

# Needle Valve Actuators

## Model FRC - Electric, 24 VDC Flow Regulating Control/Shutoff

10V2, SW, SM, VM Series  
Needle Valves to 60,000 psi (4140 bar)



### Principle of Operation:

The need to remotely control process flow electrically using high pressure multi-turn needle valves has long been sought. Pneumatic control of this type is an engineering challenge and cost prohibitive. Parker Autoclave Engineers solves these issues with our FRC line of electric actuators. When mated to our Regulating Stem Needle Valves and sent a 4-20mA signal, this actuated valve system provides precise control when needed and even provides enough torque to close the valve when not needed. This valve/actuator combination is capable of controlling Liquid or Gas flows.

The FRC Electric Actuator uses a 4-20mA input signal to turn the valve a programmed amount of turns from fully closed to fully open (typically 5 turns) while also providing a position feedback using an independent 4-20mA signal. It is also capable of closing the valve completely when a 4mA signal is received. Should power be lost, the valve will freeze and “remember” its last position and will not need to be re-zeroed. The FRC actuator is designed to work with a number of Parker Autoclave Engineers Needle Valves from 1/8" to 3/4" tube sizes and up to 60,000 psi (4140 bar) using the Regulating Stem option - see individual valve brochures for Cv and Flow Curves.

### Features:

- Designed for Multi-turn Needle Valves, tubing/pipe sizes 1/8" to 3/4"
- Precise, accurate control using Regulating Stem option.
- Operational Temperature Range: -40° to 160°F (-40° to 70°C) - Valve temperature not to exceed 600°F
- Closing Torque capable of up to 60,000 psi (4140 bar) operation
- Weatherproof or Explosionproof (CSA approved Cls 1, Div 1 Grps B, C & D)
- Maximum Rotation Speed: FRC1 = 4 sec/turn, FRC2 = 15 sec/turn (5 turn open/close)
- Weatherproof Enclosure is supplied with TURCK 5 position cable connector and 20' of cable



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# Specifications and Ordering Guide:

## Electric Actuator

### Electrical Specifications:

- Electrical Input: 24VDC only, 72 Watt maximum
- Control Input: 4-20mA
- Position Feedback: Independent 4-20mA
- Position Detection: Hall Sensors
- Motor: BLDC brushless DC motor

### Position on Powerloss:

- Remembers Last Position
- Reseats Valve if Current is Between 3.0 and 4.16mA

### Mechanical Specifications:

- Standard Enclosure - EPD Coated NEMA 4/IP65 Equivalent
- Optional Anodized Aluminum Explosion-Proof Enclosure, Nema 8/IP67, CSA Approved for Class 1, Division 1, Groups B, C, D / T6 Areas (\*Group B is suitable for Hydrogen)
- 500+ Positions per turn (+/- 0.25° Position Accuracy), 3243 Actuator Positions over Full Span
- Maximum Rotation Speed: #1 Actuator = 4 sec/turn (5 turn open/close), #2 Actuator (high torque) = 15 sec/turn (5 turn open/close)
- Actuator Operating Temperature -40°(-40°C) to 160°F(70°C), Valve Temperature not to exceed 600°F
- Actuator life Expectancy: 250,000 cycles
- Gears and Bearings are Lifetime Lubricated
- 20 ft. cable included with 6 pin/5 wire connector (FRC1 and FRC2 Weatherproof version only)
- Wiring Terminal, Maximum Wire Size: 18 Gauge  
(To Terminate larger gauge wire, see Option Code XPFL below)

### Ordering Guide: [reference individual Valve Series brochure for exact valve detail]

Example Part Number:	<b>20SM</b>	<b>9</b>	<b>8</b>	<b>8</b>	<b>2</b>	-	<b>FRC2X</b>	<b>TG</b>
Ordering Parameters/Options:	Valve Series	Tube/Pipe Size (OD)	Seat	Stem Type	Body Pattern		Electric Flow Regulating Actuator	Valve Optionsr
Table Reference: (see below)	A	B	C	D	E		F	G

**20SM9882-FRC2XTG** = 20SM Series Needle Valve, 20,000 psi MAWP, 9/16" MP Cone and Thread, 2-way Angle/Replaceable Seat Valve, Flow Regulating On/Off Explosion Proof Actuator/High Torque, PTFE Glass packing to 600°F max.

