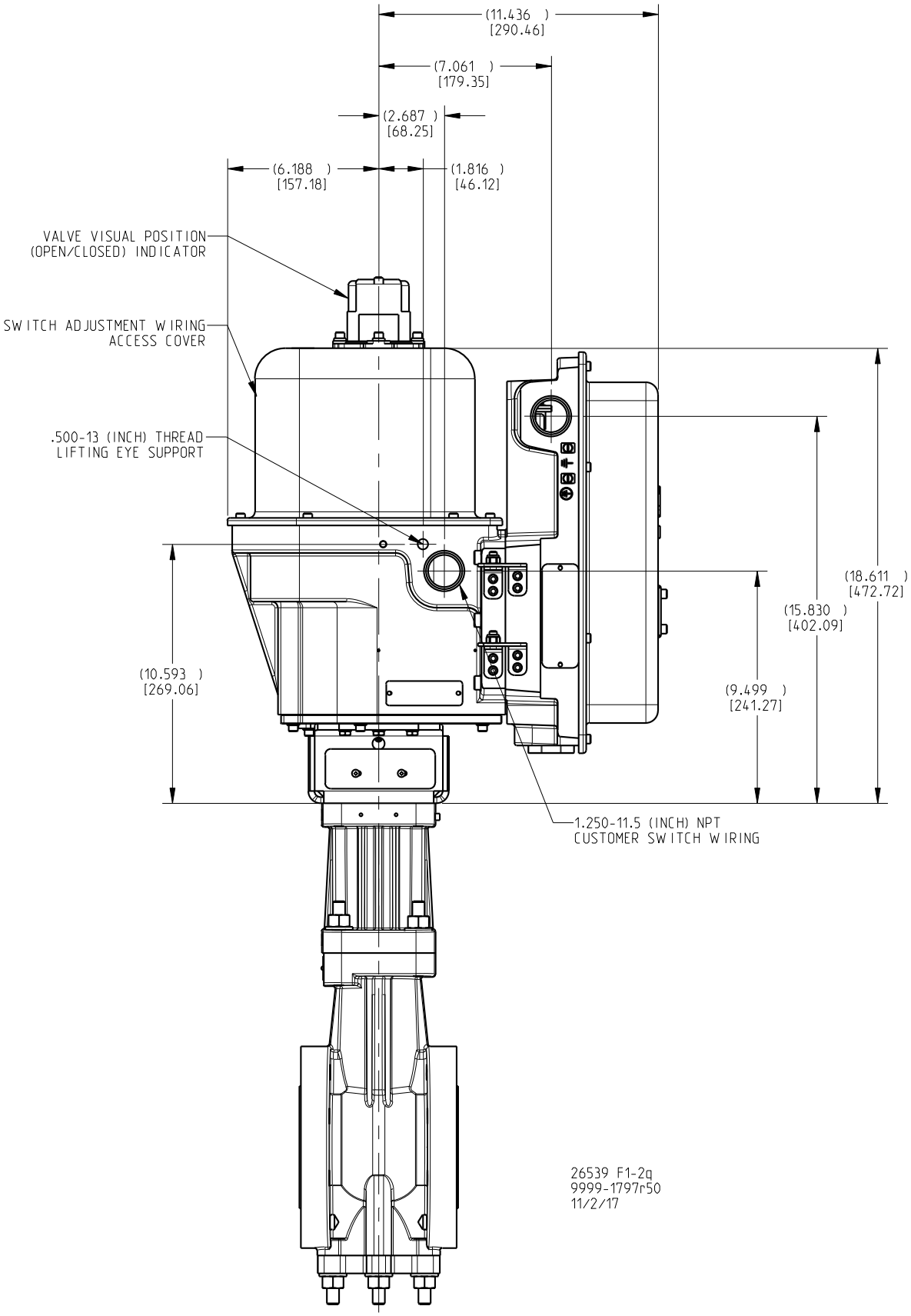

Figure 1-2q. RVP-200 Outline Drawing (90-degree Counter-Clockwise Configuration)

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Options Chart for Figure 1-2

Table 1-3. Weight

Size	Class 300	Class 600
3-inch	76 kg (168 lb.)	86 kg (189 lb.)
4-inch	90 kg (198 lb.)	127 kg (280 lb.)
6-inch	122 kg (269 lb.)	155 kg (341 lb.)

Table 1-4. Dimensions

Class 300 & 600	Dim 'A'	Dim 'B'	Dim 'C'	Dim 'D'
3-inch	(3.250) [82.55]	(6.500) [165.10]	(6.046) [153.57]	(14.070) [357.40]
4-inch	(3.810) [96.77]	(7.620) [193.55]	(6.620) [168.15]	(14.625) [371.50]
6-inch	(4.300) [109.22]	(9.000) [228.60]	(7.847) [199.31]	(15.845) [402.50]

Table 1-5. Dimensions (continued)

Class 300	CG Dim 'E'	CG Dim 'F'	CG Dim 'G'
3-inch	(–0.020) [–0.51]	(14.000) [355.60]	(–1.100) [–27.94]
4-inch	(–0.013) [–0.33]	(12.200) [309.88]	(–0.920) [–23.37]
6-inch	(–0.030) [–0.76]	(9.300) [236.22]	(–0.700) [–17.78]
Class 600	**CG Dim 'E'**	**CG Dim 'F'**	**CG Dim 'G'**
3-inch	(–0.285) [–7.24]	(12.710) [322.83]	(–0.850) [–21.59]
4-inch	(–0.190) [–4.83]	(9.080) [230.63]	(–0.700) [–17.78]
6-inch	(–0.080) [–2.03]	(6.985) [177.42]	(–0.530) [–13.46]

Table 1-6. Class 300 Flange and Driver Cover Dimensions

Class 300	nlet Flange ASME B16.5	Inlet Flange Dim 'H' (includes raised face)	Outlet Flange Dim 'J' (includes raised face)	Driver Cover Dim 'F'	
				On/Off	Modulating
3-inch	1.12 to 1.24	(1.120 to 1.305) [28.45 to 33.15]	(1.120 to 1.335) [28.45 to 33.91]	(9.971) [253.26]	(11.436) [290.47]
4-inch	1.25 to 1.37	(1.250 to 1.388) [31.75 to 35.26]	(1.250 to 1.465) [31.75 to 37.21]	(9.971) [253.26]	(11.436) [290.47]
6-inch	1.44 to 1.56	(1.440 to 1.617) [36.58 to 41.07]	(1.440 to 1.677) [36.58 to 42.60]	(9.971) [253.26]	(11.436) [290.47]

Table 1-7. Class 600 Flange and Driver Cover Dimensions

Class 600	Inlet Flange ASME B16.5	Inlet Flange Dim 'H' (includes raised face)	Outlet Flange Dim 'J' (includes raised face)	Driver Cover Dim 'F'	
				On/Off	Modulating
3-inch	1.50 to 1.62	1.510 to 1.730 [38.35 to 43.94]	1.510 to 1.730 [38.35 to 43.94]	(9.971) [253.26]	(11.436) [290.47]
4-inch	1.75 to 1.87	1.778 to 1.880 [45.16 to 47.75]	1.770 to 1.888 [44.96 to 47.96]	(9.971) [253.26]	(11.436) [290.47]
6-inch	2.13 to 2.25	2.153 to 2.357 [54.69 to 59.87]	2.145 to 2.365 [54.48 to 60.07]	(9.971) [253.26]	(11.436) [290.47]

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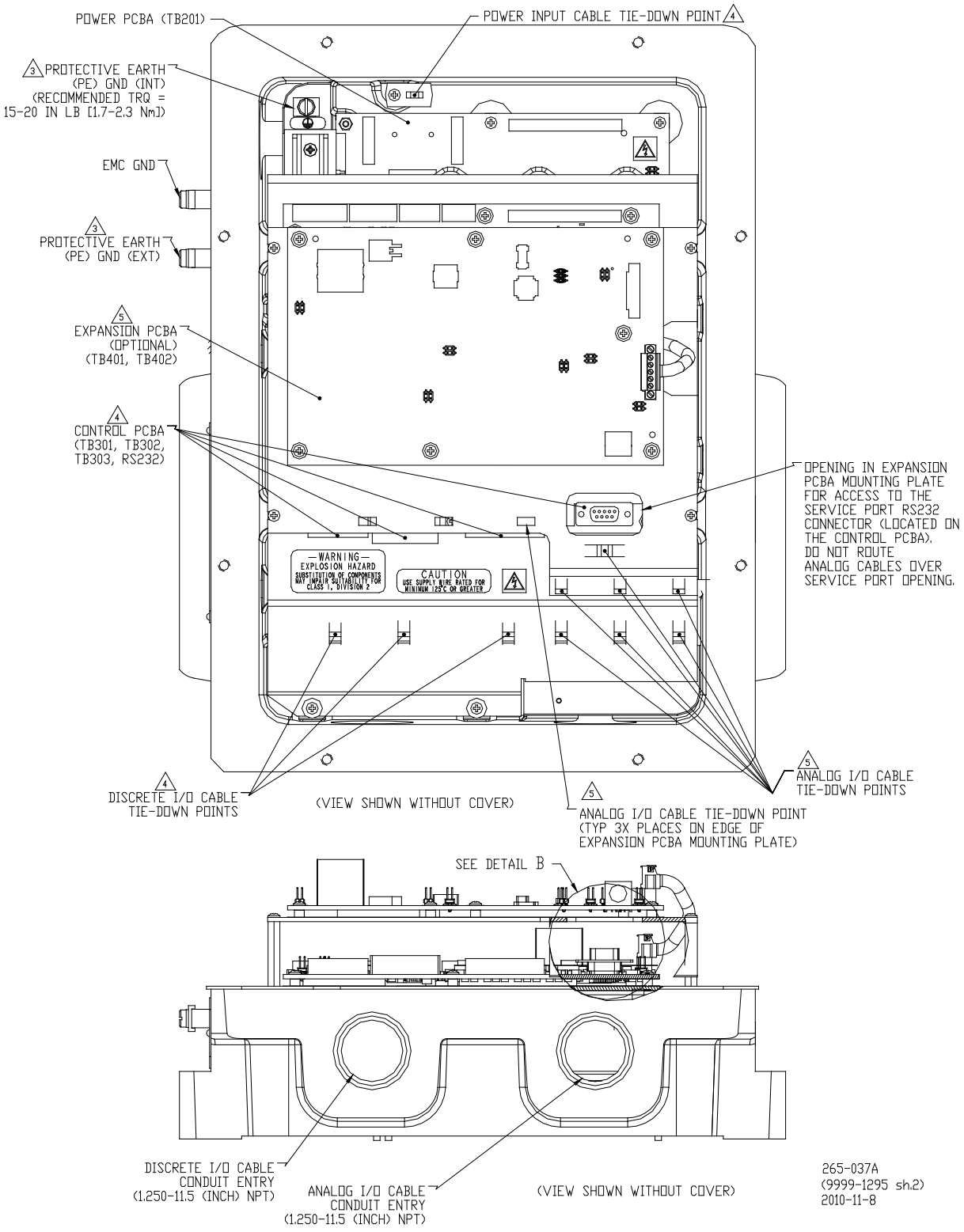

Figure 1-3a. RVP-200 Wiring Diagram

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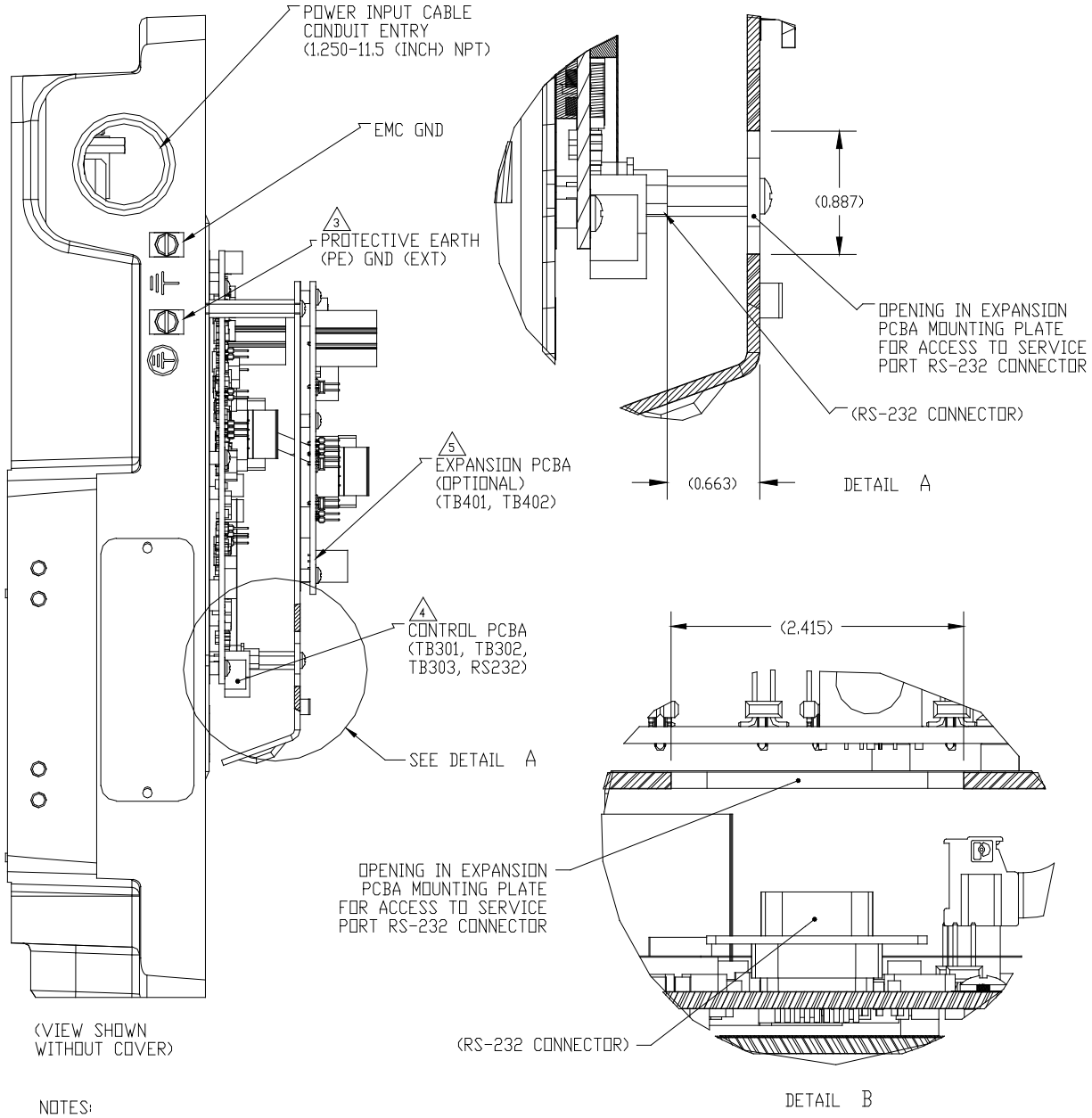

NOTES:

1. THIS DRAWING IS REFERENCED FOR MULTIPLE TOP-LEVEL ITEM NUMBERS. DEVICE APPEARANCE MAY VARY FROM THAT SHOWN, AND MAY NOT REFLECT CURRENT HARDWARE.

3 CUSTOMER PROTECTIVE EARTH (PE) GND TERMINATION MAY USE EITHER EXT OR INT LOCATION ON DRIVER.

4 USE 8926-1299 TERMINAL BLOCK KIT PROVIDED WITH DEVICE FOR POWER INPUT AND DISCRETE I/O WIRING.

5 USE 8926-1400 TERMINAL BLOCK KIT PROVIDED WITH DEVICE FOR ANALOG I/O WIRING.

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Figure 1-3b. RVP-200 Wiring Diagram

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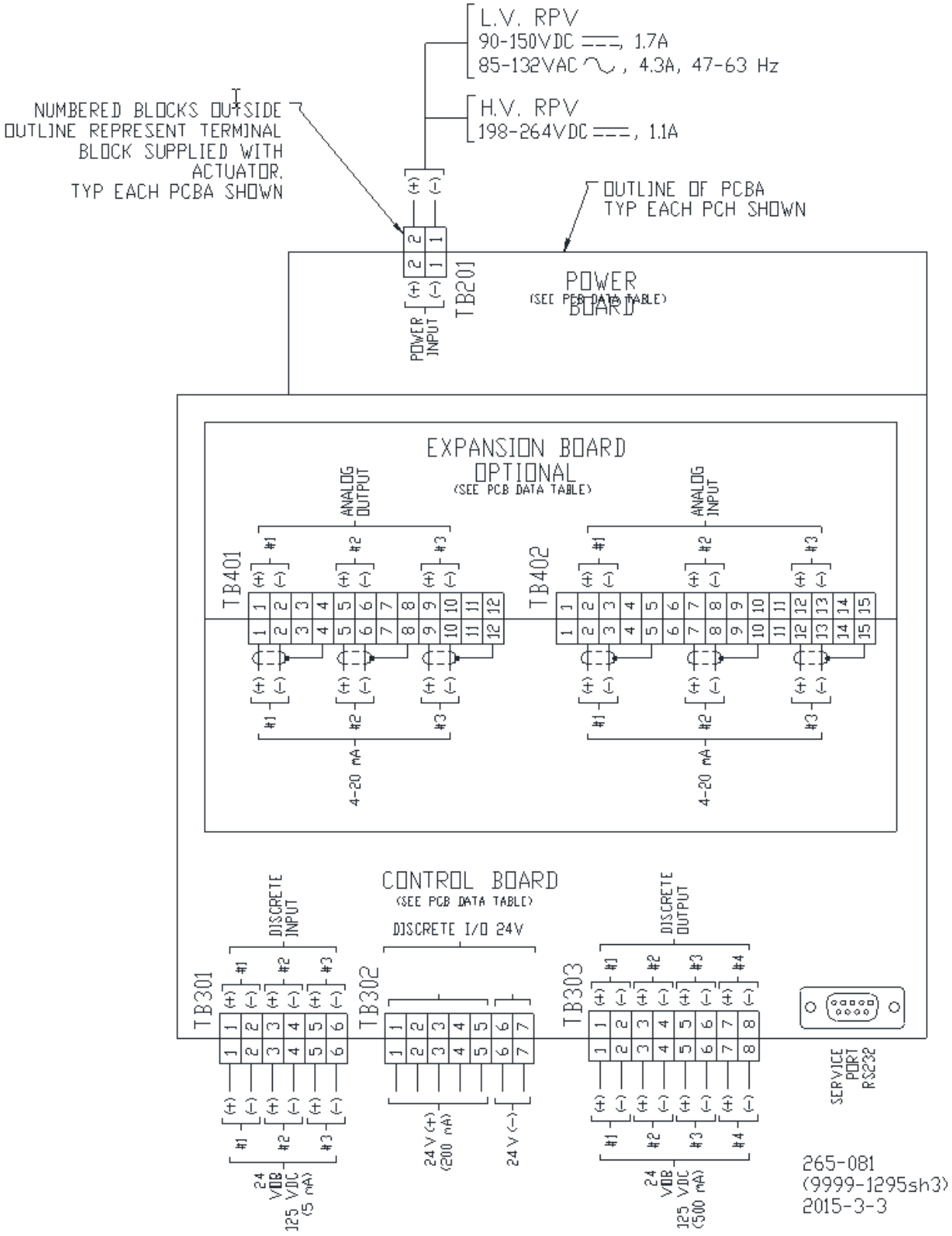

Figure 1-3c. RVP-200 Wiring Diagram

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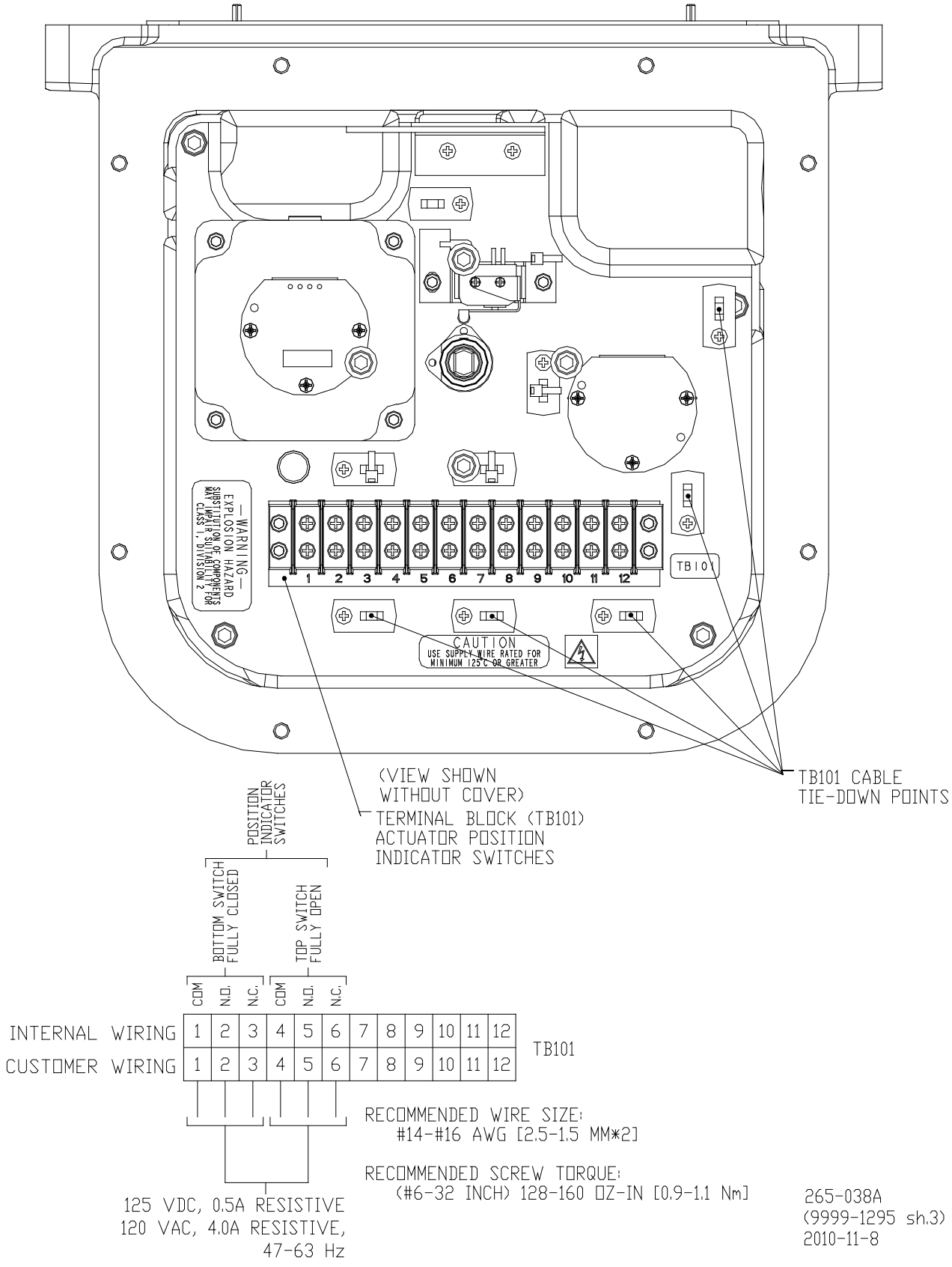

Figure 1-4a. RVP-200 Actuator (Gearbox) Wiring Diagram

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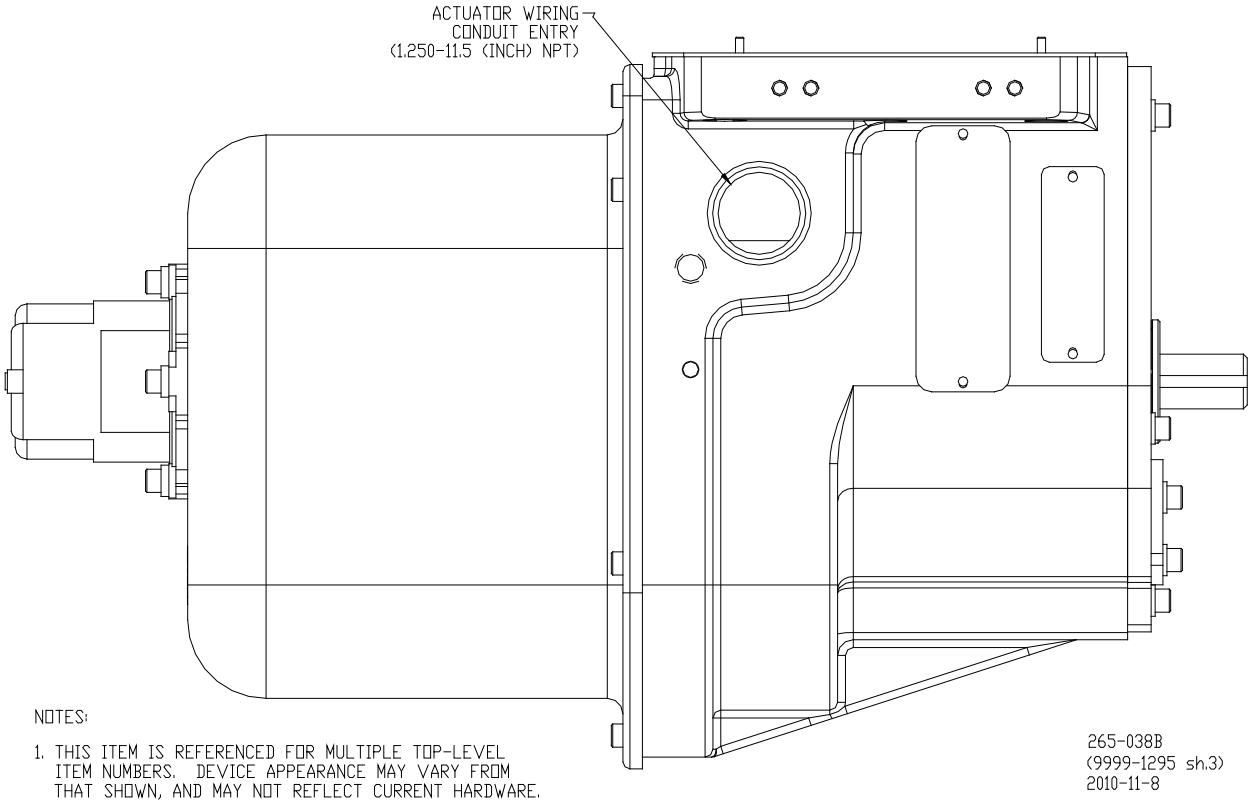

Figure 1-4b. RVP-200 Actuator (Gearbox) Wiring Diagram

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Chapter 2.
Installation

Introduction

⚠WARNING

The engine, turbine, or other type of prime mover should be equipped with an overspeed/misfire/detonation detection shutdown device(s) to protect against runaway or damage to the prime mover with possible personal injury, loss of life, or property damage.

