Electric Actuators and Control Systems

rotork®
Process Controls

Established Leaders in Valve Actuation

Actuator
Product Catalogue

Publication P002E Issue 06/10

rotork®

Rotork actuators have been in use all around the world for over 50 years. In this time Rotork has grown to become the leader in the valve automation industry. With manufacturing, service centres, offices and representatives throughout the world, Rotork is able to offer global service solutions.

In the 50 years since the company was founded, Rotork has become a byword for excellence in the field of valve, sluice gate and damper actuation products for the oil, gas, power, water and waste treatment industries - worldwide.

We owe our success to an uncompromising focus on quality at every stage and every level of Rotork's operations.

From initial site survey, specification and design, through to materials, manufacturing and testing, installation, commissioning and after-sales service we accept nothing but the best.

At the heart of the company is an exceptional workforce with highly trained, forward-thinking engineers, technicians and support staff. Each has a crucial role to play in maintaining Rotork's unrivalled reputation for innovation, reliability and first class customer support.

The Rotork family of products also includes pneumatic, hydraulic and electro-hydraulic actuators as well as a comprehensive range of gearboxes and valve accessories.

Rotork. Established leaders in valve actuation technology.

rotork® Controls

rotork® Fluid Systems

rotork® Gears

rotork® Site Services

Contents

rotork®
Process Controls

Rotork Process Controls Heavy duty and Control Valve Actuators, service a variety of needs within the Power Generation, Process Control and Industrial Automation markets. With options and custom configurations, Process products can meet any need, no matter how precise, no matter how demanding.

Each actuator section opens with general information on the torque or thrust ranges available, and follows with tables that detail the performance and options for each model. By using the information in these tables, the actuator model that most closely matches the application requirements can be determined. Once the proper model has been identified, go to that model's section of the catalog. Each model section contains a selection chart that enables the model number and all applicable configurations to be identified including options for that model.

A complete listing of options as well as a section on typical wiring diagrams is available toward the back of this catalog.

On the final page of the catalog you will find information about our Service Solutions. Rotork Process Controls offers a preventative maintenance program, on-site and in-house repair, start-up assistance and on-site and in-house training.

USA head office
tel +1 (414) 461 9200
email rpcsales@rotork.com

UK
tel +44 (0)1225 733200
email mail@rotork.com

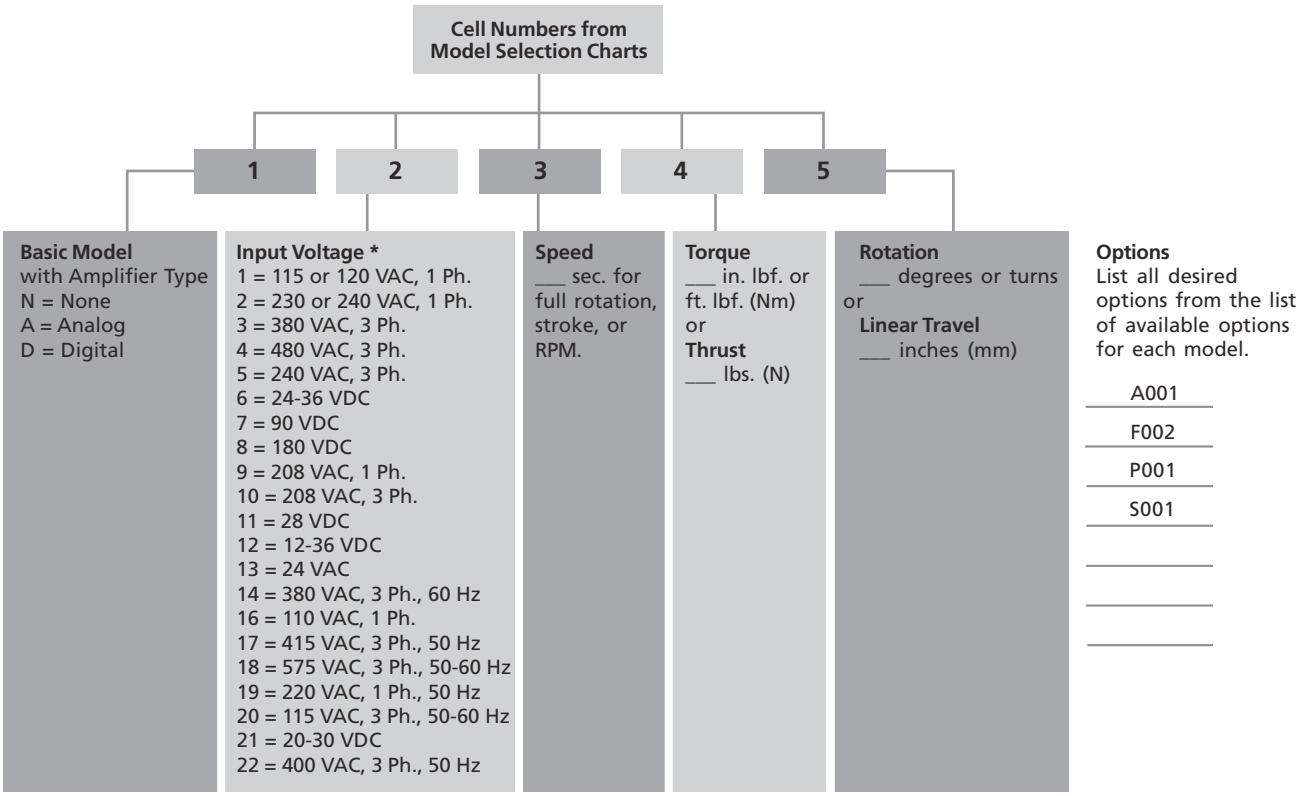
A full listing of our worldwide sales and service network is available on our website at www.rotork.com

Contents	Page

How to select an actuator

Selecting a Process Controls actuator is a simple and logical process. Selection charts are located in each section to assist you in choosing the correct actuator for your application. Each actuator has a series of cells which allow you to choose the basic model. All actuators have five cells to choose the basic model except the SM-6000, MV-1000, MV-1500 and LA-3300 Spring Return actuators, which have six.

After determining the basic model, you can then add options. Each actuator has its own unique list of options. An example of model configuration is illustrated below, though actual actuator selection must be completed using the Selection Chart located in the product section of the catalog.



* All input voltages are +/- 10%

Example:

If you wanted a 120 VAC SM-1720 rotary actuator with a digital amplifier that required a speed of 60 sec. for 90° rotation and a torque of 1,800 in. lbs. Options needed include Auto/Manual toggle switches, a fixed drive arm, position indicator and two adjustable position switches.

Your selection would look like this:

SM-1720-D — 1 — 60 — 1800 — 90°

A001
D001
P001
S001

Linear




Linear Control Valve Actuators - Performance Data

Linear

	Model	Single Phase Voltage	Motor type	DC	Enclosure Certification	Max Thrust lbs (N)	Speed in/sec (mm/sec) at Max. Thrust	Min Thrust lbs (N)	Speed in/sec (mm/sec) at Min. Thrust	Stroke length in (mm)	Manual Override	Operating Temp.	Weight lbs (kg)
	CVL 500	110/240	Brushless DC	Y	IP68	500 (2224)	0.25 (6.35)	200 (890)	0.25 (6.35)	1.5 (38.1)	Option	-22°F to 158°F -30°C to 70°C	31 (14)
	CVL 1000	110/240	Brushless DC	Y	IP68	1000 (4448)	0.1 (2.54)	400 (1780)	0.1 (2.54)	2 (50.8)	Option	-22°F to 158°F -30°C to 70°C	44 (20)
	CVL 1500	110/240	Brushless DC	Y	IP68	1500 (6672)	0.1 (2.54)	600 (2669)	0.1 (2.54)	2 (50.8)	Option	-22°F to 158°F -30°C to 70°C	44 (20)
	MV-1010	120/240	Stepper	Y	IP65; CSA ATEX; FM	100 (445)	0.05 (1.27)	25 (111)	0.25 (6.35)	1.375 (35)	Yes	-40°F to 150°F -40°C to 65°C	12 (5.44)
	MV-1020	120/240	Stepper	Y	IP65; CSA ATEX; FM	200 (890)	0.13 (3.3)	100 (445)	0.25 (6.35)	1.375 (35)	Yes	-40°F to 150°F -40°C to 65°C	16 (7.25)
	GPSA™	120/240	Stepper	Y	IP65; ATEX FM	200 (890)	0.13 (3.3)	100 (445)	0.25 (6.35)	1.375 (35)	Yes	-4°F to 150°F -20°C to 65°C	16 (7.25)
	VA-1020	120/240	Stepper	Y	IP65; CSA ATEX; FM	900 (4003)	0.014 (0.35)	220 (978)	0.034 (0.86)	1.5 (38.1)	Yes	-40°F to 150°F -40°C to 65°C	24 (10.8)
	MV-1500	120/240	Single-phase or DC	Special	IP65; CSA	3000 (13345)	0.03 (0.76)	300 (1334)	0.09 (2.2)	4 (102)	Option	-40°F to 150°F -40°C to 65°C	40 (18.1)

* = Pending

CSA - Class I, Division 1, Groups C & D; Class II, Division 1, Groups E, F & G; CSA Enclosure 4.
FM - Class I, Division 1, Groups C & D; Class II/III, Division 1, Groups E, F & G; NEMA Type 4.
ATEX - Testing and certification varies for RPC products, Apply to RPC for specific actuator information.

CVA™ Linear (CVL)

General Description

The CVA range of linear actuators provides an electrically powered process control operator suitable for most control valve types and sizes. The CVA sets a new standard for process control valve actuators.

Features

- Electrically powered.
- High performance, continuous unrestricted modulation duty - S9.
- High resolution and repeatability.
- Comparable life to pneumatic operators.
- Optional bus interfaces available.
- Comprehensive datalogging.
- Watertight IP68 and explosionproof enclosures.
- Programmable fail-to-position option.
- Separate, double sealed terminal compartment.
- Optional 'Intrinsically Safe' control & instrumentation compatible.
- Non-intrusive setup/calibration using Bluetooth.
- Optional manual override.
- Also available in Quarter-turn configuration see page 34 for details.

Specifications

- **Dual Sensor™ Technology:** In order to achieve 0.1% resolution, two independent position sensors are used to eliminate backlash and inertia effects in the gearing. The sensors are 12-bit rotary magnetic encoders, one on the motor output and the other near the output shaft of the actuator.
- **User Interface:** The primary user configuration interface is via a Bluetooth® enabled PDA (not supplied) loaded with freeware Rotork Enlight software. In addition, each actuator has a tri-colour status LED located at the top of the rotary selector.

Control Valve Actuator

- **Power Supply / Fail-to-Position:** Incorporated within each AC actuator is a switch mode power supply, which can accept a range of input voltages from 100–240 VAC 50/60Hz. An optional 24 VDC supply can be catered for. For fail-to-position action on loss of supply, the CVA can be fitted with a reserve powerpack, which consists of 'super capacitors'. The reserve powerpack will allow the actuator to move to a predetermined position on power failure.
- **DC Brushless Motor:** The CVA uses a high efficiency, continuous rated, brushless DC motor. This allows maintenance free operation even with continuous unrestricted modulation duty.
- **Hand Drive:** Optional hand drive mechanism can be provided with quarter-turn actuators to allow manual operation of the valve.
- **Terminal Bung - Double-Sealing:** The "double-sealed" terminal compartment provides a compact wiring interface for power, control and feedback indication. Four conduit entries are provided as standard with internal and external earth connection points. Control and indication circuits can be supplied certified to "IS". Double-sealing is important as the terminal compartment is then segregated by a watertight seal from the rest of the actuator. If the cover is left off during installation and conduit entries or cable glands are not properly sealed, the actuator remains fully protected.
- **Geartrain:** Simple yet durable high efficiency spur gear drive, lubricated for life with proven high reliability.

CVA™ Linear (CVL)

- **Anti Back-Drive Mechanism:** The CVA standard build is capable of resisting any back drive from the valve up to 125% of the rated force. For applications where loss of power requires absolute "fail-in-position" capability, an optional solenoid locking mechanism is available.
- **Output Drive:** CVL base may be adapted to suit individual valves.

Dwell Time Logging

The total accumulated time spent within each 1% portion of stroke is recorded by the CVA datalogger. This data may provide essential information regarding the valve sizing, control loop tuning and process stability.

For example, a valve sized for a specified process requirement to provide optimum control ranging around the 50% position should have a dwell time characteristic idealised in the graph opposite. Offsets towards the open or closed positions may indicate under or oversizing of the valve or process conditions outside design specification. A broad characteristic may confirm significant process rangeability or indicate instability. Coupled with other process data, valve dwell time can provide information leading to improved efficiency and production.

A reference dwell profile can be recorded shortly after the installation of the actuator to be used to check for sizing and stability. This may then be used for comparison in the future.

Low Deadtime

The response (right) shows the low dead-time (0.075 sec) and high resolution of the CVA. With a step change of 2% the time taken for the CVA to move 1.7% is 0.175 seconds (T86b) without overshooting the set-point.

Reliability

There are numerous advanced designed features that help achieve a reliable product, some of which are detailed below:

- Dual Sensor™ technology – utilising two independent position sensors, backlash and positional errors can be minimised.
- Brushless DC motor – the highly reliable brushless motor allows full continuous unrestricted modulation duty – S9.
- Simple, efficient geartrain – this simple yet durable high efficiency geartrain, which is lubricated for life, is designed for arduous control valve duties.
- Double-sealing – Rotork's Double-Sealing to IP68 has been applied to the CVA, providing protection in the most demanding environments.

Set-up and Configuration

All setup and configuration is performed non-intrusively using software which is freely downloadable from the website www.rotork.com.

Each actuator in range is uniquely displayed on the PDA. Once the appropriate actuator is selected the LED on the actuator will flash blue.

End-of-travel limit setting can be carried out automatically using the PDA quick setup wizard. During the setup wizard process, the CVA runs the valve closed until it meets resistance, then backs off slightly and eases into the seat where the limit is then set. This is then repeated for the opposite direction. During the quick setup procedure the applied force can be limited for the duration of the setup. Once complete the operating force can be set to meet process requirements. During the setup the actual measured load will be displayed.

When auto calibration is complete the valve travel is shown on the PDA display.

Mechanical Performance

CVL - Linear

Lbsf - Inches - Inches/second | Newtons - mm - mm/second

CVL	Min thrust	Rated Thrust*	Max Stroke	Speed	Full Stroke time (sec)
500	200	500	1.5	0.25	6
	890	2224	38.1	6.35	
1000	400	1000	2	0.1	20
	1780	4448	50.8	2.54	
1500	600	1500	2	0.1	20
	2669	6672	50.8	2.54	

*Corresponds to 100% thrust sensor setting. Minimum thrust corresponds to 40% thrust sensor setting.

CVA Electrical Power Consumption

CVA is designed to be very efficient with very low power consumption.

The relatively low power consumption measured during modulation (Continuous 2Hz, 2% Cycling Test) is due to the inertial energy in the motor being converted back to electrical energy and stored. This energy can then be used to accelerate the motor in the opposite direction.

If the reserve powerpack option is fitted, charging of the super capacitors will take place on power up. The LED will flash during charging and operation is inhibited during charging. Charge periods will vary with size. For the CVL500 the charge time is 30 seconds to 1 minute.

Power consumption data for the CVL500 is shown below. For full details of CVA range power consumption, refer to publication P130E.

Actuator State	Power @ 110 VAC (W)	Power Factor @ 110 VAC	Power @ 230 VAC (W)	Power Factor @ 230 VAC
Stationary	4.7	0.56	5.3	0.33
Moving - No Load	12.8	0.63	14.7	0.44
Moving - 50% Load	26.2	0.66	29.3	0.55
Moving Full Load*	32.1	0.66	32.1	0.56
Charging UPS (Peak Power)	58.2	0.69	55.0	0.63
Continuous 2Hz, 2% Cycling Test - Full Load*	17.1	0.53	17.5	0.45

* Full load equates to 90% of rated thrust.

Positioning Control Performance

The following control positioning performance is based on a 4-20mA control system with CVA operating over its maximum stroke, rated speed and constant force with minimum. deadband set and with a linear demand/valve characteristic. Resolution is defined as: *minimum change in input signal required for guaranteed response*.

4-20mA Control - Positioning: % demand signal range	
Resolution	≥ 0.1%
Linearity	≤ 0.5%

Position Feedback Performance

The following position feedback performance is based on CVA operating at maximum stroke with a linear characteristic set. Feedback calibration is automatic to the set limit positions.

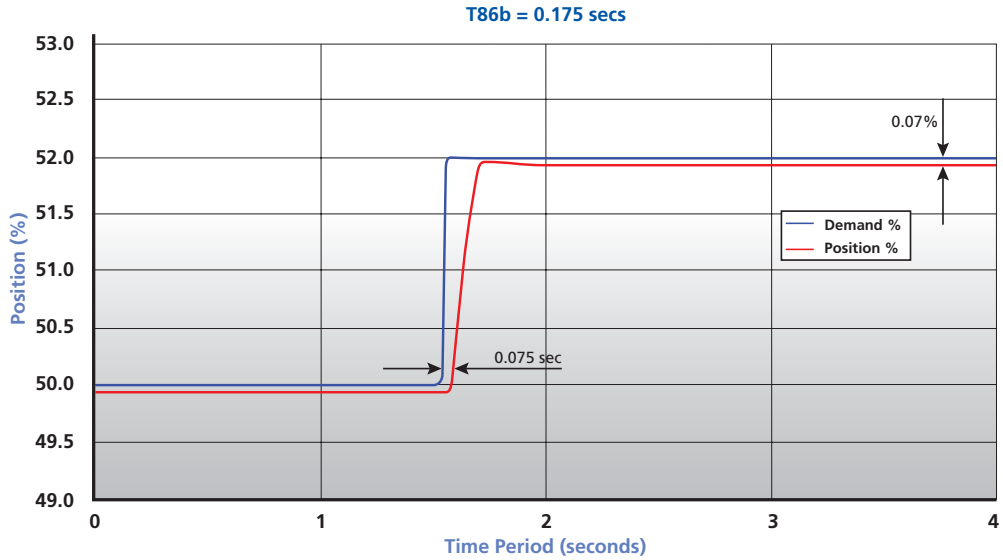
Resolution is defined as: *minimum change in position/thrust required for feedback signal change*.

4-20mA Feedback - % feedback signal range	
Resolution	≥ 0.1%
Linearity	≤ 0.5%

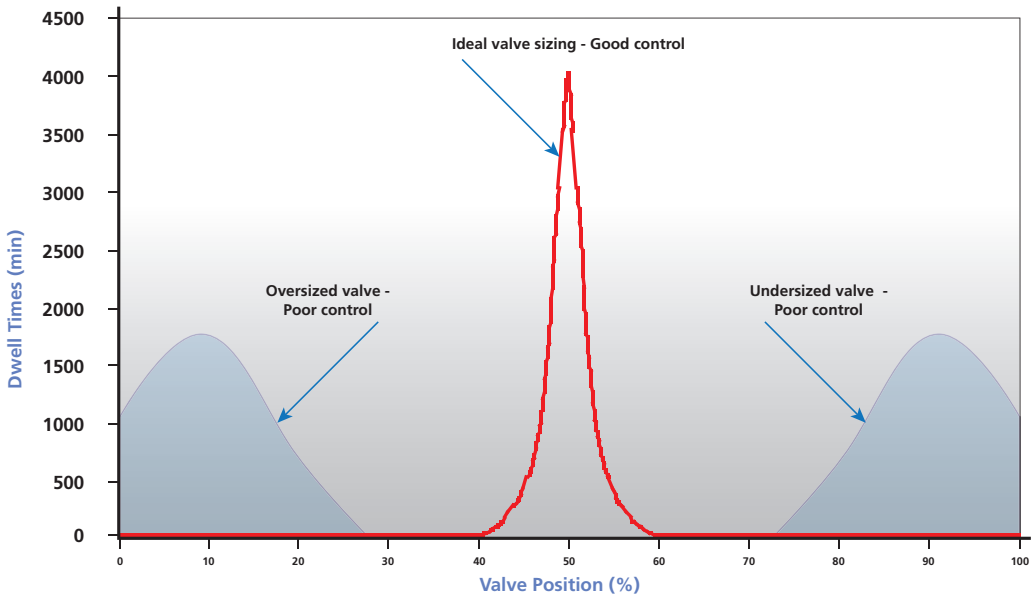
Ultimate performance will be determined by the process, valve and control system.

CVA™ Linear (CVL)

Rotork CVA Step Response



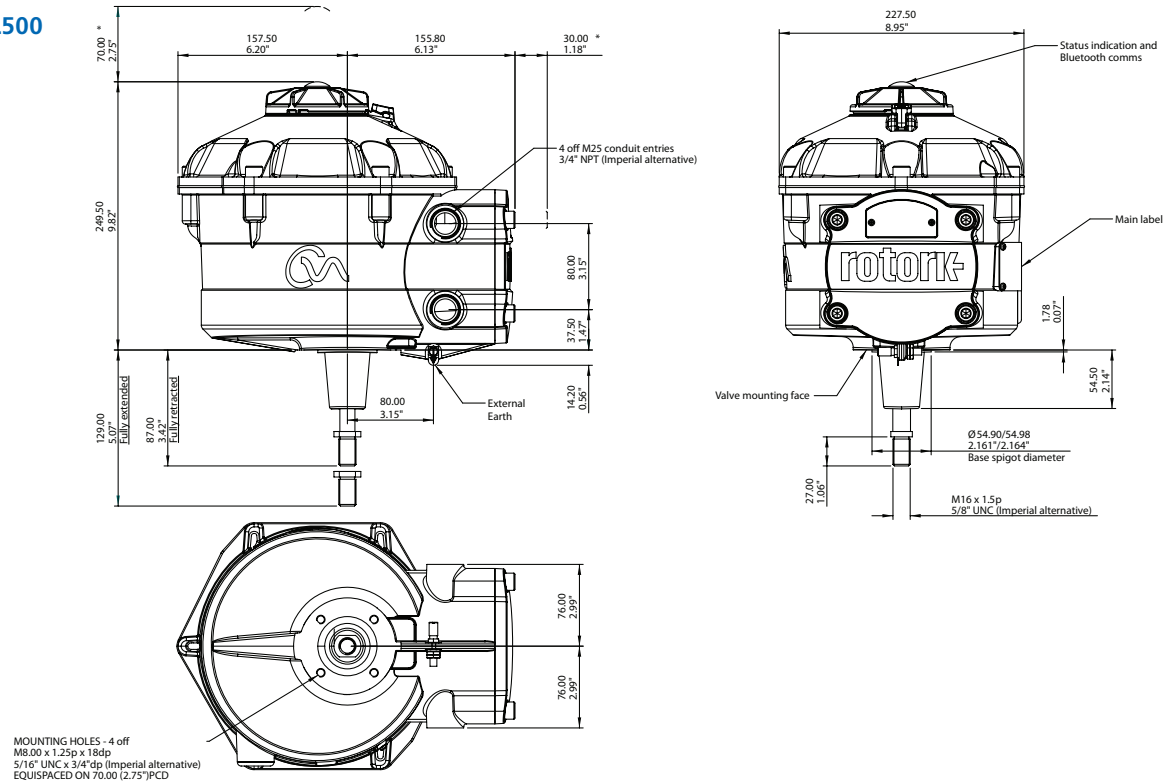
Dwell Time Graph



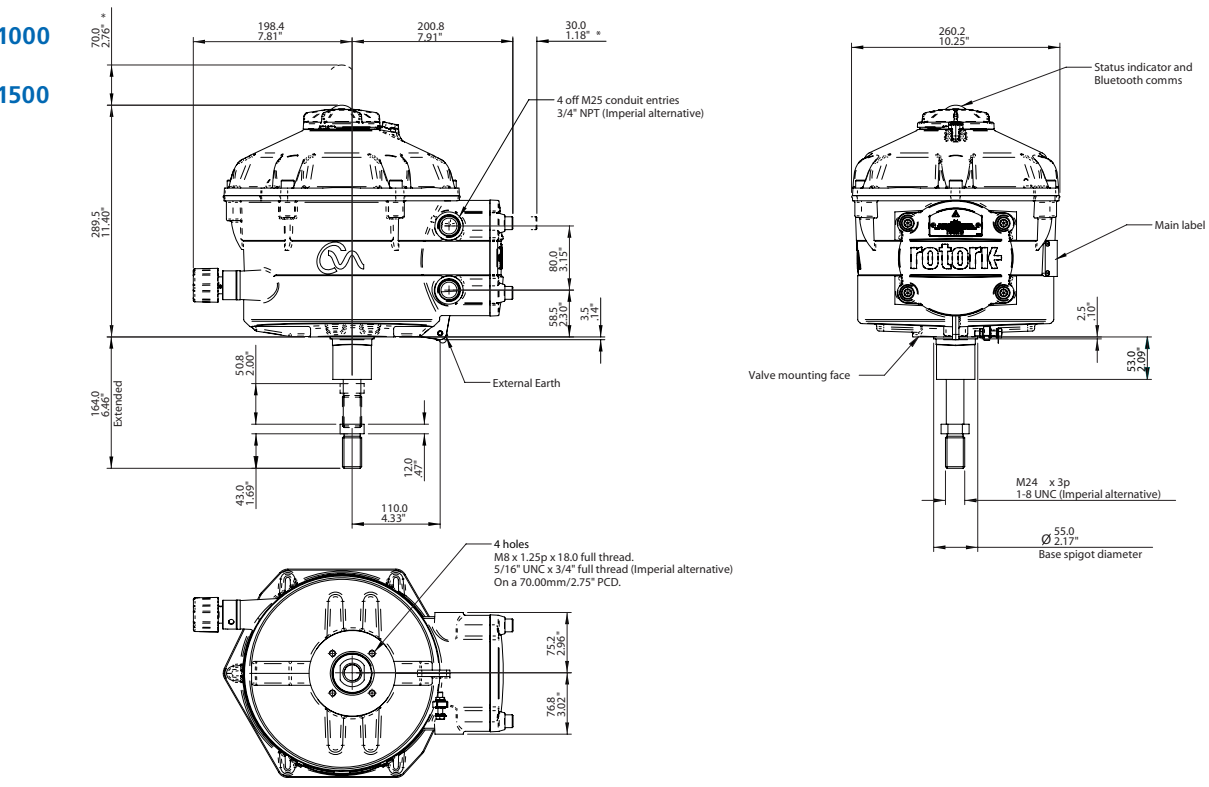
rotork Process Controls

CVA™ Linear (CVL) - General Dimensions

CVL500

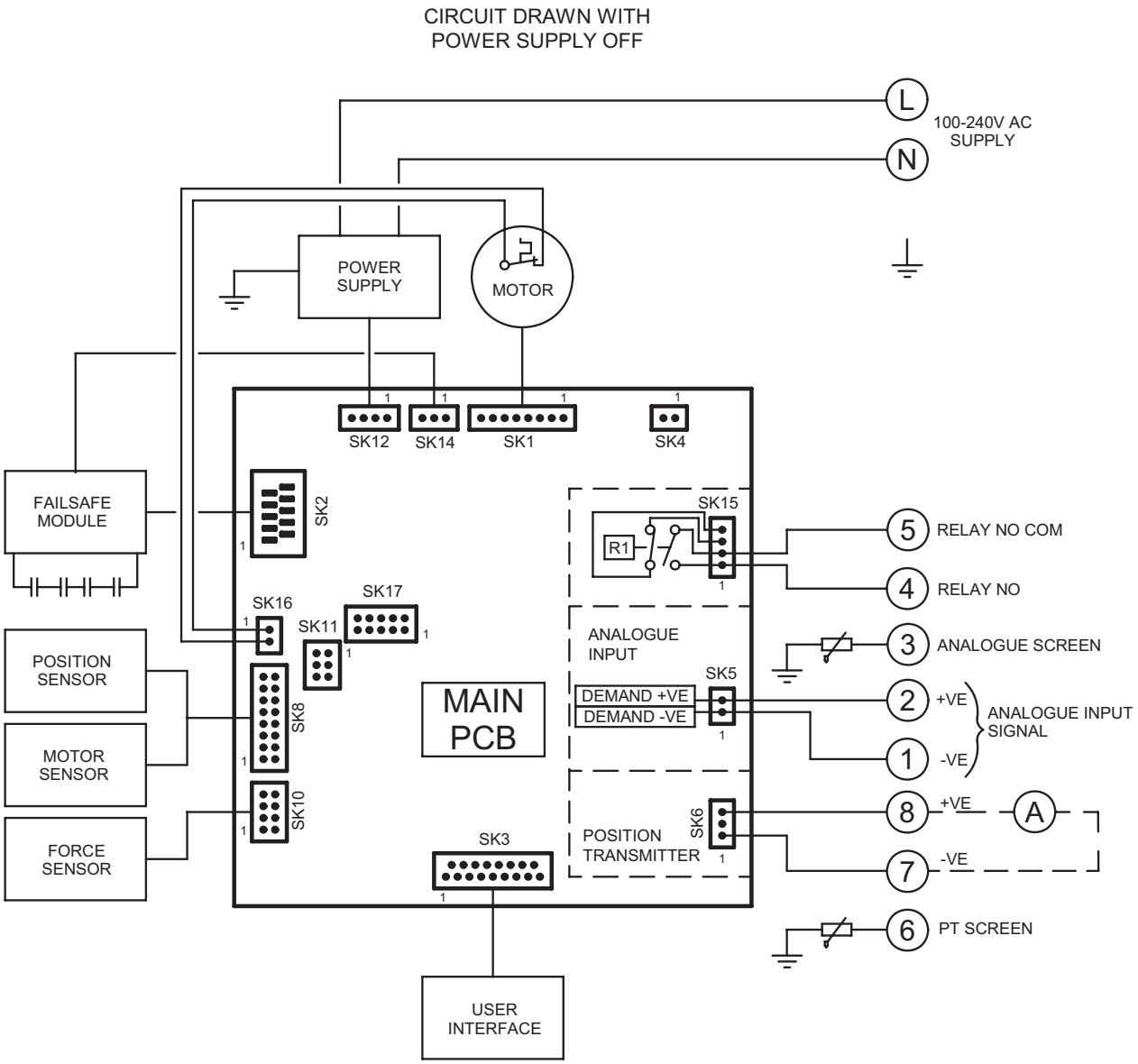


CVL1000 and CVL1500



These dimensions are subject to change without notice and should not be used for preparation of drawings or fabrication of installation mounting. For current installation manuals and other product information, see www.rotork.com.

CVA™ Linear (CVL) - Wiring Diagram



RELAY R1 CAN BE CONFIGURED TO
INDICATE ANY ONE OF THE FOLLOWING:-

0 DISABLED
1 REMOTE CONTROL AVAILABLE
2 FAULT
3 FULLY OPEN
4 FULLY CLOSED
5 FORCE TRIP OPENING
6 FORCE TRIP CLOSING
7 FORCE TRIP ANY POSITION
8 FAILSAFE OPERATION

MV-1000 Series Linear Valve Actuators

General Description

The MV-1000 series are full-featured actuators designed to be used with low thrust control valves, capable of accepting standard analog current and voltage control signals. The brushless stepper motor design provides smooth, highly accurate positioning, with positive position-lock when not in motion. The MV-1000 Series is ideally suited for valve, regulator and metering pumps requiring exact position control and unrestricted continuous modulation.

Features

- Permanently lubricated for any position mounting.
- Amplifier supplies current to hold last position and prevent backdriving, up to thrust rating under power.
- AC or DC input power versions.
- 4 to 20 mA position, loop-powered, feedback signal.
- Field selectable adjustments for:
  - speed.
  - deadband.
  - zero and span.
  - command signal type.
  - standard or reverse acting.
  - manual-auto operation.
  - output shaft position on loss of signal.
- Wide ambient temperature range.
- Full one year warranty.

Base Model Includes

- Motor (stepper).
- Manual override (except MV-1005).
- Amplifier.
- Electronic thrust limiting.
- Cast aluminum NEMA 4 (IP65) & dust ignition-proof enclosure.
- Four adjustable position switches (40 mA at 40 VDC).
- Valve position indicator.
- Internal steel gear train.
- 4-20 mA transmitter for customer use.

Popular Options (See Pages 108-117)

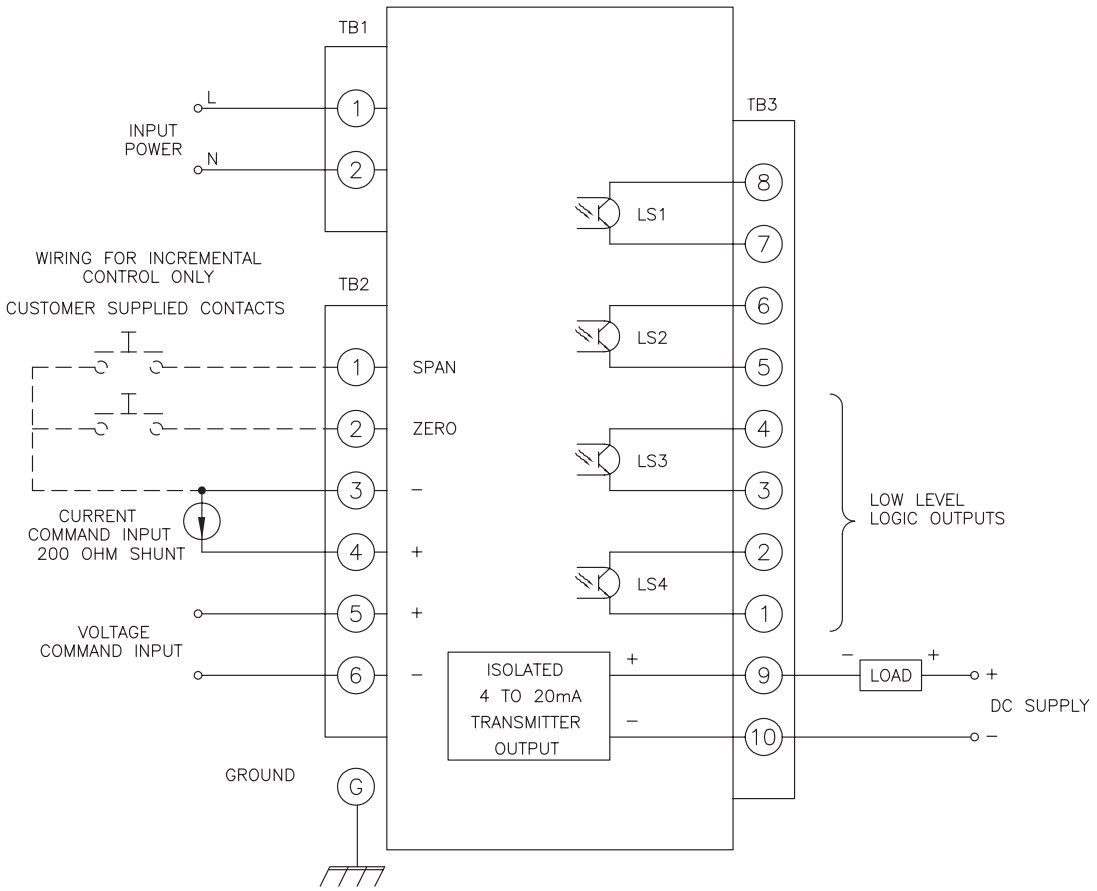
- Cast yoke base, maximum valve yoke boss diameter - 2.125 in. (53.98 mm)
- Signal Conversion Module: Convert 40 mA, 40 VDC low level to 5 Amp, 120/240 VAC current rated position limit switches.
- Low current at null (24 VDC only).
- Switching input powered AC or DC positioning for positioning actuator using AC or DCremote voltage control.
- Custom mounting and interface hardware.
- Local Auto/Manual and INC/OFF/DEC toggle switches (Close-coupled, NEMA 4).
- Exd IIB (Hydrogen) enclosure.
- Various enclosure coatings.
- Battery backup to position actuator on loss of AC power.
- Factory mounting to valve.
- ATEX & IECEx approval
  (ATEX units have M20 conduit openings).

MV-1000 Series Specifications & Typical Wiring Diagram

Specifications

- **Thrust:** Up to 200 lbf. (890 N).
- **Speed:** See selection chart on next page.
- **Input Voltage:** See selection chart on next page.
- **Linear Travel:** 0.09 inch (2.3 mm) to 1.375 inches (35 mm), adjustable.
- **Temperature Limits:** -40 to +150 °F (-40 to +65 °C). *For greater temperature ranges, consult factory.*
- **Environmental Ratings:** Explosion-proof for Class I, Division 1, Groups C and D; dust-ignition-proof for Class II, Division 1, Groups E, F, G. Also rated NEMA 4 (IP65) indoor/outdoor. (Optional Exd IIB enclosure).
- **Command Input:**
  Full Range: 4-20 mA into 200 ohms.
  Split Range: 4-12 and 12-20 mA into 200 ohms.
  Voltage: 0-5 VDC or 0-10 VDC into 200,000 ohms.
  Switch: Dry contact closures.
- **Field Wiring:** To barrier terminal blocks.
- **Thrust Limiting:** Current sensing PWM.
- **Positioning Accuracy:** 1.5% for full range.
- **Feedback:** 4-20 mA, customer supplied (loop power).
- **Loss of Signal:** Lock-in-place or run to preset.
- **Loss of Power:** Lock-in-place at last position.
- **Direction:** Extend or retract.
- **Modulation Rate:** Unrestricted modulating duty.
- **Backdrive:** Self-locking up to thrust rating.
- **Approximate Weight:**
  (without valve) MV-1010: 12 lbs. (5.4 kg)
  MV-1020: 16 lbs. (7.3 kg)
- **Approvals:** See page 119.
- **Position Switch Rating:** 40 mA at 40 VDC.

Typical Wiring Diagram



These dimensions and specifications are subject to change without notice. Current drawings and specifications are available upon request.

MV-1000 Series Selection Chart

MV/VA - 1000					
1	Basic Model	MV-1010	MV-1020	Note Ref.	Selection
2	Speed in./sec / Thrust lbf. (N)	**0.25/25** (111)			
		0.05/100 (445)			
			0.25/100 (445)		
			0.13/200 (890)		
3	Input Voltage	**1:** 120 VAC, 1-Phase, 50/60 Hz			
		2: 240 VAC, 1-Phase, 50/60 Hz			
		6: 24-36 VDC			
4	Amplifier	**D** with built in amplifier			
5	Linear Travel	**Specify Stroke** - 0.09 inch (2.3 mm) to 1.375 inches (35 mm)			

Technical Notes:
1. Maximum stroke for the VA-1020 is 1.5 inches.

MV-1000 Series Standard Options

Code	Description	Selection	
	Toggles, Lights		
A008	Local Auto/Manual and INC/OFF/DEC (Close Coupled Enclosure) NEMA 4.		
A015	ON/OFF Toggle Power Switch (Close Coupled Enclosure) NEMA 4.		
	Enclosure		
E005	CSA Exd IIB enclosure for use in Hydrogen atmosphere (AC input only).	2	
	Identification/Certification		
J001	CE Marking		
J004	One year extended warranty		
J005	Two year extended warranty		
J006	ATEX/CE Approval		
	Valve Mounting		
L001	Mounting of actuator to valve by customer. Compatible hardware supplied by Rotork Process Controls per customer specifications.	3	
L002	Valve provided by customer for mounting and set-up with actuator by Rotork Process Controls.	3	
	Painting/Coating		
W001	JCI Standard Polyurethane Blue		
W002	Two Part Epoxy		
W004	Baked On Epoxy		
	Special Electrical Options		
X012	Signal conversion module, installed and wired to actuator.	4	
X013	2 wire incremental dc input.		
X014	3 wire incremental 115/230 VAC input.		
X015	Battery Backup, only for 115/230 VAC, not available with X012.	5	

Technical Notes:
2. Consult factory for compatibility of ATEX approval with other options.
3. Complete, certified valve drawings showing topworks detail must be submitted with order.
4. Signal Conversion Module cannot be used with the Battery Backup and cannot be CSA or ATEX certified.
5. Battery Backup is only avaialble with 120 or 240 VAC 1ph, cannot be used with the Signal Conversion Module and cannot be CSA or ATEX certified.

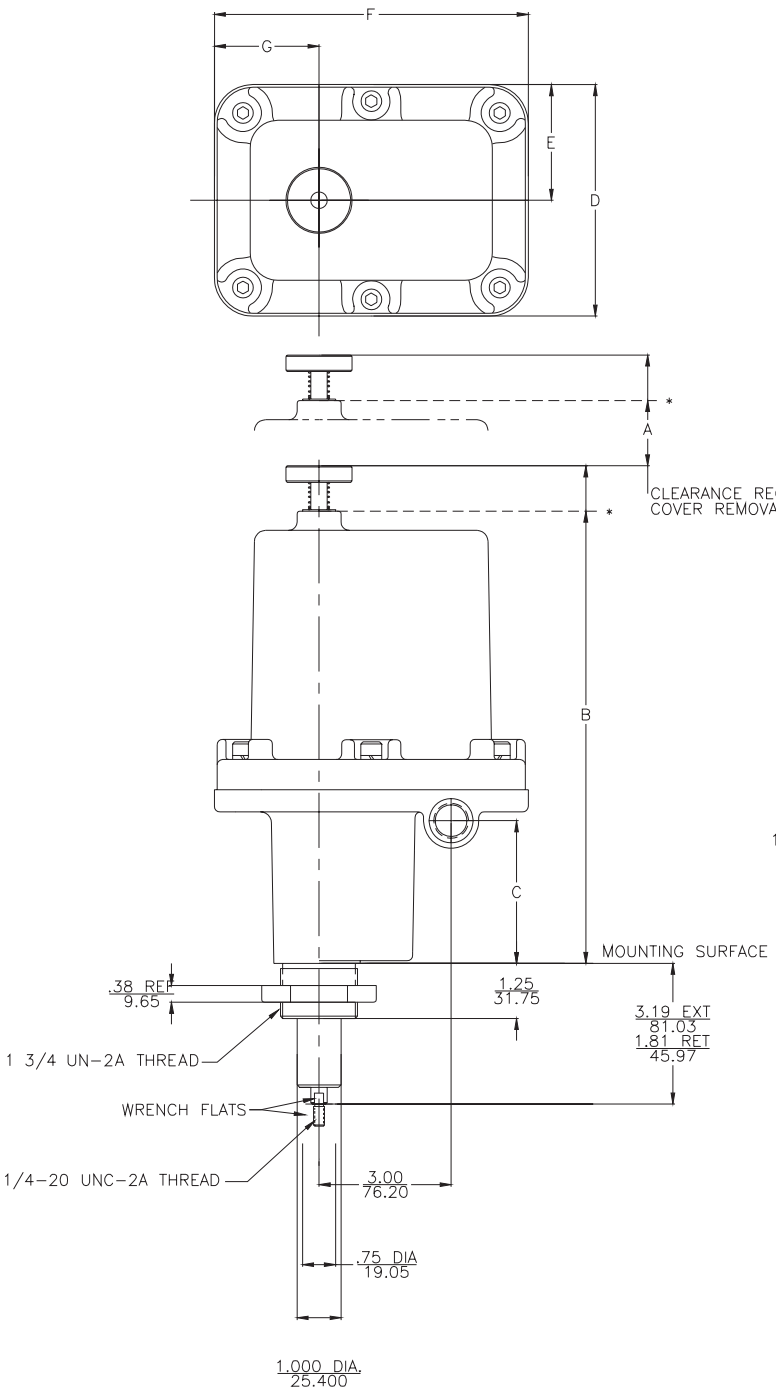
For a full description of options, go to the Complete Listing of Options starting on page 109.

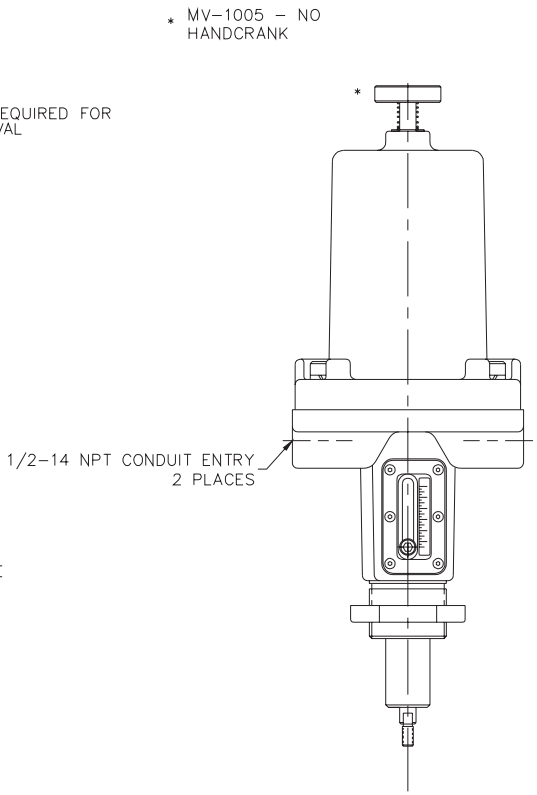
MV-1000 Series Major Dimensions

Threaded Base

Inches
(Millimeters)

	MV-1005	MV-1010	MV-1020
A	4.22 107.19	5.25 133.35	6.13 155.70
B	10.28 261.11	11.31 287.27	12.44 315.98
C	3.25 82.55	3.25 82.55	3.25 82.55
D	5.25 133.35	5.25 133.35	5.38 136.65
E	2.63 66.80	2.63 66.80	2.69 68.33
F	7.13 181.10	7.13 181.10	8.00 203.20
G	2.38 60.45	2.38 60.45	2.50 63.50

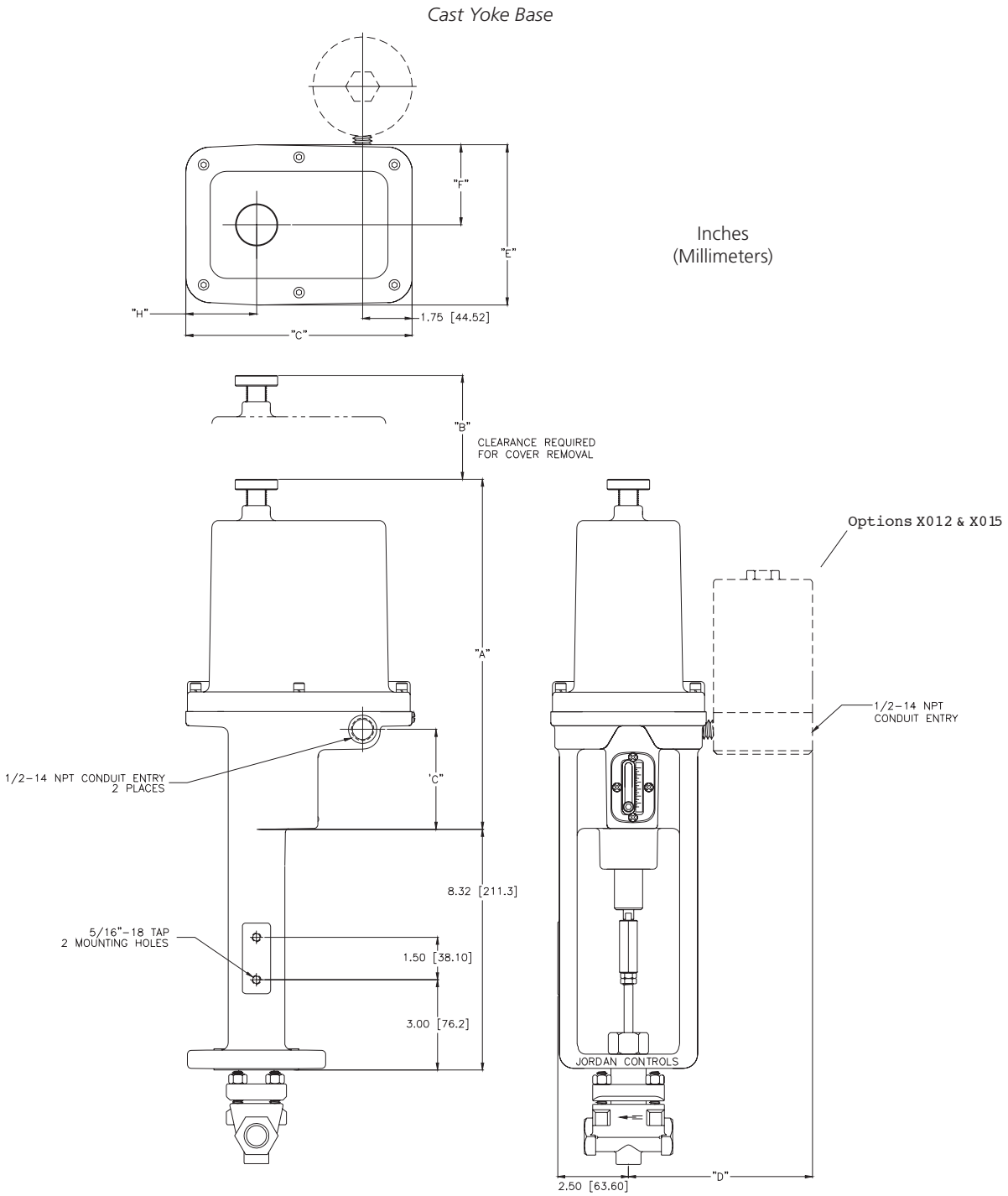




These dimensions are subject to change without notice and should not be used for preparation of drawings or fabrication of installation mounting. For current installation manuals and other product information, see www.rotork.com

MV-1000 Series Major Dimensions

Cast Yoke Base



	A	B	C	D	E	F	G	H
MV-1010	11.43 (290.3)	5.25 (133.4)	3.40 (86.4)	6.52 (165.6)	5.39 (136.9)	2.69 (68.3)	7.12 (180.8)	2.37 (60.2)
MV-1020	12.37 (314.2)	6.13 (155.7)	3.53 (89.7)	6.64 (168.7)	5.66 (143.8)	2.83 (71.9)	8.00 (203.2)	2.50 (63.5)

These dimensions are subject to change without notice and should not be used for preparation of drawings or fabrication of installation mounting. For current installation manuals and other product information, see www.rotork.com

GPSA™ Range - Linear Process Control Actuators

General Description

The Linear GPSA™ actuator range provides integrated actuation control all in one, compact package. A two line, 16 character VFD display and non-intrusive rotary switches comprise the actuator's HMI. This provides a user access for viewing and modifying parameters and data feedback. The actuator is simple to install, requiring no additional control panels or cabling, all in the safety of an explosion-proof enclosure.

A feedback signal is provided via a 4-20 mA transmitter. Additional IO is also available in the standard package.

- High reliability for peace of mind and low cost of ownership.
- Mountable in any position to adapt to environment without additional costs.
- Diagnostics for trouble free performance.
- Rugged construction for lasting reliability in the toughest conditions.

Note: GPSA™ actuators are also available in rotary configuration, see page 55 for details.

