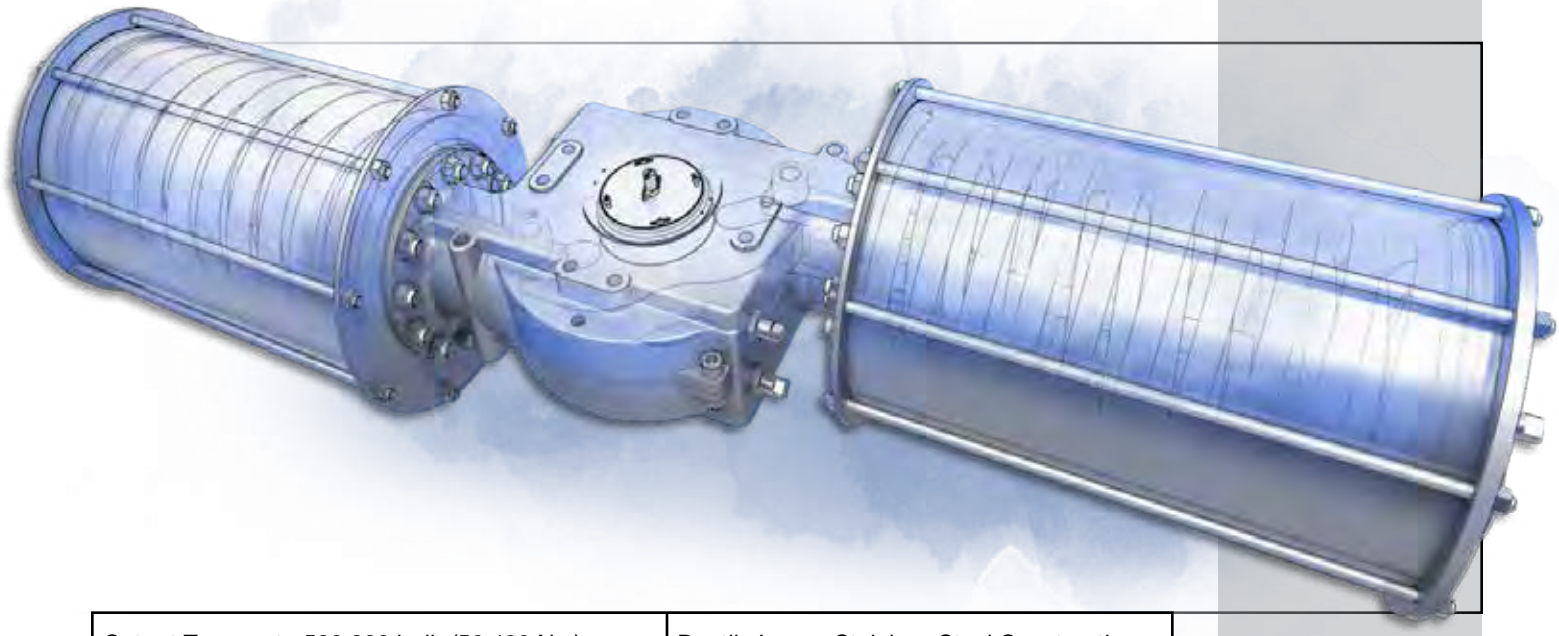
F SERIES

QUARTER-TURN PNEUMATIC & FLUID POWER ACTUATOR – **PRODUCT BULLETIN**



Output Torques to 500,000 in-lb (56,492 Nm) Temperatures from -76ºF to 450ºF (-60ºC to 232ºC)	Ductile Iron or Stainless Steel Construction Double-Acting and Spring-Return Models

HIGH CYCLE LIFE, HIGH SPEED, HIGH RELIABILITY

QTRCO

The Leader in Actuator Technology

F SERIES PRODUCT BULLETIN REVISION LOG DCN00651(17)

Date	Modifications
August 2015	Complete update of design & data
January 2016	Updates
June 2016	Update Metric weight label
October 2016	Incorporate Hydraulic Operation
November 2016	Environmental Ingress Protection

TABLE OF CONTENTS

OPERATION AND PIPING

F2 series actuators may be operated with instrument air, hydraulic fluid, water, or other power gases and fluids. Always ensure that the materials of construction are compatible with the application and that the pressure does not exceed the maximum allowable.

Environmental Ingress Protection (Submerged Service)

F2-Series actuators are capable of achieving IP67 and IP68 ratings for continuous immersion up to a depth of 10 meters. Double acting versions may achieve the IP67 and IP68 ratings by tubing in the normal manner and then plugging the actuator body ports using appropriate thread sealant. For spring return actuators, the IP67 and IP68 ratings may be achieved by one of three methods:

1. The actuator body ports may be fitted with filters or strainers, allowing fluid to enter the actuator body. This method may only be used if the submersion fluid is compatible with the actuator materials of construction and lubricants. Because the fluid will not adversely affect actuator operation, IP68 requirements will still be met. This method may reduce stroke speed depending on the flow capacity of the filter.
2. The actuator breather port may be plugged using appropriate thread sealant. This method may slightly reduce air torque output due to compression of the air trapped in the actuator body.
3. The actuator breather port may be piped to a non-submerged location and fitted with a filter or strainer device.

For the highest level of safety, QTRCO recommends method 3: piping the breather port to a non-submerged location. For F2-Series actuators, the IP67 and IP68 ratings must be requested at the time of order.

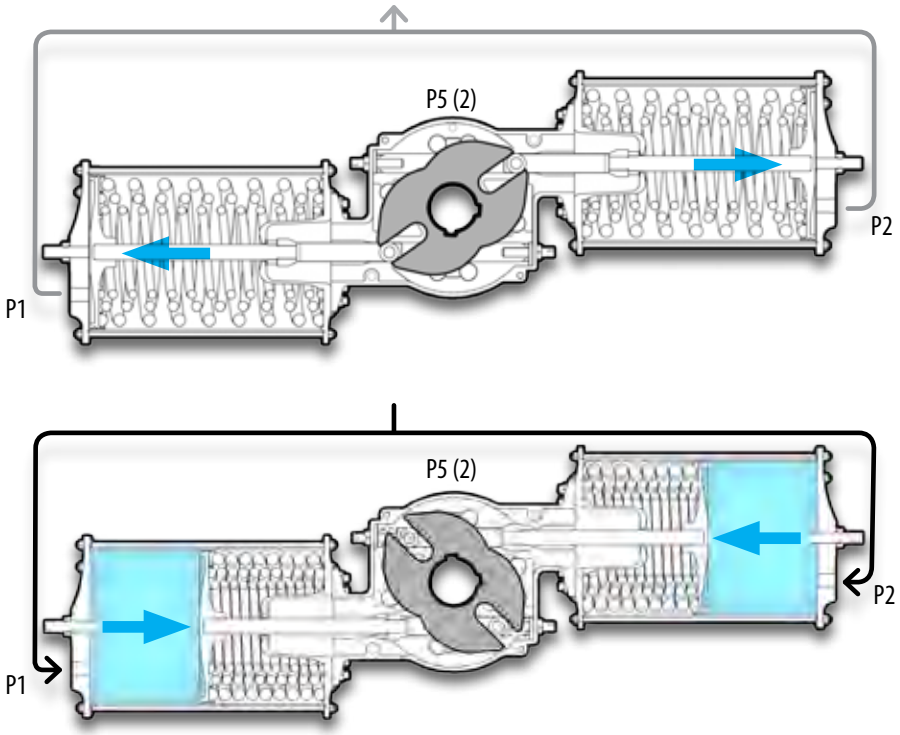
All QTRCO actuators are shipped in the Fail-Close or Left-Hand orientation unless ordered as Fail-Open or Right-Hand. The mode of operation may be reversed in the field simply by turning the actuator top-side down.

1. **Fail-Close (Left-Hand):** pressure on the end cap port(s) pushes the piston(s) inward resulting in counterclockwise rotation. Exhaustion of pressure allows springs to push outward on the piston and cause clockwise rotation.
2. **Fail-Open (Right-Hand):** pressure on the end cap port(s) pushes the piston(s) inward resulting in clockwise rotation. Exhaustion of pressure allows springs push outward on the piston and cause counterclockwise rotation.
3. **Double Acting (Left-Hand):** pressure on the end cap port(s) pushes the piston(s) inward and causes counterclockwise rotation. Pressure on the body port pushes outward on the piston(s) and cause clockwise rotation.
4. **Double Acting (Right-Hand):** pressure on the end cap port(s) pushes the piston(s) inward and causes clockwise rotation. Pressure on the body port pushes outward on the piston(s) and cause counterclockwise rotation.

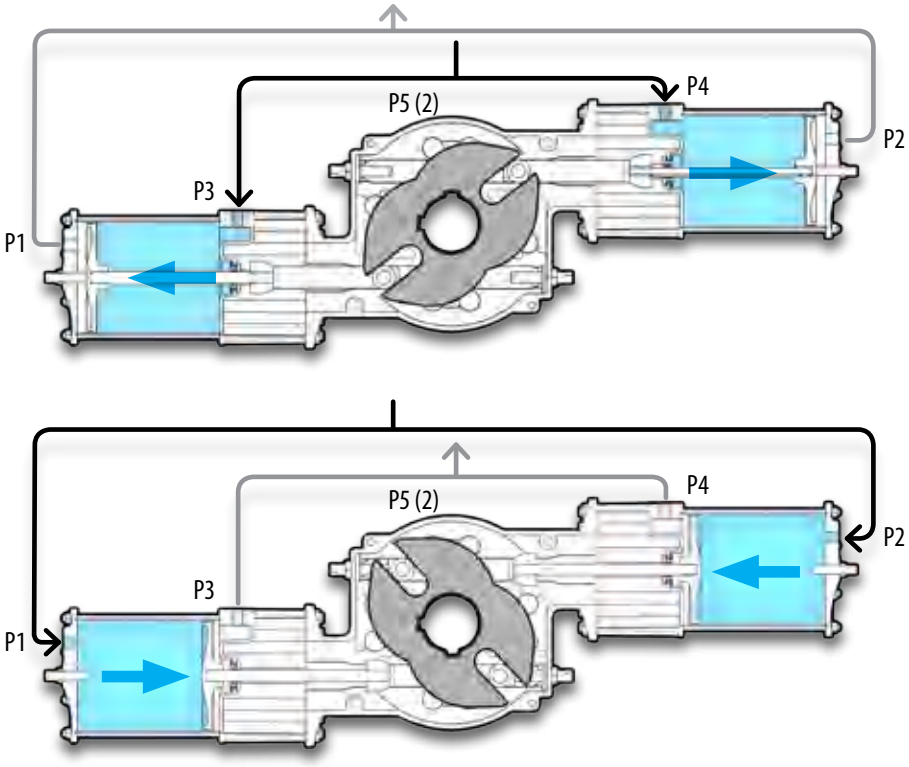
PIPING GUIDELINES:

1. Both endcap pressure ports P1 and P2 must be pressurized simultaneously for proper operation.
2. Pressure ports P1 and P2 are typically connected together and powered by a single pathway.
3. For all Double Acting (DA) models, both base plate pressure ports P3 and P4 must be pressurized simultaneously for proper operation. These ports are not present on SR models.
4. Pressure ports P3 and P4 are typically connected together and powered by a single pathway. Body ports P5 and P6 (shown in dimensional drawing on page 6) are breather ports which should be fitted with a strainer on SR models and may be plugged on DA models.