The overspeed/misfire/detonation detection shutdown device must be totally independent of the prime mover control system.

⚠WARNING

Do not operate the valve without proper support for the inlet sleeve. IF BENCH TESTING THE VALVE, ENSURE THAT ASME/ANSI RATED FLANGES ARE GASKETED AND INSTALLED OVER THE INLET AND DISCHARGE FLANGES WITH THE BOLTS PROPERLY TORQUED. The inlet retaining sleeve screws by themselves (circled in red) are not designed to hold pressure loads. Failure to comply with this warning may result in personal injury. Do not place hands inside valve body during inspection, cleaning, or operation.

Inlet Sleeve assembly screws (circled in red) are not designed to hold pressure loads. If bench testing, do not apply pressure to the valve without ANSI flanges (see below figures).

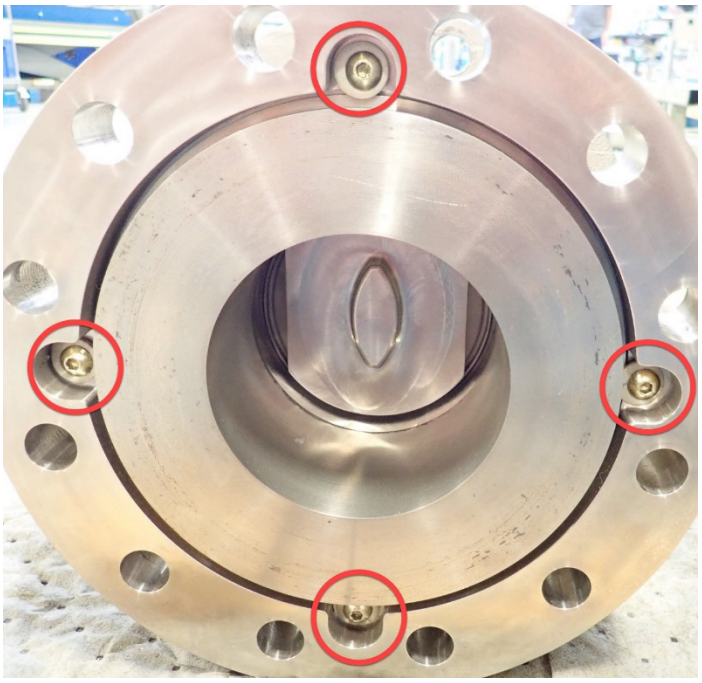

Figure 2-1. Inlet Sleeve Assembly Screws (circled in red)

Raised Face inlet sleeves should be secured with a blind flange or welding neck flange when bench testing

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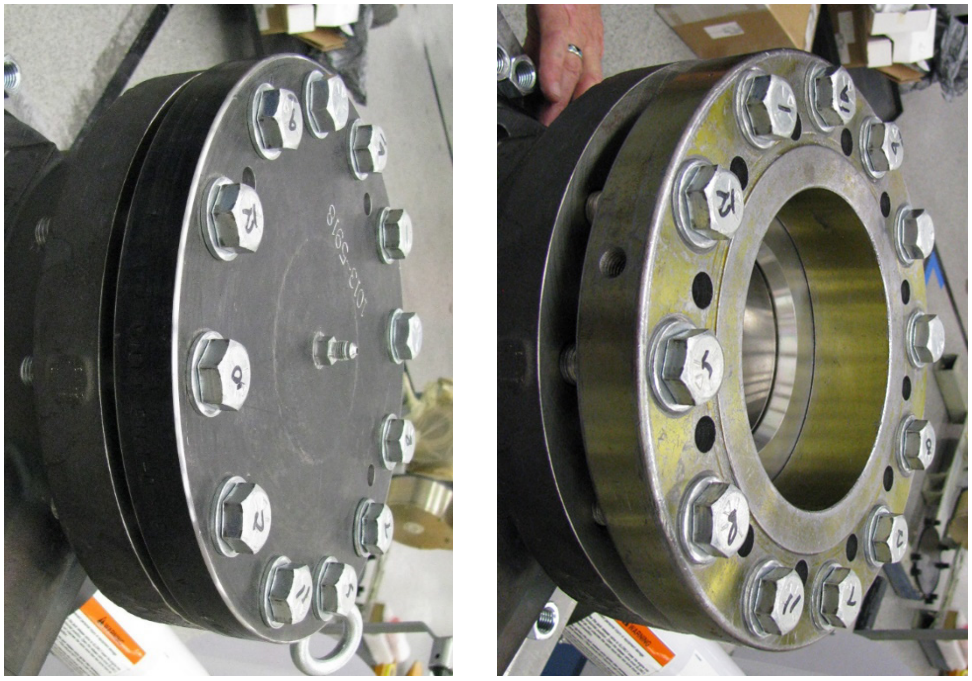

Figure 2-2. Raised Face Inlet Sleeves

Mechanical Installation Requirements

This section provides the general information for mounting location selection, installation, and wiring of the RVP-200.

Unpacking the Shipping Carton

- The valve is shipped in an airtight bag to ensure a non-corrosive environment. Woodward recommends that the valve be kept in its shipping container until installation. If the valve is to be stored for extended periods of time, encase the valve in an airtight container.
- Before unpacking the control, refer to the inside front cover of this manual and to the Regulatory Compliance page for warnings and cautions. Take special care when unpacking the control. Check for signs of damage such as bent or dented panels, scratches, and loose or broken parts. If any damage is found, immediately notify the shipper.
- The RVP-200 is shipped from the factory in an anti-static bag and crate. This bag and crate should always be used for transport of the RVP-200 when it is not installed. Read the Electrostatic Discharge Awareness page before handling the RVP-200.
- Check for and remove all manuals, connectors, mounting screws, and other items before discarding the shipping box.

General Installation Notes and Warnings

When selecting a location for mounting the RVP-200, consider the following:

- Protect the unit from direct exposure to water or a condensation-prone environment.
- The RVP-200 is designed for installation in a low vibration environment. The RVP-200 should be vibration-isolated from turbine and generator vibrations above 50 Hz. See Grounding Requirements below.
- Install the RVP-200 in an area where the operating temperatures will not exceed (–29 to +82) °C / (–20 to +180) °F.
- Provide adequate ventilation for cooling. Shield the unit from radiant heat sources.
- Allow adequate space around the unit for servicing and cable routing. This includes clearance for removal of driver and actuator covers and conduit.
- Do not install near high voltage or high current devices.
- Verify that cable lengths do not exceed lengths specified in the electrical I/O section of this chapter.

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- Use 0.500-13 swivel hoist ring in both lifting eye support locations. Use both swivel hoist rings simultaneously when lifting the valve.

⚠CAUTION

Do not stand the RVP-200 valve on the bottom cover studs unsupported. The valve could tip over and cause injury and damage the valve. Lay the valve horizontally to reduce risk of tipping.

NOTICE

For maximum thermal performance, the RVP-200 must be mounted vertically with at least 25 mm or 1 inch of clearance on all sides of the RVP-200 to allow free convection air to flow past the unit. Without proper clearance between adjacent hardware on all sides of the unit, the RVP-200 may overheat.

Do not mount the RVP-200 near sources of excessive radiant heat such as exhaust manifolds or other excessively hot turbine components.

Valve Installation

See the outline drawings for:

- Overall dimensions
- Process piping flange locations
- Electrical connections
- Lift points and center of gravity
- Weight of the valve

Installation attitude does not affect actuator or fuel valve performance, but a vertical position is generally preferred to conserve floor space as well as ease of making electrical and fuel connections.

⚠WARNING

Due to typical noise levels in turbine environments, hearing protection should be worn when working on or around the RVP.

⚠WARNING

The surface of this product can become hot enough or cold enough to be a hazard. Use protective gear for product handling in these circumstances. Temperature ratings are included in the specification section of this manual.

⚠WARNING

The surface temperature of this valve approaches the maximum temperature of the applied process media. It is the responsibility of the user to ensure that the external environment contains no hazardous gases capable of ignition in the range of the process media temperatures.

⚠WARNING

External fire protection is not provided in the scope of this product. It is the responsibility of the user to satisfy any applicable requirements for their system.

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Piping Installation

Refer to ANSI B16.5 for details of flange, gasket, and bolt types and dimensions. The valve flanges conform to ASME B16.34, ***except for flange thickness in some cases*** (see option charts for Figure 1-2).

Verify that the process piping centerline-to-flange-face dimensions meet the requirements of the outline drawings (Figure 1-2) within standard piping tolerances. The valve should mount between the piping interfaces such that the flange bolts can be installed with only manual pressure applied to align the flanges. Mechanical devices such as hydraulic or mechanical jacks, pulleys, chain-falls, or similar should never be used to force the piping system to align with the valve flanges.

The valve is designed for support by the piping flanges alone; additional supports are neither needed nor recommended. Do not use this valve to provide support to any component other than the piping to which it is directly connected.

ASTM/ASME grade bolts or studs should be used to install the valve into the process piping. The length and diameter for Class 300 flanges shall conform to the following table according to the valve flange size. Note that the thickness of the flanges on the RVP-200 can be greater than ANSI B16.5, so longer bolts or studs may be required to assure full thread engagement (see option charts for Figure 1-3).

Table 2-1. Class 300 Valve Flange Size (Metric)

Nominal Pipe Size	Number of Bolts	Diameter of Bolts	Stud Length	Machine Bolt Length
76 mm	8	19 mm	90 mm	90 mm
102 mm	8	19 mm	120 mm	95 mm
152 mm	8	19 mm	125 mm	110 mm

Table 2-2. Class 300 Valve Flange Size (Imperial)

Nominal Pipe Size	Number of Bolts	Diameter of Bolts	Stud Length	Machine Bolt Length
3 inch	8	3/4 inch	3-1/2 inch	3-1/2 inch
4 inch	8	3/4 inch	4-3/4 inch	3-3/4 inch
6 inch	8	3/4 inch	5 inch	4-1/4 inch

The length and diameter for Class 600 flanges shall conform to the following table according to the valve flange size.

Table 2-3. Class 600 Valve Flange Size (Metric)

Nominal Pipe Size	Number of Bolts	Diameter of Bolts	Stud Length	Machine Bolt Length
76 mm	8	19 mm	110 mm	110 mm
102 mm	8	22 mm	125 mm	125 mm
152 mm	12	25 mm	150 mm	150 mm

Table 2-4. Class 600 Valve Flange Size (Imperial)

Nominal Pipe Size	Number of Bolts	Diameter of Bolts	Stud Length	Machine Bolt Length
3 inch	8	3/4 inch	4-1/4 inch	4-1/4 inch
4 inch	8	7/8 inch	5 inch	5 inch
6 inch	12	1 inch	6 inch	6 inch

Flange gasket materials should conform to ANSI B16.20. The user should select a gasket material which will withstand the expected bolt loading without injurious crushing, and which is suitable for the service conditions.

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3” Valve Installation – 300# Bolt Tightening Pattern

NOTICE

When installing the valve into the process piping, it is important to properly torque the studs/bolts in the appropriate pattern to keep the flanges of the mating hardware parallel to each other. Figure 2-3. A four step torque method is recommended to the directions below. During all of the following steps, keep any gap between flanges even all around the circumference.

NOTICE

Note the flow direction arrow on the valve body. It is important to assemble and complete the torquing of the INLET side of the valve to the pipework first. Internal damage to the valve may result if the inlet side of the valve is not tightened before the outlet side. Never loosen the INLET flange bolts when aligning the OUTLET flange to the pipework or internal damage to the valve may result.

NOTICE

Note the gasket manufacturer recommended bolt torque value. Percentages of this value will be used in progressively torquing the valve into the pipeline.

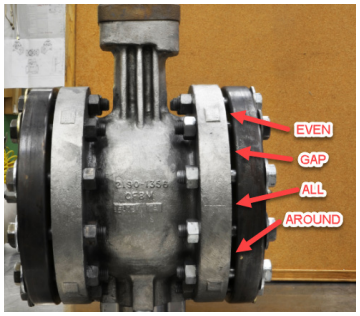

Figure 2-3. Even Gap Between Flanges

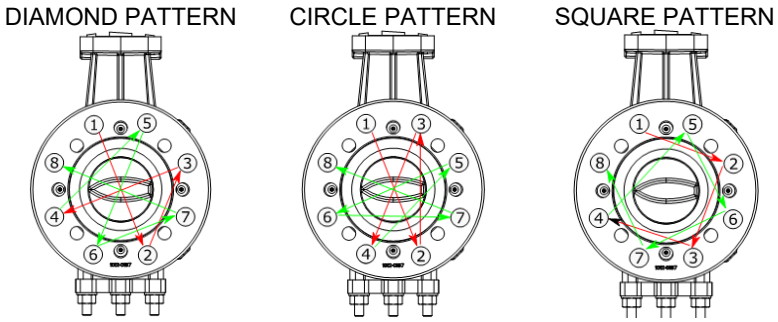

Figure 2-4. Torquing Patterns

1. Assemble the valve in the pipework and hand-tighten all the nuts and bolts.
2. Beginning with the inlet side of the valve, tighten the flange bolts to 25% of the gasket manufacturer’s recommended torque following the diamond pattern shown in Figure 2-4.
3. Continuing on the inlet side of the valve only, tighten the flange bolts to 50% of the gasket manufacturer’s recommended torque following the diamond pattern in Figure 2-4.
4. Continuing on the inlet side of the valve only, tighten the flange bolts to 75% of the gasket manufacturer’s recommended torque following the diamond pattern in Figure 2-4.
5. Continuing on the inlet side of the valve only, fully tighten the flange bolts to 100% of the gasket manufacturer’s recommended torque following the diamond pattern in Figure 2-4.
6. On the inlet side of the valve, continue tightening nuts of the flange bolts until the nuts do not move under 100% of the gasket manufacturer’s recommended torque. Alternate between the circular pattern and square pattern shown in the Figure 2-4.
7. Repeat steps 2 through 6 for the outlet side of the valve. Never loosen the inlet flange bolts when aligning the outlet flange to the pipeline.

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3” Valve Installation – 600# Bolt Tightening Pattern

NOTICE

When installing the valve into the process piping, it is important to properly torque the studs/bolts in the appropriate pattern to keep the flanges of the mating hardware parallel to each other. See Figure 2-5. A four step torque method is recommended for the directions below. During the following steps, keep any gap between flanges even all around the circumference.

NOTICE

Note the flow direction arrow on the valve body. It is important to assemble and complete the torquing of the INLET side of the valve to the pipework first. Internal damage to the valve may result if the inlet side of the valve is not tightened before the outlet side. Never loosen the INLET flange bolts when aligning the OUTLET flange to the pipework or internal damage to the valve may result.

NOTICE

Note the gasket manufacturer recommended bolt torque value. Percentages of this value will be used in progressively torquing the valve into the pipeline.

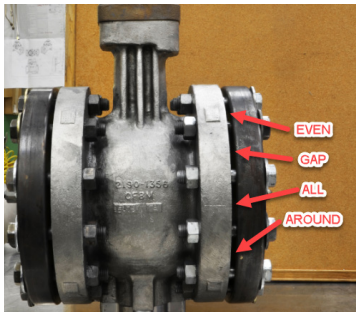

Figure 2-5. Even Gap Between Flanges

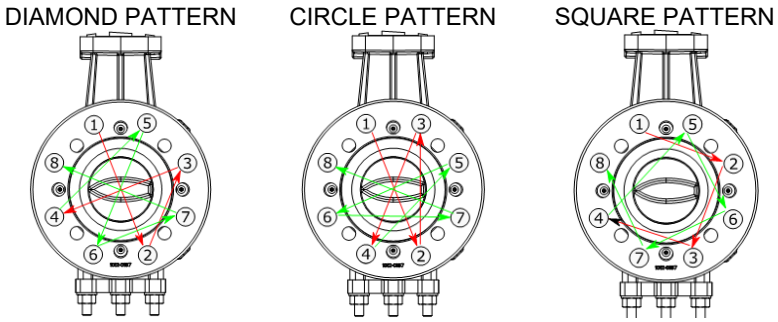

Figure 2-6. Torquing Patterns

1. Assemble the valve in the pipework and hand tighten all the nuts and bolts.
2. Beginning with the inlet side of the valve, tighten the flange bolts to 25% of the gasket manufacturer’s recommended torque following the diamond pattern shown in Figure 2-6.
3. Continuing on the inlet side of the valve only, tighten the flange bolts to 50% of the gasket manufacturer’s recommended torque following the diamond pattern in Figure 2-6.
4. Continuing on the inlet side of the valve only, tighten the flange bolts to 75% of the gasket manufacturer’s recommended torque following the diamond pattern in Figure 2-6.
5. Continuing on the inlet side of the valve only, fully tighten the flange bolts to 100% of the gasket manufacturer’s recommended torque following the diamond pattern in Figure 2-6.
6. On the inlet side of the valve, continue tightening nuts of the flange bolts until the nuts do not move under 100% of the gasket manufacturer’s recommended torque. Alternate between the circular pattern and square pattern shown in the Figure 2-6.
7. Repeat steps 2 through 6 for the outlet side of the valve. Never loosen the inlet flange bolts when aligning the outlet flange to the pipeline.

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4” Valve Installation – 300# Bolt Tightening Pattern

NOTICE

When installing the valve into the process piping, it is important to properly torque the studs/bolts in the appropriate pattern in order to keep the flanges of the mating hardware parallel to each other. See Figure 2-7. A four step torque method is recommended to the directions below. During the following steps, keep any gap between flanges even all around the circumference.

NOTICE

Note the flow direction arrow on the valve body. It is important to assemble and complete the torquing of the INLET side of the valve to the pipework first. Internal damage to the valve may result if the inlet side of the valve is not tightened before the outlet side. Never loosen the INLET flange bolts when aligning the OUTLET flange to the pipework or internal damage to the valve may result.

NOTICE

Note the gasket manufacturer recommended bolt torque value. Percentages of this value will be used in progressively torquing the valve into the pipeline.

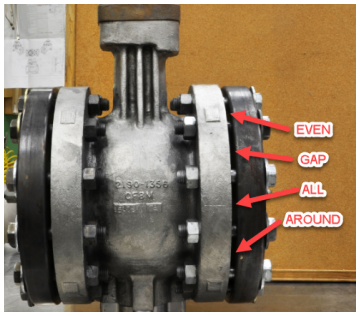

Figure 2-7. Even Gap Between Flanges

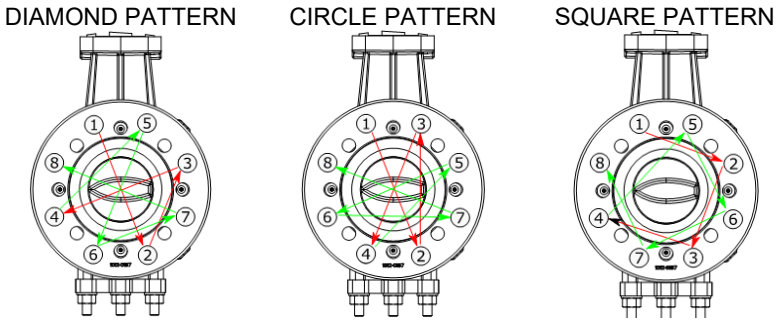

Figure 2-8. Torquing Patterns

1. Assemble the valve in the pipework and hand tighten all the nuts and bolts.
2. Beginning with the inlet side of the valve, tighten the flange bolts to 25% of the gasket manufacturer’s recommended torque following the diamond pattern shown in Figure 2-8.
3. Continuing on the inlet side of the valve only, tighten the flange bolts to 50% of the gasket manufacturer’s recommended torque following the diamond pattern in Figure 2-8.
4. Continuing on the inlet side of the valve only, tighten the flange bolts to 75% of the gasket manufacturer’s recommended torque following the diamond pattern in Figure 2-8.
5. Continuing on the inlet side of the valve only, fully tighten the flange bolts to 100% of the gasket manufacturer’s recommended torque following the diamond pattern in Figure 2-8.
6. On the inlet side of the valve, continue tightening nuts of the flange bolts until the nuts do not move under 100% of the gasket manufacturer’s recommended torque. Alternate between the circular pattern and square pattern shown in the Figure 2-8.
7. Repeat steps 2 through 6 for the outlet side of the valve. Never loosen the inlet flange bolts when aligning the outlet flange to the pipeline.

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4” Valve Installation – 600# Bolt Tightening Pattern

NOTICE

When installing the valve into the process piping, it is important to properly torque the studs/bolts in the appropriate pattern in order to keep the flanges of the mating hardware parallel to each other. See Figure 2-9. A four step torque method is recommended to the directions below. During the following steps, keep any gap between flanges even all around the circumference.

NOTICE

Note the flow direction arrow on the valve body. It is important to assemble and complete the torquing of the INLET side of the valve to the pipework first. Internal damage to the valve may result if the inlet side of the valve is not tightened before the outlet side. Never loosen the INLET flange bolts when aligning the OUTLET flange to the pipework or internal damage to the valve may result.

NOTICE

Note the gasket manufacturer recommended bolt torque value. Percentages of this value will be used in progressively torquing the valve into the pipeline.

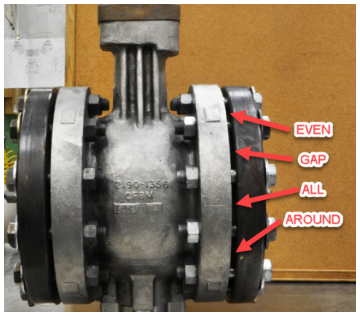

Figure 2-9. Even Gap Between Flanges

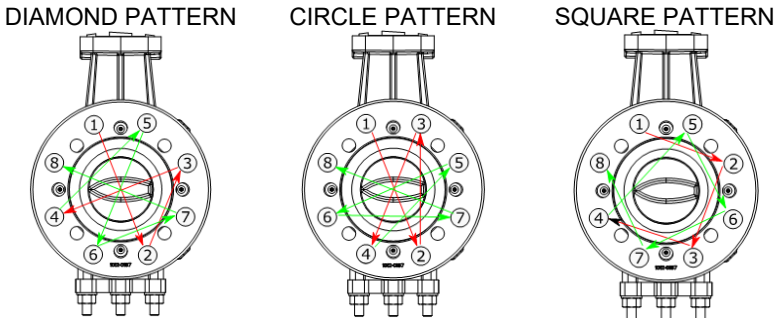

Figure 2-10. Torquing Patterns

1. Assemble the valve in the pipework and hand tighten all the nuts and bolts.
2. Beginning with the inlet side of the valve, tighten the flange bolts to 25% of the gasket manufacturer’s recommended torque following the diamond pattern shown in Figure 2-10.
3. Continuing on the inlet side of the valve only, tighten the flange bolts to 50% of the gasket manufacturer’s recommended torque following the diamond pattern in Figure 2-10.
4. Continuing on the inlet side of the valve only, tighten the flange bolts to 75% of the gasket manufacturer’s recommended torque following the diamond pattern in Figure 2-10.
5. Continuing on the inlet side of the valve only, fully tighten the flange bolts to 100% of the gasket manufacturer’s recommended torque following the diamond pattern in Figure 2-10.
6. On the inlet side of the valve, continue tightening nuts of the flange bolts until the nuts do not move under 100% of the gasket manufacturer’s recommended torque. Alternate between the circular pattern and square pattern shown in the Figure 2-10.
7. Repeat steps 2 through 6 for the outlet side of the valve. Never loosen the inlet flange bolts when aligning the outlet flange to the pipeline.

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6” Valve Installation – 300# Bolt Tightening Pattern

NOTICE

When installing the valve into the process piping, it is important to properly torque the studs/bolts in the appropriate pattern in order to keep the flanges of the mating hardware parallel to each other. See figure 2-11. A four step torque method is recommended to the directions below. During the following steps, keep any gap between flanges even all around the circumference.

NOTICE

Note the flow direction arrow on the valve body. It is important to assemble and complete the torquing of the INLET side of the valve to the pipework first. Internal damage to the valve may result if the inlet side of the valve is not tightened before the outlet side. Never loosen the INLET flange bolts when aligning the OUTLET flange to the pipework or internal damage to the valve may result.

NOTICE

Note the gasket manufacturer recommended bolt torque value. Percentages of this value will be used in progressively torquing the valve into the pipeline.

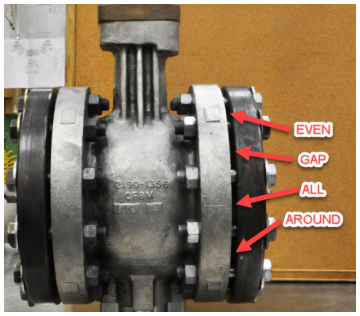

Figure 2-11. Even Gap Between Flanges

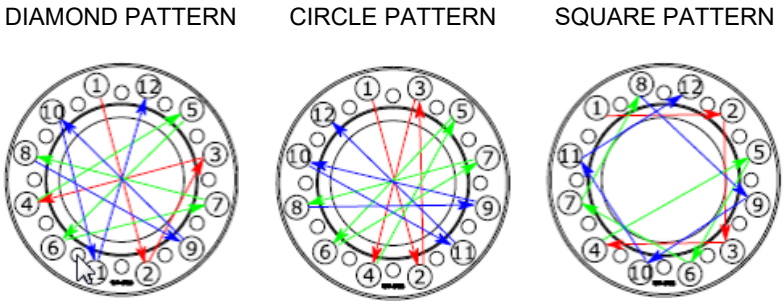

Figure 2-12. Torquing Patterns

1. Assemble the valve in the pipework and hand tighten all the nuts and bolts.
2. Beginning with the inlet side of the valve, tighten the flange bolts to 25% of the gasket manufacturer’s recommended torque following the diamond pattern shown in Figure 2-12.
3. Continuing on the inlet side of the valve only, tighten the flange bolts to 50% of the gasket manufacturer’s recommended torque following the diamond pattern in Figure 2-12.
4. Continuing on the inlet side of the valve only, tighten the flange bolts to 75% of the gasket manufacturer’s recommended torque following the diamond pattern in Figure 2-12.
5. Continuing on the inlet side of the valve only, fully tighten the flange bolts to 100% of the gasket manufacturer’s recommended torque following the diamond pattern in Figure 2-12.
6. On the inlet side of the valve, continue tightening nuts of the flange bolts until the nuts do not move under 100% of the gasket manufacturer’s recommended torque. Alternate between the circular pattern and square pattern shown in the Figure 2-12.
7. Repeat steps 2 through 6 for the outlet side of the valve. Never loosen the Inlet flange bolts when aligning the outlet flange to the pipeline.