Features

- Non-intrusive Setup and Calibration.
- Integral Process Controller.
- Manual & Electrical Local Controls.
- Local Position & Diagnostics Display.
- Local Controls.
- Manaul Override.
- Diagnostics.
- Continuous Modulation.
- Output Characterization.
- Input Signal Dampening.
- Configuration Storage.
- Configurable Set Point Source.
- Explosionproof.
- Single-Phase.
- Configurable Output Relays.
- Alarms.
- Input Contacts.
- Password Protection.
- Multiple Language Support.

HART® COMMUNICATION PROTOCOL

FOUNDATION™

PROFIBUS® PROCESS FIELD BUS

Enriched Process Control

The Linear GPSA™ series are high precision process control actuators.

The linear GPSA™ actuator is capable of producing 200 pounds of force over its 1.38 inch stroke length at a speed of up to 0.13 inches per second. At a speed of 0.25 inches per second the unit is capable of producing 100 pounds of thrust.

It can utilize upto three input signals, independently configurable as either current (4-20 mA) or voltage (1-5 V) for control. Two dry contact inputs are available and may be configured to operate as Normally Open (NO) or Normally Closed (NC). The actuator provides three output relays which are configurable as to their trigger and to act as NO or NC. A position feedback signal is provided via a 4-20 mA transmitter.

A two line, 16 character VFD display and rotary switches comprise the actuators Human Machine Interface (HMI). This provides a user access for viewing and modifying changeable parameters and data feedback.

GPSA™ Linear Series Specifications

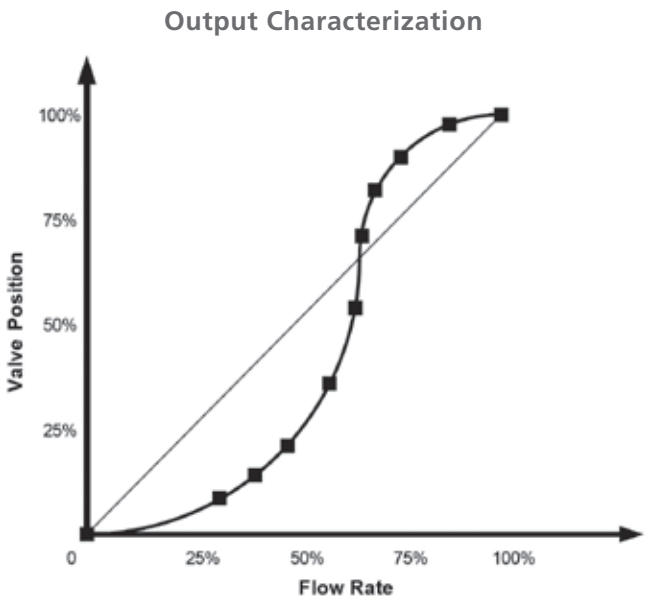
Cost saving by elimination

By integrating the local controls & process controller into the body of the GPSA™, Rotork has eliminated two major cost items as well as reducing conduit, wire, termination and labour costs.

Significant Cost Savings

- Eliminate pushbutton station HMI.
- Eliminate PLC.
- Eliminate housings.
- Reduce terminations and conduit.
- Reduce space envelope.
- Improve installation, start-up time and cost.
- Enhanced maintenance and diagnostics.

Programable output characterization to compensate for valve characteristics.



Specifications

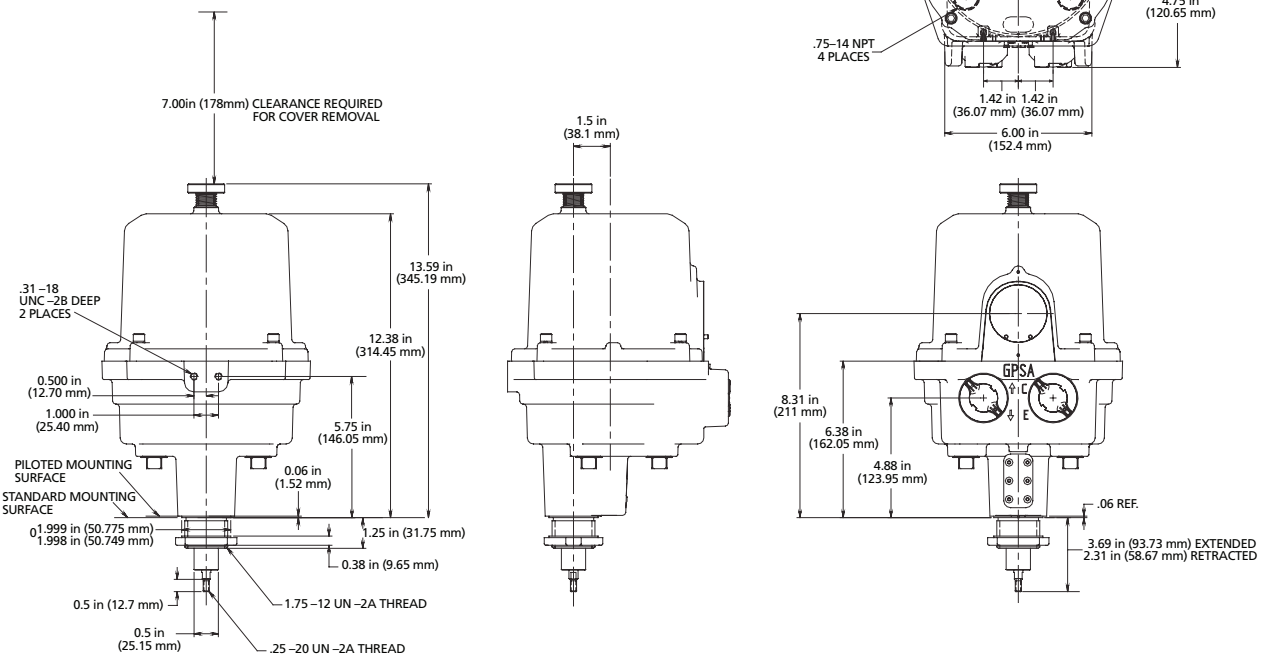
- **Input Voltage:** 120/240 Single-Phase.
- **Motor Type:** Stepper.
- **Direct Current:** Yes.
- **Enclosure Certification:** IP65 ATEX, FM.
- **Maximum Force:** 200 lbs (890 N).
- **Minimum Force:** 100 lbs (445 N).
- **Speed at Maximum:** 0.13"/sec (3.3 mm/sec).
- **Speed at Minimum:** 0.25"/sec (6.35 mm/sec).
- **Stroke Length:** 1.375" (35 mm)
- **Manual Overide:** Yes.
- **Operating Temperature:** -22 to +150 °F (-30 to +65 °C).
- **Weight:** 16 lbs (7.25 kg).

GPSA™ Linear Series Major Dimensions

GPSA™ dimensions

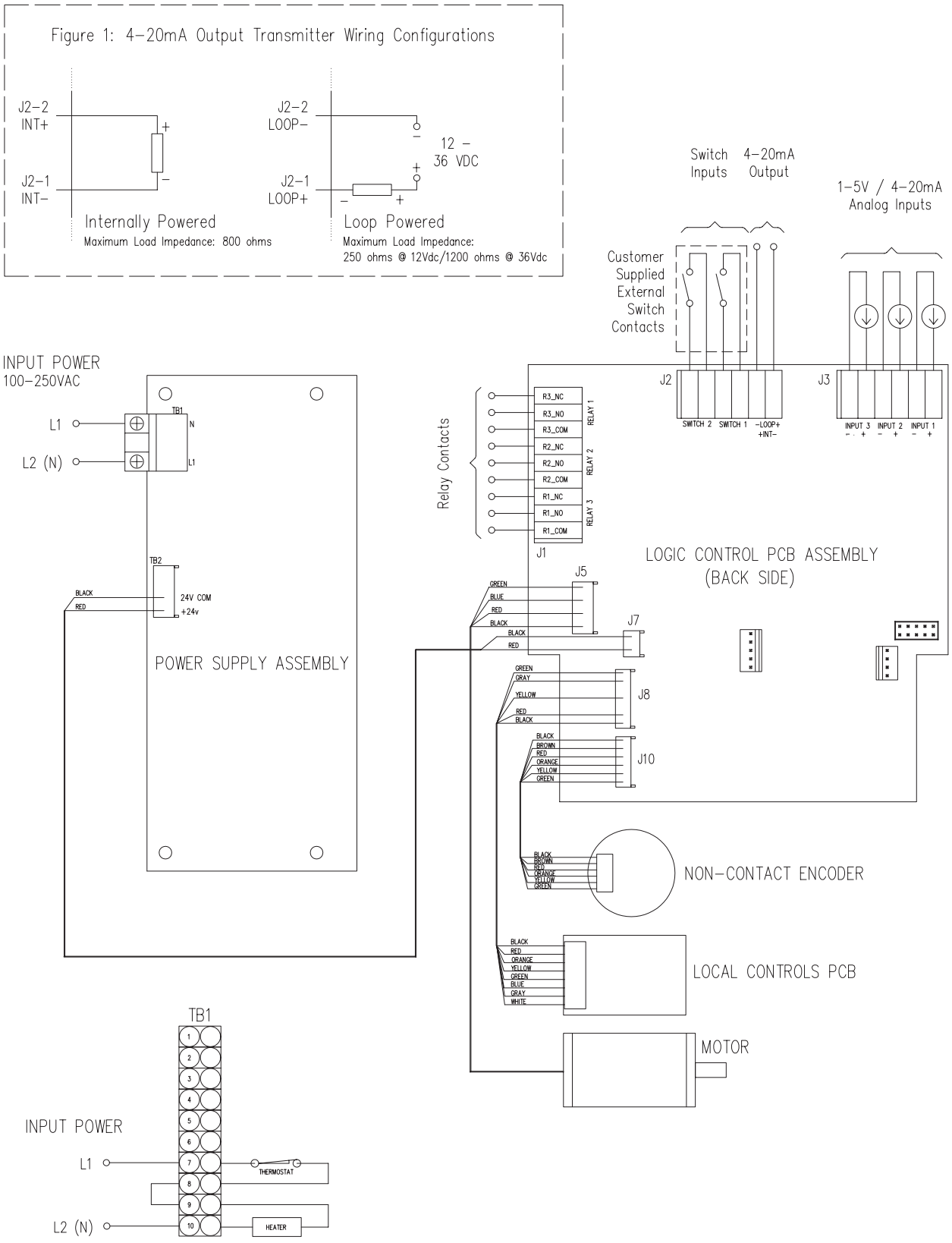
All dimensions in inches and millimetres.

Note: These dimensions refer to the Linear GPSA™ only.



These dimensions are subject to change without notice and should not be used for preparation of drawings or fabrication of installation mounting. For current installation manuals and other product information, see www.rotork.com.

GPSA™ Linear Series Typical Wiring Diagram



These dimensions and specifications are subject to change without notice. Current drawings and specifications are available upon request.

GPSA™ Linear Series Selection Chart

GPSA				
1	Basic Model	GPSA	Note Ref.	Selection
2	Speed in./sec / Thrust lbf. (N)	**0.25/100** (445)		
		0.13/200 (890)		
3	Input Voltage	**1:** 120 VAC, 1-Phase, 50/60 Hz		
		2: 240 VAC, 1-Phase, 50/60 Hz		
4	Amplifier	**D** with built in amplifier		
5	Linear Travel	**Specify Stroke** - 0.09 inch (2.3 mm) to 1.375 inches (35 mm)		

GPSA™ Linear Series Standard Options

Code	Description	Selection	
	Identification/Certification		
J001	CE Marking		
J003	FM Approval		
J006	ATEX/CE Approval		
	Valve Mounting		
L001	Mounting of actuator to valve by customer. Compatible hardware supplied by Rotork Process Controls per customer specifications.	1	
L002	Valve provided by customer for mounting and set-up with actuator by Rotork Process Controls.	1	
	Painting/Coating		
W002	Two Part Epoxy		
	Special Electrical Options		
X133	Hart		
X139	Foundation Feildbus		
X143	Profi bus DP Single Channel		

Technical Notes:
1. Complete, certified valve drawings showing topworks detail must be submitted with order.

For a full description of options, go to the Complete Listing of Options starting on page 109.

VA-1000 Series Linear Valve Actuators

General Description

The VA-1000 series are full-featured actuators designed to be used with low thrust control valves, capable of accepting standard analog current and voltage control signals. The brushless stepper motor design provides smooth, highly accurate positioning, with positive position-lock when not in motion. The VA-1000 Series is ideally suited for valve, regulator and metering pumps requiring exact position control and unrestricted continuous modulation.

Features

- Permanently lubricated for any position mounting.
- Amplifier supplies current to hold last position and prevent backdriving, up to thrust rating under power.
- AC or DC input power versions.
- 4 to 20 mA position, loop-powered, feedback signal.
- Field selectable adjustments for:
  - speed.
  - deadband.
  - zero and span.
  - command signal type.
  - standard or reverse acting.
  - manual-auto operation.
  - output shaft position on loss of signal.
- Wide ambient temperature range.
- Full one year warranty.

Base Model Includes

- Manual override.
- Amplifier.
- Electronic thrust limiting.
- Cast aluminum NEMA 4 (IP65) & dust ignition-proof enclosure.
- Four adjustable position switches (40 mA at 40 VDC).
- Valve position indicator.
- Internal steel gear train.
- 4-20 mA transmitter for customer use.

Popular Options (See Pages 109-118)

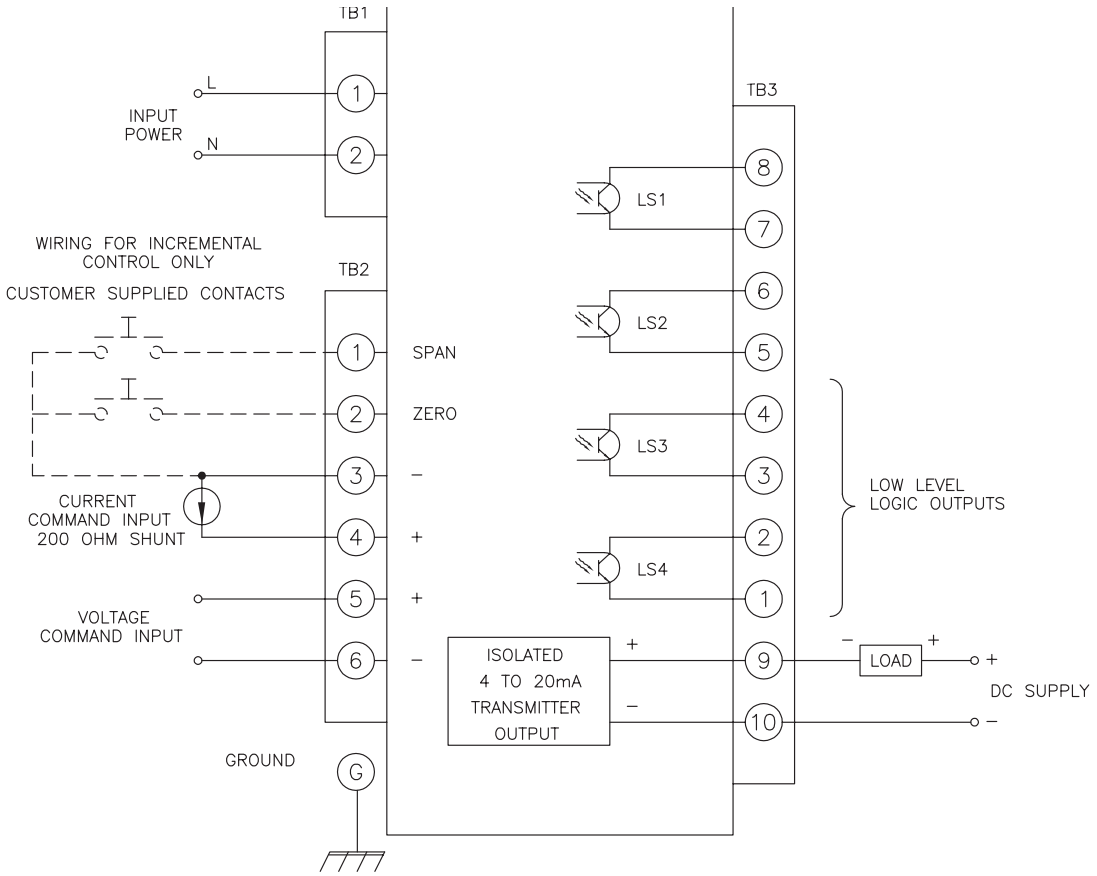
- Signal Conversion Module: Convert 40 mA, 40 VDC low level to 5 Amp, 120/240 VAC current rated position limit switches.
- Low current at null (24 VDC only).
- Switching input powered AC or DC positioning for positioning actuator using AC or DC remote voltage control.
- Custom mounting and interface hardware.
- Local Auto/Manual and INC/OFF/DEC toggle switches (Close-coupled, NEMA 4).
- Various enclosure coatings.
- Battery backup to position actuator on loss of AC power.
- Factory mounting to valve.
- ATEX Approval.

VA-1000 Series Specifications & Typical Wiring Diagram

Specifications

- **Thrust:** Up to 900 lbf. (4003 N).
- **Speed:** See selection chart on next page.
- **Input Voltage:** See selection chart on next page.
- **Linear Travel:** 0.34 inch (8.63 mm) to 1.5 inches 38.1 mm), adjustable.
- **Temperature Limits:** -40 to +150 °F (-40 to +65 °C) *For greater temperature ranges, consult factory.*
- **Environmental Ratings:** Explosion-proof for Class I, Division 1, Groups C and D; dust-ignition-proof for Class II, Division 1, Groups E, F, G. Also rated NEMA 4 (IP65) indoor/outdoor. (Optional Group B).
- **Command Input:**
  Full Range: 4-20 mA into 200 ohms.
  Split Range: 4-12 and 12-20 mA into 200 ohms.
  Voltage: 0-5 VDC or 0-10 VDC into 200,000 ohms.
  Switch: Dry contact closures.
- **Field Wiring:** To barrier terminal blocks.
- **Thrust Limiting:** Current sensing PWM.
- **Positioning Accuracy:** 1.5% for full range.
- **Feedback:** 4-20 mA, customer supplied (loop power).
- **Loss of Signal:** Lock-in-place or run to preset.
- **Loss of Power:** Lock-in-place at last position.
- **Direction:** Extend or retract.
- **Modulation Rate:** Unrestricted modulating duty.
- **Backdrive:** Self-locking up to thrust rating.
- **Approximate Weight:**
  (without valve) VA-1020: 24 lbs. (10.9 kg)
- **Approvals:** See page 119.
- **Position Switch Rating:** 40mA at 40 VDC.

Typical Wiring Diagram



These dimensions and specifications are subject to change without notice. Current drawings and specifications are available upon request.

VA-1000 Series Selection Chart

VA - 1000				
1	Basic Model	VA-1020	Note Ref.	Selection
2	Speed in./sec / Thrust lbf. (N)	**0.028/300** (1334)		
		0.014/900 (4003)		
3	Input Voltage	**1:** 120 VAC, 1-Phase, 50/60 Hz		
		2: 240 VAC, 1-Phase, 50/60 Hz		
		3: 24-36 VDC		
4	Amplifier	**D** with built in amplifier		
5	Linear Travel	**Specify Stroke** - 0.09 inch (2.3 mm) to 1.375 inches (35 mm)	1	

Technical Notes:
1. Maximum stroke for the VA-1020 is 1.5 inches.

VA-1000 Series Standard Options

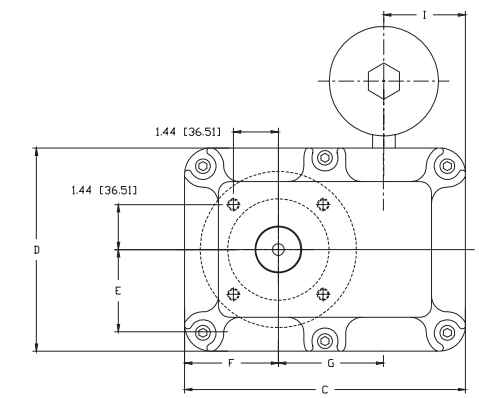
Code	Description	Selection	
	Toggles, Lights		
A008	Local Auto/Manual and INC/OFF/DEC (Close Coupled Enclosure) NEMA 4.		
A015	ON/OFF Toggle Power Switch (Close Coupled Enclosure) NEMA 4.		
	Enclosure		
E005	CSA Exd IIB enclosure for use in Hydrogen atmosphere (AC input only).	2	
	Identification/Certification		
J001	CE Marking		
J004	One year extended warranty		
J005	Two year extended warranty		
J006	ATEX/CE Approval		
	Valve Mounting		
L001	Mounting of actuator to valve by customer. Compatible hardware supplied by Rotork Process Controls per customer specifications.	3	
L002	Valve provided by customer for mounting and set-up with actuator by Rotork Process Controls.	3	
	Painting/Coating		
W001	JCI Standard Polyurethane Blue		
W002	Two Part Epoxy		
W004	Baked On Epoxy		
	Special Electrical Options		
X012	Signal conversion module, installed and wired to actuator.	4	
X013	2 wire incremental dc input.		
X014	3 wire incremental 115/230 VAC input.		

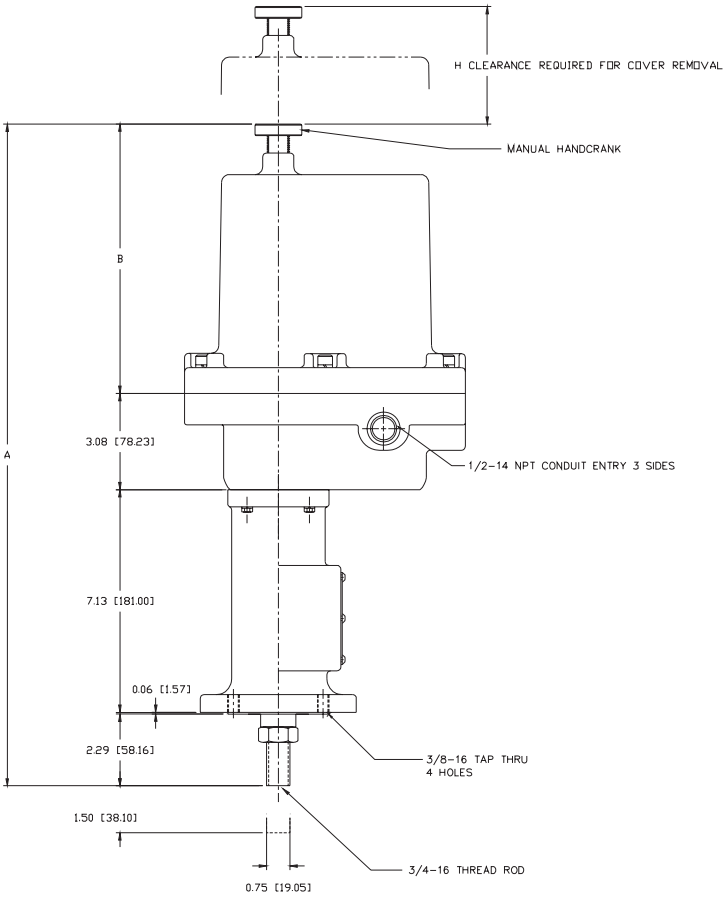
Technical Notes:t
2. Consult factory for compatibility of ATEX approval with other options.
3. Complete, certified valve drawings showing topworks detail must be submitted with order.
4. Signal Conversion Module cannot be used with the Battery Backup and cannot be CSA or ATEX certified.
5. Battery Backup is only avaialble with 120 or 240 VAC 1ph, cannot be used with the Signal Conversion Module and cannot be CSA or ATEX certified.

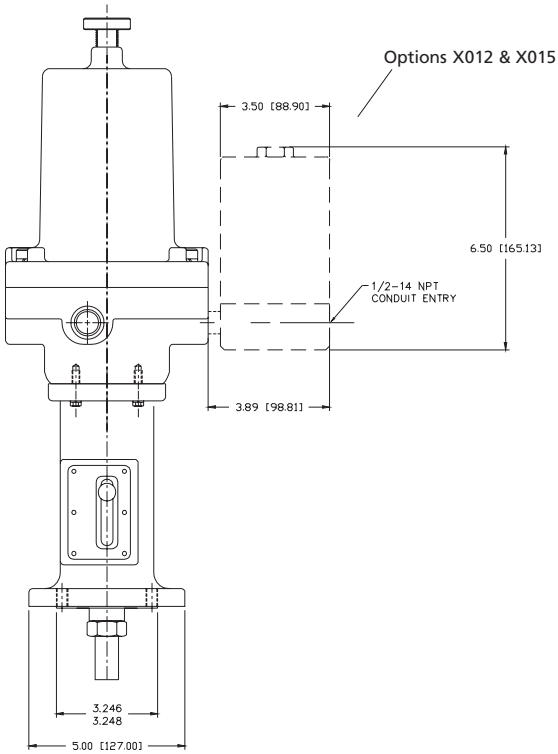
For a full description of options, go to the Complete Listing of Options starting on page 109.

VA-1000 Major Dimensions

Inches
(Millimeters)







	A	B	C	D	E	F	G	H	I
VA-1015	18.9 (480.06)	7.35 (186.69)	7.13 (181.1)	5.25 (133.35)	2.63 (66.8)	2.38 (60.45)	3.00 (76.20)	5.25 (133.35)	1.75 (44.45)
VA-1020	21.3 (541.02)	8.25 (209.55)	8.00 (203.2)	5.5 (139.7)	2.75 (69.85)	2.5 (63.5)	3.5 (88.9)	5.75 (146.05)	2.00 (50.8)

These dimensions are subject to change without notice and should not be used for preparation of drawings or fabrication of installation mounting. For current installation manuals and other product information, see www.rotork.com

MV-1500 Series Linear Valve Actuators

General Description

The MV-1500 Series are linear, bidirectional actuators, designed to meet the exacting requirements for closed-loop modulating positioning control. They can be applied to a variety of sliding stem valves to provide remote valve positioning for control of gases, steam or other liquids in various process control applications.

All MV-1500 Series actuators are also available with an internal amplifier (AC voltage only). These amplifiers are all full-featured ac switching devices designed to work seamlessly with the actuator for closed loop control.

Features

- Permanently lubricated for any position mounting.
- A wide variety of speed/thrust combinations.
- AC or DC input power versions.
- Cushioned valve seating.
- Wide ambient temperature range.
- Full one year warranty.

Base Model Includes

- End of travel switches, not for customer use
- Explosion proof enclosure.
- Internal spur gear train.
- 4-20 mA transmitter for customer use (amplifier models only).

Amplifier Features

- Isolated, two-wire, 4-20mA feedback.
- Customer-adjustable deadband.
- Customer-adjustable zero and span.
- Accepts either voltage or current command inputs.
- Selectable options for Loss-of-Signal action:

  - Lock in place - Run to preset.

- Field selectable dynamic brake.
- AC triac switching of motor for increased life.

Popular Options

- Potentiometer or 4 to 20 mA position feedback.
- Custom mounting and interface hardware.
- Anti-condensation heater and thermostat.
- Motor brake (MV-1500 only).
- Handcrank (MV-1500 only).

Specifications

	MV-1500
Thrust Range lbf. (N)	300 to 3000 (1334 to 13344)
Stroke in. (mm)	0.25 to 4.0 (6.35 to 101.6)
Speed sec./in. (sec./mm)	11 to 40 (0.43 to 1.57)
Approx. Weight lbs. (kg)	40 (18.1)

- **Temperature Limits:** -40 to +150 °F (-40 to +65 °C) *For greater temperature ranges, consult factory.*
- **Field Wiring:** To barrier terminal blocks.
- **Approvals:** See page 119.
- **Position Switch Rating:** 120/240 VAC, 10 Amp.

The MV-1500 Series do not have overthrust protection. Overthrusting the actuator will cause permanent damage.

MV-1500 Specification Chart

Actuator Model	Input Power Volts/Phase/Hz	Current (Amps) Run	Current (Amps) Stall	Command Output	Input Impedance in Ohms	Feedback	Modulation Rate*
MV-1510-N	120/1/50/60	0.44	0.65	N/A	N/A	N/A	2000 starts/hr
MV-1510-D	120/1/50/60	0.44	0.65	4-20 mA, VDC or 0-10 VDC	200 100,000	4-20 mA, loop-powered	2000 starts/hr
MV-1530-N	120/1/50/60	0.9	1.2	N/A	N/A	N/A	2000 starts/hr
MV-1530-D	120/1/50/60	0.9	1.2	4-20 mA, VDC or 0-10 VDC	200 100,000	4-20 mA, loop-powered	2000 starts/hr
MV-1540-N	24 VDC	1.7	1.9	N/A	N/A	N/A	4000 starts/hr
MV-1550-N	240/1/50/60	0.45	0.5	N/A	N/A	N/A	2000 starts/hr
MV-1550-D	240/1/50/60	0.45	0.5	4-20 mA, VDC or 0-10 VDC	200 100,000	4-20 mA, loop-powered	2000 starts/hr
MV-1570-N	240/1/50/60	0.27	0.4	N/A	N/A	N/A	2000 starts/hr
MV-1570-D	240/1/50/60	0.27	0.4	4-20 mA, VDC or 0-10 VDC	200 100,000	4-20 mA, loop-powered	2000 starts/hr

* Minimum Position Change of 1%. N/A = Not Applicable

MV-1500 Series Selection Chart

MV-1500						
1	Basic Model	MV-1510, MV-1570	MV-1530, MV1550	MV-1540	Note Ref.	Selection
2	Speed sec/in. / Thrust lbf. (N)	**40/1200** (5338)	**34/3000** (13345)	**23/1600** (7117)		
		23/600 (2669)	**32/2000** (8896)	**16/1200** (5338)		
		14/400 (1779)	**32/1600** (7117)	**11/800** (3558)		
		11/300 (1334)	**23/1200** (5338)	**8/600** (2669)		
			14/1100 (4893)			
			11/800 (3558)			
3	Input Voltage	**MV-1510, MV-1530**	**1:** 120 VAC, 1-Phase, 50/60 Hz			
		MV-1550, MV-1570	**2:** 240 VAC, 1-Phase, 50/60 Hz			
		MV-1540	**6:** 24 VDC Voltage designator			
4	Amplifier	**N** without internal amplifier				
		D with internal amplifier				
5	Travel	**Specify Travel** - 0.25 inch (6.35 mm) to 4.0 inches (101.6 mm) stroke available				
6*	Mounting Yoke Type	**S:** Standard length: Strokes to 1.5 inches (38 mm).			1	
		L: Extended length: Strokes to 2 inches (51 mm).			2	
		EL: Extended length: Strokes to 4 inches (102 mm).			3	

Technical Notes:
1. 1200 lbf mx thrust, Soft Seating extend position only. 2. 2000 lbf thrust max, Bi-directional soft seating. 3. 3000 lbf thrust max.

MV-1500 Series Standard Options

Code	Description	Selection
	Toggles, Lights	
A008	Local Auto/Manual and INC/OFF/DEC (Close Coupled Enclosure) NEMA 4.	
A015	ON/OFF Toggle Power Switch (Close Coupled Enclosure) NEMA 4.	
	Feedback	
F001	Potentiometer, 1000 ohms	
F002	Tandem Potentiometer, 1000 ohms each (Not available with amplifier)	
F003	Potentiometer, 5000 ohms (not available with amplifier)	
F004	Potentiometer, 10,000 ohms (not available with amplifier)	
F005	Transmitter, 4-20 mA output	4
F006	One Pot, 1000 ohms plus 4-20 mA Transmitter, not available with amplifier	5
F007	Hall Effect Contactless 4-20 mA Feedback	6
	Heater	
H001	Anti-Condensation Heater (24 VDC)	
H002	Anti-Condensation Heater (120 VAC)	
H003	Anti-Condensation Heater (240 VAC)	
	Identification/Certifications/Warranties	
J001	CE Marking	6
J004	One year extended warranty	
J005	Two year extended warranty	
	Handcrank	
K001	Manual Handcrank (Top-mount)	
	Valve Mounting	
L001	Mounting of actuator to valve by customer. Compatible hardware supplied by Rotork Process Controls per customer specifications.	
L002	Valve provided by customer for mounting and set-up with actuator by Rotork Process Controls.	

Continued over page.

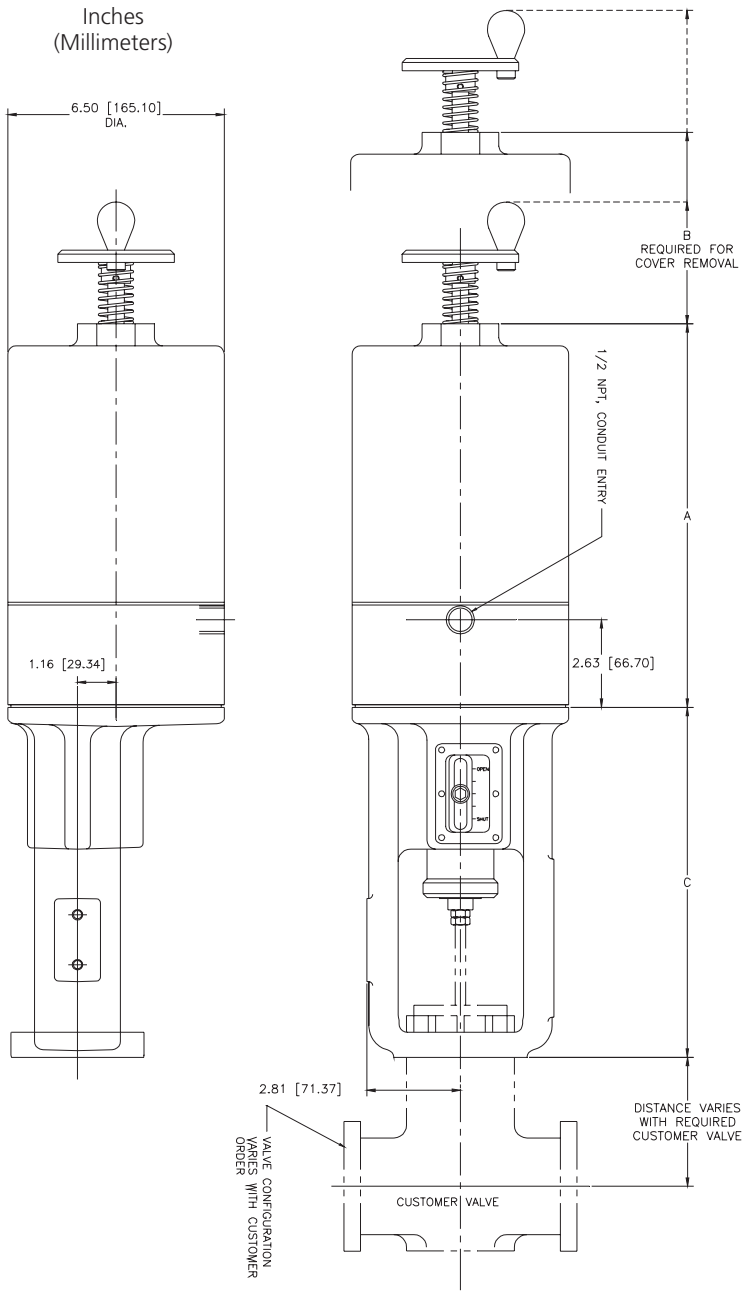
MV-1500 Series Standard Options continued

Code	Description	Selection	
	Auxiliary Switches		
S005	Aluminum Cam		
S006	Aluminum Feedback Frame		
S009	Two Adjustable Position Switches, SPDT, 10 Amp, 120/240 VAC		
S010	Two Adjustable Position Switches, DPDT, 10 Amp, 120/240 VAC, up to 5.85 turns		
S013	Two nonadjustable end of travel position switches, SPDT, 10 Amp, 120/240 VAC		
	Painting/Coating		
W001	JCI Standard Polyurethane Blue		
W002	Two Part Epoxy		
W004	Baked On Epoxy		

Technical Notes:
4. F005 is redundant for units with an amplifier.
5. Not available with an amplifier.
6. Only available for units with amplifiers.

For a full description of options, go to the Complete Listing of Options starting on page 109.

MV-1500 Major Dimensions



	A	B	C		
			Standard	*Long*	*Extra Long*
MV-1510-N **MV-1530-N** **MV-1540-N** **MV-1550-N** **MV-1570-N**	16.20 (411.48)	7.81 (198.37)	10.50 (266.70)	15.55 (394.97)	Consult Factory
MV-1510-D **MV-1530-D** **MV-1550-D** **MV-1570-D**	17.25 (438.15)	7.81 (198.37)	10.50 (266.70)	15.55 (394.97)	Consult Factory

These dimensions are subject to change without notice and should not be used for preparation of drawings or fabrication of installation mounting. For current installation manuals and other product information, see www.rotork.com

Rotary





Rotary Control Valve actuators - Performance Data

Rotary

	Model	Single Phase Voltage	Motor type	DC	Enclosure Certification	Max Torque in lb (Nm)	Speed at Max. Torque	Min Torque in lb (Nm)	Speed at Min. Torque	Total turns available	Manual Override	Operating Temp.	Weight lbs (kg)
	CVQ 1200	110/240	Brushless DC	Y	IP68	1200 (135.5)	15 secs for quarter-turn	480 (54.2)	15 sec for quarter-turn	90°	Option	-22°F to 158°F -30°C to 70°C	31 (14)
	CVQ 2400	110/240	Brushless DC	Y	IP68	2400 (271)	20 secs for quarter-turn	960 (108.4)	20 sec for quarter-turn	90°	Option	-22°F to 158°F -30°C to 70°C	44 (20)
	GPSA™	120/240	Stepper	Y	IP65 ATEX FM	350 in.lbs. (40 Nm)	0.7 RPM	85 in. lbs. (10 Nm)	3.15 RPM	10° to 20 turns	Yes	-22 to +150 °F (-30 to +65 °C)	16 (7.25)
	SM-1100	120/240	Single phase	Y	IP65; CSA	100 (445)	1.2 RPM	3.5 (0.4)	40 RPM	40° to 60 turns	No	-40°F to 150°F -40°C to 65°C	14 (6.35)
	SM-1015	120/240	Stepper	Y	IP65; CSA ATEX; FM	45 (5)	1 RPM	15 (1.69)	12.5 RPM	10° to 20 turns	Yes	-40°F to 150°F -40°C to 65°C	12 (5.44)
	SM-1020	120/240	Stepper (w/gearbox)	Y	IP65; CSA ATEX; FM	350 (40)	0.7 RPM	20 (2.25)	10 RPM	10° to 20 turns	Yes	-4°F to 150°F -20°C to 65°C	16 (7.25)
	SM-1500	120/240	Single-phase & DC brushed	Y	IP65; CSA	400 (45)	15 RPM	40 (4.5)	73 RPM	72° to 324 turns	Option	-40°F to 150°F -40°C to 65°C	20 (9.07)
	SM-1600	120/240	Single-phase & DC brushed	Y	IP65; CSA	1000 (113)	2.5 RPM	500 (56.5)	5 RPM	72° to 324 turns	Option	-40°F to 150°F -40°C to 65°C	22 (9.97)

CSA - Class I, Division 1, Groups C & D; Class II, Division 1, Groups E, F & G; CSA Enclosure 4.
FM - Class I, Division 1, Groups C & D; Class II/III, Division 1, Groups E, F & G; NEMA Type 4.
ATEX - Testing and certification varies for RPC products, Apply to RPC for specific actuator information.

CVA™ Rotary (CVQ)

General Description

The CVA range of quarter-turn actuators provides an electrically powered process control operator suitable for most control valve types and sizes. The CVA sets a new standard for process control valve actuators.

Features

- Electrically powered.
- High performance, continuous unrestricted modulation duty - S9.
- High resolution and repeatability.
- Comparable life to pneumatic operators.
- Optional bus interfaces available.
- Comprehensive datalogging.
- Watertight IP68 and explosionproof enclosures.
- Programmable fail-to-position option.
- Separate, double sealed terminal compartment.
- Optional 'Intrinsically Safe' control & instrumentation compatible.
- Non-intrusive setup/calibration using Bluetooth.
- Optional manual override.
- Also available in Linear configuration see page 7 for details.

Specifications

- **Dual Sensor™ Technology:** In order to achieve 0.1% resolution, two independent position sensors are used to eliminate backlash and inertia effects in the gearing. The sensors are 12-bit rotary magnetic encoders, one on the motor output and the other near the output shaft of the actuator.
- **User Interface:** All setup and configuration is performed non-intrusively using software which is freely downloadable from the website www.rotork.com. In addition, each actuator has a tri-colour status LED located at the top of the rotary selector.

Control Valve Actuator

- **Power Supply / Fail-to-Position:** Incorporated within each AC actuator is a switch mode power supply, which can accept a range of input voltages from 100–240 VAC 50/60Hz. An optional 24 VDC supply can be catered for. For fail-to-position action on loss of supply, the CVA can be fitted with a reserve powerpack, which consists of 'super capacitors'. The reserve powerpack will allow the actuator to move to a predetermined position on power failure.
- **DC Brushless Motor:** The CVA uses a high efficiency, continuous rated, brushless DC motor. This allows maintenance free operation even with continuous unrestricted modulation duty.
- **Hand Drive:** Optional hand drive mechanism can be provided with quarter-turn actuators to allow manual operation of the valve.
- **Terminal Bung - Double-Sealing:** The "double-sealed" terminal compartment provides a compact wiring interface for power, control and feedback indication. Four conduit entries are provided as standard with internal and external earth connection points. Control and indication circuits can be supplied certified to "IS". Double-sealing is important as the terminal compartment is then segregated by a watertight seal from the rest of the actuator. If the cover is left off during installation and conduit entries or cable glands are not properly sealed, the actuator remains fully protected.
- **Geartrain:** Simple yet durable high efficiency spur gear drive, lubricated for life with proven high reliability.

- **Anti Back-Drive Mechanism:** The CVA standard build is capable of resisting any back drive from the valve up to 125% of the rated force. For applications where loss of power requires absolute "fail-in-position" capability, an optional solenoid locking mechanism is available.
- **Output Drive:** For CVQ the base conforms to MSS SP-101 or ISO 5211.

Dwell Time Logging

The total accumulated time spent within each 1% portion of stroke is recorded by the CVA datalogger. This data may provide essential information regarding the valve sizing, control loop tuning and process stability.

For example, a valve sized for a specified process requirement to provide optimum control ranging around the 50% position should have a dwell time characteristic idealised in the graph opposite. Offsets towards the open or closed positions may indicate under or oversizing of the valve or process conditions outside design specification. A broad characteristic may confirm significant process rangeability or indicate instability. Coupled with other process data, valve dwell time can provide information leading to improved efficiency and production.

A reference dwell profile can be recorded shortly after the installation of the actuator to be used to check for sizing and stability. This may then be used for comparison in the future.

Low Deadtime

The response (right) shows the low dead-time (0.075 sec) and high resolution of the CVA. With a step change of 2% the time taken for the CVA to move 1.7% is 0.175 seconds (T86b) without overshooting the set-point.

Reliability

There are numerous advanced designed features that help achieve a reliable product, some of which are detailed below:

- Dual Sensor™ technology – utilising two independent position sensors, backlash and positional errors can be minimised.
- Brushless DC motor – the highly reliable brushless motor allows full continuous unrestricted modulation duty – S9.
- Simple, efficient geartrain – this simple yet durable high efficiency geartrain, which is lubricated for life, is designed for arduous control valve duties.
- Double-sealing – Rotork's Double-Sealing to IP68 has been applied to the CVA, providing protection in the most demanding environments.

Set-up and Configuration

All setup and configuration is performed non-intrusively using software which is freely downloadable from the website www.rotork.com.

Each actuator in range is uniquely displayed on the PDA. Once the appropriate actuator is selected the LED on the actuator will flash blue.

End-of-travel limit setting can be carried out automatically using the PDA quick setup wizard. During the setup wizard process, the CVA runs the valve closed until it meets resistance, then backs off slightly and eases into the seat where the limit is then set. This is then repeated for the opposite direction. During the quick setup procedure the applied force can be limited for the duration of the setup. Once complete the operating force can be set to meet process requirements. During the setup the actual measured load will be displayed.

When auto calibration is complete the valve travel is shown on the PDA display.

Mechanical Performance

CVQ - 90°

CVQ	Min Torque (Inch/Lbs)	Rated Torque* (Inch/Lbs)	Operating time (sec)	Min Torque (Nm)	Rated Torque* (Nm)
1200	480	1200	15	54.2	135.5
2400	960	2400	20	108.4	271

*Corresponds to 100% torque sensor setting. Minimum torque corresponds to 40% torque sensor setting. Mechanical stop adjustment: +/-5°.

CVA Electrical Power Consumption

CVA is designed to be very efficient with very low power consumption.

The relatively low power consumption measured during modulation (Continuous 2Hz, 2% Cycling Test) is due to the inertial energy in the motor being converted back to electrical energy and stored. This energy can then be used to accelerate the motor in the opposite direction.

If the reserve powerpack option is fitted, charging of the super capacitors will take place on power up. The LED will flash during charging and operation is inhibited during charging. Charge periods will vary with size. For the CVL500 the charge time is 30 seconds to 1 minute.

Power consumption data for the CVL500 is shown below. For full details of CVA range power consumption, refer to publication P130E.

Actuator State	Power @ 110 VAC (W)	Power Factor @ 110 VAC	Power @ 230 VAC (W)	Power Factor @ 230 VAC
Stationary	4.7	0.56	5.3	0.33
Moving - No Load	12.8	0.63	14.7	0.44
Moving - 50% Load	26.2	0.66	29.3	0.55
Moving Full Load*	32.1	0.66	32.1	0.56
Charging UPS (Peak Power)	58.2	0.69	55.0	0.63
Continuous 2Hz, 2% Cycling Test - Full Load*	17.1	0.53	17.5	0.45

* Full load equates to 90% of rated thrust.

Positioning Control Performance

The following control positioning performance is based on a 4-20mA control system with CVA operating over its maximum stroke, rated speed and constant force with minimum deadband set and with a linear demand/valve characteristic. Resolution is defined as: *minimum change in input signal required for guaranteed response.*

4-20mA Control - Positioning: % demand signal range	
Resolution	≥ 0.1%
Linearity	≤ 0.5%

Position Feedback Performance

The following position feedback performance is based on CVA operating at maximum stroke with a linear characteristic set. Feedback calibration is automatic to the set limit positions.

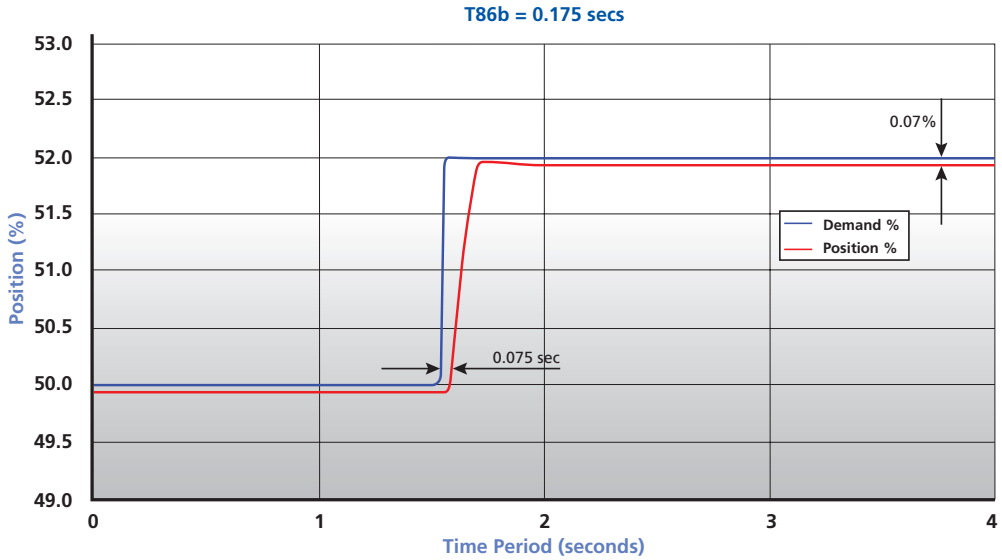
Resolution is defined as: *minimum change in position/thrust required for feedback signal change.*

4-20mA Feedback - % feedback signal range	
Resolution	≥ 0.1%
Linearity	≤ 0.5%

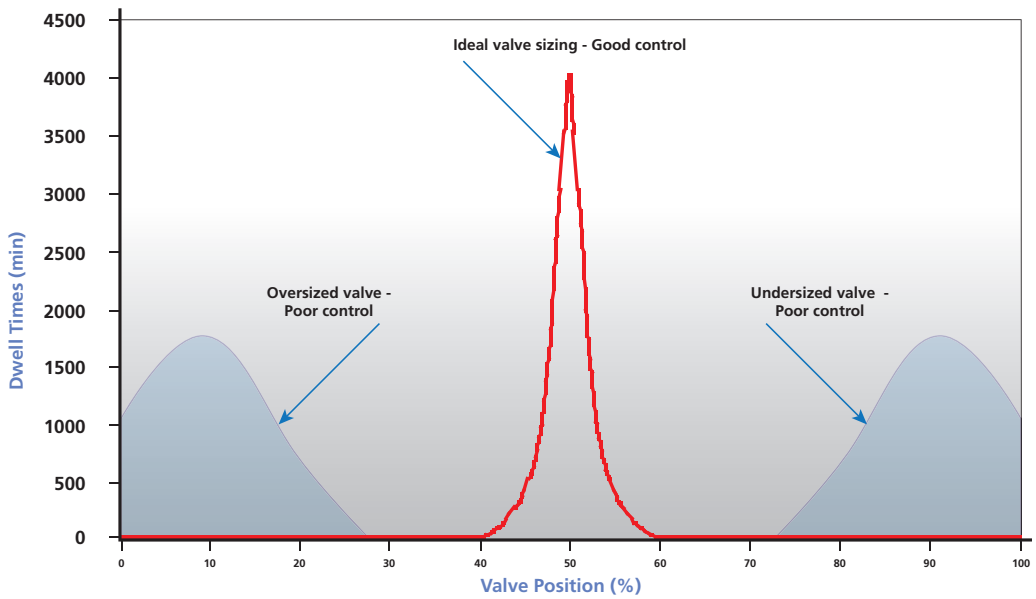
Ultimate performance will be determined by the process, valve and control system.

