

Bettis™ EHO Electro-Hydraulic Operator

The Bettis EHO is a self-contained, quarter-turn, valve actuator that combines proven technologies from Emerson's Actuation Technologies. The actuator has been designed for critical shutdown applications where reliability is crucial. The EHO utilizes a dependable spring-return actuator for the fail-safe stroke combined with an integral hydraulic power pack and electronic control module.

The EHO accepts a wide range of single-phase, three-phase or DC power sources. Solar panel systems are available for areas without electrical power. A hydraulic handpump can be used to stroke the actuator during commissioning or in the event of an emergency power loss.

Electronic modules are contained within an explosion proof, IP68 enclosure and all electronic components are isolated from the customer connection terminals.

Both spring-return and double-acting configurations are available with torque outputs up to 268,868.08 Nm. The EHO provides a compact design with actuator and control components that have been field proven for decades in critical service applications.

The EHO comes in two versions: the Standard EHO and the Smart EHO. The Standard EHO is designed for on/off ESD applications, while the Smart EHO is designed for modulating ESD applications and comes with alert, alarm, diagnostic, and self-calibration features.



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Product Attributes

- Easy Installation – Bettis™ EHO actuator is a totally self-contained system and designed for compactness and adaptable to new or existing valves
- Bettis™ G-Series hydraulic double-acting or spring-return, fail-safe actuator
- Shafer™ hydraulic control technology
- EIM™ electronics and communication technology
- Multiple input power options
- Local lockable Remote/Local/Offline selector switch
- Local Open/Close selector knob
- Fast speed of operation to fail-safe position if required
- Emergency shutdown – independent safety circuits and solenoid valve
- Dual sealed Separate Terminal Chamber allows installation wiring to be performed or fuses to be replaced without exposing control components to hostile environmental conditions
- Control enclosure is made of low-copper aluminum alloy and rated for IP68 ingress protection
- Hydraulic handpump manual override
- Optional hydraulic back-up accumulator
- Operating pressures up to 207 bar with standard components
- Easy control over actuator stroking speeds – The stroking speed is controlled through adjustable hydraulic flow control valves. This enables field personnel to easily adjust actuator stroking speed to comply with field requirements
- (Smart) Communication support through Modbus, HART and Foundation Fieldbus (FF)
- (Smart) Modulating through 4 - 20 mA analog input
- (Smart) Over 25 alerts and alarms
- (Smart) Diagnostics and self-calibration features
- (Smart) Partial stroke testing

General Specifications

Input Power (AC)

- Three-phase 50 Hz
 - 220, 230, 240, 380, 400, 440, 460, 480, 500, 550, 575, 600 volts
- Three-phase 60 Hz
 - 208, 220, 230, 380, 440, 460, 480, 575, 600 volts
- Single-phase 50 Hz
 - 110, 115, 220, 230, 240 volts
- Single-phase 60 Hz
 - 115, 120, 208, 220, 230 volts

(DC)

- 24 volts

Note: The nominal operating voltage must be specified at time of order. Published actuator performance data is for power supply variations of a $\pm 10\%$ voltage and a ± 5 Hz frequency. If power supply variations are outside these limits, please consult Actuation Technologies to ensure that actuator performance meets your requirements.

Conduit Entry Sizes

- Three 1" NPT
- One 1.5" NPT entry

Local Operation and Display

- (Standard) Open/Close/Stop pushbuttons
- (Smart) Open/Close selector knob
- Local/Off/Remote lockable selector switch
- (Smart) 2-digit LED display
- (Smart) LED alarm and alerts display
- Local/Off/Remote position indicator LEDs
- Hydraulic handpump manual override

Remote Operation (Inputs)

- Discrete Open/Close/Stop/ESD signals
- (Smart) Discrete PST signal
- (Smart) 4 - 20 mA positioning (1% accuracy)

(Outputs)

- Discrete open/close limits
- 4 - 20 mA hydraulic pressure feedback
- (Smart) 4 configurable relays
- (Smart) 1 ESD monitor relay
- (Smart) 4 - 20 mA position feedback

General Specifications (continuation)

Operating Temperature

- -20 °F to +140 °F (-29 °C to +60 °C)
- -40 °F to +140 °F (-40 °C to +60 °C) optional

Hydraulic Fluid

- CONOCO Megaflo[®]AW HVI 22
For temperatures down to -20 °F (-29 °C)
- EXXON Unavis HVI 13
For temperatures down to -40 °F (-40 °C)

Ingress Protection

- Control enclosure: IP68
- Hydraulic actuator: IP67M
- Motor: IP68

Hazardous Area Classification and SIL Certification

- CSA, Canadian Standard Association Certification
 - Class I, Division I, Groups, C and D
 - Group B configuration upon request
- FM, Factory Mutual Certification
 - Class I, II, and III, Groups C, D, E, F, G, Division I, T4
 - Group B configuration upon request
- ATEX Directive
 - EExd IIB T4
- IECEx Certificate of Conformity
 - Ex d IIB T4
- RoHS Directive

Note: This product is only intended for use in large-scale fixed installations excluded from the scope of Directive 2011/65/EU on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS 2).

- SIL-2 Certification (Standard EHO Spring-Return)
- SIL-3 Certification (Smart EHO Spring-Return)

Torque Output Data

(Spring-Return, Fail-Safe Actuator)

Spring-Return Model	EHO MOP (bar)	Actuator DISPL (L)	Spring Cycle (Nm)			Pressure Cycle @ 172 bar (Nm) or designated pressure			Pressure Cycle @ 207 bar (Nm) or designated pressure		
			Spring ETC (Nm)	Spring RUN (Nm)	Spring BTC (Nm)	Pressure BTO @ 172 bar (Nm)	Pressure @ 172 bar RUN (Nm)	Pressure ETO @ 172 bar (Nm)	Pressure BTO @ 207 bar (Nm)	Pressure @ 207 bar RUN (Nm)	Pressure ETO @ 207 bar (Nm)
E35 DSRH-100	138	0.09	173	120	308	240 @ 55.2 bar	86 @ 55.2 bar	104 @ 55.2 bar	343 @ 68.9 bar	138 @ 68.9 bar	207 @ 68.9 bar
E50 DSRH-100	138	0.36	644	437	1,104	954 @ 55.2 bar	494 @ 55.2 bar	362 @ 55.2 bar	1,353 @ 68.9 bar	561 @ 68.9 bar	893 @ 68.9 bar
E60 DSRH-100	138	0.64	1,064	728	1,842	1,378 @ 68.9 bar	523 @ 68.9 bar	597 @ 68.9 bar	1,864 @ 82.7 bar	737 @ 82.7 bar	1,088 @ 82.7 bar
G01002.0-SR4	207	0.18	1,016	600	1,200	1,351	699	1,167	1,855	970	1,671
G01002.0-SR2	207	0.18	1,361	807	1,647	1,006	489	720	1,510	761	1,224
G2002.2-SR4	207	0.30	1,765	1,098	2,348	2,237	1,065	1,654	3,077	1,516	2,493
G2002.2-SR2	207	0.30	2,304	1,399	2,960	1,697	759	1,043	2,537	1,212	1,882
G3002.5-SR4	207	0.42	3,011	1,862	4,002	2,607	1,162	1,617	3,786	1,798	2,795
G3003.0-SR2	197	0.67	3,956	2,436	5,244	5,259	2,485	3,971	6,605 ¹	3,203 ¹	5,316 ¹
G4003.0-SR4	207	0.74	5,317	3,384	7,523	4,660	1,926	2,456	6,728	3,049	4,523
G4003.5-SR2	207	1.09	7,552	4,832	10,871	7,616	3,172	4,298	10,730	4,851	7,411
G5004.5-SR4	207	2.29	10,468	7,146	16,915	21,654	9,806	15,205	28,176	13,298	21,725
G5005.0-SR2	203	2.97	14,822	10,400	25,378	27,155	11,512	16,599	34,298 ¹	15,349 ¹	23,739 ¹
G7005.0-SR4	207	3.46	20,764	14,269	34,267	27,945	11,092	14,444	37,821	19,102	29,244
G7005.0-SR3	207	3.46	24,588	16,946	40,928	29,300	10,927	12,963	33,997	13,524	17,658
G7006.0-SR1	207	5.37	33,376	23,139	56,321	43,442	16,441	20,500	58,958	24,878	36,012
G8007.0-SR3	207	8.54	39,945	25,231	56,507	82,579	39,275	66,013	107,297	52,371	90,728
G8007.0-SR2	207	8.54	47,208	29,776	66,800	75,316	34,596	55,722	100,034	47,716	80,437
G10009.0-SR4	196	19.04	65,773	46,123	112,972	209,439 @ 138 bar	97,839 @ 138 bar	162,220 @ 138 bar	246,996 @ 172 bar	117,756 @ 172 bar	199,769 @ 172 bar
G10009.0-SR3	196	19.04	78,560	56,411	141,300	196,650 @ 138 bar	86,593 @ 138 bar	133,898 @ 138 bar	234,207 @ 172 bar	106,611 @ 172 bar	171,447 @ 172 bar

Notes:

1. Torques are calculated at MOP.
2. If accumulator is required, please consult factory before selecting an actuator size.