Released

6” Valve Installation – 600# Bolt Tightening Pattern

NOTICE

When installing the valve into the process piping, it is important to properly torque the studs/bolts in the appropriate pattern in order to keep the flanges of the mating hardware parallel to each other. See Figure 2-13. A four step torque method is recommended to the directions below. During the following steps, keep any gap between flanges even all around the circumference.

NOTICE

Note the flow direction arrow on the valve body. It is important to assemble and complete the torquing of the INLET side of the valve to the pipework first. Internal damage to the valve may result if the inlet side of the valve is not tightened before the outlet side. Never loosen the INLET flange bolts when aligning the OUTLET flange to the pipework or internal damage to the valve may result.

NOTICE

Note the gasket manufacturer recommended bolt torque value. Percentages of this value will be used in progressively torquing the valve into the pipeline.

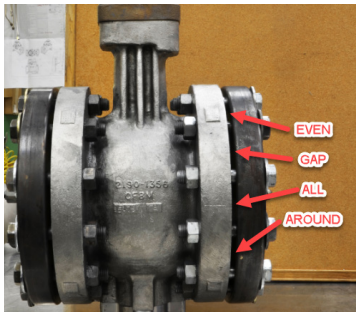

Figure 2-13. Even Gap Between Flanges

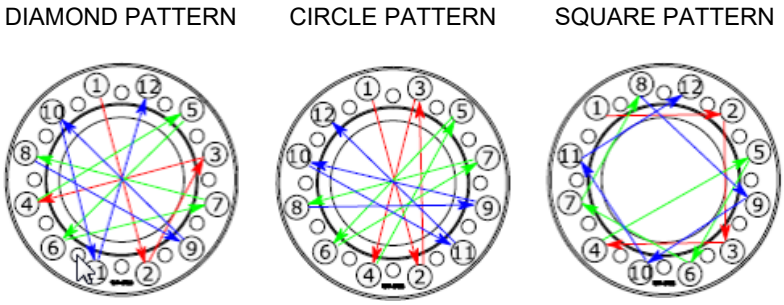

Figure 2-14. Torquing Patterns

1. Assemble the valve in the pipework and hand tighten all the nuts and bolts.
2. Beginning with the inlet side of the valve, tighten the flange bolts to 25% of the gasket manufacturer’s recommended torque following the diamond pattern shown in Figure 2-14.
3. Continuing on the inlet side of the valve only, tighten the flange bolts to 50% of the gasket manufacturer’s recommended torque following the diamond pattern in Figure 2-14.
4. Continuing on the inlet side of the valve only, tighten the flange bolts to 75% of the gasket manufacturer’s recommended torque following the diamond pattern in Figure 2-14.
5. Continuing on the inlet side of the valve only, fully tighten the flange bolts to 100% of the gasket manufacturer’s recommended torque following the diamond pattern in Figure 2-14.
6. On the inlet side of the valve, continue tightening nuts of the flange bolts until the nuts do not move under 100% of the gasket manufacturer’s recommended torque. Alternate between the circular pattern and square pattern shown in the Figure 2-14.
7. Repeat steps 2 through 6 for the outlet side of the valve. Never loosen the inlet flange bolts when aligning the outlet flange to the pipeline.

Released

Vent Port (O.B.V.D.)

There is a vent port that must be vented to a safe location if the process fluid is hazardous. In normal operation, this vent should have zero leakage. However, if excessive leakage is detected from this vent port, contact a Woodward representative for assistance. NEVER PLUG THE VENT PORT. Plugging the fuel vent port will cause the valve to malfunction or operate improperly.

Valve Insulation

NOTICE

The upper portion of the valve stem is used to isolate the electronic actuator from the temperature of the process fluids. It is important that this isolation section is not insulated. See Figure 2-15.

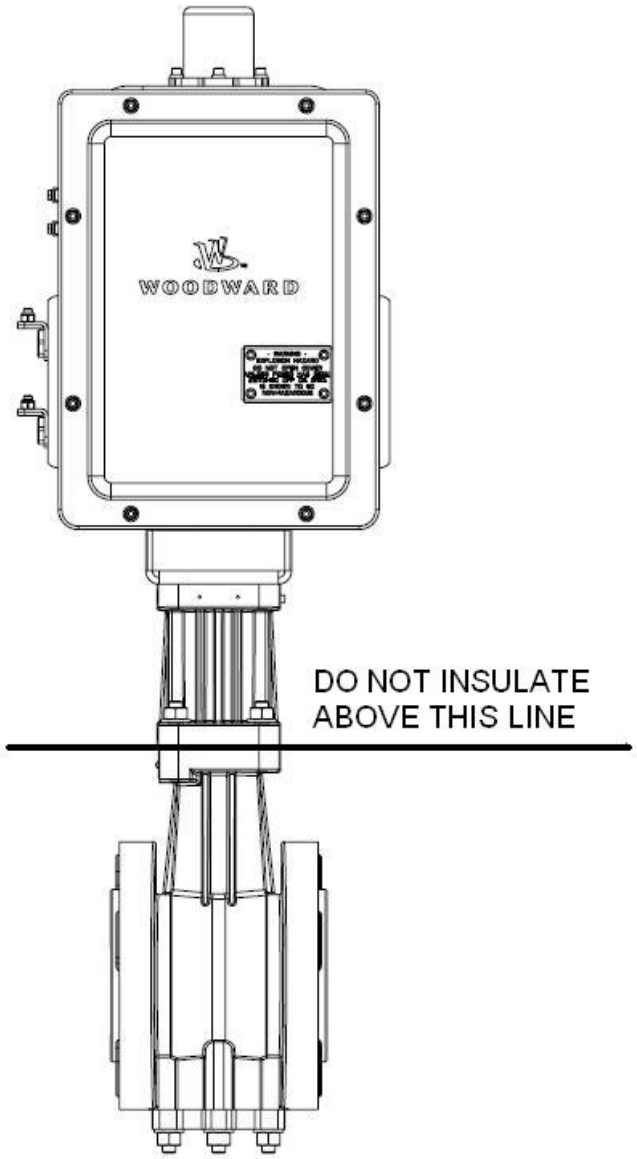

Figure 2-15. Valve Installation

Released

Electrical Installation

Grounding Requirements

WARNING **Connect the PE ground provided on the inside and/or outside of the device to avoid electrical shock hazard.**

To ensure proper safety compliance, connect the Protective Earth (PE) ⏚ ground on the inside and/or outside of the unit to earth as required by the plant installation practices. Use green/yellow safety wire of sufficient gauge to handle the rated current of the input power (3 mm² / 12 AWG typical).

To ensure proper EMC performance, connect the EMC ⏚ ground on the outside of the unit to earth using a low impedance bond. Use a short strap or cable of at least 3 mm² / 12 AWG in diameter and < 46 cm / 18 inches in length.

IMPORTANT **If the external PE connection is used, and if it also meets the low impedance bond requirements for EMC, then the EMC ground connection may be omitted at the customer's discretion.**

Shielding Requirements

The use of shielded-twisted cabling is required where indicated by the control wiring diagram to ensure EMC compliance. Terminate the cable shield as indicated by control wiring diagram using the installation notes described below.

Installation Notes

- Wires exposed beyond the shield should be as short as possible, not exceeding 50 mm (2 inches).
- The shield termination wire (or drain wire) should be kept as short as possible, not exceeding 50 mm (2 inches), and the diameter should be maximized where possible.
- Do not terminate shields on the end opposite of the RVP-200 unless the RVP-200 shield connection pin is designated as a high frequency or ac ground only. Otherwise, a low frequency ground loop will be created. Note that the shield grounds on the expansion board are connected to Chassis Ground, and the field wiring connects the Chassis to Earth Ground.
- Installations with severe electromagnetic interference (EMI) may require additional shielding precautions. Contact Woodward for more information.

IMPORTANT **Failure to provide shielding can produce future conditions which are difficult to diagnose. Proper shielding at the time of installation is required to assure satisfactory operation of the product.**

Verify details concerning installation mounting requirements; ground straps, lock washers, etc.

Conduit Entry

The RVP-200 driver sub-assembly has three 1.25"- NPT conduit entries (Power Input, Discrete I/O, Analog I/O). The RVP-200 actuator subassembly has one 1.25"-NPT conduit entry for the mechanical limit switch wiring. If an entry is not used for wiring, it must be plugged when the valve is installed. Plugs must be sized for a 1.25" - NPT conduit entry and meet the ambient temperature range of the product.

Damage to sealing surfaces may result in moisture ingress. Inspect the driver cover and actuator cover surfaces to ensure that they are not damaged or contaminated.

Released

Wiring Installation Access

To access the driver board for wiring installation, the driver cover must be temporarily removed. The driver cover can be removed by loosening and removing the eight screws holding the cover in place. Figure 2-16 shows the driver with the cover removed.

NOTICE

After wiring installation and prior to operation, the cover must be replaced, and the screws torqued to (3.4 to4.0) N-m / (30 to 35) lb.-in. to prevent moisture or dust ingress.

To access the mechanical limit switches for wiring and adjustment, the visual position indicator and gearbox cover must be temporarily removed. The visual position indicator can be removed by loosening and removing the four screws. Be careful not to misplace the O-ring under the position indicator. Valves marked IECEx will also have four spaces that fit within the position indicator slotted holes. Figure 2-5 shows an IECEx marked valve indicator removal in process.

Once the external portion of the position indicator is removed, the internal portion can be pulled off the indicator shaft. After the external portion of the position indicator is removed the internal portion can be pulled off the indicator shaft and the gearbox cover can be removed by first loosening and removing the eight screws holding the cover in place. The cover can then be slid from the indicator shaft.

Ensure the indicator seal in the gearbox cover is not damaged during cover removal. Figure 2-18 shows the actuator with the gearbox cover and visual position indicator removed.

NOTICE

After mechanical limit switch configuration and prior to operation, the gearbox cover must be replaced, and the screws torqued to (3.4 to 4.0) N-m / (30 to35) lb.-in. to prevent moisture and dust ingress. Take care not to damage the indicator shaft seal during cover installation.

Following cover installation, the visual position indicator must be replaced. Ensure the O-ring is installed under the outer portion of the indicator.

For valves marked with CE mark, but not with IECEx, torque position indicator screws to (0.8 to 1.4) N-m / (7.5 to 12.5) lb.-in.

For valves marked with IECEx, endure the four spacers are placed in the slotted holes of the indicator and then torque position indicator screws to (6.6 to 7.0) N-m / (58 to 62) lb.-in.

Figure 2-16. Driver Conduit Entry

Power Conduit Entry: Upper Left
Discrete I/O Conduit Entry: Lower Left Analog I/O Conduit Entry: Lower Right

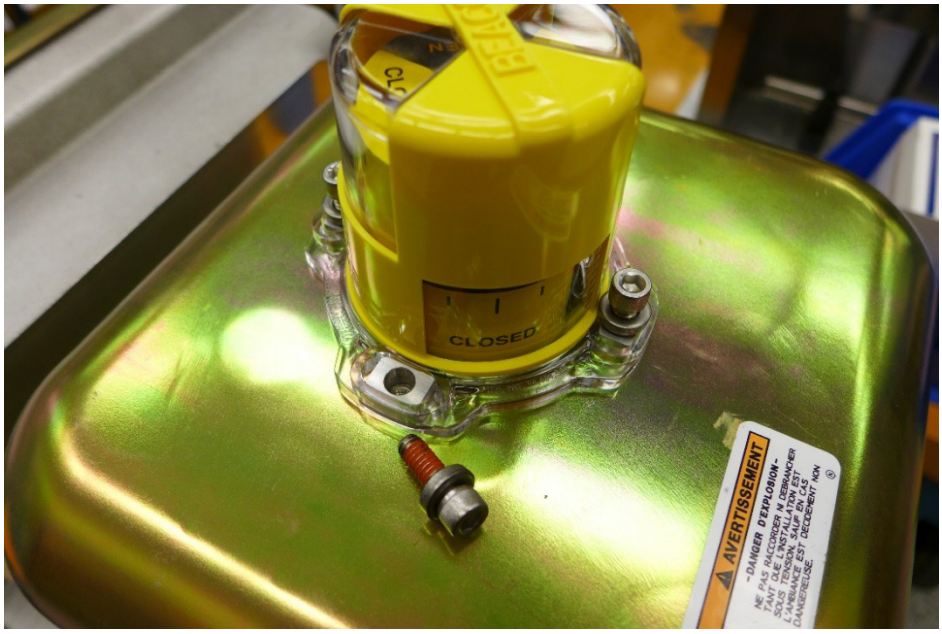

Figure 2-17. Indicator Removal In-Process (IECEx Marked Valve)

Figure 2-18. Actuator Limit Switch Conduit Entry: Upper Left

Released

NOTICE **Follow all ESD cautionary instructions at the beginning of this manual while the RVP-200 covers are removed.**

NOTICE **Do not mount the RVP-200 near sources of excessive radiant heat such as exhaust manifolds or other excessively hot turbine components.**

⚠WARNING **ELECTRICAL SHOCK HAZARD—Do not open RVP-200 covers or connect/disconnect electrical connectors unless power has been switched off.**

⚠WARNING **EXPLOSION HAZARD—Make sure connectors are completely seated to avoid arcing when power is applied.**

Wiring Requirements

⚠WARNING **All wiring used for Power Input, Discrete Inputs, Discrete Outputs, and Mechanical Limit Switches should be externally protected for overload or short-circuit. The protection circuit shall not disconnect PE ground.**

Power Input:

- Separate from discrete and analog wiring
- Wire size: (4.0 to 1.5) mm^2 / (12 to 16) AWG
- Maximum cable length: 100 meters
- Wire strip length: 7 mm / 0.25 inch
- Wire termination torque (M3): (0.5 to 0.6) N·m / (71 to 85) oz.-in
- Flange screw torque (M2.5): (0.4 to 0.5) N·m / (57 to 71) oz.-in

Discrete Inputs:

- Separate from power input and analog wiring
- Wire size: (2.5 to 0.75) mm^2 / (14 to 18) AWG
- 125 V power must be provided externally
- Maximum cable length: 100 meters
- Wire strip length: 7 mm / 0.25 inch
- Wire termination torque (M3): (0.5 to 0.6) N·m / (71 to 85) oz.-in

Discrete Outputs:

- Separate from power input and analog wiring
- Wire size: (2.5 to 0.75) mm^2/ (14 to 18) AWG
- 125 V power must be provided externally
- Maximum cable length: 100 meters
- Wire strip length: 7 mm / 0.25 inch
- Wire termination torque (M3): (0.5 to 0.6) N·m / (71 to 85) oz.-in

Released

Discrete I/O Power (24 V):

- Separate from power input and analog wiring
- Wire size: (2.5 to 0.75) mm^2/ (14 to 18) AWG
- Maximum cable length: 100 meters
- Wire strip length: 7 mm / 0.25 inch
- Wire termination torque (M3): (0.5 to 0.6) N·m / (71 to 85) oz.-in

Analog Input:

- Separate from power input and discrete wiring
- Individually shielded twisted pair cable
- Wire size: (1.5 to 0.5) mm^2/ (16 to 20) AWG
- Maximum cable length: 100 meters
- Wire strip length: 7 mm / 0.25 inch
- Wire termination torque (M2): (0.22 to 0.25) N·m / (31 to 35) oz.-in
- Flange screw torque (M2.5): (0.4 to 0.5) N·m / (57 to 71) oz.-in

Analog Output:

- Separate from power input and discrete wiring
- Individually shielded twisted pair cable (see note 1 below)
- Wire size: (1.5 to 0.5 mm^2 / (16 to 20) AWG
- Maximum cable length: 100 meters
- Wire strip length: 7 mm / 0.25 inch
- Wire termination torque (M2): (0.22 to 0.25) N·m / (31 to 35) oz.-in
- Flange screw torque (M2.5): (0.4 to 0.5) N·m / (57 to 71) oz.-in

Mechanical Limit Switches:

- Separate from valve sensor wiring
- Wire size: (2.5 to 1.5) mm^2 / (14 to 16) AWG
- Maximum cable length: 100 meters
- Terminal spacing: 11 mm (7/16 inch)
- Wire lug torque (6-32): (0.9 to 1.1) N·m / (128 to 160) oz.-in

Service Port Cable Requirements:

- 9-pin straight-through shielded serial cable (see note 1 below)
- Maximum cable length: 15 m / 50 feet

Note: The shield termination for these ports is through a high-frequency capacitor (ac coupled) only, and therefore the shields may be grounded on the end opposite of the RVP-200 without creating a ground loop.

Released

Electrical I/O

Power Input

WARNING

The AC/DC input source to the RVP-200 cannot be reversed and must be EARTH-REFERENCED.

Table 2-5. Electrical I/O Power Input

Specification Description	Low Voltage RVP-200	High Voltage RVP-200
Rated Current	(90–150 Vdc), 1.7 A (85–132 Vac), 4.3 A	(198–264 Vdc), 0.500 A
Peak Current	(90–150 Vdc), 2.5 A (85–132 Vac), 6.0 A	(198–264 Vdc), 1.1 A
Frequency (apply to AC voltage only)	47–63 Hz	NA
Protective Device - Fuse	DC: 4 A, 250 V, I^2t > 500 A^2s	DC: 2 A, 300 V, I^2t > 100 A^2s
	AC: 10 A, 250 V, I^2t > 500 A^2s	AC: NA
Protective Device – Circuit Breaker	DC: >= 20 A, 250 V, 700 A(pk) for 1ms	DC: >= 16 A, 250 V, 300 A(pk) for 2ms
	AC: >= 20 A, 250 V, 300 A(pk) for 2ms	AC: NA
	Recommend equivalent of Mitsubishi NF32-SV series Circuit Breakers	Recommend equivalent of Mitsubishi NF32-SV series Circuit Breakers

The Rated Current is the average current during a 4-second travel time while operating against the return spring.

The Peak Current is the maximum current during a 4-second travel time while operating against the return spring.

Protective Device: The protective device can take the form of a fuse only.

Circuit Breaker (CB): The CB is there to protect the wiring and not the RVP-200. If the CB rating is too high then it is recommended that both CB and fuse, or only the fuse only be used (see Table 2-5).

NOTICE

The RVP-200 has built-in protection against many internal faults. The above protective device recommendations are the minimum requirements to keep the RVP-200 powered under all operating conditions. Protective devices, such as breakers or fuses, are intended to protect the installation power source and wiring from overheating or fire in the event of faults in the wiring or the RVP-200. In addition to the information given above, the installer is responsible for local fire and safety codes that relate to the installation and usage of the RVP-200.

PE Ground ⏚
Ground studs are provided outside and inside the enclosure to terminate the PE (Protective Earth) connection.

EMC Ground ⏚

A separate ground stud is provided outside the enclosure to terminate a short, low impedance strap or cable (typically > 3 mm² / 12 AWG and <46 cm / 18 inches in length).

RS-232 Service Port

The Service Port provides an RS-232 connection for configuring and troubleshooting valve operation. The Service Port can be accessed by removing the small cover with the engraved text: “WARNING – EXPLOSION HAZARD, DO NOT OPEN COVER UNLESS POWER HAS BEEN SWITCHED OFF OR AREA IS KNOWN TO BE NON-HAZARDOUS”. This cover is attached to the driver cover with 4 screws.

NOTICE

After configuring and prior to operation, the RVP-200 service port cover must be replaced and the screws torqued to (3.4 to 4.0) N·m / (30 to 35) lb.-in to prevent moisture or dust ingress.

Service Port Specifications:

- Speed: 38.4 k bits/sec
- Cable: 9-pin straight-through serial cable (shielded)
- Connector: DB9
- Ground: connector shell is ac coupled to RVP earth ground
- Isolation: 1500 Vac from Input Power, 500 Vac from Earth Ground

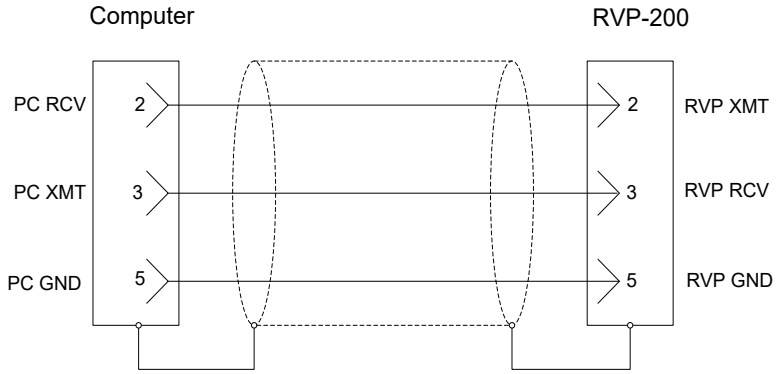

Figure 2-19. Service Port Cable

Discrete Inputs

There are three discrete inputs used to control the valve operation.

Discrete Input Specifications:

- Operating Voltage Range: (18 to 150) Vdc
- Threshold Voltage:
  - Low State: < 4 V
  - High State: > 12 V
- Input Current: 5 mA
- Response Time: 100 ms including software contact debounce filter
- Isolation: 1500 Vac from Input Power, 500 Vac from Earth Ground

Discrete Input Modes

	Input 1	Input 2	Input 3	Function
Mode 0 =	Off	Off	Off	None
Mode 1 =	SD/Reset	Reset	Off	Off
Mode 2 =	SD/Reset	Reset	Open/Close	2-wire Open/Close
Mode 3 =	SD/Reset	Open	Close	4-wire Open/Close
Mode 4 =	Reset	Open	Close	4-wire Open/Close
Mode 5 =	SD/Reset	MOpen	MClose	4-wire Open/Close Modulating

Released

Mode 6 = Reset MOpen MClose 4-wire Open/Close Modulating

Mode 2 is the default.
SD = Shut Down
M = Modulating

NOTICE

If 2-wire Open/Close Mode 2 is used, external wiring failures (open or short) are not detectable. The 4-wire Open/Close modes provide a Discrete Input Action Error if there are conflicting logic levels at the input terminals.

Discrete Outputs

There are four Discrete Outputs. The outputs can be used as high side or low side drivers depending on user preference.

Discrete Output Specifications:

- Operating Voltage Range: (18 to 150) Vdc
- Maximum Load Current: 500 mA
- Short-Circuit Protection
  - Fold-back current limited
  - Non latching
- Response Time: Less than 2 ms
- On-state Saturation Voltage: less than 1.5 V @ 500 mA
- Off-state Leakage Current: less than 10 µA @ 125 V
- Isolation: 1500 Vac from Input Power, 500 Vac from Earth Ground

Discrete On-board I/O Power (24 V)

Isolated 24 V power is provided to power the Discrete Inputs and Discrete Outputs.

Power Terminals:	5
Power Return Terminals:	2
Maximum Current:	200 mA

Analog Input (4 mA to 20 mA)

The RVP-200 modulating valve requires the expansion board, which provides 3 analog inputs. In the default configuration, Analog Input 1 controls the valve position via a (4 to 20) mA signal. Input scaling is such that 4 mA input current corresponds to 0% valve position and 20 mA input current corresponds to 100% valve position. Valve position (not flow) vs. input current is linear between these extremes.

Analog Input Specifications:

- Current Range: 2 mA to 22 mA (powered by external source)
- Max. Temperature Drift: ±200 ppm/°C
- Calibrated Accuracy: ±0.1 % of span (16 mA)
- Common Mode Voltage: ±100 V
- Common Mode Rejection Ratio: –70 dB @ 500 Hz
- Isolation: 1500 Vac from Input Power, 500 Vac from Earth Ground

Analog Output (4 mA to 20 mA)

Also provided on the expansion board are three analog outputs. In the default configuration, Analog Output 1 (4 mA to 20 mA) indicates valve position. Output scaling is such that 4 mA output corresponds to 0% valve position and 20 mA output corresponds to 100% valve position. Output between these extremes is a linear function of valve position.

Released

Analog Output Specifications:

- Calibrated Accuracy: ±0.25 % of span (16 mA)
- Current Range: 2 mA to 22 mA (powered by RVP-200 Driver)
- Load Range: 0 Ω up to 500 Ω
- Maximum Temperature Drift: ±300 ppm/°C
- Isolation: 1500 Vac from Input Power, 500 Vac from Earth Ground

Mechanical Limit Switches

There are two mechanical limit switches located in the actuator that operate when the valve is fully closed or fully open. A terminal block (Figure 1-3a) is provided for wiring termination.

Limit Switch Ratings:

- 125 Vdc, 0.5 A resistive
- 120 Vac, 4 A resistive, (47 to 63) Hz

Limit Switch Adjustment:

The fully closed limit switch (bottom location) can be adjusted in the field by pulling up on the cam and rotating.

The fully open limit switch (top location) can be adjusted in the field by pushing down on the cam and rotating.

Preservation and Storage

Woodward products are packaged and shipped with the most stringent industry standards for international shipments. In most cases, Woodward products are constructed with stainless steel and other corrosion-resistance materials. Products not manufactured from these materials are provided with a corrosion inhibiting coating to best protect the item under normal conditions.