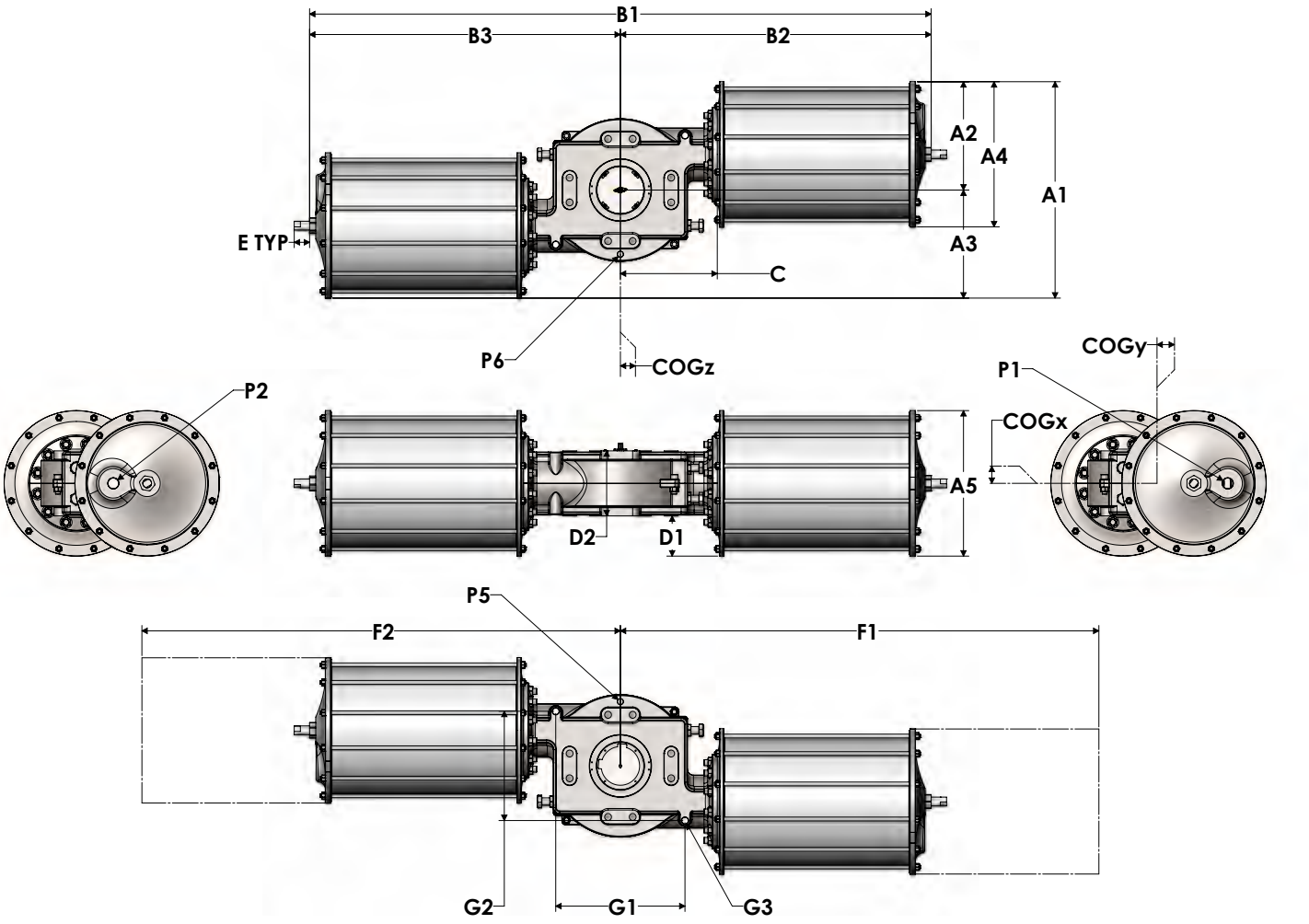
SPRING RETURN (SR)



DOUBLE ACTING (DA)

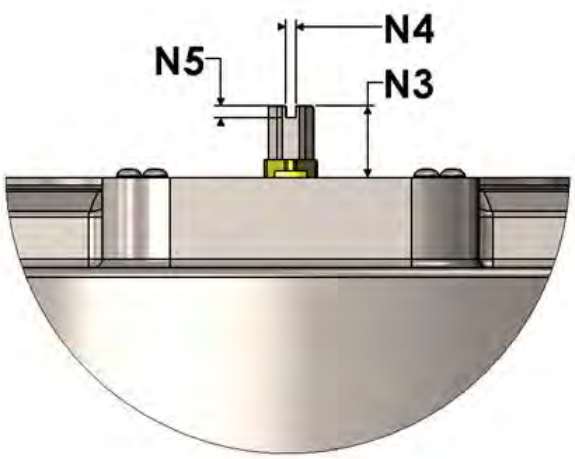


Dimensions and Technical Data

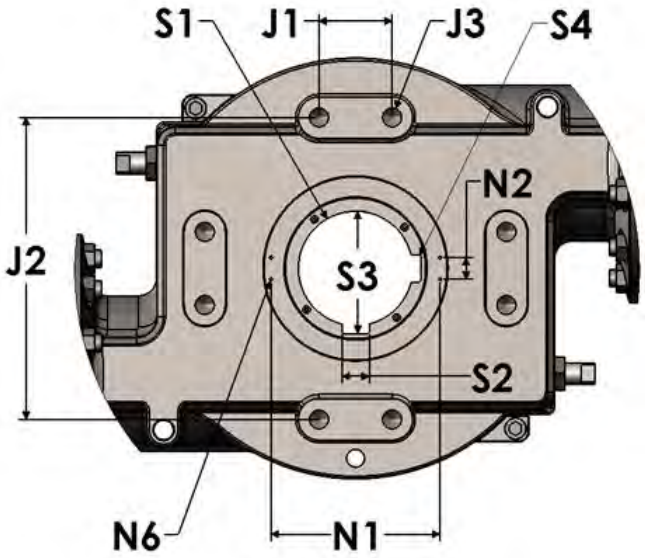


Dimensions and Technical Data

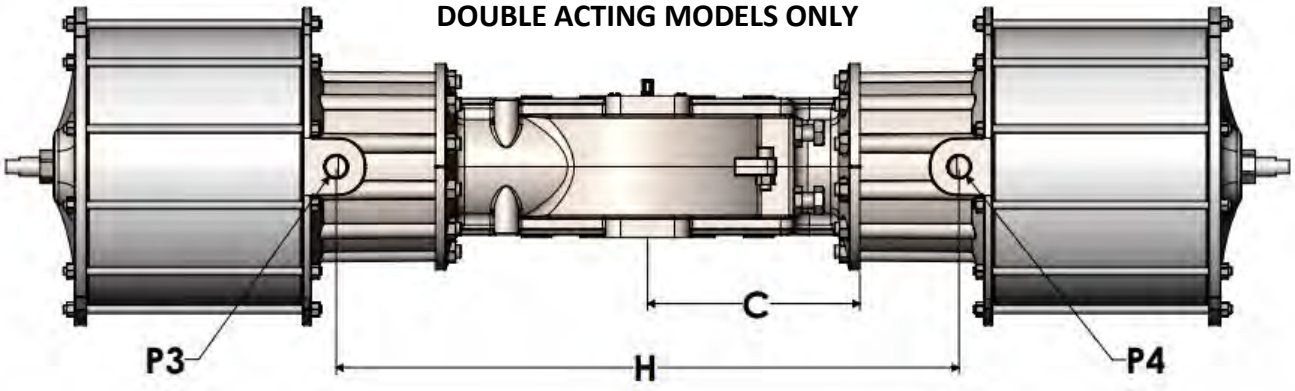
NAMUR TOP HAT DIMENSIONS



MOUNTING DIMENSIONS



DIMENSIONS BELOW FOR DOUBLE ACTING MODELS ONLY



Dimensions and Technical Data (Imperial, Inches)

ENVELOPE DIMENSIONS		2200		2250				2300			
		DA06	SR06	DA06	DA08	SR08	SR10	DA08	DA10	DA12	SR12
Width Total	**A1**	10.50	10.50	10.50	13.19	13.19	17.50	14.80	18.50	20.70	20.80
Width Side 1	**A2**	5.25	5.25	5.25	6.59	6.59	8.75	7.40	9.25	10.35	10.40
Width Side 2	**A3**	5.25	5.25	5.25	6.59	6.59	8.75	7.40	9.25	10.35	10.40
Width Cylinder	**A4**	6.50	6.50	6.50	8.75	8.75	12.50	8.75	12.50	14.80	14.80
Height Cylinder	**A5**	6.50	6.50	6.50	8.75	8.75	12.50	8.75	12.50	14.80	14.80
Length Total	**B1**	31.40	37.20	40.20	41.40	43.40	45.00	47.00	48.50	49.00	58.00
Length Side 1	**B2**	15.70	18.60	20.10	20.70	21.70	22.50	23.50	24.20	24.50	29.00
Length Side 2	**B3**	15.70	18.60	20.10	20.70	21.70	22.50	23.50	24.20	24.50	29.00
Flange Distance	**C**	6.38	6.38	7.41	7.41	7.41	7.41	10.19	12.50	12.00	10.19
Flange Depth	**D1**	1.22	1.22	0.05	1.57	1.44	3.44	1.20	3.07	4.21	4.21
Body Depth	**D2**	4.10	4.10	5.60	5.60	5.60	5.60	6.40	6.40	6.40	6.40
Stop Extension	**E TYP**	0.66	0.72	0.66	0.43	0.43	0.86	0.80	1.30	1.30	1.15
Maint Clearance	**F1**	23	30	28	29	34	35	34	33	33	45
Maint Clearance	**F2**	23	30	28	29	34	35	34	33	33	45
Lifting Eye Dim X	**G1**										
Lifting Eye Dim Y	**G2**										
Lifting Eye Diameter	**G3**										
P3 - P4 Distance	**H**	14.1		20.0	19.5			22.8	25.1	24.1	

MOUNTING PATTERN

Pattern X	J1	1.75	1.75	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Pattern Y	J2	6.50	6.50	8.00	8.00	8.00	8.00	9.00	9.00	9.00	9.00
Thread Type	J3	M12-1.75	M12-1.75	M16-2	M16-2	M16-2	M16-2	M16-2	M16-2	M16-2	M16-2
Thread Depth		0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75

NAMUR PATTERN

Length	N1	5.118	5.118	5.118	5.118	5.118	5.118	5.118	5.118	5.118	5.118
Width	N2	1.181	1.181	1.181	1.181	1.181	1.181	1.181	1.181	1.181	1.181
Height	N3	1.181	1.181	1.181	1.181	1.181	1.181	1.181	1.181	1.181	1.181
Slot Width	N4	0.157	0.157	0.157	0.157	0.157	0.157	0.157	0.157	0.157	0.157
Slot Depth	N5	0.197	0.197	0.197	0.197	0.197	0.197	0.197	0.197	0.197	0.197
Thread	N6	M5-0.8	M5-0.8	M5-0.8	M5-0.8	M5-0.8	M5-0.8	M5-0.8	M5-0.8	M5-0.8	M5-0.8
Thread Depth		0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38

The namur slotted drive can be moved to the opposite side for field reversibility

Dimensions and Technical Data (Imperial, Inches)

DRIVE DIMENSIONS		2200		2250				2300			
		DA06	SR06	DA06	DA08	SR08	SR10	DA08	DA10	DA12	SR12
Shaft Bore	**S1**	2.000	2.000	2.000	2.000	2.000	2.000	2.500	2.500	2.500	2.500
Key Width	**S2**	0.3125	0.3125	0.375	0.375	0.375	0.375	0.500	0.500	0.500	0.500
Female Key Distance	**S3**	2.147	2.147	2.174	2.174	2.174	2.174	2.729	2.729	2.729	2.729
Key Corner Radius	**S4**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Max Engagement		3.63	3.63	5.13	5.13	5.13	5.13	5.88	5.87	5.88	5.87

Shafts have two keyways 90 degrees apart. Only one keyway is required to transmit torque.
Max engagement shown with tophat. Removal of tophat allows shaft to extend through the actuator bore.

AIR/FLUID VOLUME cubic inches (cuin)	BODY SIDE	306		335	701			788	1,071	1,539	
	ENDCAP SIDE	273		370	589	589	943	686	1,122	1,640	1,640
PORT SIZE NPT (P1, P2, P3, P4)	NORMAL	1/4""	1/4"	1/4"	1/4"	1/4"	1/2"	1/4"	1/2"	1"	1"
	MAX	1"	1"	1"	1"	1"	1 ½"	1"	1 ½"	2 ½"	2 ½"
NPT (P5, P6)	STD.	1/4"	1/4"	1/4"	1/4"	1/4"	1/4"	1/4"	1/4"	1/4"	1/4"
STROKE TIME seconds	MIN	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25

Stroke time varies with supply pressure, temperature, spring rate, travel adjustment, working medium, and valve torque. Values shown with no valve resistance. Contact factory about faster stroke speeds.

