

Bettis™ EHO Electro-Hydraulic Operator

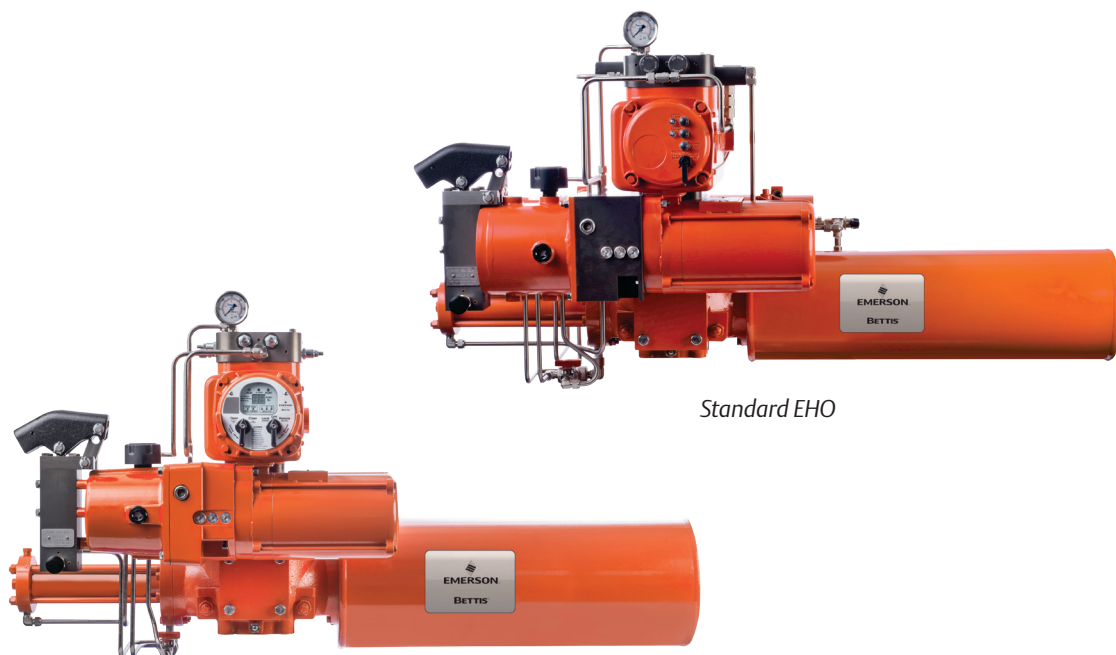
The Bettis EHO is a self-contained, quarter-turn, valve actuator that combines proven technologies from Emerson's Actuation Technologies. The actuator has been designed for critical shutdown applications where reliability is crucial. The EHO utilizes a dependable spring-return actuator for the fail-safe 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, also solar panels are available for areas without electrical power. A hydraulic hand pump 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.



Standard EHO

Smart EHO

Table of Contents

Section 1:	Product Attributes	3
Section 2:	General Specifications	4
Section 3:	Torque Output Data	
	<i>Spring-Return Fail-Safe Actuator</i>	6
	<i>Double-Acting Actuator</i>	7
Section 4:	Model Code Information	
	<i>Standard Spring-Return EHO Actuator</i>	9
	<i>Standard Double-Acting EHO Actuator</i>	11
	<i>Smart Spring-Return EHO</i>	13
	<i>Smart Double-Acting EHO</i>	15
Section 5:	Dimension	
	<i>Spring-Return, Fail-Safe Actuator</i>	17
	<i>Spring-Return Actuator</i>	18
	<i>Double-Acting Actuator</i>	19
Section 6:	Diagrams	
	<i>Standard EHO Electrical Connection Diagram</i>	20
	<i>Smart EHO Electrical Connection Diagram</i>	21

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 with AC
- Local lockable Remote/Local/Offline selector switch
- Local open/Close selector knob
- Partial-stroke test
- 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, powder-coated, salt-resistant also rated for IP68 ingress protection
- Hydraulic hand pump manual override
- Accumulators (optional)
- Operating pressures up to 3000 psi 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 4-20mA analog input
- (Smart) Over 15 alerts and alarms
- (Smart) Diagnostics and self-calibration features

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 $\pm 5\text{Hz}$ frequency. If power supply variations are outside these limits, please consult Actuation Technologies to ensure that actuator performance meets your requirements.