To maintain the Woodward warranty, items must be stored in a clean, dry environment free of ingress from any foreign debris (including animals, insects, and other organic materials). The preferred method of storage is to keep the product in the “as shipped” containers until the product is installed per the O&M manual. If this is not possible, each product is shipped with covers to prevent ingress of normal materials to the internals of the product. These shipping covers must not be removed until the product is installed per the O&M manual.

Products for the intended use of containing pressurized fluid of any kind will contain various styles of seals. After extended periods of storage (greater than 12 months), these seals can “take a set”, meaning it can take the shape of the groove or pocket and lose its elasticity or ability to seal, thereby allowing leakage during the initial use of the product. Prior to use, Woodward recommends that the product be pressurized and manually stroked over its full stroke for at least five minutes or one hundred cycles, whichever occurs first. This cycling will enable the seals to regain their preferred shape and provide optimal sealing for the remainder of the product life.

Products that include electronic components (internal driver or other circuit boards) should be powered at least once every six months. This process will ensure the integrity of the electrical components for the remainder of the product life. Following these general recommendations will allow Woodward products to be stored for long periods of time without degradation to the product performance. Please contact a Woodward representative for more detailed information or for questions based upon specific field conditions. When storing beyond three years, it is recommended to return the product to the factory for recertification as seals can take a set.

Chapter 3.
RVP-200 Monitor Service Tool

Introduction

The Woodward RVP-200 Monitor Service Tool is part of the Woodward ToolKit that provides many serviceability features.

The **RVP-200 Monitor Service Tool** serves as a monitoring tool. This tool is intended for monitoring the valve setting and the Valve Position (RVP) status. This tool does not provide the capability of saving valve changes or calibration settings.

⚠WARNING

An unsafe condition could occur with improper use of these software tools. Only qualified personnel should use these tools to modify or monitor the RVP-200 functions.

NOTICE

After using the monitor service tool and prior to operation, the RVP-200 service port cover must be replaced and the screws torqued to (3.4 to 4.0) N·m / (30 to 35) lb.-in to prevent moisture or dust ingress.

System Requirements

The minimum system requirements for the RVP-200 Monitor Service Tool software are:

- Microsoft Windows® 7, Vista SP1 or later, XP SP3 (32- & 64-bit); support for XP will end on 2014 April 8
- Microsoft .NET Framework ver. 4.0 & Hot Fix KB2592573
- 1 GHz Pentium® CPU
- 512 MB of RAM
- Minimum 800 by 600 pixel screen with 256 colors
- Recommended screen resolution 1024 x 768 or higher
- 9 pin-D Serial Port (RS232)
- Woodward ToolKit Software

Cabling Requirements

9-pin **straight through** serial sable (not a null modem cable!)

Refer to Chapter 2 for more information on the RS-232 serial port.

Obtaining the Service Tool

The **RVP-200 Monitor Service Tool** can be obtained from the Woodward website www.woodward.com/software or via e-mail.

The ToolKit Service Tool can be obtained from the Woodward website www.woodward.com/software or via e-mail. Both the latest ToolKit and RVP-200 Monitor Service Tool are recommended.

Released

Installation Procedure

After obtaining the RVP-200 Monitor Service Tool and ToolKit software installation packages from Woodward, run the included installation program and follow the instructions on the screen to install the Woodward ToolKit software and the RVP-200 Monitor Service Tool.

Getting Started with the Monitor Service Tool

The RVP-200 Monitor Service Tool runs on a personal computer (PC) and communicates to the RVP-200 via standard RS-232 communication. The PC running the RVP Monitor Service Tool is connected to the RVP-200 using a 9-pin straight-through RS-232 serial cable. If a DB9 connector RS-232 COM Port on the PC is not available, a USB-RS232 converter may be used. Refer to the appropriate RVP-200 outline drawing in Chapter 1 for the exact location of the RVP-200 service port.

IMPORTANT

Note: Woodward has observed incompatibilities with some USB/RS-232 converters. Therefore, Woodward cannot recommend one converter that is compatible with all PCs.

IMPORTANT

The serial cable used to connect the RVP-200 to the PC running the RVP-200 Monitor Service Tool has to be set up as straight-through configuration. Null Modem configured cables WILL NOT work.

After the RVP-200 and the PC have been connected via the serial cable, the RVP-200 Monitor Service Tool can be started from the Windows Start menu or a shortcut on the Desktop (if applicable). If the tool is not located on the Start menu or desktop, then it must be started by double clicking the .wstool file.

RVP-200 Monitor Service Tool Home Page

The RVP-200 Monitor Service Tool Home page is displayed as the tool is launched from a PC. This page contains information and revision of the tool (Figure 3-1).

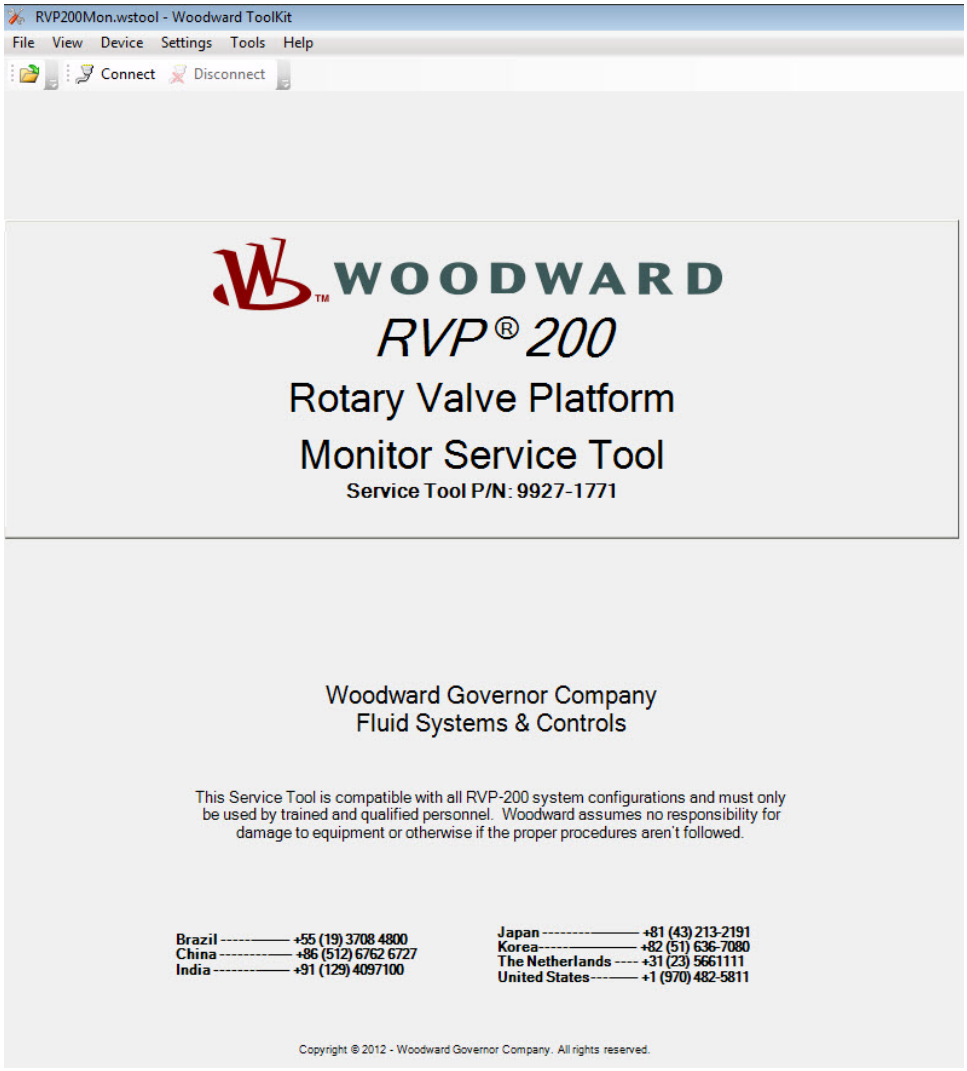

Figure 3-1. RVP-200 Monitor Service Tool Home Page

Connecting / Disconnecting the Monitor Service Tool

Connection to the RVP-200 is made by clicking the **Connect** button on the main tool bar (Figure 3-2).

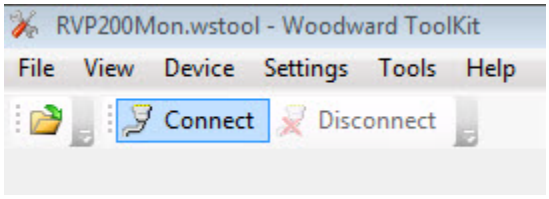

Figure 3-2. Monitor Service Tool Connection

When trying to connect the tool for the first time, the RVP-200 Monitor Service Tool shows a pull-down menu and query to select a suitable communication (COM) port for interfacing between the PC and the RVP-200. A highlight on the port indicates the port has been selected for the communication.

Note: the COM port may not appear in the list if the COM port has been connected after the service tool has been launched. Restarting the service tool may be required to refresh the COM port list.

The baud rate of the COM port is default in “AutoDetection” mode. In the case where a different baud rate is needed, the drop-down menu on the Baud Rate field provides a different option.

Placing a check mark next to “Always connect to my last selected network” indicates the selected port will be used as default in the future. To re-enable this pop-up, use the Tools->Options menu. Clicking the “**connect**” button will cause the tool to attempt to make a connection to the RVP-200 valve (Figure 3-3).

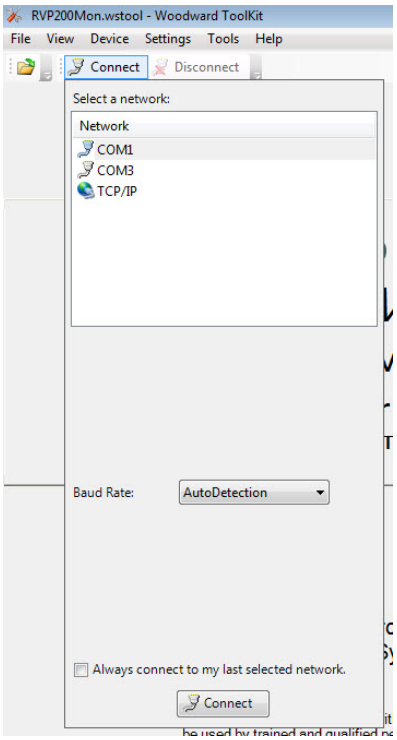

Figure 3-3. Connect to Network

The tool will always try to establish the RVP-200 connection immediately after pressing the Connect button. The tool momentarily displays the RVP-200 identification and application software part number at the bottom page upon making the connection. A “Connected” message is displayed under the status column (Figure 3-4) indicating the RVP-200 and PC are connected.

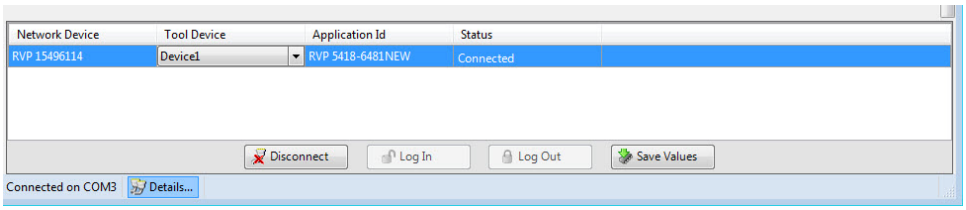

Figure 3-4. Communication Engaging

After Connection is Established

After selecting the desired communication port for the interface, the Service Tool will try to connect to the RVP-200. Following successful connection to the RVP-200, the screen will populate with the Tool Introduction page (Figure 3-1).

RVP-200 Monitor Service Tool Screen Navigation

The RVP-200 Monitor Service Tool screens can be selected by using the ToolKit Navigation Buttons to go forward or back page-by-page or using the Pull-Down menu to select the desired page. Pages of the RVP-200 Service Tool have been grouped based on the device being controlled.

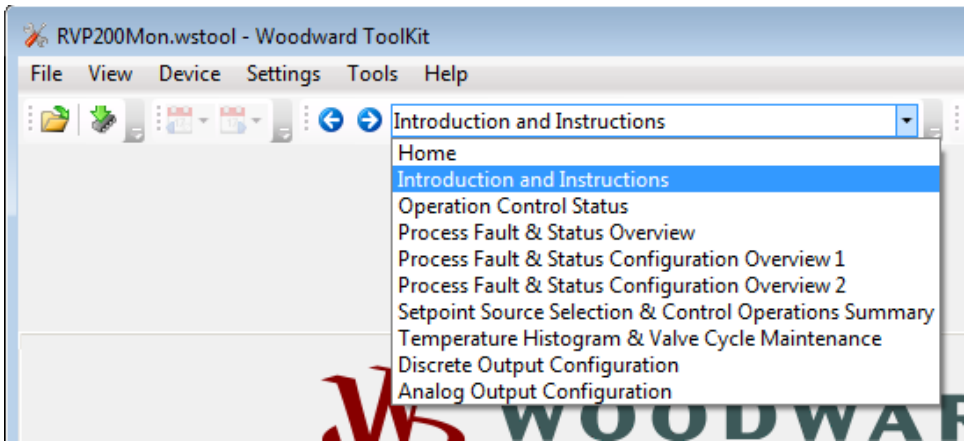

Figure 3-5. Monitor Service Tool Pull Down Menu

Home - Displays the service tool and Woodward field support information.

Introduction and Instructions - Displays the service tool, software support and Woodward Service assistance information.

Operation Control Status- Displays current valve operation mode, valve status and valve identification, and the trend chart.

Process Fault & Status Overview—Displays the overview error status of the RVP-200.

Process Fault & Status Configuration Overview 1—Displays the diagnostic configuration of each errors setting.

Process Fault & Status Configuration Overview 2—Displays the diagnostic configuration of each errors setting.

Setpoint Source Selection & Control Operations Summary—Displays the demand selector inputs. In the case that an expansion board is used, the tool displays the actuator run mode and discrete input demand mode.

Temperature Histogram & Valve Cycle Maintenance—Displays in histogram format the number of hours the RVP-200 has spent within a selected temperature range during its operation. It also displays when the recommended maintenance cycle is reached on the valve.

Discrete Output Configuration—Displays the discrete output mode configuration. In the case of the Monitor Service tool, the discrete output is Woodward factory preset.

Analog Output Configuration—Displays the analog input demand setting.

Service Tool Common Components

The top portion of every screen on the RVP-200 Monitor Service Tool contains common components that depict the overall status of the RVP-200 driver. On the RVP-200 Configuration Service Tool, two active control buttons can be used to shutdown and reset the driver at any time (Figure 3-6).

Released

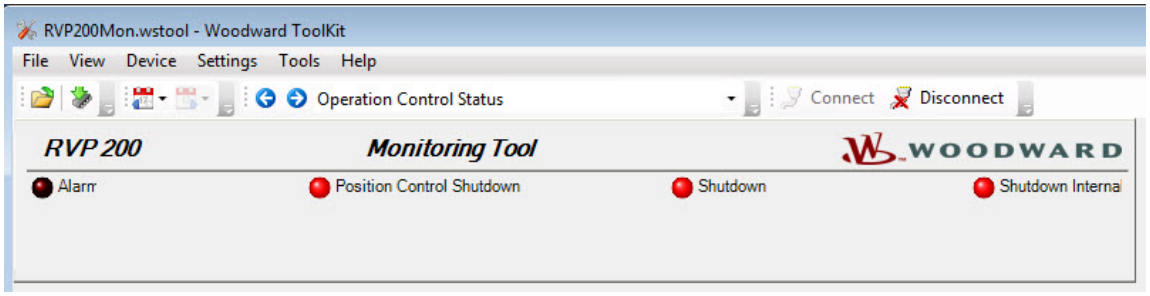

Figure 3-6. Top Portion of Each Screen with Common Components

Overall System Status (Common Header)

There are two tables that describe process faults

1. The **Process Fault and Status Overview Screen** indicates which individual conditions are causing the Shutdown LEDs to light.
2. The **Table of Shutdown LED Conditions** in the Troubleshooting Chapter describes which LED indicator relates to each fault condition.

Alarm

The Alarm LED indicates the RVP-200 has detected an error event whose associated action is configured as active and alarmed. The RVP-200 will continue to operate.

Position Control Shutdown

The Position Control Shutdown LED indicates the RVP-200 has detected a position error event whose associated action is configured as active and shutdown. With this error event, the firmware is unable to control the valve, and the springs are allowed to move the valve to the failed position.

Shutdown

The Shutdown LED indicates the RVP-200 has detected either:

- An internal board level shutdown error,
- A configured error, or
- A commanded shutdown.

The RVP-200 Driver will move the valve to the failed position.

Shutdown Internal

The Shutdown Internal LED indicates the RVP-200 has detected either

- An internal board level shutdown error, or
- A configured error.

It is used to differentiate the cause of a Shutdown LED.

Operation Control Status Screen

The Operation Control Status is used during the initial commissioning or when troubleshooting to confirm the operation of the RVP-200/actuator system. This can also be used to monitor the system responding to a change in position setpoint, valve actual and feedback position, valve identification, status of analog output, discrete input status, and the trend chart plot (Figure 3-7). The trend chart screen provides a plot of the actuator's Actual Position and actuator's Set Position to the real time action of the position control.

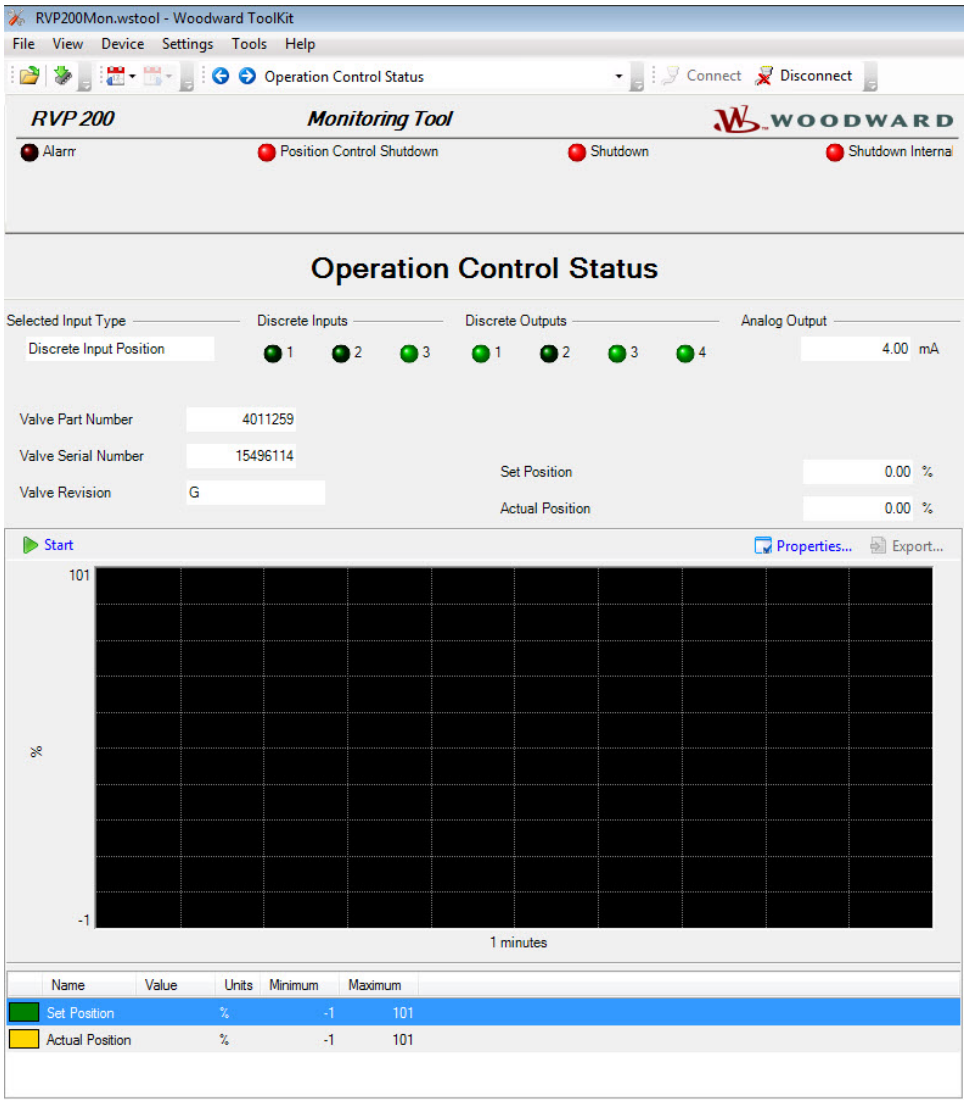

Figure 3-7. Operation Control Status

Selected Input Type

Indicates the actuator's demand source type. The selected Input Type is factory pre-configured.

- In **Discrete Input** type, the commanded set point demand is input using the discrete input signal(s).
- In **Analog Input** type, the commanded set point demand is input through the analog input signal.
- Note: When using Analog Input Mode be aware that the Discrete Input Configuration modes are still active, just not controlling. This means that the SHUTDOWN and RESET inputs will still work. The OPEN and CLOSE input will not control the valve, but it can still cause a Discrete Input Action Error fault. A typical, but not required, Discrete Input Configuration mode is SD/RESET-RESET-OFF when using Analog input.

Released

Discrete Inputs

The three LEDs indicate the status of each discrete input. The behavior of the LED is pre-configured to be lit when the channel is open or lit when the channel is closed.

> **Note:** Refer to the Discrete Input Mode field on the **Setpoint Source Selection & Control Operation Summary** screen for the functionality associated with each of the 3 LEDs.

Discrete Outputs

The four LEDs indicate the status of each discrete output.

Note: Refer to the **Discrete Output Configuration** screen for the functionality associated with each of the 4 LEDs.

Analog Output

The displayed value is the milliamp current value representing the actuator's actual position.

Set Position

The displayed value is the percent of actuator open position commanded by the selected input type.

Actual Position

The displayed value is the feedback position in percent of full stroke.

Valve Identification

These fields display the valve part number, valve serial number, and valve revision.

Trend Chart

Trend Chart plots the set point and actual position of the RVP-200 valve in real time. The "Start" button is provided on the left-hand corner of the plot to initiate the trend process. Selecting the "Stop" button will cause the trending process to stop.

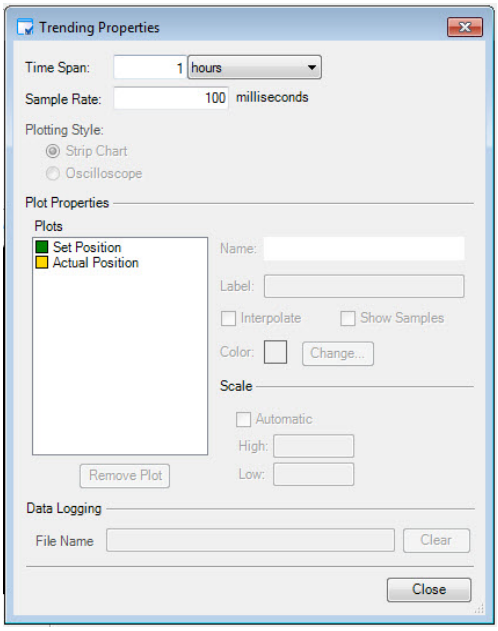

Figure 3-8. Operation Control Status

The trend chart can be modified or configured to meet the user's specific requirements. Pressing the Properties button opens the Trending Properties window (Figure 3-8). From the trend window, the time span and sample rate scaling can be modified.

The labeling and color of the plot elements can also be configured. Activate the label and color properties by placing the cursor on the plot to be changed.

Selecting the “Export” button will prompt to export the data in the trend window to an .htm formatted

Process Fault & Status Overview

The Process Fault & Status Overview screen gives an overview of the entire range of process faults, status flags, and their individual status. A red illuminated LED indicates a process fault condition. A non-illuminated LED indicates a non-error condition for both process and status flag and signals that the RVP-200 is ready for operation (Figure 3-9).

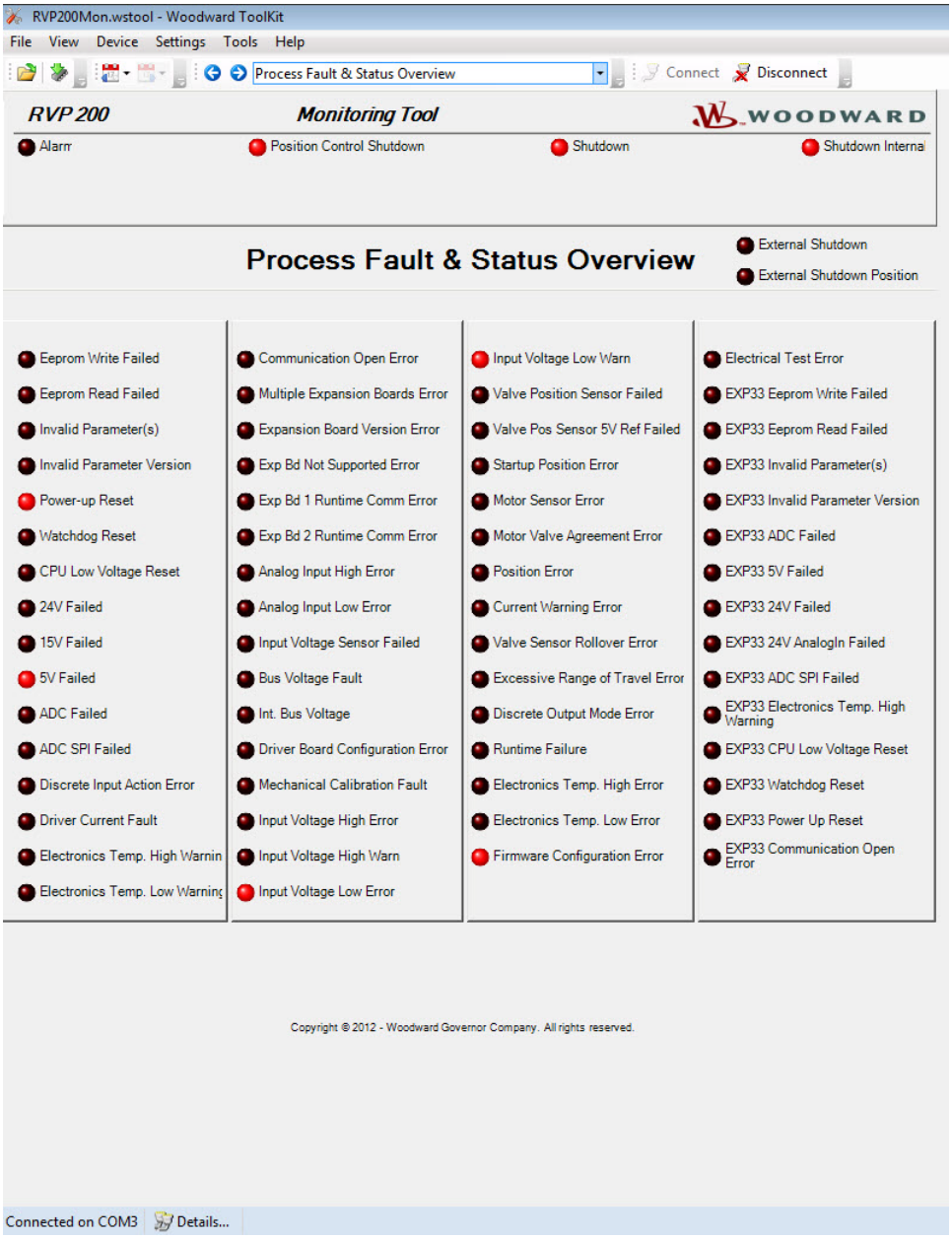

Figure 3-9. Process Fault & Status Overview

Process Fault & Status Configuration Overview 1

This screen provides an overview of the configuration of the process fault and status flags (Figure 3-10). Two LED indicators depict the configuration for each individual process fault or status flag. The flags appear in the same order as on the previous screen.