A - Valve Series	
10V2 , SW, 10/15P, 15/20SM, 30VM, 60VM	

B - Tube/Pipe Size (limited to sizes shown below)	
2	1/8" (10V2 Series only)
4	1/4"
6	3/8"
8	1/2" (SW and P Series Valves Only)
9	9/16" (SM and VM Series Valves Only)
12	3/4" (P and SM Series Valves Only)

C - Seat: STD/Replaceable Type	
0	STD
8	Replaceable (Body Pattern 2 Only)

D - Stem Type	
8	Regulating

E - Body Pattern (see individual valve brochure for details)	
1	Straight
2	Angle
3	3-Way, 2 On-Pressure
4	3-Way, 1 On-Pressure

F - Electric Flow Regulating Actuator	
FRC1	Low Torque Valves - Indoor/Weather-Proof w/20ft cable
FRC2	High Torque Valves - Indoor/Weather-Proof w/20ft cable (SW8 15P8 10P12 15SM9&12 20SM9&12 Valve Sizes)
FRC1X	Low Torque Valves - Explosion-Proof: Div. 1, Class 1, Groups B, C, and D (*Group B is suitable for Hydrogen)
FRC2X	High Torque Valves - Explosion-Proof: Div. 1, Class 1, Groups B, C, and D (*Group B is suitable for Hydrogen) (SW8 15P8 10P12 15SM9&12 20SM9&12 Valve Sizes)

G - Valve Options: (600°F Maximum Valve Temperature)	
TG	PTFE Glass Packing to 600°F
B	Cryogenic 0 to -100°F
CSS	Coated Stem and Seat
HYG	High Cycle Valve Trim Upgrade for Hydrogen/Helium
K	Anti-Vibration Glands
SOG	NACE Approved Materials
XPFL	Pre-wired Flying Leads inside 1/2" NPT Class 1, Div 1 Groups B, C&D enclosure mounted outside actuator to splice wire gauges over size 18 for Class 1, Div 1 Groups B, C& D areas to terminate larger gauge wire "outside" enclosure.
Many other options available - see individual Valve Series Catalog or contact Factory.	

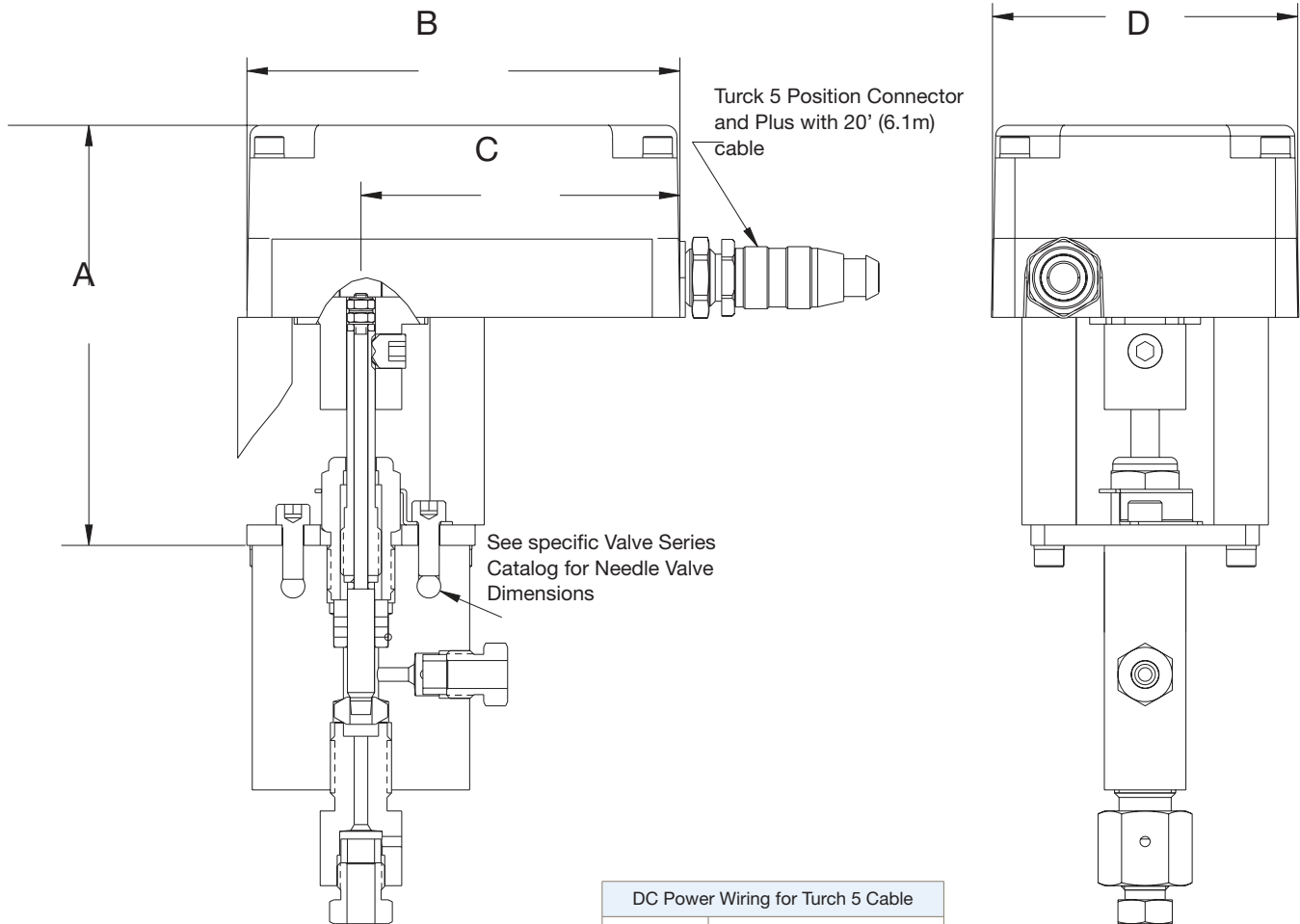
Note: Actuators can be rotated to any one of four compass locations. (requires zeroing function (re-seating).)

