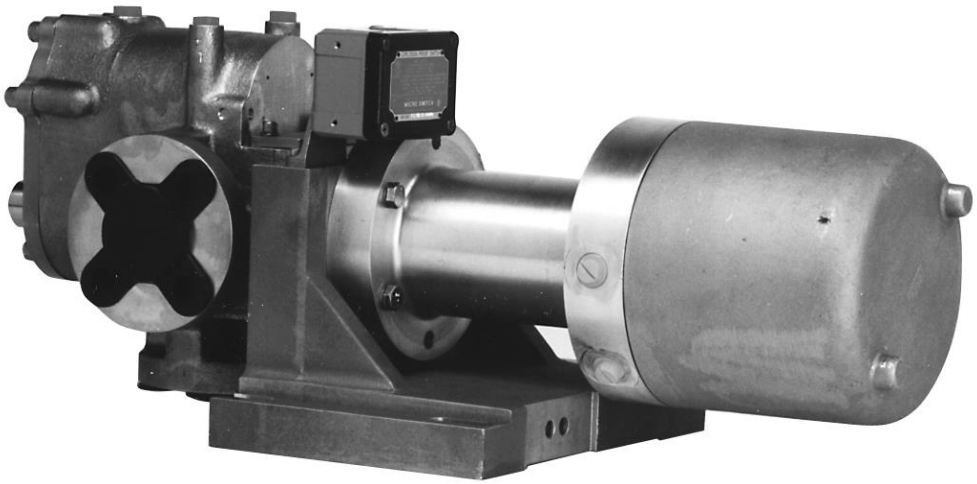
WOODWARD

Product Manual 40181
(Revision R, 3/2025)
Original Instructions



3151A Water Valve
EML100 Actuator Assembly
for Gas Turbine Water Injection System

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.

Translated Publications

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.

Woodward Industrial Support: Get Help

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.

Revisions— A bold, black line alongside the text identifies changes in this publication since the last revision.

Manual 40181

Contents

Illustrations and Tables

Warnings and Notices

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.

Regulatory Compliance

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

ATEX–Potentially Explosive Atmospheres Directive: 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
LCIE 01ATEX 6033 X
Zone 1, Category 2, Group II G, Ex db IIB T3 Gb

This suitability is the result of ATEX compliance of the individual components as follows:

EML100 Actuator: Zone 1, Category 2, Group II G, Ex db IIB T3 per LCIE 01 ATEX 6033 X

Minimum Position Switch: Zone 1, Category 2, Group II G, Ex d IIB T6 Gb per KEMA 04ATEX2312X

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

EMC Directive: Not applicable to this product. Electromagnetically passive devices are excluded from the scope of the 2004/108/EC Directive.

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.

Pressure Equipment Directive: Compliant as “SEP” per Article 3.3 to Pressure Equipment Directive 97/23/EC of 29 May 1997 on the approximation of the laws of the Member States concerning pressure equipment.

North American Compliance:
Suitability for use in North American Hazardous Locations is the result of compliance of the individual components. These listings are limited only to those units bearing the CSA or UL agency identification.

EML100 Actuator: CSA Certified for Class I, Division 1, Groups C & D, Class I, Division 2, Groups B, C, D, T3C at 93 °C Ambient. For use in Canada and the United States. Certificate 160584-1018542

Minimum Position Switch: CSA Certified for Class I, Division 1, and Groups C & D for use in Canada per CSA Certificate LR57324. UL Listed for Class I, Division 1, and Groups C & D for use in the United States per UL Certificate E14274.

Special Conditions for Safe Use

Wiring of the EML100 Actuator must be in accordance with North American Class I, Division 1, or Class I, Division 2 wiring methods as applicable to the specific application, and in accordance with the authority having jurisdiction.

The minimum position switch is certified to a Division 1 method of protection (explosion-proof). Wiring methods must comply with the Division 1 method of protection when installed in a Division 2 classified atmosphere.”

The EML100 Actuator is certified to a Zone 1/Category 2 method of protection. Wiring methods must comply with the Zone 1/Category 2 method of protection when installed in a Zone 2 classified atmosphere.

The conduit entries and the connecting devices must be certified for the mode of protection concerned (“d”) according to European standards.

Field Wiring of the EML100 must be suitable for at least 110 °C (230 °F).

The optional minimum position switch is suitable for environments up to 71 °C (160 °F).

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.

The Special Fasteners used on this product are hexagon socket head cap screws per ASME B18.3 with length 19 mm (0.750 inch), and 1/4-28 UNF-3A thread made from austenitic stainless steel (passivated) with minimum tensile strength 80 ksi.

The gaps and widths of the different flamepaths are different than the values specified in the tables of EN 60079-1.

⚠WARNING

EXPLOSION HAZARD—Do not remove covers or connect/disconnect electrical connectors unless power has been switched off or the area is known to be non-hazardous.

Substitution of components may impair suitability for Class I, Division 1 or 2 or Zone 1.

⚠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; ou que vous vous situez bien dans une zone non explosive.

La substitution de composants peut rendre ce matériel inacceptable pour les emplacements de Classe I, Division 1 ou 2 ou de Zone 1.

Chapter 1.
General Information

Introduction

The 3151A Water Valve/EML100 Actuator assembly meters water to gas-turbine combustors as part of a nitrous oxide (NOx) emission-reduction system.

This chapter describes the 3151A Water Valve/EML100 Actuator. A schematic drawing, Figure 1-1, illustrates the working relationships of the various parts.

Water Valve

The 3151A Water Valve is intended for use with high-pressure centrifugal-type pumps and provides metered bypass flow for pump-stability and heat-balance considerations.

The water valve is primarily constructed of stainless steel. A replaceable, hardened, stainless-steel sleeve is located in the drain flange area of the valve housing, and protects the housing from cavitation damage. The sleeve can be rotated in one-quarter turn increments, or it can be replaced, to extend valve life when used in severe conditions.

Ceramic is used on metering valve and regulator valve parts to prevent galling and to resist erosion in an area subjected to high-velocity water streams.

These design features make the 3151A Water Valve highly resistant to erosion, corrosion, and cavitation.

The Water Valve is designed to meter up to 250 L/min (66 US gal/min) of water, with input water pressures from 2413 to 10 342 kPa (350 to 1500 psig). The minimum flow is 3.8 L/min (1 US gal/min) of water, dependent on inlet pressure.

The degree-of-flow accuracy is either 5.0% of point or 0.5% of maximum flow, whichever value is greater.

Standard seal material allows operation with water temperatures up to 66 °C (150 °F). The minimum operating temperature is 0 °C (32 °F).