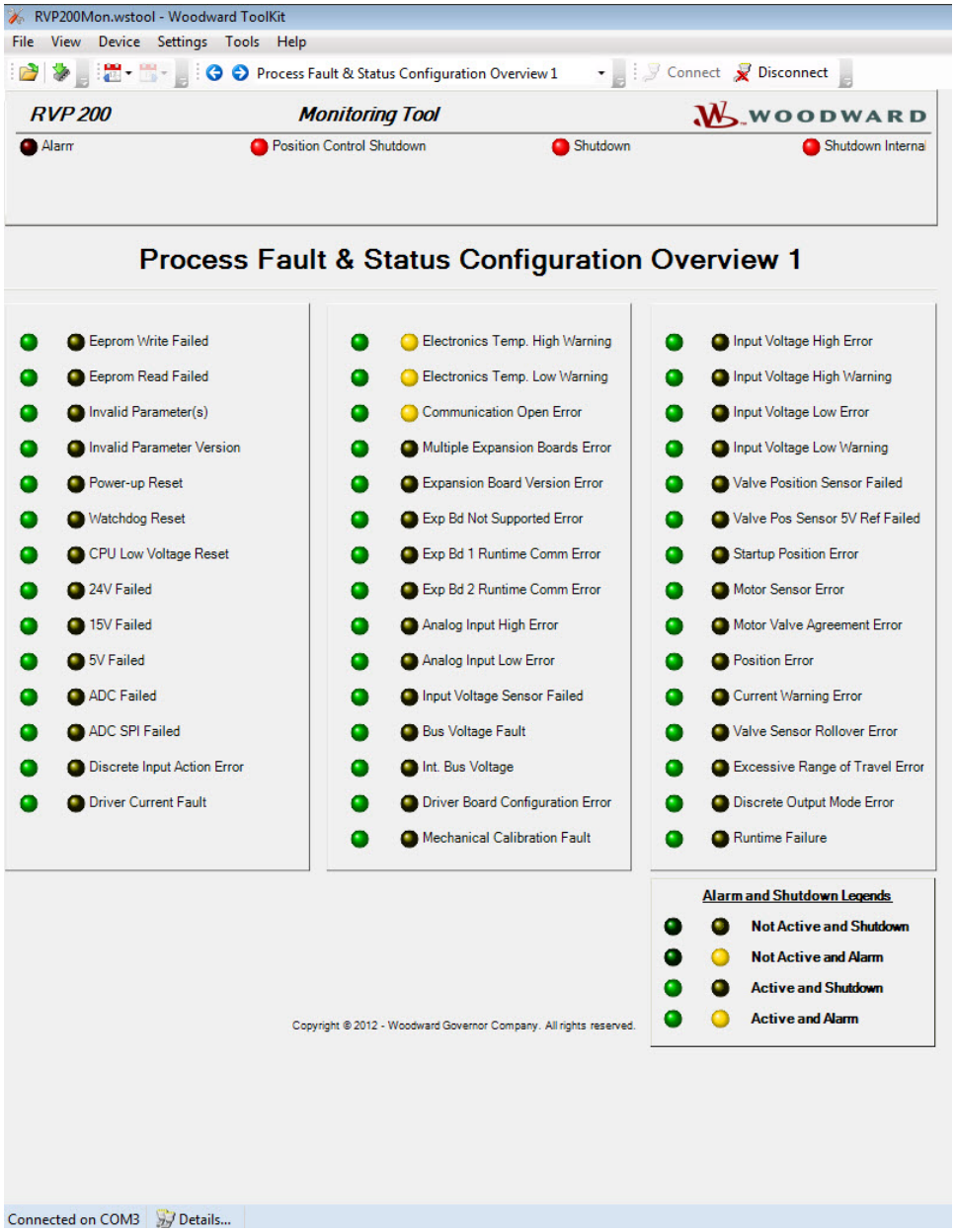

Figure 3-10. Process Fault & Status Configuration Overview 1

The screen shown in Figure 3-10 provides an overview of each process fault's action configuration. The left column indicates the associated process fault's action is Active or Not Active. An illuminated green LED indicates the associated action is Active. A dark non illuminated LED indicates the associated action is Not Active. The right column indicates which action is performed. An illuminated yellow LED indicates the action is Alarm. A dark non illuminated LED indicates the action is Shutdown. The right column only has meaning when the left column is set to Active (Illuminated green LED). Per the Alarm and Shutdown Legends shown in Figure 3-11:

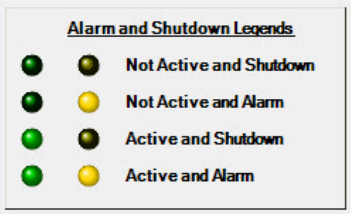

Figure 3-11. Alarm and Shutdown Legends

- Not Active and Shutdown means the detection of the associated process fault's condition will take no action.
- Not Active and Alarm means the detection of the associated process fault's condition will take no action.
- Active and Shutdown means the detection of the associated process fault's condition will set the Shutdown status flag.
- Active and Alarm means the detection of the associated process fault's condition will set the Alarm status flag.

Process Fault & Status Configuration Overview 2

This screen is a continuation of the Process Fault & Status Configuration Overview 1. Two LED indicators depict the configuration of each individual process fault or status flag (Figure 3-12; refer to Process Fault & Status Configuration Overview 1 for more details).

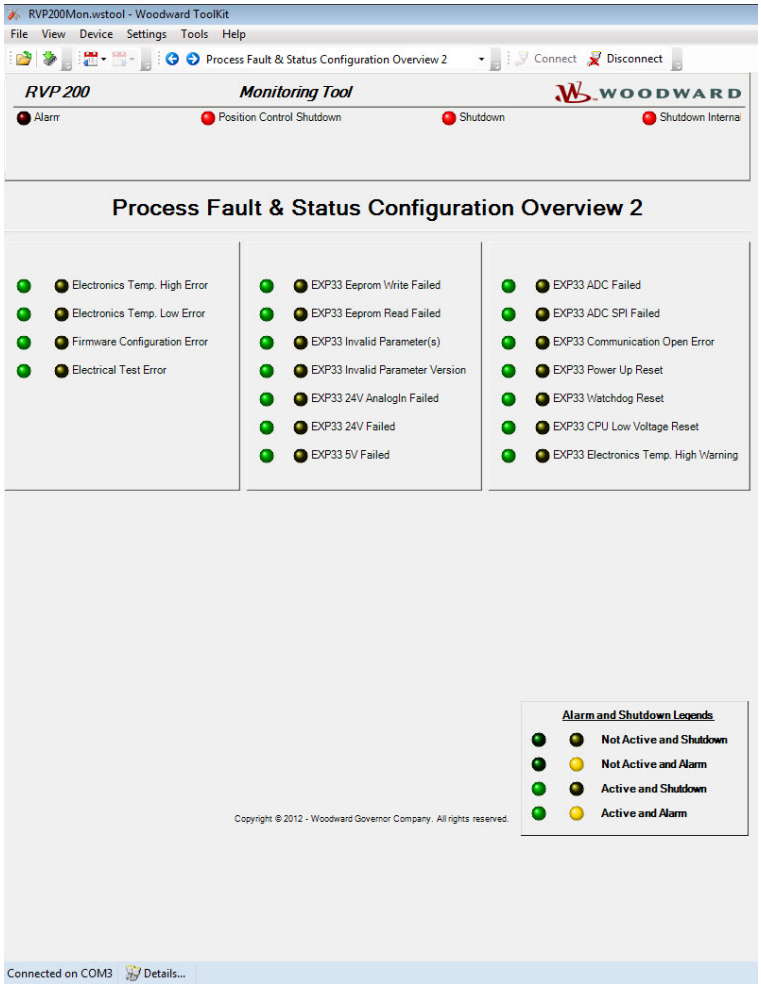

Figure 3-12. Process Fault & Status Configuration Overview 2

Setpoint Source Selection and Control Operation Summary

The Setpoint Source Selection & Control Operation Summary page provides an overview of the selected actuator's demand source, discrete input(s) assignment, current set position values, actuator slew rates, electronics temperature, input voltage, and associated information for the demand source (Figure 3-13).

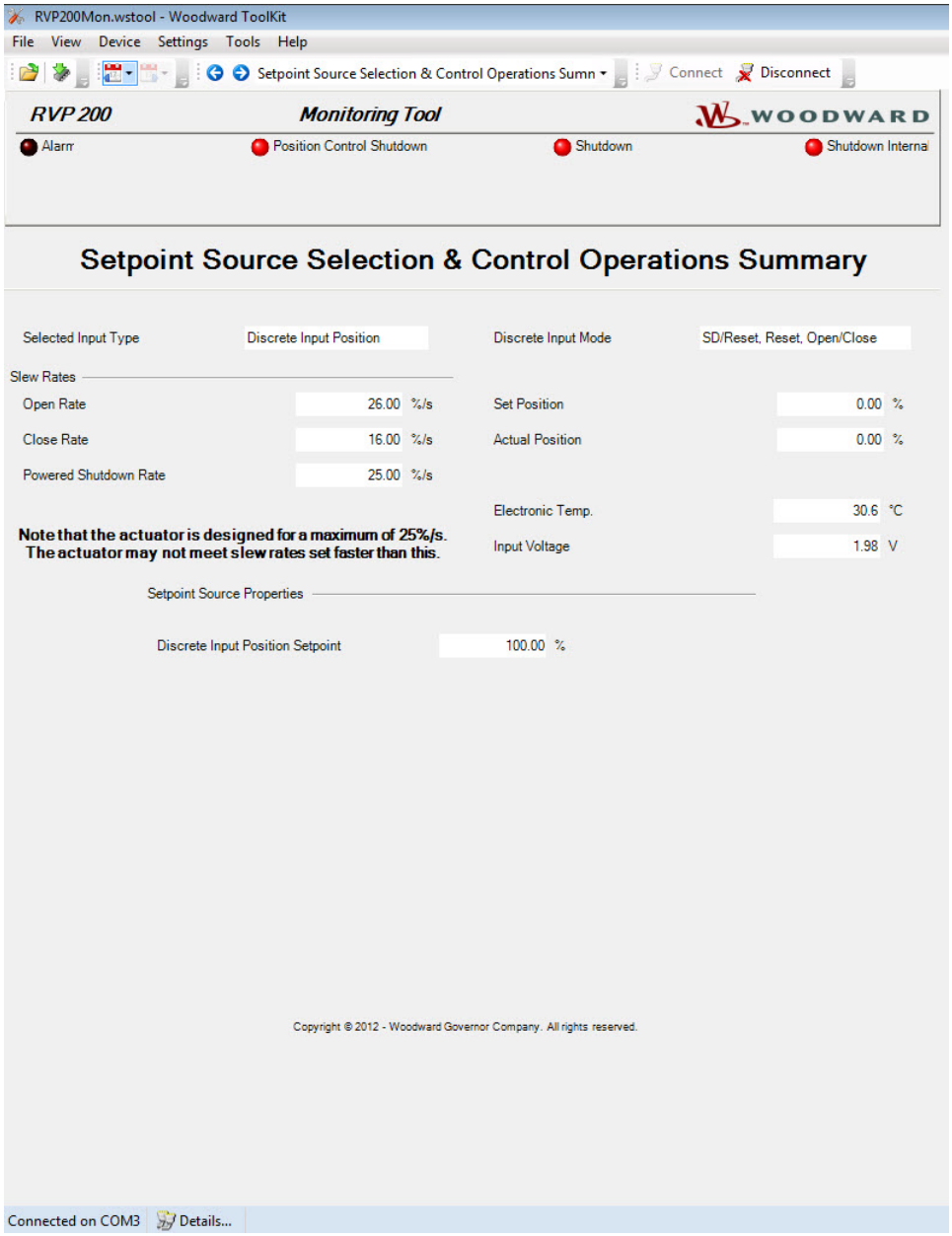

Figure 3-13. Setpoint Source Selection & Control Operation Summary
Discrete Input Position Input Type

Selected Input Type

Indicates the actuator's demand source type. The selected Input Type is factory pre-configured.

- In **Discrete Input** type, the commanded set point demand is input using the discrete input signal(s).
- In **Analog Input** type, the commanded set point demand is input through the analog input signal.

Released

Discrete Input Mode

This field shows the pre-configured functionality associated with each discrete input channel. Input 1, Input 2, and Input 3 correspond to the LEDs on the **Operation Control Status** screen. Available configurations are as follows:

Table 3-1. Operational Control Status Available Configurations

	Input 1	Input 2	Input 3	Function
Mode 0 =	Off	Off	Off	None
Mode 1 =	SD/Reset	Reset	Off	Off
Mode 2 =	SD/Reset	Reset	Open/Close	2-wire Open/Close
Mode 3 =	SD/Reset	Open	Close	4-wire Open/Close
Mode 4 =	Reset	Open	Close	4-wire Open/Close
Mode 5 =	SD/Reset	MOpen	MClose	4-wire Open/Close Modulating
Mode 6 =	Reset	MOpen	MClose	4-wire Open/Close Modulating

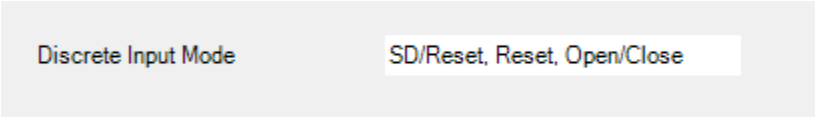

Figure 3-14. Discrete Input Mode 2

Table 3-2. Description of Functions

Input Channel Configuration	Function
SD/Reset	Input is assigned to shutdown the valve (drive it to the failed position) on an internal logic level of True, and reset on an internal falling logic level (True to False transition).
Reset	Input is assigned to reset on internal falling logic level (True to False transition).
OFF	Input is not assigned to a function.
Open/Close	Input is assigned to either Open (100%) or Close (0%) the valve per the internal logic level. A logical True sets the valve position to opposite the fail-safe direction. A logical False sets the valve position to the fail-safe direction.
Open on Input 2 and Close on Input 3	• Input 2 is assigned to command the Discrete Input Set Position to 100% (Open) on a level of True if Input 3 is False. • Input 3 is assigned to command the Discrete Input Set Position to 0% (Close) on a level of True if Input 2 is False. • If both Input 2 and Input 3 are both logic False, this will give a Discrete Input Action Error.
MOpen on Input 2 and MClose on Input 3	• Input 2 is assigned to ramp the Discrete Input Set Position toward 100% (Open) on True if Input 3 is False. • Input 3 is assigned to ramp the Discrete Input Set Position toward 0% (Close) on True if Input 2 is False. • If Input 2 and Input 3 are both True, the ramping will stop at the last value. • If Input 2 and Input 3 are both False, this will give a Discrete Input Action Error.

Slew Rates

The slew rate is the maximum rate of change in the actuator's demand source type. The slew rate is displayed in percentage of movement in 1 second's time. For example, if the Open Rate is set to 25.0% and a discrete input instantaneously commands a change in position demand from 0% position to 100% position, the Slew Open Rate will only allow the actuator to move to the 100% position at the indicated rate.

The 25% Open Rate value means the actuator will take 1 second to move 25% of the distance towards open. From the 0% position, it will take the actuator 4 seconds to reach the 100% position (fully open).

Position Status

The Set Position and Actual Position display the position set point and actual feedback position, respectively. The position is displayed as percent of full actuator opening.

Electronic Temp.

Displays the electronics temperature in Celsius.

Input Voltage

Displays the power source input voltage.

Setpoint Source Properties Display Area

This area displays different fields based on the value of the Selected Input Type field (either Discrete Position or Analog Position).

Selected Input Type = **Discrete Position** (See Fig 3-17)

Discrete Input Position Setpoint

This field contains the position demand value from the selected discrete input(s).

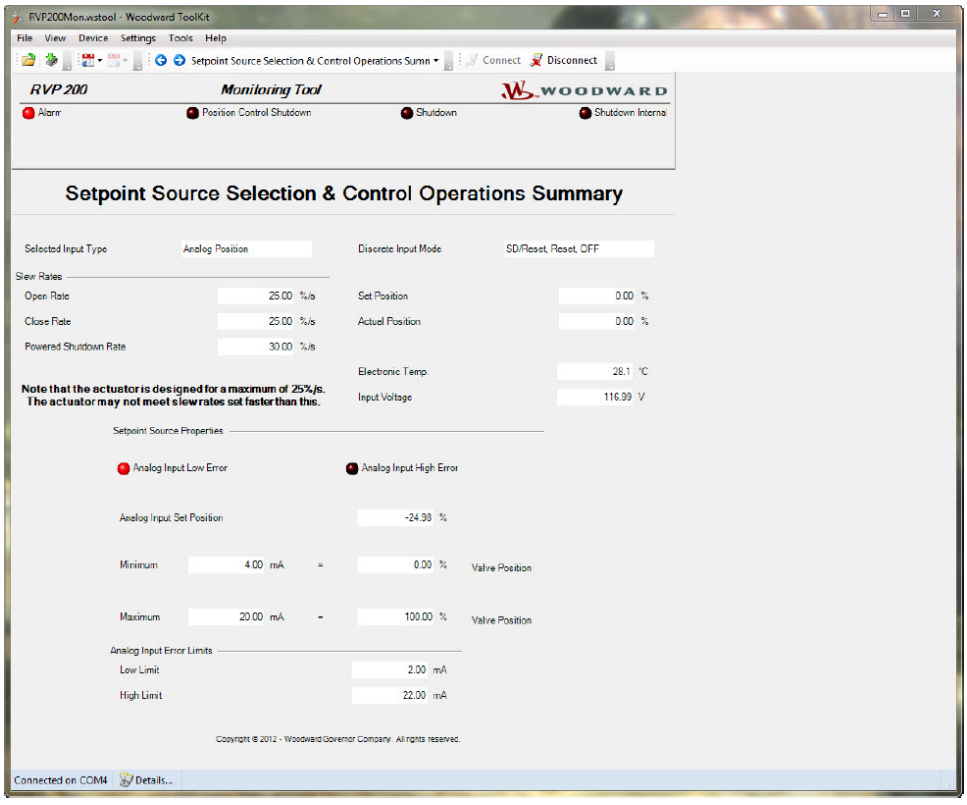

Figure 3-15. Setpoint Source Selection & Control Operation Summary
Analog Input Position Input Type

Selected Input Type = **Analog Position** (See Fig 3-19)

- **Analog Input Low Error LED**
  An illuminated LED indicates the diagnostic detects a fault condition. The analog input value is below the Analog Input Low Limit Error value.

Released

- **Analog Input High Error LED**
  An illuminated LED indicates the diagnostic detects a fault condition. The analog input value is above the Analog Input High Limit Error value.

- **Analog Input Set Position**
  This field contains the position demand value from the analog input, expressed in percent of actuator opening.

- **Minimum / Valve Position**
  These two fields show the preconfigured scaling: the analog input value for the minimum valve position.

- **Maximum / Valve Position**
  These two fields show the preconfigured scaling: the analog input value for the maximum valve position.

- **Analog Input Error Limit**
  The Analog Input Error Limit displays the maximum and minimum input current limitation. The Low Limit Error value is usually set to 2 mA, while the High Limit Error value is usually set to 22 mA.

Released

Temperature Histogram & Valve Cycle Maintenance

The RVP-200 Monitor Service tool captures and stores temperature histogram data indicating the number of hours the RVP-200 has spent within a selected temperature range during its operation. It also indicates when the valve has reached the recommended maintenance service interval (Figure 3-16).

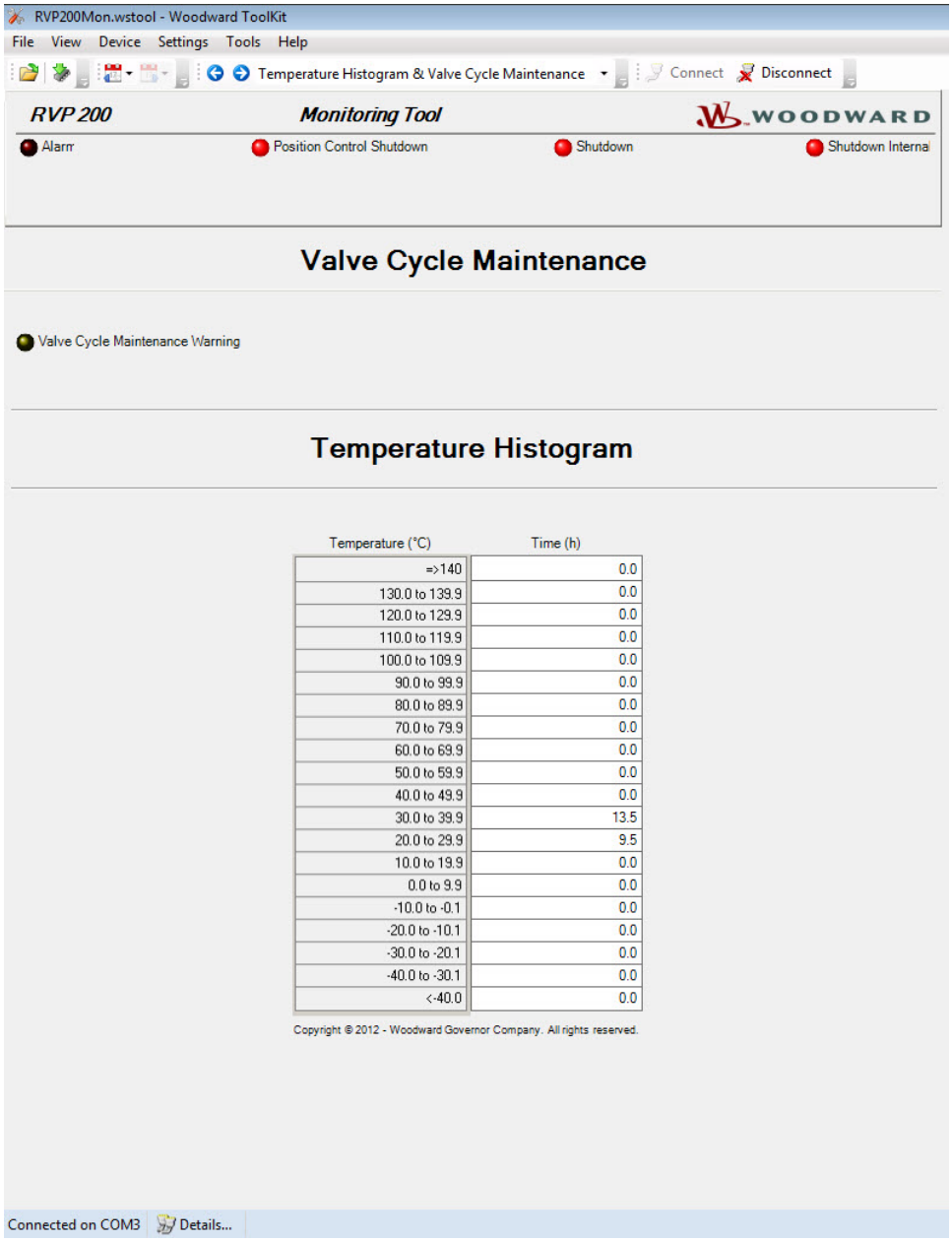

Figure 3-16. Temperature Histogram & Valve Cycle Maintenance

Valve Cycle Maintenance

An illuminated LED indicates the valve has reached or exceeded the recommended operating cycles. The RVP-200 should receive maintenance service (call Woodward for servicing options).

Discrete Output Configuration

The Discrete Output Configuration page shows the configuration and mode of the four available discrete outputs in the RVP-200 (Figure 3-17).