Torque Output Data (Double-Acting Actuator)

Counterclockwise to Open

G-Series Double-Acting Model	EHO MOP (bar)	Outboard DISPL (L)	Outboard BTO and ETO Torque Expression (Nm/bar)	Torque Outboard BTO and ETO @ 103 bar (Nm)	Torque Outboard RUN @ 103 bar (Nm)	Torque Outboard BTO and ETO @ 138 bar or MOP (Nm)	Torque Outboard RUN @ 138 bar or MOP (Nm)	Torque Outboard BTO and ETO @ 207 bar or MOP (Nm)	Torque Outboard RUN @ 207 bar or MOP (Nm)
G01002.0	207	0.24	1.52	2,084	1,121	2,803	1,503	4,223	2,261
G2002.2	201	0.37	1.92	2,524	1,357	3,394	1,820	5,113 ¹	2,737 ¹
G3003.0	163	0.81	5.03	7,119	3,787	9,541	5,066	11,266 ¹	5,979 ¹
G4003.0	270	0.98	6.11	8,609	4,589	11,535	6,138	17,331	9,217
G4004.0	151	1.75	10.86	15,573	8,251	20,832	11,025	22,761 ¹	12,044 ¹
G5004.0	207	2.26	17.79	19,989	10,617	26,715	15,952	40,041	21,255
G5005.0	170	3.54	21.96	31,596	16,716	42,202	22,314	52,099 ¹	27,546 ¹
G7005.0	207	4.34	26.95	38,768	20,528	51,786	27,404	77,629	41,088
G7008.0	106	11.13	69.00	100,558	53,009	102,710 ¹	54,142 ¹	N/A	N/A
G8008.0	143	13.18	81.78	119,022	62,747	158,744	83,679	164,449 ¹	86,689 ¹
G10008.0	207	17.30	107.34	156,197	82,390	208,337	109,879	312,004	164,644

Clockwise to Close

G-Series Double-Acting Model	EHO MOP (bar)	Inboard DISPL (L)	Inboard BTC and ETC Torque Expression (Nm/bar)	Torque Inboard BTC and ETC @ 103 bar (Nm)	Torque Inboard RUN @ 103 bar (Nm)	Torque Inboard BTC and ETC @ 138 bar or MOP (Nm)	Torque Inboard RUN @ 138 bar or MOP (Nm)	Torque Inboard BTC and ETC @ 207 bar or MOP (Nm)	Torque Inboard RUN @ 207 bar or MOP (Nm)
G01002.0	207	0.18	1.14	1,520	826	2,050	1,109	3,094	1,670
G2002.2	201	0.30	1.54	1,840	999	2,482	1,343	3,746 ¹	2,022 ¹
G3003.0	163	0.67	4.16	5,819	3,107	7,808	4,160	9,223 ¹	4,911 ¹
G4003.0	207	0.74	4.58	6,335	3,399	8,503	4,552	12,783	6,837
G4004.0	151	1.50	9.33	13,300	7,062	17,802	9,440	19,452 ¹	10,312 ¹
G5004.0	270	1.70	10.54	14,763	7,883	19,748	10,533	29,589	15,788
G5005.0	170	2.97	18.45	26,369	13,981	35,233	18,667	43,496 ¹	23,045 ¹
G7005.0	207	3.46	21.50	30,643	16,275	40,951	21,733	61,378	32,582
G7008.0	106	10.24	63.54	92,432	48,756	94,411 ¹	49,799 ¹	N/A	N/A
G8008.0	143	11.62	72.12	104,643	55,223	139,572	73,647	144,608 ¹	76,295 ¹
G10008.0	207	14.44	89.62	129,816	68,583	173,162	91,469	259,241	137,029

Notes:

1. Torques are calculated at MOP.
2. If accumulator is required, please consult factory before selecting an actuator size.

Stroking Time Data (Spring-Return, Fail-Safe Actuator)

Spring-Return Model	EHO MOP (bar)	Actuator DISPL (L)	Power Cycle				Spring Cycle		
			Stroke Time Power Cycle (seconds) AC 3-Phase ^{1,2,5}	Stroke Time Power Cycle (seconds) AC 1-Phase ^{1,2,5}	Motor HP Required	Stroke Time Power Cycle (seconds) 1/2 HP DC Motor ^{1,2}	Fastest Stroke Time with Accumulator (seconds) ^{1,4}	Fastest SR Stroke Time to Fail Position (seconds)	Slowest Recommended SR Stroke Time to Fail Position (seconds)
E35 DSRH-100	138	0.09	4	4	1.0	8	1	1.0	30
E50 DSRH-100	138	0.36	14	14	1.0	28	4	3.5	60
E60 DSRH-100	138	0.64	17	17	1.0	34	6	4.0	60
G01002.0-SR4	207	0.18	7	7	1.0	14	2	1.2	60
G01002.0-SR2	207	0.18	7	7	1.0	14	2	1.2	60
G2002.2-SR4	207	0.30	12	12	1.0	24	3	1.7	60
G2002.2-SR2	207	0.30	12	12	1.0	24	3	1.7	60
G3002.5-SR4	207	0.42	19	19	1.0	38	4	2.4	90
G3003.0-SR2	197	0.67	26	26	1.0	52	7	3.8	90
G4003.0-SR4	207	0.74	29	29	1.0	58	7	4.2	90
G4003.5-SR2	207	1.09	45	45	1.0	90	11	6.2	90
G5004.5-SR4	207	2.29	57	85.5	1.5 ⁴	114	23	13	120
G5005.0-SR2	203	2.97	70	105	1.5 ⁴	140	30	17	120
G7005.0-SR4	207	3.46	81	121.5	1.5 ⁴	C/F	35	20	120
G7005.0-SR3	207	3.46	81	121.5	1.5 ⁴	C/F	35	20	120
G7006.0-SR1	207	5.37	126	189	1.5 ⁴	C/F	54	30	120
G8007.0-SR3	207	8.54	190	285	1.5 ⁴	N/A	N/A	48	120
G8007.0-SR2	207	8.54	190	285	1.5 ⁴	N/A	N/A	48	120
G10009.0-SR4	196	19.04	400	600	1.5 ⁴	N/A	N/A	106	120
G10009.0-SR3	196	19.04	400	600	1.5 ⁴	N/A	N/A	106	120

(Double-Acting Actuator)

G-Series Double-Acting Model	EHO MOP (bar)	Outboard DISPL (L)	Counterclockwise to Open				Clockwise to Close					
			Stroke Time Power Cycle (seconds) AC 3-Phase ^{1,2,5}	Stroke Time Power Cycle (seconds) AC 1-Phase ^{1,2,5}	Stroke Time Power Cycle (seconds) 1/2 HP DC Motor ^{1,2}	Fastest Stroke Time with Accumulator (seconds) ^{1,4}	Inboard DISPL (In ³)	Stroke Time Power Cycle (seconds) AC 3-Phase ^{1,2,5}	Stroke Time Power Cycle (seconds) AC 1-Phase ^{1,2,5}	Stroke Time Power Cycle (seconds) 1/2 HP DC Motor ^{1,2}	Fastest Stroke Time with Accumulator (seconds) ^{1,4}	Motor HP Required
G01002.0	207	0.24	8	8	18	2.5	11.2	6	6	18	1.8	1.0
G2002.2	201	0.37	12	12	27	3.7	18.3	10	10	27	3.0	1.0
G3003.0	163	0.81	26	26	58	8	41	22	22	58	7	1.0
G4003.0	207	0.98	31	31	71	10	45	24	24	71	7	1.0
G4004.0	151	1.75	56	56	126	18	92	51	51	126	15	1.0
G5004.0	207	2.26	48	72	163	23	104	36	54	163	17	1.5 ⁴
G5005.0	170	3.54	75	112	C/F	36	181	63	95	C/F	30	1.5 ⁴
G7005.0	207	4.34	92	138	C/F	44	211	73	110	C/F	35	1.5 ⁴
G7008.0	106	11.13	235	353	N/A	112	625	216	324	N/A	103	1.5 ⁴
G8008.0	143	13.18	278	418	N/A	132	709	245	368	N/A	117	1.5 ⁴
G10008.0	207	17.30	366	549	N/A	174	881	305	458	N/A	145	1.5 ⁴

Notes:

1. Stroking speeds are estimates which may vary based on model configuration, temperature, and hydraulic fluid viscosity changes. Consult factory when sizing an actuator for processes with critical stroking speed requirements.
2. For stroking speed requirements less than the illustrated Power Cycle, consult factory for additional hydraulic accumulator to decrease opening stroke times.
3. If slower stroke time is required please consult factory.
4. Single phase motors will be 1 HP only.
5. If accumulator is required, please consult factory before selecting an actuator size.
6. Estimated AC Power Cycle speeds consider a 60 Hz power supply. For 50 Hz power supplies, multiply the listed speed by 0.833.