The 3151A Water Valve has a water cleanliness/filtration requirement of 10 µm nominal, 25 µm absolute.

Actuator

The EML100 Actuator consists of a high performance brushless servomotor and a precision planetary gearbox with two resolver type shaft position sensors. The use of a high efficiency gearbox facilitates high servo system bandwidth. One resolver provides motor rotor position feedback and the other resolver(s) provides accurate output shaft position feedback. The actuator also has a slip clutch to allow full speed impact into the rigid mechanical stops.

The EML100 Actuator receives commands from the driver to position the water valve. The actuator may be powered by the Woodward EM Driver or 24 V DVP. The control may be calibrated so that the water valve closely follows the fuel-flow schedule to prevent unwanted water insertion during turbine load swings. Refer to manual 40183 for more details on the EML100 actuator.

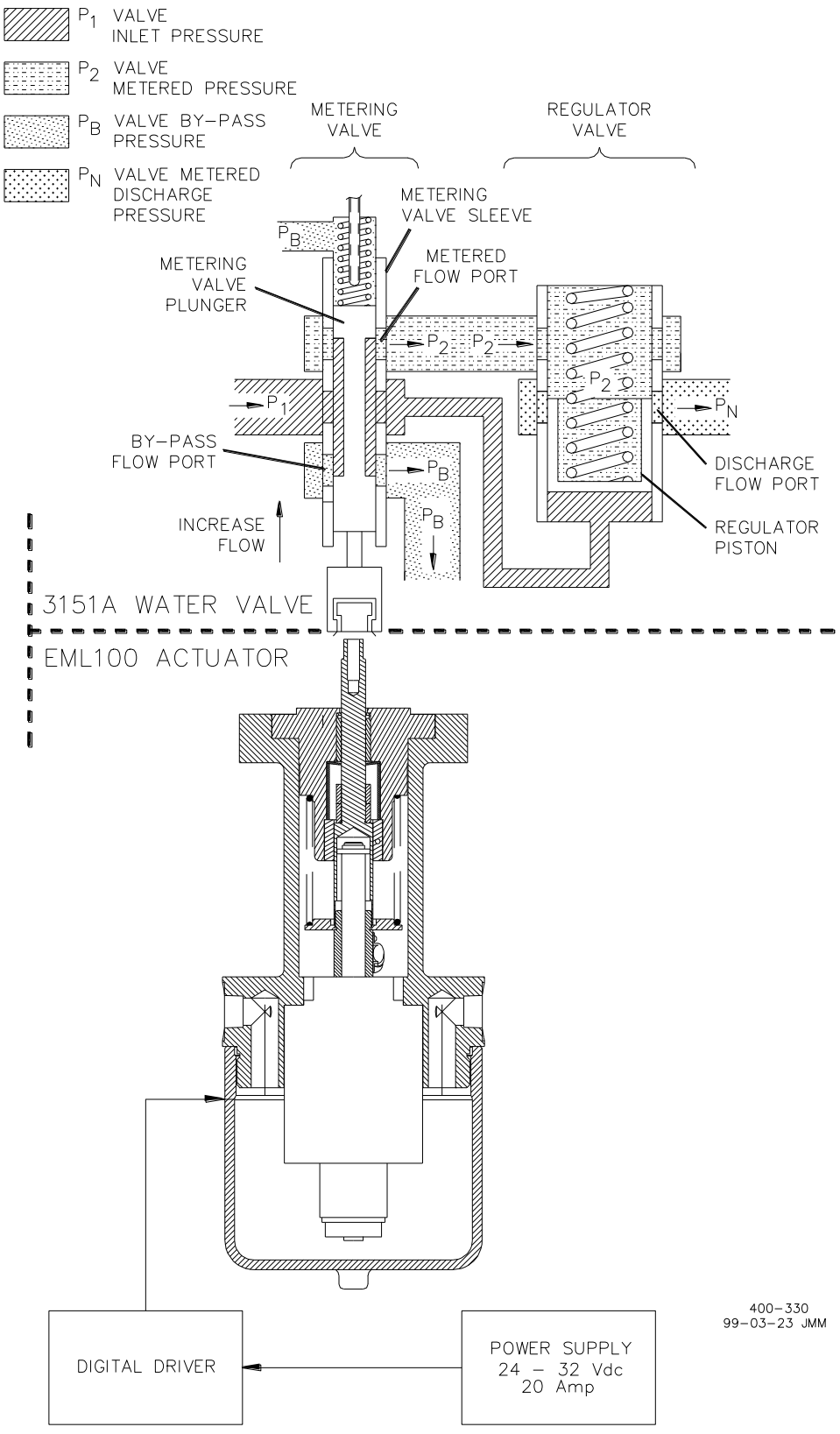


Figure 1-1. Water Valve/Actuator Schematic

Chapter 2.
Installation

Introduction

⚠WARNING

EXPLOSION HAZARD—Do not remove covers or connect/disconnect electrical connectors unless power has been switched off or the area is known to be non-hazardous.

Substitution of components may impair suitability for Class I, Division 1 or 2 or Zone 1.

During installation, handle the valve/actuator with care. Improper handling can ruin seals, mating surfaces, and factory adjustments. Keep all plastic shipping caps and covers in place until ready to connect normal service/supply lines.

The 3151A Water Valve/EML100 Actuator Assembly has a mass/weight of 44 kg (98 lb). Use proper lifting techniques and caution when handling the 3151A Water Valve/EML100 Actuator Assembly to prevent personal injury. Remove either the P1 or PN pressure monitor plugs on top of the 3151A Water Valve and install a 0.438-20 thread lifting eye at this location. Reinstall the P1 or PN pressure monitor plugs after moving the Water Valve/Actuator Assembly and re-torque to 4.5 N·m (40 lb-in).

Packaging and Storage

The water valve/actuator assembly is calibrated and then drained of fluid at the factory. The assembly is bolted to a transportation skid and shipped in a protective box. Additional cleaning prior to installing and operating unit is not necessary.

The water valve/actuator assembly may be stored as received from the factory for a short period of time prior to installation.

General Installation

NOTICE

The 3151A Water Valve MUST be installed with the pressure taps facing up. This places the drain in a down position and ensures adequate water drainage.

NOTICE

Do not expose the 3151A water valve to ambient temperatures below 0 °C (32 °F) during periods of no water flow. If water freezes inside the 3151A valve or in surrounding piping, internal ceramic parts will be damaged, and the unit will have to be returned to the factory for an expensive repair.

NOTICE

Do not rest or set the water valve on any surface other than the flat mounting plate attached to the unit. Internal damage to the valve can occur if the unit is dropped or otherwise mishandled. Especially vulnerable is the max stop adjustment cap shown in Figure 2-2b.