CVA™ Rotary (CVQ) - Standard Options

Rotork CVA Step Response

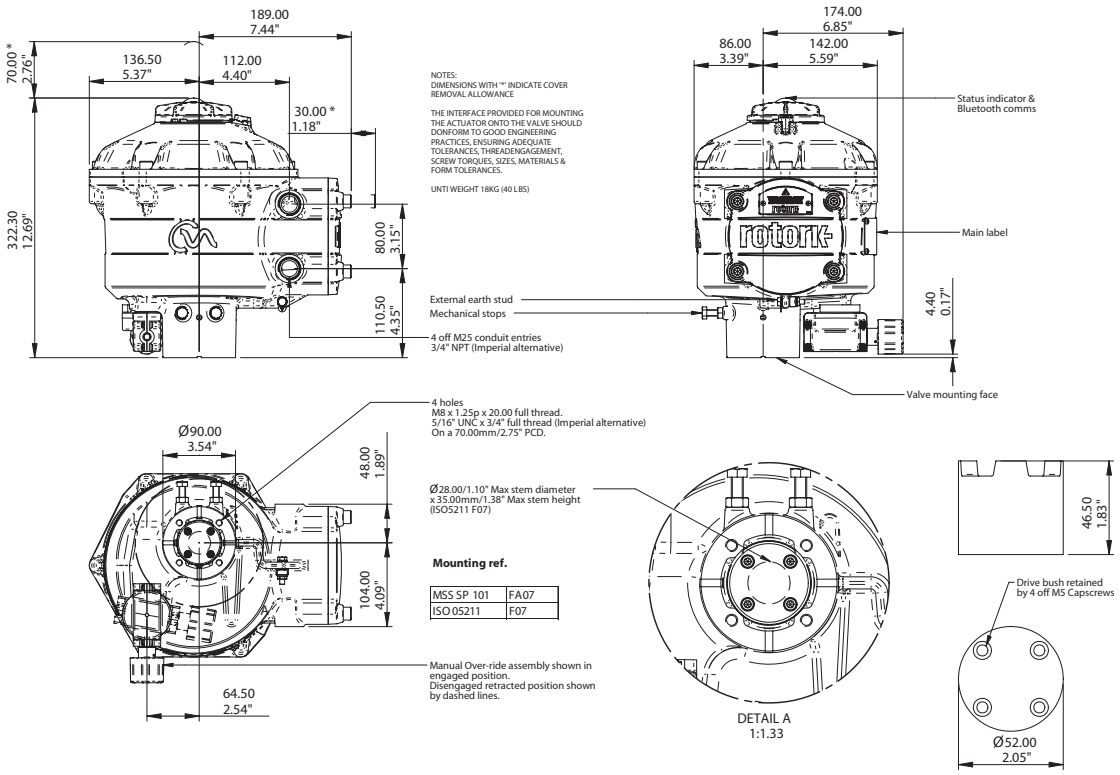


Dwell Time Graph

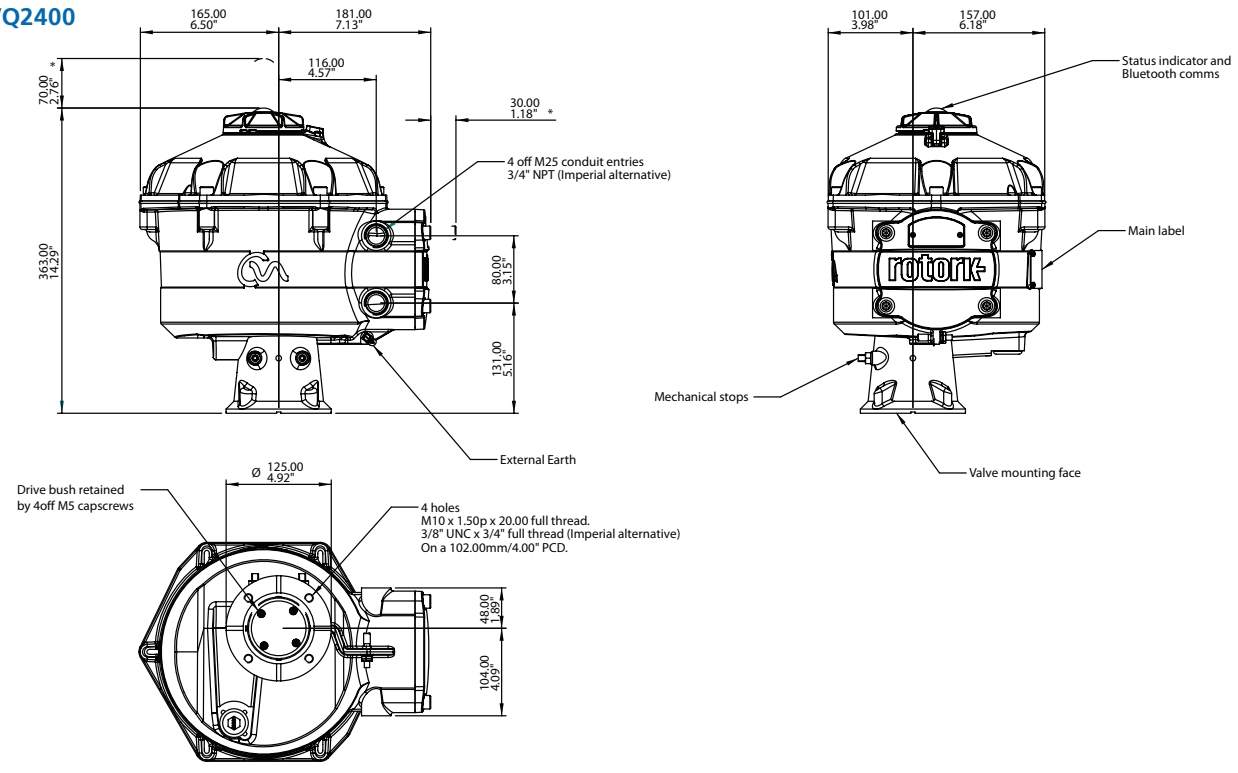


CVA™ Rotary (CVQ) - General Dimensions

CVQ1200

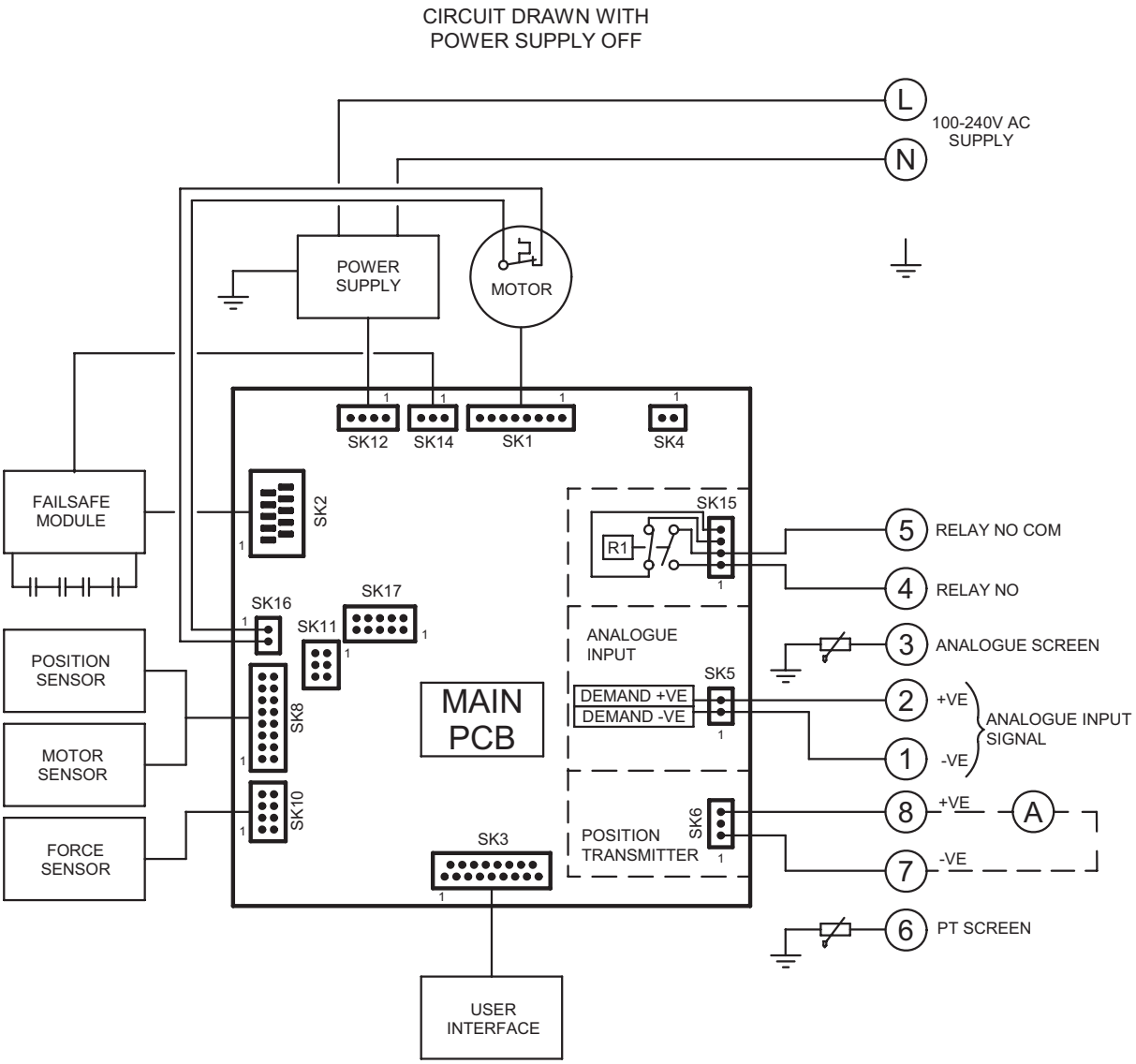


CVQ2400



These dimensions are subject to change without notice and should not be used for preparation of drawings or fabrication of installation mounting. For current installation manuals and other product information, see www.rotork.com

CVA™ Rotary (CVQ) - Wiring Diagrams



RELAY R1 CAN BE CONFIGURED TO
INDICATE ANY ONE OF THE FOLLOWING:-

0 DISABLED
1 REMOTE CONTROL AVAILABLE
2 FAULT
3 FULLY OPEN
4 FULLY CLOSED
5 FORCE TRIP OPENING
6 FORCE TRIP CLOSING
7 FORCE TRIP ANY POSITION
8 FAILSAFE OPERATION

SM-1000 Series Rotary Actuators

General Description

The SM-1000 Series are multi-turn, rotary actuators, designed to meet the exacting requirements for closed-loop modulating positioning control. Designed for low to medium torque rotary applications, these actuators are capable of accepting analog current and voltage command signals. The brushless stepper motor design provides smooth, highly accurate positioning, with positive position-lock when not in motion and powered. The SM-1000 Series is ideally suited for regulators, pilot valves, small quarter-turn valves, choke valves and dampers. All SM-1000 Series actuators come with a standard digital internal amplifier. These amplifiers are all full featured devices designed to work seamlessly with the actuator for closed loop control.

Features

- Permanently lubricated for any position mounting.
- Amplifier supplies current to hold last position and prevent backdriving, up to torque rating under power.
- AC or DC input power versions.
- 4 to 20 mA position, loop-powered, feedback signal.
- Field selectable adjustments for:
  - speed
  - deadband
  - zero and span
  - command signal type
  - standard or reverse acting
  - manual-auto operation
  - output shaft position on loss of signal.
- Wide ambient temperature range.
- Full one year warranty.

Base Model Includes

- Motor (stepper).
- Manual override.
- Drive shaft.
- Split range command input.
- Amplifier.
- Electronic torque limiting.
- Cast aluminum NEMA 4 (IP65) & dust and hazardous gas ignition-proof enclosure.
- Four adjustable position switches (40 mA at 40 VDC).
- Internal spur gear train.
- 4-20 mA transmitter for customer use.

Popular Options *(See Pages 109-118)*

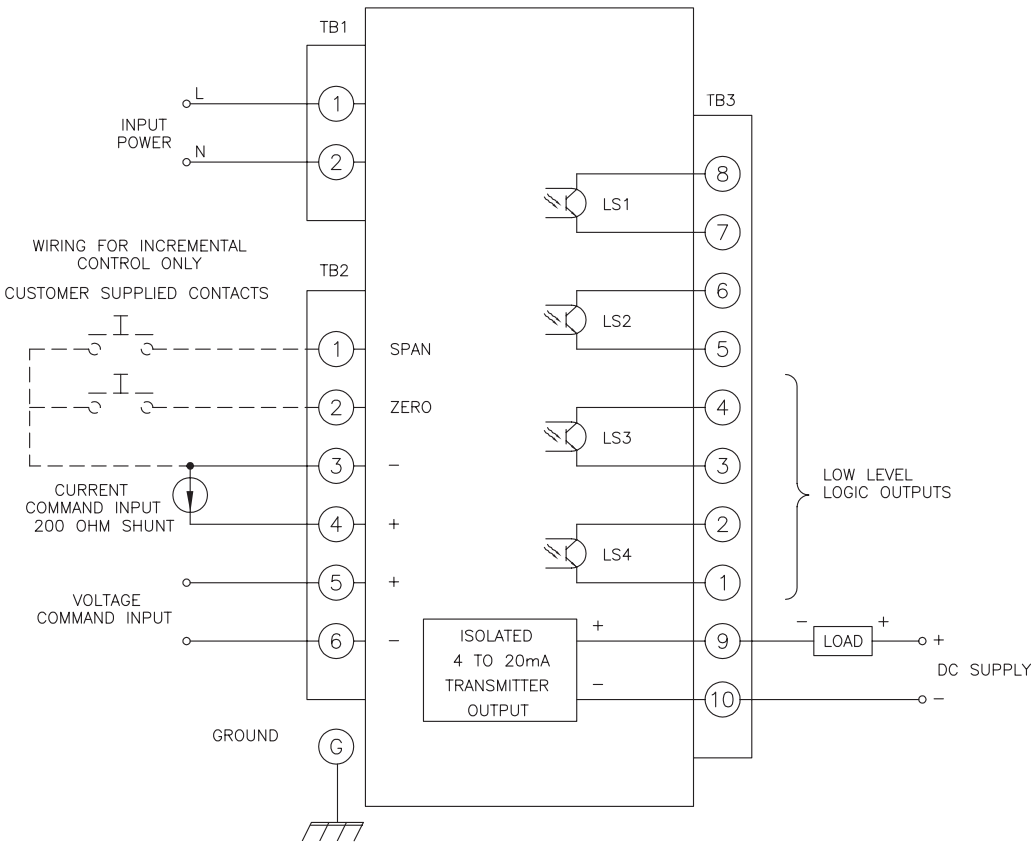
- Signal Conversion Module: Convert 40 mA, 40 VDC low level to 5 Amp, 120/240 VAC current rated position limit switches.
- Low current at null (24 VDC only).
- Switching input powered AC or DC positioning for positioning actuator using AC or DC remote voltage control.
- Process Variable Controller to control one process. variable - 120/240 VAC only.
- Custom mounting and interface hardware.
- Local Auto/Manual and INC/OFF/DEC toggle switches (Close-coupled, NEMA 4).
- Various enclosure coatings.
- CSA Exd IIB (Hydrogen) enclosure (up to 85 in. lbs.).
- Battery backup to position actuator on loss of AC power.
- ATEX Approval.

SM-1000 Series Specifications

Specifications

- **Demand:**
  SM-1015: Up to 45 in. lbs. (5 Nm)
  SM-1020: Up to 85 in. lbs. (10 Nm)
  SM-1020: with optional gearbox:
  Up to 350 in. lbs. (40 Nm). Only available up to 4.25 turns rotation.
- **Speed:** See selection chart on next page.
- **Input Voltage:** See selection chart on next page.
- **Rotation:** 10° to 20 turns standard; 90° to 4.25 turns with gearbox
- **Environmental Ratings:**
  Explosion-proof for Class I, Division 1, Groups C and D; dust-ignition-proof for Class II, Division 1, Groups E, F, G. Also rated NEMA 4 (IP65) indoor/outdoor. (Optional CSA Exd IIB enclosure).
- **Command Input:**
  Full Range: 4-20 mA into 200 ohms.
  Split Range: 4-12 and 12-20 mA into 200 ohms.
  Voltage: 0-5 VDC or 0-10 VDC into 100,000 ohms.
  Switch: Dry contact closures.
- **Temperature Limits:** -40 to +150 °F (-40 to +65 °C)
  For greater temperature ranges, consult factory.
- **Field Wiring:** Barrier terminal blocks.
- **Torque Limiting:** Current sensing PWM.
- **Positioning Accuracy:** 1.5% of full range.
- **Feedback:** 4-20 mA, customer supplied (loop power).
- **Loss of Signal:** Lock-in-place or run to preset.
- **Loss of Power:** Lock-in-place or run to preset with battery backup option.
- **Direction:** CW or CCW.
- **Modulation Rate:** Unrestricted modulating duty.
- **Backdrive:** Self-locking up to torque rating.
- **Approximate Weight:**
  SM-1015: 12 lbs. (5.4 kg)
  SM-1020: 16 lbs. (7.3 kg)
  SM-1020: with gearbox: 19 lbs. (8.6 kg)
- **Approvals:** See page 119.
- **Position Switch Rating:** 40 mA at 40 VDC.

Typical Wiring Diagram



These dimensions and specifications are subject to change without notice. Current drawings and specifications are available upon request.

SM-1000 Series Selection Chart

SM-1000								
1	Basic Model	SM-1015		SM-1020			Note Ref.	Selection
2	Speed, rpm / Torque in. lbs. (Nm)	12.5/15 (1.7)	7/25 (2.8)					
		3/37 (4.2)	1/45 (5.1)					
				10/20 (2.3)	8/40 (4.5)			
				5.5/60 (6.7)	1/85 (9.6)			
				2.1/100 (11.2)	1.5/200 (22.6)		1	
				1/300 (33.9)	0.7/350 (39.5)		1	
3	Input Voltage	SM-1015-D SM-1020-D	**1:** 115 VAC, 1-Phase, 50/60 Hz					
			2: 230 VAC, 1-Phase, 50/60 Hz					
			6: 24-36 VDC (All Models)					
			12: 12-36 VDC (SM-1020-D), max. output torque is limited - consult factory					
			13: 24 VAC (All Models)					
4	Amplifier	**D**	with built in digital amplifier					
5	Rotation	Select rotation between 10° to 20 turns (Up to 4.25 turns for units exceeding 85 in. lbs. torque)					1	

Technical Notes:
1. Maximum number of turns for the SM-1020 at 100in-lb to 350 in-lb is 4.25.

To convert RPM to sec./90°:

X = RPM

Y = Sec. for 90°

$$\frac{1}{X} \times 15 = Y$$

SM-1000 Standard Options

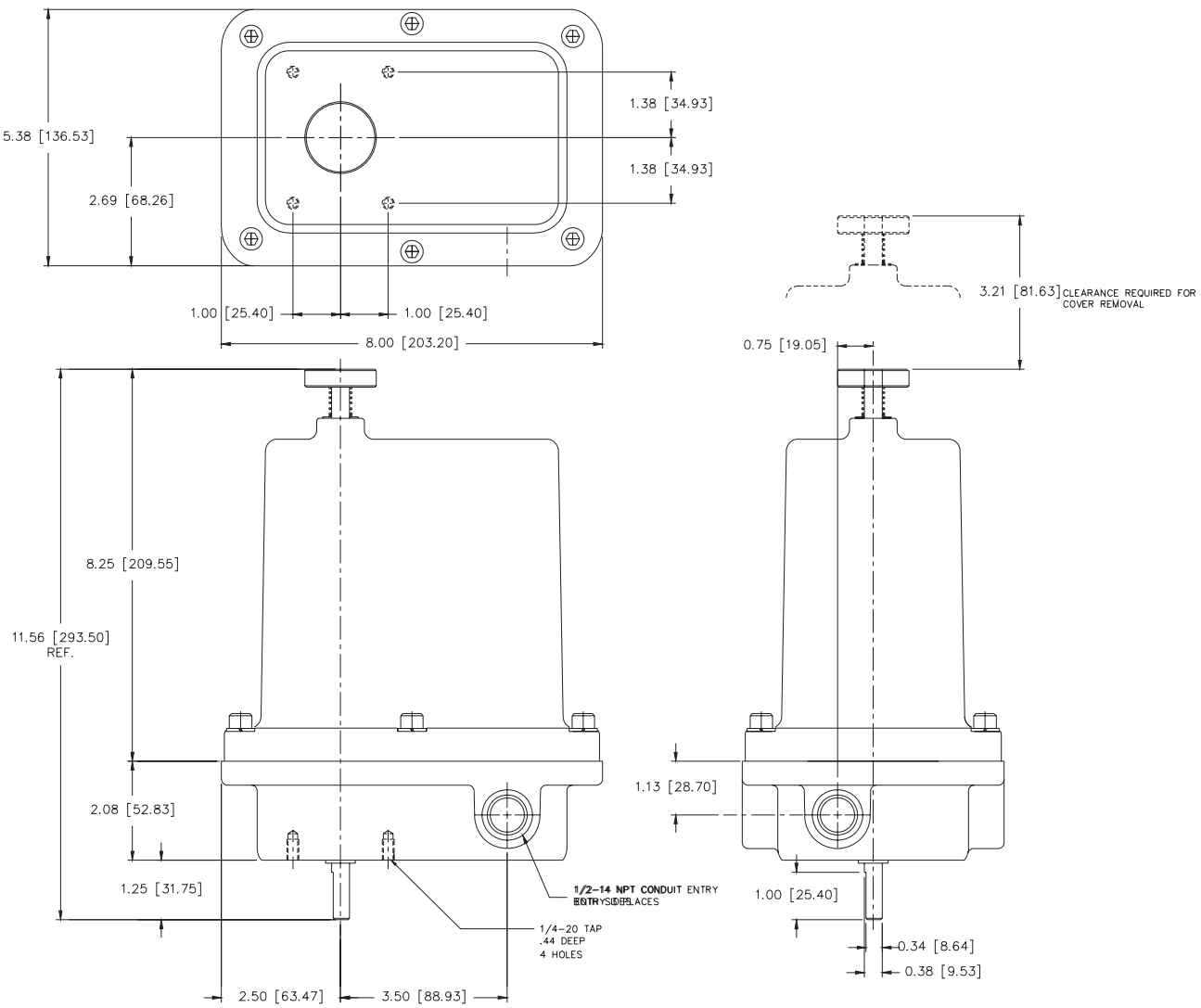
Code	Description	Selection	
	Identification/Certifications		
J001	CE Marking		
J006	ATEX/CE Approval	2	
	Valve Mounting		
L001	Mounting of actuator to valve by customer. Compatible hardware supplied by Rotork Process Controls per customer specifications	3	
L002	Valve provided by customer for mounting and set-up with actuator by Rotork Process Controls	3	
	Painting/Coating		
W001	JCI Standard Polyurethane Blue.		
W002	Two Part Epoxy		
	Special Electrical Options		
X012	Signal conversion module, installed in a close coupled, NEMA 4 enclosure	4	
X013	2 wire incremental DC input		
X014	3 wire incremental 120/240 VAC input		
X015	Battery Backup, only for 120/240 VAC, installed in a close-coupled, NEMA 4 enclosure	5	

Technical Notes:
2. Consult factory for compatibility of ATEX approval with other options.
3. Complete, certified valve drawings showing topworks detail must be submitted with order.
4. Signal Conversion Module cannot be used with the Battery Backup and cannot be CSA or ATEX certified.
5. Battery Backup is only avaialble with 120 or 240 VAC 1ph, cannot be used with the Signal Conversion Module and cannot be CSA or ATEX certified.

SM-1000 Major Dimensions

(Up to 85 in. lbs. torque)

Inches
(Millimeters)

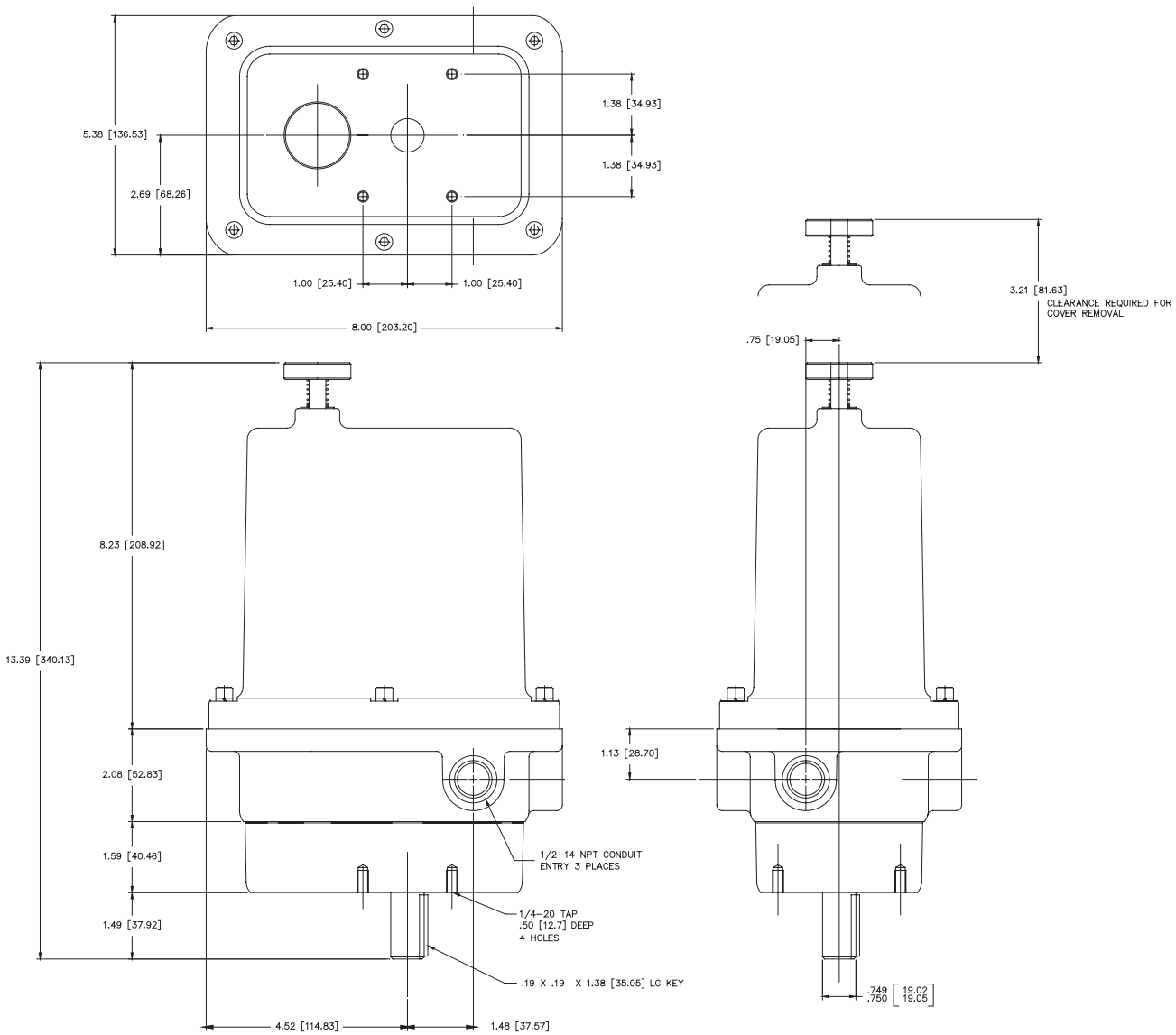


These dimensions are subject to change without notice and should not be used for preparation of drawings or fabrication of installation mounting. For current installation manuals and other product information, see www.rotork.com.

SM-1000 Major Dimensions

(Up to 85 in. lbs. torque)

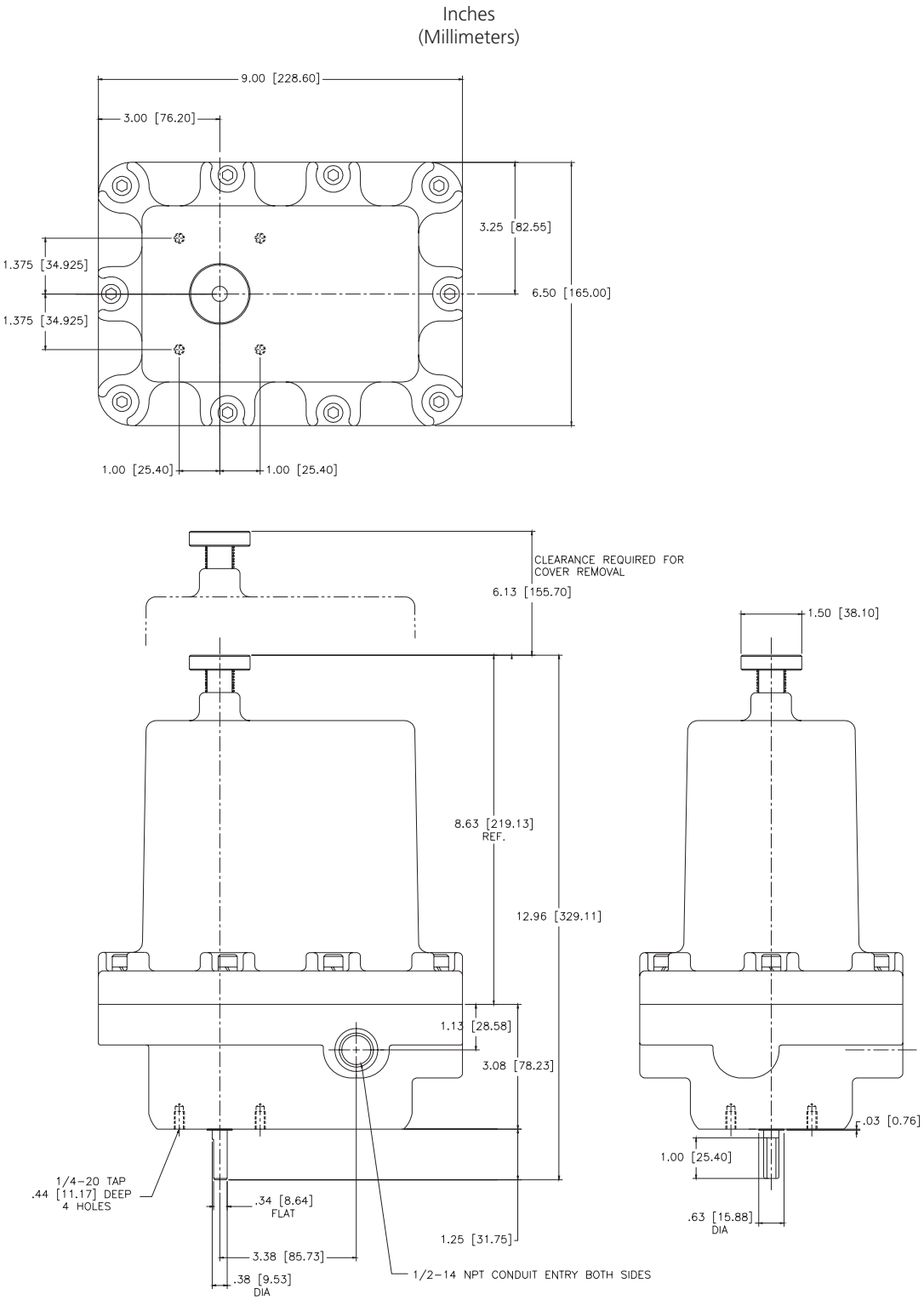
Inches
(Millimeters)



These dimensions are subject to change without notice and should not be used for preparation of drawings or fabrication of installation mounting. For current installation manuals and other product information, see www.rotork.com.

SM-1000 Major Dimensions

Optional Group B Enclosure (E005)



These dimensions are subject to change without notice and should not be used for preparation of drawings or fabrication of installation mounting. For current installation manuals and other product information, see www.rotork.com.

SM-1100/SM-1500/SM-1600 Rotary Actuators

General Description

The SM-1100, SM-1500 and SM-1600 Series are multi-turn, rotary actuators, designed to meet the exacting requirements for closed-loop modulating positioning control. They can be applied to valves, metering pumps, hydraulic and pneumatic pressure regulators, dampers, and many more industrial/ process control applications where reliable remote positioning control is required.

All SM-1100, SM-1500 and SM-1600 Series actuators are also available with an internal amplifier (AC voltage only). These amplifiers are all full-featured AC switching devices designed to work seamlessly with the actuator for closed loop control.

Features

- Permanently lubricated for any position mounting.
- A wide variety of speed/torque combinations.
- AC or DC input power versions.
- Wide ambient temperature range.
- Full one year warranty.

Base Model Includes

- Motor.
- Enclosure: NEMA Type 4 (IP65) indoor/outdoor, and/or hazardous locations for Class I, Division 1, Groups C and D, or Class II, Division 1, Groups E, F and G.
- Internal spur gear train.
- 4-20 mA transmitter for customer use (amplifier models only).
- End of travel limit switches, not for customer use.

Amplifier Features

- Isolated, two-wire, 4-20mA feedback.
- Customer-adjustable deadband.
- Customer-adjustable zero and span.
- Accepts either voltage or current command inputs.
- Selectable options for Loss-of-Signal action:
  - Lock in place - Run to preset.
- Field selectable dynamic brake.
- Solid state switching of motor for increased life.
- Easy pushbutton setup.

Popular Options *(See Pages 109-118)*

- Potentiometer or 4 to 20 mA position feedback.
- Custom mounting and interface hardware.
- Anti-condensation heater and thermostat.
- Motor brake (SM-1500/SM-1600 only).
- Manual Handcrank (SM-1500/SM-1600 only).

Specifications

Actuator	SM-1100	SM-1500	SM-1600
Torque Range in. lbs. (Nm)	3.5 to 100 (0.4 to 11.3)	40 to 400 (4.5 to 45.2)	500 to 1000 (56.5 to 113)
Rotation	40° to 60 turns	72° to 324 turns	
Speed	0.065 to 70 rpm	0.60 to 73 rpm	0.60 to 73 rpm
Approx. Weight lbs. (kg)	12-14 (5.4) to (6.4)	15 to 22 (6.8 to 10)	

- **Temperature Limits:** -40 to +150 °F (-40 to +65 °C) For greater temperature ranges, consult factory.
- **Field Wiring:** Barrier terminal blocks.
- **Approvals:** See page 119.
- **Position Switch Rating:** 120/240 VAC, 10 Amp.

SM-1100/SM-1500/SM-1600 Specification Chart

Actuator Model	Input Power Volts/Phase/Hz	Current (Amps) Run	Current (Amps) Stall	Command Output	Input Impedance in ohms	Feedback	Modulation Rate*
SM-1110-N	120/1/50/60	0.25	0.26	N/A	N/A	N/A	2000 starts/hr
SM-1110-D	120/1/50/60	0.25	0.26	4-20 mA, 0-5 VDC or 0-10 VDC	200 100,000	1000 ohm pot or 4-20mA	2000 starts/hr
SM-1120-N	120/1/50/60	0.6	0.7	N/A	N/A	N/A	600 starts/hr
SM-1120-D	120/1/50/60	0.6	0.7	4-20 mA, 0-5 VDC or 0-10 VDC	200 100,000	1000 ohm pot or 4-20mA	600 starts/hr
SM-1140-N	24 VDC	1.2	4.8	N/A	N/A	N/A	4000 starts/hr
SM-1150-N	120/1/60	0.1	0.1	N/A	N/A	N/A	2000 starts/hr
SM-1150-D	120/1/60	0.1	0.1	4-20 mA, 0-5 VDC or 0-10 VDC	200 100,000	1000 ohm pot or 4-20mA	2000 starts/hr
SM-1170-N	240/1/50/60	0.14	0.15	N/A	N/A	N/A	2000 starts/hr
SM-1170-D	240/1/50/60	0.14	0.15	4-20 mA, 0-5 VDC or 0-10 VDC	200 100,000	1000 ohm pot or 4-20mA	2000 starts/hr
SM-1180-N	24 VDC	1.9	5.2	N/A	N/A	N/A	4000 starts/hr
SM-1520-N	120/1/50/60	2.5	2.9	N/A	N/A	N/A	600 starts/hr
SM-1520-D	120/1/50/60	2.5	2.9	4-20 mA, 0-5 VDC or 0-10 VDC	200 100,000	1000 ohm pot or 4-20mA	600 starts/hr
SM-1530-N	120/1/50/60	0.9	1.2	N/A	N/A	N/A	2000 starts/hr
SM-1530-D	120/1/50/60	0.9	1.2	4-20 mA, 0-5 VDC or 0-10 VDC	200 100,000	1000 ohm pot or 4-20mA	2000 starts/hr
SM-1550-N	240/1/50/60	0.45	0.5	N/A	N/A	N/A	2000 starts/hr
SM-1550-D	240/1/50/60	0.45	0.5	4-20 mA, 0-5 VDC or 0-10 VDC	200 100,000	1000 ohm pot or 4-20mA	2000 starts/hr
SM-1580-N	24 VDC	5.2	6.25	N/A	N/A	N/A	4000 starts/hr
SM-1590-N	240/1/50/60	1.1	1.6	N/A	N/A	N/A	600 starts/hr
SM-1590-D	240/1/50/60	1.1	1.6	4-20 mA, 0-5 VDC or 0-10 VDC	200 100,000	1000 ohm pot or 4-20mA	600 starts/hr
SM-1630-N	120/1/50/60	0.9	1.2	N/A	N/A	N/A	2000 starts/hr
SM-1630-D	120/1/50/60	0.9	1.2	4-20 mA, 0-5 VDC or 0-10 VDC	200 100,000	1000 ohm pot or 4-20mA	2000 starts/hr
SM-1650-N	240/1/50/60	0.45	0.5	N/A	N/A	N/A	2000 starts/hr
SM-1650-D	240/1/50/60	0.45	0.5	4-20 mA, 0-5 VDC or 0-10 VDC	200 100,000	1000 ohm pot or 4-20mA	2000 starts/hr
SM-1680-N	24 VDC	5.2	6.25	N/A	N/A	N/A	4000 starts/hr

* Minimum Position Change of 1%. N/A = Not Applicable

Actuator/Amplifier Specifications

SM-1110-D, SM-1120-D, SM-1150-D, SM-1170-D, SM-1520-D, SM-1530-D, SM-1550-D, SM-1590-D, SM-1630-D, SM-1650-D	
Position Accuracy	1.0 % of full travel
Repeatability	0.5 % of full travel
Hysteresis	0.5 % of full travel
Linearity	+/-1 % of full travel
Deadband	0.75 % of full travel
Resolution	0.75 % of full travel

To convert RPM to sec./90°:

X = RPM

Y = Sec. for 90°

$$\frac{1}{X} \times 15 = Y$$

SM-1100 Series Selection Chart

SM-1100								
1	Basic Model	SM-1110 SM-1170	SM-1120	SM-1140	SM-1150	SM-1180	Note Ref.	Selection
2	Speed, rpm / Torque in. lbs. (Nm)	0.6/100 (11.3)	0.6/100 (11.3)	0.75/100 (11.3)	—	1/100 (11.3)		
		1.2/100 (11.3)	1.2/100 (11.3)	1.5/100 (11.3)	—	2/100 (11.3)		
		2.5/56 (6.3)	2.5/100 (11.3)	3/100 (11.3)	0.065/100 (11.3)	4/100 (11.3)		
		5/28 (3.2)	5/56 (6.3)	6/100 (11.3)	0.127/100 (11.3)	8/100 (11.3)		
		10/14 (1.6)	10/28 (3.2)	12/70 (7.9)	0.255/100 (11.3)	17/90 (10.2)		
		20/7 (0.8)	20/14 (1.6)	25/35 (4.0)	0.504/100 (11.3)	35/45 (5.1)		
		40/3.5 (0.4)	40/7 (0.8)	50/19 (2.1)	1.012/50 (5.6)	70/25 (2.8)		
3	Input Voltage	SM-1110, SM-1120 SM-1150	1: 115 VAC, 1-Phase, 50/60 Hz					
		SM-1140-D, SM-1180-N	6: 24-36 VDC				1	
		SM-1170-D	2: 240 VAC, 1-Phase, 50/60 Hz					
4	Amplifier	N						
		D					1	
5	Rotation	Select rotation between 40° and 60 turns					6	

Technical Notes:
1. 24 VDC/SM-1140 not available with built in amplifier.
6. S009 and S010 cannot be used in units with rotation greater than 5.85 turns.

SM-1100 Standard Options

Code	Description	Selection	
	Toggles, Lights		
A008	Local Auto/Manual and INC/OFF/DEC (Close Coupled Enclosure)		
A015	ON/OFF Toggle Power Switch (Close Coupled Enclosure)		
	Feedback		
F001	Potentiometer, 1000 ohms		
F002	Tandem Potentiometer, 1000 ohms each (Not available with amplifier)		
F003	Potentiometer, 5000 ohms (Not for use with models with internal amplifiers)		
F004	Potentiometer, 10,000 ohms (Not for use with models with internal amplifiers)		
F005	Transmitter, 4-20 mA	2	
F006	One Potentiometer, 1000 ohms plus Transmitter, 4-20 mA (Not available with amplifier)	3	
	Heater		
H001	Anti-Condensation Heater (24 VDC)		
H002	Anti-Condensation Heater (120 VAC)		
H003	Anti-Condensation Heater (240 VAC)		
	Identification/Certifications/Warranties		
J001	CE Marking, AC input only (only available for units with amplifiers)	4	
J002	Stainless Steel Tags		
J004	One year extended warranty		
J005	Two year extended warranty		
	Valve Mounting		
L001	Mounting of actuator to valve by customer. Compatible hardware supplied by Rotork Process Controls per customer specifications	5	
L002	Valve provided by customer for mounting and set-up with actuator by Rotork Process Controls	5	
	Shaft		
R001	Hollow Shaft, 1/2" inner diameter with keyway		
R002	Round Shaft, .38" diameter, .38" long		
	Auxiliary Switches		
S005	Aluminum Cam (Up to 5.85 turns)		
S006	Aluminum Feedback Frame (Up to 5.85 turns)		
S007	Aluminum Feedback Frame (5.85 turns or greater)		
S009	Two Adjustable Position Switches, SPDT, 10 Amp, 120/240 VAC, up to 5.85 turns		
S010	Two Adjustable Position Switches, DPDT, 10 Amp, 120/240 VAC, up to 5.85 turns	6	
S013	Two nonadjustable end of travel position switches, SPDT, 10 Amp, 120/240 VAC	6	
	Painting/Coating		
W001	JCI Standard Polyurethane Blue		
W002	Two Part Epoxy		
W004	Baked On Epoxy		
	Special Mechanical Options		
Y006	Metric mounting holes, 6mm		

Technical Notes:
1. 24 VDC/SM-1140 not available with built in amplifier.
2. F005 is a redundant 4-20 mA feedback for units with built in digital amplifier.
3. F006 is not available in units with built in digital amplifier.
4. Available with AC input power only.
5. Complete, certified valve drawings showing topworks detail must be submitted with order.
6. S009 and S010 cannot be used in units with rotation greater than 5.85 turns.

SM-1500/SM-1600 Series Selection Chart

		SM-1500/SM-1600					
1	Basic Model	SM-1520 SM-1590	SM-1530 SM-1550	SM-1580	SM-1630 SM-1650 SM-1680	Note Ref.	Selection
2	Speed, rpm / Torque in. lbs. (Nm)	0.6/400 (45)	0.6/400 (45)	0.6/400 (45)	—		
		2/400 (45)	2/400 (45)	2/400 (45)	2.5/1000 (131)		
		4/400 (45)	4/400 (45)	4/400 (45)	5/500 (56)		
		7/400 (45)	7/400 (45)	7/400 (45)	—		
		15/400 (45)	15/200 (23)	15/270 (31)	—		
		26/300 (34)	26/100 (11)	26/160 (18)	—		
		41/190 (21)	41/67 (8)	41/100 (11)	—		
		53/150 (17)	53/50 (6)	53/75 (8)	—		
3	Input Voltage	SM-1520, SM-1530, SM-1630		1: 120 VAC, 1-Phase, 50/60 Hz			
		SM-1550, SM-1590, SM-1650		2: 240 VAC, 1-Phase, 50/60 Hz			
		SM-1580, SM-1680		6: 24 VDC		1	
4	Amplifier	N		without built in digital amplifier			
		D		with built in amplifier		1	
5	Rotation	Select rotation between 72° and 324 turns				2	

Technical Notes:
1. SM-1580/ SM-1680 not available with built in amplifier.
2. S009 and S010 only be used up to 27.26 turns.

To convert RPM to sec./90°:

X = RPM

Y = Sec. for 90°

$$\frac{1}{X} \times 15 = Y$$

Code	Description	Selection	
	Toggles, Lights		
A008	Local Auto/Manual and INC/OFF/DEC (Close Coupled Enclosure)		
A015	ON/OFF Toggle Power Switch (Close Coupled Enclosure)		
	Feedback		
B001	Electrically Operated Brake 120 VAC		
B002	Electrically Operated Brake 240 VAC		
	Drive Arm/Adapter Clevis/Driven Arm		
D041	Adjustable drive arm for standard shaft		
	Feedback		
F001	Potentiometer, 1000 ohms		
F002	Tandem Potentiometer, 1000 ohms each (Not available with amplifier)		
F003	Potentiometer, 5000 ohms (Not for use with models with internal amplifiers)		
F004	Potentiometer, 10,000 ohms (Not for use with models with internal amplifiers)		
F005	Transmitter, 4-20 mA	3	
F006	One Potentiometer, 1000 ohms plus Transmitter, 4-20 mA (Not available with amplifier)	4	
	Heater		
H001	Anti-Condensation Heater (24 VDC)		
H002	Anti-Condensation Heater (120 VAC)		
H003	Anti-Condensation Heater (240 VAC)		

Continued over page.

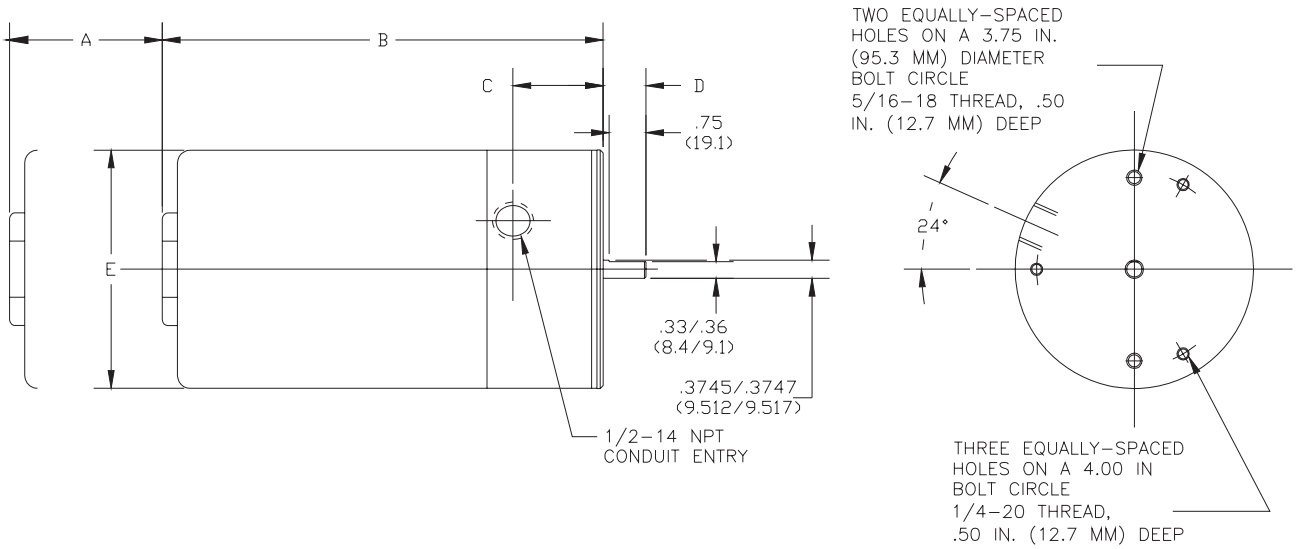
SM-1500/SM-1600 Standard Options

Code	Description	Selection	
	Identification/Certifications/Warranties		
J001	CE Marking, AC input only (only available for units with amplifiers)	5	
J002	Stainless Steel Tags		
J004	One year extended warranty		
J005	Two year extended warranty		
J006	ATEX Approval (SM-1590-D only)		
	Handcrank		
K001	Manual Handcrank (X-Proof)		
	Valve Mounting		
L001	Mounting of actuator to valve by customer. Compatible hardware supplied by Rotork Process Controls per customer specifications	6	
L002	Valve provided by customer for mounting and set-up with actuator by Rotork Process Controls		
	Shaft		
R003	Hollow Shaft, 1/2" diameter (SM-1500 only)		
R002	Round Shaft, .38" diameter, .38" long		
	Auxiliary Switches		
S005	Aluminum Cam		
S006	Aluminum Feedback Frame (Up to 30 turns)		
S009	Two Adjustable Position Switches, SPDT, 10 Amp, 120/240 VAC, 30 turns		
S010	Two Adjustable Position Switches, DPDT, 10 Amp, 120/240 VAC, 30 turns	2	
S013	Two nonadjustable end of travel position switches, SPDT, 10 Amp, 120/240 VAC	2	
	Painting/Coating		
W001	JCI Standard Polyurethane Blue		
W002	Two Part Epoxy		
W004	Baked On Epoxy		
	Special Mechanical Options		
Y006	Metric mounting holes, 6mm		

Technical Notes:
2. S009 and S010 only be used up to 27.26 turns.
3. F005 is a redundant 4-20 mA feedback for units with built in digital amplifier.
4. F006 is not available in units with built in digital amplifier.
5. J001 only available with AC input Power.
6. Complete, certified valve drawings showing topworks detail must be submitted with order.