# Dimensional information:

Electric Actuator: FRC1

## Dimensional Information:

Valve Series	Dimensions: inches (mm)			
	A	B	C	D
1/4" & 3/8" NPT - P Series 1/8", 1/4" & 3/8" Low Pressure - 10V/SW Series 1/4" & 3/8" Medium Pressure - 20SM Series 1/4", 3/8" & 9/16" High Pressure - 30VM/60VM Series	3.87 (98)	3.98 (101.2)	3.00 (76.12)	2.80 (71)



Basic Repair Kits
For <b>Valves</b> - See specific Manual Valve brochure for valve repair parts and Manual Needle Valve IOM manual for instructions.
For <b>FRC1 Actuator</b> - Replace entire Actuator using Part Number AE002865
For <b>FRC1 Mounting Kit</b> : Part Number AE002867

DC Power Wiring for Turch 5 Cable	
White	+24 VDC (72 Watt Max)
Black	Power Ground
Grey	Output Signal (4-20 mA)
Brown	Input Signal Ground
Blue	+Input Signal (4-20 mA)

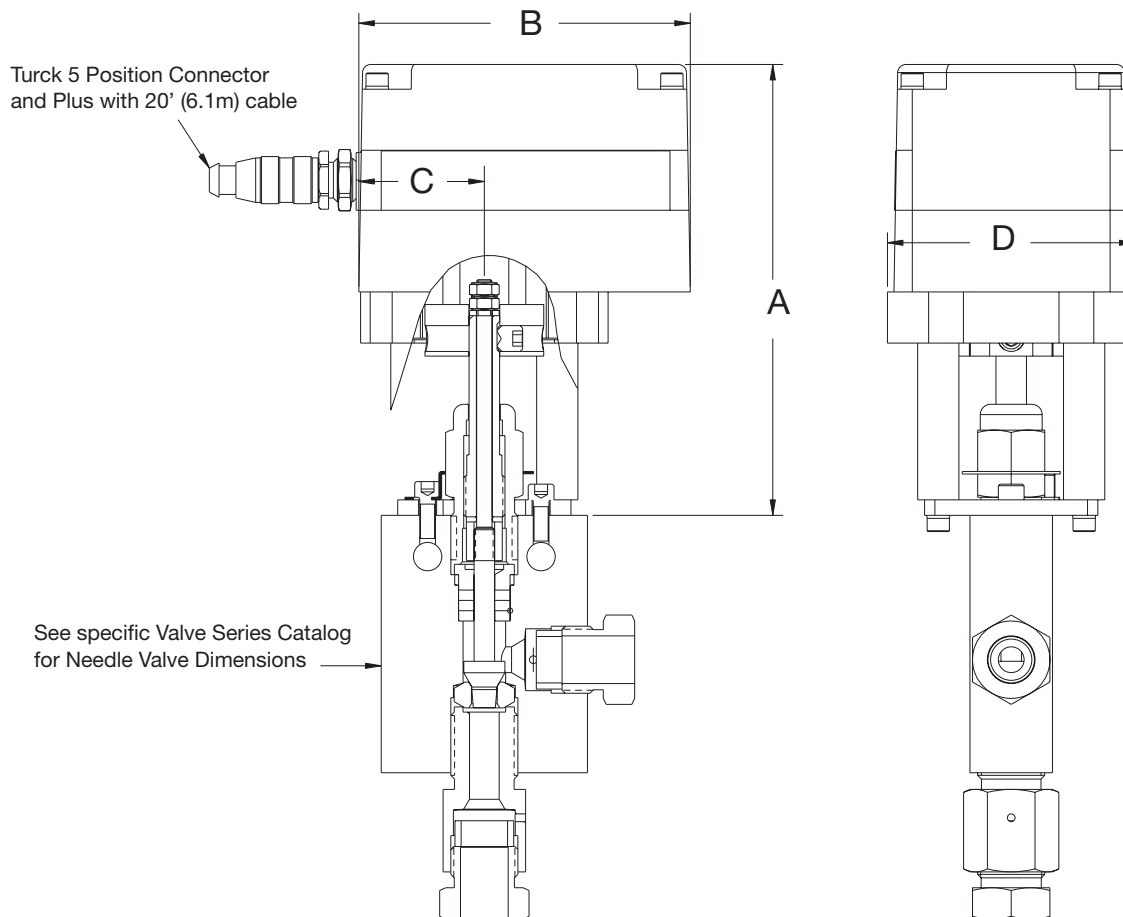
Warning: Do not connect terminal 3 (Grey wire) directly or through a Multimeter, to ground. A sensing resistor of 50 ohms or more needs to be present or damage will occur.