CENTER OF GRAVITY	COGx	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	COGy	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.05	0.13	0.03
	COGz	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
WEIGHT pounds (lb)	Stainless (FS)	90	S1: 120 S2: 117 S3: 116	136	176	S1: 222 S2: 218 S3: 216	S1: 331 S2: 301 S3: 287	230	322	397	S1: 560 S2: 529 S3: 496 S4: 493
	Ductile (FD)	78	S1: 112 S2: 109 S3: 108	118	153	S1: 208 S2: 204 S3: 202	S1: 265 S2: 235 S3: 257	200	280	345	S1: 476 S2: 445 S3: 412 S4: 409
MAX RATED TORQUE in-lb		**10,000**	**10,000**	**20,000**	**20,000**	**20,000**	**20,000**	**40,000**	**40,000**	**40,000**	**40,000**
MAX PRESSURE psig		**150**	**150**	**150**	**150**	**150**	**120**	**150**	**120**	**120**	**120**

TEMPERATURE LIMITS

LOW	STANDARD	HIGH
-60ºF to 185ºF	-20ºF to 185ºF	-20ºF to 400ºF

Environmental temperature requirements may limit the use of certain trim materials. Temperature ranges may be extended with proper insulation. Ductile iron units may be used in low temperature (less than -28ºC), but stroke speed should be limited to prevent brittle fracture. Extended temperature ranges available upon request.

Dimensions and Technical Data (Imperial, Inches)

ENVELOPE DIMENSIONS		2375			2488				2575				
		DA10	DA12	SR16	DA12	DA16	SR16	SR20	DA12	DA16	DA20	SR20	SR24
Width Total	**A1**	20.25	22.30	26.50	24.20	28.50	28.50	33.20	26.75	30.22	34.96	35.00	39.00
Width Side 1	**A2**	10.13	11.15	13.25	12.10	14.25	14.25	16.60	13.375	15.11	17.48	17.50	19.50
Width Side 2	**A3**	10.13	11.15	13.25	12.10	14.25	14.25	16.60	13.375	15.11	17.48	17.50	19.50
Width Cylinder	**A4**	12.70	14.80	19.00	14.80	19.00	18.70	23.40	15.25	18.7	23.4	23.40	27.40
Height Cylinder	**A5**	12.70	14.80	19.00	14.80	19.00	18.75	23.40	15.25	18.75	23.4	23.40	27.40
Length Total	**B1**	58.000	58.60	69.00	69.00	70.80	90.20	92.60	86	86	90.2	99.00	101.00
Length Side 1	**B2**	29.00	29.30	34.50	34.50	35.40	45.10	46.30	43	43	45.1	49.50	50.50
Length Side 2	**B3**	29.00	29.30	34.50	34.50	35.40	45.10	46.30	43	43	45.1	49.50	50.50
Flange Distance	**C**	11.06	11.06	11.06	13.13	13.13	13.13	13.13	15.75	15.75	15.75	15.75	15.75
Flange Depth	**D1**	2.90	3.90	6.10	3.00	5.10	5.10	7.50	2.52	4.066	6.5	6.50	8.50
Body Depth	**D2**	6.90	6.90	6.90	8.50	8.50	8.50	8.50	10.5	10.5	10.5	10.50	10.50
Stop Extension	**E TYP**	0.63	1.35	1.50	1.30	1.50	1.50	2.50	1.24	2.3	2.5	3.50	4.75
Maint Clearance	**F1**	40	40	55	48	49	74	75	59	58	61	80	81
Maint Clearance	**F2**	40	40	55	48	49	74	75	59	58	61	80	81
Lifting Eye Dim X	**G1**	12.26	12.26	12.29	9.00	9.00	9.00	9.00	9.91	9.91	9.91	9.91	9.91
Lifting Eye Dim Y	**G2**	6.38	6.38	6.38	7.30	7.30	7.30	7.30	8.83	8.83	8.83	8.83	8.83
Lifting Eye Diameter	**G3**	1.13	1.13	1.13	0.94	0.94	0.94	0.94	1.06	1.06	1.06	1.06	1.06
P3 - P4 Distance	**H**	30.2	29.7		34.5	35.2			44.1	47.0	46.2		
MOUNTING PATTERN													
Pattern X	J1	2.50	2.50	2.50	3.00	3.00	3.00	3.00	4.00	4.00	4.00	4.00	4.00
Pattern Y	J2	11.00	11.00	11.00	14.00	14.00	14.00	14.00	16.50	16.50	16.50	16.50	16.50
Thread Type	J3	M20-2.5	M20-2.5	M20-2.5	M24-3	M24-3	M24-3	M24-3	M30-3.5	M30-3.5	M30-3.5	M30-3.5	M30-3.5
Thread Depth		1.00	1.00	1.00	1.50	1.50	1.50	1.50	1.5	1.5	1.5	1.5	1.5
NAMUR PATTERN													
Length	N1	5.906	5.906	5.906	7.480	7.480	7.480	7.480	9.252	9.252	9.252	9.252	9.252
Width	N2	1.181	1.181	1.181	1.181	1.181	1.181	1.181	1.181	1.181	1.181	1.181	1.181
Height	N3	1.181	1.181	1.181	1.181	1.181	1.181	1.181	1.181	1.181	1.181	1.181	1.181
Slot Width	N4	0.157	0.157	0.157	0.157	0.157	0.157	0.157	0.157	0.157	0.157	0.157	0.157
Slot Depth	N5	0.197	0.197	0.197	0.197	0.197	0.197	0.197	0.197	0.197	0.197	0.197	0.197
Thread	N6	M5-0.8	M5-0.8	M5-0.8	M5-0.8	M5-0.8	M5-0.8	M5-0.8	M5-0.8	M5-0.8	M5-0.8	M5-0.8	M5-0.8
Thread Depth		0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38

The namur slotted drive can be moved to the opposite side for field reversibility

Dimensions and Technical Data (Imperial, Inches)

DRIVE DIMENSIONS		2375			2488				2575				
		DA10	DA12	SR16	DA12	DA16	SR16	SR20	DA12	DA16	DA20	SR20	SR24
Shaft Bore	**S1**	3.500	3.500	3.500	4.750	4.750	4.750	4.750	6.250	6.250	6.250	6.250	6.250
Key Width	**S2**	0.500	0.500	0.500	1.250	1.250	1.250	1.250	1.500	1.500	1.500	1.500	1.500
Female Key Distance	**S3**	3.729	3.729	3.729	5.120	5.120	5.120	5.120	6.690	6.690	6.690	6.690	6.690
Key Corner Radius	**S4**	0.00	0.00	0.00	0.06	0.06	0.06	0.06	0.13	0.13	0.13	0.13	0.13
Max Engagement		6.38	6.38	6.38	8.00	8.00	8.00	8.00	10.00	10.00	10.00	10.00	10.00

Shafts have two keyways 90 degrees apart. Only one keyway is required to transmit torque.
Max engagement shown with tophat. Removal of tophat allows shaft to extend through the actuator bore.

AIR/FLUID VOLUME cubic inches (cuin)	BODY SIDE	1,305	1,913		2,395	4,393			2,911	5,114	8,260		
	ENDCAP SIDE	1,344	2,033	3,607	2,604	4,613	4,613	7,273	3,055	5,407	8,518	8,518	12,403
PORT SIZE NPT (P1, P2, P3, P4)	NORMAL	1/2"	1"	1 ½"	1"	1 ½"	1 ½"	1 ½"	1"	1 ½"	1 ½"	1 ½"	1 ½"
	MAX	1 ½"	2 ½"	3"	2 ½"	3"	3"	3"	2 ½"	3"	3"	3"	4"
NPT (P5, P6)	STD.	3/8"	3/8"	3/8"	1/2"	1/2"	1/2"	1/2"	3/4"	3/4"	3/4"	3/4"	3/4"
STROKE TIME seconds	MIN	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5

Stroke time varies with supply pressure, temperature, spring rate, travel adjustment, working medium, and valve torque. Values shown with no valve resistance. Contact factory about faster stroke speeds.

CENTER OF GRAVITY	COGx	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	COGy	0.03	0.08	0.02	0.10	0.10	0.00	0.00	0.00	0.00	0.10	0.00	0.00
	COGz	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.00	0.00	0.00
WEIGHT pounds (lb)	Stainless (FS)	439	512	S1: 1,009 S2: 967 S3: 893 S4: 913 S5: 797	702	916	S1: 1,623 S2: 1,383 S3: 1,227	S1: 2,104 S2: 1,864 S3: 1,708	1,143	1,329	1,759	S1: 3,049 S2: 2,829 S3: 2,671 S4: 2,515	S1: 4,243 S2: 4,017 S3: 3,845 S4: 3,553 S5: 3,347 S6: 3,175
	Ductile (FD)	382	445	S1: 918 S2: 876 S3: 802 S4: 822 S5: 706	617	789	S1: 1,426 S2: 1,186 S3: 1,030	S1: 1,809 S2: 1,569 S3: 1,413	1,015	1,161	1,521	S1: 2,837 S2: 2,617 S3: 2,459 S4: 2,303	S1: 3,809 S2: 3,583 S3: 3,411 S4: 3,119 S5: 2,913 S6: 2,741
MAX RATED TORQUE in-lb		**80,000**	**80,000**	**80,000**	**200,000**	**200,000**	**200,000**	**200,000**	**500,000**	**500,000**	**500,000**	**500,000**	**500,000**
MAX PRESSURE psig		**120**	**120**	**120**	**120**	**120**	**120**	**120**	**120**	**120**	**120**	**120**	**100**

TEMPERATURE LIMITS

LOW	STANDARD	HIGH
-60ºF to 185ºF	-20ºF to 185ºF	-20ºF to 400ºF

Environmental temperature requirements may limit the use of certain trim materials. Temperature ranges may be extended with proper insulation. Ductile iron units may be used in low temperature (less than -28ºC), but stroke speed should be limited to prevent brittle fracture. Extended temperature ranges available upon request.

Dimensions and Technical Data (Metric, Millimeters)

ENVELOPE DIMENSIONS		2200		2250				2300			
		DA06	SR06	DA06	DA08	SR08	SR10	DA08	DA10	DA12	SR12
Width Total	**A1**	266.7	266.7	266.7	334.9	334.9	444.5	375.9	469.9	525.8	528.3
Width Side 1	**A2**	133.4	133.4	133.4	167.4	167.4	222.3	188.0	235.0	262.9	264.2
Width Side 2	**A3**	133.4	133.4	133.4	167.4	167.4	222.3	188.0	235.0	262.9	264.2
Width Cylinder	**A4**	165.1	165.1	165.1	222.3	222.3	317.5	222.3	317.5	375.9	375.9
Height Cylinder	**A5**	165.1	165.1	165.1	222.3	222.3	317.5	222.3	317.5	375.9	375.9
Length Total	**B1**	797.6	944.9	1021.1	1051.6	1102.4	1143.0	1193.8	1231.9	1244.6	1473.2
Length Side 1	**B2**	398.8	472.4	510.5	525.8	551.2	571.5	596.9	614.7	622.3	736.6
Length Side 2	**B3**	398.8	472.4	510.5	525.8	551.2	571.5	596.9	614.7	622.3	736.6
Flange Distance	**C**	161.9	161.9	188.1	188.1	188.1	188.1	258.8	317.5	304.8	258.8
Flange Depth	**D1**	31.0	31.0	1.1	39.9	36.6	87.4	30.5	78.0	106.9	106.9
Body Depth	**D2**	104.1	104.1	142.2	142.2	142.2	142.2	162.6	162.6	162.6	162.6
Stop Extension	**E TYP**	16.6	18.3	16.6	10.9	10.9	21.8	20.3	33.0	33.0	29.2
Maint Clearance	**F1**	576.6	750.8	720.6	748.0	870.0	893.6	851.9	831.3	843.3	1148.1
Maint Clearance	**F2**	576.6	750.8	720.6	748.0	870.0	893.6	851.9	831.3	843.3	1148.1
Lifting Eye Dim X	**G1**										
Lifting Eye Dim Y	**G2**										
Lifting Eye Diameter	**G3**										
P3 - P4 Distance	**H**	358.1		508.0	495.3			579.1	637.5	612.1	