Conduit Entry Sizes

- Two 1" NPT, One 1.5" NPT bottom entry
- One 1" NPT top entry

Local Operation and Display

- Open/Close/Stop push buttons
- (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 hand pump manual override

Remote Operation

(Inputs)

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

(Outputs)

- Discrete open/close limits
- 4 - 20mA hydraulic pressure feedback
- (Smart) 4 configurable relays
- (Smart) 1 ESD monitor relay
- (Smart) 4-20mA 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 Megaflow®AW HVI 15
For temperatures down to -20°F (-29°C)
- EXXON Unis J13
For temperatures down to -40°F (-40°C)

Ingress Protection

- Control enclosure: IP68
- Hydraulic actuator: IP67M
- Motor: IP68
- Reservoir: IP54 (IP66 optional)

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	Actuator MOP (psig)	Actuator DISPL (in ³)	Spring Cycle (lbf-in)			Pressure Cycle @ 2500 psig (lbf-in) or designated pressure			Pressure Cycle @ 3000 psig (lbf-in) or designated pressure			Stroke Time Power Cycle (seconds) AC 3-Phase****	Stroke Time Pressure Cycle (seconds) ½ HP DC Motor	SR Stroke Time to Fail Position (seconds)	Motor HP Req.
			Spring ETC (lbf-in)	Spring RUN (lbf-in)	Spring BTC (lbf-in)	Pressure BTO @ 2500 psig Unless indicated (lbf-in)	Pressure @ 2500 psig RUN (lbf-in)	Pressure ETO @ 2500 psig (lbf-in)	Pressure BTO @ 3000 psig (lbf-in)	Pressure @ 3000 psig RUN (lbf-in)	Pressure ETO @ 3000 psig (lbf-in)				
E35 DSRH-100	2000	5.7	1,530	1,060	2,730	2,121@ 800 psig	765@ 800 psig	921@ 800 psig	3,034@ 1,000 psig	1,221@ 1,000 psig	1,834@ 1,000 psig	4	***7.5	0.6	1.0
E50 DSRH-100	2000	22.1	5,700	3,870	9,770	8,440@ 800 psig	4,370@ 800 psig	3,200@ 800 psig	11,977@ 1,000 psig	4,965@ 1,000 psig	7,907@ 1,000 psig	12	***24	2.0	1.0
E60 DSRH-100	2000	38.9	9,420	6,440	16,300	12,200@ 1,000 psig	4,630@ 1,000 psig	5,280@ 1,000 psig	16,500@ 1,200 psig	6,519@ 1,200 psig	9,626@ 1,200 psig	24	***48	3.5	1.0
G01002.0-SR4	3691	11.2	8,989	5,314	10,618	11,961	6,188	10,331	16,421	8,589	14,786	6	***12	1.1	1.0
G01002.0-SR2	3691	11.2	12,046	7,139	14,578	8,902	4,330	6,375	13,361	6,739	10,830	6	***12	1.1	1.0
G2002.2-SR4	3634	18.3	15,624	9,715	20,783	19,797	9,423	14,639	27,231	13,414	22,066	10	***21	1.7	1.0
G2002.2-SR2	3634	18.3	20,394	12,378	26,199	15,024	6,714	9,227	22,457	10,726	16,655	10	***21	1.7	1.0
G3002.5-SR4	4527	25.8	26,651	16,481	35,418	23,073	10,286	14,312	33,508	15,918	24,742	15	***30	2.4	1.0
*G3003.0-SR2	*2853	41	35,011	21,557	46,409	46,545	21,993	35,147	58,455*	28,346*	47,051*	24	***48	3.8	1.0
G4003.0-SR4	5000	45	47,059	29,953	66,583	41,244	17,043	21,738	59,550	26,990	40,031	26	***53	4.2	1.0
G4003.5-SR2	3495	66.8	66,841	42,765	96,220	67,403	28,075	38,044	94,970	42,938	65,592	38	***77	6.2	1.0
G5004.5-SR4	3799	140	92,647	63,247	149,712	191,652	86,787	134,573	249,377	117,695	192,279	**54	***162	13	1.5
*G5005.0-SR2	*2940	181	131,189	92,045	224,615	240,344	101,889	146,913	303,563*	*135,853	*210,110	**70	***210	17	1.5
G7005.0-SR4	4888	211	183,781	126,295	303,286	247,335	98,171	127,844	334,745	145,628	212,232	**81	***243	20	1.5
G7005.0-SR3	4888	211	217,623	149,987	362,244	259,328	96,715	114,733	300,895	119,696	156,289	**81	***243	20	1.5
G7006.0-SR1	3150	328	295,399	204,800	498,483	384,491	145,511	181,436	521,824	220,192	318,734	**126	***378	30	1.5
G8007.0-SR3	3201	521	353,543	223,309	500,131	730,888	347,616	584,266	949,661	463,521	803,007	**190	***600	48	1.5
G8007.0-SR2	3201	521	417,822	263,542	591,226	666,599	306,200	493,184	885,372	422,319	711,925	**190	***600	48	1.5
G10009.0-SR4	2840	1162	582,143	408,224	999,882	1,853,688@ 2,000 psig	865,944@ 2,000 psig	1,435,763@ 2,000 psig	2,186,099@ 2,500 psig	1,042,225@ 2,500 psig	1,768,101@ 2,500 psig	**400	***1260	106	1.5
G10009.0-SR3	2840	1162	695,311	499,282	1,250,605	1,740,495@ 2,000 psig	766,409@ 2,000 psig	1,185,094@ 2,000 psig	2,072,906@ 2,500 psig	943,584@ 2,500 psig	1,517,433@ 2,500 psig	**400	***1260	106	1.5