# Dimensional information:

Electric Actuator: FRC2

## Dimensional Information:

Valve Series	Dimensions: inches (mm)			
	A	B	C	D
1/2" & 3/4" NPT - P Series 1/2" Low Pressure - SW Series 9/16" & 3/4" SM Series Medium Pressure	5.47 (139)	4.02 (102.0)	1.52 (39)	2.88 (73)



DC Power Wiring for Turch 5 Cable	
White	+24 VDC (72 Watt Max)
Black	Power Ground
Grey	Output Signal (4-20 mA)
Brown	Input Signal Ground
Blue	+Input Signal (4-20 mA)

Warning: Do not connect terminal 3 (Grey wire) directly or through a Multimeter, to ground. A sensing resistor of 50 ohms or more needs to be present or damage will occur.

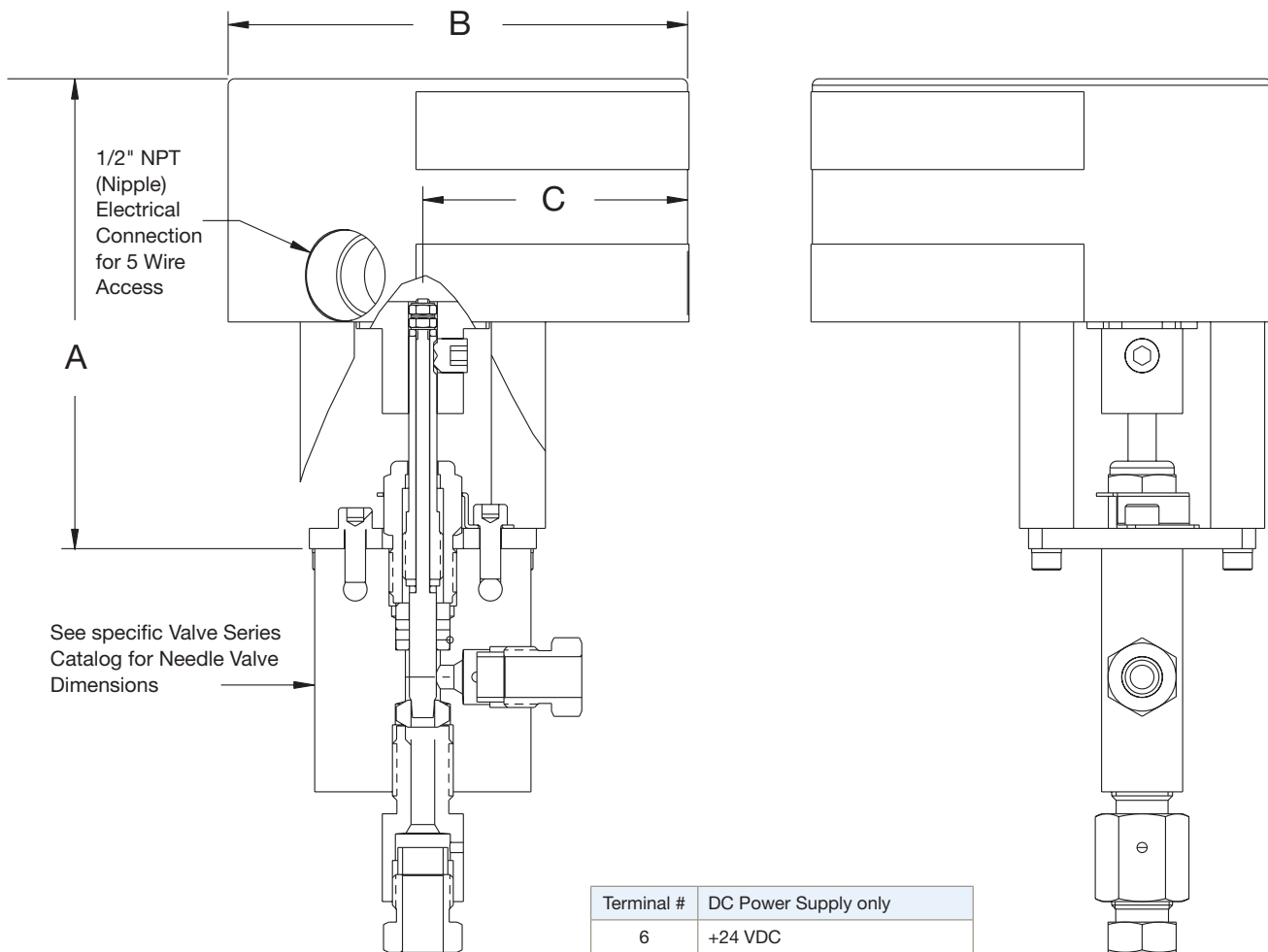
Basic Repair Kits
For <b>Valves</b> - See specific Manual Valve brochure for valve repair parts and Manual Needle Valve IOM manual for instructions.
For <b>FRC2 Actuator</b> - Replace entire Actuator using Part Number AE002865
For <b>FRC2 Gear Reduction/Mounting Kit</b> : Part Number AE002868