MOUNTING PATTERN

Pattern X	J1	44.45	44.45	50.80	50.80	50.80	50.80	50.80	50.80	50.80	50.80
Pattern Y	J2	165.10	165.10	203.20	203.20	203.20	203.20	228.60	228.60	228.60	228.60
Thread Type	J3	M12-1.75	M12-1.75	M16-2	M16-2	M16-2	M16-2	M16-2	M16-2	M16-2	M16-2
Thread Depth		19.05	19.05	19.05	19.05	19.05	19.05	19.05	19.05	19.05	19.05

NAMUR PATTERN

Length	N1	130	130	130	130	130	130	130	130	130	130
Width	N2	30	30	30	30	30	30	30	30	30	30
Height	N3	30	30	30	30	30	30	30	30	30	30
Slot Width	N4	4	4	4	4	4	4	4	4	4	4
Slot Depth	N5	5	5	5	5	5	5	5	5	5	5
Thread	N6	M5-0.8	M5-0.8	M5-0.8	M5-0.8	M5-0.8	M5-0.8	M5-0.8	M5-0.8	M5-0.8	M5-0.8
Thread Depth		9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5

The namur slotted drive can be moved to the opposite side for field reversibility

Dimensions and Technical Data (Metric, Millimeters)

DRIVE DIMENSIONS		2200		2250				2300			
		DA06	SR06	DA06	DA08	SR08	SR10	DA08	DA10	DA12	SR12
Shaft Bore	**S1**	50.80	50.80	50.80	50.80	50.80	50.80	63.50	63.50	63.50	63.50
Key Width	**S2**	7.937	7.937	9.53	9.53	9.53	9.53	12.70	12.70	12.70	12.70
Female Key Distance	**S3**	54.53	54.53	55.22	55.22	55.22	55.22	69.32	69.32	69.32	69.32
Key Corner Radius	**S4**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Max Engagement		92	92	130	130	130	130	149	149	149	149

Shafts have two keyways 90 degrees apart. Only one keyway is required to transmit torque.
Max engagement shown with tophat. Removal of tophat allows shaft to extend through the actuator bore.

AIR/FLUID VOLUME liters (L)	BODY SIDE	5.0	-	5.0	11.5	-	-	13.0	17.5	25.2	-
	ENDCAP SIDE	4.5	4.5	6.0	9.7	9.7	15.5	11.0	18.4	26.9	26.9
PORT SIZE NPT (P1, P2, P3, P4)	NORMAL	1/4""	1/4"	1/4"	1/4"	1/4"	1/2"	1/4"	1/2"	1"	1"
	MAX	1"	1"	1"	1"	1"	1 1/2 "	1"	1 1/2 "	2 1/2 "	2 1/2 "
NPT (P5, P6)	STD.	1/4"	1/4"	1/4"	1/4"	1/4"	1/4"	1/4"	1/4"	1/4"	1/4"
STROKE TIME seconds	MIN	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25

Stroke time varies with supply pressure, temperature, spring rate, travel adjustment, working medium, and valve torque. Values shown with no valve resistance. Contact factory about faster stroke speeds.

CENTER OF GRAVITY	COGx	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	COGy	0.00	0.00	0.00	0.00	0.00	0.76	0.00	1.27	3.30	0.76
	COGz	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
WEIGHT kilograms (kg)	Stainless (FS)	41	S1: 54 S2: 53 S3: 53	62	80	S1: 101 S2: 99 S3: 98	S1: 150 S2: 137 S3: 130	104	146	180	S1: 254 S2: 240 S3: 225 S4: 224
	Ductile (FD)	36	S1: 51 S2: 49 S3: 49	54	69	S1: 94 S2: 93 S3: 92	S1: 120 S2: 107 S3: 117	91	127	156	S1: 216 S2: 202 S3: 187 S4: 186
MAX RATED TORQUE N-m		**1,130**	**1,130**	**2,260**	**2,260**	**2,260**	**2,260**	**4,519**	**4,519**	**4,519**	**4,519**
MAX PRESSURE bar		**10.34**	**10.34**	**10.34**	**10.34**	**10.34**	**8.27**	**10.34**	**8.27**	**8.27**	**8.27**

TEMPERATURE LIMITS

LOW	STANDARD	HIGH
-51°C to 85°C	-28°C to 85°C	-28°C to 204°C

Environmental temperature requirements may limit the use of certain trim materials. Temperature ranges may be extended with proper insulation. Ductile iron units may be used in low temperature (less than -28°C), but stroke speed should be limited to prevent brittle fracture. Extended temperature ranges available upon request.

Dimensions and Technical Data (Metric, Millimeters)

ENVELOPE DIMENSIONS		2375			2488				2575				
		DA10	DA12	SR16	DA12	DA16	SR16	SR20	DA12	DA16	DA20	SR20	SR24
Width Total	**A1**	514.4	566.4	673.1	614.7	723.9	723.9	843.3	679.5	767.6	888.0	889.0	990.6
Width Side 1	**A2**	257.2	283.2	336.6	307.3	362.0	362.0	421.6	339.7	383.8	444.0	444.5	495.3
Width Side 2	**A3**	257.2	283.2	336.6	307.3	362.0	362.0	421.6	339.7	383.8	444.0	444.5	495.3
Width Cylinder	**A4**	322.6	375.9	482.6	375.9	482.6	475.0	594.4	387.4	475.0	594.4	594.4	696.0
Height Cylinder	**A5**	322.6	375.9	482.6	375.9	482.6	476.3	594.4	387.4	476.3	594.4	594.4	696.0
Length Total	**B1**	1473.2	1488.4	1752.6	1752.6	1798.3	2291.1	2352.0	2184.4	2184.4	2291.1	2514.6	2565.4
Length Side 1	**B2**	736.6	744.2	876.3	876.3	899.2	1145.5	1176.0	1092.2	1092.2	1145.5	1257.3	1282.7
Length Side 2	**B3**	736.6	744.2	876.3	876.3	899.2	1145.5	1176.0	1092.2	1092.2	1145.5	1257.3	1282.7
Flange Distance	**C**	280.9	280.9	280.9	333.4	333.4	333.4	333.4	400.1	400.1	400.1	400.1	400.1
Flange Depth	**D1**	73.7	99.1	154.9	76.2	129.5	129.5	190.5	64.0	103.3	165.1	165.1	215.9
Body Depth	**D2**	175.3	175.3	175.3	215.9	215.9	215.9	215.9	266.7	266.7	266.7	266.7	266.7
Stop Extension	**E TYP**	16.0	34.3	38.1	33.0	38.1	38.1	63.5	31.5	58.4	63.5	88.9	120.7
Maint Clearance	**F1**	1007.1	1015.7	1390.7	1213.4	1236.2	1875.8	1910.3	1488.4	1483.4	1546.1	2029.7	2061.7
Maint Clearance	**F2**	1007.1	1015.7	1390.7	1213.4	1236.2	1875.8	1910.3	1488.4	1483.4	1546.1	2029.7	2061.7
Lifting Eye Dim X	**G1**	311.4	311.4	312.2	228.6	228.6	228.6	228.6	251.7	251.7	251.7	251.7	251.7
Lifting Eye Dim Y	**G2**	162.1	162.1	162.1	185.4	185.4	185.4	185.4	224.3	224.3	224.3	224.3	224.3
Lifting Eye Diameter	**G3**	28.6	28.6	28.6	23.7	23.7	23.7	23.7	26.9	26.9	26.9	26.9	26.9
P3 - P4 Distance	**H**	767.1	754.4		876.3	894.1			1120.9	1193.5	1174.2		
MOUNTING PATTERN													
Pattern X	J1	63.50	63.50	63.50	76.20	76.20	76.20	76.20	101.60	101.60	101.60	101.60	101.60
Pattern Y	J2	279.40	279.40	279.40	355.60	355.60	355.60	355.60	419.10	419.10	419.10	419.10	419.10
Thread Type	J3	M20-2.5	M20-2.5	M20-2.5	M24-3	M24-3	M24-3	M24-3	M30-3.5	M30-3.5	M30-3.5	M30-3.5	M30-3.5
Thread Depth		25.40	25.40	25.40	38.10	38.10	38.10	38.10	38.1	38.1	38.1	38.1	38.1
NAMUR PATTERN													
Length	N1	150	150	150	190	190	190	190	235	235	235	235	235
Width	N2	30	30	30	30	30	30	30	30	30	30	30	30
Height	N3	30	30	30	30	30	30	30	30	30	30	30	30
Slot Width	N4	4	4	4	4	4	4	4	4	4	4	4	4
Slot Depth	N5	5	5	5	5	5	5	5	5	5	5	5	5
Thread	N6	M5-0.8	M5-0.8	M5-0.8	M5-0.8	M5-0.8	M5-0.8	M5-0.8	M5-0.8	M5-0.8	M5-0.8	M5-0.8	M5-0.8
Thread Depth		9.53	9.53	9.53	9.53	9.53	9.53	9.53	9.53	9.53	9.53	9.53	9.53

The namur slotted drive can be moved to the opposite side for field reversibility

Dimensions and Technical Data (Metric, Millimeters)

DRIVE DIMENSIONS		2375			2488				2575				
		DA10	DA12	SR16	DA12	DA16	SR16	SR20	DA12	DA16	DA20	SR20	SR24
Shaft Bore	S1	88.90	88.90	88.90	120.65	120.65	120.65	120.65	158.75	158.75	158.75	158.75	158.75
Key Width	S2	12.70	12.70	12.70	31.75	31.75	31.75	31.75	38.10	38.10	38.10	38.10	38.10
Female Key Distance	S3	94.72	94.72	94.72	130.05	130.05	130.05	130.05	169.93	169.93	169.93	169.93	169.93
Key Corner Radius	S4	0.00	0.00	0.00	1.52	1.52	1.52	1.52	3.18	3.18	3.18	3.18	3.18
Max Engagement		162	162	162	203	203	203	203	254	254	254	254	254

Shafts have two keyways 90 degrees apart. Only one keyway is required to transmit torque.
Max engagement shown with tophat. Removal of tophat allows shaft to extend through the actuator bore.

AIR/FLUID VOLUME liters (L)	BODY SIDE	21.4	31.3		39.2	72.0			47.7	83.8	135.4		
	ENDCAP SIDE	22.0	33.3	59.0	42.7	75.6	75.6	119.2	50.0	88.6	139.6	139.6	203.2
PORT SIZE NPT (P1, P2, P3, P4)	NORMAL	1/2"	1"	1 ½ "	1"	1 ½"	1 ½"	1 ½"	1"	1 ½"	1 ½"	1 ½ "	1 ½"
	MAX	1 ½"	2 ½"	3"	2 ½"	3"	3"	3"	2 ½"	3"	3"	3"	4"
NPT (P5, P6)	STD.	3/8"	3/8"	3/8"	1/2"	1/2"	1/2"	1/2"	3/4"	3/4"	3/4"	3/4"	3/4"
STROKE TIME seconds	MIN	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5

Stroke time varies with supply pressure, temperature, spring rate, travel adjustment, working medium, and valve torque. Values shown with no valve resistance. Contact factory about faster stroke speeds.