*G3003.0-SR2 MOP = 2853 psig, torques are calculated at MOP

*G5005.0-SR2 MOP = 2940 psig, torques are calculated at MOP

** If AC motors are single phase, the stroke time of the G5 and larger will be 1 ½ x the AC strokes shown: example 400 seconds with 1 ½ HP would be 400 x 1.5 = 600 seconds. If motor is 50 hertz, please consult factory for stroke times.

*** If a 1/6 HP DC motor is utilized, the stroke time of the actuators shall be approximately 4.5 X the stroke times listed for the ½ HP DC motor as shown: example 20 seconds with ½ HP motor would be 20 x 4.5 = 90 seconds

**** If motor is 50 hertz, please consult factory for stroke times.

Note: 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	MOP (psig)	Outboard DISPL (In ³)	Outboard BTO & ETO Torque Expression (lbf-in/psig)	Torque Outboard BTO & ETO @ 1,500 psig (lbf-in)	Torque Outboard RUN @ 1,500 psig (lbf-in)	Torque Outboard BTO & ETO @ 2,000 psig or MOP (lbf-in)	Torque Outboard RUN @ 2,000 psig or MOP (lbf-in)	Torque Outboard BTO & ETO @ 3,000 psig or MOP (lbf-in)	Torque Outboard RUN @ 3,000 psig or MOP (lbf-in)	**Estimated Stroke Time Open (seconds)
G01002.0	3,015	14.9	12.39	18,448	9,924	24,810	13,306	37,378	20,015	7.8
G2002.2	2,916	22.8	15.14	22,336	12,011	30,040	16,105	45,256	*24,227	11.8
G3003.0	2,358	49.5	42.17	63,009	33,517	84,446	44,840	*99,716	*52,920	25.7
G4003.0	3,884	60.0	50.99	76,200	40,615	102,097	54,327	153,395	81,578	31.2
G4004.0	2,184	107.0	92.11	137,831	73,027	184,382	97,582	*201,452	*106,597	55.6
G5004.0	3,854	138.0	118.10	176,914	93,966	236,449	141,186	354,389	188,125	47.8
G5005.0	2,469	216.0	186.65	279,646	147,946	373,518	197,491	*461,118	*243,806	74.8
G7005.0	3,898	265.0	228.98	343,128	181,687	458,340	242,542	687,073	363,660	91.8
G7008.0	1,532	679.0	593.36	890,012	469,167	*909,062	*479,198	N/A	N/A	235.1
G8008.0	2,072	804.0	702.42	1,053,431	555,357	1,405,002	740,624	*1,455,495	*767,257	278.4
G10008.0	3,158	1,056.0	921.37	1,382,462	729,214	1,843,934	972,512	2,761,461	1,457,219	365.7