NOTICE

The 3151A water valve bypass line pressure must not exceed 50 psig during operation. Restrictions in the bypass line piping that result in pressures higher than 50 psig will affect the dynamic response and available force margin of the EML100 actuator. Position errors, position shutdowns, and driver current limiting can occur.

NOTICE

The Overboard Drain Port, located on the actuator/valve mounting adapter shown in Figure 2-2b view A-A, must not be plugged or exposed to positive water pressure. The Overboard Drain Port must be left open to atmosphere or plumbed to a gravity drain system to prevent water build-up and pressurization of this cavity.

Refer to outline drawing, Figure 2-2, for:

- Overall dimensions
- Location of installation holes
- Electrical connection locations

Water Valve Installation

The Water Valve must be installed with the drain port at the bottom to provide proper water drainage.

Refer to ASME B16.5 for details of flange, gasket, and bolt types and dimensions.

Since the valve contains a replaceable/rotatable sleeve at the drain flange, a minimum clearance of 89 mm (3.5 inches) (152 mm/6.0 inches maximum) must be provided for the sleeve's removal or rotation. This consideration is especially important in operations with more than 6206 kPa (900 psig) water inlet pressure. The proper clearance can be obtained by constructing a piece of removable pipe in the drain line, or by constructing the drain so it can swing away from the valve housing.

Plumb the Overboard Drain Port (Figure 2-2b view A-A) to a gravity drain system at atmospheric pressure or leave unplugged. This drain port is designed to be a convenient collection point for any water leakage that may occur from the valve's shaft seal.

Leakage from the shaft seal is not expected unless damage to the seal has occurred. At no time should the Overboard Drain Port be pressurized, since water could be forced into the electric actuator through the actuator shaft seal or mating part clearances. The result can be electrical failure of the motor or mechanical seizure of the gear train.

Electrical Connections

IMPORTANT

Refer to the following manuals for additional electrical installation instructions:

- **EML100: 40183**
- **EM Driver: 26159**
- **24 V DVP: 26329**

The EML100 actuator has four 0.500-14 NPTF female conduit connections for customer wiring. This permits the actuator motor power wires to be separated from each of the low voltage resolver wire bundles to minimize the possibility of noise interference. A #8, 0.164-32 UNF female thread external ground screw is also provided.

⚠WARNING

Due to the hazardous location listings associated with this product, proper wire type and wiring practices are critical to operation. As applicable, the electrical installation shall be carried out according to EN 60079-14.

⚠WARNING

EXPLOSION HAZARD—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.

⚠WARNING

EXPLOSION HAZARD—For Zone 1/Division 1 installation of the EML100, the threaded cover must be installed hand-tight with the cover lock screw torqued to 8.8 N·m (78 in-lb).

The EML100 Actuator is certified to a Zone 1-Category 2 ATEX method of protection "d". Wiring methods must comply with the Zone 1-Category 2 method of protection when installed in a Zone 2 classified atmosphere.

Take care to protect the cover threads and mating actuator threads when they are exposed, as they are critical to the Zone 1/Division 1 methods of protection.

⚠CAUTION

Due to typical noise levels in turbine environments, hearing protection should be worn when working on or around the EML100 Actuator.

⚠CAUTION

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.

Figure 2-3 provides a wiring diagram for reference only. Refer to the EM Driver manual (26159) or 24 V DVP manual (26329), as appropriate, for all wiring procedures and requirements.