CENTER OF GRAVITY	COGx	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	COGy	0.76	2.03	0.51	2.54	2.54	0.00	0.00	0.00	0.00	2.54	0.00	0.00
	COGz	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.54	0.00	0.00	0.00
WEIGHT kilograms (kg)	Stainless (FS)	199	232	S1: 458 S2: 439 S3: 405 S4: 414 S5: 362	318	415	S1: 736 S2: 627 S3: 557	S1: 954 S2: 845 S3: 775	518	603	798	S1: 1,383 S2: 1,283 S3: 1,212 S4: 1,141	S1: 1,925 S2: 1,822 S3: 1,744 S4: 1,612 S5: 1,518 S6: 1,440
	Ductile (FD)	173	202	S1: 416 S2: 397 S3: 364 S4: 373 S5: 320	280	350	S1: 647 S2: 538 S3: 467	S1: 821 S2: 712 S3: 641	460	527	690	S1: 1,287 S2: 1,187 S3: 1,115 S4: 1,045	S1: 1,728 S2: 1,625 S3: 1,547 S4: 1,415 S5: 1,321 S6: 1,243
MAX RATED TORQUE N-m		9,039	9,039	9,039	22,597	22,597	22,597	22,597	56,492	56,492	56,492	56,492	56,492
MAX PRESSURE bar		8.27	8.27	8.27	8.27	8.27	8.27	8.27	8.27	8.27	8.27	8.27	6.89

TEMPERATURE LIMITS

LOW	STANDARD	HIGH
-51°C to 85°C	-28°C to 85°C	-28°C to 204°C

Environmental temperature requirements may limit the use of certain trim materials. Temperature ranges may be extended with proper insulation. Ductile iron units may be used in low temperature (less than -28°C), but stroke speed should be limited to prevent brittle fracture. Extended temperature ranges available upon request.

PRESSURE EQUIPMENT DIRECTIVE (PED) CATEGORY DETERMINATION

The European Pressure Equipment Directive (PED, 2014/68/EU, supersedes 97/23/EC) requires equipment to be placed in categories based on Fluid Group and Bar Liter rating. Determination of Fluid Group is the responsibility of the End User.
QTRCO F2-Series actuator ratings are listed below:

Model	Bar Liter Rating	CATEGORY	
		Fluid Group 2	For Fluid Group 1
F2200SR06	37.21	SEP	1
F2200SP106	74.41	1	2
F2200SP108	132.29	1	2
F2250SR08	82.68	1	2
F2250SP108	165.37	1	2
F2250SR10	129.19	1	2
F2250SP110	258.38	2	3
F2251SR08	86.04	1	2
F2251SP108	172.07	1	2
F2300SR12	223.24	2	3
F2300SP112	446.49	2	3
F2375SR16	496.10	2	3
F2375SP116	992.20	2	3
F2488SR16	645.59	2	3
F2488SP116	1291.18	3	4
F2488SR20	1008.73	3	4
F2488SP120	2017.47	3	4
F2575SR20	1188.57	3	4
F2575SP120	2377.14	3	4
F2575SR24	1426.28	3	4
F2575SP124	2852.57	3	4

Model	Bar Liter Rating	CATEGORY	
		Fluid Group 2	For Fluid Group 1
F2200DA06	44.03	SEP	1
F2200DP106	88.07	1	2
F2250DA06	55.01	1	2
F2250DP106	110.02	1	2
F2250DA08	95.38	1	2
F2250DP108	190.77	1	2
F2300DA08	101.07	1	2
F2300DP108	202.15	2	3
F2300DA10	155.03	1	2
F2300DP110	310.06	2	3
F2300DA12	223.24	2	3
F2300DP112	446.49	2	3
F2375DA10	201.34	2	3
F2375DP110	402.67	2	3
F2375DA12	279.06	2	3
F2375DP112	558.11	2	3
F2488DA12	363.14	2	3
F2488DP112	726.29	2	3
F2488DA16	645.59	2	3
F2488DP116	1291.18	3	4
F2575DA12	427.88	2	3
F2575DP112	855.77	2	3
F2575DA16	760.68	2	3
F2575DP116	1521.37	3	4
F2575DA20	1188.57	3	4
F2575DP120	2377.14	3	4

Ratings are shown at maximum operating pressure. Models that fall under SEP are below the minimum Bar Liter rating and not required to comply with the PED.

OUTPUT TORQUE DATA

The following tables show output torque for common pressures. For additional output information, download the interactive toque tables at QTRCO.com. Actuators may generate more torque than the maximum rating at higher pressures (refer to page 6 for torque ratings). Actuators should not be sized above their maximum torque rating unless there is no possibility that the valve will resist with a value above that rating.

DOUBLE ACTING (in-lb)

	20 psig			40 psig			60 psig			80 psig			100 psig			120 psig		
	Start	Min.	End	Start	Min.	End	Start	Min.	End	Start	Min.	End	Start	Min.	End	Start	Min.	End
F2200DA06	4,927	2,036	3,469	9,854	4,072	6,938	14,781	6,107	10,407	19,708	8,143	13,876	24,635	10,179	17,345	29,562	12,215	20,814
F2250DA06	6,159	2,564	4,336	12,318	5,129	8,673	18,477	7,693	13,009	24,636	10,257	17,345	30,795	12,821	21,681	36,954	15,386	26,018
F2250DA08	10,949	4,524	7,709	21,898	9,048	15,418	32,847	13,572	23,127	43,796	18,096	30,836	54,745	22,620	38,545	65,694	27,144	46,254
F2300DA08	13,139	5,429	9,251	26,278	10,858	18,502	39,417	16,286	27,753	52,556	21,715	37,004	65,695	27,144	46,255	78,834	32,573	55,506
F2300DA10	20,529	8,482	14,454	41,059	16,964	28,909	61,588	25,446	43,363	82,117	33,928	57,817	102,646	42,410	72,271	123,176	50,892	86,726
F2300DA12	29,563	12,215	20,815	59,125	24,429	41,629	88,688	36,644	62,444	118,250	48,858	83,258	147,813	61,073	104,073	177,375	73,287	124,887
F2375DA10	25,662	10,603	18,068	51,324	21,206	36,136	76,985	31,808	54,204	102,647	42,411	72,272	128,309	53,014	90,340	153,971	63,617	108,408
F2375DA12	36,953	15,268	26,018	73,906	30,536	52,037	110,859	45,804	78,055	147,812	61,072	104,073	184,765	76,340	130,091	221,718	91,608	156,110
F2488DA12	48,039	19,849	33,824	96,078	39,698	67,648	144,117	59,546	101,471	192,156	79,395	135,295	240,195	99,244	169,119	288,234	119,093	202,943
F2488DA16	85,403	35,286	60,131	170,806	70,573	120,262	256,208	105,859	180,393	341,611	141,145	240,524	427,014	176,431	300,655	512,417	211,718	360,786
F2575DA12	56,661	23,411	39,895	113,323	46,822	79,790	169,984	70,233	119,684	226,645	93,644	159,579	283,306	117,055	199,474	339,968	140,466	239,369
F2575DA16	100,731	41,620	70,924	201,463	83,240	141,848	302,194	124,859	212,772	402,925	166,479	283,696	503,656	208,099	354,620	604,388	249,719	425,544
F2575DA20	157,393	65,031	110,819	314,786	130,062	221,638	472,179	195,093	332,456	629,572	260,124	443,275	786,965	325,155	554,094	944,358	390,186	664,913

DOUBLE ACTING (N-m)

	1.5 bar			3 bar			4 bar			5.5 bar			7 bar			8 bar		
	Start	Min.	End	Start	Min.	End	Start	Min.	End	Start	Min.	End	Start	Min.	End	Start	Min.	End
F2200DA06	606	250	426	1,211	500	853	1,615	667	1,137	2,220	917	1,563	2,826	1,168	1,990	3,230	1,334	2,274
F2250DA06	757	315	533	1,514	630	1,066	2,019	840	1,421	2,776	1,156	1,954	3,532	1,471	2,487	4,037	1,681	2,842
F2250DA08	1,346	556	947	2,691	1,112	1,895	3,588	1,483	2,527	4,934	2,039	3,474	6,280	2,595	4,421	7,177	2,965	5,053
F2300DA08	1,615	667	1,137	3,230	1,334	2,274	4,306	1,779	3,032	5,921	2,446	4,169	7,536	3,114	5,306	8,612	3,558	6,064
F2300DA10	2,523	1,043	1,776	5,046	2,085	3,553	6,728	2,780	4,737	9,251	3,823	6,513	11,774	4,865	8,290	13,456	5,560	9,474
F2300DA12	3,633	1,501	2,558	7,266	3,002	5,116	9,688	4,003	6,821	13,321	5,504	9,379	16,955	7,006	11,937	19,377	8,006	13,643
F2375DA10	3,154	1,303	2,221	6,308	2,606	4,441	8,410	3,475	5,922	11,564	4,778	8,142	14,718	6,081	10,363	16,821	6,950	11,843
F2375DA12	4,542	1,876	3,198	9,083	3,753	6,395	12,111	5,004	8,527	16,653	6,880	11,725	21,194	8,757	14,923	24,222	10,008	17,055
F2488DA12	5,904	2,439	4,157	11,808	4,879	8,314	15,744	6,505	11,085	21,648	8,945	15,242	27,553	11,384	19,400	31,489	13,011	22,171
F2488DA16	10,496	4,337	7,390	20,993	8,674	14,781	27,990	11,565	19,707	38,486	15,902	27,098	48,983	20,238	34,488	55,980	23,130	39,415
F2575DA12	6,964	2,877	4,903	13,928	5,755	9,806	18,570	7,673	13,075	25,534	10,550	17,978	32,498	13,427	22,882	37,140	15,346	26,150
F2575DA16	12,380	5,115	8,717	24,760	10,230	17,434	33,014	13,641	23,245	45,394	18,756	31,961	57,774	23,871	40,678	66,028	27,281	46,489
F2575DA20	19,344	7,993	13,620	38,688	15,985	27,240	51,584	21,313	36,320	70,928	29,306	49,940	90,272	37,298	63,560	103,168	42,627	72,640

OUTPUT TORQUE DATA (CONTINUED)

The torque values above indicate the actual actuator output torque. Some values may exceed the max rating of the actuator.

	SPRING RETURN (in-lb)			Operating Pressure (psig)					
	Left Hand (FAIL CLOSE)		SPRINGS	20	40	60	80	100	120
F2200	SR06-S1	Start	7,971			7,533	12,460	17,387	22,314
		Minimum	3,940			2,040	4,033	6,027	8,020
		End	7,248			2,436	5,905	9,374	12,843
	SR06-S2	Start	5,899		4,867	9,794	14,721	19,648	24,575
		Minimum	2,844		1,177	3,188	5,199	7,210	9,220
		End	4,987		1,039	4,508	7,977	11,446	14,915
	SR06-S3	Start	2,071	2,666	7,594	12,521	17,448	22,376	27,303
		Minimum	1,095	939	2,974	5,008	7,042	9,077	11,111
		End	2,261	1,398	4,867	8,336	11,805	15,274	18,743
F2250	SR08-S11	Start	19,046			14,076	25,025	35,974	46,923
		Minimum	9,689			3,598	8,027	12,456	16,885
		End	18,771			4,082	11,791	19,501	27,210
	SR08-S1	Start	16,000			17,086	28,035	38,984	49,933
		Minimum	8,138			5,281	9,754	14,227	18,700
		End	15,761			7,127	14,836	22,545	30,254
	SR08-S21	Start	11,430		10,537	21,486	32,435	43,385	54,334
		Minimum	5,833		3,168	7,668	12,168	16,669	21,169
		End	11,362		3,989	11,698	19,407	27,117	34,826
	SR08-S2	Start	11,085		11,023	21,972	32,921	43,870	54,819
		Minimum	5,630		3,371	7,871	12,371	16,872	21,372
		End	10,875		4,333	12,042	19,751	27,460	35,169
	SR08-S31	Start	7,616	3,539	14,489	25,438	36,387	47,337	58,286
		Minimum	3,856	657	5,171	9,684	14,197	18,711	23,224
		End	7,410	93	7,802	15,511	23,220	30,929	38,638
	SR08-S3	Start	4,915	6,063	17,012	27,961	38,910	49,859	60,808
		Minimum	2,509	2,009	6,527	11,045	15,563	20,081	24,599
		End	4,886	2,794	10,503	18,212	25,921	33,630	41,339
	SR10-S1	Start	23,363		11,136	28,244	45,352	62,460	79,568
		Minimum	11,896		2,108	9,110	16,112	23,114	30,116
		End	23,080		728	12,773	24,818	36,864	48,909
	SR10-S2	Start	16,000		18,455	35,563	52,671	69,779	86,887
		Minimum	8,138		5,941	12,980	20,019	27,059	34,098
		End	15,761		8,091	20,136	32,181	44,227	56,272
	SR10-S3	Start	11,085		23,341	40,449	57,557	74,665	91,773
		Minimum	5,630		8,478	15,532	22,586	29,640	36,694
		End	10,875		13,006	25,052	37,098	49,143	61,189

OUTPUT TORQUE DATA (CONTINUED)

The torque values above indicate the actual actuator output torque. Some values may exceed the max rating of the actuator.