Model Code Information

Standard Spring-Return EHO

Code	Product Description	
EHO	Standard Self-Contained Electro-Hydraulic Actuator	
Code	Actuator Size	
	Spring-Return Actuator Model	
E35D-SRH100		
G01001.5-SR9		
E50D-SRH100		
G01002.0-SR5		
E60D-SRH100		
G01002.0-SR4		
G01002.0-SR2		
G2002.2-SR4		
G2002.2-SR2		
G3002.5-SR4		
G3003.0-SR2		
G4003.0-SR4		
G4003.5-SR2		
G5004.5-SR4		
G5005.0-SR2		
G7005.0-SR4		
G7005.0-SR3		
G7006.0-SR1		
G8007.0-SR3		
G8007.0-SR2		
G10009.0-SR4		
G10009.0-SR3		
Code	Temperature Rating	
A	-20 °F (-29 °C)	
B	-40 °F (-40 °C)	
Code	Valve Rotation Direction	
0	Clockwise to close	
1	Counterclockwise to close	
Code	Actuator Function	
A	On/Off	
Code	Fail Function	
	Loss of Power	Loss of ESD Signal
0	Stay put (No ESD)	N/A
1	Stay put	Close
2	Close	Close
3	Stay put	Open
4	Open	Open
5	Close (No ESD)	N/A
6	Open (No ESD)	N/A
Code	ESD Solenoid Valve	
X	No ESD Solenoid Valve (Fail Function Code 0 only)	
N	Internally Powered ESD Solenoid Valve, No ESD Signal (Fail Function Codes 5 and 6 only, if Low Wattage Required Add -S)	
S	Internal Standard Solenoid Valve, 24 V DC SIGNAL (Fail Function Codes 1, 2, 3, and 4) - Common	
R	Internal Standard Solenoid Valve with External Manual Reset Pushbutton Box, 24 V DC SIGNAL (Fail Function Codes 1, 2, 3, and 4)	
L	External Low Wattage Solenoid Valve (down to -36C), 24 V DC SIGNAL (Fail Function Codes 1, 2, 3, and 4)	
D	Dual ESD Solenoid Valves, 24 V DC SIGNAL (Fail Function Codes 1, 2, 3, and 4)	
T	Internal Standard Solenoid Valve, 120 V AC SIGNAL (Fail Function Codes 1, 2, 3, and 4) - Common	
P	Internal Standard Solenoid Valve with External Manual Reset Pushbutton Box, 120 V AC SIGNAL (Fail Function Codes 1, 2, 3, and 4)	
K	External Low Wattage Solenoid Valve (down to -36C), 120 V AC SIGNAL (Fail Function Codes 1, 2, 3, and 4)	
E	Dual ESD Solenoid Valves, 120 V AC SIGNAL (Fail Function Codes 1, 2, 3, and 4)	
U	Internal Standard Solenoid Valve, Non-standard Signal Voltage Specified in -S (Fail Function Codes 1, 2, 3, and 4) - Uncommon	
Q	Internal Standard Solenoid Valve with External Manual Reset Pushbutton Box, Non-standard Signal Voltage Specified in -S (Fail Function Codes 1, 2, 3, and 4) - Uncommon	
J	External Low Wattage Solenoid Valve (down to -36C), Non-standard Signal Voltage Specified in -S (Fail Function Codes 1, 2, 3, and 4) - Uncommon	
F	Dual ESD Solenoid Valves, Non-standard Signal Voltage Specified in -S (Fail Function Codes 1, 2, 3, and 4) - Uncommon	

Model Code Information

Standard Spring-Return EHO (continuation)

Code	Remote Control			
0	Discrete			
Code	Limit Switches			
A	2 SPDT			
B	4 SPDT			
Code	Output			
0	None			
1	Internal pressure transmitter with 4-20 mA output for hydraulic pressure monitoring			
2	Internal pressure switch for low pressure alarm			
3	Internal pressure switch for low pressure alarm (accumulator)			
Code	Power Supply			
	Volts		Phase	Hz
1	208	AC	3	60
2	230	AC	3	60
3	460	AC	3	60
T	460	AC	3	50
4	575	AC	3	60
5	380	AC	3	50
N	380	AC	3	60
6	115	AC	1	60
7	208	AC	1	60
8	230	AC	1	60
9	415	AC	3	50
K	220	AC	1	50
P	220	AC	3	50
L	115	AC	1	50
R	550	AC	3	50
S	660	AC	3	60
A	400	AC	3	50
V	690	AC	3	50
W	690	AC	3	60
F	24	DC	-	-
Code	Orientation (Operator to Pipeline)			
	Pipeline Orientation	Valve Stem Orientation	Actuator Cylinder Orientation	
1	Horizontal	Vertical	Parallel to pipeline	
2	Horizontal	Vertical	Perpendicular to pipeline	
3	Horizontal	Horizontal	Parallel to pipeline	
4	Horizontal	Horizontal	Perpendicular to pipeline	
5	Vertical	Horizontal	Perpendicular to pipeline	
6	Vertical	Horizontal	Parallel to pipeline	
Code	Valve Mounting			
MN	No Valve Mounting Adaptor			
MA	Valve mounting Adaptor			
Code	Options (Multiple Choices)			
AX	Accumulator for X strokes, for example, A1 means accumulator for 1 stroke			
CB	Close coupled circuit breaker			
PC	Customer specified paint			
PS	Bettis standard paint			
RB	Remote mounted circuit breaker			
RD	Remote display module			
SP	Solar panel and battery (only 24 V DC model)			
SW	Level Switch			
Code	Certificates (Multiple Choices)			
AX	ATEX Eexd IIB T4			
CS*	CSA Class I Div. I Group C, D			
FM*	FM Class I Div. I Group C, D			
IE	IECEX			
S2	SIL-2			
Code	Special Configuration			
S	Special Configuration			

Note:

* CSA and FM group B certification available as a special configuration upon request.

Model Code Information

Standard Double-Acting EHO

Code	Product Description	
EHO	Smart Self-Contained Electro-Hydraulic Actuator	
Code	Actuator Size	
	Double-Acting Actuator Model	
G01002.0		
G2002.2		
G3003.0		
G4003.0		
G4004.0		
G5004.0		
G5005.0		
G7005.0		
G7008.0		
G8008.0		
G10008.0		
Code	Temperature Rating	
A	-20 °F (-29 °C)	
B	-40 °F (-40 °C)	
Code	Valve Rotation Direction	
0	Clockwise to close	
1	Counterclockwise to close	
Code	Actuator Function	
A	On/Off	
Code	Fail Function	
	Loss of Power	Loss of ESD Signal
0	Stay put (No ESD)	N/A
1	Stay put	Close
2	Close	Close
3	Stay put	Open
4	Open	Open
5	Close (No ESD)	N/A
6	Open (No ESD)	N/A
Code	ESD Solenoid Valve	
X	No ESD Solenoid Valve (Fail Function Code 0 only)	
N	Internally Powered ESD Solenoid Valve, No ESD Signal (Fail Function Codes 5 and 6 only, if Low Wattage Required Add -S)	
S	Internal Standard Solenoid Valve, 24 V DC SIGNAL (Fail Function Codes 1, 2, 3, and 4) - Common	
R	Internal Standard Solenoid Valve with External Manual Reset Pushbutton Box, 24 V DC SIGNAL (Fail Function Codes 1, 2, 3, and 4)	
L	External Low Wattage Solenoid Valve (down to -36C), 24 V DC SIGNAL (Fail Function Codes 1, 2, 3, and 4)	
D	Dual ESD Solenoid Valves, 24 V DC SIGNAL (Fail Function Codes 1, 2, 3, and 4)	
T	Internal Standard Solenoid Valve, 120 V AC SIGNAL (Fail Function Codes 1, 2, 3, and 4) - Common	
P	Internal Standard Solenoid Valve with External Manual Reset Pushbutton Box, 120 V AC SIGNAL (Fail Function Codes 1, 2, 3, and 4)	
K	External Low Wattage Solenoid Valve (down to -36C), 120 V AC SIGNAL (Fail Function Codes 1, 2, 3, and 4)	
E	Dual ESD Solenoid Valves, 120 V AC SIGNAL (Fail Function Codes 1, 2, 3, and 4)	
U	Internal Standard Solenoid Valve, Non-standard Signal Voltage Specified in -S (Fail Function Codes 1, 2, 3, and 4) - Uncommon	
Q	Internal Standard Solenoid Valve with External Manual Reset Pushbutton Box, Non-standard Signal Voltage Specified in -S (Fail Function Codes 1, 2, 3, and 4) - Uncommon	
J	External Low Wattage Solenoid Valve (down to -36C), Non-standard Signal Voltage Specified in -S (Fail Function Codes 1, 2, 3, and 4) - Uncommon	
F	Dual ESD Solenoid Valves, Non-standard Signal Voltage Specified in -S (Fail Function Codes 1, 2, 3, and 4) - Uncommon	
Code	Remote Control	
0	Discrete	