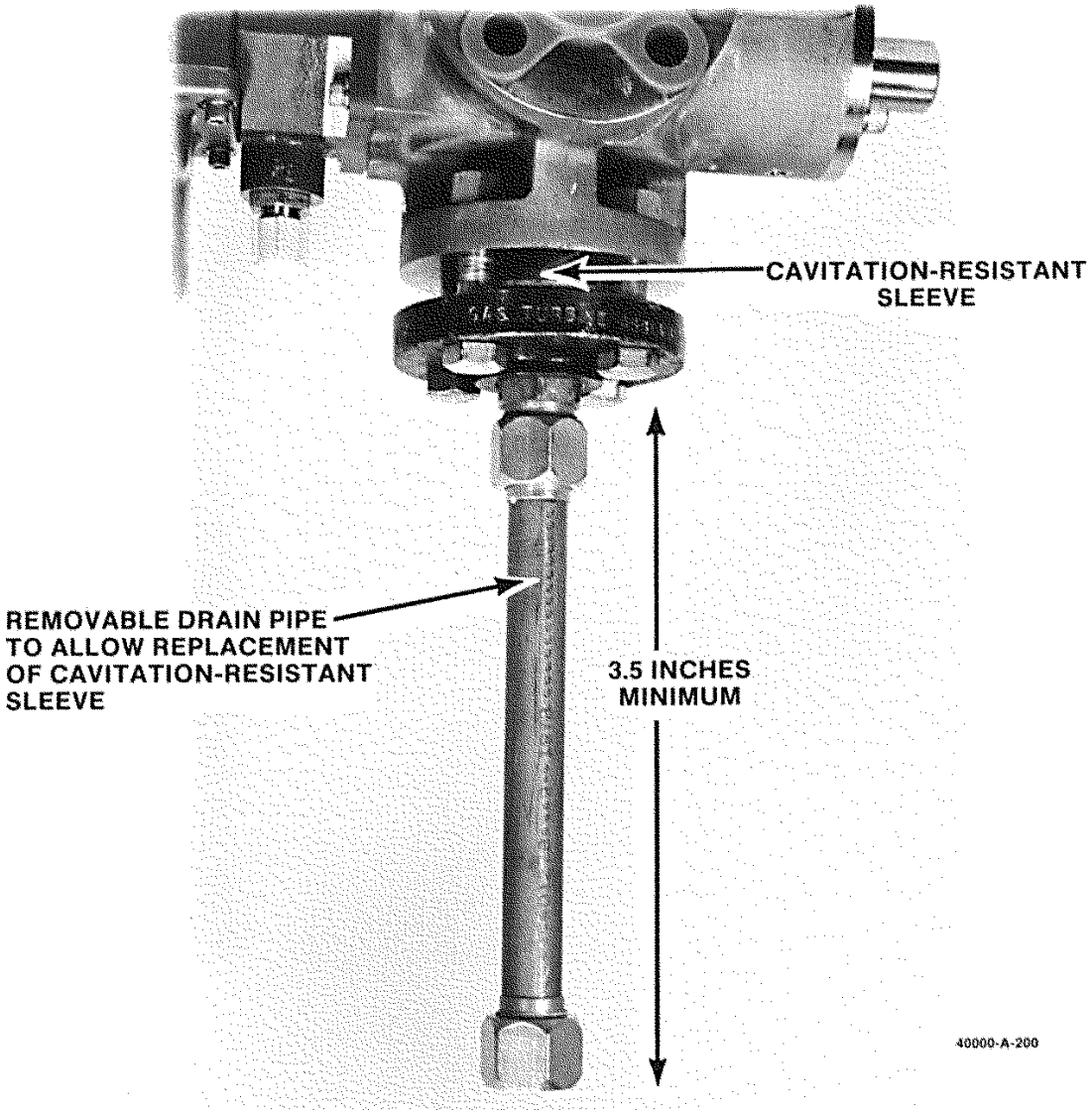


Figure 2-1. Valve Installed with Removable Drain Pipe

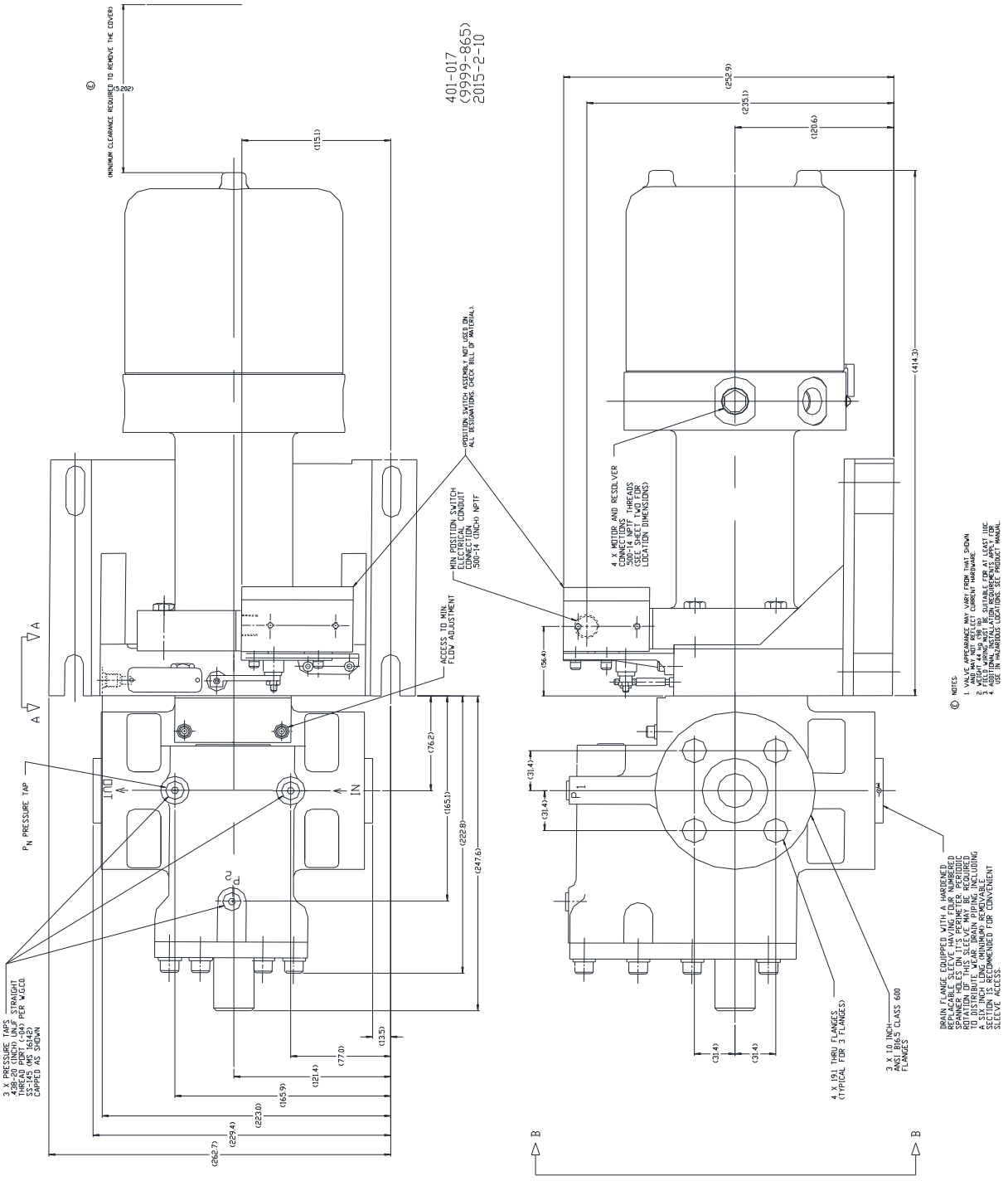


Figure 2-2a. Water Valve/Actuator Outline Drawing
(optional minimum position switch shown)