SPRING RETURN (in-lb)				Operating Pressure (psig)					
Left Hand (FAIL CLOSE)			SPRINGS	20	40	60	80	100	120
F2300	SR12-S1	Start	46,325			46,062	75,624	105,187	134,749
		Minimum	22,991			12,974	24,962	36,951	48,939
		End	42,625			16,119	36,934	57,748	78,563
	SR12-S2	Start	37,246			54,416	83,979	113,541	143,104
		Minimum	18,486			17,770	29,855	41,941	54,026
		End	34,272			25,198	46,013	66,827	87,642
	SR12-S3	Start	29,503		31,978	61,540	91,102	120,665	150,227
		Minimum	14,643		9,620	21,752	33,884	46,015	58,147
		End	27,147		12,126	32,941	53,756	74,570	95,385
	SR12-S4	Start	25,900		35,293	64,856	94,419	123,981	153,544
		Minimum	12,855		11,452	23,605	35,758	47,912	60,065
		End	23,832		15,729	36,544	57,359	78,173	98,988
F2375	SR16-S1	Start	81,397			110,341	176,035	241,730	307,424
		Minimum	42,648			38,370	65,376	92,382	119,388
		End	86,742			57,367	103,622	149,876	196,131
	SR16-S2	Start	63,151		64,091	129,785	195,479	261,174	326,868
		Minimum	33,088		21,079	48,162	75,245	102,329	129,412
		End	67,298		29,358	75,613	121,868	168,122	214,377
	SR16-S3	Start	52,628		75,305	140,999	206,693	272,388	338,082
		Minimum	27,575		26,630	53,733	80,836	107,938	135,041
		End	56,084		39,881	86,136	132,391	178,645	224,900
	SR16-S4	Start	47,014		81,287	146,982	212,677	278,371	344,066
		Minimum	24,633		29,580	56,687	83,794	110,900	138,007
		End	50,102		45,495	91,750	138,005	184,259	230,514
	SR16-S5	Start	34,383	29,054	94,749	160,443	226,137	291,832	357,526
		Minimum	18,015	9,102	36,218	63,335	90,452	117,568	144,685
		End	36,640	11,872	58,126	104,381	150,636	196,890	243,145

OUTPUT TORQUE DATA (CONTINUED)

The torque values above indicate the actual actuator output torque. Some values may exceed the max rating of the actuator.

SPRING RETURN (in-lb)				Operating Pressure (psig)					
Left Hand (FAIL CLOSE)			SPRINGS	20	40	60	80	100	120
F2488	SR16-S1	Start	176,794				165,880	251,282	336,685
		Minimum	90,225				49,598	84,554	119,510
		End	175,731				63,730	123,862	183,993
	SR16-S2	Start	101,571		67,292	152,695	238,098	323,500	408,903
		Minimum	52,321		18,106	53,320	88,533	123,747	158,960
		End	103,514		18,691	78,822	138,953	199,085	259,216
	SR16-S3	Start	75,223		98,588	183,991	269,394	354,796	440,199
		Minimum	37,904		32,523	67,736	102,949	138,163	173,376
		End	72,218		45,039	105,170	165,301	225,433	285,564
	SR20-S1	Start	176,794			224,594	358,036	491,478	624,920
		Minimum	90,225			74,644	129,600	184,556	239,512
		End	175,731			105,071	199,026	292,980	386,935
	SR20-S2	Start	101,571		163,370	296,812	430,254	563,696	697,138
		Minimum	52,321		57,803	112,866	167,928	222,990	278,052
		End	103,514		86,339	180,294	274,249	368,203	462,158
	SR20-S3	Start	75,223	61,224	194,666	328,107	461,549	594,991	728,433
		Minimum	37,904	17,158	72,220	127,282	182,344	237,406	292,468
		End	72,218	18,732	112,686	206,641	300,596	394,550	488,505
F2575	SR20-S1	Start	356,035				298,448	455,840	613,233
		Minimum	177,338				78,588	142,570	206,551
		End	331,124				87,239	198,057	308,876
	SR20-S2	Start	270,815			216,551	373,944	531,336	688,729
		Minimum	135,621			57,873	122,371	186,869	251,367
		End	255,628			61,640	172,459	283,277	394,096
	SR20-S3	Start	246,715			246,007	403,400	560,792	718,185
		Minimum	122,249			71,330	135,857	200,383	264,910
		End	226,172			85,740	196,559	307,377	418,196
	SR20-S4	Start	194,540			291,730	449,123	606,517	763,910
		Minimum	96,805			97,300	162,001	226,703	291,404
		End	180,449			137,916	248,735	359,553	470,372
	SR24-S1	Start	523,709				405,081	631,727	858,373
		Minimum	263,649				105,204	197,418	289,631
		End	501,502				114,606	274,184	433,763
	SR24-S2	Start	438,489				480,578	707,224	933,870
		Minimum	221,908				149,216	241,996	334,777
		End	426,005				199,826	359,404	518,983
	SR24-S3	Start	414,389				510,034	736,680	963,326
		Minimum	208,564				162,760	255,590	348,421
		End	396,550				223,926	383,504	543,083
	SR24-S4	Start	356,035			348,813	575,459	802,105	1,028,751
		Minimum	177,338			101,525	194,480	287,434	380,389
		End	331,124			122,701	282,280	441,858	601,437
	SR24-S5	Start	270,815			424,309	650,955	877,601	1,104,247
		Minimum	135,621			144,063	237,291	330,519	423,747
		End	255,628			207,921	367,500	527,078	686,657
	SR24-S6	Start	246,715		227,120	453,765	680,411	907,057	1,133,703
		Minimum	122,249		64,222	157,457	250,692	343,928	437,163
		End	226,172		72,442	232,021	391,600	551,178	710,757

OUTPUT TORQUE DATA (CONTINUED)

The torque values above indicate the actual actuator output torque. Some values may exceed the max rating of the actuator.

SPRING RETURN (N-m)				Operating Pressure (bar)					
Left Hand (FAIL CLOSE)			SPRINGS	1.5	3	4	5.5	7	8
F2200	SR06-S1	Start	901			796	1,401	2,007	2,411
		Minimum	445			208	453	698	861
		End	819			236	663	1,089	1,373
	SR06-S2	Start	667		648	1,051	1,657	2,262	2,666
		Minimum	321		173	338	585	832	997
		End	563		186	470	897	1,323	1,607
	SR06-S3	Start	234	350	956	1,359	1,965	2,571	2,974
		Minimum	124	126	376	543	793	1,043	1,210
		End	255	192	619	903	1,329	1,756	2,040
F2250	SR08-S11	Start	2,152			1,468	2,813	4,159	5,056
		Minimum	1,095			357	901	1,446	1,808
		End	2,121			375	1,322	2,270	2,901
	SR08-S1	Start	1,808			1,808	3,153	4,499	5,396
		Minimum	919			547	1,096	1,646	2,013
		End	1,781			719	1,666	2,614	3,245
	SR08-S21	Start	1,291		1,408	2,305	3,651	4,996	5,893
		Minimum	659		447	816	1,369	1,922	2,291
		End	1,284		604	1,235	2,183	3,130	3,762
	SR08-S2	Start	1,252		1,463	2,360	3,705	5,051	5,948
		Minimum	636		470	839	1,392	1,945	2,314
		End	1,229		642	1,274	2,222	3,169	3,801
	SR08-S31	Start	860	508	1,854	2,751	4,097	5,443	6,340
		Minimum	436	119	674	1,044	1,598	2,153	2,523
		End	837	87	1,034	1,666	2,614	3,561	4,193
	SR08-S3	Start	555	794	2,139	3,036	4,382	5,728	6,625
		Minimum	283	272	827	1,197	1,753	2,308	2,678
		End	552	392	1,340	1,971	2,919	3,866	4,498
	SR10-S1	Start	2,640		1,598	2,999	5,102	7,205	8,606
		Minimum	1,344		377	951	1,811	2,672	3,246
		End	2,608		321	1,308	2,789	4,269	5,256
	SR10-S2	Start	1,808		2,425	3,826	5,929	8,032	9,433
		Minimum	919		811	1,388	2,253	3,118	3,695
		End	1,781		1,153	2,140	3,620	5,101	6,088
	SR10-S3	Start	1,252		2,977	4,378	6,481	8,584	9,985
		Minimum	636		1,098	1,676	2,543	3,410	3,988
		End	1,229		1,708	2,695	4,176	5,656	6,643

OUTPUT TORQUE DATA (CONTINUED)

The torque values above indicate the actual actuator output torque. Some values may exceed the max rating of the actuator.

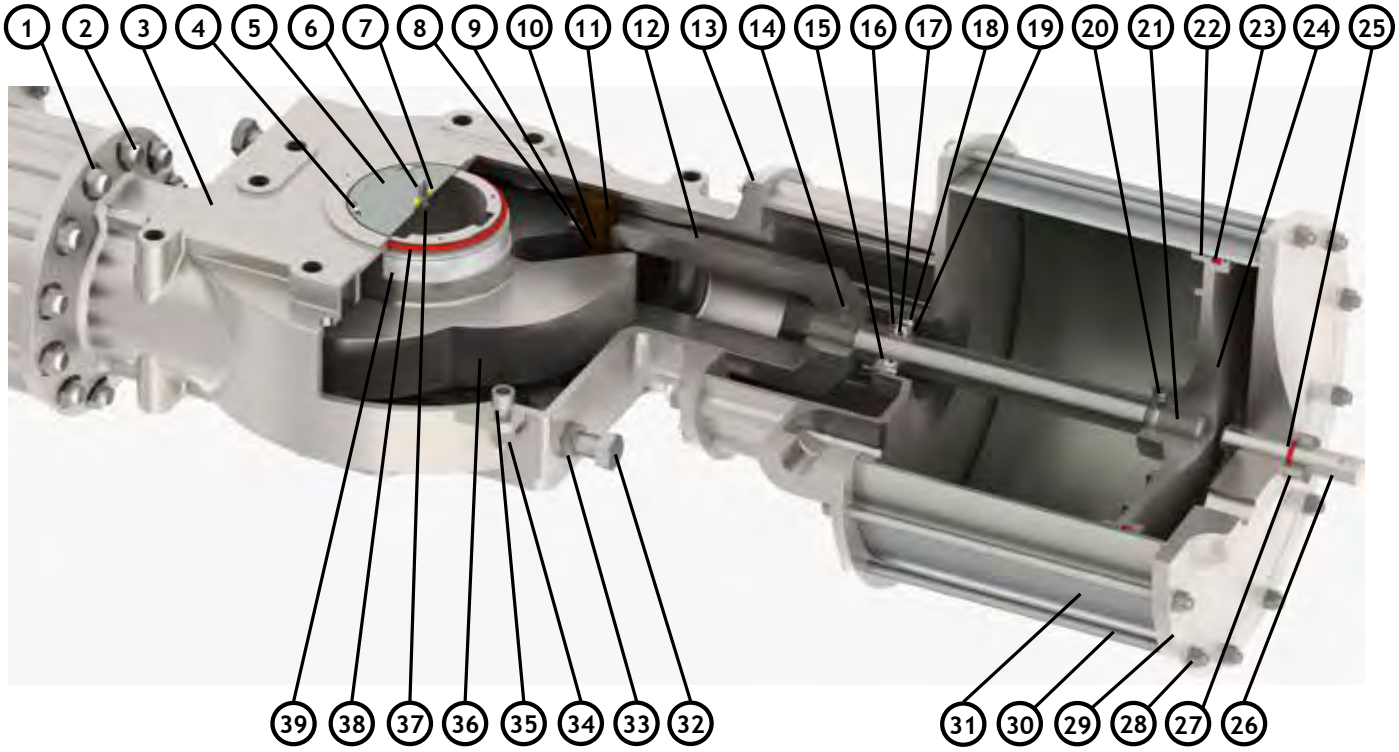
SPRING RETURN (N-m)				Operating Pressure (bar)					
Left Hand (FAIL CLOSE)			SPRINGS	1.5	3	4	5.5	7	8
F2300	SR12-S1	Start	5,234			4,873	8,506	12,139	14,562
		Minimum	2,598			1,331	2,805	4,278	5,261
		End	4,816			1,588	4,146	6,704	8,410
	SR12-S2	Start	4,208			5,817	9,450	13,083	15,506
		Minimum	2,089			1,872	3,358	4,843	5,833
		End	3,872			2,614	5,172	7,730	9,435
	SR12-S3	Start	3,333		4,199	6,622	10,255	13,888	16,310
		Minimum	1,654		1,328	2,322	3,813	5,304	6,298
		End	3,067		1,783	3,488	6,047	8,605	10,310
	SR12-S4	Start	2,926		4,574	6,996	10,630	14,263	16,685
		Minimum	1,452		1,535	2,531	4,024	5,518	6,514
		End	2,693		2,190	3,896	6,454	9,012	10,717
F2375	SR16-S1	Start	9,197			11,730	19,804	27,878	33,261
		Minimum	4,819			4,032	7,352	10,671	12,883
		End	9,801			5,963	11,648	17,333	21,123
	SR16-S2	Start	7,135		8,544	13,927	22,001	30,075	35,458
		Minimum	3,738		2,919	5,138	8,467	11,795	14,014
		End	7,604		4,235	8,025	13,709	19,394	23,184
	SR16-S3	Start	5,946		9,811	15,194	23,268	31,342	36,725
		Minimum	3,116		3,546	5,767	9,098	12,429	14,650
		End	6,337		5,424	9,213	14,898	20,583	24,373
	SR16-S4	Start	5,312		10,487	15,870	23,944	32,018	37,401
		Minimum	2,783		3,880	6,101	9,432	12,764	14,985
		End	5,661		6,058	9,848	15,533	21,217	25,007
	SR16-S5	Start	3,885	3,934	12,008	17,391	25,465	33,539	38,922
		Minimum	2,035	1,297	4,630	6,852	10,185	13,517	15,739
		End	4,140	1,800	7,485	11,275	16,960	22,645	26,435