# Dimensional information:

Electric Actuator: FRC1X

## Dimensional Information:

Valve Series	Dimensions: inches (mm)		
	A	B	C
1/4" & 3/8" NPT - P Series 1/8", 1/4" & 3/8" Low Pressure - 10V/SW Series 1/4" & 3/8" Medium Pressure - 20SM Series 1/4", 3/8" & 9/16" High Pressure - 30VM/60VM Series	3.67 (93.2)	4.25 (108)	3.00 (76)



Basic Repair Kits
For <b>Valves</b> - See specific Manual Valve brochure for valve repair parts and Manual Needle Valve IOM manual for instructions.
For <b>FRC1X Explosion Proof Actuator</b> - Replace entire Actuator using Part Number AE003534
For <b>FRC1X Mounting Kit</b> : Part Number AE002899

Terminal #	DC Power Supply only
6	+24 VDC
5	Power Ground
4	Output Signal (4-20 mA)
3	Not Connected
2	Isolated Input Signal GND
1	Isolated Input +Signal (4.30mA)

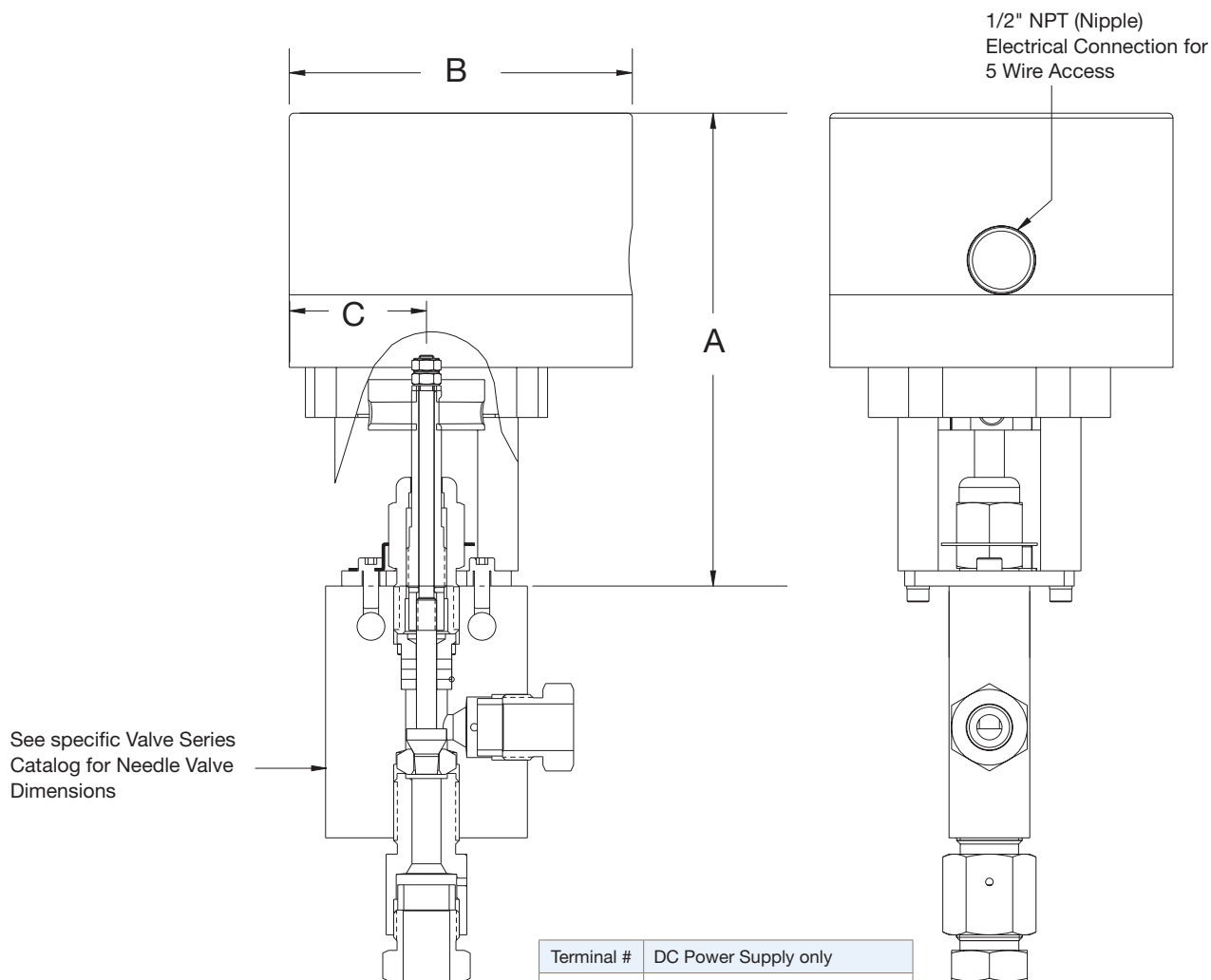
Warning: Do not connect terminal 4 directly or through a Multimeter, to ground. A sensing resistor of 50 ohms or more needs to be present or damage will occur.