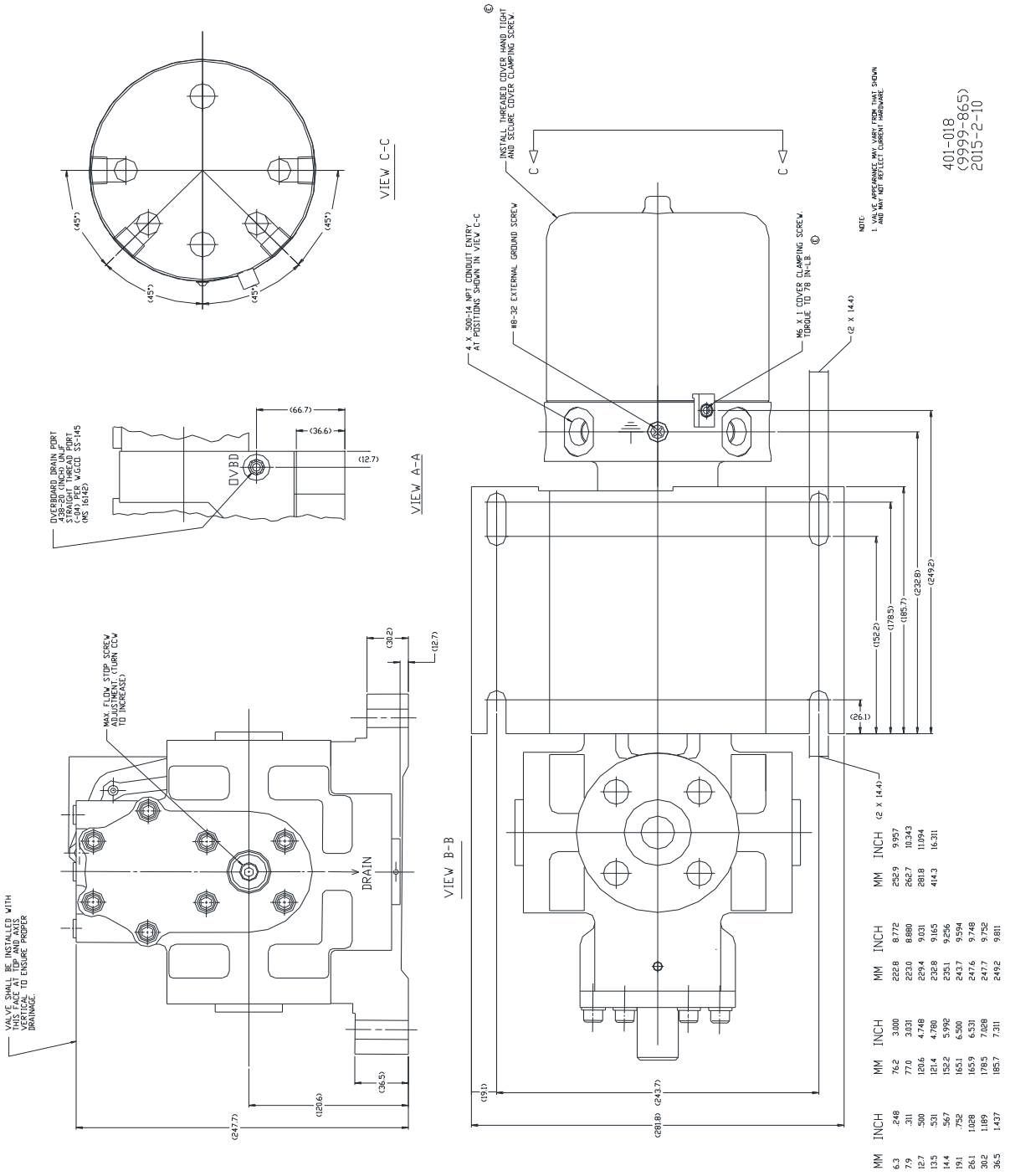
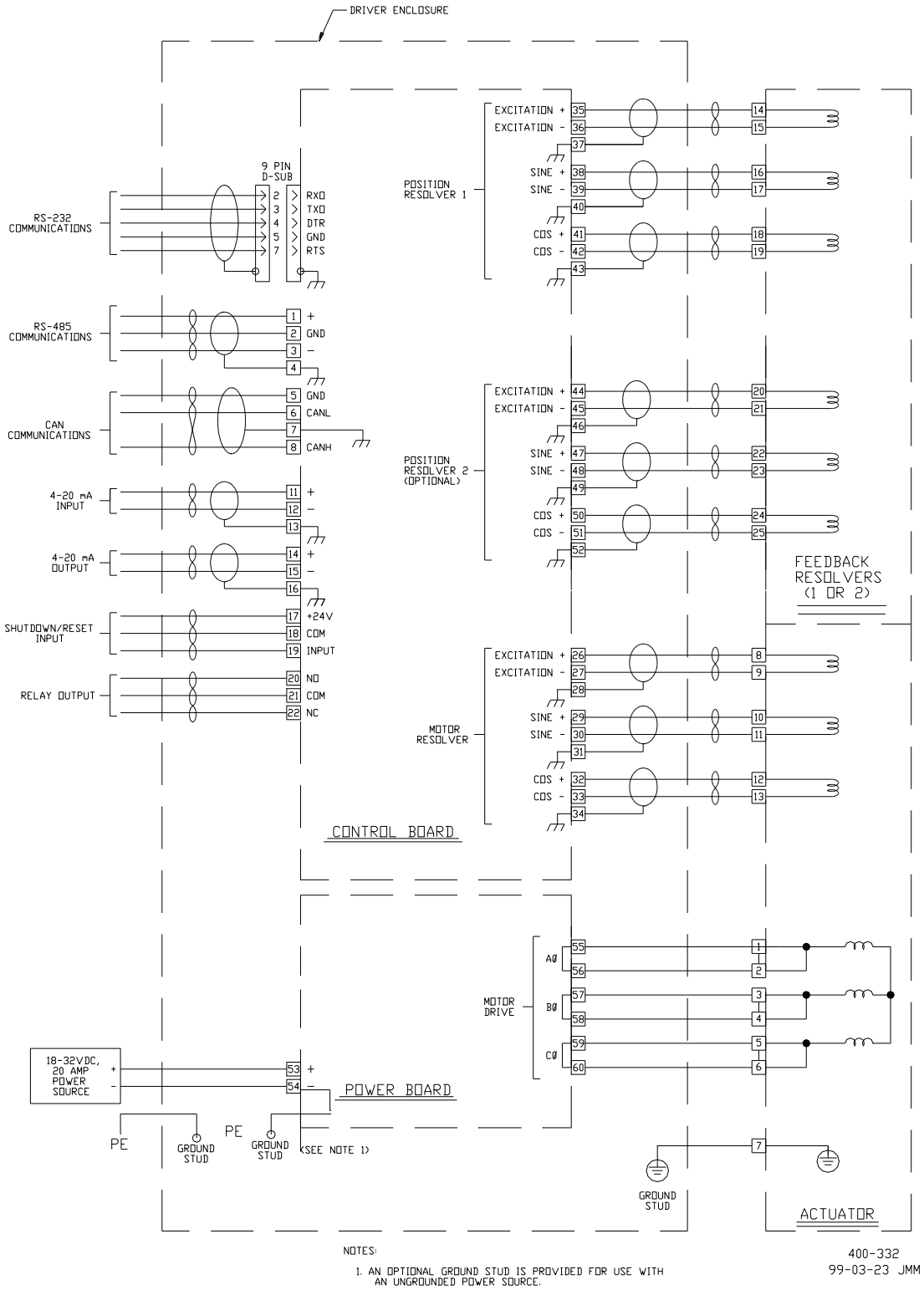


Figure 2-2b. Water Valve/Actuator Outline Drawing
(optional minimum position switch shown)



IMPORTANT **Refer to EM/LQ driver manual 26159 for wiring procedures and requirements.**

Figure 2-3. Wiring Diagram

Chapter 3.
Start-up, Inspection, and Adjustment

Introduction

⚠WARNING

EXPLOSION HAZARD—Do not remove covers or connect/disconnect electrical connectors unless power has been switched off or the area is known to be non-hazardous.

Substitution of components may impair suitability for Class I, Division 1 or 2 or Zone 1.

This chapter describes the initial operation and drain-flange sleeve adjustment on the 3151A Water Valve/EML100 Actuator assembly.

⚠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.