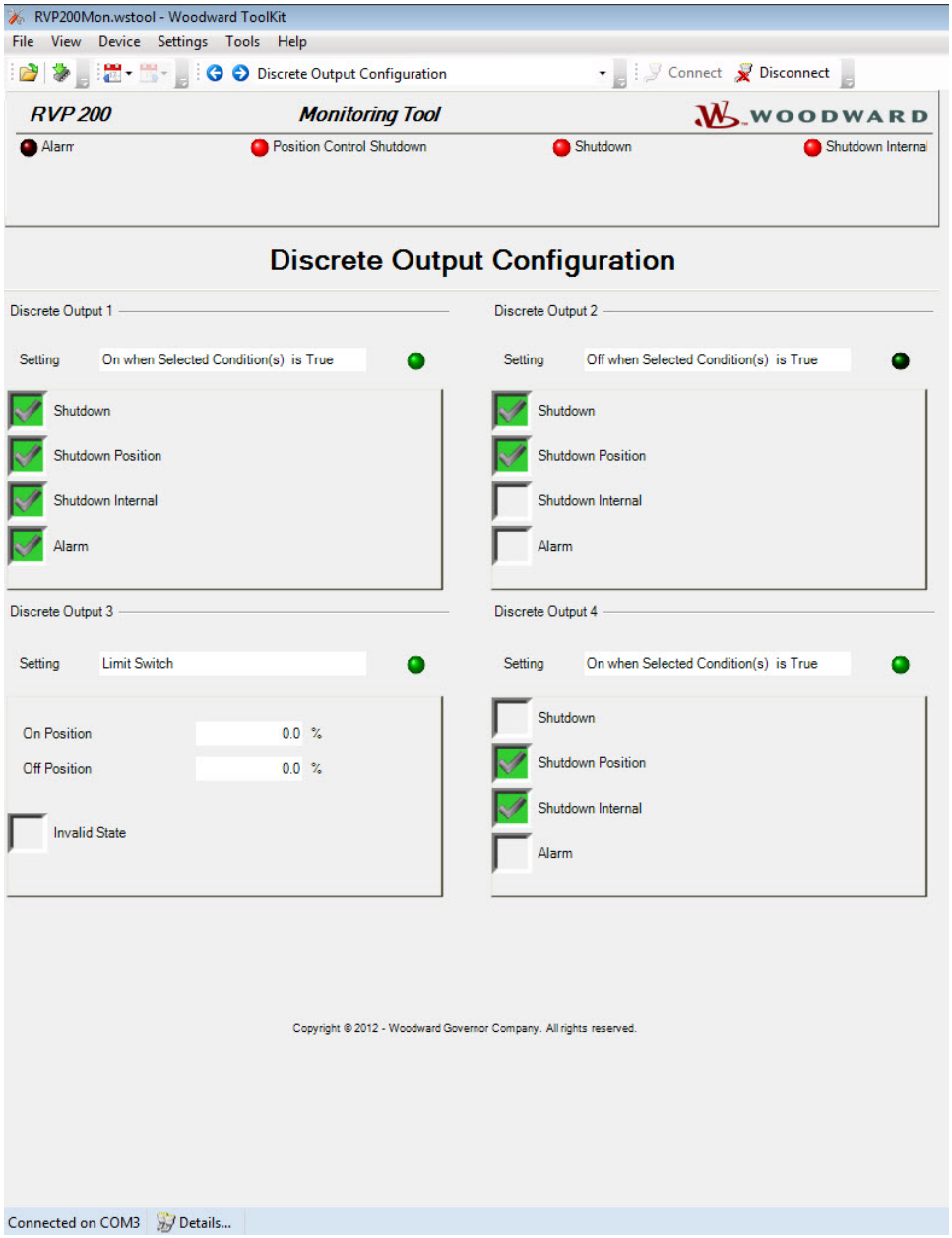

Figure 3-17. Discrete Output Configuration

Discrete Output Setting

DO — This field displays the selected mode for the discrete output channel. There are 5 available modes – see descriptions below.

DO LED — This LED displays the logic level of the discrete output channel per the selected Discrete Output Modes description below.

Released

Discrete Output Modes

1. Discrete Output mode = **OFF**
   Discrete Output will display N/A.

2. Discrete Output mode = **On when Selected Condition(s) is True**
   Discrete Output will display the four possible events (Shutdown, Shutdown Position, Shutdown Internal, Alarm) associated with this mode. A logical **OR** of the checked events (when they are present) will generate a logic level of True, otherwise a logic level of False.

The selectable conditions are Shutdown, Shutdown Position, Shutdown Internal, and Alarm.

- Shutdown occurs when any error event's associated action is configured for shutdown and the event is present or the discrete input logic generates a shutdown.
- Shutdown Position occurs when any severe (electronics capability to position valve is compromised) error event's associated action is configured for shutdown and the event is present.
- Shutdown Internal occurs when any error event's associated action is configured for shutdown and the event is present.
- Alarm occurs when any error event's associated action is configured for alarm and the event is present.

3. Discrete Output mode = **Off when Selected Condition(s) is True**
   Discrete Output will display the possible events (Shutdown, Shutdown Position, Shutdown Internal, Alarm – see above) associated with this mode. A logical **OR** of the selected events (when they are present) will generate a logic level of False, otherwise a logic level of True.

4. Discrete Output mode = **Limit Switch**
   Discrete Output will display the On Position value, Off Position value, and Invalid State event associated with this mode.

   Forward Logic: If the On Position value is greater than or equal to the Off Position, a forward logic limit switch is applied. The forward logic limit switch will set the discrete output to True when the Actual Position is greater than the On Position. When the Actual Position becomes less than the Off Position the discrete output will go False. It will stay False until the Actual Position is greater than the On Position.

   Reverse Logic: If the On Position value is less than or equal to the Off Position, a reverse logic limit switch is applied. The reverse logic limit switch will set the discrete output to True when the Actual Position is less than the On Position. When the Actual Position becomes greater than the Off Position the discrete output will go False. It will stay False until the Actual Position is less than the On Position.

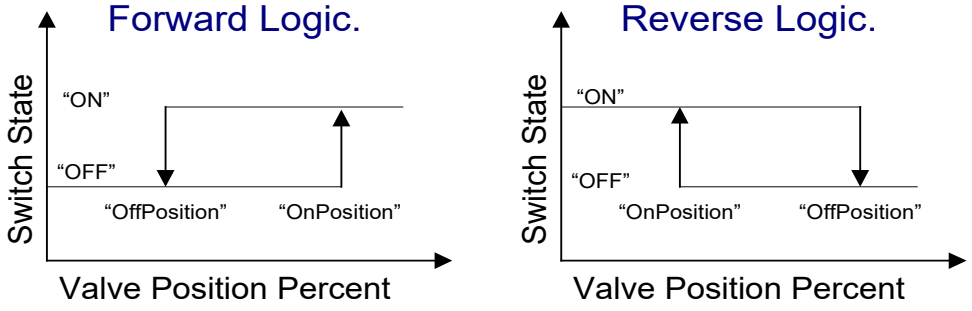

Figure 3-18. Forward and Reverse Logic

With both **Forward Logic** and **Reverse Logic** there is the option for **Invalid State event**. If the Actual Position is found to be invalid due to an internal error, then the discrete output will go True.

5. Discrete Output mode = **Valve Maintenance**
   Discrete Output will display a checked box for Maintenance Indicator. The discrete output will go True when the valve is due for maintenance.

Analog Output Configuration

The Analog Output Configuration page displays the analog output configuration of the RVP-200 (Figure 3-18). Minimum Valve Position field is the milliamps generated on the analog output at the Minimum opening percentage value. The Maximum Valve Position field is the milliamps generated on the analog output at the Maximum opening percentage value.

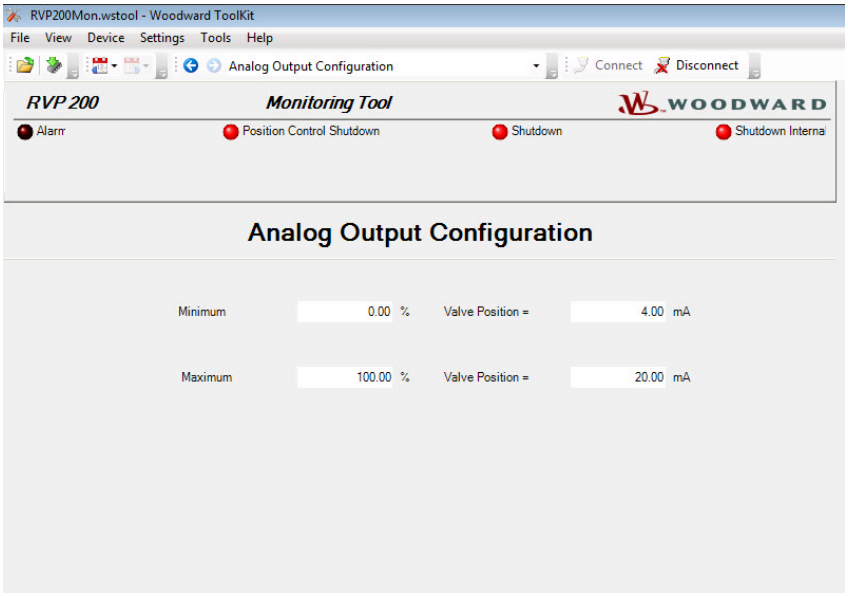

Figure 3-19. Analog Output Configuration

Settings Drop-Down Menu

The RVP-200 Monitor Service Tool allows for monitor only and does NOT have configuration capability.

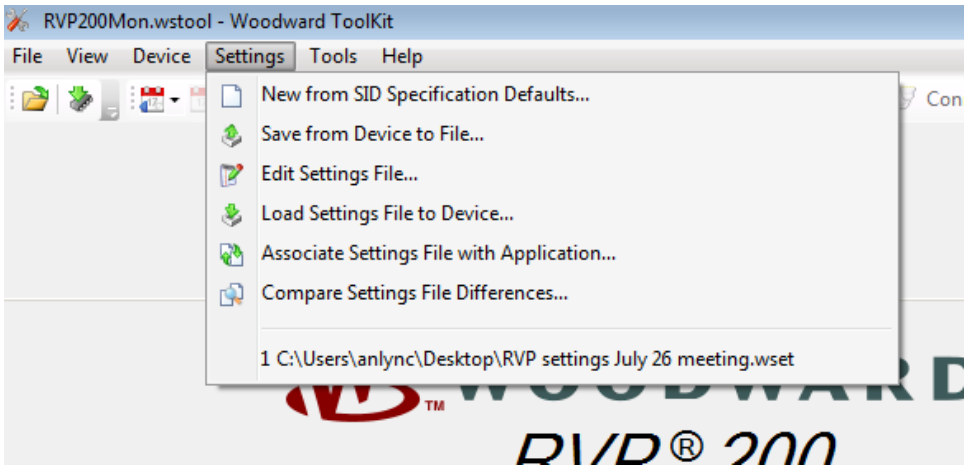

Figure 3-20. ToolKit Settings Menu

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Chapter 4.
Maintenance and Hardware Replacement

Maintenance

Woodward recommends the following maintenance program every 24,000 hours of continuous operation or every 2000 full stroke cycles:

1. Replace the valve disc-sealing element.

Woodward recommends the following maintenance program every 10, 000 full stroke cycles. For these items, the valve must be returned to Woodward:

1. Replace all the valve stem seal components.
2. Replace all the actuator bearings and seals and inspect gears for wear.
3. Re-lubricate the entire actuator/gearbox with new grease.

When proper installation, maintenance, and environmental limitations are observed, the useful life of the RVP is 20 years. The RVP can be refurbished and achieve a product life of up to 30 years.

Hardware Replacement

⚠WARNING

To prevent possible serious personal injury, or damage to equipment, be sure all electric power and gas pressure have been removed from the valve and actuator before beginning any maintenance or repairs.

⚠WARNING

Do not lift or handle the valve by any conduit. Lift or handle the valve only by using the eyebolts.

⚠WARNING

The surface of this product can become hot enough or cold enough to be a hazard. Use protective gear for product handling in these circumstances. Temperature ratings are included in the specification section of this manual.

⚠WARNING

Never place hands inside the valve without ensuring the power is disconnected. When inspecting the valve internally through the flanges for potential blockages, remove the valve from the fuel system and ensure that all power and electrical cables are disconnected.

⚠WARNING

The RVP-200 covers must be replaced and the screws torqued to (3.4 to 4.0) N•m / (30 to 35) lb.-in to prevent moisture or dust ingress following any maintenance, adjustments, or hardware replacement.

To facilitate field replacement of items, spare parts should be kept on-site. See the outline drawings (Figures 1-1 and 1-2) for the locations of items. Contact Woodward for a complete list of field-replaceable parts and additional instructions for their replacement.

In cases of excessive seat leakage one of two actions may be taken: seat adjustment or seat replacement. Seat adjustment may be effective if the seat leakage is slightly above the required amount after a relatively short duration of valve operation. If the valve is leaking immediately or very shortly after installation, the seat is likely damaged and must be replaced.

Released

Replacement of Valve Disc-Sealing Element

Disassembly Procedure

- Use penetrating oil per manufacturer's recommendations on the seat retaining bolt.
- Remove the eight socket head cap screws that retain the driver cover.
- Position valve assembly so that both inlet and outlet are accessible.
- Loosen the screw from the seat plate nut. The screw is located inside the carrier. Some RVP models have both axial and radial sleeve retaining bolts

Note: Bolt can be very difficult to remove due to use at high temperatures. Use an impact driver to initially loosen bolt.

- Command valve open.
- Remove the screws and washers from each of the four holes of the valve housing radially around the outside flange of the sleeve. Command valve shut.
  a. Some RVP models have both axial and radial sleeve retaining bolts
     I. Radial backup jam bolts must be removed; radial dog point retaining bolts must be loosened but do not have to be removed.
     II. Axial retaining bolts and washers must be removed.
- Remove the sleeve and spiral gasket from the inlet bore of the valve housing.
- Command valve shut
- Remove the screw from the seat plate nut. Then remove the seat plate nut and seat plate.

Note: When removing seat plate bolt, hold the nut firmly against the seat plate to prevent shearing the locating pin.

- Clean and inspect all surfaces of the valve housing, carrier, and seals. Remove corrosion and contamination. Only chemical cleaning is allowed. Use isopropanol cleaning fluid.

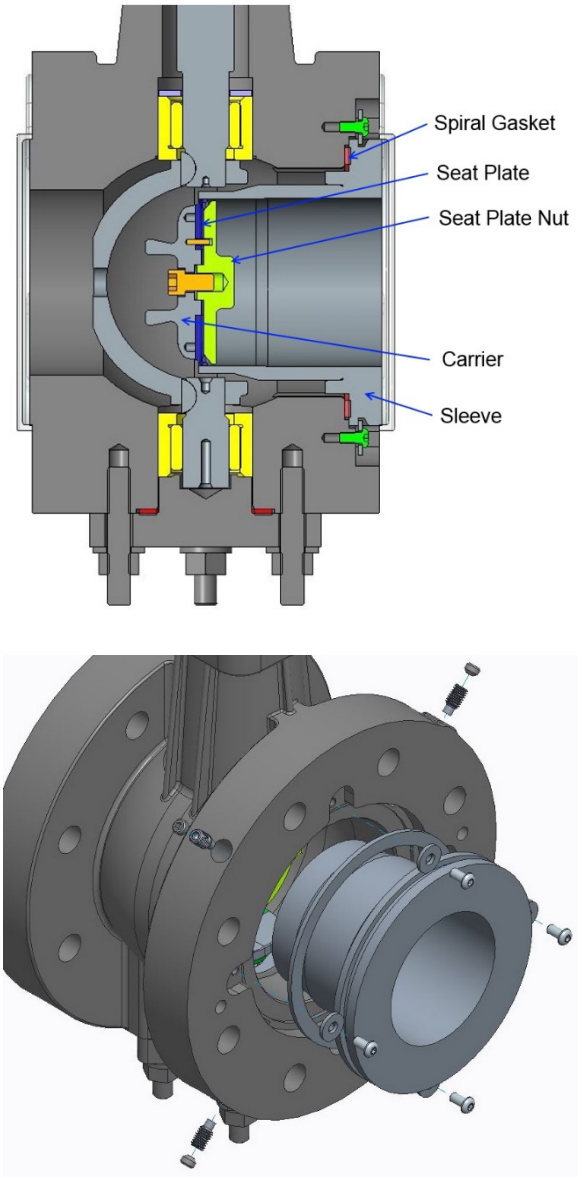

Figure 4-1. Removing the Seat Plate and Sleeve

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Assembly Procedure

- Inventory replacement parts kit to verify all replacement parts listed in the Installation Drawing are present.

Note: Take extra precautions to prevent damage to the serrated flange face

- Install the new seat plate onto the carrier, aligning the small anti-rotation hole in the seat plate with the pin in the carrier.
- Reinstall the seat plate nut onto the carrier with the alignment pin in the bore of the nut.
- Apply NEVER SEEZ - Pure Nickel Special Anti-Seize or equivalent to the threads of screw and install screw through the carrier into the seat plate nut.
- Hand-tighten screw at this step, then loosen 1/8 of a turn. A later step has instruction when to apply torque.
- Orient the seat plate with the lip positioned upwards and align the locating bore in line with the alignment pin and place onto the carrier.

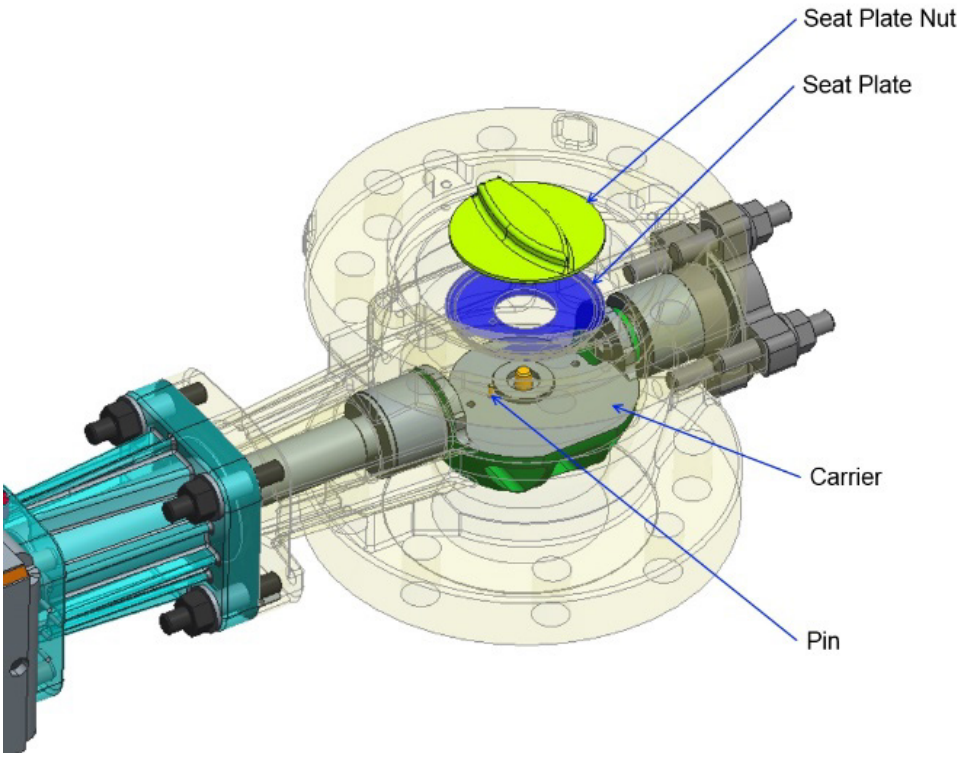

Figure 4-2. Reposition the Valve Assembly, Orient the Seat Plate

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- Reposition the valve assembly to position the inlet bore of the valve housing upwards.

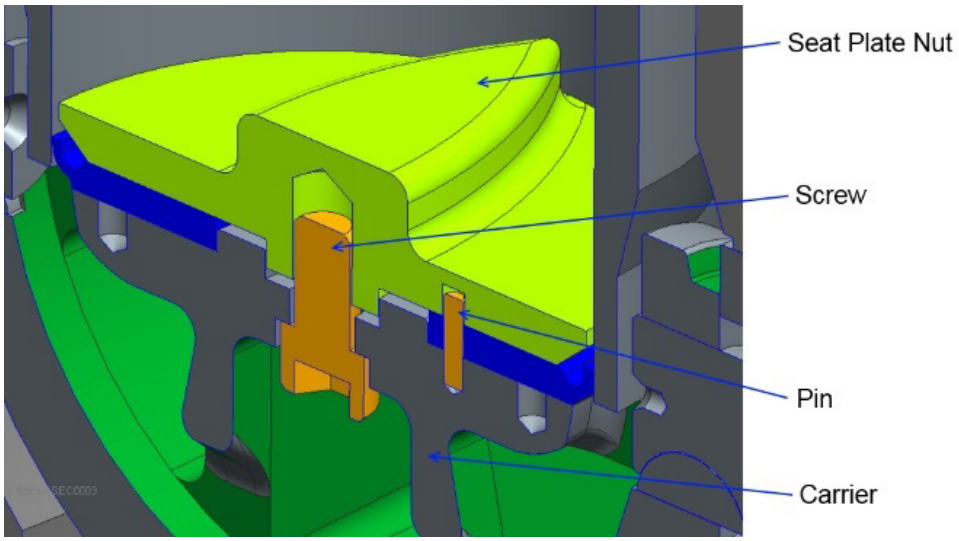

Figure 4-3. Install the Seat Plate and Seat Plate Nut

Command the valve fully open.

- Install the spiral gasket in the counter bore of the inlet flange of the valve housing.
- Install the seal sleeve into the inlet bore of the valve housing and center it lengthwise along the vertical axis of the valve over the seal carrier.

⚠WARNING **The RVP-200 contains a mechanical spring under load. Keep clear.**

NOTICE **Make sure that the valve is in the open position during the sleeve installation.**

- Apply Never-Seez - Pure Nickel Special Anti-Seize lubricant to the threads of four screws. Install one washer and screw into each of the four holes of the valve housing radially around the outside flange of the sleeve. Hand-tighten the screws until they contact the flange of the sleeve and then back off 1/8 of a turn so that the washer moves freely. Ensure the washer is in the groove of the inlet sleeve (Figure 3-6).
- Command the valve closed. This critical step will align the disk and sleeve to each other.

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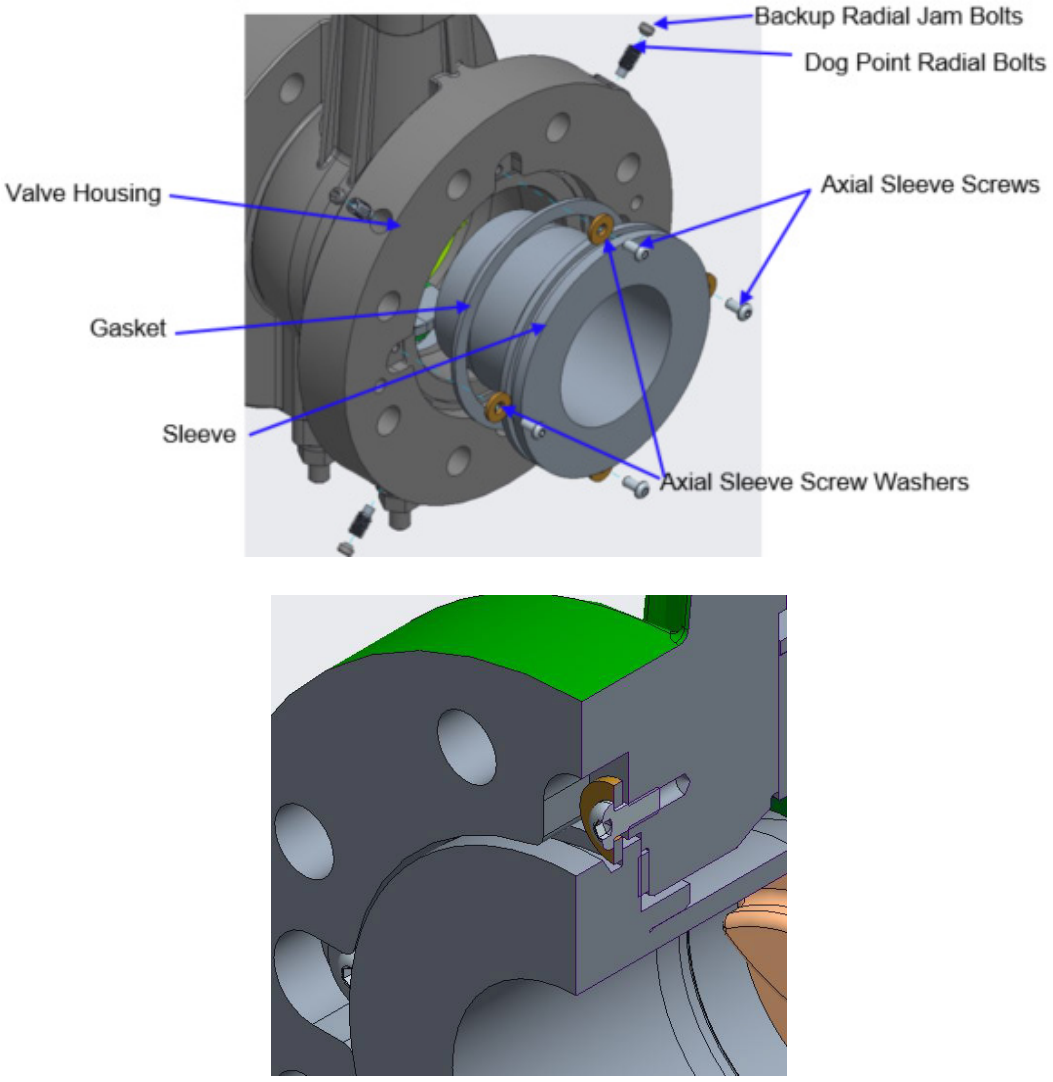

Figure 4-4. Install Spiral Gasket and Sleeve

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- Attach the blind flange gasket crushing tool (see table) to the flange of the valve housing. Torque flange bolts to the torque specification per the valve size being assembled and the torquing sequence starting with the diamond pattern, then the circle pattern, and finishing with the square pattern (see diagrams on the next page).