SM-1100 Major Dimensions

Inches
(Millimeters)

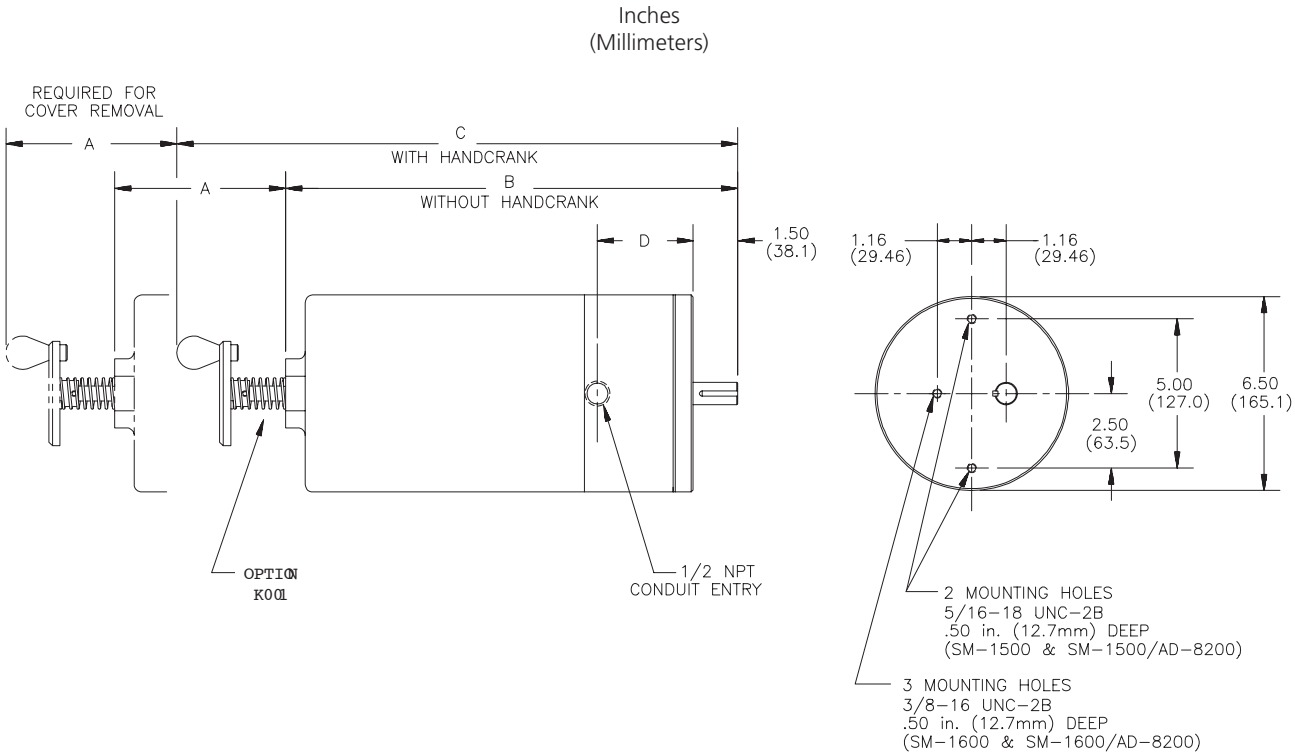


SM-1100-N	A	B	C	D	E (Dia.)
Nema Type 4 Watertight and X-proof	6.28 (159.5)	8.65 (219.7)	1.84 (46.7)	0.88 (22.4)	4.88 (124)

SM-1100-D	A	B	C	D	E (Dia.)
Nema Type 4 Watertight and X-proof	7.81 (198.4)	10.21 (259.3)	1.84 (46.7)	0.88 (22.4)	4.88 (124)

These dimensions are subject to change without notice and should not be used for preparation of drawings or fabrication of installation mounting. For current installation manuals and other product information, see www.rotork.com.

SM-1500/SM-1600 Major Dimensions



SM-1100-N/SM-1600	A		B		C		D
	Without an internal amplifier	With an internal amplifier	Without an internal amplifier	With an internal amplifier	Handcrank without an internal amplifier	Handcrank with an internal amplifier	
Nema Type 4 Watertight and X-proof	7.00 (177.8)	10.13 (257.3)	12.20 (309.9)	15.33 (389.4)	18.89 (479.8)	18.89 (479.8)	3.20 (81.3)

Output Shaft Dimensions	SM-1500 Series	SM-1600 Series
Output Shaft Diameter	0.7490/0.7496 (19.025/19.040)	0.9990-0.9996 (25.375/25.390)
Keyway Dimensions	0.187 W x 0.105 D x 1.25 L	0.250 W x 0.145 D x 1.25 L
Key (supplied)	3/16 Sq. x 1.19 L	1/4 Sq. x 1.19 L

These dimensions are subject to change without notice and should not be used for preparation of drawings or fabrication of installation mounting. For current installation manuals and other product information, see www.rotork.com.

GPSA™ Range - Rotary Process Control Actuators

General Description

The Rotary GPSA™ actuator range provides integrated actuation control all in one, compact package. A two line, 16 character VFD display and non-intrusive rotary switches comprise the actuator's HMI. This provides a user access for viewing and modifying parameters and data feedback. The actuator is simple to install, requiring no additional control panels or cabling, all in the safety of an explosionproof enclosure.

A feedback signal is provided via a 4-20 mA transmitter. Additional IO is also available in the standard package.

- High reliability for peace of mind and low cost of ownership.
- Mountable in any position to adapt to environment without additional costs.
- Diagnostics for trouble free performance.
- Rugged construction for lasting reliability in the toughest conditions.

Note: GPSA™ actuators are also available in linear configuration, see page 18 for details.

Features

- Non-intrusive Setup and Calibration.
- Integral Process Controller.
- Manual & Electrical Local Controls.
- Local Position & Diagnostics Display.
- Local Controls.
- Manaul Override.
- Diagnostics.
- Continuous Modulation.
- Output Characterization.
- Input Signal Dampening.
- Configuration Storage.
- Configurable Set Point Source.
- Explosionproof.
- Single-Phase.
- Configurable Output Relays.
- Alarms.
- Input Contacts.
- Password Protection.
- Multiple Language Support.

HART® COMMUNICATION PROTOCOL

FOUNDATION™

PROFI® PROCESS FIELD BUS BUS

Enriched Process Control

The rotary GPSA™ series are high precision process control actuators.

The rotary GPSA™ actuator is capable of upto 350 in. lbs. of torque at 0.7 rpm. At a torque of 85 in. lbs. the unit operates at a speed of 3.15 rpm. The units can be set from 10 degrees to 20 turns.

It can utilize upto three input signals, independently configurable as either current (4-20 mA) or voltage (1-5 V) for control. Two dry contact inputs are available and may be configured to operate as Normally Open (NO) or Normally Closed (NC). The actuator provides three output relays which are configurable as to their trigger and to act as NO or NC. A position feedback signal is provided via a 4-20 mA transmitter.

A two line, 16 character VFD display and rotary switches comprise the actuators Human Machine Interface (HMI). This provides a user access for viewing and modifying changeable parameters and data feedback.

GPSA™ Rotary Series - Specifications

Cost saving by elimination

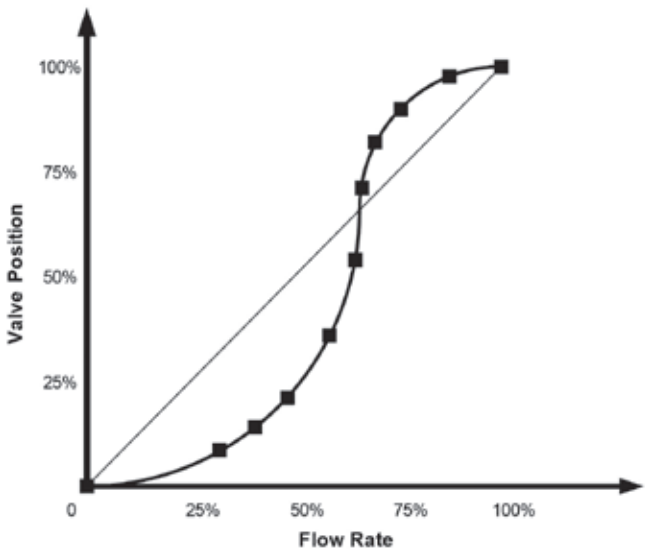
By integrating the local controls & process controller into the body of the GPSA™, Rotork has eliminated two major cost items as well as reducing conduit, wire, termination and labour costs.

Significant Cost Savings

- Eliminate pushbutton station HMI.
- Eliminate PLC.
- Eliminate housings.
- Reduce terminations and conduit.
- Reduce space envelope.
- Improve installation, start-up time and cost.
- Enhanced maintenance and diagnostics.

Programable output characterization to compensate for valve characteristics.

Output Characterization



Specifications

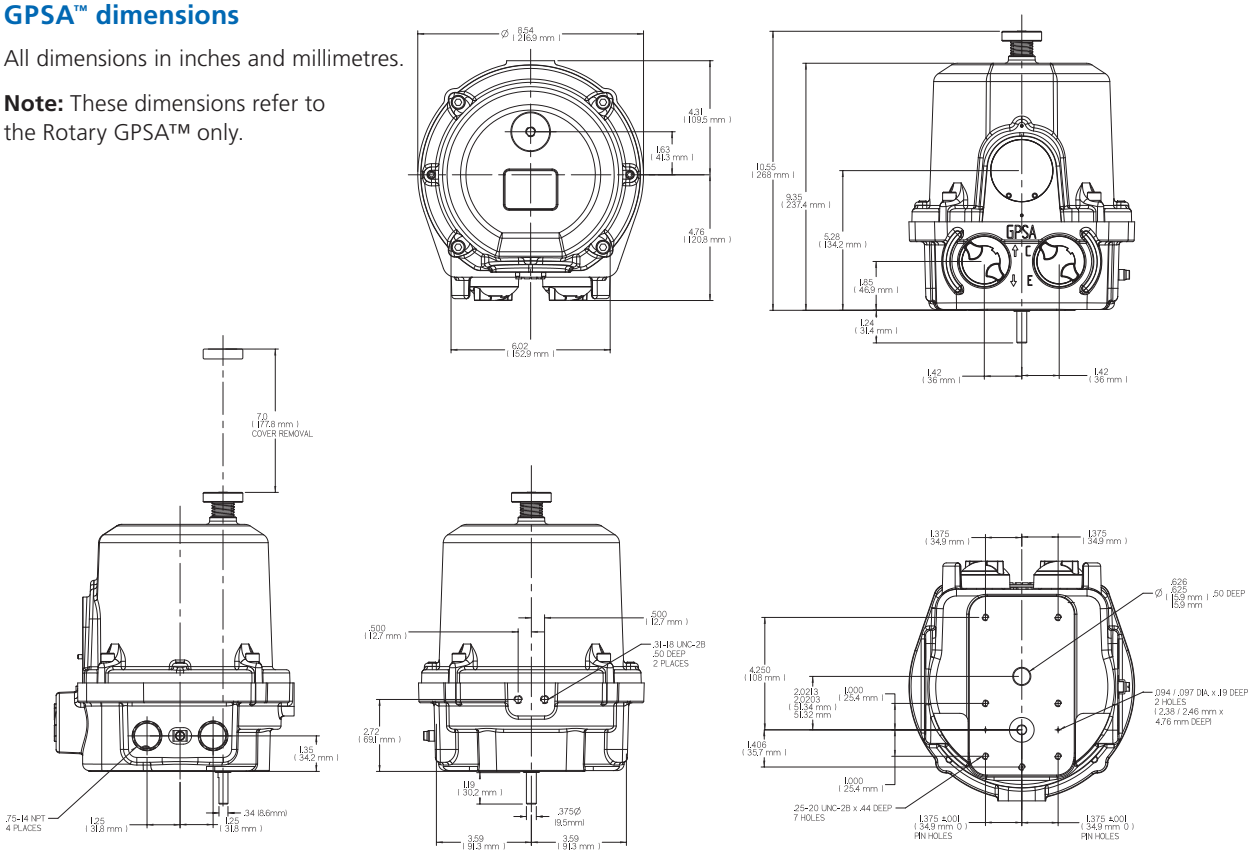
- **Input Voltage:** 120/240 Single-Phase.
- **Motor Type:** Stepper.
- **Direct Current:** Yes.
- **Enclosure Certification:** IP65 ATEX (Pending), FM (Pending).
- **Maximum Force:** 350 in. lbs (40 Nm).
- **Minimum Force:** 85 in. lbs (10 Nm).
- **Speed at Maximum:** 0.7 "/sec (1.78 mm/sec).
- **Speed at Minimum:** 3.15 "/sec (80 mm/sec).
- **Stroke Rotation:** 10° to 20 turns.
- **Manual Overide:** Yes.
- **Operating Temperature:** -22 to +150 °F (-30 to +65 °C).
- **Weight:** 16 lbs (7.25 kg).

GPSA™ Rotary Series - Major Dimensions

GPSA™ dimensions

All dimensions in inches and millimetres.

Note: These dimensions refer to the Rotary GPSA™ only.



These dimensions are subject to change without notice and should not be used for preparation of drawings or fabrication of installation mounting. For current installation manuals and other product information, see www.rotork.com.

GPSA™ Rotary Series - Selection Chart

GPSA				
1	Basic Model	GPSA	Note Ref.	Selection
2	Speed, sec (a) / Torque in. lbs. (Nm)	**3.15/85** (10)		
		0.7/350 (40)		
3	Input Voltage	**1:** 120 VAC, 1-Phase, 50/60 Hz		
		2: 240 VAC, 1-Phase, 50/60 Hz		
4	Amplifier	**D** with built in amplifier		
5	Rotation	Select rotation between 10° to 20 turns (Up to 4.25 turns for units exceeding 85 in. lbs. torque)	1	

Technical Notes: (a) Speeds are for 90° of rotation.
1. Maximum number of turns for the SM-1020 at 100in-lb to 350 in-lb is 4.25.

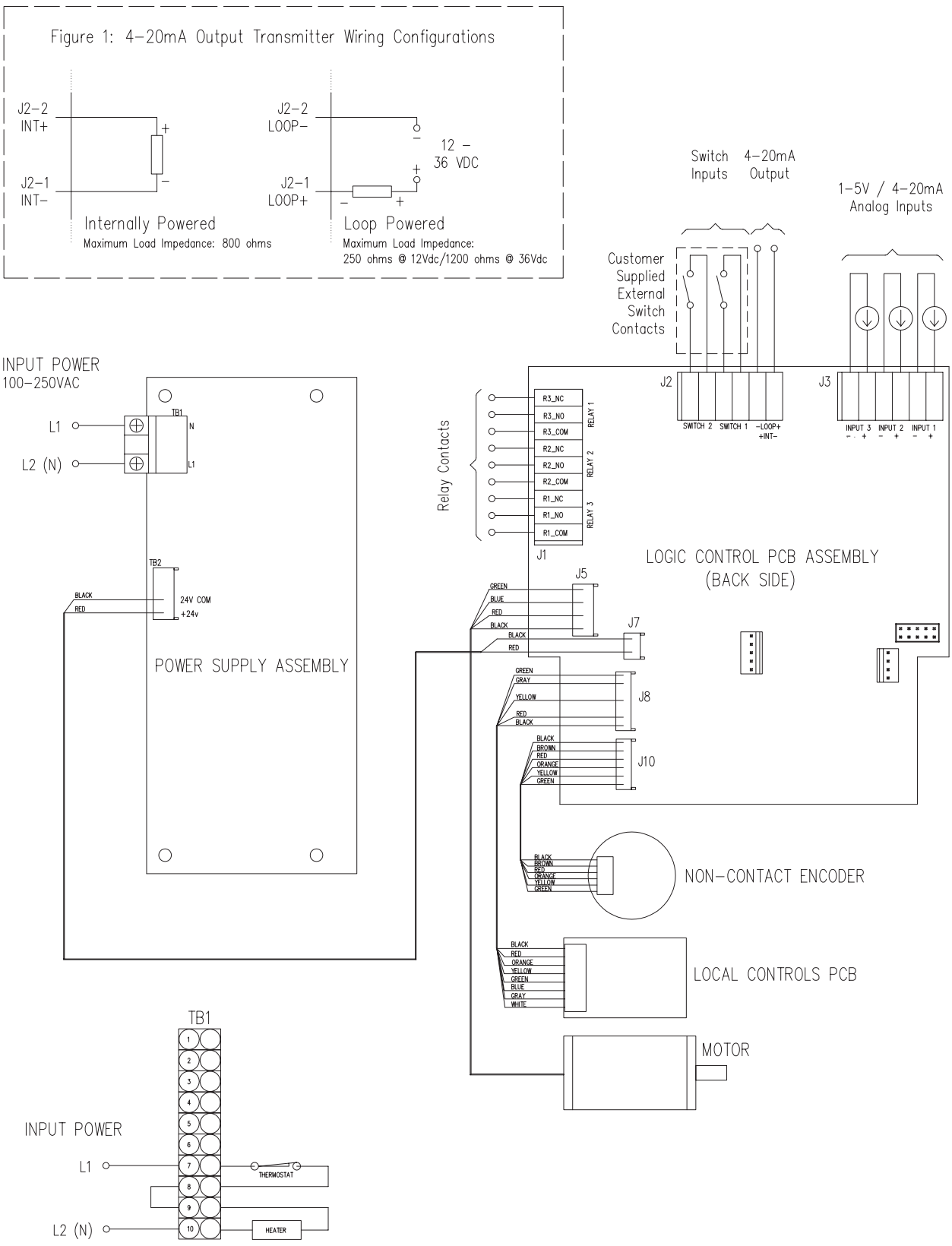
GPSA™ Rotary Series Standard Options

Code	Description	Note Ref.	Selection
	Identification/Certification		
J001	CE Marking		
J003	FM Approval		
J006	ATEX/CE Approval		
	Valve Mounting		
L001	Mounting of actuator to valve by customer. Compatible hardware supplied by Rotork Process Controls per customer specifications.	1	
L002	Valve provided by customer for mounting and set-up with actuator by Rotork Process Controls.	1	
	Painting/Coating		
W002	Two Part Epoxy		
	Special Electrical Options		
X133	Hart		
X139	Foundation Fieldbus		
X143	Profi bus DP Single Channel		

Technical Notes: 1. Complete, certified valve drawings showing topworks detail must be submitted with order.

For a full description of options, go to the Complete Listing of Options starting on page 109.

GPSA™ Rotary Series - Typical Wiring Diagram



These dimensions and specifications are subject to change without notice. Current drawings and specifications are available upon request.

Linear

Linear Heavy Duty actuators - Performance Data

Linear

	Model	Enclosure Certification	Max. Thrust lbs (N)	Speed in/sec (mm/sec)	Min. Thrust lbs (N)	Speed in/sec (mm/sec)	Max. Stroke in (mm)	Manual Override	Weight lbs (kg)
	LA-2410 LA-2450	IP65 CSA - (1)	800 (3558)	0.2 (5)	200 (890)	0.7 (17.8)	24 (610)	Yes	40 (18.1)
	LA-2420 LA-2490	IP65 CSA - (1)	1500 (6672)	0.2 (5)	450 (2002)	0.7 (17.8)	24 (610)	Yes	40 (18.1)
	LA-2500	IP65 CSA - (2) ATEX	1600 (7117)	0.9 (22.8)	800 (3558)	0.9 (22.8)	24 (610)	Yes	105 (47.6)

1. CSA - Class II, Division 1, Groups E, F & G; CSA Enclosure 4
2. CSA - Class I, Division 1, Groups C & D; Class II, Division 1, Groups E, F & G; CSA Enclosure 4
ATEX - Testing and certification varies for Rotork Process Controls products.
Apply to Rotork Process Controls for specific actuator information.

LA-2000 Series Linear Actuators

General Description

The LA-2000 Series are self-contained, bi-directional, linear actuators internally geared to produce up to 1,600 lbs. (7117 N) of thrust, and offer continuous modulating duty up to 2,000 starts per hour. A variety of speeds, thrusts and motors are available which make the LA-2000 Series ideally suited for reliable positioning of dampers, combustion controls, gates, diverters, variable speed drives, or other linear positioning applications.

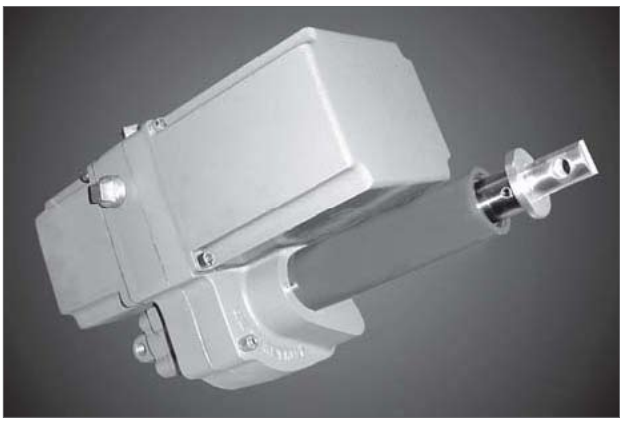
Most LA-2000 Series actuators are also available with an internal amplifier. These amplifiers are all fullfeatured ac or dc switching devices designed to work seamlessly with the actuator for closed loop control.

Features

- Permanently lubricated for any position mounting*.
- Internal or remote mounted amplifier.
- Self-locking drive system to hold in last position and prevent backdriving up to thrust rating.
- AC input power (single and three-phase) or DC input power versions.
- Wide ambient temperature range.
- Two year warranty.

Base Model Includes

- Motor.
- Manual override (except LA-2300).
- Automatic thrust limiting (except LA-2300).
- End of travel switches, not for customer use.
- Aluminum NEMA 4 (IP65) enclosure.
- Clevis mounting.
- Anti-condensation heater and thermostat (except LA-2300).
- Internal spur gear train and acme power thread.
- 4-20 mA transmitter for customer use (amplifier models only).



LA-2320

Amplifier Features

- Analog or digital available.
- Isolated, two-wire, 4-20mA output.
- Push button set-up for digital amplifier.
- Customer-adjustable zero and span.
- Adjustable deadband.
- Accepts either voltage or current command inputs.
- Selectable options for Loss-of-Signal action:

  - Lock in place - Run to preset
- Digital amplifier proportional control.
- Dynamic brake.

Popular Options (See Pages 109-118)

- Auxilliary position limit switches.
- Trunnion mount.
- Flange mount for LA-2300, LA-2400 models**.
- Potentiometer, contactless or 4 to 20 mA position feedback.
- Waterproof tube and handcrank, used when tube is in up position and subject to moisture intrusion**.
- ATEX approval for LA-2520.

LA-2000 Series Actuators Basic Specifications

- **Stroke:** 6 to 36 in. (152-762 mm)**.
- **Temperature Limits:** -40 to +150 °F (-40 to +65 °C)**.
- **Position Limit Switches:** 10 Amp SPDT switch (LA-2300, LA-2400), 20 Amp SPDT switch (LA-2500), one for each end of travel.
- **Environmental Ratings:**

Model Series	Watertight	Explosion-proof Gas	Dust-ignition Proof
LA-2300	S	NA	S
LA-2400	S	NA	S
LA-2500	S	S	S

KEYS: S: Standard NA: Not Available

ENCLOSURE DEFINTIONS:
Watertight = NEMA Type 4 (IP65) Indoor/outdoor
Explosionproof Gas = NEMA Type 7 Explosion proof, Class I, Division 1, Groups C & D, indoor/outdoor
ATEX (Optional) Ex II 2GD Exd II BT4
Dust-Ignition Proof = NEMA Type 9 Explosion proof, Class II, Division 1, Groups E, F & G, indoor/outdoor

- **Back Drive:** Self-locking up to thrust rating.
- **Field Wiring:** To barrier terminal blocks.
- **Thrust Limiting:** 20 Amp, SPDT switch, one each extend and retract. Switch will change states when thrust exceeds rated thrust for actuator. (10 Amp for LA-2400) (Not available for LA-2300).
- **Field Wiring:** To barrier terminal blocks.
- **Approvals:** See page 119.
- **Position Switch Rating:**
  LA-2300 & LA-2400: 120/240 VAC, 10 amp
  LA-2500: 120/240 VAC, 20 amp
- **Approximate Weight:**
  LA-2300: 40 lbs. (18 kg)
  LA-2400: 40 lbs. (18 kg)
  LA-2500: 105 lbs. (48 kg)

*** Check with factory for special considerations.*

LA-2300 & LA-2400 Specification Chart

Actuator Model	Input Power Volts/Phase /Hz	Current (Amps) Run	Current (Amps) Stall	Maximum Thrust lbf. (N) Running	Maximum Thrust lbf. (N) Breakaway	Speeds in./sec. mm/sec.	Command Output	Input Impedance in ohms	Feedback	Modulation Rate*	Dynamic Braking	Loss of Power	Loss of Command Signal
LA-2320-N	120/1/50/60	2.5	2.9	750 (3336)	1500 (6672)	2.0 (50.8)	N/A	N/A	N/A	600 starts/hour	N/A	L.I.P.	N/A
LA-2320-D	120/1/50/60	2.5	2.9	750 (3336)	1500 (6672)	2.0 (50.8)	4-20 mA, 0-5 VDC or 0-10 VDC	200 100,000	4-20mA loop-powered	600 starts/hour	Yes	L.I.P.	L.I.P. or R.T.P.
LA-2390-N	240/1/50/60	1.1	1.6	750 (3336)	1500 (6672)	2.0 (50.8)	N/A	N/A	N/A	600 starts/hour	N/A	L.I.P.	N/A
LA-2390-D	240/1/50/60	1.1	1.6	750 (3336)	1500 (6672)	2.0 (50.8)	4-20 mA, 0-5 VDC or 0-10 VDC	200 100,000	4-20mA loop-powered	600 starts/hour	Yes	L.I.P.	L.I.P. or R.T.P.
LA-2315-N	240/480/3/50/60	0.4/0.2	1.3/0.65	1500 (6672)	N/A	0.7 (18)	N/A	N/A	N/A	2000 starts/hour	N/A	L.I.P.	N/A
	38/3/50	0.3	0.9	1500 (6672)	N/A	0.6 (15)							
LA-2410-N	120/1/50/60	0.9	1.2	800 (3558)	N/A	0.7 (18)	N/A	N/A	N/A	2000 starts/hour	N/A	L.I.P.	N/A
LA-2410-D	120/1/50/60	0.9	1.2	800 (3558)	N/A	0.7 (18)	4-20 mA, 0-5 VDC or 0-10 VDC	200 100,000	4-20mA loop-powered	2000 starts/hour	Yes	L.I.P.	L.I.P. or R.T.P.
LA-2415-N	240/480/3/50/60	0.4/0.2	1.3/0.65	1500 (6672)	N/A	0.7 (18)	N/A	N/A	N/A	2000 starts/hour	N/A	L.I.P.	N/A
	38/3/50	0.3	0.9	1500 (6672)	N/A	0.6 (15)							
LA-2420-N	120/1/50/60	2.5	2.9	1500 (6672)	N/A	0.7 (18)	N/A	N/A	N/A	600 starts/hour	N/A	L.I.P.	N/A
LA-2420-D	120/1/50/60	2.5	2.9	1500 (6672)	N/A	0.7 (18)	4-20 mA, 0-5 VDC or 0-10 VDC	200 100,000	4-20mA loop-powered	600 starts/hour	Yes	L.I.P.	L.I.P. or R.T.P.
LA-2440-N	24 VDC	1.7	7.5	550 (2446)	N/A	2.0 (50.8)	N/A	N/A	N/A	2000 starts/hour	N/A	L.I.P.	N/A
LA-2450-N	240/1/50/60	0.45	0.5	800 (3558)	N/A	0.7 (18)	N/A	N/A	N/A	2000 starts/hour	N/A	L.I.P.	N/A
LA-2450-D	240/1/50/60	0.45	0.5	800 (3558)	N/A	0.7 (18)	4-20 mA, 0-5 VDC or 0-10 VDC	200 100,000	4-20mA loop-powered	2000 starts/hour	Yes	L.I.P.	L.I.P. or R.T.P.
LA-2460-N	90 VDC	1.7	1.9	550 (2446)	N/A	2.0 (50.8)	N/A	N/A	N/A	2000 starts/hour	N/A	L.I.P.	N/A
LA-2490-N	240/1/50/60	1.1	1.6	1500 (6672)	N/A	0.7 (18)	N/A	N/A	N/A	600 starts/hour	N/A	L.I.P.	N/A
LA-2490-D	240/1/50/60	1.1	1.6	1500 (6672)	N/A	0.7 (18)	4-20 mA, 0-5 VDC or 0-10 VDC	200 100,000	4-20mA loop-powered	600 starts/hour	Yes	L.I.P.	L.I.P. or R.T.P.

* Minimum position change of 1% (5% for LA-2300 models)
L.I.P. = Lock-in-Place R.T.P. = Run to Position N/A = Not Applicable

LA-2500 Specification Chart

Actuator Model	Input Power Volts/Phase /Hz	Current (Amps) Run	Current (Amps) Stall	Maximum Thrust lbf. (N) Running	Maximum Thrust lbf. (N) Breakaway	Speeds in./sec. mm/sec.	Command Output	Input Impedance in ohms	Feedback	Modulation Rate*	Dynamic Braking	Loss of Power	Loss of Command Signal
LA-2510-N	240/480/3/50/60	3/1.5	7.5/3.75	1600 (7117)	N/A	0.9 (23)	N/A	N/A	N/A	1200 starts/hour	N/A	L.I.P.	N/A
	380/3/50	2.4	4.7			0.8 (19)							
LA-2520-D	120/240/1/50/60	6/3	15/7.5	1600 (7117)	N/A	0.9 (23)	4-20 mA, 0-5 VDC or 0-10 VDC	200 100,000	4-20mA loop-powered	1200 starts/hour		L.I.P.	L.I.P. or R.T.P.
LA-2520-E	120/240/1/50/60	6/3	15/7.5	1600 (7117)	N/A	0.9 (23)	4-20 mA, 0-5 VDC or 0-10 VDC	200 100,000	4-20mA loop-powered	1200 starts/hour		L.I.P.	L.I.P. or R.T.P.
LA-2520-N	120/240/1/50/60	6/3	15/7.5	1600 (7117)	N/A	0.9 (23)	N/A	N/A	N/A	1200 starts/hour	N/A	L.I.P.	L.I.P. or R.T.P.

* Minimum position change of 1%
L.I.P. = Lock-in-Place
R.T.P. = Run to Position
N/A = Not Applicable

LA-2300 Series Selection Chart

LA-2300											
1	Basic Model	LA-2320, LA-2390				LA-2315		Note Ref.	Selection
2	Speed in./s. (mm/s.) / Breakaway Thrust lbf. (N) / Thrust lbf. (N)	6"-24"	6"-18"	6"-30"	6"-36"	6"-18"	6"-36"		
		0.2/1000/500	**0.4/1500/750**	**0.8/750/340**	**2.0/260/130**	**0.2/1500/750**	**0.4/600/300**		
		(5.1/4448/2224)	(10.2/6672/3336)	(20.3/3336/1512)	(50.8/1156/578)	(5.1/6672/3336)	(10.2/2668/1334)		
							0.8/380/190		
							(20.3/1690/845)		
							2.0/150/75		
							(50.8/667/334)		
3	Input Voltage	**LA-2320**	**1:** 120 VAC, 1-Phase, 50/60 Hz						
		LA-2390	**2:** 240 VAC, 1-Phase, 50/60 Hz						
		LA-2315	**10:** 208 VAC, 3-Phase, 50 Hz					1	
			5: 240 VAC, 3-Phase, 50/60 Hz					1	
			3: 380 VAC, 3-Phase, 50 Hz					1	
			4: 480 VAC, 3-Phase, 50/60 Hz					1	
4	Amplifier	**N**	without built in digital amplifier						
		D	with built in amplifier					1	
5	Linear Travel	(Travel less than the selected maximum is established by limit switch settings for models without amp.)							
		6: 6 inches (152 mm) (specify desired max. travel)						2	
		12: 12 inches (305 mm) (specify desired max. travel)						3	
		18: 18 inches (457 mm) (specify desired max. travel)						3	
		24: 24 inches (610 mm) (specify desired max. travel						4	
		30: 30 inches (762 mm) (specify desired max. travel)						5	
		36: 36 inches (914 mm) (specify desired max. travel)						5	

Technical Notes:
1. The LA-2315 is not available with Internal Amplifier.
2. 1500 lbf. Maximum.
3. 750 lbf. Maximum.
4. 550 lbf. Maximum.
5. 300 lbf. Maximum.

LA-2300 Standard Options

Code	Description	Selection	
	Toggles, Lights		
A001	Local Auto/Manual Toggle Switches		
A003	ocal Auto/Manual Toggle Switches & INC/OFF/DEC Toggles (A001 & A002)		
A009	ON/OFF Toggle Power Switch - NEMA 4		
	Drive Arm/Adapter Clevis/Driven Arm		
D030	Trunnion Mount, not available with 6 inch stroke	6	
D034	Flange Mount, not avail. with 6 inch stroke	6	
D047	Special front clevis (provide dimensions)	7	
D048	Special rear clevis (provide dimensions)	7	
D055	Bellows for Linear Actuators		
D056	Vertical Moisture Shield	8	
	Position Feedback		
F001	Potentiometer, 1000 ohms		
F002	Tandem Potentiometer, 1000 ohms each (Not for use with models with internal amplifiers)		
F003	Potentiometer, 5000 ohms (Not for use with models with internal amplifiers)		
F004	Potentiometer, 10,000 ohms (Not for use with models with internal amplifiers)		
F005	Transmitter, 4-20 mA output	9	
F006	One Potentiometer, 1000 ohms plus Transmitter, 4-20 mA (Not available with internal amplifiers)	10	
F007	Hall Effect Contactless 4-20 mA Feedback, only available with amplifier	11	
	Heater		
H002	Anti-Condensation Heater (120 VAC)		
H003	Anti-Condensation Heater (240 VAC)		
J001	CE Marking, AC input only, (only available for units with amplifiers)	12	
J002	Stainless Steel Tags		
J004	One year extended warranty		
J005	Two year extended warranty		
S009	Two Adjustable Position Switches, SPDT, 10 Amp, 120/240 VAC		
S010	Two Adjustable Position Switches, DPDT, 10 Amp, 120/240 VAC		
S013	Two nonadjustable end of travel position switches, SPDT, 10 Amp, 120/240 VAC		
W001	JCI Standard Polyurethane Blue		
W002	Two Part Epoxy		

Technical Notes:
6. Not available with 6 inch stroke.
7. Dimensions must be provided at time of order.
8. Not available with D055.
9. F005 is redundant for units with an amplifier.
10. F006 not available for units with internal amplifiers.
11. Only available with amplifier.
12. AC input only.

For a full description of options, go to the Complete Listing of Options starting on page 109.

LA-2400 Series Selection Chart

LA-2400										
1	Basic Model	LA-2410, LA-2415, LA-2450		LA-2420, LA-2490				LA-2440, LA-2460	Note Ref.	Selection
2	Speed in./s. (mm/s.) / Thrust lbf. (N)	6"-18"	24"	6"	6"-12"	12"-18"	24"	6"-24"		
		0.1/800 (2.5/3558)	**0.1/550** (2.5/2446)	**0.1/1500** (2.5/6672)	**0.1/1200** (2.5/5338)	**0.1/1000** (2.5/4448)	**0.1/800** (2.5/3558)	**0.2/550** (5.1/2446)		
		0.2/800 (5.1/3558)	**0.2/550** (5.1/2446)	**0.2/1500** (5.1/6672)	**0.2/1200** (5.1/5338)	**0.2/1000** (5.1/4448)	**0.2/800** (5.1/3558)	**0.25/550** (6.4/2446)		
		0.4/200 (10.2/890)	**0.4/200** (10.2/890)		**0.4/550** (10.2/2446)	**0.4/550** (10.2/2446)	**0.4/550** (10.2/2446)	**0.6/150** (15.2/667)		
		0.7/200 (17.8/890)	**0.7/200** (17.8/890)		**0.7/450** (17.8/2002)	**0.7/450** (17.8/2002)	**0.7/450** (17.8/2002)	**1/150** (25.4/667)		
3	Input Voltage	**LA-2410, LA2420**		**1:** 120 VAC, 1-Phase, 50/60 Hz						
		LA-2450, LA 2490		**2:** 240 VAC, 1-Phase, 50/60 Hz						
				19: 220 VAC, 1-Phase (LA-2450-D and LA-2490-D)						
		LA-2415		**10:** 208 VAC, 3-Phase, 50 Hz					1	
				5: 240 VAC, 3-Phase, 50/60 Hz					1	
				3: 380 VAC, 3-Phase, 50 Hz					1	
				4: 480 VAC, 3-Phase, 50/60 Hz					1	
		LA-2440		**6:** 24 VDC voltage designator						
		LA-2460		**7:** 90 VDC voltage designator						
4	Amplifier	**N**	without built in digital amplifier							
		D	with built in amplifier						1	
5	Linear Travel	(Travel less than the selected maximum is established by limit switch settings for models without amp.)								
		6: 6 inches (152 mm) (specify desired max. travel)							2	
		12: 12 inches (305 mm) (specify desired max. travel)							3	
		18: 18 inches (457 mm) (specify desired max. travel)							3	
		24: 24 inches (610 mm) (specify desired max. travel							4	

See Technical Notes on next page.

LA-2400 Standard Options

Code	Description	Selection	
	Toggles, Lights		
A001	Local Auto/Manual Toggle Switches		
A003	Local Auto/Manual Toggle Switches & INC/OFF/DEC Toggles (A001 & A002)		
A009	ON/OFF Toggle Power Switch		
	Drive Arm/Adapter Clevis/Driven Arm		
D031	Trunnion Mount, not available with 6 inch stroke		
D044	Flange Mount, not avail. with 6 inch stroke		
D045	Female front clevis		
D046	Female rear clevis		
D047	Special front clevis (provide dimensions)		
D048	Special rear clevis (provide dimensions)		
D055	Bellows for Linear Actuators		
D056	Vertical Moisture Shield		
	Position Feedback		
F001	Potentiometer, 1000 ohms		
F002	Tandem Potentiometer, 1000 ohms each (not available for units with internal amplifiers)		
F003	Potentiometer, 5000 ohms (not available for units with internal amplifiers)		
F004	Potentiometer, 10,000 ohms (not available for units with internal amplifiers)		
F005	Transmitter, 4-20 mA output		
F006	One Potentiometer, 1000 ohms plus 4-20 mA Transmitter (not available for units with internal amplifiers)		

LA-2400 Series Standard Options continued

Code	Description	Selection	
	Identification/Certification		
J001	CE Marking, AC input only, (only available for units with amplifiers)		
J002	Stainless Steel Tags		
J004	One year extended warranty		
J005	Two year extended warranty		
	Auxiliary Switches		
S009	Two Adjustable Position Switches, SPDT, 10 Amp, 120/240 VAC		
S010	Two Adjustable Position Switches, DPDT, 10 Amp, 120/240 VAC		
S013	Two nonadjustable end of travel position switches, SPDT, 10 Amp, 120/240 VAC		
	Painting/Coating		
W001	JCI Standard Polyurethane Blue		
W002	Two Part Epoxy		

Technical Notes:
1. Not available with internal amplifier
2. 1500 lbf. Maximum
3. 750 lbf. Maximum
4. 550 lbf. Maximum
5. Not available with 6 inch stroke
7. Not available with D055
8. F005 is redundant for units with an amplifier
9. F006 not available for units with internal amplifiers
10. Only available with amplifier
11. AC input only

For a full description of options, go to the Complete Listing of Options starting on page 109.

LA-2500 Series Selection Chart

LA-2500					
1	Basic Model	**LA-2510, LA-2520**		Note Ref.	Selection
2	Speed in./s. (mm/s.) / Thrust lbf. (N)	**6"-24"**			
		0.9/800 (23/3558)			
		0.9/1200 (23/5338)			
		0.9/1600 (23/7117)			
3	Input Voltage	**LA-2520**	**1:** 120 VAC, 1-Phase, 50/60 Hz		
			2: 240 VAC, 1-Phase, 50/60 Hz		
		LA-2510	**10:** 208 VAC, 3-Phase, 50 Hz	1	
			5: 240 VAC, 3-Phase, 50/60 Hz	1	
			3: 380 VAC, 3-Phase, 50 Hz	1	
			4: 480 VAC, 3-Phase, 50/60 Hz	1	
4	Amplifier	**N**	without built in digital amplifier		
		D	with built in amplifier	1	
		E	"Quikset" internal analog amplifier	1	
5	Linear Travel	**6:** 6 inches (152.4 mm)			
		12A: 12 inches (304.8 mm) (clevis to clevis dimension of 24.88 inches (631.9 mm), ITT equivalent)		2	
		12B: 12 inches (304.8 mm) (clevis to clevis dimension of 25.38 inches (644.6 mm), LA-2601 equivalent)		3	
		12C: 12 inches (304.8 mm) (standard clevis to clevis dimension of 26.50 inches (673 mm) - LA-2800 equivalent)		4	
		12D: 12 inches (304.8 mm) (clevis to clevis dimension of 26.59 inches (675.3mm), B&W MC-107xx equivalent)		5	
		18: 18 inches (457.2 mm)			
		24: 24 inches (609.6 mm)			

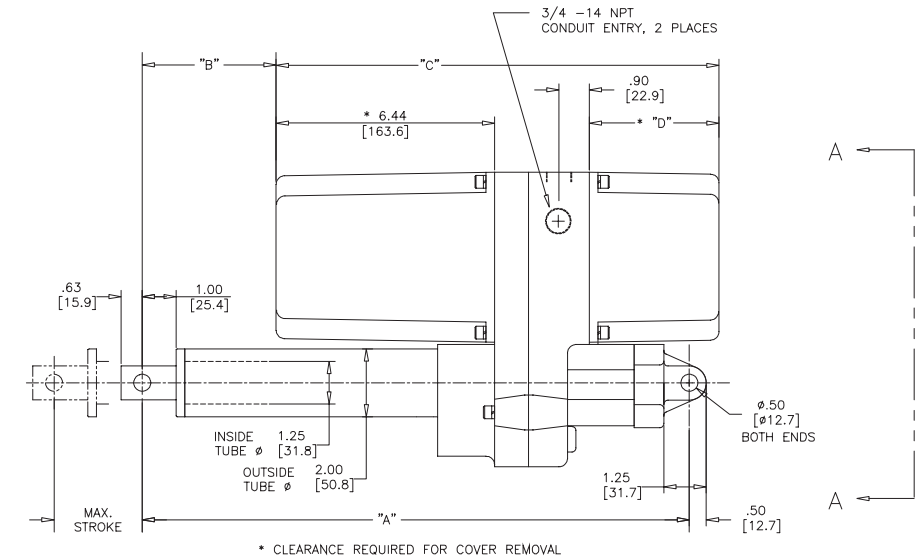
* Contact factory for greater stroke lengths

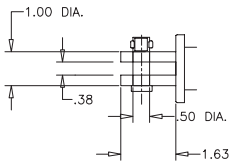
LA-2500 Standard Options

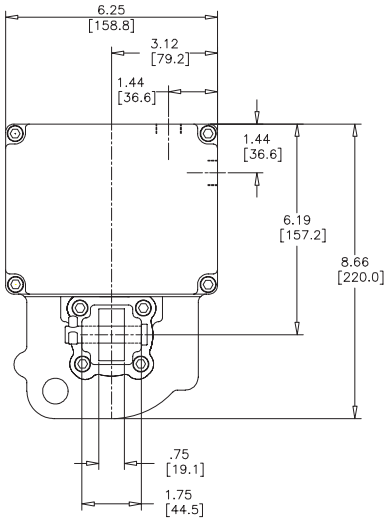
Code	Description	Selection	
	Toggles, Lights		
A001	Local Auto/Manual Toggle Switches		
A003	Local Auto/Manual Toggle Switches & INC/OFF/DEC Toggles (A001 & A002)		
A009	ON/OFF Toggle Power Switch		
	Brake		
B004	Drag Brake (800 lbs. maximum)		
	Drive Arm/Adapter Clevis/Driven Arm		
D032	Trunnion Mount (not avail. for 6" stroke)		
D049	Special front clevis (provide dimensions)		
D050	Special rear clevis (provide dimensions)		
D055	Bellows for Linear Actuators		
	Position Feedback		
F001	Potentiometer, 1000 ohms		
F002	Tandem Potentiometer, 1000 ohms each (not available for units with internal amplifiers)		
F003	Potentiometer, 5000 ohms (not available for units with internal amplifiers)		
F004	Potentiometer, 10,000 ohms (not available for units with internal amplifiers)		
F005	Transmitter, 4-20 mA output		
F006	One Potentiometer, 1000 ohms plus 4-20 mA Transmitter (not available for units with internal amplifiers)		
F007	Hall Effect Contactless 4-20 mA		
	Identification/Certification		
J002	Stainless Steel Tags		
J004	One year extended warranty		
J005	Two year extended warranty		
J006	ATEX/CE Approval		
	Auxiliary Switches		
S001	Two Adjustable Position Switches, SPDT, 20 Amp, 120/240 VAC		
S002	Two Adjustable Position Switches, DPDT, 20 Amp, 120/240 VAC		
S003	Four Adjustable Position Switches, SPDT, 20 Amp, 120/240 VAC (Not available with F002 or F006)		
S004	Four Adjustable Position Switches, DPDT, 20 Amp, 120/240 VAC (Not available with F002 or F006)		
S008	Two nonadjustable end of travel position switches, SPST, 10 Amp, 120/240 VAC		
S014	Two nonadjustable end of travel position switches, SPDT, 20 Amp, 120/240 VAC		
S017	Two nonadjustable thrust limit switches SPDT, 10 Amp, 120/240 VAC		
S021	Two nonadjustable thrust limit switches SPST, 20 Amp, 120/240 VAC		
	Conduit Entries		
V001	1/2 inch Conduit Entry Additional (NEMA 4)		
	Painting/Coating		
W001	JCI Standard Polyurethane Blue		
W002	Two Part Epoxy		

For a full description of options, go to the Complete Listing of Options starting on page 109.

LA-2300 Major Dimensions





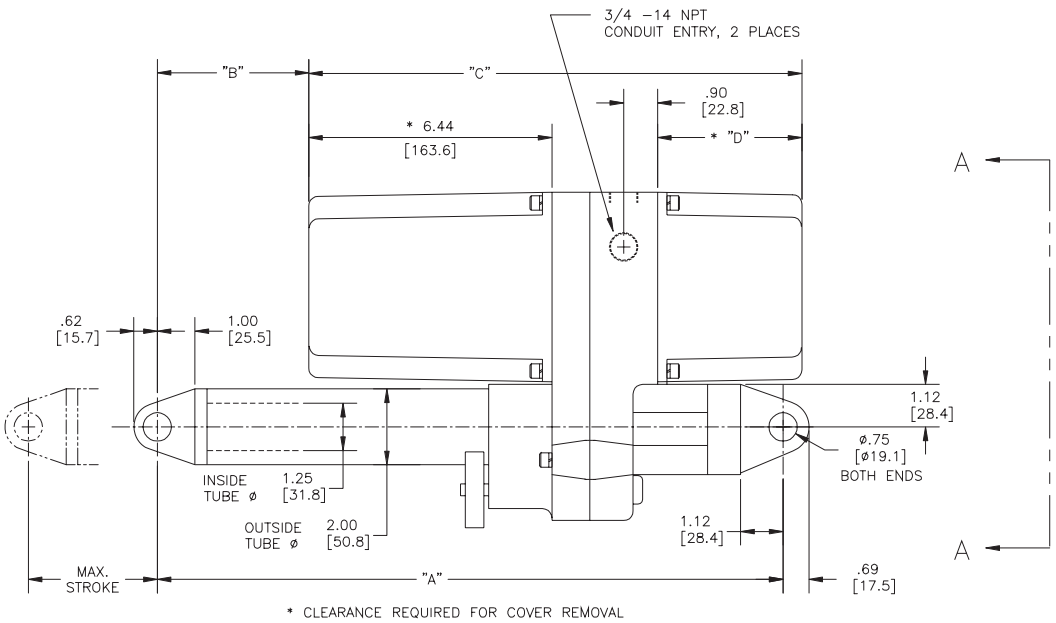


Inches
(Millimeters)

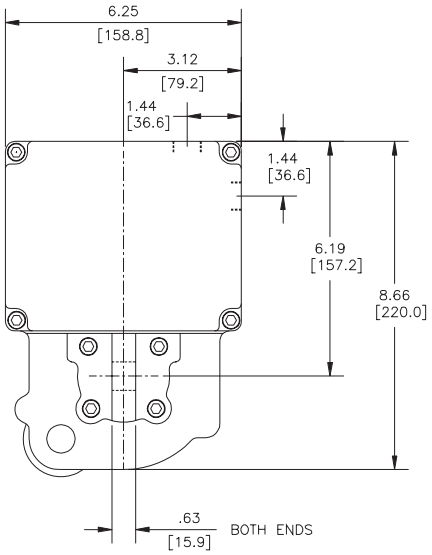
Stroke in.(mm)	A	B	C	D	
				Without Amp	With Amp
6 (152)	15.43 (392)	2.83 (72)	6 max. (152)	3.81 (97)	6.44 (164)
12 (305)	21.43 (544)	8.83 (224)	12 max. (305)	3.81 (97)	6.44 (164)
18 (457)	27.43 (697)	14.83 (377)	18 max. (457)	3.81 (97)	6.44 (164)
24 (610)	33.43 (849)	20.83 (529)	24 max. (609)	3.81 (97)	6.44 (164)
30 (762)	39.43 (1002)	26.83 (681)	30 max. (762)	3.81 (97)	6.44 (164)
36 (914)	45.43 (1154)	32.83 (834)	36 max. (914	3.81 (97)	6.44 (164)

These dimensions are subject to change without notice and should not be used for preparation of drawings or fabrication of installation mounting. For current installation manuals and other product information, see www.rotork.com

LA-2400 Major Dimensions



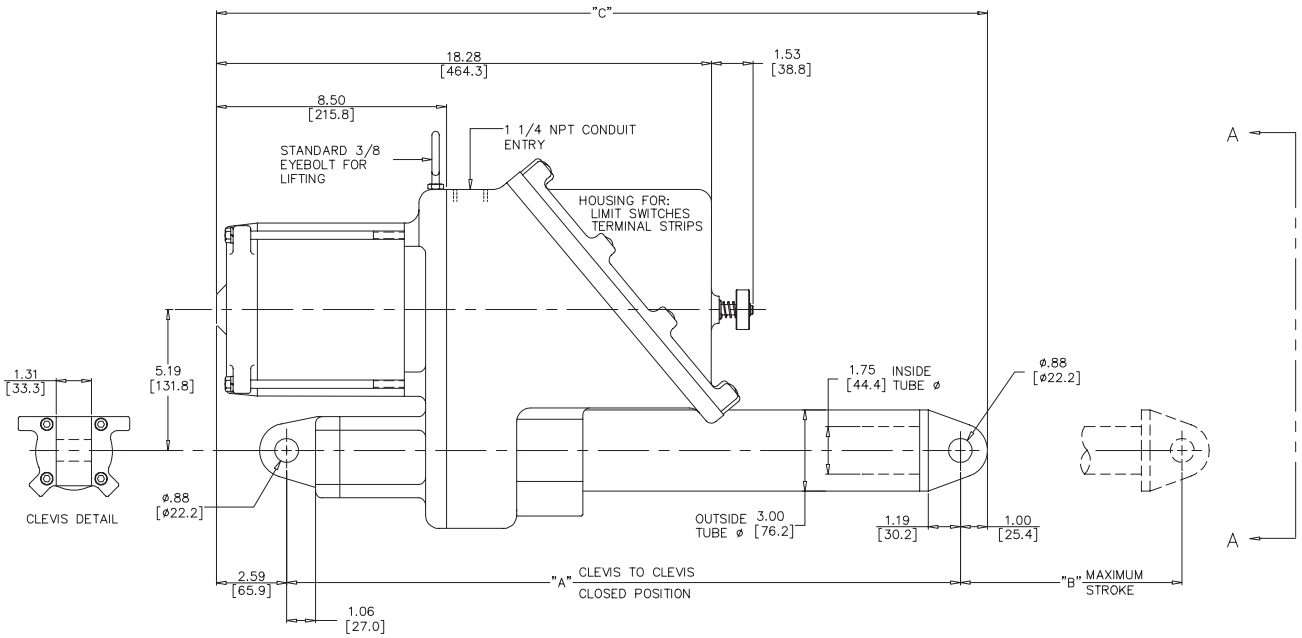
Inches
(Millimeters)



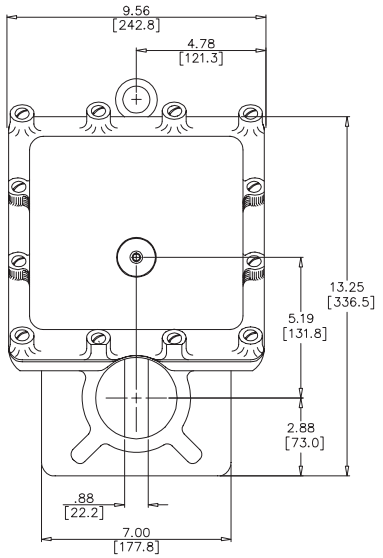
Stroke in.(mm)	A	B	C		D	
			Without Amp	With Amp	Without Amp	With Amp
2 (51) to 6 (152)	16.61 (422)	4.01 (102)	13.1 (333)	15.73 (400)	3.81 (97)	6.44 (164)
6.01 (153) to 12 (305)	22.61 (574)	10.01 (254)	13.1 (333)	15.73 (400)	3.81 (97)	6.44 (164)
12.01 (305) to 18 (457)	28.61 (727)	16.01 (407)	13.1 (333)	15.73 (400)	3.81 (97)	6.44 (164)
18.01 (457) to 246 (610)	34.61 (879)	22.01 (559)	13.1 (333)	15.73 (400)	3.81 (97)	6.44 (164)

These dimensions are subject to change without notice and should not be used for preparation of drawings or fabrication of installation mounting. For current installation manuals and other product information, see www.rotork.com

LA-2500 Major Dimensions



Inches
(Millimeters)

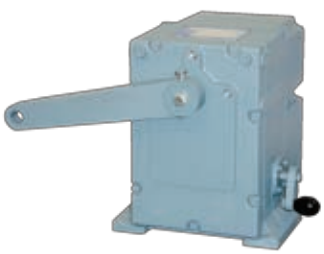


VIEW A–A

Stroke in.(mm)	A	B Linear Travel	C
6 (152)	20.5 (521)	6	24.09 (612)
12 (305)	24.88 (632)	12A	28.47 (723)
	25.38 (645)	12B	28.97 (736)
	26.55 (673)	12C	30.09 (764)
	26.59 (675)	12D	30.18 (767)
18 (457)	32.5 (826)	18	36.09 (917)
24 (610)	39.5 (1003)	24	43.09 (1094)

These dimensions are subject to change without notice and should not be used for preparation of drawings or fabrication of installation mounting. For current installation manuals and other product information, see www.rotork.com

Rotary



Rotary Heavy Duty actuators - Performance Data

Rotary

	Model	Enclosure Certification	Max. Torque ft lbs (Nm)	Seconds for quarter-turn at Max. Torque	Min. Torque ft lbs (Nm)	Seconds for quarter-turn at Min. Torque	Max. Rotation Degrees	Manual Override	Weight lbs (kg)
	SM-1700	IP65 CSA	200 (271)	60	50 (67)	12	120	Yes	40 (18)
	SM-5100	IP65 CSA	300 (406)	29	150 (203)	16	90	Yes	80 (36)
	SM-5200	IP65	1000 (1355)	28	600 (813)	28	90	Yes	210 (95)
	SM-5300	IP65	3200 (4338)	47	1600 (2169)	23	90	Yes	350 (158)
	SM-5400	IP65	12500 (16950)	70	5000 (6779)	40	90	Yes	565 (256)
	SM-6000	IP65	370 (501)	10	NA	NA	120	Yes	186 (84)
		IP65	550 (745)	10	NA	NA	120	Yes	186 (84)
		IP65	800 (1084)	10	NA	NA	120	Yes	204 (92)
		IP65	1400 (1898)	10	NA	NA	120	Yes	254 (115)
		IP65	2500 (3390)	10	NA	NA	120	Yes	403 (182)
		IP65	4400 (5965)	10	NA	NA	120	Yes	613 (278)
		IP65	6200 (8406)	10	NA	NA	120	Yes	956 (433)
		IP65	8000 (10846)	12	NA	NA	120	Yes	1589 (720)
		IP65	11000 (14914)	18	NA	NA	120	Yes	1589 (720)
		IP65	16500 (22371)	26	NA	NA	120	Yes	2196 (996)
		IP65	26000 (35251)	42	NA	NA	120	Yes	3453 (1566)

CSA - Class I, Division 1, Groups C & D; Class II, Division 1, Groups E, F & G; CSA Enclosure 4

SM-1700 Series Rotary Actuators

General Description

The SM-1700 Series are 90° to 360° rotary actuators internally geared to produce up to 2400 in. lbs. (271 Nm) of torque and offer continuous modulation. This actuator series uses high efficiency spur gears that are designed to meet the exacting requirements for closed-loop, modulating positioning control. The SM-1700 Series is ideally suited for dampers, vanes, valves and other process control applications requiring exact positioning control.