⚠CAUTION

Due to typical noise levels in turbine environments, hearing protection should be worn when working on or around the 3151A Water Valve/EML100 Actuator.

⚠CAUTION

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.

Initial Operation

Before initial use of the water valve/assembly, be sure that all installation steps found in this manual and the driver manual have been completed. All electrical connections and water fittings must be properly and securely installed.

The 3151A Water Valve/EML100 Actuator assembly must be calibrated to its associated driver before initial use. Specific calibration instructions are explained in the EM Driver manual (26159) or 24 V DVP manual (26329).

Each valve/actuator assembly is shipped from the factory with at least one copy of a “Flow Calibration Schedule”. This production acceptance test information is the latest calibration data specific to a particular valve based on serial number and designation number. See Figure 3-1 for an example. This information must be used during the calibration procedure to assure the highest flow accuracy possible.

Important calibration information is circled and numbered with explanations below (see Figure 3-1):

1. Woodward Valve/actuator part number.
2. Woodward Valve/actuator serial number, unique to this unit.
3. Position resolver reading at minimum flow, corresponds to Test point #1. This resolver reading will be used during the calibration procedure as the “Minimum” Resolver position. It will correspond to a 4.0 milliamp demand signal. This resolver reading will be stamped on a decal attached to the actuator motor. The actuator cover must be removed to view this decal.

FLOW CALIBRATION SCHEDULE
FOR EML100 / 3151A ASSEMBLY

DESIGNATION NO: 8915-895 ①

DATE TESTED _____

S/N _____②_____

TESTED BY: _____

1) Proof pressure test valve at 2000 psig for 2 minutes. No external leakage. [ ]

2) **Calibration Data**: Resolver at **Min flow** (4.0 mA) -- Test point 1: ③ ____(degrees). Resolver at **Max flow** (20.0 mA) –Test point 11: ④ ____(degrees).
These values to be used as the electrical Min and Max flow stops during customer calibration and are stamped on the actuator motor decal.

Test Point	Valve Pos. %	Set Demand Current *mAmp*	Set P1 *psig*	Set PN *psig*	Water flow (ref) *pph*	Record Metered Flow Wf of SG=.77 fluid *(pph)* Nom.	Min.	Rec. ⑤	Max.	Water Inlet *pph*	Record Inlet Flow Wi of SG=.77 fluid *(pph)* Min.	Rec. ⑥	Max.	Record Values Position (0.001) inches	Resolver Position *deg*	ΔP *psid*
1	0	4.00	1138	0	0	0	N/A		439	20280	16016		19575			
2	10	5.60	1138	180	2404	2110	2004		2215	20280	16016		19575			
3	20	7.20	1138	240	4807	4218	4007		4429	20280	16016		19575			
4	30	8.80	1138	320	7211	6328	6011		6644	20280	16016		19575			
5	40	10.40	1138	380	9614	8436	8014		8858	20280	16016		19575			
6	50	12.00	1138	450	12018	10546	10018		11073	20280	16016		19575			
7	60	13.60	1138	540	14421	12654	12022		13287	20280	16016		19575			
8	70	15.20	1138	610	16825	14764	14026		15502	20280	16016		19575			
9	80	16.80	1138	690	19228	16873	16029		17716	20280	16016		19575			
10	90	18.40	1138	775	21632	18982	18033		19931	21632	18033		20880			
11	100 Max	20.00 Stop	1025	860	24035	21091	20669	⑦	21512	24035	20669		23200	⑧		
		±0.08	±10	±10												

Resolver position at Hard Stop Minimum ⑨ ____(degrees). Resolver position at Hard Stop Maximum ⑩ ____(degrees).
These values to be used as the minimum and maximum "Hard Stop" resolver positions during customer calibration.

3) Set min flow switch at test point #1. Check operation of both the NO and NC contacts. [ ]

4) Drain calibrating fluid and install protective covers where required. [ ]

Note: Above calibration data assumes use of MIL-F-7024 Type 2 calibrating fluid at 70 ± 10 °F (SG = 0.77).
To convert the recorded mass flow rates to the equivalent mass flow rate of water (SG = 1.0), multiply by {sqrt[1.0/0.77]} or 1.140.

Figure 3-1. EML100/3151A Assembly Flow Calibration Schedule

1. Position resolver reading at maximum flow, corresponds to Test point #11. This resolver reading will be used during the calibration procedure as the “Maximum” Resolver position. It will correspond to a 20.0 milliamp demand signal. This resolver reading will be stamped on a decal attached to the actuator motor. The actuator cover must be removed to view this decal.
2. Valve metered flow at minimum position (4.0 milliamp Demand) in pounds per hour (pph) of US MIL-F-7024 calibrating fluid which has a specific gravity of 0.77.
3. Total valve flow as measured at the inlet of the valve in pph of US MIL-F-7024. It includes both metered flow and bypass flow. Bypass flow is easily calculated by subtracting the metered flow from the inlet flow.
4. Valve metered flow at Maximum position (20.0 milliamp Demand).
5. Total valve linear travel at Maximum flow position in thousands of an inch. Typically between 10.2 and 12.7 mm (0.400 and 0.500 inches).
6. Position resolver reading at minimum Hard Stop position. This value will usually be 5 degrees less than #3. This allows the actuator to be positioned at the minimum flow point without operating against a hard mechanical stop. This resolver reading will be used during the calibration procedure as the "Hard Stop at Minimum".
7. Position resolver reading at maximum Hard Stop position. This value will usually be 2–3 degrees more than #4. This allows the actuator to be positioned at the maximum flow point without operating against a hard mechanical stop. This resolver reading will be used during the calibration procedure as the “Hard Stop at Maximum”.

IMPORTANT

On dual position resolver units, there will be two distinct sets of min and max resolver readings to be used during calibration.

Inspection and Adjustment

There are no inspection or adjustment requirements for the EML100 Actuator.

All water flow adjustments on the 3151A Water Valve/EML 100 Actuator assembly are made to exact customer specifications at the factory. The unit should not require any further mechanical flow adjustments in the field.

⚠WARNING

EXPLOSION HAZARD—Do not remove covers or connect/disconnect electrical connectors unless power has been switched off or the area is known to be non-hazardous.

Substitution of components may impair suitability for Class I, Division 1 or 2 or Zone 1.

⚠CAUTION

Do not attempt any inspection or adjustment on the 3151A Water Valve/EML100 Actuator assembly without first removing all fluid pressure from the 3151A Water Valve. Failure to follow these instructions can cause personal injury and/or property damage.