IMPORTANT **For blind flange tool part numbers, refer to the table in CMM-02004, Section 3.2.**

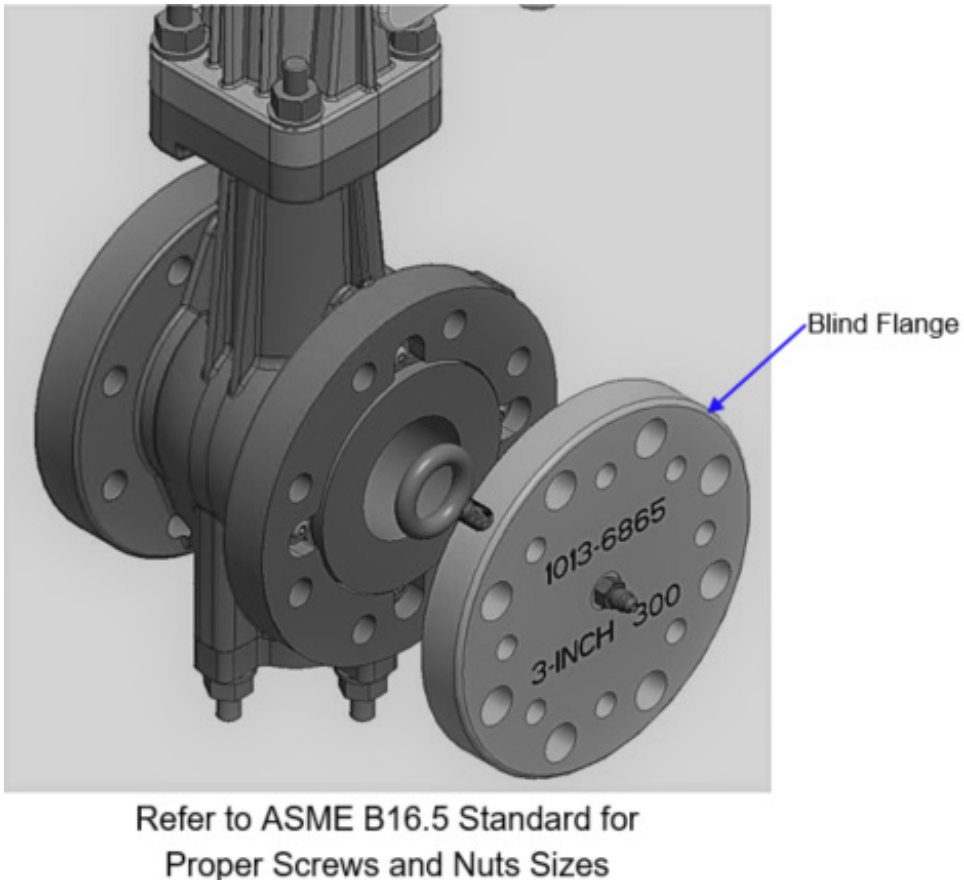

Figure 4-5. Blind Flange Tool

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- Torque the four **sleeve screws** to the appropriate specification per the valve size (see table).

Note: Use small screwdriver or pick to push washers deeper into the groove in the sleeve

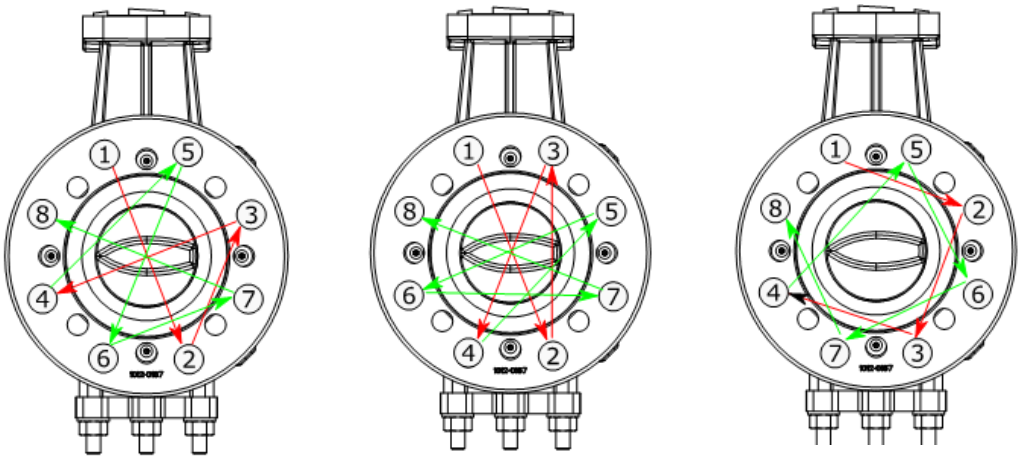
Sleeve Screw Torque Values

Valve Class	Valve Size	Torque Value
300/600	3 inch	70 lb-in ± 5 lb-in
300/600	4 inch	70 lb-in ± 5 lb-in
300/600	6 inch	95 lb-in ± 5 lb- in

Note: Some RVP models have both axial and radial sleeve retaining bolts. Torque the dog point radial sleeve retaining bolts to 17 lb.-ft ±1 lb.-ft. Torque the backup jam bolt to 8.5 lb.-ft ± 0.5 lb.-ft.

THREE AND FOUR INCH FLANGE TORQUING PATTERNS AND VALUES

1. DIAMOND PATTERN 50 LB-FT
2. CIRCLE PATTERN 100 LB-FT
3. SQUARE PATTERN 150 LB-FT



SIX INCH FLANGE TORQUING PATTERNS AND VALUES

1. DIAMOND PATTERN 50 LB-FT
2. CIRCLE PATTERN 100 LB-FT
3. SQUARE PATTERN 150 LB-FT

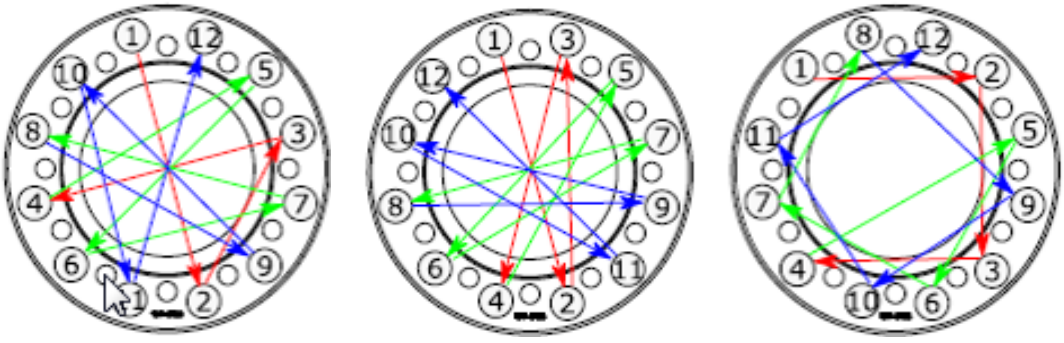


Figure 4-6. Torquing Patterns and Values

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- Torque the **carrier seat plate screw** (see table).

Carrier Seat Plate Screw Torque Values

Valve Class	Valve Size	Tool P/N
300/600	3 inch	125 lb.-in ± 5 lb.-in
300/600	4 inch	29.5 lb.-ft ± 2.5 lb.-ft
300/600	6 inch	75 lb.-ft ± 5 lb.-ft

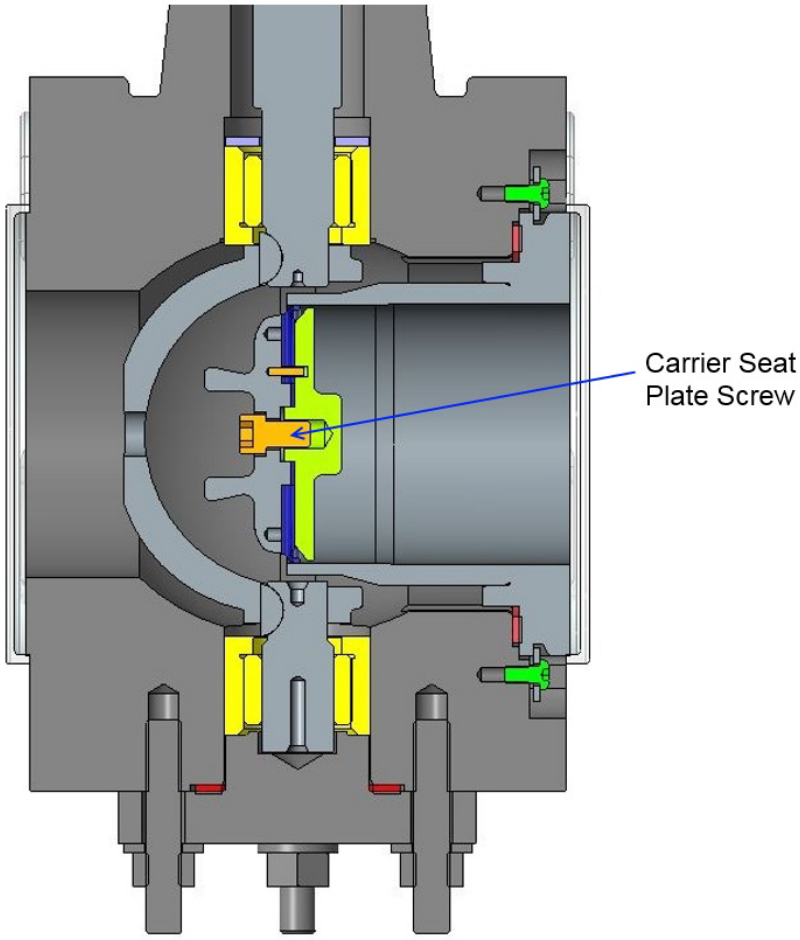

Figure 4-7. Torque the Carrier Seat Plate Screw

Chapter 5. Troubleshooting

Introduction

WARNING

ELECTRICAL SHOCK HAZARD—Follow all local plant and safety instructions/precautions before proceeding with troubleshooting the RVP-200 control.

WARNING

Never place hands inside the valve without ensuring the power is disconnected. When inspecting the valve internally through the flanges for potential blockages, remove the valve from the fuel system and ensure that all power and electrical cables are disconnected.

This chapter addresses several possible causes and recommended actions for many common problems that may be encountered with a system including the RVP-200, its power source, the actuator/valve assembly, and the wiring interconnect between these components.

Monitor Service Tool Start-up Troubleshooting

Monitor Service Tool Does Not Launch

Verify you have downloaded the latest version of ToolKit and RVP-200 Service Tool from the Woodward website www.woodward.com/software or via e-mail. Older versions of ToolKit can cause this error.

Monitor Service Tool Does Not Connect to RVP-200

Attempt the following to correct the issue:

- Disconnect the Service Tool from the RVP-200 by either selecting the disconnect button or using 'Disconnect' from the main tool bar.
- Check the serial connection between the RVP-200 and the PC and make sure the straight-through serial cable is connected correctly on the PC and RVP-200 side.
- Verify the correct COM port is selected.
- In some cases, a USB-RS232 converter will not be compatible, in which case you may need to try a different brand.

Service Tool Cannot Find the Correct SID File

A dialog box similar to the following appears upon trying to connect if the Service Tool cannot find the correct SID file to communicate with the RVP-200.

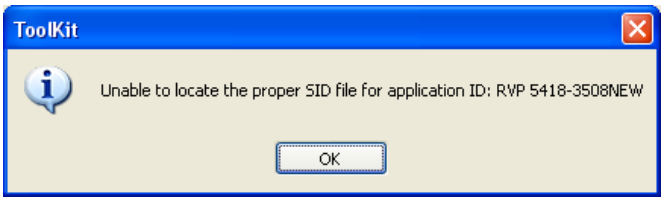

Figure 5-1. Service Tool Unable to Locate SID File

This error indicates that you may be:

- Attempting to connect to the wrong product (not an RVP-200); or
- Attempting to connect to an outdated version of firmware on the RVP-200. In this case, contact Woodward technical support for assistance in firmware upgrade.

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RVP Troubleshooting Guide

The table has been ordered in the sequence of appearance of the diagnostic in the RVP-200 Monitor service tool.

Table 5-1. RVP Troubleshooting Guide

Diagnostic Indications (type of internal shutdown in parenthesis)	Probable Causes	Recommended Action
Table 5-1a. Driver Reset Diagnostics		
Power-up Reset Detection: CPU reset by a power up event.	It is normal for the Power Up Reset diagnostic to occur upon power up of the RVP.	Issue a reset to the RVP using a discrete input.
	If this occurs while the RVP is powered, and the diagnostic is set during a fast position transient, most likely the power infrastructure is not delivering the power needed.	During transient: Check terminal voltage at the RVP during a (0 to 100) % position transient, check wire gauge, fuses, or other resistive components in the power supply system.
Watchdog Reset Detection: CPU reset without a power up event.	It is normal for this to occur after the software is updated.	Issue a reset to the RVP using a discrete input.
	A software lockup occurred.	No customer on-site solution exists. Contact Woodward Technical Support for further assistance.
Table 5-1b. Shutdown Command Diagnostics		
Ext. Shutdown Position	This function is not currently used.	N/A
External Shutdown Detection: Command sent by Digital Signal like: Discrete Input or Service Tool.	It is normal for this to occur when a shutdown has been commanded from an external source. I.E. Service Tool or Discrete Input.	Take away command and reset RVP for normal operation using a discrete input.
	Discrete input wiring problem.	Check for wire continuity, polarity, or continuity on upstream devices.
Table 5-1c. Electronics Internal Diagnostics		
Int. Bus Voltage Detection: The internal bus voltage is above max value or is below min value.	Internal problem with the electronics	No customer on-site solution exists. Contact Woodward Technical Support for further assistance.
Bus Voltage Fault Voltage Detection: The internal bus voltage sensor counts are outside acceptable range.	Internal problem with the electronics	No customer on-site solution exists. Contact Woodward Technical Support for further assistance.

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Driver Current Fault Detection: The Driver fault is detected by monitoring the currents in the driver output stages.	A short exists between phases of the motor or wiring.	Check for phase to phase shorts in the wiring. Check for phase to phase short in the motor.
	A short exists between a phase and the ground (wiring or motor)	Check for phase to ground shorts in the wiring. Check for phase to ground (earth ground, motor housing) short in the motor.
	A short exists between phase and power supply positive (Wiring problem)	Check for phase to power supply positive short in wiring.
	Internal electronics problem.	No customer on-site solution exists. Contact Woodward Technical Support for further assistance.
EEPROM Read Failed Detection: After multiple retries and data comparison the software is not able to read from the non-volatile memory.	Internal electronics failure.	No customer on-site solution exists. Contact Woodward Technical Support for further assistance.
EEPROM Write Failed Detection: After multiple retries and data comparison the software is not able to write to the non-volatile memory.	Internal electronics failure.	No customer on-site solution exists. Contact Woodward Technical Support for further assistance.
Invalid Parameters(s) Detection: CRC16 check failures on both parameter sections.	If a new embedded program has been loaded the parameters have not been updated.	Refer to the embedded software update procedure to update the parameters. Cycle power to restart the RVP.
	Internal electronics failure.	No customer on-site solution exists. Contact Woodward Technical Support for further assistance.
Invalid Parameter Version Detection: Version information is not correct in the non-volatile memory.	Internal electronics failure.	No customer on-site solution exists. Contact Woodward Technical Support for further assistance.

Table 5-1d. Internal Diagnostics

CPU Low Voltage Reset Detection: CPU internal voltage was outside acceptable range. Generate an actuator electronics reset.	Internal electronics failure.	No customer on-site solution exists. Contact Woodward Technical Support for further assistance.
24 V Failed Detection: Internal +24 V is outside acceptable range of 21 V to 26 V.	Internal electronics failure.	No customer on-site solution exists. Contact Woodward Technical Support for further assistance.

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15 V Failed Detection: Internal +15 V is outside acceptable range of 12 V to 18 V.	Internal electronics failure.	No customer on-site solution exists. Contact Woodward Technical Support for further assistance.
5 V Failed Detection: Internal +5 V is outside acceptable range of 4.5 V to 5.5 V.	Internal electronics failure.	No customer on-site solution exists. Contact Woodward Technical Support for further assistance.
ADC Failed Detection: Internal ADC in processor core has stopped running.	Internal electronics failure.	No customer on-site solution exists. Contact Woodward Technical Support for further assistance.

Table 5-1e. Internal Diagnostics

ADC SPI Failed Detection: External ADC has stopped running or ADC reference voltage is outside acceptable range.	Internal electronics failure.	No customer on-site solution exists. Contact Woodward Technical Support for further assistance.
Input Voltage Sensor Failed Detection: The input voltage sensor counts are outside acceptable range.	Internal electronics failure.	No customer on-site solution exists. Contact Woodward Technical Support for further assistance.
Valve Position Sensor Failed Detection: The valve position sensor counts are outside acceptable range.	Internal electronics failure.	No customer on-site solution exists. Contact Woodward Technical Support for further assistance.
Valve Pos Sensor 5 V Ref Failed Detection: The valve position sensor 5 volt reference counts are outside acceptable range.	Internal electronics failure.	No customer on-site solution exists. Contact Woodward Technical Support for further assistance.
Runtime Failure Detection: Firmware branched to an undefined state in a switch statement.	Internal electronics failure.	No customer on-site solution exists. Contact Woodward Technical Support for further assistance.

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Table 5-1f. User Input Signal Diagnostics

Input Voltage High Error Detection: The measured voltage is higher than the specification limit: 150.0 V for AC source and 210.0 V for DC source (for Low Voltage RVP-200 version) 290.0 V for DC source (for High Voltage RVP-200 version)	Power supply and/or setting incorrect for application.	Check input voltage at the RVP-200 power input terminals and correct voltage to within specification limits.
	Excessive charging voltage and/or battery failure.	
	Power supply has problem regulating the voltage at the input terminals during high current transients.	Determine if the power supply is of the correct type to be used with the RVP. See power supply section in this manual.
Input Voltage Low Error Detection: The measured voltage is lower than the specification limit: 45.0 V for AC source and 50.0 V for DC source (for low voltage RVP-200 version) 180.0 V for DC source (for High Voltage RVP-200 version)	Power supply and/or setting incorrect for application.	Check input voltage and correct voltage to within specification limits.
	Excessive charging voltage and/or battery failure.	
	Power supply has problem regulating the voltage at the input terminals during high current transients.	Determine if the power supply is of the correct type to be used with the RVP. See power supply section in this manual.
Input Voltage High Warn Detection: The measured voltage is higher than the specification limit: 145.0 V for AC source and 165.0 V for DC source (for Low Voltage RVP-200 version) 270.0 V for DC source (for High Voltage RVP-200 version)	Power supply and/or setting incorrect for application.	Check input voltage and correct voltage to within specification limits.
	Excessive charging voltage and/or battery failure.	
	Power supply has problem regulating the voltage at the input terminals during high current transients.	Determine if the power supply is of the correct type to be used with the RVP. See power supply section in this manual.
Input Voltage Low Warn Detection: The measured voltage is lower than the specification limit: 75.0 V for AC source and 80.0 V for DC source (for Low Voltage RVP-200 version) 190.0 V for DC source (for High Voltage RVP-200 version)	Power supply and/or setting incorrect for application.	Check input voltage and correct voltage to within specification limits.
	Excessive charging voltage and/or battery failure.	
	Power supply has problem regulating the voltage at the input terminals during high current transients.	Determine if the power supply is of the correct type to be used with the RVP. See power supply section in this manual.

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Table 5-1g. User Input Signal Diagnostics

Items marked with * can only be performed by trained Woodward personnel.

Analog Input Low Error Detection: The analog input is below the diagnostic threshold. This is a user configurable parameter. Typically, 2 mA.	Wiring is disconnected or loose.	Check terminals and connections.
	Control system is turned off.	Check if the control system is turned on and providing the 4 to 20 mA current to the driver.
	Short in wiring to ground, or between the Plus and minus wires.	Check for short between analog input wiring and any other wiring.
	Control system 4 to 20 mA output has failed low.	Check the current in the input to the RVP. Fix control system.
	*Incorrect user configurable parameter in the driver for the min input diagnostic.	*Verify the (4 to 20) mA Diagnostic Range: Low Limit Value using the RVP Service Tool.
	Internal electronics failure.	No customer on-site solution exists. Contact Woodward Technical Support for further assistance.
Analog Input High Error Detection: The analog input is above the diagnostic threshold. This is a user configurable parameter. Typically, 22 mA.	Short in wiring to external voltage.	Check wiring for shorts to positive voltages.
	Control system 4 to 20 mA output has failed high	Check the current to the analog input to the RVP. Fix control system
	*Incorrect user configurable parameter in the driver for the max input diagnostic.	*Verify the (4 to 20) mA Diagnostic Range: High Limit Value using the RVP Service Tool.
	Internal electronics failure.	No customer on-site solution exists. Contact Woodward Technical Support for further assistance.
Discrete Input Action Error Detection: The discrete input firmware logic is getting conflicting logic levels for the open and close discrete input signals.	Wiring is disconnected or loose.	Check terminals and connections.
	Control system is turned off.	Check if the control system is turned on and providing the discrete input signals to the driver.
	Short in wiring to ground, or between the Plus and minus wires.	Check for short between discrete input wiring and any other wiring.
	*Incorrect user configurable parameter in the driver for the discrete input mode.	*Verify the discrete input mode using the RVP Service Tool.
	Internal electronics failure.	No customer on-site solution exists. Contact Woodward Technical Support for further assistance.
Discrete Output Mode Error Detection: The discrete output firmware logic has detected an undefined mode value.	*Incorrect user configurable parameter in the driver for the discrete output mode.	*Verify the discrete output mode using the RVP Service Tool.
	Internal electronics failure.	No customer on-site solution exists. Contact Woodward Technical Support for further assistance.

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Table 5-1h. Electronics Temperature Diagnostics

Electronics Temp. High Warning Detection: The Motor Control Board temperature sensor indicates a temperature above 105 Degrees C.	The ambient temperature of the driver is higher than allowed by specification.	Reduce ambient temperature to within specification limits.
	The Temperature sensor is defective.	No customer on-site solution exists. Contact Woodward Technical Support for further assistance.
Electronics Temp. Low Warning Detection: The Motor Control Board temperature sensor indicates a temperature below -20 Degrees C.	The ambient temperature of the driver is lower than allowed by specification.	Raise ambient temperature to within specification limits.
	The Temperature sensor is defective.	No customer on-site solution exists. Contact Woodward Technical Support for further assistance.
Electronics Temp. High Error Detection: The Motor Control Board temperature sensor indicates a temperature above 150 Degrees C.	The ambient temperature of the driver is higher than allowed by specification.	Reduce ambient temperature to within specification limits.
	The Temperature sensor is defective.	No customer on-site solution exists. Contact Woodward Technical Support for further assistance.
Electronics Temp. Low Error Detection: The Motor Control Board temperature sensor indicates a temperature below -40 Degrees C.	The ambient temperature of the driver is lower than allowed by specification.	Raise ambient temperature to within specification limits.
	The Temperature sensor is defective.	No customer on-site solution exists. Contact Woodward Technical Support for further assistance.

Table 5-1i. Diagnostics

Driver Board Configuration Error Detection: The firmware detected conflicting configuration information.	Firmware expecting EXP33 board, but EXP33 not responding.	Verify correct Hardware configuration.
	Firmware expecting no EXP33 board, but an expansion board is responding.	Verify correct Hardware configuration.
	Internal problem with the electronics.	No customer on-site solution exists. Contact Woodward Technical Support for further assistance.
Firmware Configuration Error Detection: The firmware detected conflicting configuration information.	Analog Input run mode selected, but EXP33 board not configured.	Verify correct firmware configuration.
	EXP33 board communications selected, but no board type configured.	Verify correct firmware configuration.
	Unknown Fail Direction configured.	Contact Woodward Technical Support for further assistance.
	Internal problem with the electronics.	Contact Woodward Technical Support for further assistance.
Mechanical Calibration Fault Detection: Firmware detected missing mechanical calibration values.	Valve not calibrated correctly.	Contact Woodward Technical Support for further assistance.

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Electrical Test Error Detection: Configuration item is not correct in the non-volatile memory.	Internal problem with the electronics.	No customer on-site solution exists. Contact Woodward Technical Support for further assistance.

Table 5-1j. Internal Communication Diagnostics

Communication Open Error Detection: Internal firmware failure.	Internal problem with the electronics.	No customer on-site solution exists. Contact Woodward Technical Support for further assistance.
Multiple Expansion Boards Error Detection: Firmware detected multiple boards.	Internal problem with the electronics.	No customer on-site solution exists. Contact Woodward Technical Support for further assistance.
Expansion Board Not Supported Error Detection: Firmware detected unknown board type.	Internal problem with the electronics.	No customer on-site solution exists. Contact Woodward Technical Support for further assistance.
Expansion Board Version Error Detection: Firmware detected incompatible firmware version.	Internal problem with the electronics.	No customer on-site solution exists. Contact Woodward Technical Support for further assistance.
Exp Bd 1 Runtime Communication Error Detection: Firmware detected unknown board type.	Internal problem with the electronics.	No customer on-site solution exists. Contact Woodward Technical Support for further assistance.
Exp Bd 2 Runtime Communication Error Detection: Firmware detected unknown board type.	Internal problem with the electronics.	No customer on-site solution exists. Contact Woodward Technical Support for further assistance.

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Table 5-1k. Internal Algorithm Diagnostics

Startup Position Error Detection: The internal valve position sensor output is not within the required tolerance of the power-up position established during calibration.	Internal problem with the position sensor or driver electronics. (This is a permissive condition prior to entering run mode.)	Verify no debris or viscous material is causing the valve to stick open off of the valve minimum position.
Motor Sensor Error Detection: The motor position sensor output is invalid.	Internal problem with the motor wiring or electronics.	No customer on-site solution exists. Contact Woodward Technical Support for further assistance.
Motor Valve Agreement Error Detection: A large discrepancy between the motor sensor and the valve sensor.	Internal problem with the motor sensor or valve sensor.	No customer on-site solution exists. Contact Woodward Technical Support for further assistance.
Position Error Detection: The actuator is not following the demand within the configured time tolerance.	The product is sticking, binding or is slow to respond.	Check for debris or port damage. Check for viscous material buildup causing high friction
Current Warning Error Detection: The actuator is requiring more current than normal.	This warning is intended to trigger maintenance before a position error occurs. In the absence of other faults (position error), this is only a warning – a position error will occur if the current required to move continues to increase.	Takes steps to initiate preventive maintenance at next customer availability. Contact Woodward Technical Support for assistance.
Valve Sensor Rollover Error Detection: The position sensor reading crossed the sensor's operational boundary indicating a "rollover" shift.	The position sensor may have shifted or is malfunctioning. This error occurs only during calibration check.	No customer on-site solution exists. Contact Woodward Technical Support for further assistance.
Excessive Range of Travel Error Detection: The valve position sensor cannot differentiate between the max and min stop positions.	This occurs only during calibration.	No customer on-site solution exists. Contact Woodward Technical Support for further assistance.