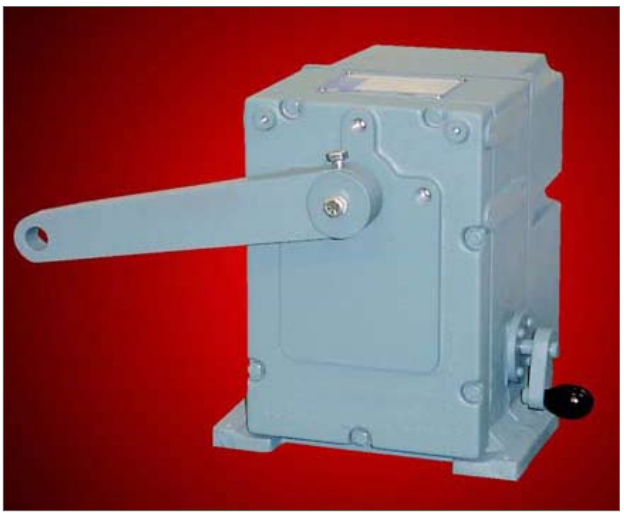
All SM-1700 Series actuators are also available with an internal amplifier (excluding SM-1740 & SM-1760). These amplifiers are all full-featured ac switching devices designed to work seamlessly with the actuator for closed loop control.

Features

- Spur gear train for longer maintenance-free operation.
- Permanently lubricated for any position mounting.
- Internal or remote-mounted amplifier.
- Self-locking drive system to hold last position and prevent backdriving, up to torque rating.
- AC input power (single and three-phase) or DC input power versions.
- Wide ambient temperature range.
- Foot, face, or side mounting.
- Full two year warranty.

Base Model Includes

- Motor.
- Manual override, safely isolated from the motor.
- Splined output shaft (20 tooth).
- Cast aluminum NEMA 4 (IP65) & dust ignition-proof enclosure.
- Anti-condensation heater and thermostat.
- Automatic torque limiting.
- Internal spur gear train.
- 4-20 mA transmitter for customer use (amplifier models only).
- End of travel switches, not for customer use.



Popular Options (See Pages 109-118)

- Position switch outputs.
- Keyed output shaft.
- Drive arm, adapter/clevis kit, and driven arm linkage components.
- Auxilliary position limit switches.
- Custom mounting and interface hardware.
- Local Auto/Manual toggle or key lock rotary switches.
- Open-Close-Stop pushbuttons.
- Various enclosure coatings.
- Local position indicator.

Base Model Includes

- Digital amplifiers.
- Isolated, two-wire, 4-20mA feedback.
- Pushbutton, customer-adjustable zero and span.
- Adjustable deadband.
- Accepts either voltage or current command inputs.
- Selectable options for Loss-of-Signal action:

  - Lock in place - Run to preset
- Field selectable dynamic brake.
- AC triac switching of AC motors and IGBT for DC motors for increased life.
- Easy pushbutton setup.

SM-1700 Series Actuators Specifications

Specifications

- **Rotation:** 0° to 360°, set at factory (Less than 90°, consult factory).
- **Drive Train:** Spur gearing.
- **Input Power:** See specification chart on next page.
- **Torque:** Up to 2400 in.lbs. (271 Nm).
- **Speed:** 12 to 60 seconds for 90° rotation 48 to 240 seconds for 360° rotation For faster speeds, consult factory.
- **Temperature Limits:** -40 to +185 °F (-40 to +85 °C). For greater temperature ranges, consult factory.
- **Enclosure:** Cast aluminum.
- **Environmental Ratings:** NEMA Type 4 (IP65), dust ignition proof, Class II, Division 1, Groups E, F & G.
- **Backdrive:** Self-locking up to rated torque.
- **Field Wiring:** Barrier terminal blocks.
- **Torque Limiting:** 10 Amp, SPDT switch, one for each direction (CW & CCW). Switch contacts will open when torque exceeds rated torque for actuator.
- **Approximate Weight:** 40 lbs. (18.1 kg).
- **Approvals:** See page 119.
- **Position Switch Rating:** 120/240 VAC, 20 amps.

Actuator/Amplifier Specifications

	SM-1715-D, SM-1720-D, SM-1730-D, SM-1740-D, SM-1750-D & SM-1790-D	SM-1760-D
Position Accuracy	1.0 % of full travel	0.25 % of full travel
Repeatability	0.5 % of full travel	0.25 % of full travel
Hysteresis	0.5 % of full travel	0.25 % of full travel
Linearity	+/-1 % of full travel	+/-0.5 % of full travel
Deadband	0.75 % of full travel	0.5 % of full travel
Resolution	0.75 % of full travel	0.5 % of full travel

SM-1700 Specification Chart

Actuator Model	Input Power Volts/Phase /Hz	Current (Amps) Run	Current (Amps) Stall	Max. Available Torques in.lbs. (Nm)	Speeds For 90° (sec.)	Command Output	Input Impedance in ohms	Feedback	Modulation Rate*	Dynamic Braking	Loss of Power	Loss of Command Signal
SM-1720-N	208/3/50/60	0.5	1.5	1200 (136)	12, 24 or 48	N/A	N/A	N/A	2000 starts/hour	N/A	Lock in Place	N/A
	240/3/50/60	0.4	1.4									
	380/3/50	0.3	0.9									
	480/3/50/60	0.2	0.65									
SM-1720-N	120/1/50/60	1.3	1.9	2400 (271)	31 or 60	N/A	N/A	N/A	2000 starts/hour	N/A	Lock in Place	N/A
SM-1720-D	120/1/50/60	1.3	1.9	2400 (271)	31 or 60	4-20 mA, 0-5 VDC or 0-10 VDC	200 100,000	1000 ohm pot or 4-20mA	2000 starts/hour	Yes	Lock in Place	Lock in Place or Run to Preset
SM-1730-N	120/1/50/60	0.9	1.2	1200 (136)	12, 24 or 48	N/A	N/A	N/A	2000 starts/hour	N/A	Lock in Place	N/A
SM-1730-D	120/1/50/60	0.9	1.2	1200 (136)	12, 24 or 48	4-20 mA, 0-5 VDC or 0-10 VDC	200 100,000	1000 ohm pot or 4-20mA	2000 starts/hour	Yes	Lock in Place	Lock in Place or Run to Preset
SM-1740-N	24 VDC	1.7	1.9	1000 (113)	16, 31 or 40	N/A	N/A	N/A	4000 starts/hour	N/A	Lock in Place	N/A
SM-1750-N	240/1/50/60	0.45	0.5	1200 (136)	12, 24 or 48	N/A	N/A	N/A	2000 starts/hour	N/A	Lock in Place	N/A
SM-1750-D	240/1/50/60	0.45	0.5	1200 (136)	12, 24 or 48	4-20 mA, 0-5 VDC or 0-10 VDC	200 100,000	1000 ohm pot or 4-20mA	2000 starts/hour	Yes	Lock in Place	Lock in Place or Run to Preset
SM-1760-N	90 VDC	1.7	1.9	1000 (113)	16, 31 or 40	N/A	N/A	N/A	4000 starts/hour	N/A	Lock in Place	N/A
SM-1790-N	240/1/50/60	0.45	0.5	2400 (271)	31 or 60	N/A	N/A	N/A	2000 starts/hour	N/A	Lock in Place	N/A
SM-1790-D	240/1/50/60	0.45	0.5	2400 (271)	31 or 60	4-20 mA, 0-5 VDC or 0-10 VDC	200 100,000	1000 ohm pot or 4-20mA	2000 starts/hour	Yes	Lock in Place	Lock in Place or Run to Preset

* Minimum Position Change of 1%.

SM-1700 Series Selection Chart

SM-1700						
1	Basic Model	SM-1720, SM-1790	SM-1715, SM-1730, SM-1750	SM-1740, SM-1760	Note Ref.	Selection
2	Speed, sec. / Torque in. lbs. (Nm)	60/1800 (203)	12/1200 (136)	16/1000 (113)		
		31/1800 (203)	24/1200 (136)	31/1000 (113)		
		60/2400 (271)	48/1200 (136)	40/1000 (113)		
3	Input Voltage	SM-1715	10: 3-Phase, 208 VAC		1	
			5: 3-Phase, 240 VAC			
			3: 3-Phase, 380 VAC			
			4: 3-Phase, 480 VAC			
		SM-1720 SM-1730	1: 1-Phase, 120 VAC			
		SM-1740	6: 24 VDC		1	
		SM-1750 SM-1790	2: 1-Phase, 240 VAC			
		SM-1760	7: 90 VDC		1	
4	Amplifier	N	without built in digital amplifier			
		D	with built in amplifier			
5	Rotation	Specify required output shaft rotation in degrees. Must be between 90° and 120°.				

Technical Notes:
1. Not available with built in amplifier.

SM-1700 Standard Options

Code	Description	Selection	
	Toggles, Lights		
A001	Local Auto/Manual Toggle Switches		
A002	INC/OFF/DEC Toggle Switches		
A003	Local Auto/Manual Toggle Switches & INC/OFF/DEC Toggles (A001 & A002)		
A008	Local Auto/Manual and INC/OFF/DEC (Close Coupled Enclosure)		
A009	ON/OFF Toggle Power Switch		
A015	ON/OFF Toggle Power Switch (Close Coupled Enclosure)		
	Drive Arm/Adapter Clevis/Driven Arm		
D001	Fixed drive arm for splined shaft (old SA1)		
D002	Adjust. drive arm for splined shaft (old SA2)		
D003	Adapter clevis kit used with D001 & D005 (old AK1)		
D004	Adapter clevis kit used with D002 & D006 (old AK2)		
D005	Driven arm used with D001 and D003 (old DA1)		
D006	Driven arm used with D002 and D004 (old DA2)		
D019	Hagan Bailey Pneumatic Replacement (Must provide model number and drive arm dimensions)		
D024	Wedgelock Coupling (valve dims. required)		
	Feedback		
F001	Potentiometer, 1000 ohms		
F002	Tandem Potentiometer, 1000 ohms each (Not available with amplifier)		
F003	Potentiometer, 5000 ohms (Not for use with models with internal amplifiers)		
F004	Potentiometer, 10,000 ohms (Not for use with models with internal amplifiers)		
F005	Transmitter, 4-20 mA	2	
F006	One Potentiometer, 1000 ohms plus Transmitter, 4-20 mA (Not available with amplifiers)	3	
F007	Hall Effect Contactless 4-20 mA Feedback, only available with amplifier	4	
	Identification/Certifications/Warranties		
J001	CE Marking, AC input only (only available for units with amplifiers)	5	
J002	Stainless Steel Tags		
J004	One year extended warranty		
J005	Two year extended warranty		
	Position Indicator		
P001	Local Position Indicator (90° rotation only) not CSA	6	
	Shaft		
R004	Keyed Shaft, 1" diameter, 1/4" square keyway		
	Auxiliary Switches		
S001	Two Adjustable Position Switches, SPDT, 20 Amp, 120/240 VAC (Up to 120°) S006		
S002	Two Adjustable Position Switches, DPDT, 20 Amp, 120/240 VAC (Up to 120°)		
S003	Four Adjustable Position Switches, SPDT, 20 Amp, 120/240 VAC (Up to 120°)		
S004	Four Adjustable Position Switches, DPDT, 20 Amp, 120/240 VAC (Up to 120°)		
S014	Two nonadjustable end of travel position switches, SPDT, 20 Amp, 120/240 VAC		
S015	Two nonadjustable torque limit switches, SPST, 10 Amp, 120/240 VAC		
	Painting/Coating		
W001	JCI Standard Polyurethane Blue		
W002	Two Part Epoxy		
	Special Mechanical Options		
Y006	Metric mounting holes, 6mm		

Technical Notes:
2. F005 is a redundant 4-20 mA feedback for units with built in digital amplifier.
3. F006 is not available in units with built in digital amplifier.
4. F007 only available with amplifier.
5. J001 is only available with units with AC input.
6. P001 is for 90 degrees only.

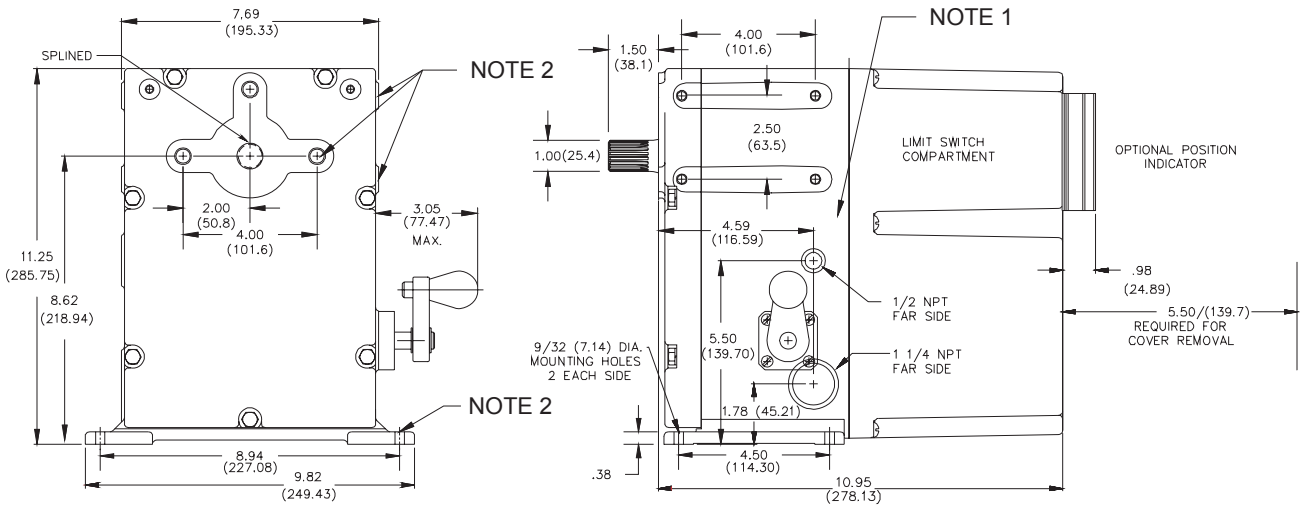
SM-1700 Special Options

(Consult factory for special requirements)

Code	Description	Selection	
	Toggles, Lights		
A004	Open-Close-Stop Push Buttons - NEMA 4		
A005	Two Pilot Lights - NEMA 4		
A006	Two Position Selector Switches - NEMA 4 (Auto/Manual)		
A007	Three Position Selector Switches - NEMA 4 (INC/OFF/DEC)		
A010	Local Auto/Manual Switches & (INC/OFF/DEC) Switches (A006 & A007)		
A011	Key locks for rotary Auto/Manual switches - NEMA 4		
A012	ON/OFF Rotary Power Switch - NEMA 4		
	Connectors		
C001	Plug-In Cannon Type Connector on Enclosure for Power and Control		
C002	Mating Plug-In Cannon Type Connector on Enclosure for Power and Control		
	Feedback		
F008	Contactless 4-20 mA		
F009	Contactless 0-10 VDC		
F010	Anti Backlash Feedback Gearing (single turn)		
	Special Electrical Options		
X001	24 VDC power supply, 320 mA, 100-240 VAC input		

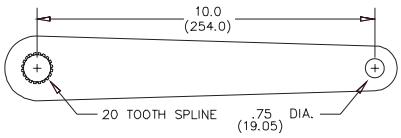
For a full description of options, go to the Complete Listing of Options starting on page 109.

SM-1700 Standard Options

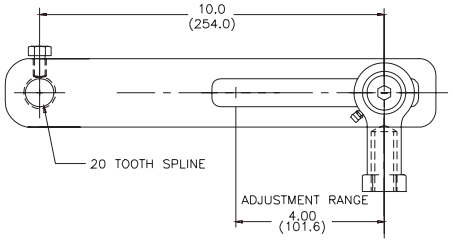


Spline Data

Spline No.	Chord	Large Dia.	Root Dia.	No. Teeth
0875-20-2	.204 - .205	.925 - .930	.820 - .825	20

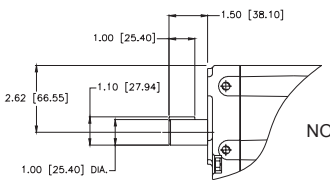


F14



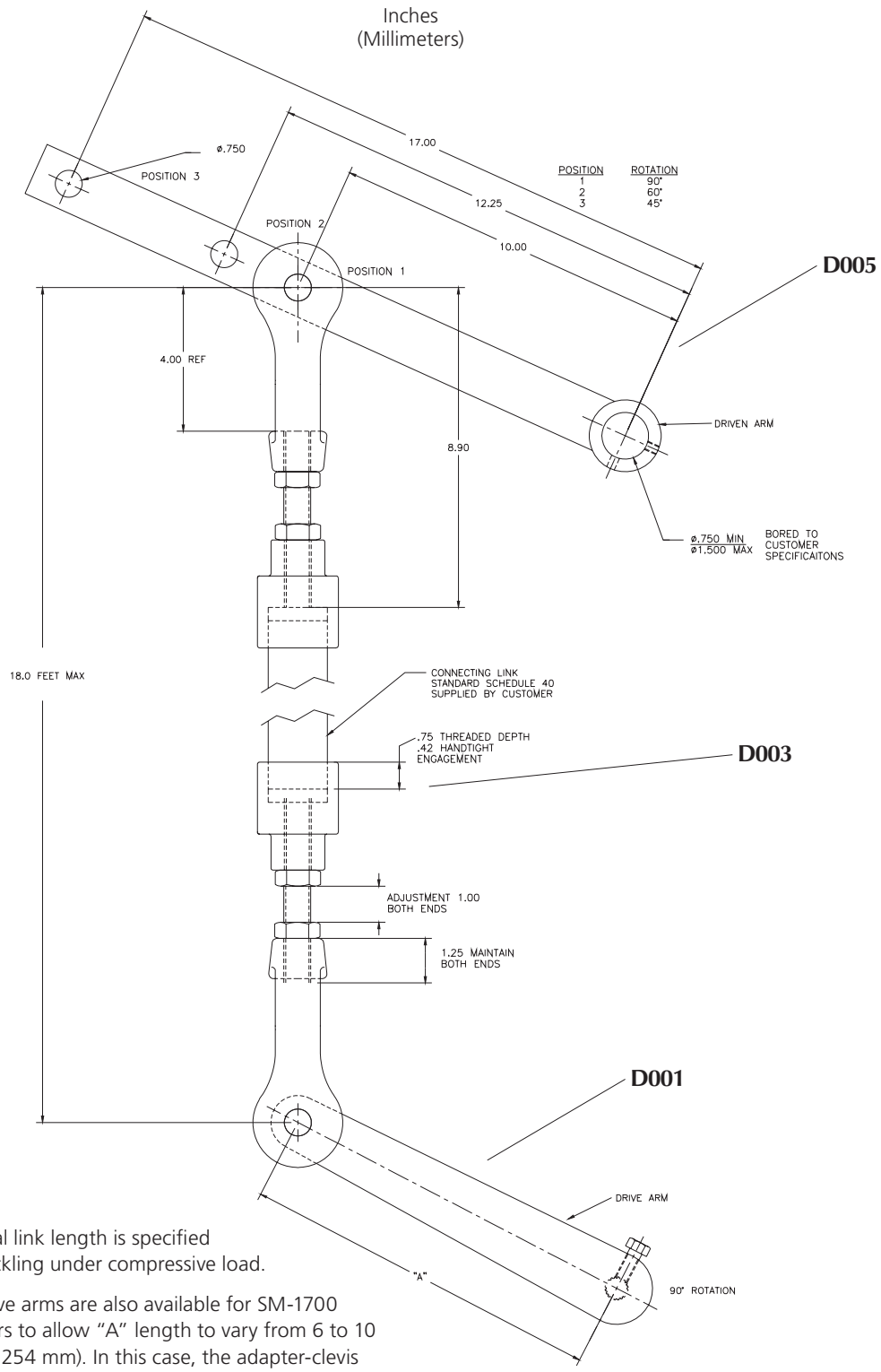
Notes:

1. The optional local toggle switches are located on these surfaces.
2. The SM-1700 series actuators can be foot, face or side mounted.
3. A keyed output shaft (optional) is available in a one inch (25.4 mm) diameter with 1/4 inch (6.35 mm) square keyway.
4. See page 209 and 211 for use as linear output to increase or decrease torque.



These dimensions are subject to change without notice and should not be used for preparation of drawings or fabrication of installation mounting. For current installation manuals and other product information, see www.rotork.com.

SM-1700 Series Drive Arm And Linkage Options



Notes:

1. Maximum total link length is specified to prevent buckling under compressive load.
2. Adjustable drive arms are also available for SM-1700 Series actuators to allow "A" length to vary from 6 to 10 inches (152 to 254 mm). In this case, the adapter-clevis has rod ball ends with lubricating fittings.
3. Special drive arm lengths are available to meet specific application requirements.

These dimensions are subject to change without notice and should not be used for preparation of drawings or fabrication of installation mounting. For current installation manuals and other product information, see www.rotork.com.

SM-5000 Series Rotary Actuators

General Description

The SM-5000 Series are quarter turn, rotary actuators internally geared to produce up to 12,500 ft.lbs. (16,950 Nm) of torque, and offer continuous modulation up to 4,000 starts per hour. This series of actuators uses a scotch-yoke output gearing design that provides up to 66% more torque than rated at the ends of travel (0° & 90° positions).
The SM-5000 Series is ideally suited for dampers, vanes, valves and other process control applications requiring high torque and exact positioning control.

All SM-5000 Series actuators are also available with an internal amplifier (excluding SM-5140). These amplifiers are all full-featured ac or dc switching devices designed to work seamlessly with the actuator for closed loop control.

Features

- "Scotch-yoke" output torque increases at ends of travel by 66% above rated torque for positive seating and unseating of valves, dampers, etc.
- Permanently lubricated for any position mounting.
- Internal amplifier available (except SM-5140).
- Self-locking drive system to hold in last position and prevent backdriving up to torque rating.
- AC input power (single and three-phase) or DC input power versions.
- Foot or face mounting.
- Full two year warranty.

Base Model Includes

- Motor.
- Manual override.
- Splined output shaft.
- Cast aluminum painted NEMA 4 (IP65) enclosure.
- Anti-condensation heater and thermostat.
- Automatic torque limiting.
- Internal Scotch-yoke gear train.
- 1000 ohm potentiometer feedback (amplifier models only).
- End of travel switches, not for customer use.

SM-5160

Popular Options (See Pages 109-118)

- Position switch outputs.
- Keyed output shaft.
- Drive arm, adapter/clevis kit, and driven arm linkage components.
- Auxilliary position limit switches.
- Custom mounting and interface hardware.
- Local Auto/Manual toggle or key lock rotary switches.
- Open-Close-Stop pushbuttons.
- Pilot lights.
- Extended temperature ranges
- Contactless feedback
- Local position indicator.

Select Actuator By Torque

Up to 300 ft. lbs. (407 Nm) **SM-5100**
300 (407) to 1,000 ft. lbs. (1356 Nm) **SM-5200**
1,000 (1356) to 3,200 ft. lbs. (4339 Nm) **SM-5300**
3,200 (4339) to 12,500 ft. lbs. (16,947 Nm) **SM-5400**

SM-5000 Series Actuators Basic Specifications

Specifications

- **Rotation:** Up to 90°, set at factory.
- **Drive Train:** Scotch-yoke.
- **Temperature Limits:** -40 to + 150 °F (-40 to +65 °C) (For higher temperatures consult factory).
- **Environmental Ratings:** SM-5100 - NEMA 4 (IP65) Explosion Proof, Class I, Division 1, Groups C& D. Class II, Division 1, Groups E, F & G SM-5200, SM-5300, SM-5400 - NEMA 4 (IP65).
- **Enclosure:** Cast aluminum with polyurethane coating.
- **Back Drive:** Self-locking up to twice the torque rating.
- **Field Wiring:** Barrier terminal blocks.
- **Torque Limiting:** 20 Amp, SPDT switch, one for each direction (CW & CCW). Switch will change states when torque exceeds rated torque for actuator. (10 Amp switches for SM-5100).
- **Approximate Weight:**

  SM-5100: 80 lbs. (36 kg) SM-5200: 210 lbs. (84 kg)
  SM-5300: 350 lbs. (147 kg) SM-5400: 565 lbs. (238 kg).
- **Approvals:** See page 119.
- **Position Switch Rating:** 20 Amp, SPDT switch, one for each direction (CW & CCW).

Actuator/Amplifier Specifications

	SM-5115-D, SM-5120-D, SM-5160-D, SM-5190-D, SM-5210-D, SM-5220-D, SM-5260-D, SM-5310-D, SM-5320-D, SM-5360-D, SM-5430-D & SM-5480-D	SM-5160-D, SM-5260-D, SM-5360-D, & SM-5480-D
Position Accuracy	1.0 % of full travel	0.25 % of full travel
Repeatability	0.5 % of full travel	0.25 % of full travel
Hysteresis	0.5 % of full travel	0.25 % of full travel
Linearity	+/-1 % of full travel	+/-0.5 % of full travel
Deadband	0.75 % of full travel	0.5 % of full travel
Resolution	0.75 % of full travel	0.5 % of full travel

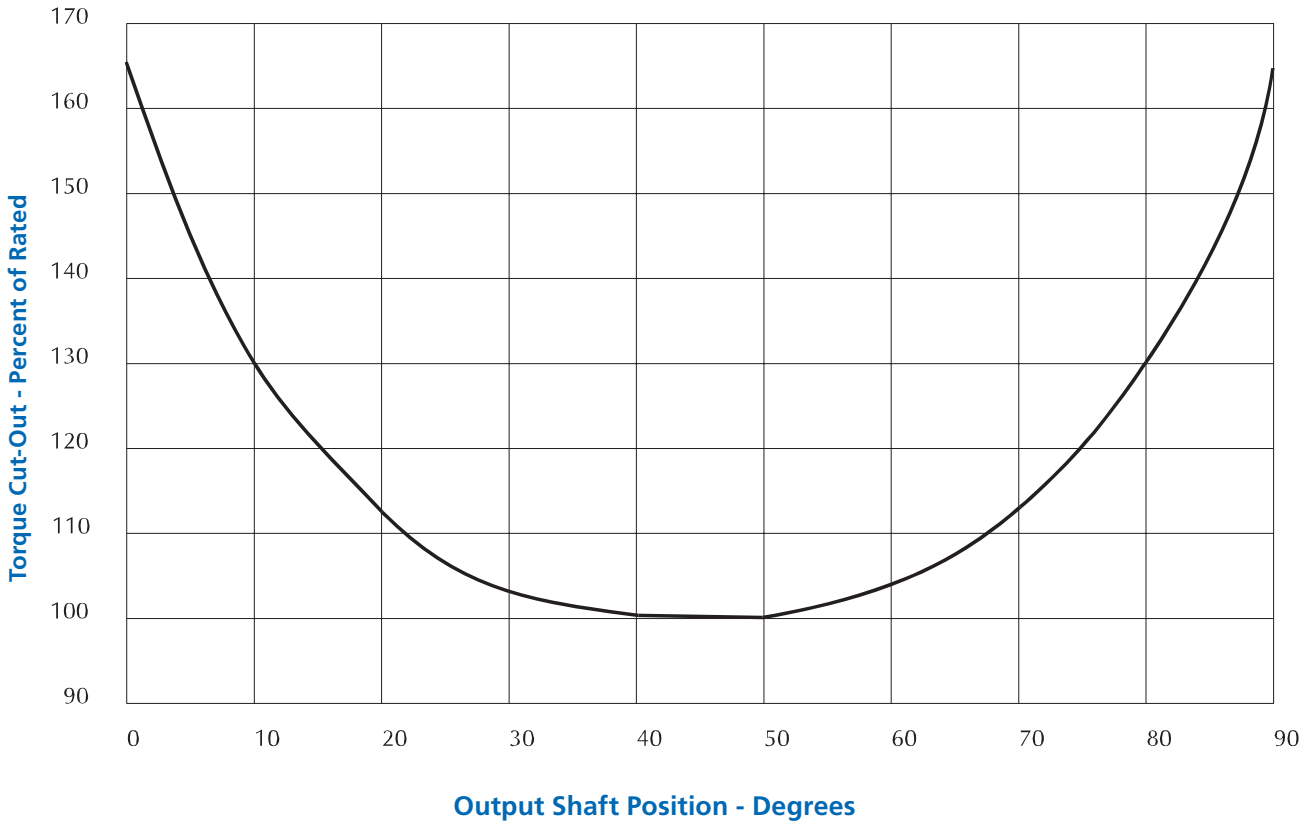
SM-5000 Series Scotch-Yoke Drive Torque Characteristics

The SM-5000 Series actuators utilize a scotch-yoke drive for transforming linear motion from a traveling nut to the rotary motion on the output shaft. The characteristics of the scotch-yoke drive are such that the torque output varies with shaft position as shown below.

Advantages

1. Allows use of smaller torque rated actuators for nonlinearloads.
2. Aids in linearization of linkage driven loads.
3. Allows actuators to be selected based on position related torque rather than peak plus safety factor.
4. Assures high seating and unseating torque without oversizing of the actuator.

Torque Output Curve
Torque Cut-Out - Percent of Rated



SM-5000 Series Torque Output Chart

Output Shaft Position (Degrees)	SM-5100 150 ft. lbs. (203Nm)	SM-5100 300 ft. lbs. (407Nm)	SM-5200 600 ft. lbs. (813Nm)	SM-5200 1000 ft. lbs. (1356Nm)	SM-5300 1600 ft. lbs. (2169Nm)	SM-5300 3200 ft. lbs. (4339Nm)
0°	249 (337)	498 (675)	996 (1350)	1660 (2249)	2656 (3599)	5312 (7198)
10°	198 (268)	396 (537)	792 (1074)	1320 (1789)	2112 (2862)	4224 (5724)
20°	170 (230)	340 (461)	678 (919)	1130 (1531)	1808 (2450)	3616 (4900)
30°	155 (210)	310 (420)	618 (838)	1030 (1396)	1648 (2233)	3296 (4466)
40°	150 (203)	300 (407)	600 (813)	1000 (1356)	1600 (2169)	3200 (4339)
45°	150 (203)	300 (407)	600 (813)	1000 (1356)	1600 (2169)	3200 (4339)
50°	150 (203)	300 (407)	600 (813)	1000 (1356)	1600 (2169)	3200 (4339)
60°	155 (210)	310 (420)	618 (838)	1030 (1396)	1648 (2233)	3296 (4466)
70°	170 (230)	340 (461)	678 (919)	1130 (1531)	1808 (2450)	3616 (4900)
80°	198 (268)	396 (537)	792 (1074)	1320 (1789)	2112 (2862)	4224 (5724)
90°	249 (337)	498 (675)	996 (1350)	1660 (2249)	2656 (3599)	5312 (7198)

Output Shaft Position (Degrees)	SM-5400 5000 ft. lbs. (6779Nm)	SM-5400 7500 ft. lbs. (10169Nm)	SM-5400 10000 ft. lbs. (13558Nm)	SM-5400 12500 ft. lbs. (16948Nm)
0°	8300 (11247)	12450 (16870)	16600 (22493)	20750 (28133)
10°	6600 (8943)	9900 (13415)	13200 (17886)	16500 (22371)
20°	5650 (7656)	8475 (11484)	11300 (15312)	14125 (19151)
30°	5150 (6978)	7725 (10467)	10300 (13957)	12875 (17456)
40°	5000 (6779)	7500 (10169)	10000 (13558)	12500 (16948)
45°	5000 (6779)	7500 (10169)	10000 (13558)	12500 (16948)
50°	5000 (6779)	7500 (10169)	10000 (13558)	12500 (16948)
60°	5150 (6978)	7725 (10467)	10300 (13957)	12875 (17456)
70°	5650 (7656)	8475 (11484)	11300 (15312)	14125 (19151)
80°	6600 (8943)	9900 (13415)	13200 (17886)	16500 (22371)
90°	8300 (11247)	12450 (16870)	16600 (22493)	20750 (28133)

SM-5100 Series Specification Chart

Actuator Model	Input Power Volts/Phase /Hz	Current (Amps) Run	Current (Amps) Stall	Max. Available Torques in.lbs. (Nm)	Speeds (sec.)	Command Output	Input Impedance in ohms	Feedback	Modulation Rate*	Dynamic Braking	Loss of Power	Loss of Command Signal
SM-5115-N	208/3/50/60	0.5	1.6	150 (203)	16, 29 or 48	N/A	N/A	N/A	2000 starts/hour	N/A	Lock in Place	N/A
	240/3/50/60	0.4	1.3									
	380/3/50	0.3	0.9	300 (407)	29 or 48							
	480/3/50/60	0.2	0.65									
SM-5115-A	208/3/50/60	0.5	1.5	150 (203)	16, 29 or 48	4-20 mA, 0-5 VDC or 0-10 VDC	475	1000 ohm pot or 4-20mA	2000 starts/hour	Yes	Lock in Place	Lock in Place or Run to Preset
	240/3/50/60	0.4	1.4									
	380/3/50	0.3	0.9	300 (407)	29 or 48							
	480/3/50/60	0.2	0.65									
SM-5120-N	120/1/50/60	2.5	2.9	150 (203)	16, 29 or 48	N/A	N/A	N/A	2000 starts/hour	N/A	Lock in Place	N/A
				300 (407)	29 or 48							
SM-5120-D	120/1/50/60	2.5	2.9	150 (203)	16, 29 or 48	4-20 mA, 0-5 VDC or 0-10 VDC	200 100,000	1000 ohm pot or 4-20mA	2000 starts/hour	Yes	Lock in Place	Lock in Place or Run to Preset
				300 (407)	29 or 48							
SM-5140-N	24 VDC	4.5	10	150 (203)	20 or 33	N/A	N/A	N/A	4000 starts/hour	N/A	Lock in Place	N/A
				300 (407)	33							
SM-5160-N	90 VDC	2.5	1.9	150 (203)	13, 24 or 39	N/A	N/A	N/A	4000 starts/hour	N/A	Lock in Place	N/A
				300 (407)	24 or 39							
SM-5160-A	120/1/50/60	2.5	6	150 (203)	13, 24 or 39	4-20 mA, 0-5 VDC or 0-10 VDC	475	1000 ohm pot or 4-20mA	4000 starts/hour	Yes	Lock in Place	Lock in Place or Run to Preset
	208/1/50/60											
	240/1/50/60			300 (407)	24 or 39							
	208/3/50/60											
	240/3/50/60											
SM-5160-D	120/1/50/60	2.5	6	150 (203)	13, 24 or 39	4-20 mA, 0-5 VDC or 0-10 VDC	475	1000 ohm pot or 4-20mA	4000 starts/hour	Yes	Lock in Place	Lock in Place or Run to Preset
	208/1/50/60											
	240/1/50/60			300 (407)	24 or 39							
	208/3/50/60											
	240/3/50/60											
SM-5190-N	240/1/50/60	1.2	1.5	150 (203)	16, 29 or 48	N/A	N/A	N/A	2000 starts/hour	N/A	Lock in Place	N/A
				300 (407)	29 or 48							
SM-5190-D	240/1/50/60	1.2	1.5	150 (203)	16, 29 or 48	4-20 mA, 0-5 VDC or 0-10 VDC	200 100,000	1000 ohm pot or 4-20mA	2000 starts/hour	Yes	Lock in Place	Lock in Place or Run to Preset
				300 (407)	29 or 48							

* Minimum Position Change of 1%.

SM-5100 Series Selection Chart

SM-5100						
1	Basic Model	SM-5115, SM-5120, SM-5190	SM-5140	SM-5160	Note Ref.	Selection
2	Speed, sec. (a) / Torque ft. lbs. (Nm)	16/150 (203)	20/150 (203)	13/150 (203)		
		29/150 (203)	33/150 (203)	24/150 (203)		
		29/300 (407)	33/300 (407)	24/300 (407)		
		48/150 (203)		39/150 (203)		
		48/300 (407)		39/300 (407)		
3	Input Voltage	SM-5115 — 10: 3-Phase, 208 VAC				
		SM-5115 — 5: 3-Phase, 240 VAC				
		SM-5115 — 3: 3-Phase, 380 VAC				
		SM-5115 — 4: 3-Phase, 480 VAC				
		SM-5120 / SM-5190 — 1: 1-Phase, 120 VAC				
		SM-5120 / SM-5190 — 2: 1-Phase, 240 VAC				
		SM-5140 — 6: 24 VAC			1	
		SM-5160 — 1: 1-Phase, 120 VAC			2	
		SM-5160 — 2: 1-Phase, 240 VAC			2	
		SM-5160 — 7: 90 VDC			2	
4	Amplifier	N — without built in digital amplifier				
		D — with built in amplifier				
5	Rotation	Specify required output shaft rotation in degrees. Must be between 33° and 90°.				

(a) Speeds are for 90° of rotation.

Technical Notes:
1. 24 VDC not available with amplifier.
2. 120/240 only available with amplifier, 90 VDC not available with amplifier.

SM-5100 Standard Options

Code	Description	Selection	
	Toggles, Lights		
A001	Local Auto/Manual Toggle Switches - NEMA 4		
A002	INC/OFF/DEC Toggle Switches - NEMA 4		
A003	Local Auto/Manual Toggle Switches & INC/OFF/DEC Toggles (A001 & A002) - NEMA 4		
A004	Open-Close-Stop Push Buttons - NEMA 4		
A005	Two Pilot Lights - NEMA 4		
A006	Two Position Selector Switches - NEMA 4 (Auto/Manual)		
A007	Three Position Selector Switches - NEMA 4 (INC/OFF/DEC)		
A009	ON/OFF Toggle Power Switch - NEMA 4		
A010	Local Auto/Manual Switches & (INC/OFF/DEC) Switches - NEMA 4 (A006 & A007)		
A011	Key locks for rotary Auto/Manual switches -NEMA 4		
A012	ON/OFF Rotary Power Switch - NEMA 4		
	Drive Arm/Adapter Clevis/Driven Arm		
D001	Fixed drive arm for splined shaft (old SA1)		
D002	Adjust. drive arm for splined shaft (old SA2)		
D003	Adapter clevis kit used with D001 & D005 (old AK1)		
D004	Adapter clevis kit used with D002 & D006 (old AK2)		
D005	Driven arm used with D001 and D003 (old DA1)		
D006	Driven arm used with D002 and D004 (old DA2)		
D020	Hagan Bailey Pneumatic Replacement (Must provide model number and drive arm dimensions)		
D025	Wedgelock Coupling (valve dims. required)		
	Feedback		
F001	Potentiometer, 1000 ohms		
F002	Tandem Potentiometer, 1000 ohms each (Not for use with models with internal amplifiers)		
F003	Potentiometer, 5000 ohms (Not for use with models with internal amplifiers)		
F004	Potentiometer, 10,000 ohms (Not for use with models with internal amplifiers)		
F005	Transmitter, 4-20 mA output	3	
F006	One Potentiometer, 1000 ohms plus Transmitter, 4-20 mA (Not available with internal amplifiers)	4	
F007	Hall Effect Contactless 4-20 mA Feedback, Only available with amplifier	5	
	Identification/Certifications/Warranties		
J001	CE Marking, AC input only (only available for units with amplifiers)	6	
J002	Stainless Steel Tags		
J004	One year extended warranty		
J005	Two year extended warranty		
	Position Indicator		
P001	Local Position Indicator (90° rotation only) Not CSA	7	
	Shaft		
R004	Keyed Shaft, 1" diameter, 1/4" square keyway		
	Auxiliary Switches		
S001	Two Adjustable Position Switches, SPDT, 20 Amp, 120/240 VAC		
S002	Two Adjustable Position Switches, DPDT, 20 Amp, 120/240 VAC		
S003	Four Adjustable Position Switches, SPDT, 20 Amp, 120/240 VAC		
S004	Four Adjustable Position Switches, DPDT, 20 Amp, 120/240 VAC		
S014	Two nonadjustable end of travel position switches, SPDT, 20 Amp, 120/240 VAC		
S016	Two nonadjustable torque limit switches SPDT, 10 Amp, 120/240 VAC		
	Painting/Coating		
W001	Std Polyurethane (Blue)		
W002	Two Part Epoxy (Grey)		

SM-5100 Special Options

(Consult factory for special requirements)

Code	Description	Selection	
	Connectors		
C001	Plug-In Cannon Type Connector on Enclosure for Power and Control		
C002	Mating Plug-In Cannon Type Connector on Enclosure for Power and Control		
	Enclosure		
E003	Explosion Proof - Class 1, Div. 1, Groups C & D, indoor/outdoor (NEMA 7)		
	Feedback		
F008	Contactless 4-20 mA		
F009	Contactless 0-10 VDC		
	3-Phase Controls		
G001	3-Phase Contactor with Overloads		
G002	Control Transformer (120 VAC control voltage)		
G003	Control Transformer (240 VAC control voltage)		
	Motor		
M001	3-Phase, 575 VAC		
	Special Electrical Options		
X001	24 VDC power supply, 320 mA, 100-240 VAC input		
X004	Voltage to current converter		
X005	Loop powered 4 to 20 isolator, M-system HSN-IAA		
X006	± 15 VDC power supply		
X010	Customer command and feedback, 0-10 VDC or 0-5 VDC instead of 4-20 mA		
X019	AC Power Sensing with Output		
	Special Mechanical Options		
Y008	Metric mounting holes, 12mm		

Technical Notes:
1. 24 VDC not available with amplifier.
2. 120/240 only available with amplifier, 90 VDC not available with amplifier.
3. F005 is a redundant 4-20 mA feedback for units with built in digital amplifier.
4. F006 is not available in units with built in digital amplifier.
5. F007 only available with amplifier.
6. J001 is only available with units with AC input.
7. P001 is for 90 degrees only.

For a full description of options, go to the Complete Listing of Options starting on page 109.

SM-5200 Series Specification Chart

Actuator Model	Input Power Volts/Phase /Hz	Current (Amps) Run	Current (Amps) Stall	Max. Available Torques in.lbs. (Nm)	Speeds (sec.)	Command Output	Input Impedance in ohms	Feedback	Modulation Rate*	Dynamic Braking	Loss of Power	Loss of Command Signal
SM-5210-N	208/3/50/60	2.1	11.9	600 (814)	30 or 50	N/A	N/A	N/A	2000 starts/hour	N/A	Lock in Place	N/A
	240/3/50/60	1.8	10.3									
	380/3/50	2.4	4.7	1000 (1356)					20%			
	480/3/50/60	0.9	5.2									
SM-5210-A	208/3/50/60	2.1	11.9	600 (814)	30 or 50	4-20 mA, 0-5 VDC or 0-10 VDC	475	1000 ohm pot or 4-20mA	2000 starts/hour	Yes	Lock in Place	Lock in Place or Run to Preset
	240/3/50/60	1.8	10.3									
	380/3/50	2.4	4.7	1000 (1356)					20%			
	480/3/50/60	0.9	5.2									
SM-5220-N	120/1/50/60	7	13.2	600 (814)	30 or 50	N/A	N/A	N/A	2000 starts/hr	N/A	Lock in Place	N/A
	240/1/50/60	3.5	6.6	1000 (1356)					20%			
SM-5220-D	120/1/50/60	7	13.2	600 (814)	30 or 50	4-20 mA, 0-5 VDC or 0-10 VDC	200 100,000	1000 ohm pot or 4-20mA	2000 starts/hr	Yes	Lock in Place	Lock in Place or Run to Preset
	240/1/50/60	3.5	6.6	1000 (1356)					20%			
SM-5260-N	90 VDC	4.7	N/A	600 (814)	28 or 48	N/A	N/A	N/A	4000 starts/hr	N/A	Lock in Place	N/A
				1000 (1356)					20%			
SM-5260-A	120/1/50/60	4.7	N/A	600 (814)	28 or 48	4-20 mA, 0-5 VDC or 0-10 VDC	475	1000 ohm pot or 4-20mA	4000 starts/hour	Yes	Lock in Place	Lock in Place or Run to Preset
	208/1/50/60											
	240/1/50/60											
	208/3/50/60			1000 (1356)					20%			
	240/3/50/60											
SM-5260-D	120/1/50/60	4.7	N/A	600 (814)	28 or 48	4-20 mA, 0-5 VDC or 0-10 VDC	475	1000 ohm pot or 4-20mA	4000 starts/hour	Yes	Lock in Place	Lock in Place or Run to Preset
	208/1/50/60											
	240/1/50/60											
	208/3/50/60			1000 (1356)					20%			
	240/3/50/60											

* Minimum Position Change of 1%.

SM-5200 Series Selection Chart

SM-5200						
1	Basic Model	SM-5210, SM-5220		SM-5260	Note Ref.	Selection
2	Speed, sec (a) / Torque ft. lbs. (Nm)	30/600 (814)		28/600 (814)		
		50/600 (814)		48/600 (814)		
		30/1000 (1356)		28/1000 (1356)		
		50/1000 (1356)		48/1000 (1356)		
3	Input Voltage	SM-5210	10: 3-Phase, 208 VAC			
			5: 3-Phase, 240 VAC			
			3: 3-Phase, 380 VAC			
			4: 3-Phase, 480 VAC			
		SM-5220	1: 1-Phase, 120 VAC			
			2: 1-Phase, 240 VAC			
		SM-5260	1: 1-Phase, 120 VAC		1	
			2: 1-Phase, 240 VAC		1	
			7: 90 VDC		1	
4	Amplifier	N	without built in digital amplifier			
		D	with built in amplifier			
5	Rotation	Specify required output shaft rotation in degrees. Must be between 33° and 90°.				

(a) Speeds are for 90° of rotation.

Technical Notes:
1. 120/240 only available with amplifier, 90 VDC not available with amplifier.