# Dimensional information:

Electric Actuator: FRC2X

## Dimensional Information:

Valve Series	Dimensions: inches (mm)		
	A	B	C
1/2" & 3/4" NPT - P Series 1/2" Low Pressure - SW Series 9/16" & 3/4" SM Series Medium Pressure	5.57 (141.4)	4.25 (108)	3.00 (76)



Terminal #	DC Power Supply only
6	+24 VDC
5	Power Ground
4	Output Signal (4-20 mA)
3	Not Connected
2	Isolated Input Signal GND
1	Isolated Input +Signal (4.30mA)

Warning: Do not connect terminal 4 directly or through a Multimeter, to ground. A sensing resistor of 50 ohms or more needs to be present or damage will occur.

Basic Repair Kits
For <b>Valves</b> - See specific Manual Valve brochure for valve repair parts and Manual Needle Valve IOM manual for instructions.
For <b>FRC2X Explosion Proof Actuator</b> - Replace entire Actuator using Part Number AE003534
For <b>FRC2X Gear Reduction/Mounting Kit</b> : Part Number AE003535

# Parker's Motion & Control Technologies

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MARKET	KEY MARKETS	KEY PRODUCTS		
 <b>AEROSPACE</b>	Aircraft Engines Commercial Commerical Transports Military Aircraft Regional Transports	Business and General Aviation Land-Based Weapons Systems Missiles and Launch Vehicles Unmanned Aerial Vehicles	Flight Control Systems & Components Fluid Conveyance Systems Fluid Metering Delivery & Atomization Devices Fuel Systems & Components	Hydraulic Systems & Components Inert Nitrogen Generating Systems Pneumatic Systems & Components Wheels & Brakes
 <b>CLIMATE CONTROL</b>	Agriculture Food, Beverage and Dairy Precision Cooling Transportation	Air Conditioning Life Sciences & Medical Processing	Co2 Controls Electronic Controllers Filter Driers Hand Shut-Off Valves Hose & Fittings	Pressure Regulating Valves Refrigerant Distributors Safety Relief Valves Solenoid Valves Thermostatic Expansion Valves
 <b>ELECTRO-MECHANICAL</b>	Aerospace Life Science & Medical Packaging Machinery Plastics Machinery & Converting Semiconductor & Electronics Factory Automation	Machine Tools Paper Machinery Primary Metals Textile Wire & Cable	AC/DC Drives & Systems Electric Actuators, Gantry Robots & Slides Electrohydrostatic Actuation Systems Electromechanical Actuation Systems Human Machine Interface	Linear Motors Stepper Motors, Servo Motors Drives & Controls Structural Extrusions
 <b>FILTRATION</b>	Food & Beverage Life Sciences Mobile Equipment Power Generation Transportation	Industrial Machinery Marine Oil & Gas Process	Analytical Gas Generators Compressed Air & Gas Filters Condition Monitoring Engine Air, Fuel & Oil Filtration & Systems	Hydraulic, Lubrication & Coolant Filters Process, Chemical, Water Microfiltration Filters Nitrogen, Hydrogen & Zero Air Generators
 <b>FLUID and GAS HANDLING</b>	Aerospace Agriculture Bulk Chemical Handling Construction Machinery Food & Beverage Fuel & Gas Delivery	Industrial Machinery Mobile Oil & Gas Transportation Welding	Brass Fittings & Valves Diagnostic Equipment Fluid Conveyance Systems Industrial Hose	PTFE & PFA Hose, Tubing & Plastic Fittings Rubber & Thermoplastic Hose & Couplings Tube Fittings & Adapters Quick Disconnects
 <b>HYDRAULICS</b>	Aerospace Aerial lift Agriculture Construction Machinery Forestry	Industrial Machinery Mining Oil & Gas Power Generation & Energy Truck Hydraulics	Diagnostic Equipment Hydraulic Cylinders & Accumulators Hydraulic Motors & Pumps Hydraulic Systems Hydraulic Valves & Controls	Power Take-Offs Rubber & Thermoplastic Hose & Couplings Tube Fittings & Adapters Quick Disconnects
 <b>PNEUMATICS</b>	Aerospace Conveyor & Material Handling Factory Automation Life Science & Medical	Machine Tools Packaging Machinery Transportation & Automotive	Air Preparation Brass Fittings & Valves Manifolds Pneumatic Accessories Pneumatic Actuators & Grippers Pneumatic Valves & Controls	Quick Disconnects Rotary Actuators Rubber & Thermoplastic Hose & Couplings Structural Extrusions Thermoplastic Tubing & Fittings Vacuum Generators, Cups & Sensors
 <b>PROCESS CONTROL</b>	Chemical & Refining Food, Beverage & Dairy Medical & Dental	Microelectronics Oil & Gas Power Generation	Analytical Sample Conditioning Products & Systems Fluoropolymer Chemical Delivery Fittings, Valves & Pumps High Purity Gas Delivery Fittings, & Valves & Regulators	Instrumentation Fittings, Valves Regulators Medium Pressure Fittings & Valves Process Control Manifolds
 <b>SEALING and SHIELDING</b>	Aerospace Chemical Processing Consumer Energy, Oil & Gas Fluid Power General Industrial	Information Technology Life Sciences Military Semiconductor Transportation	Dynamic Seals Elastomeric O-Rings Emi Shielding Extruded & Precision-Cut, Fabricated Elastomeric Seals	Homogeneous & Inserted Elastomeric Shapes High Temperature Metal Seals Metal & Plastic Retained Composite Seals Thermal Management