Model Code Information

Standard Double-Acting EHO (continuation)

Code	Limit Switches			
A	2 SPDT			
B	4 SPDT			
Code	Output			
0	None			
1	Internal pressure transmitter with 4-20 mA output for hydraulic pressure monitoring			
2	Internal pressure switch for low pressure alarm			
3	Internal pressure switch for low pressure alarm (accumulator)			
Code	Power Supply			
	Volts		Phase	Hz
1	208	AC	3	60
2	230	AC	3	60
3	460	AC	3	60
T	460	AC	3	50
4	575	AC	3	60
5	380	AC	3	50
N	380	AC	3	60
6	115	AC	1	60
7	208	AC	1	60
8	230	AC	1	60
9	415	AC	3	50
K	220	AC	1	50
P	220	AC	3	50
L	115	AC	1	50
R	550	AC	3	50
S	660	AC	3	60
A	400	AC	3	50
V	690	AC	3	50
W	690	AC	3	60
F	24	DC	-	-
Code	Orientation (Operator to Pipeline)			
	Pipeline Orientation	Valve Stem Orientation	Actuator Cylinder Orientation	
1	Horizontal	Vertical	Parallel to pipeline	
2	Horizontal	Vertical	Perpendicular to pipeline	
3	Horizontal	Horizontal	Parallel to pipeline	
4	Horizontal	Horizontal	Perpendicular to pipeline	
5	Vertical	Horizontal	Perpendicular to pipeline	
6	Vertical	Horizontal	Parallel to pipeline	
Code	Valve Mounting			
MN	No Valve Mounting Adaptor			
MA	Valve mounting Adaptor			
Code	Options (Multiple Choices)			
AX	Accumulator for X strokes, for example, A1 means accumulator for 1 stroke			
CB	Close coupled circuit breaker			
PC	Customer specified paint			
PS	Bettis standard paint			
RB	Remote mounted circuit breaker			
RD	Remote display module			
SP	Solar panel and battery (only 24 V DC model)			
SW	Level Switch			
Code	Certificates (Multiple Choices)			
AX	ATEX Eexd IIB T4			
CS*	CSA Class I Div. I Group C, D			
FM*	FM Class I Div. I Group C, D			
IE	IECEX			
Code	Special Configuration			
S	Special Configuration			

Note:

* CSA and FM group B certification available as a special configuration upon request.

Model Code Information

Smart Spring-Return EHO

Code	Product Description	
SEHO	Smart Self-Contained Electro-Hydraulic Actuator	
Code	Actuator Size	
	Spring-Return Actuator Model	
E35D-SRH100		
G01001.5-SR9		
E50D-SRH100		
G01002.0-SR5		
E60D-SRH100		
G01002.0-SR4		
G01002.0-SR2		
G2002.2-SR4		
G2002.2-SR2		
G3002.5-SR4		
G3003.0-SR2		
G4003.0-SR4		
G4003.5-SR2		
G5004.5-SR4		
G5005.0-SR2		
G7005.0-SR4		
G7005.0-SR3		
G7006.0-SR1		
G8007.0-SR3		
G8007.0-SR2		
G10009.0-SR4		
G10009.0-SR3		
Code	Temperature Rating	
A	-20 °F (-29 °C)	
B	-40 °F (-40 °C)	
Code	Valve Rotation Direction	
0	Clockwise to close	
1	Counterclockwise to close	
Code	Actuator Function	
B	On/Off or Intermittent Positioning	
C	Modulating	
Code	Fail Function	
	Loss of Power	Loss of ESD Signal
0	Stay put (No ESD)	N/A
1	Stay put	Close
2	Close	Close
3	Stay put	Open
4	Open	Open
5	Close (No ESD)	N/A
6	Open (No ESD)	N/A
Code	ESD Solenoid Valve	
X	No ESD Solenoid Valve (Fail Function Code 0 only)	
N	Internally Powered ESD Solenoid Valve, No ESD Signal (Fail Function Codes 5 and 6 only, if Low Wattage Required Add -S)	
S	Internal Standard Solenoid Valve, 24 V DC SIGNAL (Fail Function Codes 1, 2, 3, and 4) - Common	
R	Internal Standard Solenoid Valve with External Manual Reset Pushbutton Box, 24 V DC SIGNAL (Fail Function Codes 1, 2, 3, and 4)	
L	External Low Wattage Solenoid Valve (down to -36C), 24 V DC SIGNAL (Fail Function Codes 1, 2, 3, and 4)	
D	Dual ESD Solenoid Valves, 24 V DC SIGNAL (Fail Function Codes 1, 2, 3, and 4)	
T	Internal Standard Solenoid Valve, 120 V AC SIGNAL (Fail Function Codes 1, 2, 3, and 4) - Common	
P	Internal Standard Solenoid Valve with External Manual Reset Pushbutton Box, 120 V AC SIGNAL (Fail Function Codes 1, 2, 3, and 4)	
K	External Low Wattage Solenoid Valve (down to -36C), 120 V AC SIGNAL (Fail Function Codes 1, 2, 3, and 4)	
E	Dual ESD Solenoid Valves, 120 V AC SIGNAL (Fail Function Codes 1, 2, 3, and 4)	
U	Internal Standard Solenoid Valve, Non-standard Signal Voltage Specified in -S (Fail Function Codes 1, 2, 3, and 4) - Uncommon	
Q	Internal Standard Solenoid Valve with External Manual Reset Pushbutton Box, Non-standard Signal Voltage Specified in -S (Fail Function Codes 1, 2, 3, and 4) - Uncommon	
J	External Low Wattage Solenoid Valve (down to -36C), Non-standard Signal Voltage Specified in -S (Fail Function Codes 1, 2, 3, and 4) - Uncommon	
F	Dual ESD Solenoid Valves, Non-standard Signal Voltage Specified in -S (Fail Function Codes 1, 2, 3, and 4) - Uncommon	

Model Code Information

Smart Spring-Return EHO (continuation)

Code	Communication Protocols			
0	No communication protocol			
1	Modbus (CAM05)			
2	HART (CAM16)			
3	Foundation Fieldbus (CAM228)			
Code	Limit Switches			
N	No Limit Switches			
A	2 SPDT			
B	4 SPDT			
Code	Power Supply			
	Volts		Phase	Hz
1	208	AC	3	60
2	230	AC	3	60
3	460	AC	3	60
T	460	AC	3	50
4	575	AC	3	60
5	380	AC	3	50
N	380	AC	3	60
6	115	AC	1	60
7	208	AC	1	60
8	230	AC	1	60
9	415	AC	3	50
K	220	AC	1	50
P	220	AC	3	50
L	115	AC	1	50
R	550	AC	3	50
S	660	AC	3	60
A	400	AC	3	50
V	690	AC	3	50
W	690	AC	3	60
F	24	DC	-	-
Code	Orientation (Operator to Pipeline)			
	Pipeline Orientation	Valve Stem Orientation	Actuator Cylinder Orientation	
1	Horizontal	Vertical	Parallel to pipeline	
2	Horizontal	Vertical	Perpendicular to pipeline	
3	Horizontal	Horizontal	Parallel to pipeline	
4	Horizontal	Horizontal	Perpendicular to pipeline	
5	Vertical	Horizontal	Perpendicular to pipeline	
6	Vertical	Horizontal	Parallel to pipeline	
Code	Valve Mounting			
MN	No Valve Mounting Adaptor			
MA	Valve mounting Adaptor			
Code	Options (Multiple Choices)			
AX	Accumulator for X strokes, for example, A1 means accumulator for 1 stroke			
CB	Close coupled circuit breaker			
PC	Customer specified paint			
PS	Bettis standard paint			
RB	Remote mounted circuit breaker			
SP	Solar panel and battery (only 24 V DC model)			
SW	Level Switch			
Code	Certificates (Multiple Choices)			
AX	ATEX Eexd IIB T4			
CS*	CSA Class I Div. I Group C, D			
FM*	FM Class I Div. I Group C, D			
IE	IECEX			
S3	SIL 3			
Code	Special Configuration			
S	Special Configuration			

Note:

* CSA and FM group B certification available as a special configuration upon request.