SM-5200 Standard Options

Code	Description	Selection	
	Toggles, Lights		
A001	Local Auto/Manual Toggle Switches - NEMA 4		
A002	INC/OFF/DEC Toggle Switches - NEMA 4		
A003	Local Auto/Manual Toggle Switches & INC/OFF/DEC Toggles (A001 & A002) - NEMA 4		
A004	Open-Close-Stop Push Buttons - NEMA 4		
A005	Two Pilot Lights - NEMA 4		
A006	Two Position Selector Switches - NEMA 4 (Auto/Manual)		
A007	Three Position Selector Switches - NEMA 4 (INC/OFF/DEC)		
A009	ON/OFF Toggle Power Switch - NEMA 4		
A010	Local Auto/Manual Switches & (INC/OFF/DEC) Switches - NEMA 4 (A006 & A007)		
A011	Key locks for rotary Auto/Manual switches -NEMA 4		
A012	ON/OFF Rotary Power Switch - NEMA 4		
	Brake		
B001	Electrically Operated Brake 120 VAC		
B002	Electrically Operated Brake 240 VAC		
	Drive Arm/Adapter Clevis/Driven Arm		
D007	Fixed (10") drive arm for splined shaft (old SA1)		
D008	Adjustable drive arm for splined shaft (old SA2)		
D009	Adapter clevis kit used with D007 & D011 (old AK1)		
D010	Adapter clevis kit used with D008 & D012 (old AK2)		
D011	Driven arm used with D007 and D009 (old DA1)		
D012	Driven arm used with D008 and D010 (old DA2)		
D021	Hagan Bailey Pneumatic Replacement (Must provide model number and drive arm dimensions)		
D026	Wedgelock Coupling (valve dim. required)		
	Feedback		
F001	Potentiometer, 1000 ohms		
F002	Tandem Potentiometer, 1000 ohms each (Not for use with models with internal amplifiers)		
F003	Potentiometer, 5000 ohms (Not for use with models with internal amplifiers)		
F004	Potentiometer, 10,000 ohms (Not for use with models with internal amplifiers)		
F005	Transmitter, 4-20 mA output	2	
F006	One Potentiometer, 1000 ohms plus Transmitter, 4-20 mA (Not available with internal amplifiers)	3	
F007	Hall Effect Contactless 4-20 mA Feedback	4	
F010	Anti Backlash Feedback Spring		
	3-Phase Controls		
G001	3-Phase Contactor with Overloads		
G002	Control Transformer (120 VAC control voltage)		
G003	Control Transformer (240 VAC control voltage)		
	Identification/Certifications/Warranties		
J001	CE Marking, AC input only (only available for units with amplifiers)	5	
J002	Stainless Steel Tags		
J004	One year extended warranty		
J005	Two year extended warranty		
	Position Indicator		
P001	Local Position Indicator (90° rotation only) Not CSA	6	
	Shaft		
R005	Keyed Shaft, 1.75" dia., 3/8" square keyway		

SM-5200 Standard Options continued

Code	Description	Selection	
	Auxiliary Switches		
S001	Two Adjustable Position Switches, SPDT, 20 Amp, 120/240 VAC		
S002	Two Adjustable Position Switches, DPDT, 20 Amp, 120/240 VAC		
S003	Four Adjustable Position Switches, SPDT, 20 Amp, 120/240 VAC		
S004	Four Adjustable Position Switches, DPDT, 20 Amp, 120/240 VAC		
S014	Two nonadjustable end of travel position switches, SPDT, 20 Amp, 120/240 VAC		
S016	Two nonadjustable torque limit switches, SPDT, 10 Amp, 120/240 VAC		
	Painting/Coating		
W001	Std Polyurethane (Blue)		
W002	Two Part Epoxy (Grey)		
	Special Mechanical Options		
Y008	Metric mounting holes, 20mm		

Technical Notes:
1. 120/240 only available with amplifier, 90 VDC not available with amplifier.
2. F005 is a redundant 4-20 mA feedback for units with built in digital amplifier.
3. F006 is not available in units with built in digital amplifier.
4. F007 only available with amplifier.
5. J001 is only available with units with AC input.
6. P001 is for 90 degrees only.

SM-5200 Special Options

(Consult factory for special requirements)

Code	Description	Selection	
	Connectors		
C001	Plug-In Cannon Type Connector on Enclosure for Power and Control		
C002	Mating Plug-In Cannon Type Connector on Enclosure for Power and Control		
	Feedback		
F008	Contactless 4-20 mA		
F009	Contactless 0-10 VDC		
	Motor		
M001	3-Phase, 575 VAC		
	Special Electrical Options		
X001	24 VDC power supply, 320 mA, 100-240 VAC input		
X004	Voltage to current converter		
X005	Loop powered 4 to 20 isolator, M-system HSN-IAA		
X006	± 15 VDC power supply		
X010	Customer command and feedback, 0-10 VDC or 0-5 VDC instead of 4-20 mA		
X019	AC Power Sensing with Output		

For a full description of options, go to the Complete Listing of Options starting on page 109.

SM-5300 Series Specification Chart

Actuator Model	Input Power Volts/Phase /Hz	Current (Amps) Run	Current (Amps) Stall	Max. Available Torques in.lbs. (Nm)	Speeds (sec.)	Command Output	Input Impedance in ohms	Feedback	Modulation Rate*	Dynamic Braking	Loss of Power	Loss of Command Signal
SM-5310-N	208/3/50/60	2.9	14.5	1600 (2170)	23 or 47	N/A	N/A	N/A	2000 starts/hour	N/A	Lock in Place	N/A
	240/3/50/60	2.5	12.5									
	380/3/50	2.2	13.5	3200 (4339)	47							
	480/3/50/60	1.2	6.2									
SM-5310-A	208/3/50/60	2.1	11.9	1600 (2170)	23 or 47	4-20 mA, 0-5 VDC or 0-10 VDC	475	1000 ohm pot or 4-20mA	2000 starts/hour	Yes	Lock in Place	Lock in Place or Run to Preset
	240/3/50/60	2.5	12.5									
	380/3/50	2.2	13.5	3200 (4339)	47							
	480/3/50/60	1.2	6.2									
SM-5320-N	120/1/50/60	10	12	1600 (2170)	23 or 47	N/A	N/A	N/A	2000 starts/hour	N/A	Lock in Place	N/A
	240/1/50/60	5	6	3200 (4339)	47							
SM-5360-N	90 VDC	9.5	N/A	1600 (2170)	23 or 47	N/A	N/A	N/A	4000 starts/hour	N/A	Lock in Place	N/A
				3200 (4339)	47							
SM-5360-A	120/1/50/60	9.5	N/A	1600 (2170)	23 or 47	4-20 mA, 0-5 VDC or 0-10 VDC	475	1000 ohm pot or 4-20mA	4000 starts/hour	Yes	Lock in Place	Lock in Place or Run to Preset
	208/1/50/60											
	240/1/50/60			3200 (4339)	47							
	208/3/50/60											
	240/3/50/60											
SM-5360-D	120/1/50/60	9.5	N/A	1600 (2170)	23 or 47	4-20 mA, 0-5 VDC or 0-10 VDC	475	1000 ohm pot or 4-20mA	4000 starts/hour	Yes	Lock in Place	Lock in Place or Run to Preset
	208/1/50/60											
	240/1/50/60			3200 (4339)	47							
	208/3/50/60											
	240/3/50/60											

* Minimum Position Change of 1%.

SM-5300 Series Selection Chart

SM-5300					
1	Basic Model	SM-5310, SM-5320, SM-5360		Note Ref.	Selection
2	Speed, sec. (a) / Torque in. lbs. (Nm)	23/1600 (2170)			
		47/1600 (2170)			
		47/3200 (4339)			
3	Input Voltage	SM-5310	10: 3-Phase, 208 VAC		
			5: 3-Phase, 240 VAC		
			3: 3-Phase, 380 VAC		
			4: 3-Phase, 480 VAC		
		SM-5320	1: 1-Phase, 120 VAC	1	
			2: 1-Phase, 240 VAC	1	
		SM-5360	1: 1-Phase, 120 VAC	2	
			2: 1-Phase, 240 VAC	2	
			7: 90 VDC	1	
4	Amplifier	N	without built in digital amplifier	1	
		D	with built in amplifier	2	
5	Rotation	Specify required output shaft rotation in degrees. Must be between 33° and 90°.			

(a) Speeds are for 90° of rotation.

Technical Notes:
1. Not available with amplifier.
2. Only available with amplifier.

SM-5300 Standard Options

Code	Description	Selection	
	Toggles, Lights		
A001	Local Auto/Manual Toggle Switches - NEMA 4		
A002	INC/OFF/DEC Toggle Switches - NEMA 4		
A003	Local Auto/Manual Toggle Switches & INC/OFF/DEC Toggles (A001 & A002) - NEMA 4		
A004	Open-Close-Stop Push Buttons - NEMA 4		
A005	Two Pilot Lights - NEMA 4		
A006	Two Position Selector Switches - NEMA 4 (Auto/Manual)		
A007	Three Position Selector Switches - NEMA 4 (INC/OFF/DEC)		
A009	ON/OFF Toggle Power Switch - NEMA 4		
A010	Local Auto/Manual Switches & (INC/OFF/DEC) Switches - NEMA 4 (A006 & A007)		
A011	Key locks for rotary Auto/Manual switches -NEMA 4		
A012	ON/OFF Rotary Power Switch - NEMA 4		
	Drive Arm/Adapter Clevis/Driven Arm		
D013	Fixed (12") drive arm for splined shaft (old SA)		
D014	Adapter clevis kit used with D013 and D015 (old AK)		
D015	Driven arm used with D013 and D014 (old DA)		
D022	Hagan Bailey Pneumatic Replacement (Must provide model number and drive arm dimensions)		
D027	Wedgelock Coupling (valve dim. required)		
	Feedback		
F001	Potentiometer, 1000 ohms		
F002	Tandem Potentiometer, 1000 ohms each (Not for use with models with internal amplifiers)		
F003	Potentiometer, 5000 ohms (Not for use with models with internal amplifiers)		
F004	Potentiometer, 10,000 ohms (Not for use with models with internal amplifiers)		
F005	Transmitter, 4-20 mA output	3	
F006	One Potentiometer, 1000 ohms plus Transmitter, 4-20 mA (Not available with internal amplifiers)	4	
F007	Hall Effect Contactless 4-20 mA Feedback	5	
F010	Anti Backlash Feedback Spring		
F999	Special Potentiometer (consult factory)		
	3-Phase Controls		
G001	3-Phase Contactor with Overloads		
G002	Control Transformer (120 VAC control voltage)		
G003	Control Transformer (240 VAC control voltage)		
	Identification/Certifications/Warranties		
J001	CE Marking, AC input only (only available for units with amplifiers)	6	
J002	Stainless Steel Tags		
J004	One year extended warranty		
J005	Two year extended warranty		
	Position Indicator		
P001	Local Position Indicator (90° rotation only) Not CSA	7	
	Shaft		
R006	Keyed Shaft, 2.75" dia., 5/8" square keyway		

Continued over page

Technical Notes:
3. F005 is redundant for units with an amplifier.
4. F006 is not available in units with built in digital amplifier.
5. F007 only available with amplifier.
6. J001 is only available with units with AC input.
7. P001 is for 90 degrees only.

For a full description of options, go to the Complete Listing of Options starting on page 109.

SM-5300 Standard Options continued

Code	Description	Selection	
	Auxiliary Switches		
S001	Two Adjustable Position Switches, SPDT, 20 Amp, 120/240 VAC		
S002	Two Adjustable Position Switches, DPDT, 20 Amp, 120/240 VAC		
S003	Four Adjustable Position Switches, SPDT, 20 Amp, 120/240 VAC		
S004	Four Adjustable Position Switches, DPDT, 20 Amp, 120/240 VAC		
S014	Two nonadjustable end of travel position switches, SPDT, 20 Amp, 120/240 VAC		
S016	Two nonadjustable torque limit switches, SPDT, 10 Amp, 120/240 VAC		
	Painting/Coating		
W001	Std Polyurethane (Blue)		
W002	Two Part Epoxy (Grey)		
	Special Mechanical Options		
Y008	Metric mounting holes, 20mm		

SM-5300 Special Options

(Consult factory for special requirements)

Code	Description	Selection	
	Connectors		
C001	Plug-In Cannon Type Connector on Enclosure for Power and Control		
C002	Mating Plug-In Cannon Type Connector on Enclosure for Power and Control		
	Feedback		
F008	Contactless 4-20 mA		
F009	Contactless 0-10 VDC		
	Motor		
M001	3-Phase, 575 VAC		
	Special Electrical Options		
X001	24 VDC power supply, 320 mA, 100-240 VAC input		
X004	Voltage to current converter		
X005	Loop powered 4 to 20 isolator, M-system HSN-IAA		
X006	± 15 VDC power supply		
X010	Customer command and feedback, 0-10 VDC or 0-5 VDC instead of 4-20 mA		
X019	AC Power Sensing with Output		

For a full description of options, go to the Complete Listing of Options starting on page 109.

SM-5400 Series Specification Chart

Actuator Model	Input Power Volts/Phase /Hz	Current (Amps) Run	Current (Amps) Stall	Max. Available Torques in.lbs. (Nm)	Speeds (sec.)	Command Output	Input Impedance in ohms	Feedback	Modulation Rate*	Dynamic Braking	Loss of Power	Loss of Command Signal
SM-5430-N	208/3/50/60	4.8	37	5000 (6780) or 7500 (10,170)	42, 56 or 73	N/A	N/A	N/A	2000 starts/hour	N/A	Lock in Place	N/A
	240/3/50/60	4.2	32	10,000 (13,560)	56 or 73							
	380/3/50	2.5	16.9	7500 (10,170) or 12,500 (16,950)	73							
	480/3/50/60	2.1	16									
SM-5430-A	208/3/50/60	4.8	37	5000 (6780) or 7500 (10,170)	42, 56 or 73	4-20 mA, 0-5 VDC or 0-10 VDC	475	1000 ohm pot or 4-20mA	2000 starts/hour	Yes	Lock in Place	Lock in Place or Run to Preset
	240/3/50/60	4.2	32	10,000 (13,560)	56 or 73							
	380/3/50	2.5	16.9	7500 (10,170) or 12,500 (16,950)	73							
	480/3/50/60	2.1	16									
SM-5480-N	180 VDC	9.2	N/A	5000 (6780) or 7500 (10,170)	40, 54 or 70	N/A	N/A	N/A	4000 starts/hour	N/A	Lock in Place	N/A
				10,000 (13,560)	54 or 70							
				7500 (10,170) or 12,500 (16,950)	70							
SM-5480-A	208/3/50/60	9.2	N/A	5000 (6780) or 7500 (10,170)	40, 54 or 70	4-20 mA, 0-5 VDC or 0-10 VDC	475	1000 ohm pot or 4-20mA	2000 starts/hour	Yes	Lock in Place	Lock in Place or Run to Preset
	240/3/50/60			10,000 (13,560)	54 or 70							
	380/3/50			7500 (10,170) or 12,500 (16,950)	70							
	480/3/50/60											
SM-5480-D	208/3/50/60	9.2	N/A	5000 (6780) or 7500 (10,170)	40, 54 or 70	4-20 mA, 0-5 VDC or 0-10 VDC	475	1000 ohm pot or 4-20mA	2000 starts/hour	Yes	Lock in Place	Lock in Place or Run to Preset
	240/3/50/60			10,000 (13,560)	54 or 70							
	380/3/50			7500 (10,170) or 12,500 (16,950)	70							
	480/3/50/60											

* Minimum Position Change of 1%.

SM-5400 Series Selection Chart

SM-5400					
1	Basic Model	SM-5430	SM-5480	Note Ref.	Selection
2	Speed, sec. (a) / Torque in. lbs. (Nm)	42/5,000 (6779)	40/5,000 (6779)		
		42/7,500 (10,168)	40/7,500 (10,168)		
		56/5,000 (6779)	54/5,000 (6779)		
		56/7,500 (10,168)	54/7,500 (10,168)		
		56/10,000 (13,558)	54/10,000 (13,558)		
		73/5,000 (6779)	70/5,000 (6779)		
		73/7,500 (10,168)	70/7,500 (10,168)		
		73/12,500 (16,947)	70/12,500 (16,947)		
3	Input Voltage	SM-5430	**10:** 3-Phase, 208 VAC		
			5: 3-Phase, 240 VAC		
			3: 3-Phase, 380 VAC		
			4: 3-Phase, 480 VAC		
		SM-5480	**2:** 1-Phase, 240 VAC		
			8: 180 VDC	1	
			9: 208 VAC, 1-Phase, 50 Hz (SM-5480-A or SM-5480-D)	2	
4	Amplifier	**N**	without built in digital amplifier	2	
		D	with built in amplifier	1	
5	Rotation	Specify required output shaft rotation in degrees. Must be between 70° and 90°.			

(a) Speeds are for 90° of rotation.

Technical Notes:
1. Only available with amplifier.
2. Not available with amplifier.

SM-5400 Standard Options

Code	Description	Selection	
	Toggles, Lights		
A001	Local Auto/Manual Toggle Switches - NEMA 4		
A002	INC/OFF/DEC Toggle Switches - NEMA 4		
A003	Local Auto/Manual Toggle Switches & INC/OFF/DEC Toggles (A001 & A002) - NEMA 4		
A004	Open-Close-Stop Push Buttons - NEMA 4		
A005	Two Pilot Lights - NEMA 4		
A006	Two Position Selector Switches - NEMA 4 (Auto/Manual)		
A007	Three Position Selector Switches - NEMA 4 (INC/OFF/DEC)		
A009	ON/OFF Toggle Power Switch - NEMA 4		
A010	Local Auto/Manual Switches & (INC/OFF/DEC) Switches - NEMA 4 (A006 & A007)		
A011	Key locks for rotary Auto/Manual switches -NEMA 4		
A012	ON/OFF Rotary Power Switch - NEMA 4		
	Drive Arm/Adapter Clevis/Driven Arm		
D016	Fixed (15") drive arm for splined shaft (old SA)		
D017	Adapter clevis kit used with D016 and D018 (old AK)		
D018	Driven arm used with D016 and D017 (old DA)		
D023	Hagan Bailey Pneumatic Replacement (Must provide model number and drive arm dimensions)		
D028	Wedgelock Coupling (valve dim. required)		
	Feedback		
F001	Potentiometer, 1000 ohms		
F002	Tandem Potentiometer, 1000 ohms each (Not for use with models with internal amplifiers)		
F003	Potentiometer, 5000 ohms (Not for use with models with internal amplifiers)		
F004	Potentiometer, 10,000 ohms (Not for use with models with internal amplifiers)		
F005	Transmitter, 4-20 mA output	3	
F006	One Potentiometer, 1000 ohms plus Transmitter, 4-20 mA (Not available with internal amplifiers)	4	
F007	Hall Effect Contactless 4-20 mA Feedback, only available with amplifier	5	
F010	Anti Backlash Feedback Spring		
	3-Phase Controls		
G001	3-Phase Contactor with Overloads		
G003	Control Transformer (240 VAC control voltage)		
	Identification/Certifications/Warranties		
J001	CE Marking, AC input only (only available for units with amplifiers)	6	
J002	Stainless Steel Tags		
J004	One year extended warranty		
J005	Two year extended warranty		
	Position Indicator		
P001	Local Position Indicator (90° rotation only) Not CSA	7	
	Shaft		
R007	Keyed Shaft, 4.25" dia., 1" square keyway		
	Special Mechanical Options		
Y012	Metric mounting holes, 26 mm		

Continued over page

For a full description of options, go to the Complete Listing of Options starting on page 109.

SM-5400 Standard Options continued

Code	Description	Selection	
	Auxiliary Switches		
S001	Two Adjustable Position Switches, SPDT, 20 Amp, 120/240 VAC		
S002	Two Adjustable Position Switches, DPDT, 20 Amp, 120/240 VAC		
S003	Four Adjustable Position Switches, SPDT, 20 Amp, 120/240 VAC		
S004	Four Adjustable Position Switches, DPDT, 20 Amp, 120/240 VAC		
S014	Two nonadjustable end of travel position switches, SPDT, 20 Amp, 120/240 VAC		
S016	Two nonadjustable torque limit switches, SPDT, 10 Amp, 120/240 VAC		
	Painting/Coating		
W001	Std Polyurethane (Blue)		
W002	Two Part Epoxy (Grey)		
	Special Mechanical Options		
Y012	Metric mounting holes, 26 mm		

Technical Notes:
3. F005 is redundant for units with an amplifier
4. F006 is not available in units with built in digital amplifier
5. F007 only available with amplifier
6. J001 is only available with units with AC input
7. P001 is for 90 degrees only

SM-5400 Special Options

(Consult factory for special requirements)

Code	Description	Selection	
	Connectors		
C001	Plug-In Cannon Type Connector on Enclosure for Power and Control		
C002	Mating Plug-In Cannon Type Connector on Enclosure for Power and Control		
	Feedback		
F008	Contactless 4-20 mA		
F009	Contactless 0-10 VDC		
	Motor		
M001	3-Phase, 575 VAC		
	Special Electrical Options		
X001	24 VDC power supply, 320 mA, 100-240 VAC input		
X004	Voltage to current converter		
X005	Loop powered 4 to 20 isolator, M-system HSN-IAA		
X006	± 15 VDC power supply		
X010	Customer command and feedback, 0-10 VDC or 0-5 VDC instead of 4-20 mA		
X019	AC Power Sensing with Output		

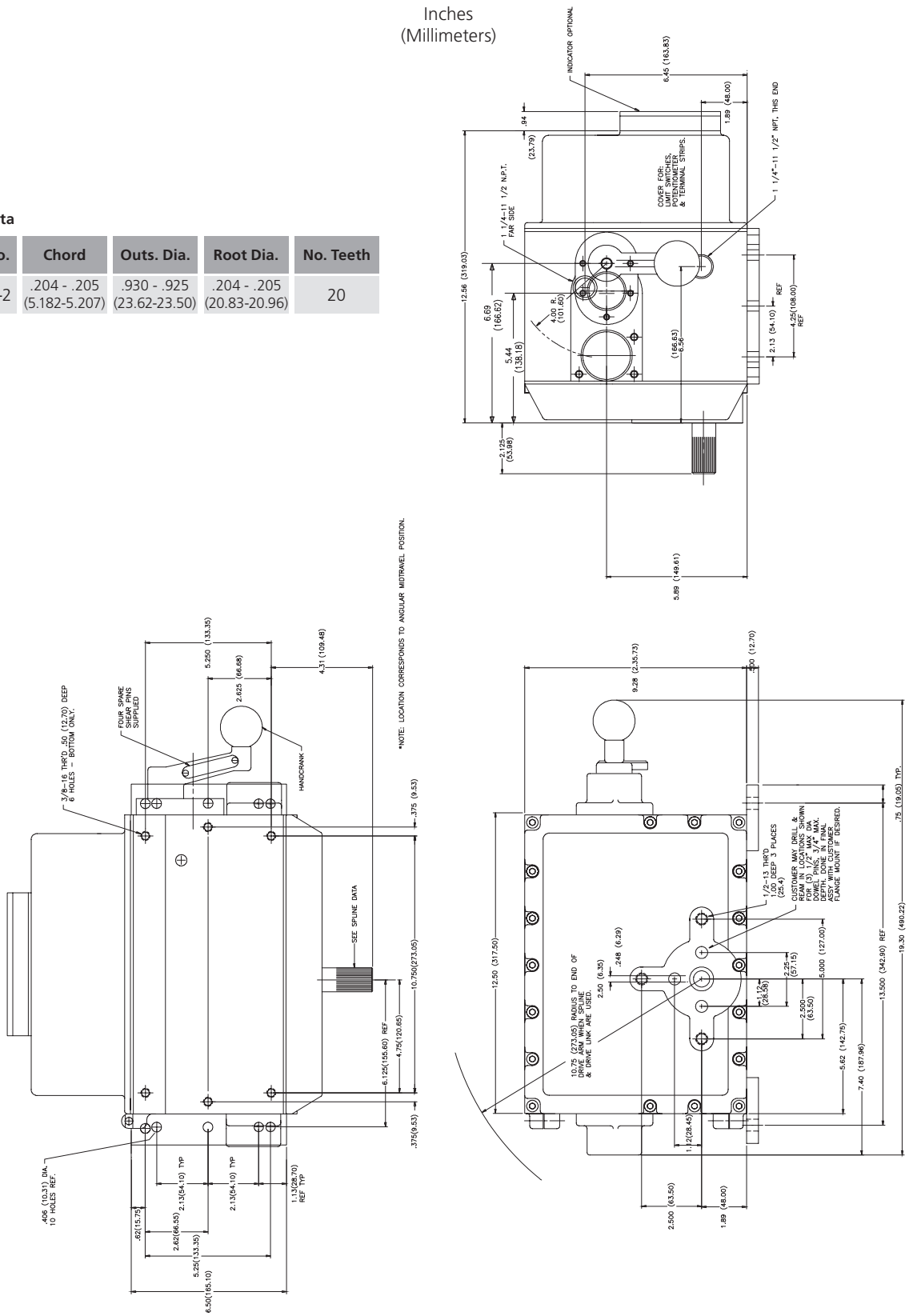
For a full description of options, go to the Complete Listing of Options starting on page 109.

SM-5100 Major Dimensions

Inches
(Millimeters)

Spline Data

Spline No.	Chord	Outs. Dia.	Root Dia.	No. Teeth
0875-20-2	.204 - .205 (5.182-5.207)	.930 - .925 (23.62-23.50)	.204 - .205 (20.83-20.96)	20



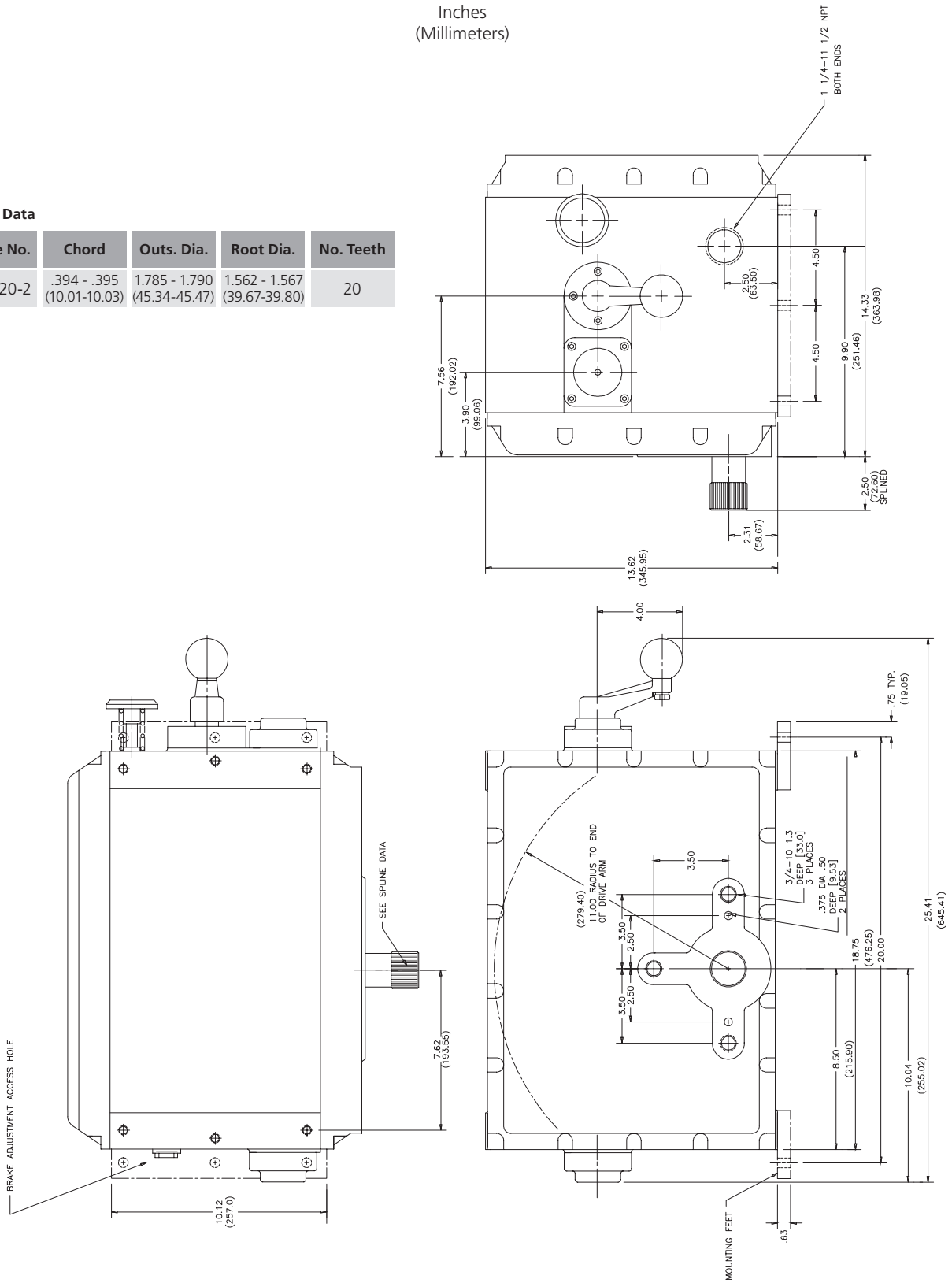
These dimensions are subject to change without notice and should not be used for preparation of drawings or fabrication of installation mounting. For current installation manuals and other product information, see www.rotork.com.

SM-5200 Major Dimensions

Inches
(Millimeters)

Spline Data

Spline No.	Chord	Outs. Dia.	Root Dia.	No. Teeth
1687-20-2	.394 - .395 (10.01-10.03)	1.785 - 1.790 (45.34-45.47)	1.562 - 1.567 (39.67-39.80)	20



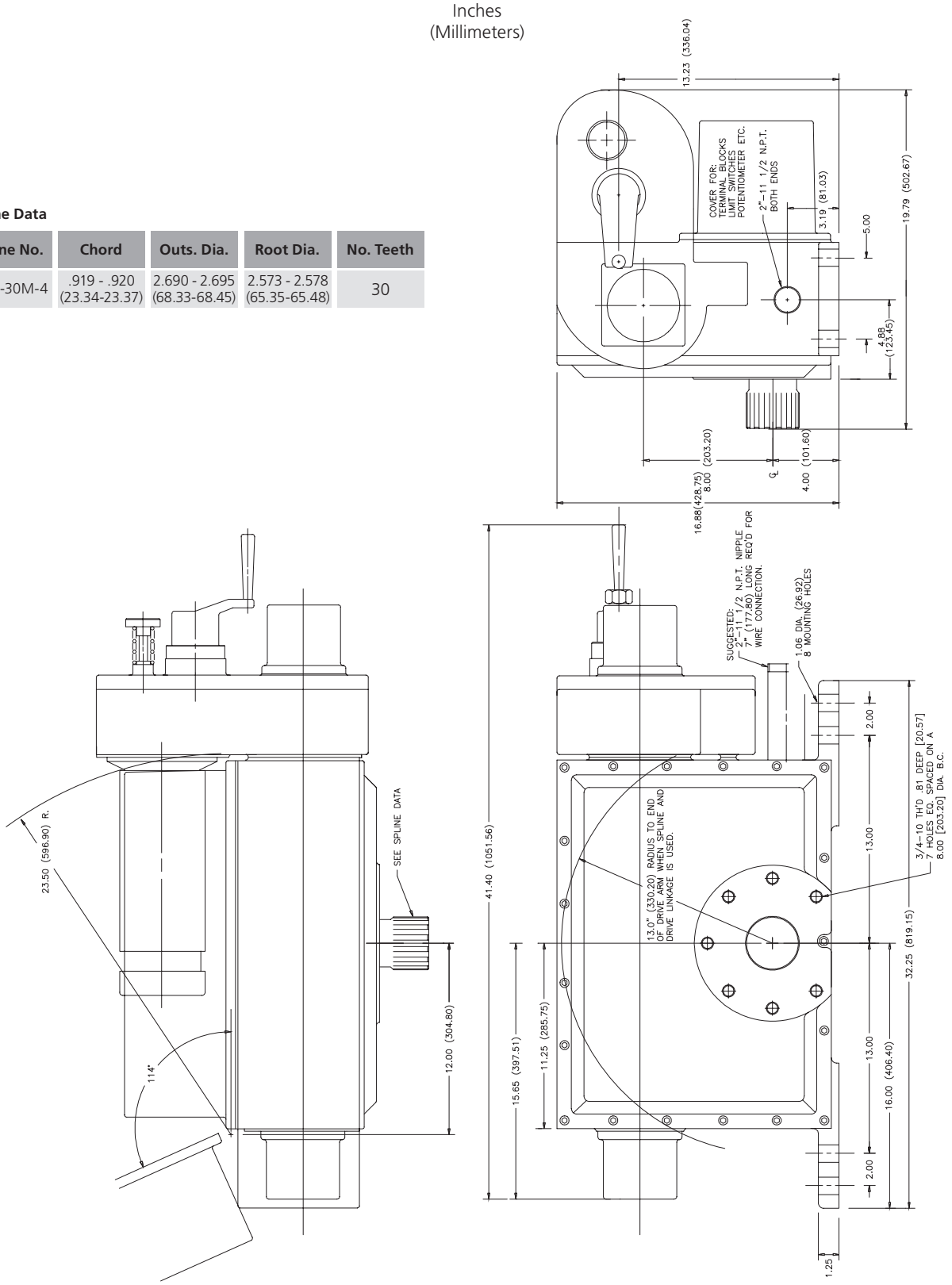
These dimensions are subject to change without notice and should not be used for preparation of drawings or fabrication of installation mounting. For current installation manuals and other product information, see www.rotork.com.

SM-5300 Major Dimensions

Inches
(Millimeters)

Spline Data

Spline No.	Chord	Outs. Dia.	Root Dia.	No. Teeth
2625-30M-4	.919 - .920 (23.34-23.37)	2.690 - 2.695 (68.33-68.45)	2.573 - 2.578 (65.35-65.48)	30



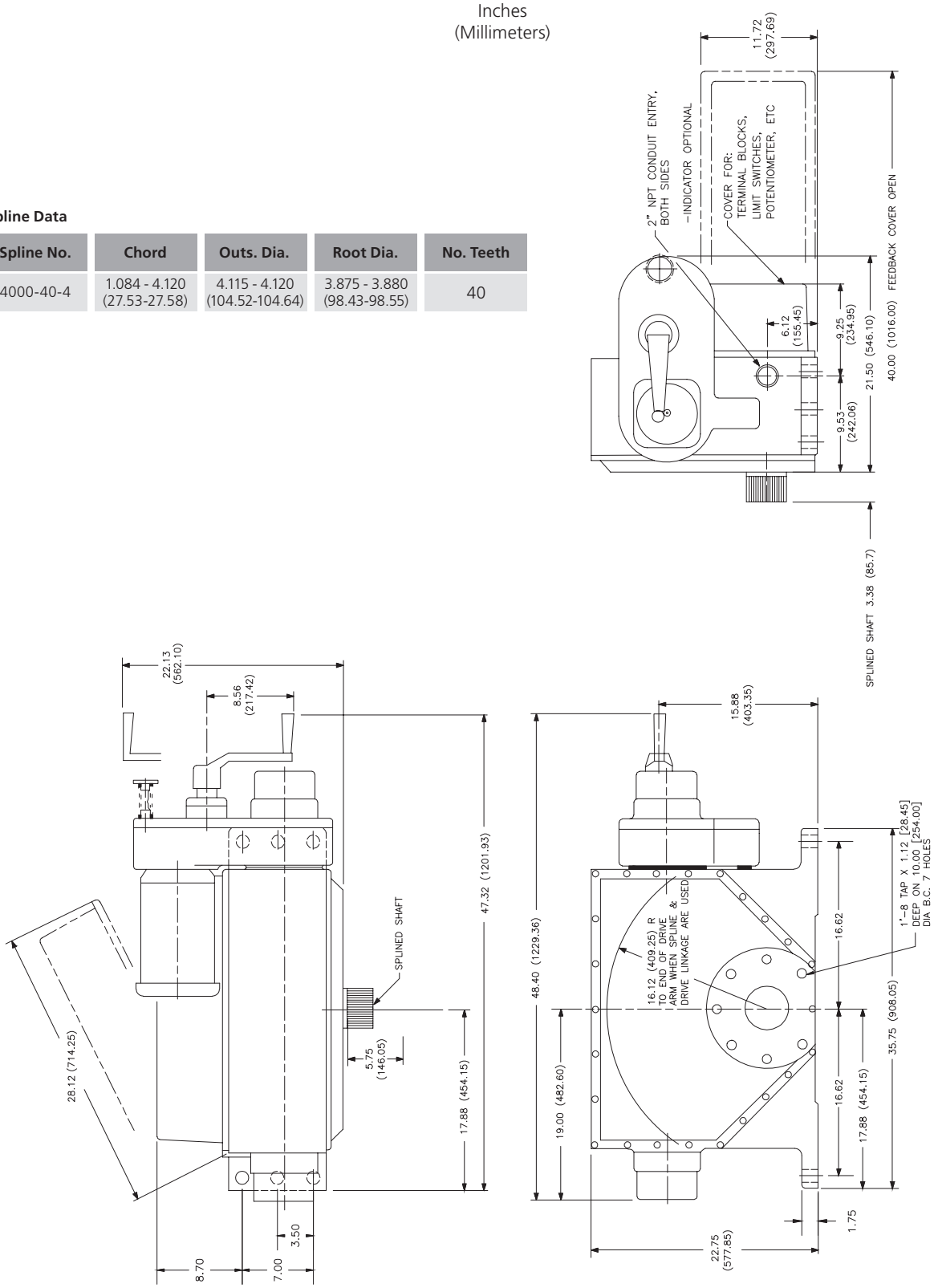
These dimensions are subject to change without notice and should not be used for preparation of drawings or fabrication of installation mounting. For current installation manuals and other product information, see www.rotork.com.

SM-5400 Major Dimensions

Inches
(Millimeters)

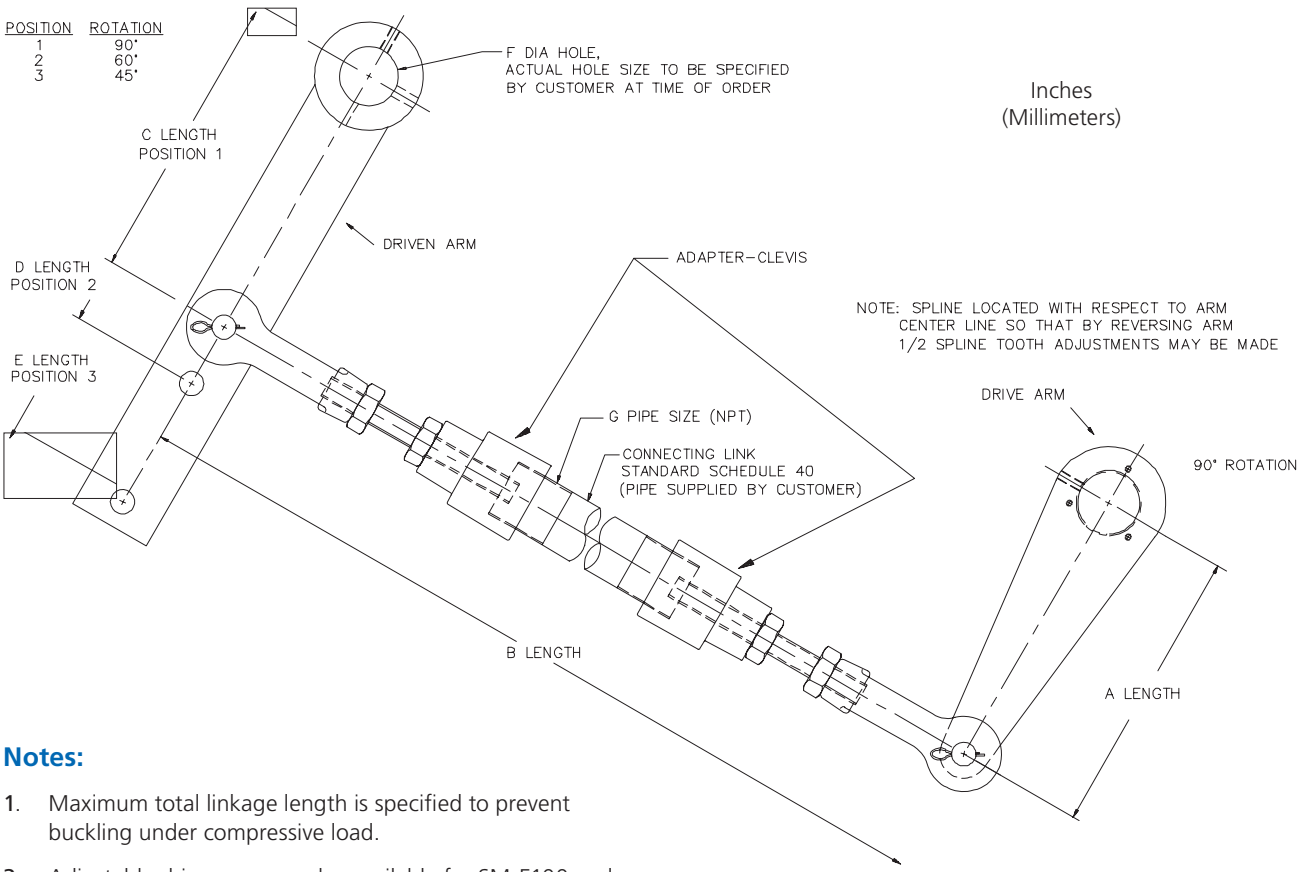
Spline Data

Spline No.	Chord	Outs. Dia.	Root Dia.	No. Teeth
4000-40-4	1.084 - 4.120 (27.53-27.58)	4.115 - 4.120 (104.52-104.64)	3.875 - 3.880 (98.43-98.55)	40



These dimensions are subject to change without notice and should not be used for preparation of drawings or fabrication of installation mounting. For current installation manuals and other product information, see www.rotork.com.

SM-5000 Series Drive Arm And Linkage Options



Notes:

1. Maximum total linkage length is specified to prevent buckling under compressive load.
2. Adjustable drive arms are also available for SM-5100 and SM-5200 Series actuators to allow "A" length to vary from 6 to 10 inches (152 to 254 mm). In this case, the adapter-clevis has rod ball ends with lubricating fittings.
3. Special drive arm lengths are available to meet application requirements.

Model	"A" LENGTH in. (mm) (See Note 3)	"B" MAXIMUM LENGTH ft. (m)	"C" LENGTH in. (mm)	"D" LENGTH in. (mm)	"E" LENGTH in. (mm)	"F" DIA. HOLE min.-max. in. (mm)	"G" PIPE SIZE
SM-5100	10 (254)	18 (5.5)	10 (254)	12.25 (311)	17 (432)	0.75 - 1.5 (19 - 38.1)	1 - ¼ (NPT)
SM-5200	10 (254)	30 (9.1)	10 (254)	12.25 (311)	17 (432)	1 - 2 (25.4 - 50.8)	2 - ½ (NPT)
SM-5300	12 (305)	18 (5.5)	12 (305)	14.70 (373)	21.50 (546)	1.5 - 3.5 (38.1 - 88.9)	2 - ½ (NPT)
SM-5400	15 (381)	18 (5.5)	15 (381)	18.38 (467)	25.50 (648)	2.5-5 (63.5 - 127)	3 - ½ (NPT)

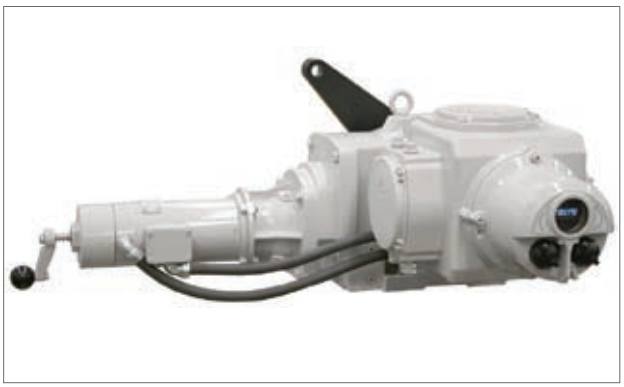
Model	Drive Arm Option	Adapter Kit Option	Driven Arm Option
SM-5100	D001	D003	D005
SM-5200	D007	D009	D011
SM-5300	D013	DO14	D015
SM-5400	D016	D017	D018

SM-6000 Series Rotary Actuators

General Description

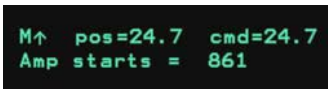
The SM-6000 Series are rotary actuators internally geared to produce up to 26,000 ft. lbs. (35,251 Nm) of torque at unrestricted, continuous modulating duty. The SM-6000 Series is ideally suited for dampers, vanes, valves and other process control applications requiring high speed, high torque and exact positioning control.

The SM-6000 Series actuator features an internally mounted digital amplifier which is easily programmed via non-intrusive switches and Vacuum fluorescent display mounted on the front of the unit.



Features

- Automatic torque limiting - protects actuator and driven equipment from damage due to overloads.
- Watertight enclosure for outdoor use.
- AC input power (single and three-phase).
- Anti-backdrive.
- Absolute encoder, contactless feedback.
- Operating temperature: -40 to +185 °F (-40 to +85 °C) Option for 225 °F (107 °C).
- Anti-condensation heater.
- NEMA 4 IP65.
- Easy to program keypad located on front panel
  - To setup unit
  - To change parameters.
- Easy to read Vacuum fluorescent display located on front panel



  - Readout to assist programming
  - Readout of position during operation
  - Brightly lit, is easy to read
  - Not temperature sensitive.
- Handcrank for manual operation when power is not available.
- Synthetic oil filled, built for extreme duty use.
- Adjustable speed.
- Opposite-side shaft extension.
- Full two year warranty.

Base Model Includes

- DC Motor.
- Manual override.
- Absolute encoder, contactless feedback.
- Increase and decrease front panel selector switches.
- Keyed output shaft.
- Anti-condensation heater.
- Painted NEMA 4 (IP65) enclosure.
- Absolute encoder feedback.
- End of travels limit switches.

Popular Options (See Pages 108-117).

- Drive arm, adapter/clevis kit, and driven arm linkage components.
- Additional position limit switches.
- Switches, relays.
- Extended temperature ranges to 225 °F (107 °C).
- Motor-up mounting for tight space applications.

SM-6000 Series Rotary Actuators

Electrical Specifications

- **Input Voltage:** 120/1/50-60 ±10%, 240/1/50-60 ±10%, 208/1/50-60 ±10%, 240/3/50-60 ±10% or 208/3/50-60 ±10% amplifier input power.
- **Operating Current:** 10A nominal at 120/1/60 input.
- **Servo Amplifier:** Digital amplifier, internally or remotely mounted with display and switches mounted on the actuator cover.
- **Electrical Enclosure:** Watertight for outdoor applications.
- **Feedback:** Contactless feedback is standard, potentiometer also available for higher temperatures.
- **Command Signal Input:** 4-20 mA, 0-5 VDC, 0-10 VDC through customer supplied shielded cable.
- **Terminal Wiring:** Screw type terminals accepting up to #14 AWG solid or stranded copper wire.
- **Position Transmitter:** 4-20 mA isolated, loop powered position transmitter. Requires external power supply. Transmitter ZERO and SPAN are automatically set to actuator ZERO and SPAN, no customer adjustment is required. Operates when power is available to the amplifier.
- **Duty Cycle:** Unrestricted modulating duty.
- **Torque Limiting:** Determined through motor current. Torque is limited to approximately 125-150% of actuator rating.
- **Reverse Acting:** ZERO and SPAN points can be set anywhere in actuator operating range.
- **Incremental Control:** Allows INC/DEC switch operation.
- **Loss of Command Signal:** Selectable Lock-in-place, or move to field setable preset position.

Mechanical Specifications

- **Output Torque & Speed:** Refer to selection chart.
- **Output Shaft:** Round with keyway, key supplied.
- **Maximum Travel:** 313 degrees. Greater travel is available as an option; consult factory.
- **Positioning Accuracy:** 0.10% of maximum travel.
- **Repeatability:** 0.10% of maximum travel.
- **Storage Temperature:** -40 to +185 °F (-40 to +85 °C)
- **Ambient Operating Temperature:** -40 to +185 °F (-40 ° to 85 °C) with integral electronics.Remote mounted electronics allow the actuator to operate in ambient temperatures to 225 °F (107 °C).
- **Lubrication:** Synthetic extreme duty industrial oil.
- **Mounting Position:** Base foot mounted only. An optional motor-up mounting is available, consult factory.
- **Conduit Openings:** Four ½ inch conduit openings are provided in the enclosure for customer use.
- **PC Board:** Modular PC board set is easily field replaced for service or upgrades.
- **Handwheel:** A handwheel is provided at rear of motor for manual operation.
- **Loss of Power:** Self locking, up to 150% of load.

SM-6000 Series Selection Chart

SM-6000								
1	Basic Model	SM-6003	SM-6005	SM-6008	SM-6014	SM-6025	Note Ref.	Selection
2	Speed, sec. (a) / Torque ft. lbs. (Nm)	10/370 (502)	10/550 (746)	10/800 (1085)	10/1400 (1898)	10/2500 (3389)		
3	Input Voltage	1:	120 VAC, 1-Phase, 60 Hz					
		2:	240 VAC, 1-Phase, 50/60 Hz					
		3:	380 VAC, 3-Phase, 50/60 Hz					
		4:	480 VAC, 3-Phase, 50/60 Hz					
		5:	240 VAC, 3-Phase, 50/60 Hz					
		9:	208 VAC, 1-Phase, 50/60 Hz					
		10:	208 VAC, 3-Phase, 50/60 Hz					
		19:	220 VAC, 1-Phase, 50 Hz					
4	Amplifier	D	with built in digital amplifier					
5	Rotation	Specify required output shaft rotation in degrees. Must be between 25° and 120°						
6	Output Shaft	L:	Left Hand					
		R:	Right Hand					
		V:	Vertical					

(a) Speeds are for 90° of rotation.