*Torques are calculated at MOP

**Estimated Stroking speeds will vary with temperature and hydraulic fluid viscosity changes. For stroking speed requirements less than the illustrated, consult factory for additional hydraulic accumulator to decrease open and closing speeds.

If motor is 50 hertz, please consult factory for stroke times.

Note: If accumulator is required, please consult factory before selecting an actuator size.

Torque Output Data (*Double-Acting Actuator*)

Clockwise to Close

G-Series Double-Acting Model	MOP (psig)	Inboard DISPL (In ³)	Inboard BTC & ETC Torque Expression (lbf-in/psig)	Torque Inboard BTC & ETC @ 1,500 psig (lbf-in)	Torque Inboard RUN @ 1,500 psig (lbf-in)	Torque Inboard BTC & ETC @ 2,000 psig or MOP (lbf-in)	Torque Inboard RUN @ 2,000 psig or MOP (lbf-in)	Torque Inboard BTC & ETC @ 3,000 psig or MOP (lbf-in)	Torque Inboard RUN @ 3,000 psig or MOP (lbf-in)	**Estimated Stroke Time Close (seconds)
G01002.0	3,015	11.2	9.06	13,450	7,307	18,147	9,818	27,382	14,783	5.8
G2002.2	2,916	18.3	11.07	16,285	8,845	21,971	11,883	*33,153	*17,893	9.5
G3003.0	2,358	41.0	34.50	51,506	27,500	69,108	36,818	*81,634	*43,462	21.3
G4003.0	3,884	45.0	37.57	56,072	30,084	75,259	40,285	113,139	60,515	23.4
G4004.0	2,184	91.8	78.69	117,714	62,502	157,559	83,548	*172,162	*91,272	47.7
G5004.0	3,854	104.0	87.27	130,667	69,772	174,786	93,226	261,884	139,736	36.0
G5005.0	2,469	181.0	155.81	233,383	123,744	311,835	165,221	*384,971	*203,969	62.7
G7005.0	3,898	211.0	181.04	271,210	144,046	362,449	192,354	543,237	288,378	73.0
G7008.0	1,532	625.0	545.42	818,094	431,526	*835,610	*440,754	N/A	N/A	216.4
G8008.0	2,072	709.0	617.60	926,163	488,762	1,235,311	651,831	*1,279,883	*675,267	245.5
G10008.0	3,158	881.0	765.70	1,148,968	607,007	1,532,608	809,570	2,294,472	1,212,806	305.1

*Torques are calculated at MOP

**Estimated Stroking speeds will vary with temperature and hydraulic fluid viscosity changes. For stroking speed requirements less than the illustrated, consult factory for additional hydraulic accumulator to decrease open and closing speeds.

If motor is 50 hertz, please consult factory for stroke times.

Note: If accumulator is required, please consult factory before selecting an actuator size.