Model Code Information

Smart Double-Acting EHO

Code	Product Description	
SEHO	Smart Self-Contained Electro-Hydraulic Actuator	
Code	Actuator	
	Double-Acting Actuator Model	
G01002.0		
G2002.2		
G3003.0		
G4003.0		
G4004.0		
G5004.0		
G5005.0		
G7005.0		
G7008.0		
G8008.0		
G10008.0		
Code	Temperature Rating	
A	-20 °F (-29 °C)	
B	-40 °F (-40 °C)	
Code	Valve Rotation Direction	
0	Clockwise to close	
1	Counterclockwise to close	
Code	Actuator Function	
B	On/Off or Intermittent Positioning	
C	Modulating	
Code	Fail Function	
	Loss of Power	
	Loss of ESD Signal	
0	Stay put (No ESD)	N/A
1	Stay put	Close
2	Close	Close
3	Stay put	Open
4	Open	Open
5	Close (No ESD)	N/A
6	Open (No ESD)	N/A
Code	ESD Solenoid Valve	
X	No ESD Solenoid Valve (Fail Function Code 0 only)	
N	Internally Powered ESD Solenoid Valve, No ESD Signal (Fail Function Codes 5 and 6 only, if Low Wattage Required Add -S)	
S	Internal Standard Solenoid Valve, 24 V DC SIGNAL (Fail Function Codes 1, 2, 3, and 4) - Common	
R	Internal Standard Solenoid Valve with External Manual Reset Pushbutton Box, 24 V DC SIGNAL (Fail Function Codes 1, 2, 3, and 4)	
L	External Low Wattage Solenoid Valve (down to -36C), 24 V DC SIGNAL (Fail Function Codes 1, 2, 3, and 4)	
D	Dual ESD Solenoid Valves, 24 V DC SIGNAL (Fail Function Codes 1, 2, 3, and 4)	
T	Internal Standard Solenoid Valve, 120 V AC SIGNAL (Fail Function Codes 1, 2, 3, and 4) - Common	
P	Internal Standard Solenoid Valve with External Manual Reset Pushbutton Box, 120 V AC SIGNAL (Fail Function Codes 1, 2, 3, and 4)	
K	External Low Wattage Solenoid Valve (down to -36C), 120 V AC SIGNAL (Fail Function Codes 1, 2, 3, and 4)	
E	Dual ESD Solenoid Valves, 120 V AC SIGNAL (Fail Function Codes 1, 2, 3, and 4)	
U	Internal Standard Solenoid Valve, Non-standard Signal Voltage Specified in -S (Fail Function Codes 1, 2, 3, and 4) - Uncommon	
Q	Internal Standard Solenoid Valve with External Manual Reset Pushbutton Box, Non-standard Signal Voltage Specified in -S (Fail Function Codes 1, 2, 3, and 4) - Uncommon	
J	External Low Wattage Solenoid Valve (down to -36C), Non-standard Signal Voltage Specified in -S (Fail Function Codes 1, 2, 3, and 4) - Uncommon	
F	Dual ESD Solenoid Valves, Non-standard Signal Voltage Specified in -S (Fail Function Codes 1, 2, 3, and 4) - Uncommon	
Code	Communication Protocols	
0	No communication protocol	
1	Modbus (CAM05)	
2	HART (CAM16)	
3	Foundation Fieldbus (CAM228)	

Model Code Information

Smart Double-Acting EHO (continuation)

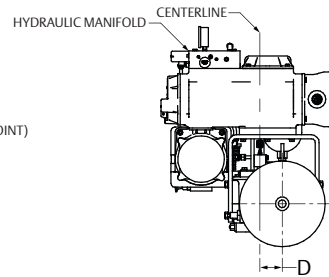
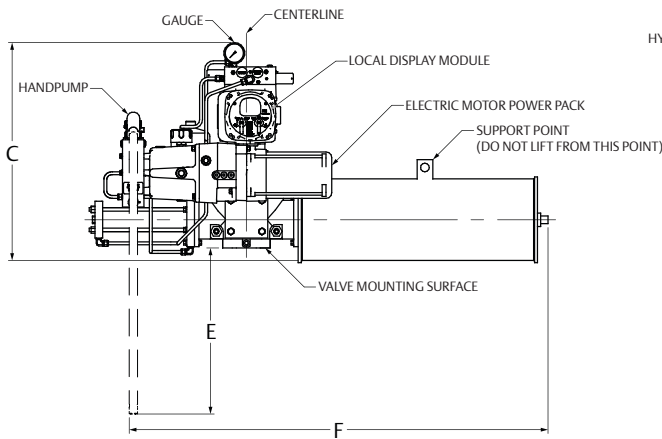
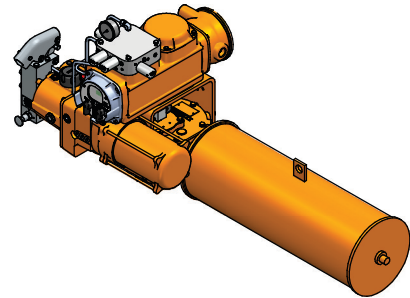
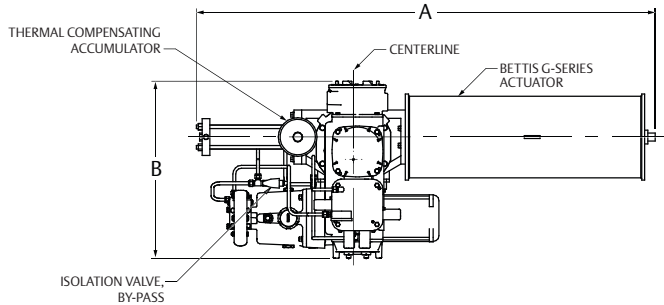
Code		Limit Switches		
N		No Limit Switches		
A		2 SPDT		
B		4 SPDT		
Code		Output		
0		None		
1		Internal pressure transmitter with 4 - 20 mA output for hydraulic pressure monitoring		
2		Internal pressure switch for low pressure alarm		
Code		Power Supply		
		Volts	Phase	Hz
1		208	AC	3
2		230	AC	3
3		460	AC	3
T		460	AC	3
4		575	AC	3
5		380	AC	3
N		380	AC	3
6		115	AC	1
7		208	AC	1
8		230	AC	1
9		415	AC	3
K		220	AC	1
P		220	AC	3
L		115	AC	1
R		550	AC	3
S		660	AC	3
A		400	AC	3
V		690	AC	3
W		690	AC	3
F		24	DC	-
Code		Orientation (Operator to Pipeline)		
		Pipeline Orientation	Valve Stem Orientation	Actuator Cylinder Orientation
1		Horizontal	Vertical	Parallel to pipeline
2		Horizontal	Vertical	Perpendicular to pipeline
3		Horizontal	Horizontal	Parallel to pipeline
4		Horizontal	Horizontal	Perpendicular to pipeline
5		Vertical	Horizontal	Perpendicular to pipeline
6		Vertical	Horizontal	Parallel to pipeline
Code		Valve Mounting		
MN		No Valve Mounting Adaptor		
MA		Valve mounting Adaptor		
Code		Options (Multiple Choices)		
AX		Accumulator for X strokes, for example, A1 means accumulator for 1 stroke		
CB		Close coupled circuit breaker		
PC		Customer specified paint		
PS		Bettis standard paint		
RB		Remote mounted circuit breaker		
SP		Solar panel and battery (only 24 V DC model)		
SW		Level Switch		
Code		Certificates (Multiple Choices)		
AX		ATEX Eexd IIB T4		
CS*		CSA Class I Div. I Group C, D		
FM*		FM Class I Div. I Group C, D		
IE		IECEX		
Code		Special Configuration		
S		Special Configuration		

Note:

* CSA and FM group B certification available as a special configuration upon request.