SM-6000								
1	Basic Model	SM-6044	SM-6062	SM-6080	SM-6110	SM-6165	SM-6260	Note Ref.	Selection
2	Speed, sec. (a) / Torque ft. lbs. (Nm)	10/4400 (5965)	10/6200 (8406)	12/8000 (10846)	18/11,000 (14914)	26/16,500 (22371)	42/26,000 (35251)		
3	Input Voltage	1:	Not available for 120 Vac input voltage						
		2:	240 VAC, 1-Phase, 50/60 Hz						
		3:	380 VAC, 3-Phase, 50/60 Hz						
		4:	480 VAC, 3-Phase, 50/60 Hz						
		5:	240 VAC, 3-Phase, 50/60 Hz						
		9:	208 VAC, 1-Phase, 50/60 Hz						
		10:	208 VAC, 3-Phase, 50/60 Hz						
		19:	220 VAC, 1-Phase, 50 Hz						
4	Amplifier	D	with built in digital amplifier						
5	Rotation	Specify required output shaft rotation in degrees. Must be between 25° and 120°							
6	Output Shaft	L:	Left Hand						
		R:	Right Hand						
		V:	Vertical						

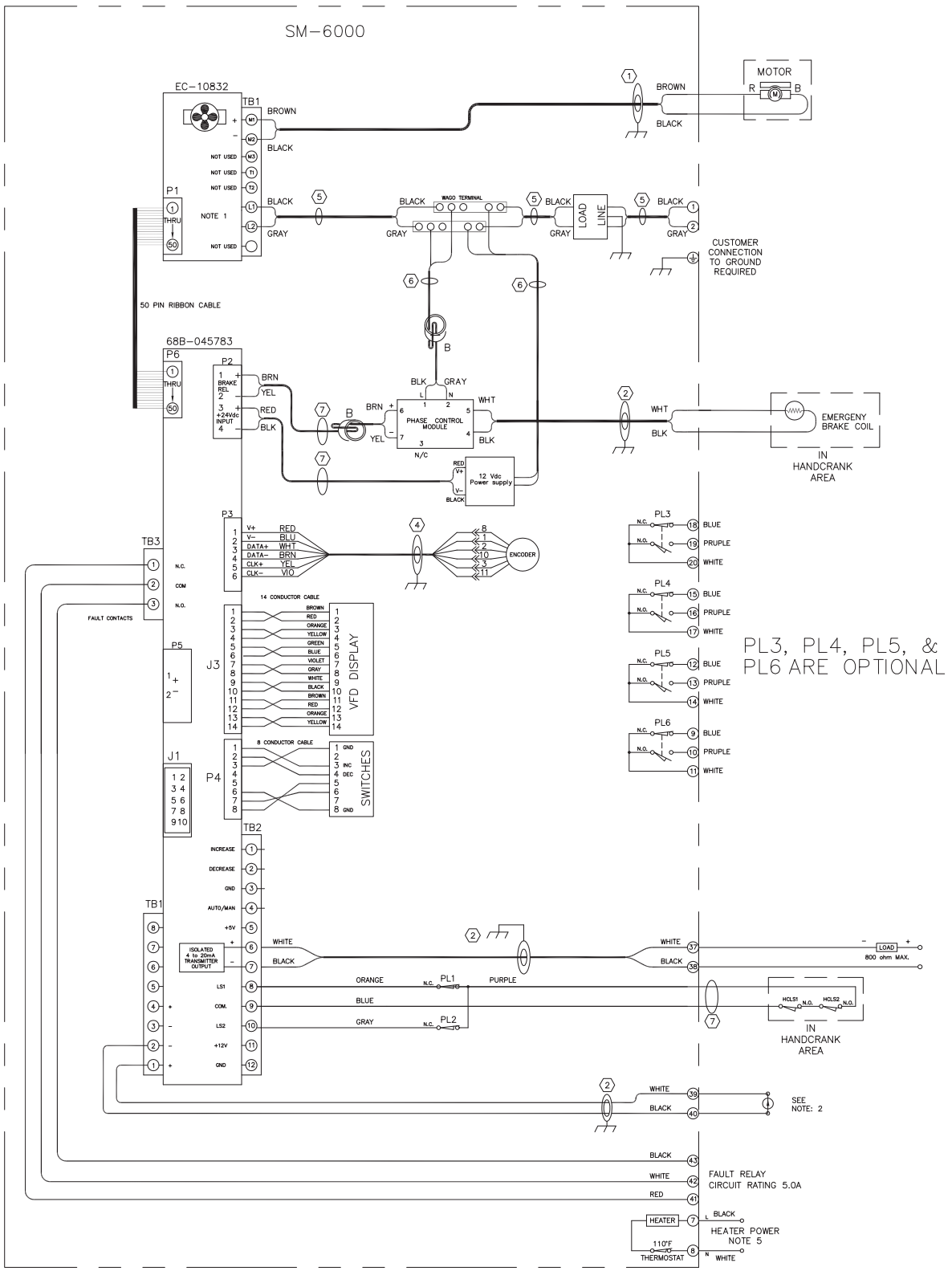
(a) Speeds are for 90° of rotation.

SM-6000 Standard Options

Code	Description	Selection	
	Toggles, Lights		
A005	Two Pilot Lights - NEMA 4		
A012	ON/OFF Rotary Power Switch - NEMA 4		
A016	Fault Indicator Light		
A017	Power Indicator Light		
A018	Auto/Manual Indicator Light		
	Connectors		
C001	Plug-In Cannon Type Connector on Enclosure for Power and Control		
C002	Mating Plug-In Cannon Type Connector on Enclosure for Power and C ontrol		
	Drive Arm/Adapter Clevis/Driven Arm		
D059	Keyed drive arm for 370 ft. lb. unit		
D060	Keyed drive arm for 800 ft. lb. unit		
D061	Keyed drive arm for 1400 ft. lb. unit		
D062	Keyed drive arm for 2500 ft. lb. unit		
D063	Keyed drive arm for 4400 ft. lb. unit		
D064	Keyed drive arm for 6200 ft. lb. unit		
D065	Keyed drive arm for 8000 & 11000 ft. lb. unit		
D066	Keyed drive arm for 16500 ft. lb. unit		
D067	Keyed drive arm for 26000 ft. lb. unit		
D068	Adapter assembly kit for 370 ft. lb. unit		
D069	Adapter assembly kit for 800 & 1400 ft. lb. unit		
D070	Adapter assembly kit for 2500 & 4400 ft. lb. unit		
D071	Adapter assembly kit for 6200, 8000, 11000 & 16500 ft. lb. unit		
D072	Adapter assembly kit for 26000 ft. lb. unit		
D073	Driven arm for 370 ft. lb. unit		
D074	Driven arm for 800 & 1400 ft. lb. unit		
D075	Driven arm for 2500 & 4400 ft. lb. unit		
D076	Driven arm for 6200, 8000, 11000 & 16500 ft. lb. unit		
D077	Driven arm for 26000 ft. lb. unit		
D078	Pedestal replacement & drive arm to replace SM-5100		
D079	Pedestal replacement & drive arm to replace SM-5200		
D080	Pedestal replacement & drive arm to replace SM-5300		
D081	Pedestal replacement & drive arm to replace SM-5400		
D082	Pedestal replacement & drive arm to replace Hagan Bailey		
D083	Adjustable length drive arm for 370 ft. lb. unit		
D084	Adjustable length drive arm for 800 ft. lb. unit		
D085	Adapter clevis kit for 370 ft. lb. unit (Used with D083)		
D086	Adapter clevis kit for 800 ft. lb. unit (Used with D084)		
D124	Adjustable length drive arm for 550 ft. lb. unit		
D125	Adapter clevis kit for 550 ft. lb. unit (Used with D124)		
D126	Driven arm for 550 ft. lb. unit		

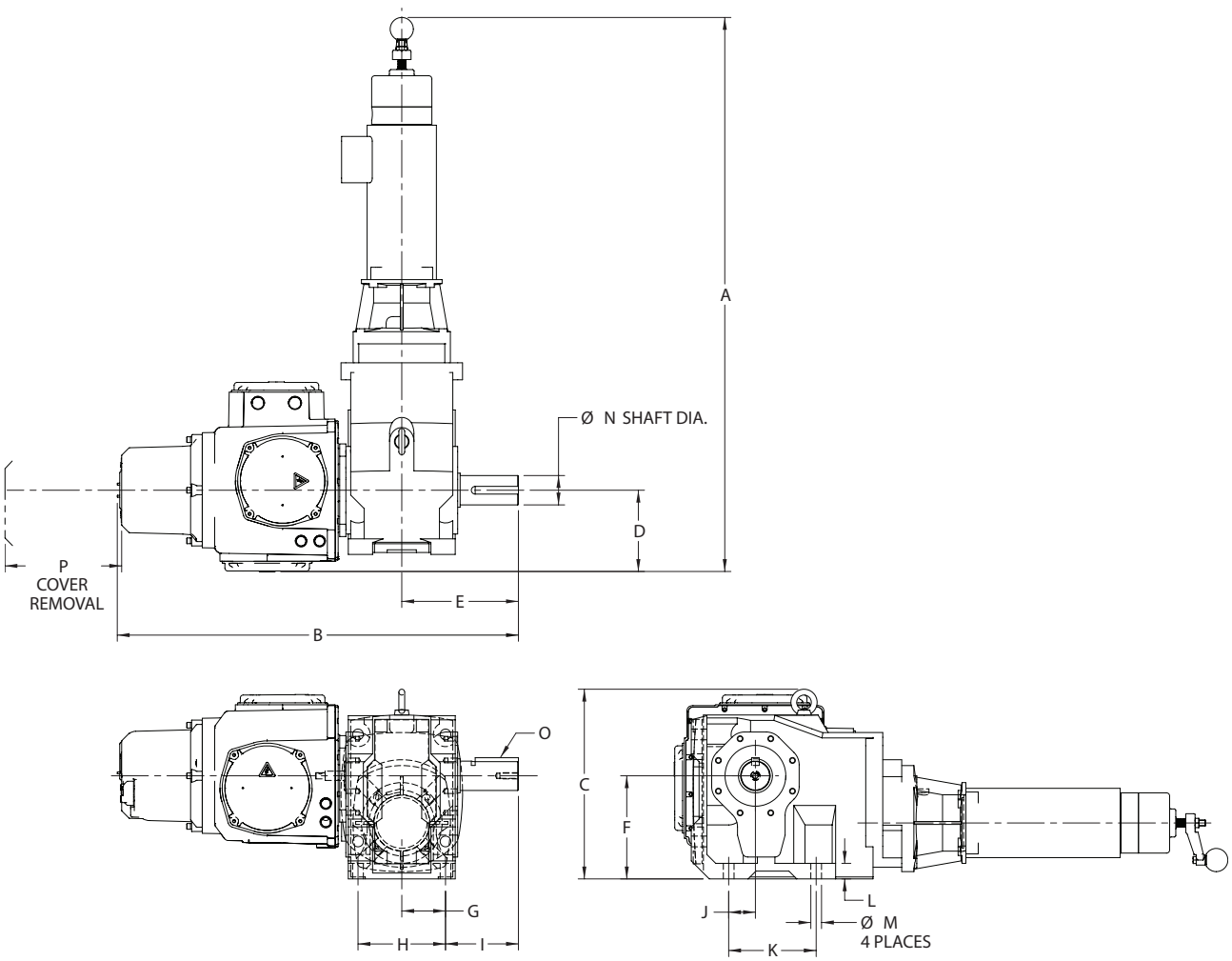
For a full description of options, go to the Complete Listing of Options starting on page 109.

SM-6000 Typical Wiring Diagram



These dimensions and specifications are subject to change without notice. Current drawings and specifications are available upon request.

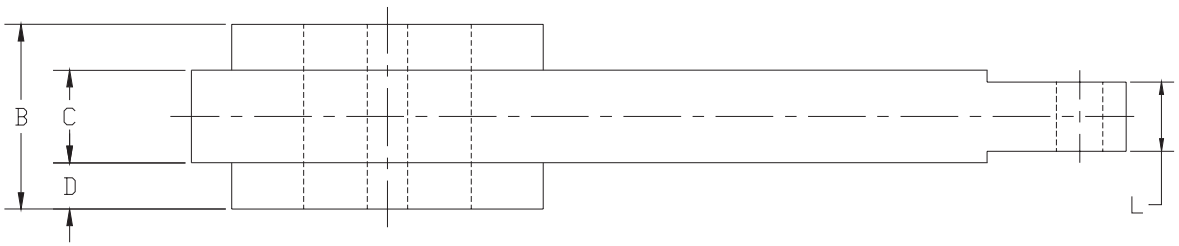
SM-6000 Major Dimensions

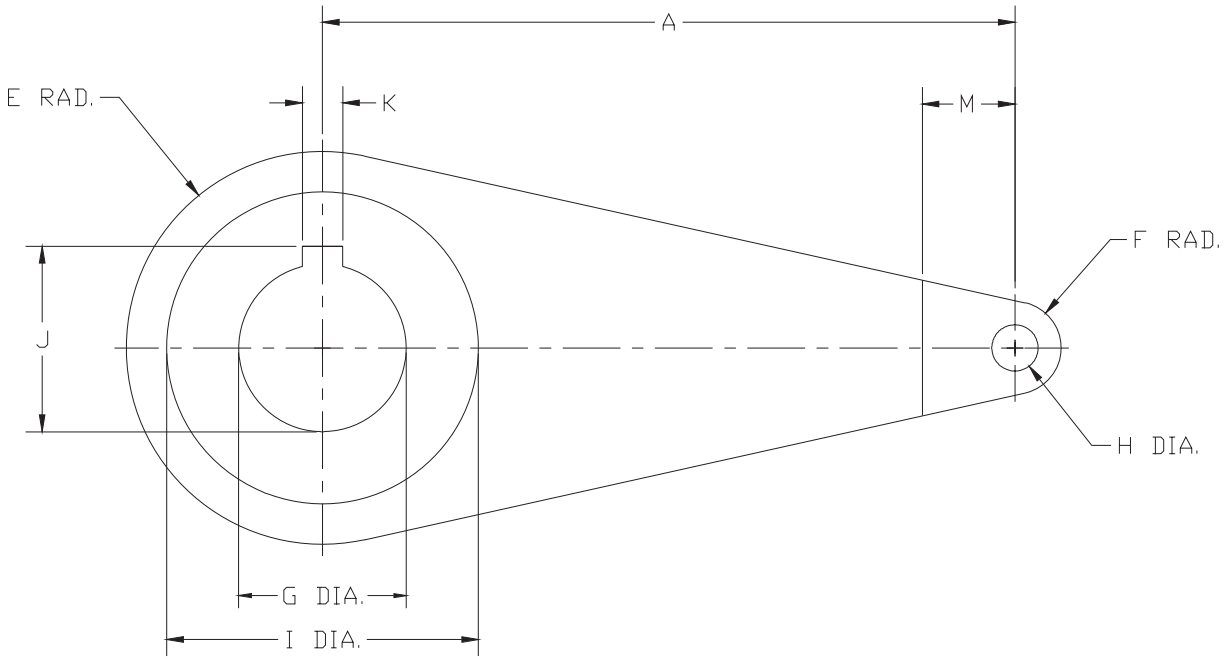


Speed/ Torque	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	Key
10/370	13.16	34.84	9.02	4.4	1.46	5.12	.63	1.42	5.12	2.80	2.36	2.80	4.72	5.32	11.21	1.14	.43	1.36	1.250/1.24	.25 x .25 x 1.63 LG.
10/800	14.26	36.85	10.61	5.51	1.97	5.12	.95	2.76	4.72	3.94	2.76	3.39	5.51	6.34	11.80	.19	.55	1.51	1.375/1.374	.31 x .31 x 2.13 LG.
10/1400	15.82	38.09	12.99	7.09	2.56	7.48	.99	2.94	5.91	4.41	3.25	3.94	6.50	7.72	12.35	—	.71	1.92	1.750/1.749	.38 x .38 x 2.50 LG.
10/2500	17.10	45.74	15.35	8.35	3.03	8.66	1.26	3.03	7.09	5.20	3.54	4.53	7.09	9.45	12.94	—	.88	2.65	2.375/2.374	.63 x .63 x 4.00 LG.
10/4400	19.18	53.21	18.78	10.43	3.335	11.02	1.50	3.35	9.45	6.30	4.73	5.71	9.45	11.46	14.12	2.70	1.02	3.20	2.875/2.874	.75 x .75 x 4.50 LG.
10/6200	21.80	63.37	21.97	12.40	4.13	12.20	1.65	4.13	11.02	7.87	5.32	6.69	10.63	13.66	15.10	—	1.30	4.01	3.625/3.624	.88 x .88 x 5.50 LG.
12/8000	23.50	70.88	27.91	14.76	4.33	15.75	1.77	4.33	13.78	8.86	6.46	7.87	12.99	16.46	16.28	—	1.54	4.82	4.375/4.374	1.00 x 1.00 x 7.25 LG.
18/11000	23.50	70.88	27.91	14.76	4.33	15.75	1.77	4.33	13.78	8.86	6.46	7.87	12.99	16.46	16.28	—	1.54	4.82	4.375/4.374	1.00 x 1.00 x 7.25 LG.
26/16500	26.47	73.44	32.46	17.72	4.72	18.90	1.97	4.33	14.96	9.84	8.27	9.37	16.54	17.99	17.78	—	1.54	5.30	4.750/4.749	1.25 x 1.25 x 7.25 LG.
42/26000	28.44	80.41	36.60	19.69	4.53	21.25	1.97	4.53	21.25	12.40	9.45	11.61	18.90	21.85	20.02	—	1.30	6.05	5.500/5.499	1.25 x 1.25 x 8.38 LG.

These dimensions are subject to change without notice and should not be used for preparation of drawings or fabrication of installation mounting. For current installation manuals and other product information, see www.rotork.com.

SM-6000 Drive Arm Dimensions





Speed/Torque	A	B	C	D	E	F	G	H	I	J	K	L	M
10/370	10.00	1.00	–	–	1.08	.75	1.25	.75	–	1.39	.25	1.00	–
10/800	10.00	1.50	–	–	1.50	1.00	1.38	1.00	–	1.54	.31	1.50	–
10/1400	10.00	1.50	–	–	1.50	1.00	1.75	1.00	–	1.95	.38	1.50	–
10/2500	12.00	2.50	1.50	.50	2.63	1.00	2.38	1.00	4.50	2.68	.63	1.50	–
10/4400	12.00	2.50	1.50	.50	2.63	1.00	2.88	1.00	4.50	3.23	.75	1.50	–
10/6200	15.00	4.00	2.00	1.00	4.25	1.00	3.63	1.00	6.75	4.04	.88	1.50	2.00
12/8000 & 18/11,000	15.00	4.00	2.00	1.00	4.25	1.00	4.38	1.00	6.75	4.85	1.00	1.50	2.00
26/16,500	15.00	4.00	2.00	1.00	4.25	1.00	4.75	1.00	6.75	5.33	1.25	1.50	2.00
42/26,000	18.00	5.00	2.00	1.50	4.63	1.50	5.50	1.25	7.75	6.08	1.25	2.00	–

These dimensions are subject to change without notice and should not be used for preparation of drawings or fabrication of installation mounting. For current installation manuals and other product information, see www.rotork.com.

Complete Listing of Options

Toggles, Lights

A001 Local Auto/Manual Toggle Switch - NEMA 4. Switch for Auto (i.e. 4-20 mA from control room), or Manual (local control at actuator). Switch is maintain type.

A002 INCREASE/OFF/DECREASE Toggle Switch - NEMA 4. Momentary toggle type switch for local control of actuator.

A003 Local Auto/Manual Toggle Switch & INCREASE/OFF/DECREASE Toggle Switch - NEMA 4. (A001 & A002) (See photos for A001 & A002)

A004 Open-Close-Stop Push Buttons - NEMA 4. Three pushbutton control. Open & Close momentary type pushbutton with maintain type Stop button (pull to release)

A005 Two Pilot Lights - NEMA 4. Used for indication of ends of travel or intermediate position.

A006 Two Position Selector Switch, NEMA 4 (Auto/Manual) Switch for Auto (i.e. 4-20 mA from control room), or Manual (local control at actuator). Switch is maintain type. Toggles, Lights.

A007 INCREASE/OFF/DECREASE Three Position Selector Switch. NEMA 4 momentary type switch for local control of actuator.

A008 Local Auto/Manual, INCREASE/ OFF/DECREASE (Close Coupled Enclosure). Option A003 mounted in a NEMA 4 enclosure.

A009 ON/OFF Toggle Power Switch - NEMA 4. Removes main power to the actuator for single-phase input.

A010 Local Auto/Manual Switch & (INCREASE/OFF/DECREASE) Switch - NEMA 4 (See photos A006 & A007)

A011 Key lock for rotary switches - NEMA 4 (Auto/Manual). Manual operation only after unlocked.

A012 ON/OFF NEMA 4 Toggle Power Switch. Removes main power to the actuator for single-phase input.

A013 Local Auto/Manual (Close Coupled Enclosure) Option A001 mounted in a NEMA 4 enclosure.

A014 INCREASE/OFF/DECREASE (Close Coupled Enclosure) Option A002 mounted in a NEMA 4 enclosure.

A015 ON/OFF Toggle Switch (Power) (Close Coupled Enclosure) Option A009 mounted in a NEMA 4 enclosure.

A016 Fault Indicator Light (SM-6000 Series)

A017 Power Indicator Light (SM-6000 Series)

A018 Auto/Manual Indicator Light (SM-6000 Series)

A031 Auto/Manual Switches (JOM2-N, JOM3-N), 1 Ph.

A032 Auto/Manual Switches (JOM4-N, JOM5-N, JOM6-N), 1 Ph.

A033 Auto/Manual Switches (JOM7-N, JOM8-N), 1 Ph.

A034 Auto/Manual Switches (JOM2-N, JOM3-N), 3 Ph.

A035 Auto/Manual Switches (JOM4-N, JOM5-N, JOM6-N), 3 Ph.

A036 Auto/Manual Switches (JOM7-N, JOM8-N), 3 Ph.

Brakes

B001 120 VAC Electrically Operated Brake. Electronically released brake, HOLDS when there is no power to HOLD a load, or to minimize coasting of the actuator. (Used on units with a high RPM rating). See drawing on page 186.

B002 240 VAC Electrically Operated Brake. Electronically released brake, HOLDS when there is no power to HOLD a load, or to minimize coasting of the actuator. (Used on units with a high RPM rating). See drawing on page 186.

B003 Drag Brake (will decrease torque rating, contact factory for rating). Mechanical drag brake mounted on motor shaft to minimize coasting and to HOLD a load. (Used on units with a high RPM rating).

B004 Drag Brake (800 lbs. maximum thrust). Mechanical drag brake mounted on motor shaft to minimize coasting.

Connectors

C001 Quick disconnect NEMA 4 connector on enclosure for power and control.

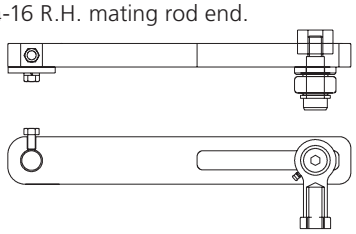
C002 Mating quick disconnect NEMA 4 connector on enclosure for power and control. (For use with C001).

Options

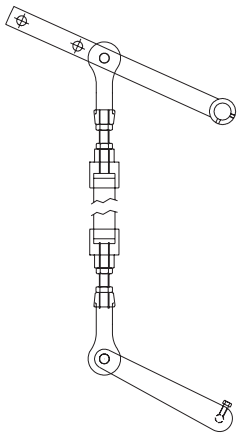
Drive Arm/Adapter Clevis/Driven Arm

D001 Fixed (10") drive arm for splined shaft of SM-1700 and SM-5100. Pinhole diameter of 0.75 in. and thickness of 1.0 in.

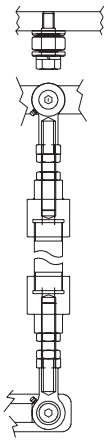
D002 Adjustable drive arm for splined shaft of SM-1700 and SM-5100. Adjustable range of 6 in. - 10 in., with a ¾-16 R.H. mating rod end.



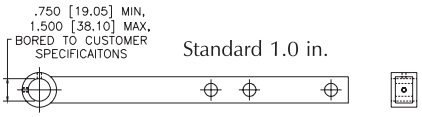
D003 Adapter clevis kit used with D001 & D005 for splined shaft of SM-1700 and SM-5100. Female clevis ends with a pinhole diameter of 0.75 in. and width of 1.0 in.



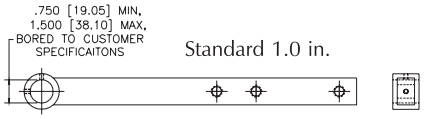
D004 Adapter clevis kit used with D002 & D006 for splined shaft of SM-1700 and SM-5100. Threaded ends of ¾-16 to meet with rod ends.



D005 Driven arm used with D001 and D003. 1.0 in. width driven arm with 1.0 in. diameter pin holes at 10, 12.25 and 17. End bored to 1.0 in. for damper shaft.



D006 Driven arm used with D002 and D004. 1.0 in. width driven arm with 5/8-11 in. taps at 10, 12.25 and 17 in. End bored to 1.0 in. for damper shaft.



D007 Fixed (10") drive arm for splined shaft of SM-5200. Pinhole diameter of 1.0 in. and thickness of 1.50 in. See drawing for D001.

D008 Adjustable drive arm for splined shaft of SM-5200. Adjustable range of 6 in. - 10 in., with a 1¼-12 R.H. mating rod end. See drawing for D002.

D009 Adapter clevis kit used withD007 and D011 for splined shaft of SM-5200. Female clevis ends with a pinhole diameter of 1.0 in. and width of 1.50 in. See drawing for D003.

D010 Adapter clevis kit used withD008 and D012 for splined shaft of SM-5200. Threaded ends of 1¼-16 to meet with rod ends. See drawing for D004.

D011 Driven arm used with D007 and D009. 1.50 in. width driven arm with 1.0 in. diameter pin holes at 10, 12.25 and 17 in. End bored to 0.25 pilot for damper shaft. See drawing for D005.

D012 Driven arm used with D008 and D010. 1.5 in. width driven arm with ¾-10 taps at 10, 12.25 and 17 in. End bored to 0.25 pilot for damper shaft. See drawing for D006.

D013 Fixed (12") drive arm for splined shaft of SM-5300. Pinhole diameter of 1.0 in. and thickness of 1.50 in. See drawing for D001.

D014 Adapter clevis kit used with D013 and D015 for splined shaft of SM-5300. Female clevis ends with a pinhole diameter of 1.0 in. and width of 1.50 in. See drawing for D003.

D015 Driven arm used with D013 and D014. 1.50 in. width driven arm with 1.0 in. diameter pin holes at 12, 14.7 and 20.4 in. End bored to 1.938/1.940 in. for damper shaft. See drawing for D005.

Options

Drive Arm/Adapter Clevis/Driven Arm

D016 Fixed (15") drive arm for splined shaft of SM-5400. Pinhole diameter of 1.0 in. and thickness of 1.50 in. See drawing for D001.

D017 Adapter clevis kit used with D016 and D018 for splined shaft of SM-5400. Female clevis ends with a pinhole diameter of 1.0 in. and width of 1.50 in. See drawing for D003.

D018 Driven arm used with D016 and D017. 1.50 in. width driven arm with 1.0 in. diameter pin holes at 15, 18.38 and 25.5. End bored to 0.25 pilot for damper shaft. See drawing for D005.

D019 Hagan Bailey Pneumatic Replacement (Pedestal Drive Arm) for SM-1700. Retrofit pedestal and drive arm to match Hagan and Bailey pneumatic drives up to 200 ft. lbs. of torque. Allows use of existing linkage and mounting. See D022 photo.

D020 Hagan Bailey Pneumatic Replacement (Pedestal Drive Arm) for SM-5100. Same as D019, but up to 300 ft. lbs. of torque. See D022 photo.

D021 Hagan and Bailey Pneumatic Replacement (Pedestal Drive Arm) for SM-5200. Same as D019, but up to 1,000 ft. lbs. of torque. See D022 photo.

D022 Hagan and Bailey Pneumatic Replacement (Pedestal Drive Arm) for SM-5300. Same as D019, but up to 3,200 ft. lbs. of torque.

D023 Hagan and Bailey Pneumatic Replacement (Pedestal Drive Arm) for SM-5400. Same as D019, but up to 12,500 ft.lbs. of torque. See photo for D022.

D024 Wedgelock Coupling for the SM-1700. Three piece coupling that allows adjustment of actuator and valve/ damper without removal of either from the mounting bracket.

D025 Wedgelock Coupling for SM-5100. See description and photo of D024.

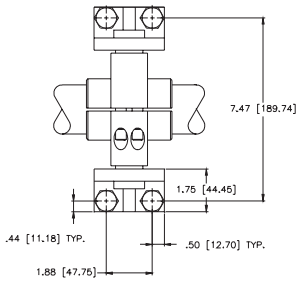
D026 Wedgelock Coupling for SM-5200. See description and photo of D024.

D027 Wedgelock Coupling for SM-5300. See description and photo of D024.

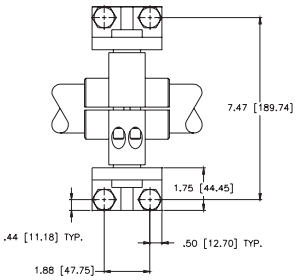
D028 Wedgelock Coupling for SM-5400. See description and photo of D024.

D029 PT-1300 Mounting Kit. Universal mounting kit for sliding stem valves.

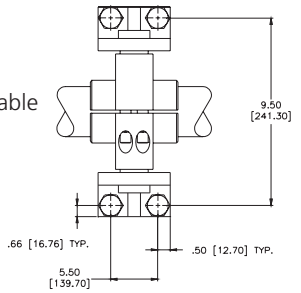
D030 Trunnion Mount for LA-2300. Allows actuator to be foot mounted. (Not available for 6 in. stroke).



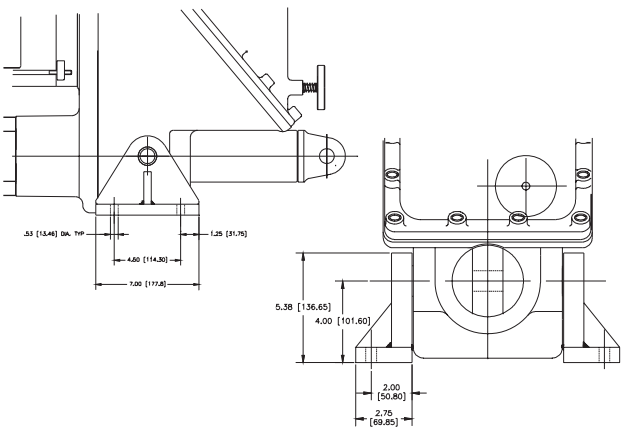
D031 Trunnion Mount for LA-2400. Allows actuator to be foot mounted. (Not available for 6 in. stroke).



D032 Trunnion Mount for LA-2500. Allows actuator to be foot mounted. (Not available for 6 in. stroke).



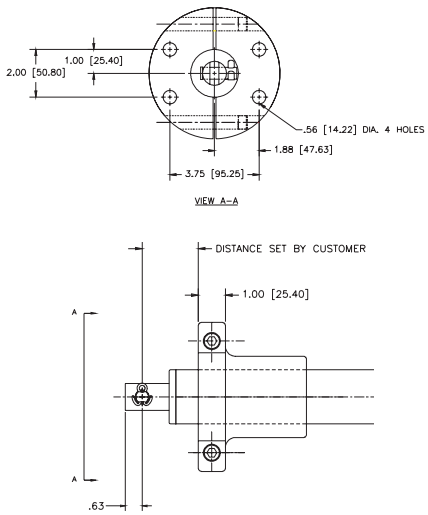
D033 Trunnion Mount for LA-2600. Allows actuator to be foot mounted. (Available up to 3,600 lbf).



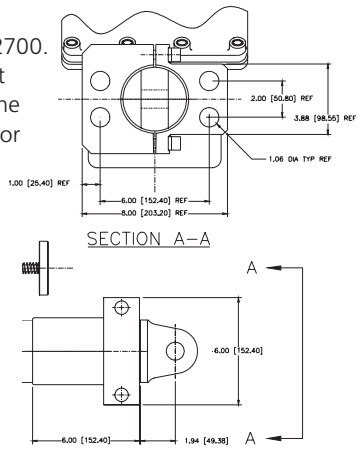
Options

Drive Arm/Adapter Clevis/Driven Arm

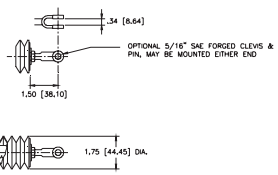
D034 Flange Mount for LA-2300. Mounting bracket which clamps to the tube of the actuator with a four bolt mounting face. (Not available for 6 in. stroke).



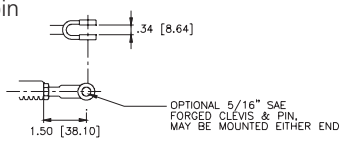
D035 Flange Mount for LA-2600 and LA-2700. Mounting bracket which clamps to the tube of the actuator with a four bolt mounting face.



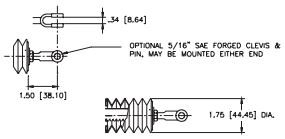
D036 Rack Bellows for LF-1210. Boot that protects the rack from dirt and moisture.



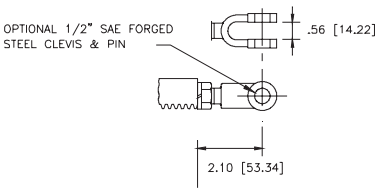
D037 Female clevis with pin for LA-1100.



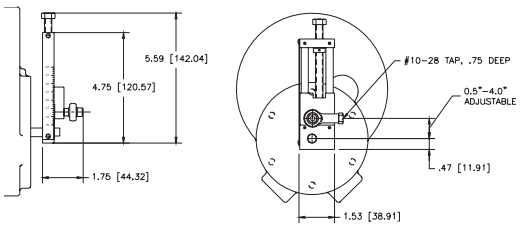
D038 Rack Bellows for LA-1500. Boot that protects the rack from dirt and moisture.



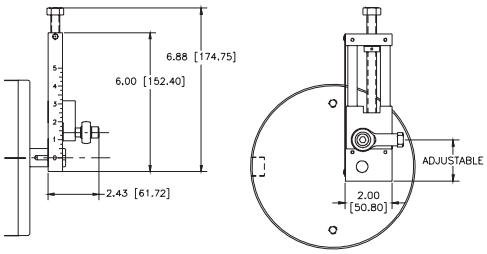
D039 Female clevis with pin for LA-1500.



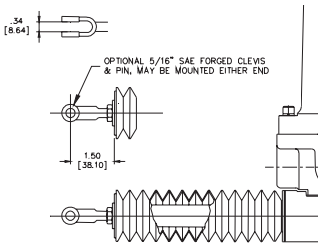
D040 Adjustable Drive Arm for TA-1200. Adjustable range of 0.5 in. to 4.0 in., with a #10- 28 tap, 0.75 deep.



D041 Adjustable Drive Arm for SM-1500. Adjustable range of 0.5 in. to 4.0 in., with a #10- 28 tap, 0.75 deep.



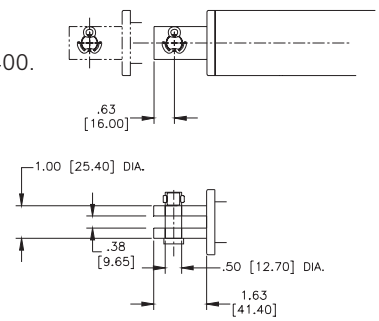
D042 Clevis, one end for LA-1000 & LA-1100.



D043 Clevis, both ends for LA-1000 & LA-1100.

D044 Flange Mount for LA-2400. Mounting bracket which clamps to the tube of the actuator with a four bolt mounting face. (Not available for 6 in. stroke). See drawing for D034.

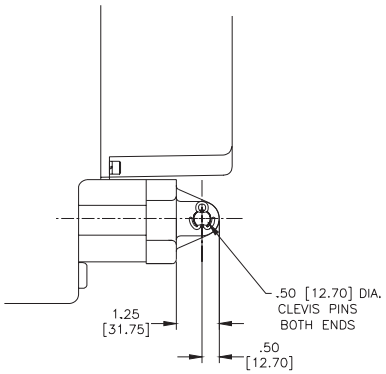
D045 Female front clevis for LA-2400.



Options

Drive Arm/Adapter Clevis/Driven Arm

D046 Female rear clevis for LA-2400.



D047 Special front clevis for LA-2300 & LA-2400 (consult factory, customer must provide dimensions).

D048 Special rear clevis for LA-2300 & LA-2400 (consult factory, customer must provide dimensions).

D049 Special front clevis for LA-2500 (consult factory, customer must provide dimensions).

D050 Special rear clevis for LA-2500 (consult factory, customer must provide dimensions).

D051 Special front clevis for LA-2600 & LA-2700 (consult factory, customer must provide dimensions).

D052 Special rear clevis for LA-2600 & LA-2700 (consult factory, customer must provide dimensions).

D053 Special front clevis for LA-2900 (consult factory, customer must provide dimensions).

D054 Special rear clevis for LA-2900 (consult factory, customer must provide dimensions).

D055 Bellows for Linear Actuators (LA-2400/2500). Protects against dust and moisture when ram extends up.

D056 Vertical Moisture Shield (LA- 2300/2400). Protects against rain when ram extends up.

D057 Adjustable drive arm for 1/2 inch output shaft of TA-1200. Used with R008.

D058 Rotating clevis for LA-2400

D059 Keyed drive arm for 370 ft. lb. SM-6000. See drawing on page 53.

D060 Keyed drive arm for 800 ft. lb. SM-6000. See drawing on page 53.

D061 Keyed drive arm for 1400 ft. lb. SM-6000. See drawing on page 53.

D062 Keyed drive arm for 2500 ft. lb. SM-6000. See drawing on page 53.

D063 Keyed drive arm for 4400 ft. lb. SM-6000. See drawing on page 53.

D064 Keyed drive arm for 6200 ft. lb. SM-6000. See drawing on page 53.

D065 Keyed drive arm for 8000 & 11000 ft. lb. SM-6000. See drawing on page 53.

D066 Keyed drive arm for 16500 ft. lb. SM-6000. See drawing on page 53.

D067 Keyed drive arm for 26000 ft. lb. SM-6000. See drawing on page 53.

D068 Adapter assembly kit for 370 ft. lb. SM-6000.

D069 Adapter assembly kit for 800 & 1400 ft. lb. SM-6000.

D070 Adapter assembly kit for 2500 & 4400 ft. lb. SM-6000.

D071 Adapter assembly kit for 6200, 8000, 11000 & 16500 ft. lb. SM-6000.

D072 Adapter assembly kit for 26000 ft. lb. SM-6000.

D073 Driven arm for 370 ft. lb. SM-6000.

D074 Driven arm for 800 & 1400 ft. lb. SM-6000.

D075 Driven arm for 2500 & 4400 ft. lb. SM-6000.

D076 Driven arm for 6200, 8000, 11000 & 16500 ft. lb. SM-6000.

D077 Driven arm for 26000 ft. lb. SM-6000.

D078 Pedestal replacement & drive arm to replace SM-5100

D079 Pedestal replacement & drive arm to replace SM-5200

D080 Pedestal replacement & drive arm to replace SM-5300

D081 Pedestal replacement & drive arm to replace SM-5400.

D082 Pedestal replacement & drive arm to replace Hagan Bailey.

D083 Adjustable length drive arm for 370 ft. lb. SM-6000.

D084 Adjustable length drive arm for 800 ft. lb. SM-6000.

D085 Adapter clevis kit for 370 ft. lb. SM-6000 (Used with D083).

D086 Adapter clevis kit for 800 ft. lb. SM-6000 (Used with D084).

D124 Adjustable length drive arm for 550 ft. lb. SM-6000

D125 Adapter clevis kit for 550 ft. lb. SM-6000 (Used with D124).

D126 Driven arm for 550 ft. lb. SM-6000.

Options

Enclosure

E001 Watertight, NEMA 4 (IP65).

E002 NEMA 12 (IP52).

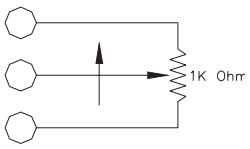
E003 Explosion Proof - Class 1, Div. 1, Groups C & D, indoor/outdoor (NEMA 7).

E004 Dust-Ignition Proof - Class II, Div. 1, Groups E, F & G, indoor/outdoor (NEMA 9).

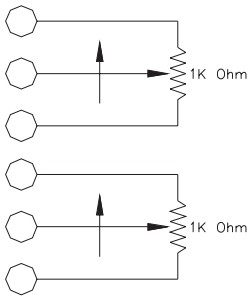
E005 Group B enclosure for use in Hydrogen atmosphere (AC input only).

Position Feedback

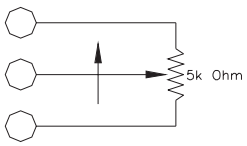
F001 1000 ohm, wire wound potentiometer.



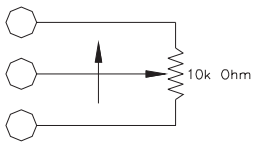
F002 Tandem Potentiometer, 1000 ohms each, wire wound, (not available for units with internal amplifiers).



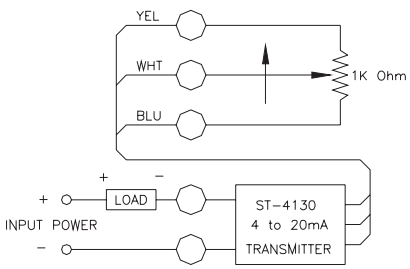
F003 5,000 ohm, wire wound potentiometer, (not avail. for units with internal amplifiers). F004 10,000 ohm, wire wound potentiometer, (not available for units with internal amplifiers).



F004 10,000 ohm, wire wound potentiometer, (not available for units with internal amplifiers).



F005 Transmitter, 4-20 mA output.



F006 One Potentiometer, 1000 ohms plus 4-20 mA Transmitter (not available for units with internal amplifiers).

F007 Hall Effect Contactless 4-20 mA Feedback.

F008 Contactless 4-20 mA.

F009 Contactless 0-10 VDC.

F010 Anti Backlash Feedback Gearing (Single Turn).

F011 Anti Backlash Feedback Gearing (Multi Turn).

F012 Tandem Potentiometers, 5000 ohms (not available for units with internal amplifiers). See drawing for F002.

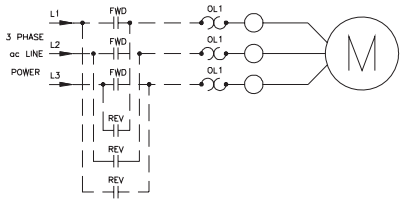
F013 Tandem Potentiometers, 10,000 ohms (not avail. for units with internal amplifiers). See drawing for F002.

F014 Absolute Encoder Contactless Feedback.

F036 4-20 mA output transmitter.

3-Phase Controls

G001 3-Phase Contactor with Overloads.

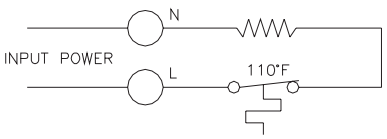


G002 120 VAC Control Transformer.

G003 240 VAC Control Transformer.

Heater

H001 Anti-Condensation Heater (24 VDC).



H002 Anti-Condensation Heater (120 VAC). See drawing for H001.

H003 Anti-Condensation Heater (240 VAC). See drawing for H001.

Options

Identification/Certifications

J001 CE Marking (AC input only).

J002 Stainless Steel Tags.

J003 FM approved (Factory Mutual).

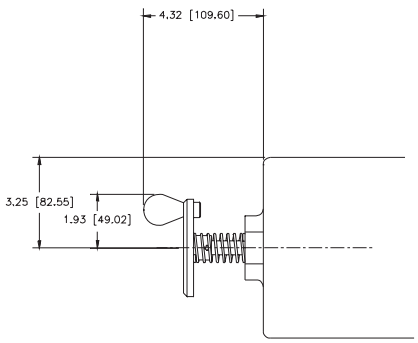
J004 One year extended warranty.

J005 Two year extended warranty.

J006 ATEX Approval.

Handcrank

K001 Manual Handcrank for SM-1500/1600 Series.



Valve Mounting

L001 Mounting of actuator to valve by customer Compatible hardware supplied by Rotork Process Controls per customer specifications. Complete, certified valve drawings showing topworks detail must be submitted with order.

L002 Valve provided by customer for mounting and set-up with actuator by Rotork Process Controls.

L004 No regulato.

L005 Rotate unit 180 degrees CW viewing actuator from top so conduit entry is 174 degrees from current.

Motor

M001 575 Motor - 3-Phase, for SM-5000 and LA-5000 Series actuators.

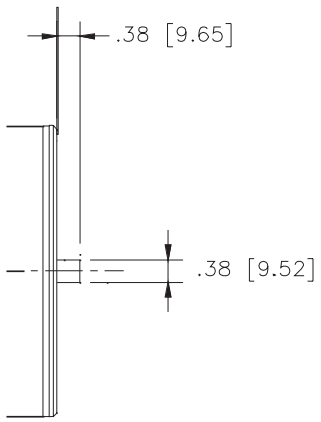
Position Indicator

P001 Local Position Indicator.

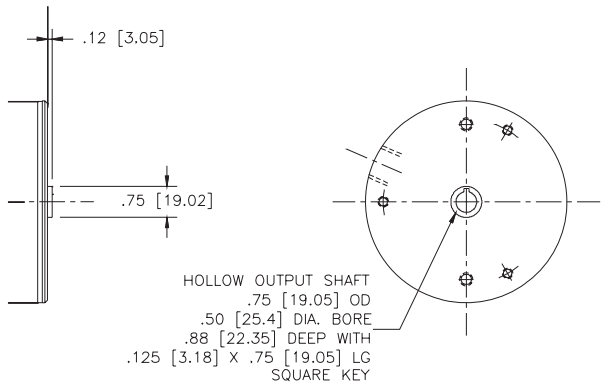
Options

Shafts

R001 3/8" Lg Shaft for SM-1100.

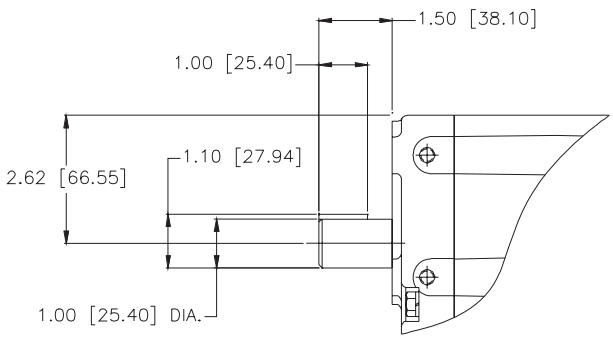


R002 Hollow Shaft for SM-1100.

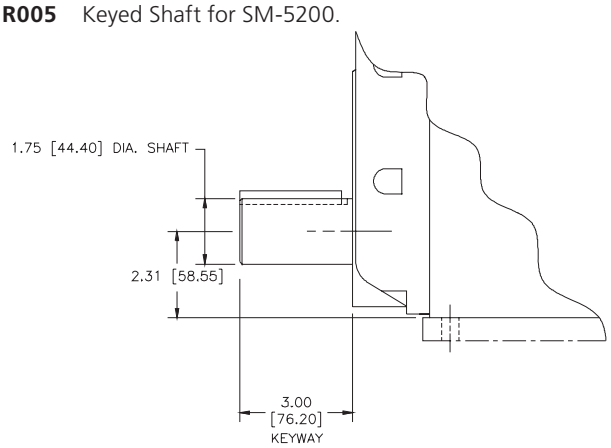


R003 Hollow Shaft for SM-1500.

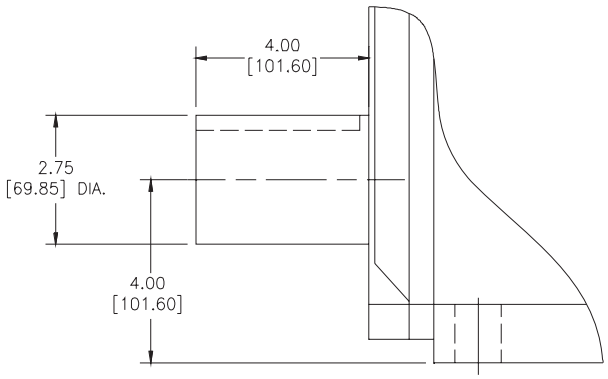
R004 Keyed Shaft for SM-1700 & SM-5100.



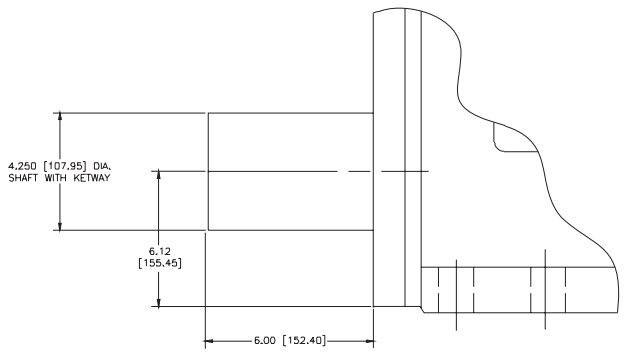
R005 Keyed Shaft for SM-5200.



R006 Keyed Shaft for SM-5300.



R007 Keyed Shaft for SM-5400.

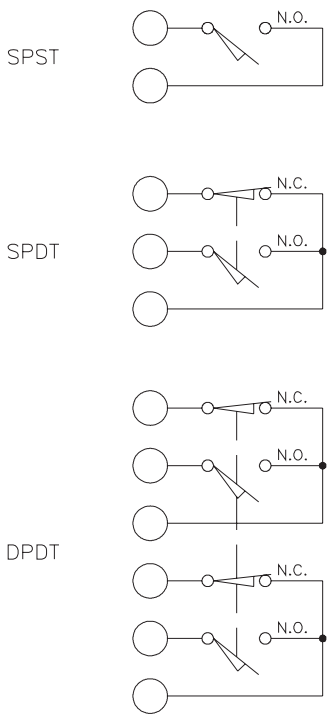


R008 1/2 inch Output Shaft for TA-1200 with woodruf key.

These dimensions are subject to change without notice and should not be used for preparation of drawings or fabrication of installation mounting. For current installation manuals and other product information, see www.rotork.com

Options

Auxiliary Position Switches



S001 Two Adjustable Position Switches, SPDT, 20 Amp.

S002 Two Adjustable Position Switches, DPDT, 20 Amp.

S003 Four Adjustable Position Switches, SPDT, 20 Amp.

S004 Four Adjustable Position Switches, DPDT, 20 Amp.

S005 Aluminum Cam.

S006 Aluminum Feedback Frame.

S007 Aluminum Feedback Frame.

S009 Two Adjustable Position Switches, SPDT, 10 Amp.

S010 Two Adjustable Position Switches, DPDT, 10 Amp.

S011 Four Adjustable Position Switches, SPDT, 10 Amp.

S012 Four Adjustable Position Switches, DPDT, 10 Amp.

S013 Two nonadjustable end of travel position switches, SPDT, 10 Amp.

S014 Two nonadjustable end of travel position switches, SPDT, 20 Amp.

S016 Two nonadjustable torque limit switches (CW & CCW), SPDT, 10 Amp.

S017 Two nonadjustable thrust limit switches (EXT & RET), SPDT, 10 Amp.