OUTPUT TORQUE DATA (CONTINUED)

The torque values above indicate the actual actuator output torque. Some values may exceed the max rating of the actuator.

SPRING RETURN (N-m)				Operating Pressure (bar)					
Left Hand (FAIL CLOSE)			SPRINGS	1.5	3	4	5.5	7	8
F2488	SR16-S1	Start	19,975				18,631	29,128	36,125
		Minimum	10,194				5,559	9,855	12,719
		End	19,855				7,123	14,513	19,440
	SR16-S2	Start	11,476			16,295	26,791	37,287	44,285
		Minimum	5,912			5,629	9,957	14,285	17,170
		End	11,696			8,232	15,622	23,012	27,939
	SR16-S3	Start	8,499		12,833	19,831	30,327	40,823	47,821
		Minimum	4,283		4,373	7,258	11,586	15,914	18,799
		End	8,160		6,282	11,208	18,599	25,989	30,916
	SR20-S1	Start	19,975			23,880	40,280	56,681	67,614
		Minimum	10,194			7,817	14,572	21,326	25,829
		End	19,855			10,818	22,365	33,913	41,611
	SR20-S2	Start	11,476		21,105	32,039	48,440	64,840	75,774
		Minimum	5,912		7,623	12,135	18,902	25,669	30,181
		End	11,696		11,619	19,317	30,864	42,412	50,110
	SR20-S3	Start	8,499	8,241	24,641	35,575	51,976	68,376	79,310
		Minimum	4,283	2,485	9,252	13,764	20,531	27,298	31,810
		End	8,160	3,048	14,596	22,294	33,841	45,389	53,087
F2575	SR20-S1	Start	40,227				33,516	52,861	65,757
		Minimum	20,037				8,796	16,660	21,902
		End	37,412				9,713	23,333	32,413
	SR20-S2	Start	30,598			22,702	42,046	61,390	74,287
		Minimum	15,323			5,816	13,743	21,670	26,954
		End	28,882			5,722	19,342	32,962	42,042
	SR20-S3	Start	27,875			26,030	45,374	64,719	77,615
		Minimum	13,812			7,336	15,266	23,197	28,484
		End	25,554			8,445	22,065	35,685	44,765
	SR20-S4	Start	21,980			31,196	50,541	69,885	82,781
		Minimum	10,938			10,268	18,220	26,172	31,473
		End	20,388			14,340	27,960	41,580	50,660
	SR24-S1	Start	59,171				45,475	73,330	91,901
		Minimum	29,788				11,767	23,100	30,656
		End	56,662				12,742	32,355	45,430
	SR24-S2	Start	49,543				54,005	81,860	100,431
		Minimum	25,072				16,739	28,142	35,744
		End	48,132				22,371	41,984	55,059
	SR24-S3	Start	46,820				57,333	85,188	103,759
		Minimum	23,565				18,269	29,678	37,285
		End	44,804				25,094	44,706	57,782
	SR24-S4	Start	40,227			36,869	64,725	92,581	111,151
		Minimum	20,037			10,429	21,853	33,277	40,894
		End	37,412			12,074	31,687	51,300	64,375
	SR24-S5	Start	30,598			45,399	73,255	101,110	119,681
		Minimum	15,323			15,232	26,690	38,148	45,786
		End	28,882			21,703	41,315	60,928	74,003
	SR24-S6	Start	27,875		30,157	48,727	76,583	104,439	123,009
		Minimum	13,812		9,106	16,745	28,204	39,663	47,302
		End	25,554		11,350	24,426	44,038	63,651	76,726

PARTS DIAGRAM & MATERIALS OF CONSTRUCTION - DOUBLE ACTING



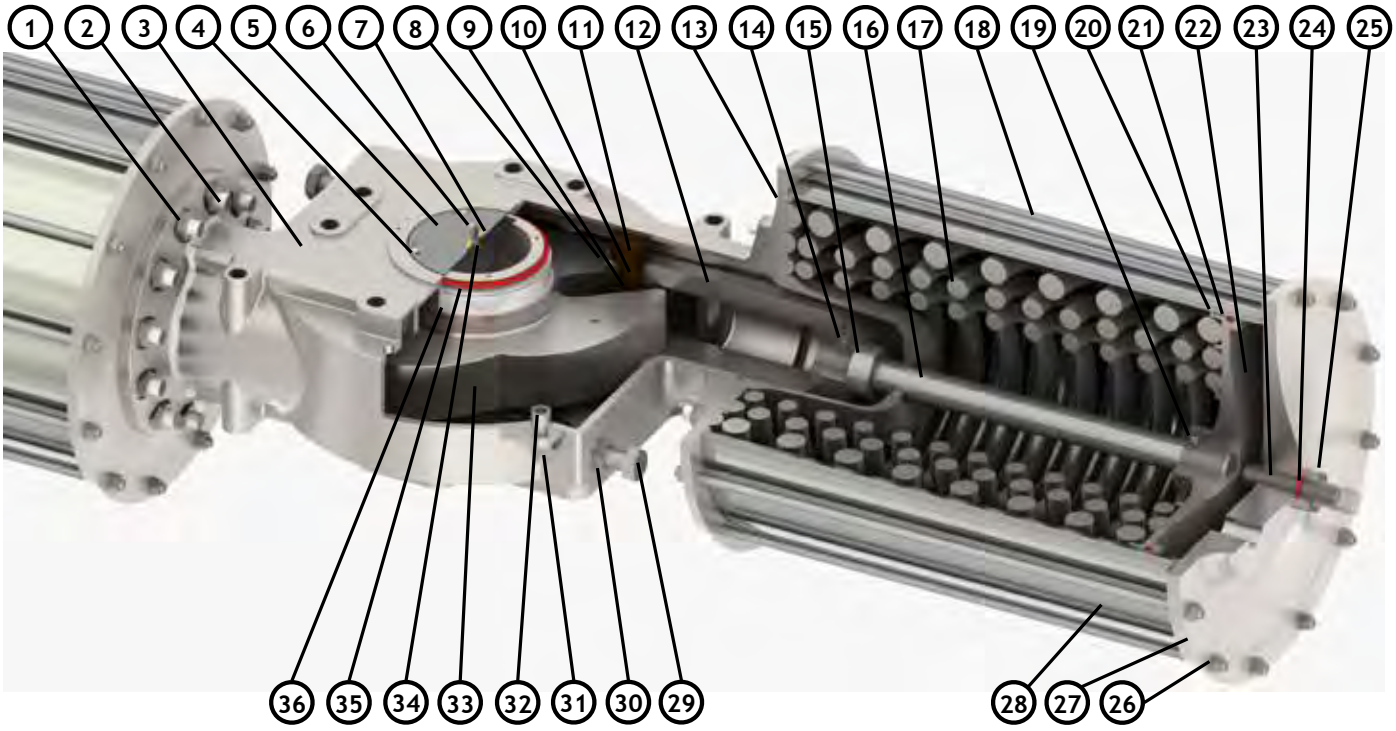
Item No.	Part Description	Material (FS)	Material (FD)
1	Stud Hex Nut	304 SST	304 SST
2	Stud	304 SST	304 SST
3	Body	CF8 SST	Ductile Iron[2]
4	Top Hat Base Bolt	304 SST	304 SST
5	Top Hat Base	304 SST	304 SST
6	Top Hat	316 SST Pm	316 SST Pm
7	Top Hat Indicator	Nylon 6/6 GF30	Nylon 6/6 Gf30
8	Clevis Pin Set Screw	304 SST	304 SST
9	Yoke Roller	304 SST NIT	304 SST NIT
10	Clevis Pin	304 SST NIT	304 SST NIT
11	Body Roller	304 SST NIT	304 SST NIT
12	Clevis	CF8 SST	Ductile Iron[2]
13	Base Plate	CF8 SST	Ductile Iron[2]
14	Clevis Set Screw	304 SST	304 SST
15	Seal Carrier	Option[1]	Option[1]
16	Carrier Float Seal	Option[1]	Option[1]
17	Carrier Rod Seal	Option[1]	Option[1]
18	Carrier Retainer	304 SST	304 SST
19	Carrier Retainer Screw	304 SST	304 SST
20	Piston Set Screw	304 SST	304 SST

Item No.	Part Description	Material (FS)	Material (FD)
21	Piston Bolt	304 SST	304 SST
22	Wiper Ring	Option[1]	Option[1]
23	Piston Seal	Option[1]	Option[1]
24	Piston	CF8 SST	Ductile Iron[2]
25	Travel Stop Seal	Option[1]	Option[1]
26	End Cap Travel Stop	304 SST	304 SST
27	Travel Stop Nut	304 SST	304 SST
28	Tie Rod Hex Nut	304 SST	304 SST
29	End Cap	CF8 SST	Ductile Iron[2]
30	Tie Rod	304 SST	304 SST
31	Cylinder	304 SST[1]	Black Amalgon[1]
32	Body Travel Stop	304 SST	304 SST
33	Body Travel Stop Nut	304 SST	304 SST
34	Body Fastening Nut	304 SST	304 SST
35	Body Fastening Bolt	304 SST	304 SST
36	Yoke	CF8 SST	Ductile Iron[2]
37	Top Hat Bolt	304 SST	Ductile Iron[2]
38	Yoke Seal	Option[1]	Option[1]
39	Yoke Bushing	Option[1]	Option[1]

1: "Option" materials depend on trim code, see engineering string.
2: Ductile iron components are coated or plated for corrosion resistance.