Woodward recommends periodic inspection of the sleeve until you are able to determine an appropriate length of time between index operations. If the water pressure exceeds 6206 kPa (900 psig), the sleeve should be indexed at least after every 4320 hours of operation (6 months of continuous operation). However, you should be aware that service life of the sleeve is dependent on several factors—two important factors are water pressure and water purity. After four indexing operations, remove the sleeve and inspect for excessive cavitation damage of the interior surface.

NOTICE **Water must meet all purity and de-ionization requirements as established by the turbine manufacturer.**

The 3151A Water Valve has a water cleanliness/filtration requirement of 10 µm nominal, 25 µm absolute.

When indexing the sleeve, loosen the four drain-flange bolts, insert a 3/32 inch Allen wrench or a 1/8 inch diameter punch in one of the four spanner holes, and turn the sleeve 1/4 turn. In order to help reposition the sleeve, the spanner holes are numbered and an index is marked on the drain flange (see Figure 3-2). The appropriate spanner hole should be aligned with the flange index. After four repositioning operations, the sleeve should be removed and examined.

To remove the sleeve, insert a punch or an Allen wrench into a spanner hole. Place a screwdriver, or other lever, between the punch (Allen wrench) and the flange face. Pry up until the sleeve loosens and can be removed from the valve.

When the sleeve is free of the valve body, examine the interior surface of the sleeve for excessive pitting or distortion. Discoloration and minor wear of the internal surface is normal. If the sleeve shows excessive pitting or distortion, replace it.

The sleeve contains an O-ring located in a groove on the surface of the outer diameter. Any time the sleeve is removed, the O-ring should be replaced.

A replacement sleeve or O-ring may be ordered from Woodward.

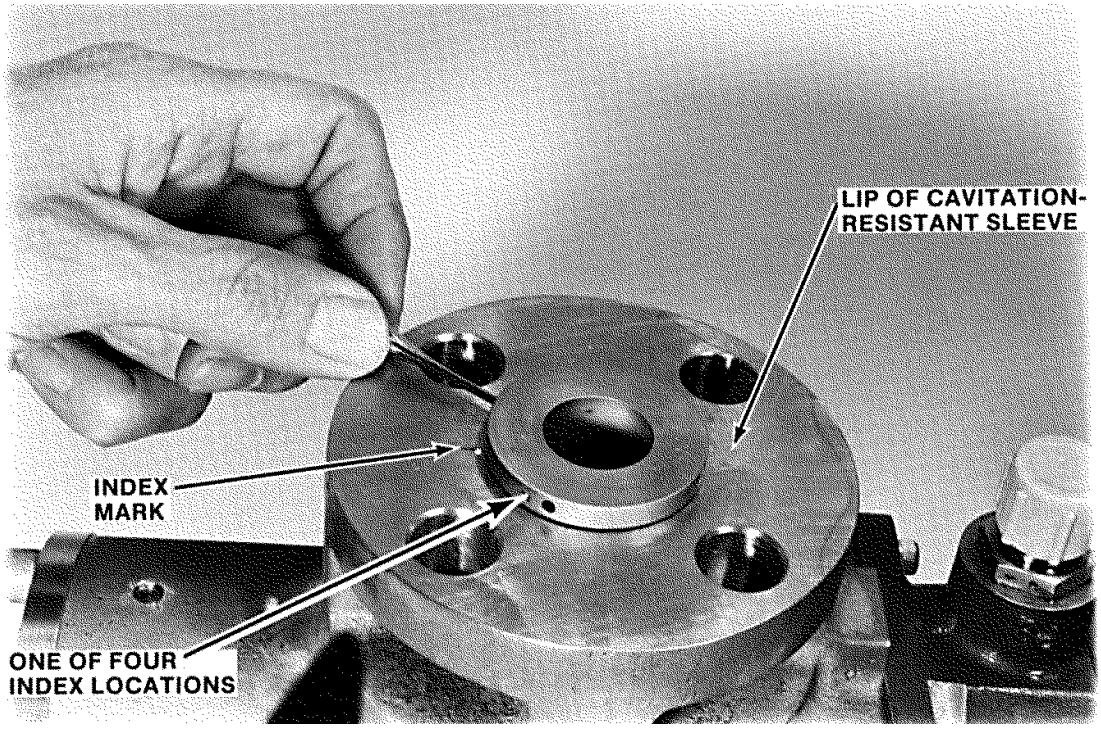


Figure 3-2. Indexing Cavitation-Resistant Sleeve

Chapter 4.
Maintenance

Introduction

This chapter describes basic preventative maintenance and troubleshooting of the 3151A Water Valve/EML100 Actuator assembly.

There are no maintenance requirements for the EML100 Actuator.

⚠CAUTION

Do not attempt any maintenance on the 3151A Water Valve/EML100 Actuator assembly without first removing all fluid pressure from the 3151A Water Valve. Failure to follow these instructions can cause personal injury and/or property damage.

Indexing Drain-Flange Sleeve

The cavitation-resistant sleeve located in the drain flange should be indexed on a routine basis. The frequency of sleeve rotation is determined by the amount of water found in each application. If uncertain of a rotation frequency, a period of not more than 4320 operational hours (six months) is suggested as a possible operating period between rotations.

Chapter 3 of this manual contains instructions on the adjustment and removal of the drain-flange sleeve.

Troubleshooting

If variations in water delivery occur, inspect all components, including the turbine, for proper operation. Refer to the correct Woodward control manual for assistance in isolating the problem.

Field disassembly or adjustment of the 3151A Water Valve/EML100 Actuator assembly is not recommended. All work and adjustments should be performed by personnel thoroughly trained in the proper procedures.

When requesting information or service from Woodward, be sure to specify the part number and serial number of your valve/actuator assembly.

⚠WARNING

EXPLOSION HAZARD—Do not remove covers or connect/disconnect electrical connectors unless power has been switched off or the area is known to be non-hazardous.

Substitution of components may impair suitability for Class I, Division 1 or 2 or Zone 1.

⚠CAUTION

Due to typical noise levels in turbine environments, hearing protection should be worn when working on or around the 3151A Water Valve/EML100 Actuator.

⚠CAUTION

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.

Chapter 5.
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

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*.

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

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.