# Parker Worldwide

## North America

**USA** – Corporate, Cleveland, OH  
Tel: +1 256 896 3000

**USA** – IPD, Huntsville, AL  
Tel: +1 256 881 2040  
ipdcct@parker.com

**USA** – IPD, (Autoclave), Erie, PA  
Tel: +1 814 860 5700  
ipdaect@parker.com

**CA** – Canada, Grimsby, Ontario  
Tel: +1 905-945-2274  
ipd\_canada@parker.com

## South America

**AR** – Argentina, Buenos Aires  
Tel: +54 3327 44 4129  
falecom@parker.com

**BR** – Brazil, Diadema, SP  
Tel: +55 11 4360 6700  
falecom@parker.com

**CL** – Chile, Santiago  
Tel: +56 (0) 2 2303 9640  
falecom@parker.com

**MX** – Mexico, Toluca  
Tel: +52 722 275 4200  
contacto@parker.com

## Asia Pacific

**AU** – Australia, Dandenong  
Tel: +61 (0)2 9842 5150  
customer.service.au@parker.com

**CN** – China, Shanghai  
Tel: +86 21 2899 5000  
INGtechnical.china@parker.com

**HK** – Hong Kong  
Tel: +852 2428 8008

**IN** – India, Mumbai  
Tel: +91 22 6513 7081-85

**ID** – Indonesia, Tangerang  
Tel: +62 2977 7900  
parker.id@parker.com

**JP** – Japan, Tokyo  
Tel: +(81) 3 6365 4020  
infophj@parker.com

**KR** – South Korea, Seoul  
Tel: +82 2 559 0400  
parkerkr@parker.com

**MY** – Malaysia, Selangor  
Tel: +603 784 90 800  
parkermy@parker.com

**SG** – Singapore,  
Tel: +65 6887 6300  
parkerkg@parker.com

**TH** – Thailand, Bangkok  
Tel: +66 2 186 7000  
phthailand@parker.com

**TW** – Taiwan, Taipei  
Tel: +886 2 2298 8987  
enquiry.taiwan@parker.com

**VN** – Vietnam, Hochi Minh City  
Tel: +848 382 508 56  
parker\_viet@parker.com

## Europe, Middle East, Africa

**AE** – UAE, Dubai  
Tel: +971 4 812 7100  
parker.me@parker.com

**AT** – Austria, Wiener Neustadt  
Tel: +43 (0)2622 23501-0  
parker.austria@parker.com

**AT** – Eastern Europe, Wiener Neustadt  
Tel: +43 (0)2622 23501 900  
parker.easteurope@parker.com

**AZ** – Azerbaijan, Baku  
Tel: +994 50 2233 458  
parker.azerbaijan@parker.com

**BE/LU** – Belgium, Nivelles  
Tel: +32 (0)67 280 900  
parker.belgium@parker.com

**BG** – Bulgaria, Sofia  
Tel: +359 2 980 1344  
parker.bulgaria@parker.com

**BY** – Belarus, Minsk  
Tel: +48 (0)22 573 24 00  
parker.belarus@parker.com

**CH** – Switzerland, Etoy  
Tel: +41 (0) 21 821 87 00  
parker.switzerland@parker.com

**CZ** – Czech Republic, Klecany  
Tel: +420 284 083 111  
parker.czechrepublic@parker.com

**DE** – Germany, Kaarst  
Tel: +49 (0)2131 4016 0  
parker.germany@parker.com

**DK** – Denmark, Ballerup  
Tel: +45 43 56 04 00  
parker.denmark@parker.com

**ES** – Spain, Madrid  
Tel: +34 902 33 00 01  
parker.spain@parker.com

**FI** – Finland, Vantaa  
Tel: +358 (0)20 753 2500  