Dimension

Spring-Return, Fail-Safe Actuator

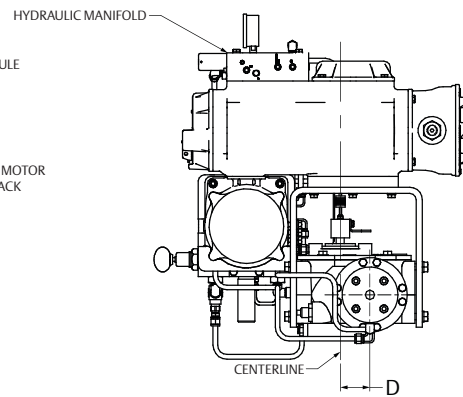
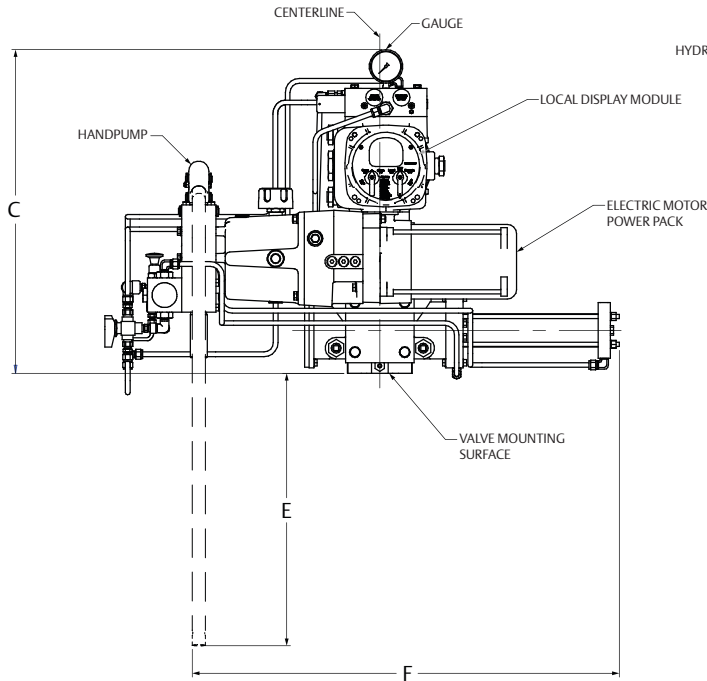
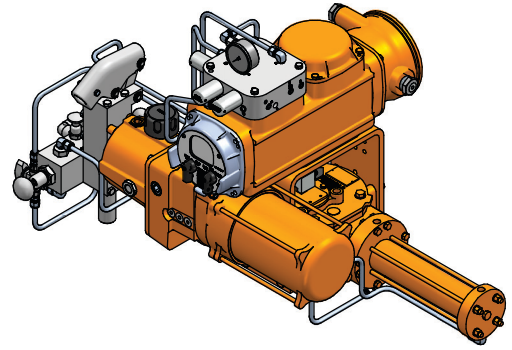
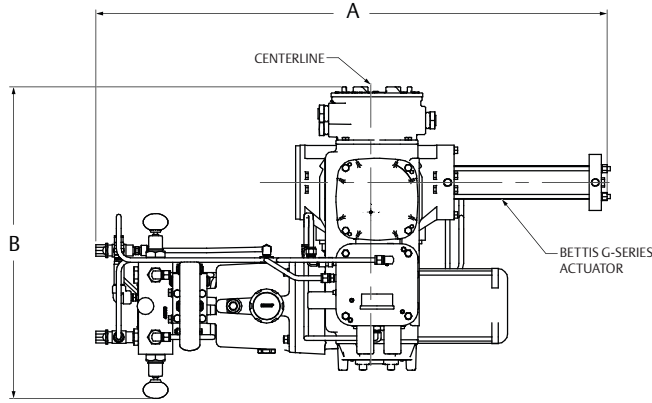


OUTLINE DIMENSION AND DETAILS

Actuator	A		B		C		D		E		F		Approximate Weight	
	inch	cm	inch	cm	inch	cm	inch	cm	inch	cm	inch	cm	lb	kg
E35D-SRH100	32.00	81.30	22.6	57.40	28.10	71.40	1.40	3.50	22.8	57.91	25.0	63.50	515	234
E50D-SRH100	48.50	123.20	22.6	57.40	28.10	71.40	2.20	5.60	20.2	51.31	30.0	76.20	565	259
E60D-SRH100	54.00	137.20	22.6	57.40	30.10	76.50	2.40	6.10	18.4	46.74	30.9	78.49	625	284
G01002.0-SR2-CW	54.0	137.16	22.6	57.40	28.1	71.37	2.4	6.10	21.9	55.63	34.4	87.38	669	303
G01002.0-SR4-CW	54.0	137.16	22.6	57.40	28.1	71.37	2.4	6.10	21.9	55.63	34.4	87.38	655	297
G2002.2-SR2-CW	57.8	146.81	22.6	57.40	28.1	71.37	2.9	7.37	21.4	54.36	54.0	137.16	774	351
G2002.2-SR4-CW	57.8	146.81	22.6	57.40	28.1	71.37	2.9	7.37	21.4	54.36	54.0	137.16	759	344
G3002.5-SR4-CW	65.5	166.37	22.6	57.40	32.1	81.53	3.5	8.89	17.9	45.47	57.1	145.03	916	415
G3003.0-SR2-CW	65.5	166.37	22.6	57.40	32.1	81.53	3.5	8.89	17.9	45.47	57.1	145.03	945	429
G4003.0-SR4-CW	76.2	193.55	27.7	70.36	31.7	80.52	4.3	10.92	16.4	41.66	62.6	159.00	1229	557
G4003.5-SR2-CW	76.2	193.55	27.7	70.36	31.7	80.52	4.3	10.92	16.4	41.66	62.6	159.00	1313	596
G5004.5-SR4-CW	89.0	226.06	31.1	78.99	35.9	91.19	5.5	13.97	13.3	33.78	69.3	176.02	1970	894
G5005.0-SR2-CW	89.0	226.06	31.1	78.99	35.9	91.19	5.5	13.97	13.3	33.78	69.3	176.02	2099	952
G7005.0-SR3-CW	105.6	268.22	35.7	90.68	42.4	107.70	6.8	17.27	10.3	26.16	91.8	233.17	3238	1469
G7005.0-SR4-CW	105.6	268.22	35.7	90.68	42.4	107.70	6.8	17.27	10.3	26.16	91.8	233.17	3325	1508
G7006.0-SR4-CW	105.6	268.22	35.7	90.68	42.4	107.70	6.8	17.27	10.3	26.16	91.8	233.17	3312	1502
G8007.0-SR2-CW	139.7	354.84	36.9	93.73	43.1	109.47	8.0	20.32	9.2	23.37	111.2	282.45	5447	2471
G8007.0-SR3-CW	139.7	354.84	36.9	93.73	43.1	109.47	8.0	20.32	9.2	23.37	111.2	282.45	5427	2462
G10009.0-SR4-CW	168.6	428.24	39.4	100.08	45.3	115.06	10.5	154.94	7.2	18.29	127.0	322.58	7497	3401