Model Code Information

Standard Spring-Return EHO Actuator

Code	Product Description	
EHO	Standard Self-Contained Electro-Hydraulic Actuator	
Code	Actuator Size	
	Spring-Return Actuator Model	
E35D-SRH100		
E50D-SRH100		
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	
N	No ESD Solenoid Valve	
S	Internal Standard Solenoid Valve	
R	Internal Standard Solenoid Valve with External Manual Reset Push Button Box	
L	External Low Wattage Solenoid Valve(down to -37C)	
D	Dual ESD Solenoid Valves	
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)	

Model Code Information

Standard Spring-Return EHO Actuator (continuation)

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			
PT	Partial stroke test			
RB	Remote mounted circuit breaker			
RD	Remote display module			
SP	Solar panel and battery (only 24 VDC model)			
Code		Certificates (Multiple Choices)		
AX	ATEX Eexd IIB T4			
CS	CSA Class I Div. I Group C,D			
CB	CSA Class I Div. I Group B,C,D			
FM	FM Class I Div. I Group C, D			
FB	FM Class I Div. I Group B,C,D			
IE	IECEX			
S2	SIL-2			
Code		Special Configuration		
S	Special Configuration			

Model Code Information

Standard Double-Acting EHO Actuator

Code	Product Description	
EHO	Standard 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	
N	No ESD Solenoid Valve	
S	Internal Standard Solenoid Valve	
R	Internal Standard Solenoid Valve with External Manual Reset Push Button Box	
L	External Low Wattage Solenoid Valve(down to -37C)	
D	Dual ESD Solenoid Valves	
Code	Remote Control	
0	Discrete	
Code	Limit Switches	
A	2 SPDT	
B	4 SPDT	
Code	Output	
0	None	
1	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)	

Model Code Information

Standard Double-Acting EHO Actuator (continuation)

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			
PT	Partial stroke test			
RB	Remote mounted circuit breaker			
RD	Remote display module			
SP	Solar panel and battery (only 24 VDC model)			
Code	Certificates (Multiple Choices)			
AX	ATEX Eexd IIB T4			
CS	CSA Class I Div. I Group C,D			
CB	CSA Class I Div. I Group B,C,D			
FM	FM Class I Div. I Group C, D			
FB	FM Class I Div. I Group B,C,D			
IE	IECEX			
Code	Special Configuration			
S	Special Configuration			

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		
G01x01.5-SR9		
E50D-SRH100		
G01x02.0-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	
N	No ESD Solenoid Valve	
S	Internal Standard Solenoid Valve	
R	Internal Standard Solenoid Valve with External Manual Reset Push Button Box	
L	External Low Wattage Solenoid Valve(down to -37C)	
D	Dual ESD Solenoid Valves	
Code	Communication Protocols	
1	Modbus(CAM05)(Default)	
2	HART(CAM16)	
3	Foundation Fieldbus(CAM228)	
Code	Limit Switches	
N	No Limit Switches	
A	2 SPDT	
B	4 SPDT	

Model Code Information

Smart Spring-Return EHO (continuation)

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 VDC model)			
SW	Level Switch			
Code				
Certificates (Multiple Choices)				
AX	ATEX Eexd IIB T4			
CS	CSA Class I Div. I Group C,D			
CB	CSA Class I Div. I Group B,C,D			
FM	FM Class I Div. I Group C, D			
FB	FM Class I Div. I Group B,C,D			
IE	IECEX			
S3	SIL 3			
Code				
Special Configuration				
S	Special Configuration			

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	
N	No ESD Solenoid Valve	
S	Internal Standard Solenoid Valve	
L	External Low Wattage Solenoid Valve	
D	Dual ESD Solenoid Valves	
Code	Communication Protocols	
1	Modbus(CAM05)(Default)	
2	HART(CAM16)	
3	Foundation Fieldbus(CAM228)	
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	