304 or CF8 stainless steel may be upgraded to 316 or CF8M stainless steel based on availability or customer request. Materials shown are standard. Other materials available, contact QTRCO for special options. Special coatings, plating, or surface treatments are also available

PARTS DIAGRAM & MATERIALS OF CONSTRUCTION - SPRING RETURN



Item No.	Part Description	Material (FS)	Material (FD)
1	Stud Hex Nut	304 SST	304 SST
2	Stud	304 SST	304 SST
3	Body	CF8 SST	Ductile Iron[3]
4	Top Hat Base Bolt	304 SST	304 SST
5	Top Hat Base	304 SST	304 SST
6	Top Hat	316 SST PM	316 SST PM
7	Top Hat Indicator	Nylon 6/6 Gf30	Nylon 6/6 Gf30
8	Clevis Pin Set Screw	304 SST	304 SST
9	Yoke Roller	304 SST NIT	304 SST NIT
10	Clevis Pin	304 SST NIT	304 SST NIT
11	Body Roller	304 SST NIT	304 SST NIT
12	Clevis	CF8 SST	Ductile Iron[3]
13	Spring Retainer	CF8 SST	Ductile Iron[3]
14	Clevis Set Screw	304 SST	304 SST
15	Safety Collar	304 SST	304 SST
16	Piston Bolt	304 SST	304 SST
17	Springs	Chrome Silicon[1]	Chrome Silicon[1]
18	Tie Rod	304 SST	304 SST

Item No.	Part Description	Material (FS)	Material (FD)
19	Piston Set Screw	304 SST	304 SST
20	Wiper Ring	Option[2]	Option[2]
21	Piston Seal	Option[2]	Option[2]
22	Piston	CF8 SST	Ductile Iron[3]
23	End Cap Travel Stop	304 SST	304 SST
24	Travel Stop Seal	Option[2]	Option[2]
25	End Cap Travel Stop Nut	304 SST	304 SST
26	Tie Rod Hex Nut	304 SST	304 SST
27	End Cap	CF8 SST	Ductile Iron[3]
28	Cylinder	304 SST[2]	Black Amalgon[2]
29	Body Travel Stop	304 SST	304 SST
30	Body Travel Stop Nut	304 SST	304 SST
31	Body Fastening Nut	304 SST	304 SST
32	Body Fastening Bolt	304 SST	304 SST
33	Yoke	CF8 SST	Ductile Iron[3]
34	Top Hat Bolt	304 SST	304 SST
35	Yoke Seal	Option[2]	Option[2]
36	Yoke Bushing	Option[2]	Option[2]

1: Chrome Silicon springs are powder coated. Stainless Steel springs available.
2: "Option" materials depend on trim code, see engineering string.
3: Ductile iron components are coated or plated for corrosion resistance.

304 or CF8 stainless steel may be upgraded to 316 or CF8M stainless steel based on availability or customer request. Materials shown are standard. Other materials available, contact QTRCO for special options. Special coatings, plating, or surface treatments are also available

ENGINEERING STRING

For ordering actuators with standard options and trim, specify items 1-8 and 16 as applicable. QTRCO will choose the appropriate trim.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
__	_	___	_____	___	___	___	_	__	_	__	__	__	__	__	__	__,_____	___

Model (1)

FS Stainless Steel
FD Ductile Iron

Grade (2)

C*Commercial
N Nuclear

Size (3)

2200
2250
2300
2375
2488
2575

Action (4)

Replace xx with piston size according to torque tables.

DAxx*	Double Acting
SRxx*	Spring Return, Fail to 0 or 90 degrees
SYxx	Spring Return, Fail to 45 degrees
SZxx	Spring Return, Fail to other angles
SPaxx	Spring Return with partial stroke (Xrciser) add-on. Replace 'a' with number of partial stroke positions (standard is 1)
SEaxx	Spring Return with tandem cylinders to assist spring compression. Replace 'a' with number of tandem pistons (Standard is 2, must be multiples of 2)
SPaEbxx	Spring Return with partial stroke (Xrciser) add-on and tandem cylinders to assist spring compression. Replace 'a' with number of partial stroke positions (standard is 1). Replace 'b' with number of tandem pistons (Standard is 2, must be multiples of 2)
DPaxx	Double Acting with partial stroke (Xrciser) add-on. Replace 'a' with number of partial stroke positions (standard is 1)

PST/SZ Angle (5)

Axx

SP actuators: Angle of travel as measured from the piston fully inward position that valve will be allowed to travel during partial stroke test.

SZ actuators: Angle (from fully CCW position) of fail position for SZ actuator. Example: for an SZ actuator that travels 30deg CW and 60 degrees CCW, this field would be A30

Spring Set (6)

Sxx
Choose spring set based on required torque (N/A for DA and DP models).

Port Size (7)

P00	Custom
P01*	1/4 NPT
P02	3/8 NPT
P03	1/2 NPT
P04	3/4 NPT
P05	1 NPT
P06	1 1/4 NPT
P07	1 1/2 NPT
P08	2 NPT
P09	2 1/2 NPT
P10	3 NPT
P11	4 NPT

Temp Limits (8)

T	Custom Range
Q	-76ºF to 310ºF
G	-60F to 185F
M*	-20F to 185F
H	-20F to 400F

Spring Material (9)

10	Custom
11*	Chrome Silicon
12	17-7 PH Stainless

Cylinder Material (10)

U	Custom
A*	Amalga
L	Aluminum
C	Carbon Steel
S*	Stainless Steel

Bushings (11)

20	Custom
21*	Acetal[2]
22*	Bronze Filled PTFE
23	PEEK
24	Carbon Filled PTFE

Wiper Rings (12)

30	Custom
31*	PTFE
32	UHMWPE

O-Rings (13)

40	Custom
41*	Buna N
42	Viton
43	Silicon
44	EPDM

Cylinder End Seals (14)

50	Custom
51*	PTFE
52	Grafoil

Grease (15)

60	Custom
61*	Standard
62	Food Grade
63	Nuclear Grade

Orientation (16)

LH*	Left Hand. Pistons move outward to turn the valve clockwise. This is commonly called "Fail Closed" for spring return actuators.
RH	Right Hand. Pistons move outward to turn the valve counterclockwise. This is commonly called "Fail Open" for spring return actuators.

Options (17) Separate multiple options with a comma)

JR	Jackscrew. Handwheel size and material specified separately.
HRxxxx	Hydraulic override, cylinders only. Pump and reservoir specified separately. xxxx is defined by QTRCO to specify the cylinder size.
ETSxx.yy	XX: Travel Adjustment End Cap Side YY: Travel Adjustment Body Side Example: 15.80 (65 degrees total travel): A spring return actuator would fail to a 15 degree position in both LH and RH (fail-open or fail-closed) models, and would stroke with pressure to an 80 degree position (65 degrees total travel). An LH double acting model would stroke clockwise to the 15 degree position, and counter clockwise to the 80 degree position.
IPxx	Special Ingress Protection (IP) rating. Replace xx with rating required. Rating certificate will be provided.

Modifier (18)

3-digit number used by QTRCO to identify further customization. Contact QTRCO for details.

Pressure Equipment Directive (19)

SEP	Actuator will be provided based on SEP with appropriate documentation
PED	Actuator will be provided as fully PED compliant

NOTES:* items are considered standard Ensure material compatibility of all components with applications requirements.
(7) Port size limited by piston size.

PISTON SIZE (IN)	4	6	8	10	12	16	20	24
Pmax	P04	P05	P05	P07	P09	P10	P10	P11

(8) Environmental temperature requirements may limit the use of certain trim materials. Temperature ranges may be extended with proper insulation. Ductile iron units may be used in low temperature (less than -20F), but stroke speed should be limited to prevent brittle fracture. Allowable temperature on SP units may be limited by selected sensors (specified separately).

(9) Standard springs are various grades of spring steel, most commonly chrome silicon, with powder coat.

(15) QTRCO selects the appropriate grease based on application requirements.

(17) Multiple compatible options may be chosen. Separate options with a comma

(18) This number is assigned by QTRCO for modifications that cannot be defined by the engineering string. Contact QTRCO for details about specific modifiers.

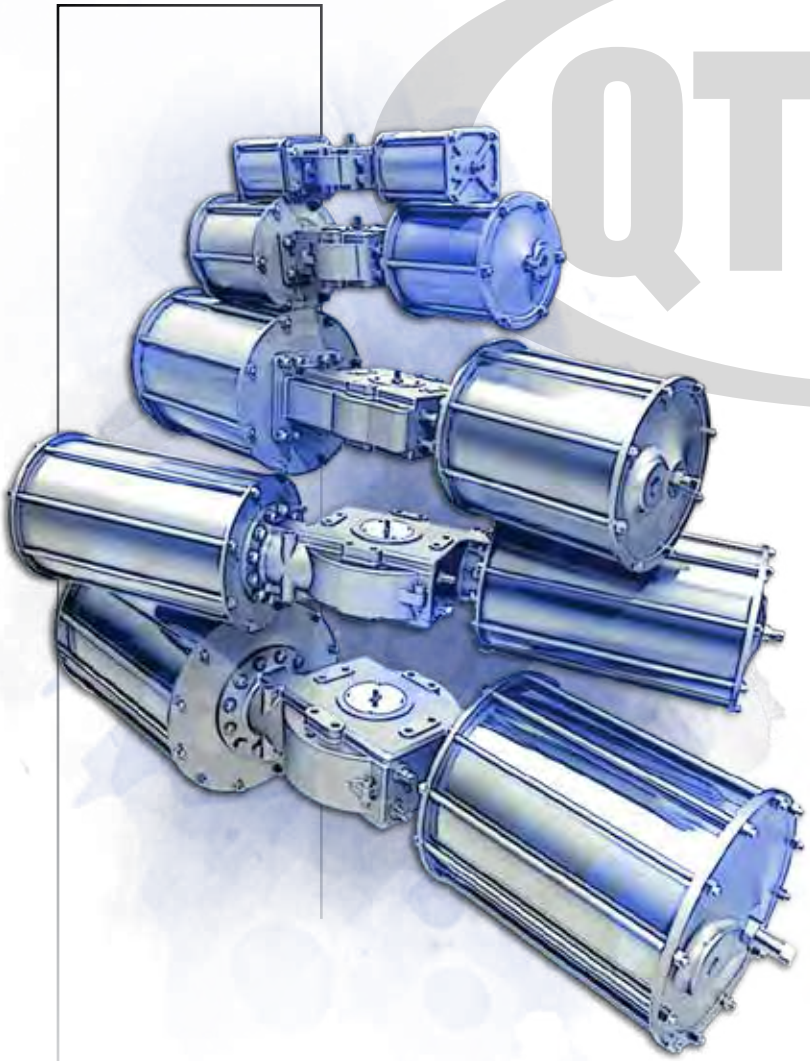
(19) Omit if not required.

ENGINEERING STRING

For ordering actuators with standard options and trim, specify items 1-8 and 16 as applicable. QTRCO will choose the appropriate trim.

SAMPLE SPECIFICATIONS	DESCRIPTION
FSCxxxxSRxx-S06-P01-M-11-S-21-31-41-51-61-LH	Standard stainless SR actuator with medium temp trim.
FDCxxxxDAxx-P01-G-A-21-31-43-51-61-LH	Standard ductile iron DA actuator with low temp trim.
FDCxxxxSRxx-S02-P01-H-11-L-22-31-42-51-61-LH	Standard ductile iron SR actuator with high temp trim.
FDCxxxxSP1xx-A15-S10-P04-G-11-A-21-31-43-51-61-LH	Ductile iron, 1 position partial stroke at 15degrees, ¾" NPT ports, standard low temp trim.
FSCxxxxSRxx-S04-P01-M-11-S-22-31-42-51-61-LH	Stainless, medium temp trim.
FDCxxxxDAxx-P01-H-11-L-22-31-42-51-61-LH-SEP	Ductile iron, high temp trim, SEP documentation required.
FSNxxxxSRxx-S03-P01-M-12-S-23-33-44-52-63-RH-HR	Stainless, nuclear grade with medium temp nuclear trim and stainless springs. Right hand (fail open) orientation with hydraulic override.
FDCxxxxSP1xx-A15-S40-P04-G-12-S-24-31-43-51-62-LH-HR3001,ETS22.90,IP69K-PED	Ductile iron, 1 position partial stroke at 15degrees, ¾" NPT ports, low temp trim stainless springs and cylinders, carbon filled PTFE bushings, food grade grease, hydraulic override code number 3001, extended travel stops that allow the actuator to fail at a 22 degree position and travel fully to the opposite position, IP69K rating required, full PED compliance required.

F SERIES



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