Dimension

Double-Acting Actuator

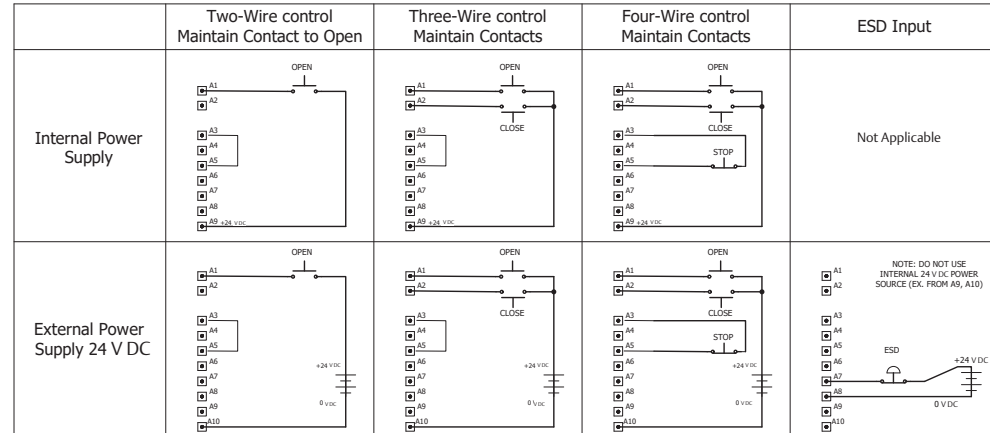
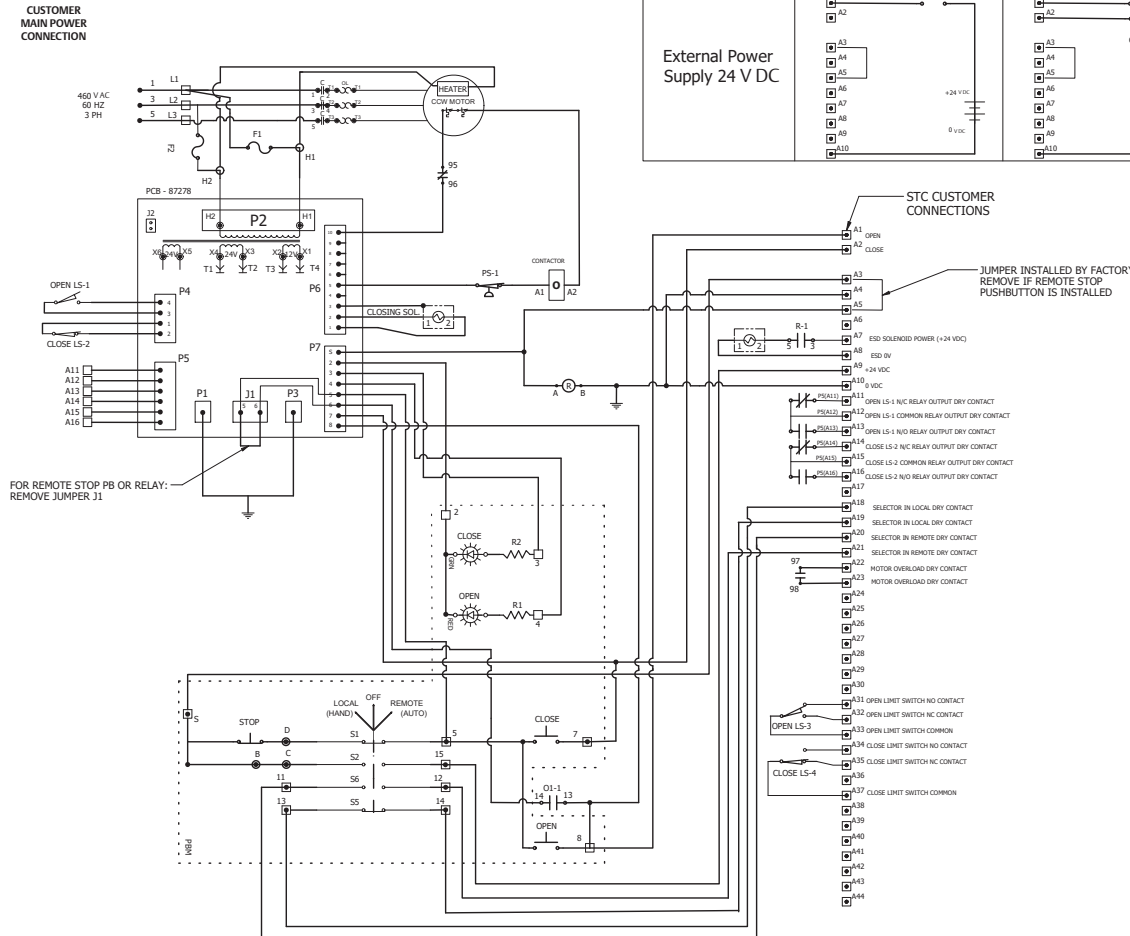


OUTLINE DIMENSION AND DETAILS

Actuator	A		B		C		D		E		F		Approximate Weight	
	inch	cm	inch	cm	inch	cm	inch	cm	inch	cm	inch	cm	lb	kg
G01002.0	41.2	104.65	25.2	64.01	26.5	67.31	2.4	6.10	21.9	55.63	34.4	87.38	669	303
G2002.2	42.4	107.70	25.2	64.01	27.3	69.34	3.0	7.62	24.4	61.98	35.4	89.92	774	351
G3003.0	45.6	115.82	25.2	64.01	31.4	79.76	3.5	8.89	18.0	45.72	38.5	97.79	916	415
G4004.0	55.2	140.21	25.2	64.01	33.0	83.82	4.3	10.92	14.0	35.56	48.0	121.92	1229	557
G5004.0	61.6	156.46	28.5	72.39	35.9	91.19	5.5	13.97	14.2	36.07	54.2	137.67	1970	894
G5005.0	61.6	156.46	28.5	72.39	35.9	91.19	5.5	13.97	14.2	36.07	54.2	137.67	2099	952
G7005.0	65.5	166.37	31.3	79.38	37.5	95.25	6.7	17.02	10.4	26.42	58.5	148.59	3238	1469
G7008.0	65.5	166.37	31.3	79.38	37.5	95.25	6.7	17.02	10.4	26.42	58.5	148.59	3325	1508
G8008.0	71.6	181.86	33.6	85.34	40.2	102.11	8.0	20.32	9.4	23.88	64.6	164.08	5447	2471
G10008.0	83.5	212.09	37.9	96.27	43.2	109.73	10.5	26.67	7.3	18.54	76.5	194.31	7497	3401

Standard EHO

Generic Electrical Connection Diagram (Serial Numbers Prior to 1195521)

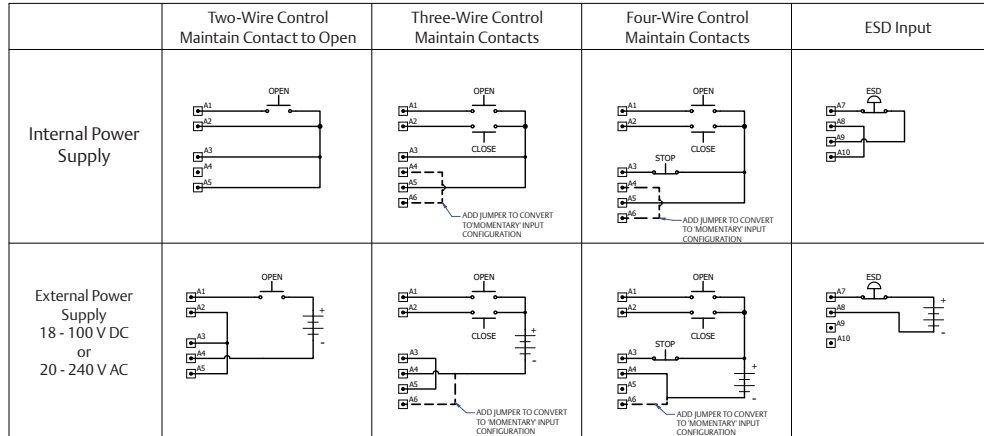
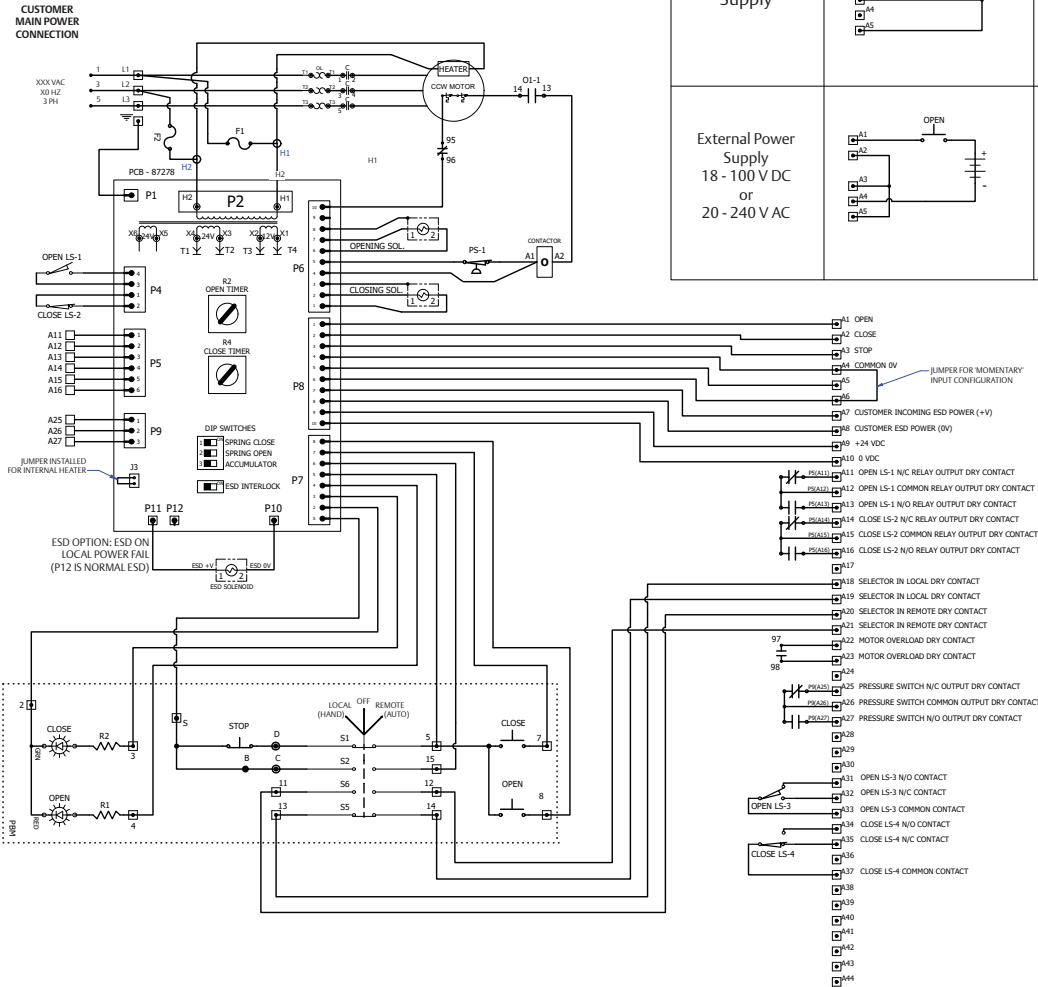