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Table 5-1l. Internal EXP33 Diagnostics

Most EXP33 errors are the result of internal electronics failure and will require return of the actuator to Woodward.

EXP33 EEPROM Read Failed Detection: After multiple retries and data comparison the software is not able to read from the non-volatile memory.	Internal electronics failure.	No customer on-site solution exists. Contact Woodward Technical Support for further assistance.
EXP33 EEPROM Write Failed Detection: After multiple retries and data comparison the software is not able to write to the non-volatile memory.	Internal electronics failure.	No customer on-site solution exists. Contact Woodward Technical Support for further assistance.
EXP33 Invalid Parameters(s) Detection: CRC16 check failures on both parameter sections.	If a new embedded program has been loaded the parameters have not been updated.	Refer to the embedded software update procedure to update the parameters. Cycle power to restart the RVP.
	Internal electronics failure.	No customer on-site solution exists. Contact Woodward Technical Support for further assistance.
EXP33 Invalid Parameter Version Detection: Version information is not correct in the non-volatile memory.	Internal electronics failure.	No customer on-site solution exists. Contact Woodward Technical Support for further assistance.
EXP33 24 V Analog In Failed Detection: Exp33 +24 V Analog In is outside acceptable range.	Internal electronics failure.	No customer on-site solution exists. Contact Woodward Technical Support for further assistance.
EXP33 24 V Failed Detection: Exp33 +24 V is outside acceptable range.	Internal electronics failure.	No customer on-site solution exists. Contact Woodward Technical Support for further assistance.
EXP33 5 V Failed Detection: Exp33 +5 V is outside acceptable range	Internal electronics failure.	No customer on-site solution exists. Contact Woodward Technical Support for further assistance.
EXP33 ADC Failed Detection: Exp33 internal ADC in processor core has stopped running.	Internal electronics failure.	No customer on-site solution exists. Contact Woodward Technical Support for further assistance.
EXP33 ADC SPI Failed Detection: Exp33 external ADC has stopped running or ADC reference voltage is outside acceptable range.	Internal electronics failure.	No customer on-site solution exists. Contact Woodward Technical Support for further assistance.

Released

EXP33 Communication Open Error Detection: Exp33 Internal firmware failure.	Internal problem with the electronics.	No customer on-site solution exists. Contact Woodward Technical Support for further assistance.
EXP33 Power-up Reset Detection: Exp33 CPU reset by a power up event.	It is normal for the Power Up Reset diagnostic to occur upon power up of the RVP.	Issue a reset to the RVP using a discrete input.
	If this occurs while the RVP is powered, and the diagnostic is set during a fast position transient, most likely the power infrastructure is not delivering the power needed.	During transient: Check terminal voltage at the RVP during a (0 to 100) % position transient, check wire gauge, fuses, or other resistive components in the power supply system.
EXP33 Watchdog Reset (Shutdown) Detection: Exp33 CPU reset without a power up event.	It is normal for this to occur after the software is updated.	Issue a reset to the RVP using a discrete input.
	A software lockup occurred.	No customer on-site solution exists. Contact Woodward Technical Support.
EXP33 CPU Low Voltage Reset Detection: Exp33 CPU internal voltage was outside acceptable range. Generate an actuator electronics reset.	Internal electronics failure.	No customer on-site solution exists. Contact Woodward Technical Support for further assistance.
EXP33 Electronics Temp. High Warning Detection: The Exp33 Board temperature sensor indicates a temperature above 130 Degrees C.	The ambient temperature of the driver is higher than allowed by specification.	Reduce ambient temperature to within specification limits.
	The Temperature sensor is defective.	No customer on-site solution exists. Contact Woodward Technical Support for further assistance.

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Table of Internal Shutdown LED Conditions

- Refer to the **Process Fault & Status Configuration Overview Screens 1 and 2** to see how the condition is configured on your particular RVP-200. Note that conditions can be configured as Alarm or Shutdown.
- When a condition below is configured as a **Shutdown**, it will trigger one of the two LEDs (Position Control Shutdown or Shutdown).
- When a condition below is configured as a **Shutdown**, it will cause a Shutdown Internal LED.
- When a condition below is configured as an **Alarm**, it will not trigger any Shutdown LEDs, but will trigger the Alarm LED.

Table 5-2a. Internal Shutdown LED Conditions

	SD Position LED	Shutdown LED
MAIN_EEP_WRITE_FAIL	x	
MAIN_EEP_READ_FAIL	x	
MAIN_PARAMETER_ERR	x	
MAIN_PARAMETER_VERSION_ERR	x	
POWERUP_RESET		x
WATCHDOG_RESET_ERR	x	
CPU_LOW_VOLTAGE_RESET_ERR	x	
HW_WATCHDOG_ERR	x	
SENSE_SOLENOID_24VOLT_ERR	x	
SENSE_15VOLT_ERR	x	
SENSE_5VOLT_ERR	x	
ADC_10BITS_ERR	x	
SPI_ADC_ERR	x	
DISCRETE_IN_ACTION_ERR		x
DRIVER_CURRENT_FAULT_ERR	x	
ELEC_TEMPERATURE_HIGH_ERR		x
ELEC_TEMPERATURE_LOW_ERR		x
LOCAL_CAN_COMM_OPEN_ERR		x
LOCAL_CAN_MULTIPLE_BOARD_ERR		x
LOCAL_CAN_BOARD_VERSION_ERR		x
LOCAL_CAN_BOARD_NOT_SUPPORTED_ERR		x
EXP33_COMM_ERR		x
COMM_SLOT2_LINK_ERR		x
ANALOG_IN_HIGH_ERR		x
ANALOG_IN_LOW_ERR		x
INPUT_VOLTAGE_FAULT_ERR		x
BUS_VOLTAGE_FAULT_ERR		x
BUS_VOLTAGE_ERR		x
DRVR_PCB_CONFIG_ERR		x
ACTUATOR_NOT_CALIBRATED_ERR	x	
INPUT_VOLTAGE_HIGH_ERR		x
INPUT_VOLTAGE_HIGH_WARN_ERR		x
NPUT_VOLTAGE_LOW_ERR		x
INPUT_VOLTAGE_LOW_WARN_ERR		x
VALVE_POS_FB_FAULT_ERR		x
VALVE_POS_5V_REF_FAULT_ERR		x
STARTUP_POS_ERR	x	
MOTOR_SENSOR_ERR	x	
MOTOR_VALVE_AGREEMENT_ERR	x	
POSITION_ERR	x	

Table 5-2b. Internal Shutdown LED Conditions (continued)

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	SD Position LED	Shutdown LED
CURRENT_WARNING_ERR		x
VALVE_SENSOR_ROLLOVER_ERR		x
EXCESSIVE_RANGE_OF_TRAVEL_ERR		x
DISCRETE_OUT_MODE_ERR	x	
SW_PROCESS_STATE_ERR	x	
ELEC_TEMPERATURE_HIGH_WARN		x
ELEC_TEMPERATURE_LOW_WARN		x
CONFIGURE_ERR	x	
ELECTRICAL_TEST_ERR		x
EXP33_INT_MAIN_EEP_WRITE_FAIL		x
EXP33_INT_MAIN_EEP_READ_FAIL		x
EXP33_INT_MAIN_PARAMETER_ERR		x
EXP33_INT_MAIN_PARAMETER_VERSION_ERR		x
EXP33_INT_SENSE_24VOLT_ANALOGIN_ERR		x
EXP33_INT_SENSE_24VOLT_ERR		x
EXP33_INT_SENSE_5VOLT_ERR		x
EXP33_INT_ADC_10BITS_ERR		x
EXP33_INT_SPI_ADC_ERR		x
EXP33_INT_LOCAL_CAN_COMM_OPEN_ERR		x
EXP33_INT_POWERUP_RESET_ERR		x
EXP33_INT_WATCHDOG_RESET_ERR		x
EXP33_INT_CPU_LOW_VOLT_RESET_ERR		x
EXP33_INT_ELECT_TEMP_HIGH_ERR		x

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Chapter 6.
Product Support and Service Options

Product Support Options

If you are experiencing problems with the installation, or unsatisfactory performance of a Woodward product, the following options are available:

- Consult the troubleshooting guide in the manual.
- Contact the manufacturer or packager of your system.
- Contact the Woodward Full Service Distributor serving your area.
- Contact Woodward technical assistance (see “How to Contact Woodward” later in this chapter) and discuss your problem. In many cases, your problem can be resolved over the phone. If not, you can select which course of action to pursue based on the available services listed in this chapter.

OEM or Packager Support: Many Woodward controls and control devices are installed into the equipment system and programmed by an Original Equipment Manufacturer (OEM) or Equipment Packager at their factory. In some cases, the programming is password-protected by the OEM or packager, and they are the best source for product service and support. Warranty service for Woodward products shipped with an equipment system should also be handled through the OEM or Packager. Please review your equipment system documentation for details.

Woodward Business Partner Support: Woodward works with and supports a global network of independent business partners whose mission is to serve the users of Woodward controls, as described here:

- A **Full Service Distributor** has the primary responsibility for sales, service, system integration solutions, technical desk support, and aftermarket marketing of standard Woodward products within a specific geographic area and market segment.
- An **Authorized Independent Service Facility (AISF)** provides authorized service that includes repairs, repair parts, and warranty service on Woodward's behalf. Service (not new unit sales) is an AISF's primary mission.

A current list of Woodward Business Partners is available at:
https://www.woodward.com/en/support/industrial/service-and-spare-parts/find-a-local-partner

Product Service Options

The following factory options for servicing Woodward products are available through your local Full-Service Distributor or the OEM or Packager of the equipment system, based on the standard Woodward Product and Service Warranty (Woodward North American Terms and Conditions of Sale 5-09-0690) that is in effect at the time the product is originally shipped from Woodward or a service is performed:

- Replacement/Exchange (24-hour service)
- Flat Rate Repair
- Flat Rate Remanufacture

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Replacement/Exchange: Replacement/Exchange is a premium program designed for the user who is in need of immediate service. It allows you to request and receive a like-new replacement unit in minimum time (usually within 24 hours of the request), providing a suitable unit is available at the time of the request, thereby minimizing costly downtime. This is a flat-rate program and includes the full standard Woodward product warranty (Woodward North American Terms and Conditions of Sale 5-09-0690).

This option allows you to call your Full-Service Distributor in the event of an unexpected outage, or in advance of a scheduled outage, to request a replacement control unit. If the unit is available at the time of the call, it can usually be shipped out within 24 hours. You replace your field control unit with the like-new replacement and return the field unit to the Full-Service Distributor.

Charges for the Replacement/Exchange service are based on a flat rate plus shipping expenses. You are invoiced the flat rate replacement/exchange charge plus a core charge at the time the replacement unit is shipped. If the core (field unit) is returned within 60 days, a credit for the core charge will be issued.

Flat Rate Repair: Flat Rate Repair is available for the majority of standard products in the field. This program offers you repair service for your products with the advantage of knowing in advance what the cost will be. All repair work carries the standard Woodward service warranty (Woodward North American Terms and Conditions of Sale 5-09-0690) on replaced parts and labor.

Flat Rate Remanufacture: Flat Rate Remanufacture is very similar to the Flat Rate Repair option with the exception that the unit will be returned to you in “like-new” condition and carry with it the full standard Woodward product warranty (Woodward North American Terms and Conditions of Sale 5-09-0690). This option is applicable to mechanical products only.

Returning Equipment for Repair

If a control (or any part of an electronic control) is to be returned for repair, please contact your Full-Service Distributor in advance to obtain Return Authorization and shipping instructions.

When shipping the item(s), attach a tag with the following information:

- Return authorization number
- Name and location where the control is installed
- Name and phone number of contact person
- Complete Woodward part number(s) and serial number(s)
- Description of the problem
- Instructions describing the desired type of repair

Packing a Control

Use the following materials when returning a complete control:

- Protective caps on any connectors
- Antistatic protective bags on all electronic modules
- Packing materials that will not damage the surface of the unit
- At least 100 mm (4 inches) of tightly packed, industry-approved packing material
- A packing carton with double walls
- A strong tape around the outside of the carton for increased strength

NOTICE

To prevent damage to electronic components caused by improper handling, read and observe the precautions in Woodward manual 82715, *Guide for Handling and Protection of Electronic Controls, Printed Circuit Boards, and Modules*.

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Replacement Parts

When ordering replacement parts for controls, include the following information:

- The part number(s) (XXXX-XXXX) that is on the enclosure nameplate
- The unit serial number, which is also on the nameplate

Engineering Services

Woodward offers various Engineering Services for our products. For these services, you can contact us by telephone, by email, or through the Woodward website.

- Technical Support
- Product Training
- Field Service

Technical Support is available from your equipment system supplier, your local Full-Service Distributor, or from many of Woodward's worldwide locations, depending upon the product and application. This service can assist you with technical questions or problem solving during the normal business hours of the Woodward location you contact. Emergency assistance is also available during non-business hours by phoning Woodward and stating the urgency of your problem.

Product Training is available as standard classes at many of our worldwide locations. We also offer customized classes, which can be tailored to your needs and can be held at one of our locations or at your site. This training, conducted by experienced personnel, will assure that you will be able to maintain system reliability and availability.

Field Service engineering on-site support is available, depending on the product and location, from many of our worldwide locations or from one of our Full-Service Distributors. The field engineers are experienced both on Woodward products as well as on much of the non-Woodward equipment with which our products interface.

For information on these services, please contact one of the Full-Service Distributors listed at **https://www.woodward.com/en/support/industrial/service-and-spare-parts/find-a-local-partner**

Contacting Woodward's Support Organization

For the name of your nearest Woodward Full-Service Distributor or service facility, please consult our worldwide directory at **https://www.woodward.com/support**, which also contains the most current product support and contact information.

You can also contact the Woodward Customer Service Department at one of the following Woodward facilities to obtain the address and phone number of the nearest facility at which you can obtain information and service.

Products Used in Electrical Power Systems

Facility	Phone Number
Brazil	+55 (19) 3708 4800
China	+86 (512) 8818 5515
Germany	+49 (711) 78954-510
India	+91 (124) 4399500
Japan	+81 (43) 213-2191
Korea	+82 (51) 636-7080
Poland	+48 (12) 295 13 00
United States	+1 (970) 482-5811

Products Used in Engine Systems

Facility	Phone Number
Brazil	+55 (19) 3708 4800
China	+86 (512) 8818 5515
Germany	+49 (711) 78954-510
India	+91 (124) 4399500
Japan	+81 (43) 213-2191
Korea	+82 (51) 636-7080
The Netherlands	+31 (23) 5661111
United States	+1 (970) 482-5811

Products Used in Industrial Turbomachinery Systems

Facility	Phone Number
Brazil	+55 (19) 3708 4800
China	+86 (512) 8818 5515
India	+91 (124) 4399500
Japan	+81 (43) 213-2191
Korea	+ 82 (51) 636-7080
The Netherlands	+31 (23) 5661111
Poland	+48 (12) 295 13 00
United States	+1 (970) 482-5811

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Technical Assistance

If you need to contact technical assistance, you will need to provide the following information. Please write it down here before contacting the Engine OEM, the Packager, a Woodward Business Partner, or the Woodward factory:

General

Your Name _____

Site Location _____

Phone Number _____

Fax Number

Prime Mover Information

Manufacturer _____

Turbine Model Number _____

Type of Fuel (gas, steam, etc.) _____

Power Output Rating _____

Application (power generation, marine, etc.) _____

Control/Governor Information

Control/Governor #1

Woodward Part Number & Rev. Letter _____

Control Description or Governor Type _____

Serial Number

Control/Governor #2

Woodward Part Number & Rev. Letter _____

Control Description or Governor Type _____

Serial Number

Control/Governor #3

Woodward Part Number & Rev. Letter _____

Control Description or Governor Type _____

Serial Number

Symptoms

Description _____

_____

If you have an electronic or programmable control, please have the adjustment setting positions or the menu settings written down and with you at the time of the call.

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RVP-200 Specifications

Electrical Specifications

Table S-1. Power Input

Specification	Low Voltage RVP-200	High Voltage RVP-200
Voltage	90–150 Vdc, 1.7 A 85–132 Vac, 4.3 A	198–264 Vdc, 1.1 A
Frequency (only AC)	47–63 Hz	NA

Discrete Inputs
- Number of Channels: 3
- Operating Voltage Range: (18 to 150) Vdc
- Threshold Voltage:
  - Low State: < 4 V
  - High State: > 12 V
- Input Current: 5 mA
- Response Time: 100 ms including software contact debounce filter
- Isolation: 1500 Vac from input power, 500 Vac from earth ground

Discrete Outputs
- Number of Channels: 3
- Operating Voltage Range: (18 to 150) Vdc
- Maximum Load Current: 500 mA
- Short-Circuit Protection
  - Fold-back current limited
  - Non latching
- Response Time: Less than 2 ms
- On-state Saturation Voltage: less than 1.5 V @ 500 mA
- Off-state Leakage Current: less than 10 µA @ 125 V
- Isolation: 1500 Vac from input power, 500 Vac from earth ground

Discrete On-board I/O Power (24 V)
- Isolated 24 V power is provided to power the Discrete Inputs and Discrete Outputs.
- Power Terminals: 5
- Power Return Terminals: 2
- Maximum Current: 200 mA

Analog Input (4 mA to 20 mA)
- Number of Channels: 3
- Current Range: 2 mA to 22 mA (powered by external source)
- Max. temperature Drift: ±200 ppm/°C
- Calibrated Accuracy: ±0.1 % of span (16 mA)
- Common Mode Voltage: ±100 V
- Common Mode Rejection Ratio: –70 dB @ 500 Hz
- Isolation: 1500 Vac from input power, 500 Vac from earth ground

Analog Output (4 mA to 20 mA)
- Number of Channels: 3
- Calibrated Accuracy: ±0.25 % of span (16 mA)
- Current Range: 2 mA to 22 mA (powered by RVP-200 Driver)
- Load Range: 0 Ω up to 500 Ω
- Maximum Temperature Drift: ±300 ppm/°C
- Isolation: 1500 Vac from input power, 500 Vac from earth ground

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RS-232 Service Port

- Speed: 38.4 k bits/sec
- Cable: 9-pin straight-through serial cable (shielded)
- Connector: DB9
- Ground: connector shell is ac coupled to RVP earth ground
- Isolation: 1500 Vac from input power, 500 Vac from earth ground

Environmental Specifications

- Ambient Operating Temperature: (–29 to +82) °C / (–20 to +180) °F
- Humidity:95 % non-condensing
- Mechanical Vibration:Woodward Specification RV5 (0.04 G²/Hz, 10 Hz to 500 Hz, 2 hours/axis, 1.04 Grms)
- Mechanical Shock:Woodward Specification MS2 (30 G, 11 ms Half Sine Pulse)
- EMI/RFI Specification:EN61000-6-2: Immunity for Industrial Environments
- EN61000-6-4: Emissions for Industrial Environments
- Woodward imposed requirements: Conducted Low Frequency Immunity, 50 Hz to 10 kHz
- Ingress Protection:IP56

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Revision History

Changes in Revision AC—
- Replaced EU DoC

Changes in Revision AB—
- Removed CE line from Pressure Equipment Directive (Valve Portion) in Regulatory Compliance section.
- Updated EU DoC

Changes in Revision AA—
- Revisions and additions to the Regulatory Compliance section

Changes in Revision Y—
- Added Preservation and Storage Section to Chapter 2
- Added a statement to the Maintenance Section in Chapter 4
- Updated EU Declaration of Conformity
- Updated Declaration of Incorporation

Changes in Revision W—
- Revised the PED in the Regulatory Compliance Section
- Removed EAC Customs Union
- Replaced content in Replacement of Valve Disc-Sealing Element section in Chapter 4
- Replaced the Declarations

Changes in Revision V—
- Revised the following Directives and Compliance in the Regulatory Compliance Section
  - ATEX – Potentially Explosive Atmospheres Directive
  - ATEX Directive
  - IECEx International Compliance
- Replaced the Declarations

Changes in Revision U—
- Updated the Pressure Equipment Directive in Regulatory Compliance section
- Added RoHS Directive to Regulatory Compliance section
- Deleted 203 mm row from Table 2-1
- Deleted 8 in row from Table 2-2
- Deleted 203 mm row from Table 2-3
- Deleted 8 in row from Table 2-4
- Inserted size and class specific bolt tightening patterns in pages 41 – 47
- Edited Step 21 on Page 79
- Added Figures 4-1 and 4-2
- Added Step 22 on Page 79
- Replaced DoC

Changes in Revision T—
- Added note and Step 6 to eight and 12 bolt tightening sequences in Chapter 2
- Edits to and new content in Table 2-6
- New Notice Box Content on pg. 49 of Chapter 2
- New content and Replacement of Valve Disc-Sealing Element procedure added to Chapter 4
- Updated PED certification in Regulatory and Compliance section
- Replace EU Declaration of Conformity.

Changes in Revision P—
- Added note and Step 6 to eight and 12 bolt tightening sequences in Chapter 2
- Edits to and new content in Table 2-6

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- New Notice Box Content on pg. 48 of Chapter 2

Changes in Revision N—
- Added two notes to Table 1-1 and references to the notes within Table 1-1

Changes in Revision M—
- Updated Captions for Figures 1-2g, 1-2h, 1-2i, 1-2j, 1-2k, and 1-2l
- Added Figure 1-2m, 1-2n, 1-2o, 1-2p, 1-2q

Changes in Revision L—
- Updated Certifications
- Replaced DOC/DOI

Changes in Revision K—
- Updated Max differential pressures for Class 300 and Class 600 in Table 1-1

Changes in Revision J—
- Added Figure 1-2b and 1-2h for IECEx marked values
- Added Figure 2-6
- Added sections in Chapter 2 (Installation) that describe the Wiring Installation and Limit Switch Access

Changes in Revision H—
- Updated Electrical I/O Power Input Table to reflect actual valve requirements

Changes in Revision G—
- Updated Open/Close verbiage in Description of Functions Table to match intent of open/close operation

Changes in Revision F—
- Updated Compliance information

Changes in Revision E—
- Updated Compliance information
- Updated technical data relative to new part number

Changes in Revision D—
- Added Figures 1-1f through 1-1j for new part number 9909-247

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Declarations

EU DECLARATION OF CONFORMITY

EU DoC No.:	00368-04-EU-02-01
Manufacturer's Name:	WOODWARD INC.
Manufacturer's Contact Address:	1041 Woodward Way Fort Collins, CO 80524 USA
Model Name(s)/Number(s):	RVP-200 Valves with integral actuators, Valve sizes 3", 4", 6".
The object of the declaration described above is in conformity with the following relevant Union harmonization legislation:	Directive 2014/34/EU on the harmonisation of the laws of the Member States relating to equipment and protective systems intended for use in potentially explosive atmospheres Directive 2014/68/EU on the harmonisation of the laws of the Member States relating to the making available on the market of pressure equipment 3", 4": PED Category II 6": PED Category III Directive 2014/30/EU of the European Parliament and of the Council of 26 February 2014 on the harmonization of the laws of the Member States relating to electromagnetic compatibility (EMC)
Markings in addition to CE marking:	Ex Category 3 Group II G, Ex nA nC IIC T4 Gc
Applicable Standards:	EN 61000-6-4, 2007/A1:2011: EMC Part 6-4: Generic Standards - Emissions for Industrial Environments EN 61000-6-2, 2005: EMC Part 6-2: Generic Standards - Immunity for Industrial Environments ASME B16.34, 2013 Valves – Flanged, Threaded, and Welding End ASME Boiler and Pressure Vessel Code VIII, Div. 2, 2010 EN 60079-15:2010 Electrical apparatus for explosive gas atmospheres – Part 15: Construction, test, and marking of type of protection 'n' EN IEC 60079-0:2018 Explosive atmospheres-Part 0 : Equipment – General Requirements
Conformity Assessment:	PED Module H – Full Quality Assurance CE-0062-PED-H-WDI 001-25-USA-rev-A Bureau Veritas SAS (0062) 4 Place des Saisons, 92400 COURBEVOIE, FRANCE

This declaration of conformity is issued under the sole responsibility of the manufacturer
We, the undersigned, hereby declare that the equipment specified above conforms to the above Directive(s).

MANUFACTURER

Signature	Annette Lynch
Full Name	**Annette Lynch**
Position	**Engineering Manager**
Place	**Woodward, Inc., Fort Collins, CO, USA**
Date	14 April 2025

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DECLARATION OF INCORPORATION
Of Partly Completed Machinery
2006/42/EC

File name:	00368-04-EU-02-02
Manufacturer's Name:	WOODWARD INC.
Contact Address:	1041 Woodward Way Fort Collins, CO 80524 USA
Model Names:	RVP-200 Valves with integral actuators, Valve sizes 3, 4, and 6 inch.
This product complies, where applicable, with the following Essential Requirements of Annex I:	1.1, 1.2, 1.3, 1.5, 1.6, 1.7

The relevant technical documentation is compiled in accordance with part B of Annex VII. Woodward shall transmit relevant information if required by a reasoned request by the national authorities. The method of transmittal shall be agreed upon by the applicable parties.

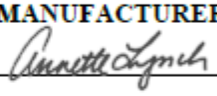
The person authorized to compile the technical documentation:

Name: Dominik Kania, Managing Director
Address: Woodward Poland Sp. z o.o., ul. Skarbowa 32, 32-005 Niepolomice, Poland

This product must not be put into service until the final machinery into which it is to be incorporated has been declared in conformity with the provisions of this Directive, where appropriate.

The undersigned hereby declares, on behalf of Woodward Inc. of Loveland and Fort Collins, Colorado that the above referenced product is in conformity with Directive 2006/42/EC as partly completed machinery:

MANUFACTURER



Signature

Annette Lynch

Full Name

Engineering Manager

Position

Woodward, Inc., Fort Collins, CO, USA

Place

November 11, 2021

Date

Document: 5-09-1182 (rev. 16)

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We appreciate your comments about the content of our publications.

Send comments to: industrial.support@woodward.com

Please reference publication 26539.

WOODWARD

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Email and Website—www.woodward.com

Woodward has company-owned plants, subsidiaries, and branches, as well as authorized distributors and other authorized service and sales facilities throughout the world.

Complete address / phone / fax / email information for all locations is available on our website.