parker.finland@parker.com

**FR** – France, Contamine s/Arve  
Tel: +33 (0)4 50 25 80 25  
parker.france@parker.com

**GR** – Greece, Athens  
Tel: +30 210 933 6450  
parker.greece@parker.com

**HU** – Hungary, Budapest  
Tel: +36 223 885 470  
parker.hungary@parker.com

**IE** – Ireland, Dublin  
Tel: +353 (0)1 466 6370  
parker.ireland@parker.com

**IT** – Italy, Corsico (MI)  
Tel: +39 02 45 19 21  
parker.italy@parker.com

**KZ** – Kazakhstan, Almaty  
Tel: +7 7273 561 000  
parker.easteurope@parker.com

**NL** – The Netherlands, Oldenzaal  
Tel: +31 (0)541 585 000  
parker.nl@parker.com

**NO** – Norway, Stavanger  
Tel: +47 66 75 34 00  
parker.norway@parker.com

**PL** – Poland, Warsaw  
Tel: +48 (0)22 573 24 00  
parker.poland@parker.com

**PT** – Portugal, Leca da Palmeira  
Tel: +351 22 999 7360  
parker.portugal@parker.com

**RO** – Romania, Bucharest  
Tel: +40 21 252 1382  
parker.romania@parker.com

**RU** – Russia, Moscow  
Tel: +7 495 645-2156  
parker.russia@parker.com

**SE** – Sweden, Spånga  
Tel: +46 (0)8 59 79 50 00  
parker.sweden@parker.com

**SK** – Slovakia, Banská Bystrica  
Tel: +421 484 162 252  
parker.slovakia@parker.com

**SL** – Slovenia, Novo Mesto  
Tel: +386 7 337 6650  
parker.slovenia@parker.com

**TR** – Turkey, Istanbul  
Tel: +90 216 4997081  
parker.turkey@parker.com

**UA** – Ukraine, Kiev  
Tel: +48 (0)22 573 24 00  
parker.ukraine@parker.com

**UK** – United Kingdom, Warwick  
Tel: +44 (0)1926 317 878  
parker.uk@parker.com

**ZA** – South Africa, Kempton Park  
Tel: +27 (0)11 961 0700  
parker.southafrica@parker.com

### ! CAUTION !

Do not mix or interchange component parts or tubing with those of other manufacturers. Doing so is unsafe and will void warranty.

Parker Autoclave Engineers Valves, Fittings, and Tools are not designed to interface with common commercial instrument tubing and are designed to only connect with tubing manufactured to Parker Autoclave Engineers AES specifications. Failure to do so is unsafe and will void warranty.

### WARNING

**FAILURE, IMPROPER SELECTION OR IMPROPER USE OF THE PRODUCTS AND/OR SYSTEMS DESCRIBED HEREIN OR RELATED ITEMS CAN CAUSE DEATH, PERSONAL INJURY AND PROPERTY DAMAGE.**

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Instrumentation Products Division  
Autoclave Engineers Operation  
8325 Hessinger Drive  
Erie, PA 16509-4679  
Tel: 814 860 5700  
Fax: 814 860 5811

Instrumentation Products Division  
Division Headquarters  
1005 A Cleaner Way  
Huntsville, AL 35805 USA  
Tel: 256 881 2040  
Fax: 256 881 5072