Temperature Rating

T001 Extended operating temperature of -40 to +185 °F (-40 to +85 °C).

T002 Extended operating temperature of -40 to +225 °F (-40 to +107 °C).

T003 Extended operating temperature of -40 to +150 °F (-40 to +66 °C). Electro- Hydraulic Only. Temperature Rating Conduit Entries.

Temperature Rating

V001 ½ inch Conduit Entry Additional (1000 Series, LA2500).

Painting/Coating

W001 RPC Standard Polyurethane Blue.

W002 Two Part Epoxy.

W003 Food Grade Epoxy.

W004 Baked On Epoxy.

W005 Teflon.

Options

Special Electrical Options

X001 24 VDC power supply, 320 mA, 100-240 VAC input.

X002 Loss of signal high or low.

X003 Loss of signal low.

X004 Voltage to current converter.

X005 Loop powered 4 to 20 isolator, M-system HSN-IAA.

X006 EC-10726 ± 15 VDC power supply.

X007 MOVs for AD-8000 (Required for output to solenoids or starters).

X008 Fail open at loss of power and loss of command signal.

X009 Fail close at loss of power and loss of command signal.

X010 Command and feedback, 0-10 VDC or 0-5 VDC instead of 4-20 mA.

X012 Signal conversion module, installed & wired to actuator.

X013 2 wire incremental DC input.

X014 3 wire incremental 120/240 VAC input.

X015 Battery Backup, only for 120/ 240 VAC, not available with X012.

X016 HART communication protocol.

X017 Process variable.

X018 Low current at null.

X019 AC Power Sensing with Output.

X020 Palm Pilot Setup for AD-9120.

X021 AD-8120 and AD-8220 replacement for use with AD-8240.

X022 Form C relay contact and powered retransmission of process input for MT-6400.

X023 Special control outputs for MT-6400.

X025 Relay contact to detect overtorque (stall) for SM-6000.

X026 Remote Amplifier for SM-6000 (185° F).

X027 Remote Amplifier for SM- 6000 (225° F)

X028 208 VAC input power for AD-9120

X033 Loss of line power relay for SM-6000

X034 Loss of signal relay for SM-6000

X055 Step down transformer for 480 to 240 VAC. Close coupled, 4400 ft. lbs. and higher.

X057 Step down transformer for 480 to 240 VAC. Remote mounted, up to 2500 ft. lbs.

X070 Torque overload indicator for SM-6000.

X088 75% Duty cycle for JOM1 & JOMB (AC only).

X089 75% Duty cycle for JOM2 - JOM8 (AC only).

X095 75% Duty cycle (All VDC, 12 VAC & 24 VAC).

Special Mechanical Options

Y001 Increased rotation for SM-1000 Series actuators to 33 turns.

Y002 Helicoil Screw Thread Inserts(specify screw thread).

Y003 Increased rotation for TA-1200 Series actuators to 135°.

Y004 Metric mounting holes, 6mm(LF-1210).

Y005 Metric mounting holes, 6mm(SM-1000).

Y006 Metric mounting holes, 6mm(SM-1100).

Y008 Metric mounting holes, 12mm (SM-1700).

Y009 Metric mounting holes, 12mm (SM-5100).

Y010 Metric mounting holes, 20mm (SM-5200).

Y011 Metric mounting holes, 20mm (SM-5300).

Y012 Metric mounting holes, 26mm (SM-5400).

Y013 Metric mounting holes, 8mm (SM-1600).

Y014 Metric mounting holes, 6mm (LA-1000).

Y015 Metric mounting holes, 6mm (LA-1100).

Y016 Metric mounting holes, 8mm (LA-1500).

Y017 Metric mounting holes, 8mm (SM-3300).

Y018 Metric mounting holes, 8mm (LA-3300).

Y019 Metric mounting holes, 6mm (PT-1010 & PF-1010).

Y020 Metric mounting holes, 6mm (PF-1210).

Y021 Metric mounting holes, 6mm (PT-1330).

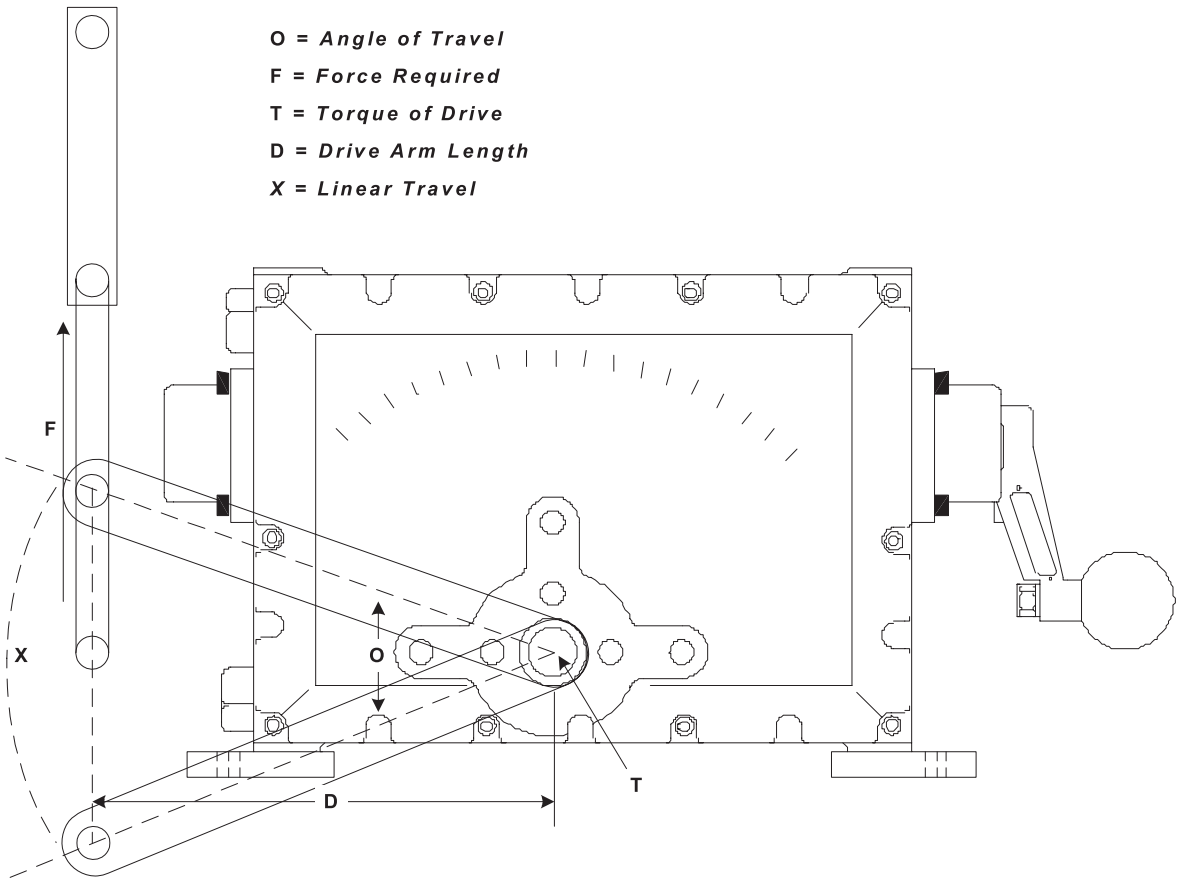
Y022 Faster speeds (SM-6000).

Y023 Extended rotation beyond 300° (SM-6000).

Conversion Chart

To Convert From	Into	Multiply By
	Thrust	
oz. Force	Newton	0.278
lb. Force	Newton	4.4482
Newton	oz. Force	3.596
Newton	lb. Force	0.2248
	Torque	
in. lbf.	Nm	0.1129
ft. lbf.	Nm	1.355
Nm	in. lbf.	8.85
Nm	ft. lbf.	0.7375
	Length	
Inch	Centimeter	2.54
Inch	Meter	0.0254
Inch	Millimeter	25.4
Foot	Centimeter	30.48
Foot	Meter	0.3048
Millimeter	Inch	0.0393
Centimeter	Inch	0.3937
Centimeter	Foot	0.0328
Meter	Inch	39.36
Meter	Foot	3.28
	Mass	
Ounce	Kilogram	0.0283
Pound	Kilogram	0.4535
Kilogram	Ounce	35.27
Kilogram	Pound	2.204
	Temperature	
°F	°C	(F - 32) x .555
°C	°F	(C x 1.8) + 32
	Flow	
Gallon/hour	Liter/hour	3.7854
Gallon/minute	Liter/minute	3.785
Liter/hour	Gallon/hour	0.2641
Liter/minute	Gallon/minute	0.2641
	Pressure	
PSI	Bar	0.0689
Bar	PSI	14.5
Feet of water (at 4° C)	PSI	0.4335
PSI	Feet of water (at 4° C)	2.3067

Using a 90° Actuator for Linear Applications



$$\text{Drive Arm Length} = \frac{\text{Linear Travel}}{1.42}$$

Torque of Drive = Force Required x Drive Arm Length

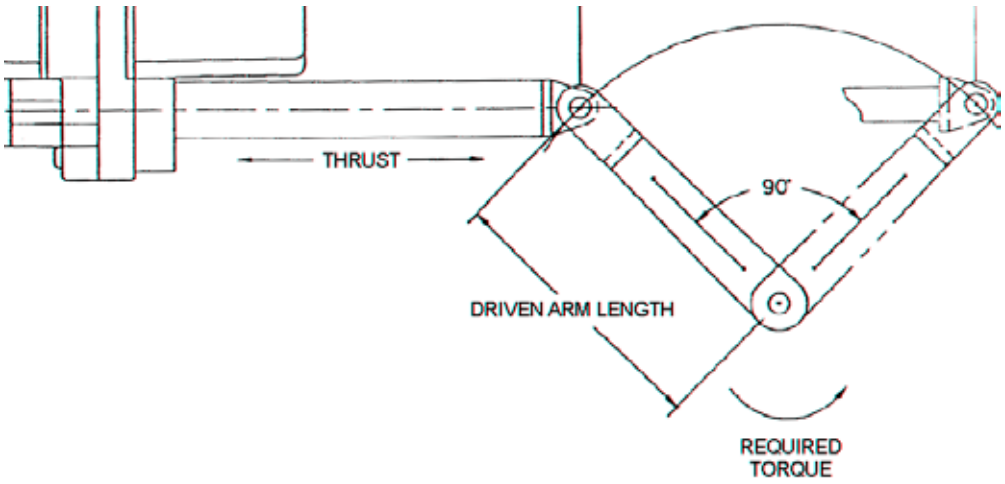
***Example*:**

- Angle of Travel = *90°*
- Force required = *500 N (112 lbf.)*
- Linear Travel = *0.4 m (15.7 in.)*

$$\text{Drive Arm Length} = \frac{0.4 \text{ m } (15.7 \text{ in.})}{1.42} = 0.281 \text{ m } (11.1 \text{ in})$$

Torque of Drive = 500 N x 0.281 m (11.1 in.) = 140.5 Nm (103.6 ft.lb)

Using a Linear Actuator for 90° Applications



$$\frac{\text{Torque Required}}{\text{Driven Arm Length}} \times 1.42 = \text{Thrust}$$

Driven Arm Length x 1.42 = Linear Travel

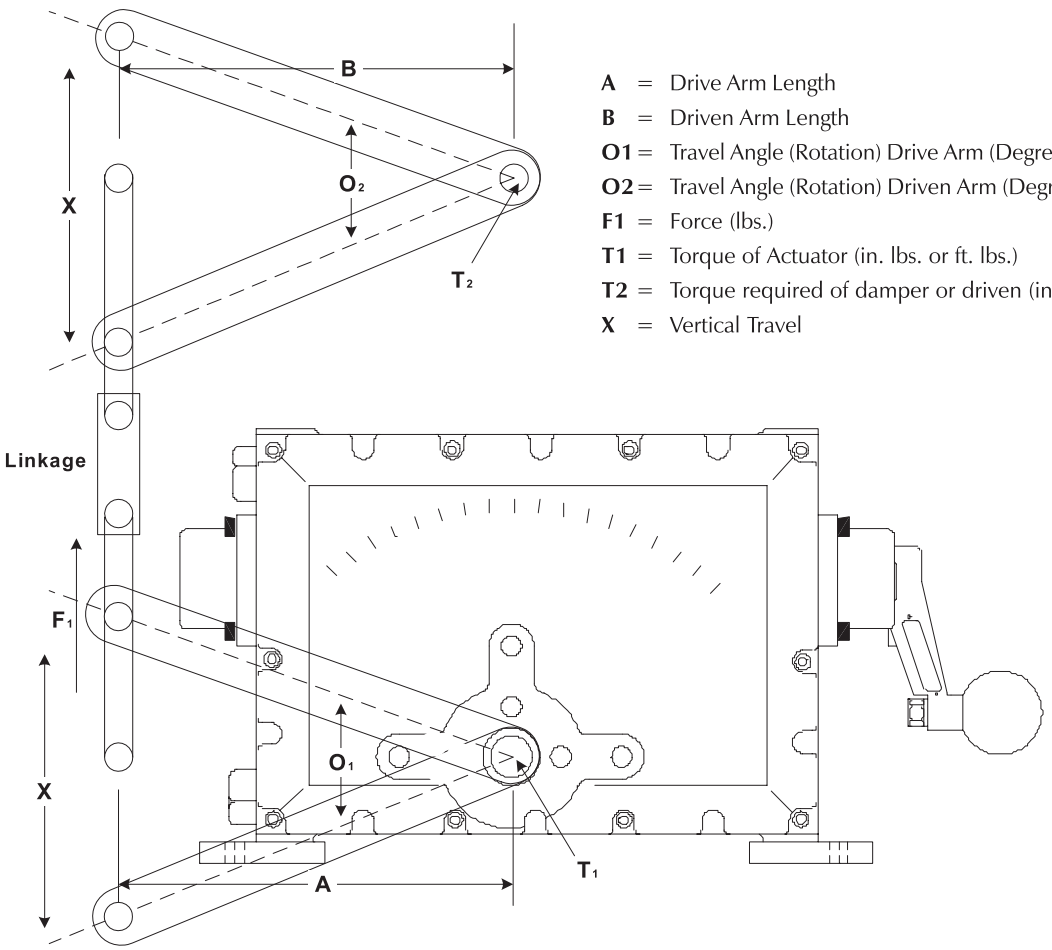
***Example*:**

- **Driven Arm = *0.3 m (11.8 in.)***
- **Torque required = *200 Nm (1772 in. lb.)***

$$\text{Thrust} = \frac{200\ \text{Nm (1772 in. lb.)}}{0.3\ \text{m (11.8 in.)}} \times 1.42 = \mathbf{947\ N\ (213\ lbf.)}$$

Linear Travel = 0.3m (11.8 in.) x 1.42 = **0.426 m (16.77 in.)**

Using a Rotary Actuator for Rotary Applications



A = Drive Arm Length
B = Driven Arm Length
O1 = Travel Angle (Rotation) Drive Arm (Degrees)
O2 = Travel Angle (Rotation) Driven Arm (Degrees)
F1 = Force (lbs.)
T1 = Torque of Actuator (in. lbs. or ft. lbs.)
T2 = Torque required of damper or driven (in. lbs. or ft. lbs.)
X = Vertical Travel

***Example*:**

- **Drive Arm Rotation = *90°***
- **Driven Arm Rotation = *120°***
- **Driven Arm Length = *12 in.***
- **Driven Arm Torque Required = *1000 in. lb.***

$$F1 = \frac{T2}{B} = \frac{1000}{12} = 83.33 \text{ lb.}$$

To get Vertical Travel

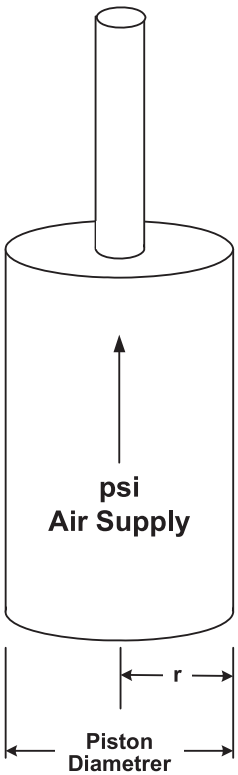
$$\frac{X}{\text{Sin}120} = \frac{12}{\text{Sin}30} \qquad X = \frac{\text{Sin}120 \ (12)}{\text{Sin}30} \qquad X = 20.78 \text{ in.}$$

To get Drive Arm Length

$$\frac{20.78}{\text{Sin}90} = \frac{A}{\text{Sin}45} \qquad A = \frac{\text{Sin}45 \ (20.78)}{\text{Sin}90} \qquad A = 14.7 \text{ in.}$$

Required Torque of Actuator*: T1 = F1 x A = 83.33 x 14.7 = *1,225 in. lb.

Replacement of Pneumatic or Hydraulic Cylinders



The linear force (lbs.) produced by a pneumatic cylinder can be calculated if the pressure supplied to the cylinder and the piston diameter of the cylinder are known.

***Example*:**

- **Piston Diameter = *3 inches***
- **Pressure Supplied = *120 psi***

Area of Piston = $(3.14)(r)^2 = (3.14)(1.5)^2 = 7.07$ in.^{2}

Force = (Area)(Pressure) = (7.07 in.^{2})(120 psi) = 848 lbs.

A cylinder with a 3 inch diameter piston pressurized to 120 psi will produce 848 lbs. of axial force when extending. The force produced while retracting will be slightly less due to the diameter of the rod (the rod reduces the effective area that the pressure works over).

To Convert RPM to Seconds for 90° of Travel

***To convert RPM to sec./90°*:**

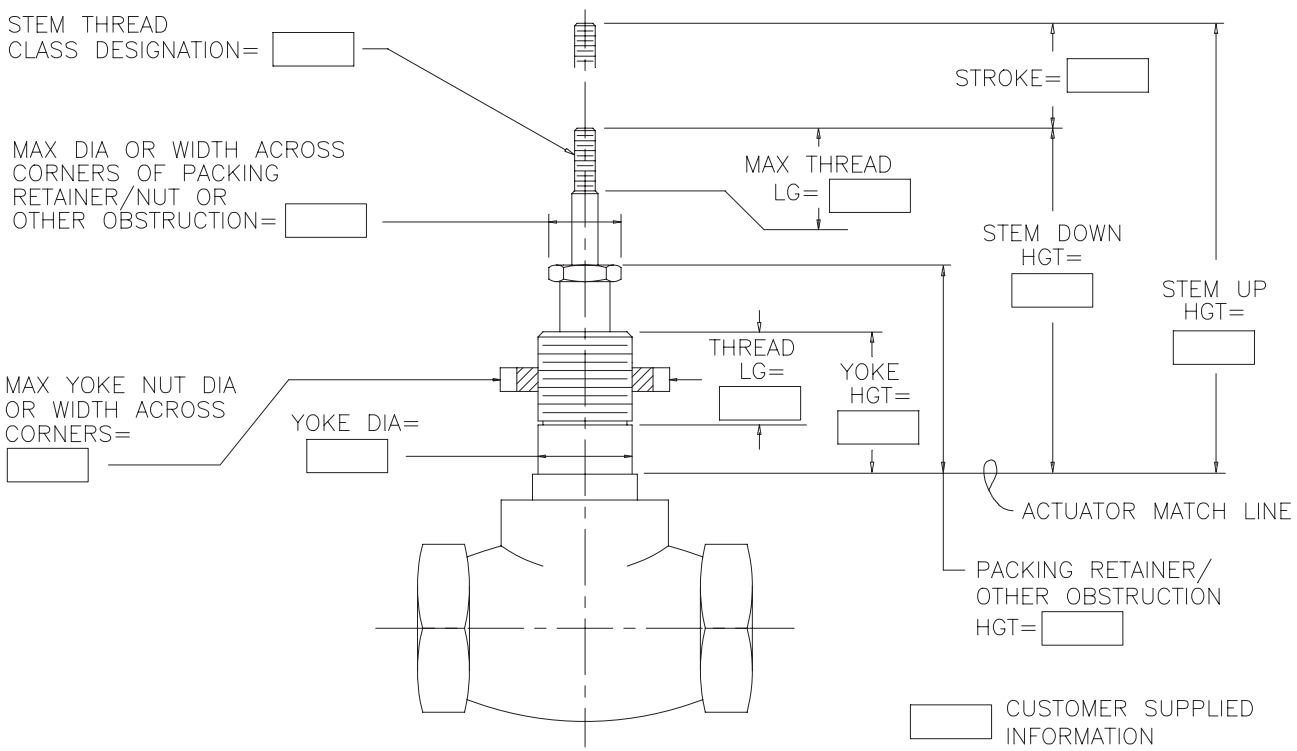
X = *RPM*
Y = *Sec. for 90°*

$$\frac{1}{X} \times 15 = Y$$

Required Valve Mounting Information

When mounting of the actuator to the valve is done by the customer, complete "top-works" of valve dimensions for the drawing below must be furnished to Process Controls.

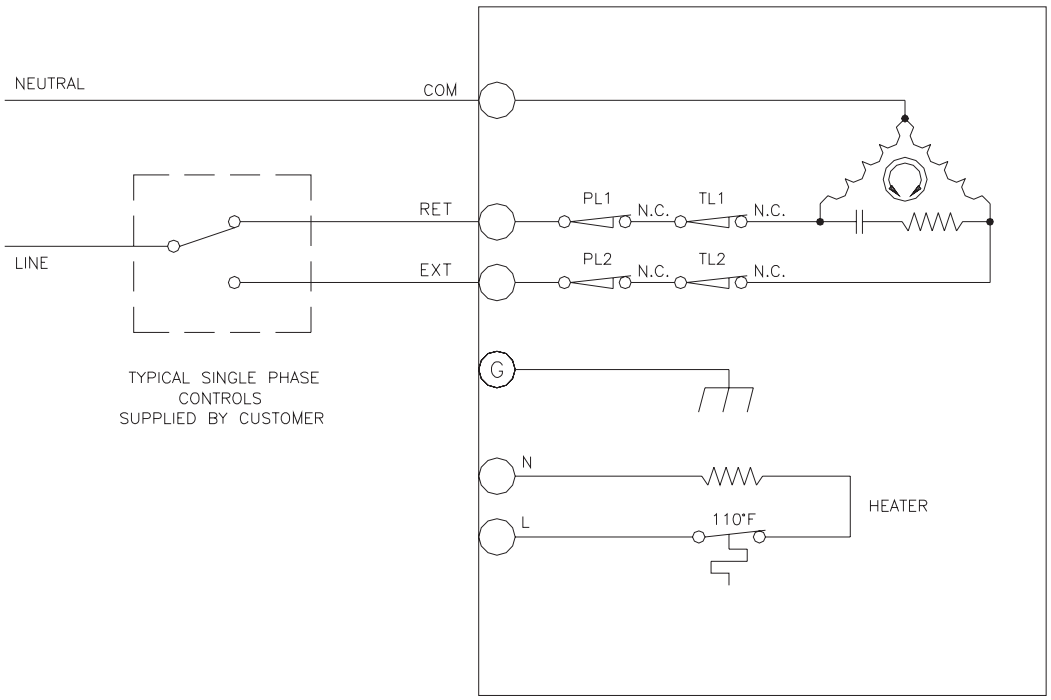
This is necessary to properly machine the actuator yoke, and to provide appropriate coupling hardware.



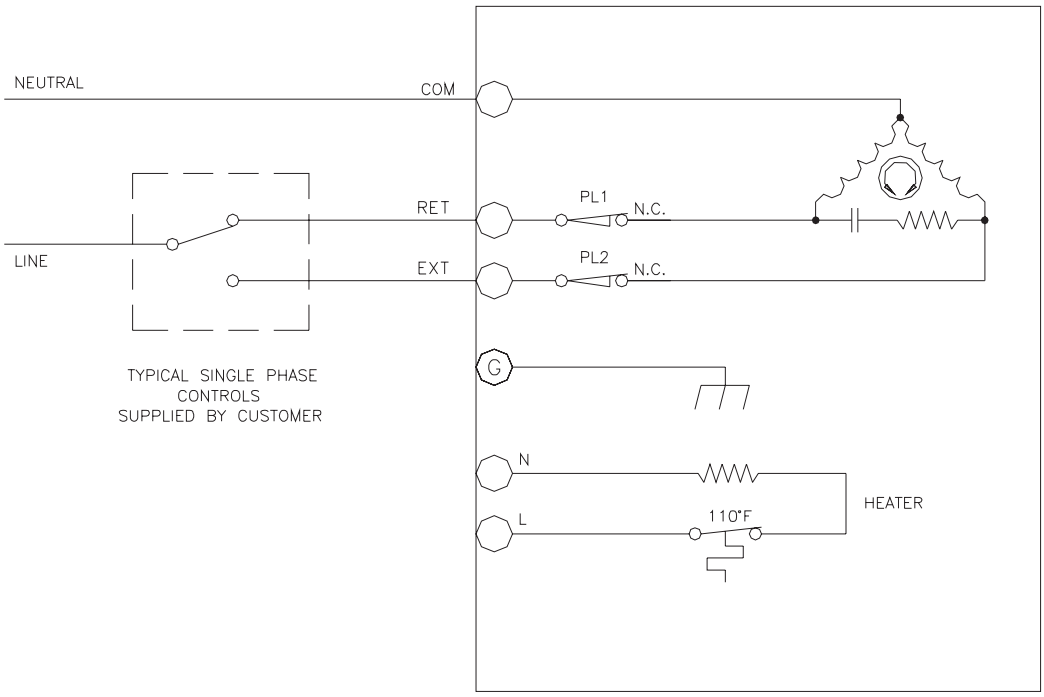
If valve is to be attached to yoke by any other method or has a unique mounting configuration, please provide necessary drawings.

Typical Wiring Diagrams

Single-Phase AC Linear Actuators with Thrust Limiting

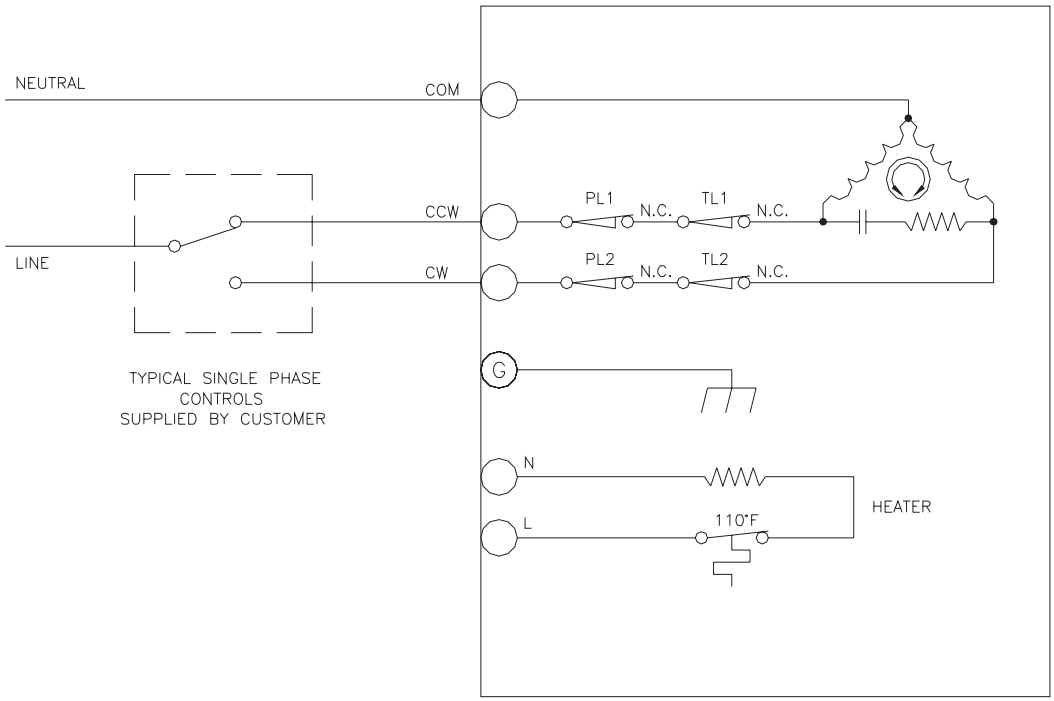


Single-Phase AC Linear Actuators without Thrust Limiting

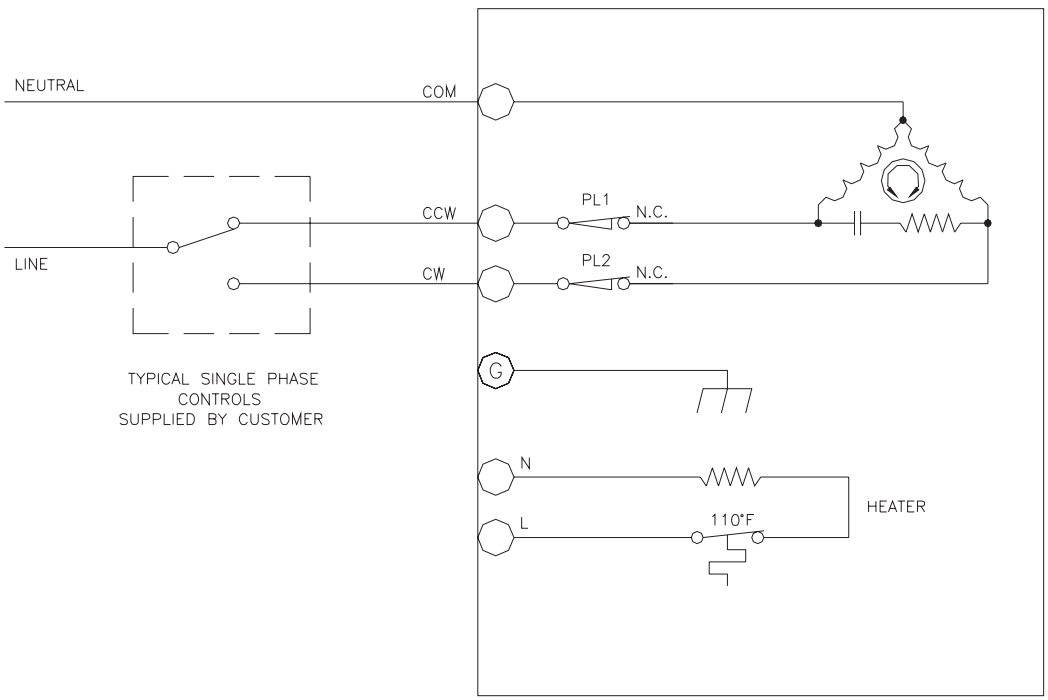


Typical Wiring Diagrams

Single-Phase AC Rotary Actuators with Torque Limiting

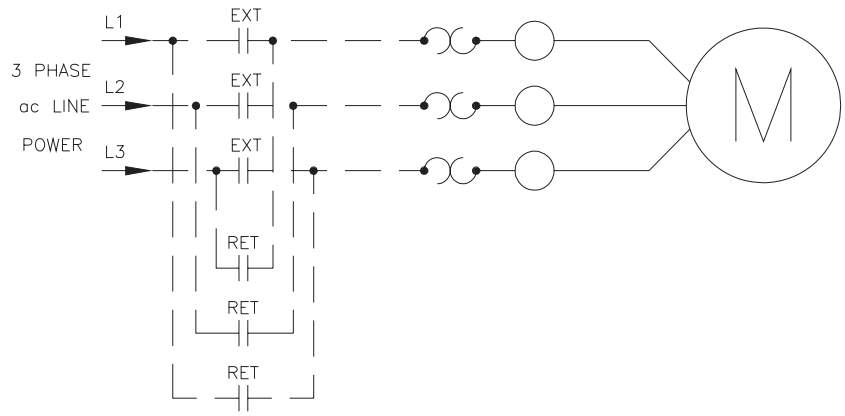


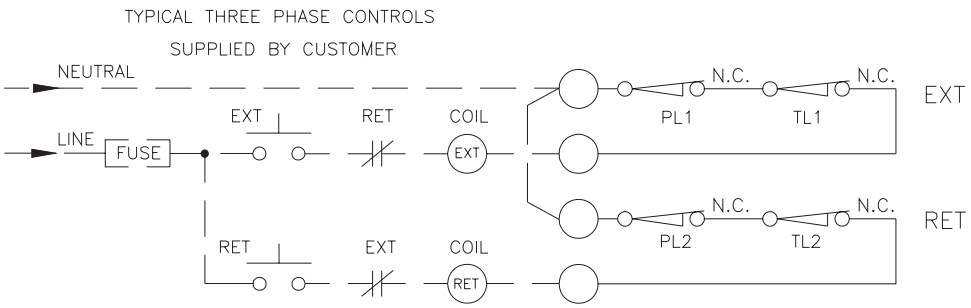
Single-Phase AC Rotary Actuators without Torque Limiting



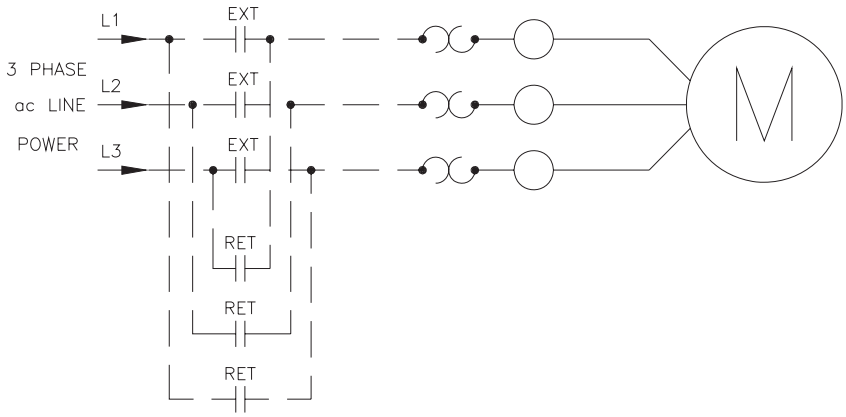
Typical Wiring Diagrams

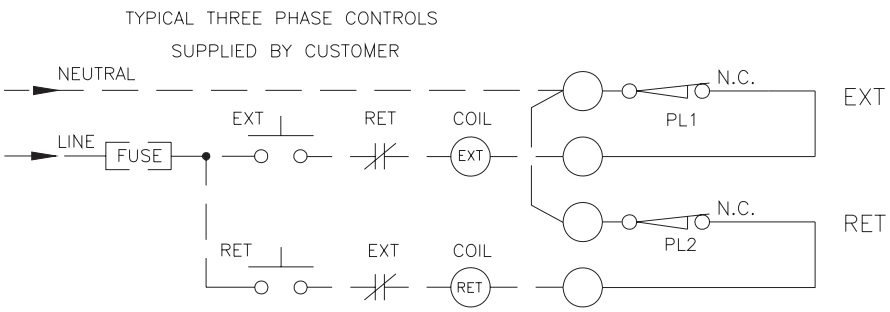
Three-Phase AC Linear Actuators with Thrust Limiting





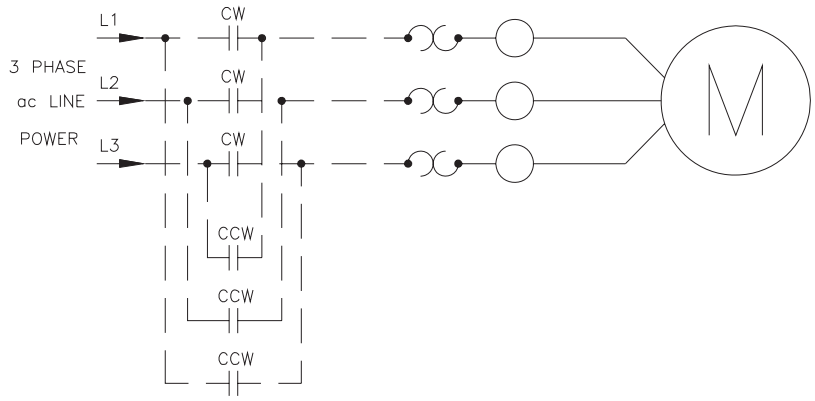
Three-Phase AC Linear Actuators without Thrust Limiting

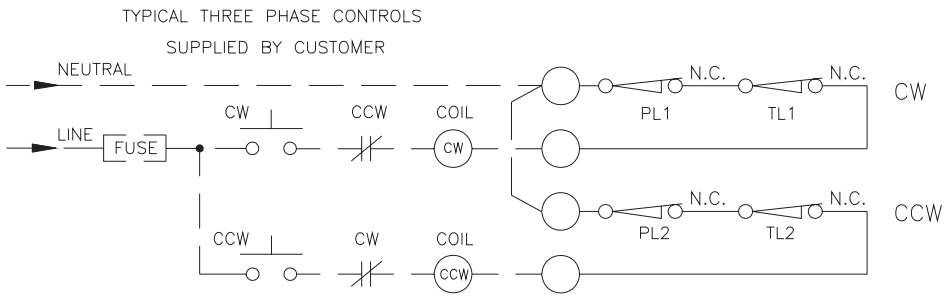




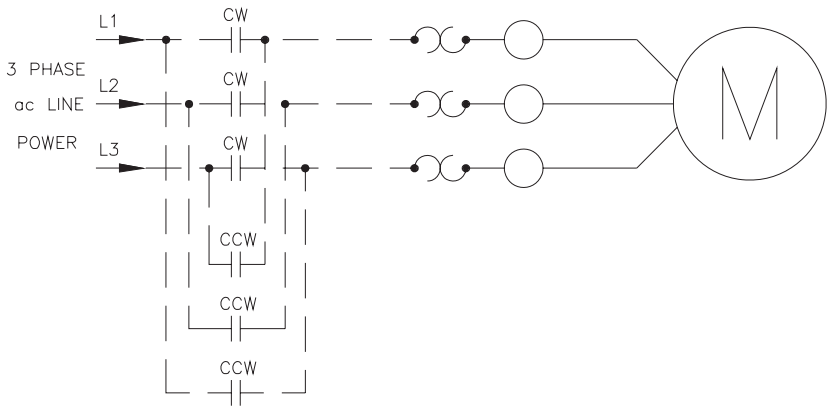
Typical Wiring Diagrams

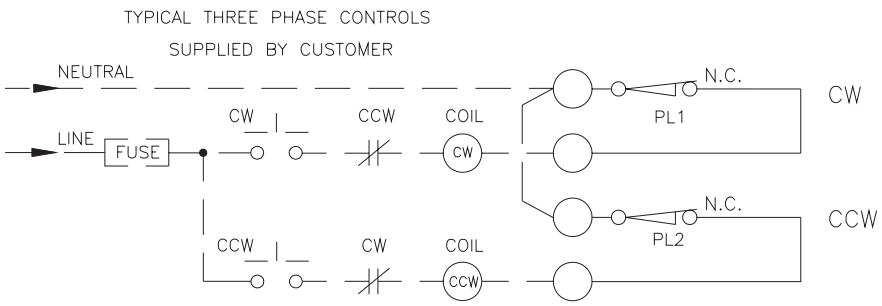
Three-Phase AC Rotary Actuators with Torque Limiting





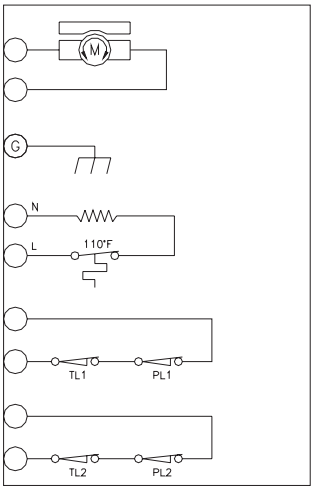
Three-Phase AC Rotary Actuators without Torque Limiting



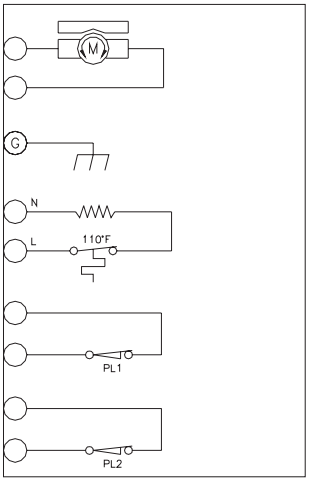


Typical Wiring Diagrams

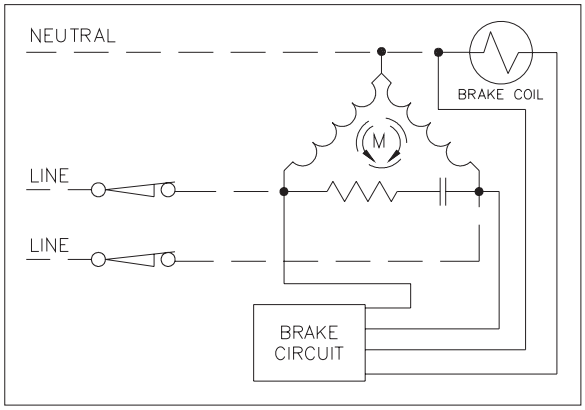
DC Actuators with Thrust Limiting



DC Actuators without Thrust Limiting



120 VAC & 240 VAC Electronically Controlled Brake



Glossary of Terms

AC- Alternating current or voltage which changes direction and polarity at a rate of 50 or 60 Hz. The most common alternating current used in industry is sinusoidal.

Accumulator - A gas pressurized storage vessel used to store hydraulic fluid under pressure so it may be used as a source of potential energy.

Accuracy - Measured in percent of span, indicates how close the actual movement was compared to command set point.

Actuator - A device that transforms a source of energy into another upon command. In Process actuators, electrical motor energy provides rotary or linear motion upon command.

Acme Screw - A special rolled thread on a straight shaft designed to have contact with a nut on the faces of the thread, and to transmit rotary motion into linear motion.

Ampere (Amp) - Unit of measurement of electron flow or current.

Amplifier - See servo amplifier.

Analog - Measurement system where the units and signals bear a direct linear relationship to functions. Measured in milliamps (mA).

Auxiliary Switches - Auxiliary circuit switches fitted and mechanically coupled to switching devices for the purpose of indicating the state of the main contacts.

Backdrive - The ability of a device to be driven "backwards". Force applied to the output shaft can cause the input shaft to rotate.

Bellows – A protective "accordion" type mechanical covering used to protect the rod of a cylinder or actuator from the environment.

Brake - Dynamic, Motor, Electric, Drag.

Breakaway (unseating) Torque or Thrust - Torque or thrust initially used at start-up for a very brief period of time, usually expressed in m. sec.

Clevis - A device on the ends of a push-pull linear actuator or linkage for mounting and connecting.. Either forked or spade.

Close-Coupled - An enclosure mounted next to an actuator.

Closed Loop – A control system that will automatically respond to changes without the need for an operator.

Command - A DC control signal supplied by the customer to the servo amplifier, i.e.: of 4-20 mA current or 0-5 or 0-10 VDC.

Continuous Modulating Duty - An actuator that is constantly in the process of reaching a commanded position. Typically the actuator will constantly be moving at a very slow speed, in an attempt to reach a constantly moving command position.

Control - The method by with the actuator is caused to move in response to a process change i.e.: incrementally pulsed, DC signal input.

Control Switches - Power circuit switches for the direct control of electrical equipment, or auxiliary circuit switches for indirect control.

Current - Flow of electrons through an electric circuit.

DC - Direct current or voltage which has a constant value related to zero value. Can be stipulated as a positive or negative value.

Deadband - An adjustable window around the desired set point of the actuator in which there is no movement of the actuator.

Digital – Typically using a microprocessor type device to compare and act upon input signals to it.

Drive Arm - A lever that is attached to a rotary actuator to provide linear motion through an arc.

Driven Arm - A lever that is attached to a device which produces rotary motion from a drive arm.

Duty Cycle - Maximum "On" time of a motor in a specific time period expressed as a percent of a time period.

Dynamic Brake - An electronic method used to stop a motor by applying voltage to both windings of the motor at the same time for a controlled period of time.

Efficiency - Ratio of useful ouput power to total input power.

Electric - Self Contained electric motor power package with or without closed loop feedback.

Electro-Hydraulic - Self contained, motorized, hydraulic package. Typically designed with closed loop feed back.

Enclosure Rating – Resistance to intrusion by either liquids or gasses, as specified by a standards organization, typically NEMA.

Explosion-proof - Characteristic of an enclosure to contain or prevent an explosion.

Fail safe - Characteristic of an actuator to move to a safe condition upon the failure of electric power, power source, etc.

Failure mode - Upon electric power failure to the actuator, the actuator moves to a predetermined position (fail open, fail **closed, fail in last position).**

Feedback - A signal from an actuator feedback element that relates to 0 to 100% of the actuator output shaft movement.
- – Internal feedback to the servo amplifier from a pot or contactless device.
- – Output position signal from the actuator transmitted to the DCS.

Feed Back Element - Component(s) that measure or indicate the position of the output shaft, i.e.: position limit switches, potentiometer, Hall Effect sensor, LVDT (linear variable displace transducer) or RVDT.

Gain – The rate at which the speed of an actuator will begin to slow as the actuator approaches the desired position.

Glossary of Terms

Alternating Gear Ratio - Ratio of number of turns the input device takes to rotate the output device one turn.

Gearbox - A mechanical device that typically transforms high speed, low torque rotary motion into low speed, high torque rotary motion.

Hazardous environment - Any combination of combustible or potentially explosive mixtures existing in the surrounding atmosphere.

Hertz Unit of Frequency - Number of times per second that alternating current flows in one direction, reverses, and flows in the other direction. Power companies in the United States hold this figure constant at 60 cycles per second (hertz).

Hydraulic - Pressurized fluid (oil) used for power transmission incorporating a hydraulic power unit, hoses, and a cylinder or motor. Typically designed with out closed loop feed back.

Hysteresis - Measured effect of the delay in action due to compressive or elastic effects.

IGBT – Insulated Gate Bipolar Transistor

Incremental Control – Control that uses ON and OFF pulses, either automatically generated, or by an operator.

In-rush Current - Current draw of a motor on starting.

Limit Switch - Set of electric contacts that are activated mechanically.

Linear Travel - Movement in a straight line.

Linearity - Maximum deviation from best straight line representing ratio of output amplitude to input amplitude.

Lock-in-Place (LIP) – Refers to stopping when an event occurs.

Loop Control - A process management system designed to maintain a process variable at a desired set point.

L**oss of Signal (LOS)** – An absence of a command, or demand, signal.

Manual Override - Capability provided to actuators that allows the manual positioning of the actuator. Also known as handcrank.

Milliamp (mA) – A measure of electric current, one thousandth of an ampere.

Modulating - Regulating or adjusting a control element proportional to a process change.

Modulation Rate - Number of actuator starts (cycles) per hour. Minimum off-time of actuator is one-half of a cycle. (Example: If actuator is rated at 1200 starts/hr, this is 3 seconds per cycle, therefore minimum off-time is 1.5 sec.)

Moment Arm - Linear distance from the center of rotation upon which a force may act to produce torque.

Multi-Turn/Rising Stem - Describes a valve that requires multiple turns of the actuator output shaft to raise and lower the stem of a valve using a threaded portion of the stem.

NEMA Classification - Code established for the construction of electrical components by the National Electrical Manufacturers Association.

Null - Output of servo amplifier at rest or off when feedback signal matches command signal within deadband window.

Planetary Gears - A type of gear reduction where spur gears rotate around the axis of a central spur gear.

Plug Reversal – Immediate reversing of a motor without allowing the shaft to stop.

Position/Limit Switch - A mechanically tripped switch used to limit end travel movement, or to trip at a desired position.

Potentiometer - A three terminal, variable resistance device, that when turning the potentiometer shaft will result in a varying resistance.

Power Supply - There are two types of power supply: direct current and alternating current. The latter is the most widely used power supply.

Pneumatic - Compressed air used for power or control of devices utilizing clean dry instrument air.

Position Accuracy - See Accuracy.

Power - Input voltage required to drive the actuator i.e.: 120 VAC/1ph/60 Hz.

Process Control - Act of maintaining or correcting a process within preset limits using a measurement of the actual process conditions in comparison to an established, desired condition.

Proportional Controller - Provides a response from an actuator that is directly related to the feedback from a remote sensor. Used to control a process automatically.

Rack - Linear gear that operates in conjunction with a pinion gear to provide rotary motion.

Repeatability - Measured accuracy in percent of span of a control device to match a set point when approaching from either direction.

Resolution - Smallest possible movement that can be measured.

Rotary Actuator - Device that provides rotating movement to a final control element.

Scotch Yoke - Method of converting linear motion to rotary motion by using a slotted lever arm.

Seat - That portion of the seat ring or valve body which a valve closure member contacts for closure.

Seating Torque - Value depicting the turning force required to seat a valve or damper into its closed position.

Self-Locking - The ability of a device to counteract the effects of gravity. An actuator that is self-locking will hold a load from lowering.

Glossary of Terms

Servo Amplifier - An electronic device used to control actuator output shaft position based on the difference between command and feedback signal.

Shift Time - Actuator travel time in seconds for 0 - 100% travel.

Span - The high end adjustment for a signal input to a servo amplifier. aka: Range or High Trim.

Splined Shaft - A shaft with raised areas to positively transmit torque. Could be thought of as multiple keys/ keyway.

Split Command Input – A system whereby multiple actuators move in sequence with each other.

Spring-return Actuator - Device that contains a spring element having the capability of returning a valve-actuator system to its normal position in the absence of electric power.

Spur Gearing - Method of transferring torque from one shaft to another. Usually results in a decrease in speed with an increase in torque.

Stability - Ability of an actuator to not show a change in position when subjected to extraneous input like electronic noise, temperature or vibration.

Throttling - Action of an actuator in modulating motion.

Thrust - A linear force acting on an object, causing motion, measured in lbs., or Newtons

Thrust Limiting – A mechanical device inside the actuator which stops the actuator if the maximum thrust rating is exceeded.

Torque - A twisting force acting on a shaft, resulting in rotation, measured in in-lbs., ft-lbs.,or Nm.

Torque Limiting - A mechanical device inside the actuator which stops the actuator if the maximum torque rating is exceeded.

Triac – An electronic device which serves as an AC switch.

Unrestricted Modulating Duty - See modulating duty.

Valves - Butterfly, globe, plug, ball, etc.

Zero - Low end adjustment for signal input, aka: Low Trim.

rotork®
Process Controls

A full listing of our worldwide sales and service network is available on our website.

UK
Rotork plc
tel +44 (0)1225 733200
fax +44 (0)1225 333467
email mail@rotork.com

USA
Rotork Process Controls
tel +1 (414) 461 9200
fax +1 (414) 461 1024
email rpcinfo@rotork.com

Controls
Electric Actuators and Control Systems

Fluid Systems
Fluid Power Actuators and Control Systems

Gears
Gearboxes and Gear Operators

Site Services
Projects, Services and Retrofit

www.rotork.com

Published and produced in the UK by Rotork Controls Limited. POWSH0610