Revision History

Changes in Revision R—
- Updated EU DoC

Changes in Revision P—
- ATEX PED and EML100 Actuator Certifications Updated
- Updated DOC

Changes in Revision N—
- ATEX Certification Update
- Updated Declarations

Changes in Revision M—
- Compliance updates including adding Minimum Position Switch and deleting two “Important” information boxes
- Added Honeywell DOC to Declarations section

Changes in Revision L—
- General Compliance updates
- Updated Figure 2-2

Changes in Revision K—
- Updated outline drawing (Figure 2-2)

Changes in Revision J—
- Added new Declaration of Conformity

Declarations

CERTIFICATE

EC-Type Examination

(1)

(2) **Equipment and protective systems intended for use in potentially explosive atmospheres - Directive 94/9/EC**

(3) EC-Type Examination Certificate Number: **KEMA 04ATEX2312 X** Issue Number: **3**

(4) Equipment: **Micro Switch Series .Ex.-... and .ExHT-...**

(5) Manufacturer: **Honeywell Sensing and Control**

(6) Address: **11 West Spring Street, Freeport, Il 61032, USA**

(7) This equipment and any acceptable variation thereto is specified in the schedule to this certificate and the documents therein referred to.

(8) DEKRA Certification B.V., notified body number 0344 in accordance with Article 9 of the Council Directive 94/9/EC of 23 March 1994, certifies that this equipment has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of equipment and protective systems intended for use in potentially explosive atmospheres given in Annex II to the directive.

The examination and test results are recorded in confidential test report number NL/KEM/ExTR.0023/02.

(9) Compliance with the Essential Health and Safety Requirements has been assured by compliance with:

EN 60079-0 : 2009 **EN 60079-1 : 2007**

(10) If the sign "X" is placed after the certificate number, it indicates that the equipment is subject to special conditions for safe use specified in the schedule to this certificate.

(11) This EC-Type Examination Certificate relates only to the design, examination and tests of the specified equipment according to the Directive 94/9/EC. Further requirements of the directive apply to the manufacturing process and supply of this equipment. These are not covered by this certificate.

(12) The marking of the equipment shall include the following:

II 2 G Ex d IIB + H_2 T6 Gb (Series .Ex.-...)
II 2 G Ex d IIB + H_2 T2 Gb (Series .ExHT-...)

This certificate is issued on 5 October 2012 and, as far as applicable, shall be revised before the date of cessation of presumption of conformity of (one of) the standards mentioned above as communicated in the Official Journal of the European Union.

DEKRA Certification B.V.

M. Erdhuizen.
Certification Manager

Page 1/2

PRODUCTS RvAC 001

All testing, inspection, auditing and certification activities of the former KEMA Quality are an integral part of the DEKRA Certification Group

DEKRA Certification B.V. Utrechtseweg 310, 6812 AR Arnhem P.O. Box 5185, 6802 ED Arnhem The Netherlands
T +31 26 3 56 20 00 F +31 26 3 52 58 00 www.dekra-certification.com Registered Arnhem 09085396

DEKRA

(13) **SCHEDULE**

(14) **to EC-Type Examination Certificate KEMA 04ATEX2312 X** Issue No. **3**

(15) **Description**

The Micro Switch Series .Ex.-... and .ExHT-... consists of a switch mounted in an aluminium enclosure. The switch is actuated by means of a rotary lever or plunger.

Ambient temperature range:	-40 °C to +70 °C	Series .EX.-...
	-40 °C to +204 °C	Series .EXHT-...

Electrical data

Ratings: 125, 250, 480 Vac/ 20 A max
125 Vdc/ 0,5 A max
250 Vdc/ 0,25 A max

Installation instructions

The instructions provided with the equipment shall be followed in detail to assure safe operation.

(16) **Test Report**

No. NL/KEM/ExTR.0023/02.

(17) **Specific conditions of use**

For information regarding the dimensions of the flameproof joints the manufacturer shall be contacted.

(18) **Essential Health and Safety Requirements**

Covered by the standards listed at (9).

(19) **Test documentation**

As listed in Test Report No. NL/KEM/ExTR.0023/02.

EU DECLARATION OF CONFORMITY

EU DoC No.:	00109-04-CE-02-01
Manufacturer's Name:	WOODWARD INC.
Manufacturer's Contact Address:	1041 Woodward Way Fort Collins, CO 80524 USA
Model Name(s)/Number(s):	EML100 Actuator / 9907-621, 9907-779, 9908-376
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
Markings in addition to CE marking:	Ex II 2 G, Ex db IIB T3 Gb
Applicable Standards:	EN IEC 60079-0:2018 – Explosive atmospheres – Part 0: Equipment – General requirements (A review against EN 60079-0:2018, which is harmonized, shows no significant changes relevant to this equipment so EN 60079-0:2012/A11:2013 continues to represent "State of the Art") EN 60079-1:2014 – Explosive atmospheres – Part 1: Equipment protection by flameproof enclosures 'd' (A review against EN 60079-1:2014, which is harmonized, shows no significant changes relevant to this equipment so EN 60079-1:2007 continues to represent "State of the Art")
Third Party Certification:	LCIE 01 ATEX 6033 X Laboratoire Central des Industries Electriques (LCIE) (0081) Avenue du Général Leclerc BP 8 F92266 Fontenay-aux-Roses, FRANCE
Conformity Assessment:	ATEX Annex IV - Production Quality Assessment, 01 220 113542 TUV Rheinland Industrie Service GmbH (0035) Am Grauen Stein, D51105 Cologne GERMANY

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	**Engineering Manager**
Position	**Woodward, Fort Collins, CO, USA**
Place	31 January 2025
Date	

5-09-1183 Rev 41

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

File name: 00109-04-CE-02-02
Manufacturer's Name: WOODWARD INC.
Manufacturer's Address: 1041 Woodward Way
Fort Collins, CO 80524 USA
Model Names: EML100 Actuator
This product complies, where applicable, with the following Essential Requirements of Annex I: 1.1, 1.3, 1.4, 1.5, 1.6, 1.7
Applicable Standards: EN ISO 12100:2010

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 Governor Company 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

Christopher Perkins
Full Name

Engineering Manager
Position

Woodward Inc., Fort Collins, CO, USA
Place

01-JUN-2016
Date

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

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

File name:	00275-04-EU-02-01
Manufacturer's Name:	WOODWARD INC.
Manufacturer's Address:	1041 Woodward Way Fort Collins, CO 80524 USA
Model Names:	3151A Water Valve
This product complies, where applicable, with the following Essential Requirements of Annex I:	1.1, 1.3, 1.4, 1.5, 1.6, 1.7
Applicable Standards:	EN ISO 12100:2010

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 Governor Company 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

Christopher Perkins

Full Name

Engineering Manager

Position

Woodward Inc., Fort Collins, CO, USA

Place

06 - JUN - 2016

Date

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

This Page Intentionally Left Blank

Released

We appreciate your comments about the content of our publications.

Send comments to: industrial.support@woodward.com

Please reference publication 40181.

B 4 0 1 8 1 : R

PO Box 1519, Fort Collins CO 80522-1519, USA
1041 Woodward Way, Fort Collins CO 80524, USA
Phone +1 (970) 482-5811

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.