LIMIT SWITCH	CONTACT	VALVE POSITION		
		FULLY OPEN	MID POSITION	FULLY CLOSED
LS-2 and 4	N.C.			
LS-1 and 3	N.O.			
	N.C.			
	N.O.			

TRANS	DIR	AUTO
S1	X	O
S2	O	X
S6	O	X
S5	X	O

Standard EHO

Generic Electrical Connection Diagram (Serial Numbers After 1195521)



REVISIONS			
REV	ECN	DATE	

LIMIT SWITCH CONTACT DEVELOPMENT				
LIMIT SWITCH	CONTACT	VALVE POSITION		
		FULLY OPEN	MID POSITION	FULLY CLOSED
LS-2 and 4	N.C.			
LS-1 and 3	N.O.			
	N.C.			
	N.O.			

DIP SWITCHES				
	1	2	3	
SR, FAIL, CLOSE, NO ACC	X	O	O	
SR, FAIL, CLOSE, ACC	X	O	X	
SR, FAIL, OPEN, NO ACC	O	X	O	
SR, FAIL, OPEN, ACC	O	X	X	
DA, NO ACC	O	O	O	
DA, ACC	O	O	X	

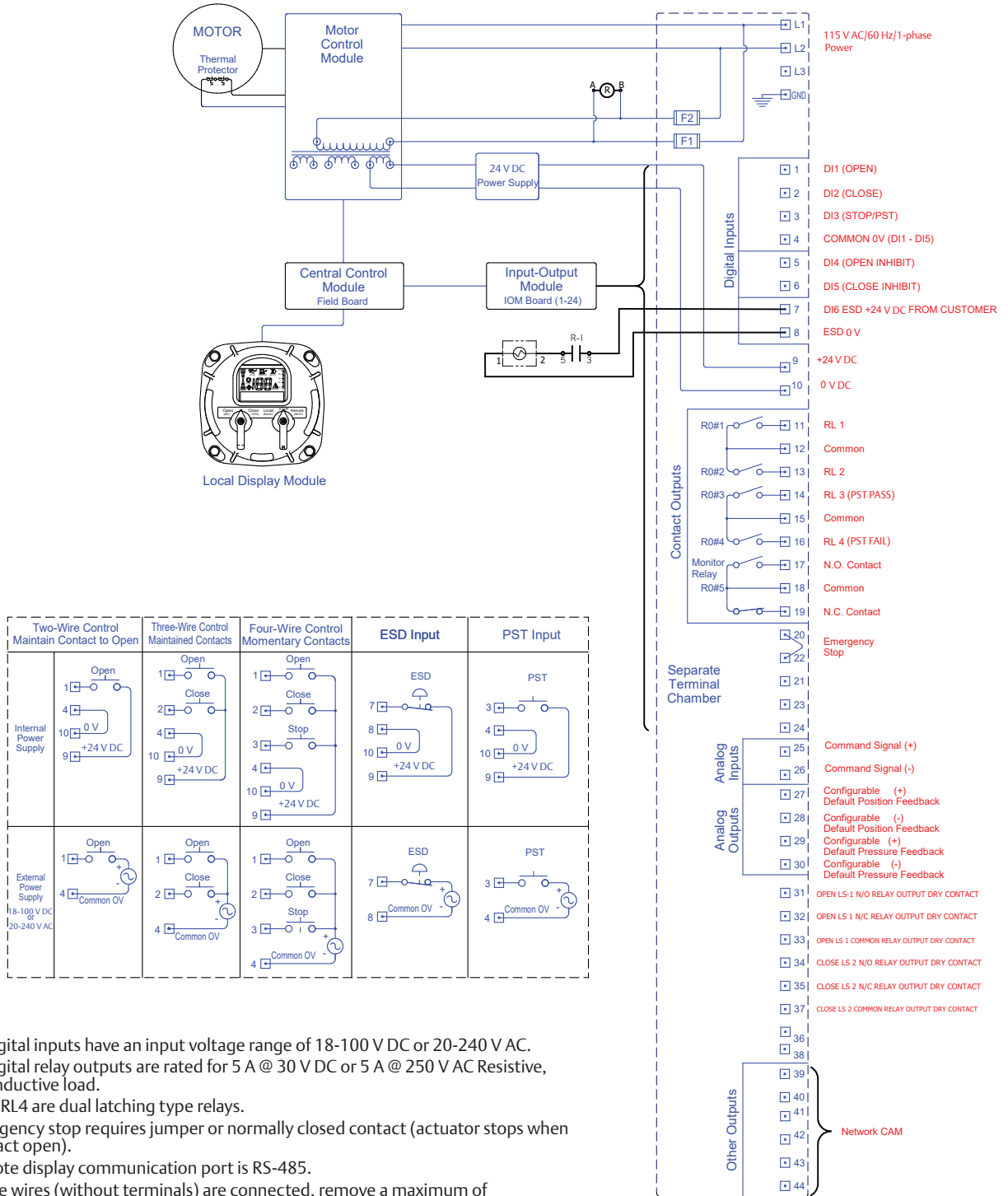
SELECTOR SWITCH				
	1	2	3	
HAND/OFF/AUTO	X	O	O	
S1	X	O	O	
S2	O	O	X	
S6	O	O	X	
S5	X	O	O	

Notes:

1. All digital inputs have an input voltage range of 18-100 V DC or 20-240 V AC.
2. All digital relay outputs are rated for 5 A @ 30 V DC or 5 A @ 250 V AC Resistive, 2 A Inductive load.
3. Pressure Switch and Limit Switch relays are non latching type relays.
4. Emergency stop requires jumper or normally closed contact (actuator stops when contact is open).
5. If bare wires (without terminals) are connected, remove a maximum of 0.25 inch insulation.
6. User replaceable primary fuses (F1 and F2) are located in the Terminal Chamber Enclosure.
7. For single phase supply option, terminal L1 should be used as Live connection and L2 should be used as neutral connection.
8. When ESD Interlock Dip Switch is set to ON, motor will not run when ESD signal is lost. ESD Interlock Dip Switch defaults to OFF.
9. Timers provide a 1 to 15 seconds delay in shutting off the solenoid/motor at the end of the stroke. Timers start at a 1 second delay in the full CCW position and adjust at a rate of 1 second per every 1.5 turns to a maximum of 15 seconds.

Smart EHO

Generic Electrical Connection Diagram



Notes:

1. All digital inputs have an input voltage range of 18-100 V DC or 20-240 V AC.
2. All digital relay outputs are rated for 5 A @ 30 V DC or 5 A @ 250 V AC Resistive, 2 A Inductive load.
3. RL1 - RL4 are dual latching type relays.
4. Emergency stop requires jumper or normally closed contact (actuator stops when contact open).
5. Remote display communication port is RS-485.
6. If bare wires (without terminals) are connected, remove a maximum of 0.25 inch insulation.
7. User replaceable primary fuses (F1 and F2) are located in the Terminal Chamber Enclosure.
8. For single phase supply option, terminal L1 should be used as Live connection and L2 should be used as Neutral connection.
9. The Shield connections of RS485, Analog input and Analog output lines should be terminated on terminal #24.

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