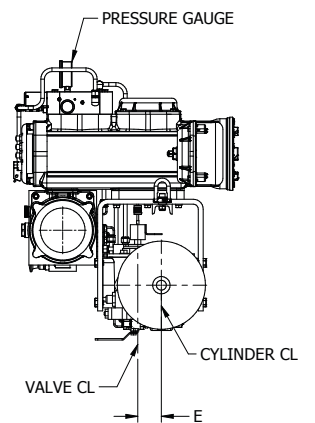
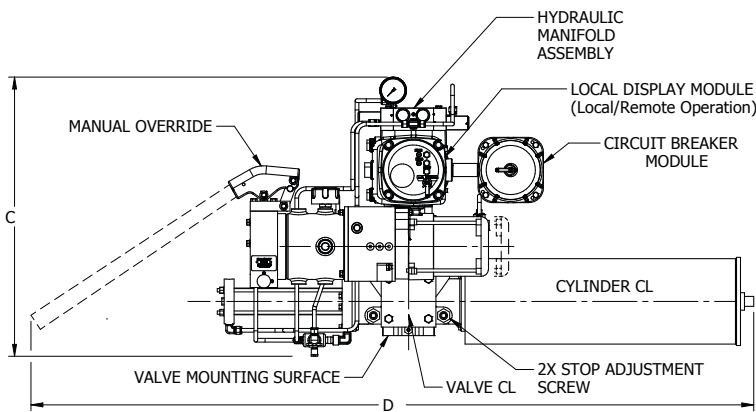
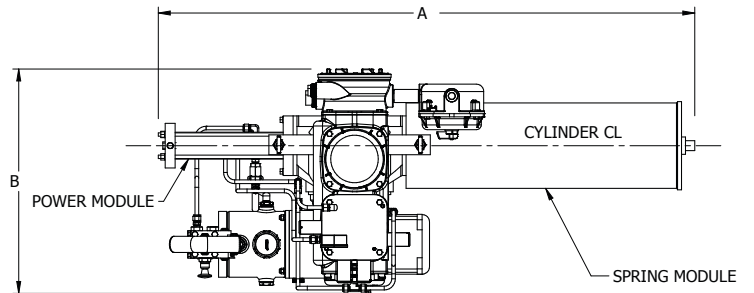
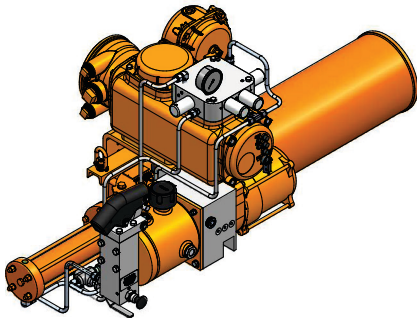
Model Code Information

Smart Double-Acting EHO (continuation)

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 VDC model)			
SW	Level Switch			
Code Certificates (Multiple Choices)				
AX	ATEX Eexd IIB T4			
CS	CSA Class I Div. I Group C,D			
CB	CSA Class I Div. I Group B,C,D			
FM	FM Class I Div. I Group C, D			
FB	FM Class I Div. I Group B,C,D			
IE	IECEX			
Code Special Configuration				
S	Special Configuration			

Dimension

Spring-Return, Fail-Safe Actuator

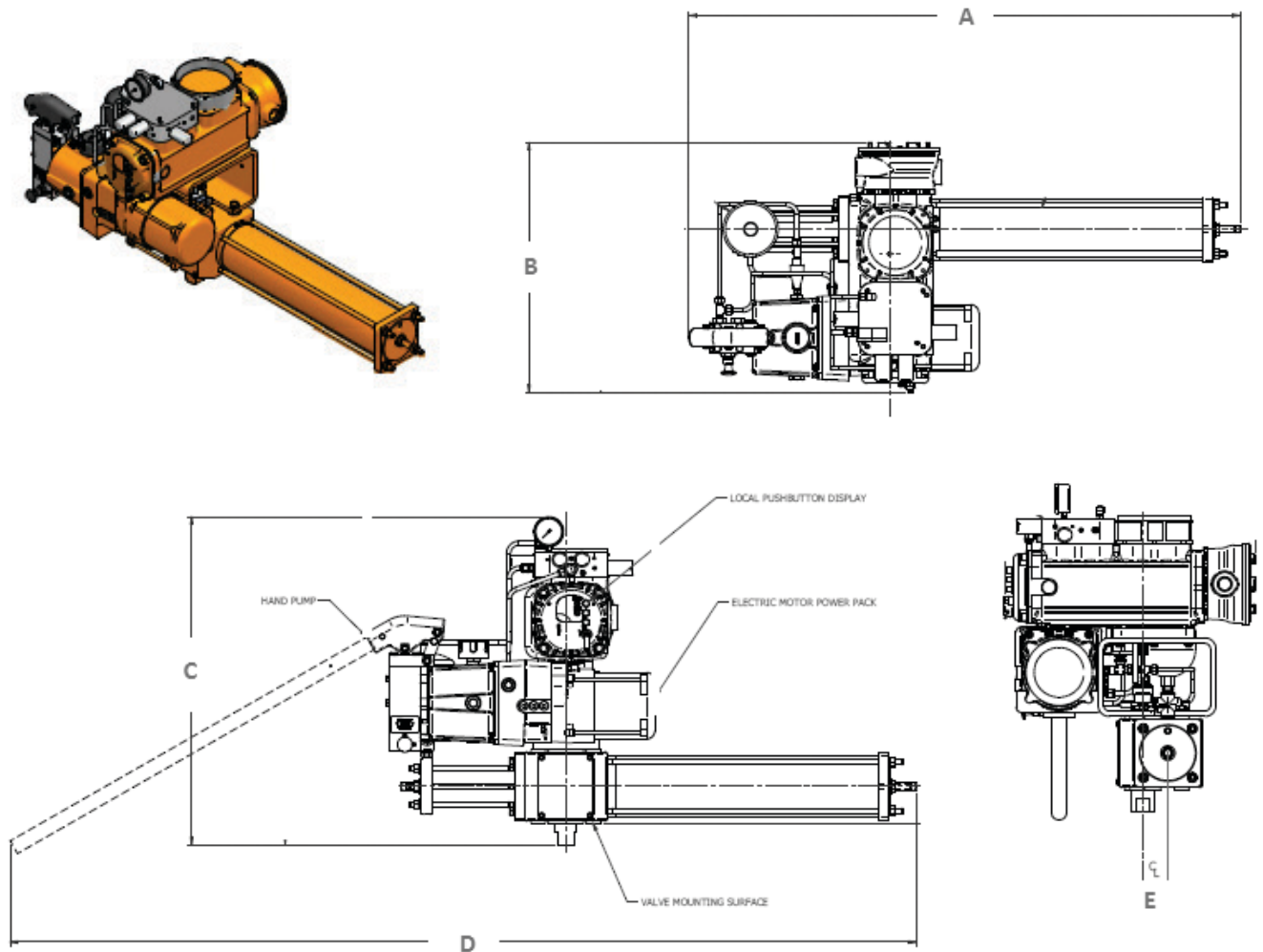


OUTLINE DIMENSION AND DETAILS

Actuator	A		B		C		D		E		Approximate Weight	
	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	lbs	kg
G01002.0-SR2-CW	54.0	1371.6	22.6	574.0	28.1	713.7	72.7	1846.6	2.4	61.0	669	303
G01002.0-SR4-CW	54.0	1371.6	22.6	574.0	28.1	713.7	72.7	1846.6	2.4	61.0	655	297
G2002.2-SR2-CW	57.8	1468.1	22.6	574.0	28.1	729.0	76.9	1953.3	2.9	73.7	774	351
G2002.2-SR4-CW	57.8	1468.1	22.6	574.0	28.1	729.0	76.9	1953.3	2.9	73.7	759	344
G3002.5-SR4-CW	65.5	1663.7	22.6	574.0	32.1	815.3	80.1	2034.5	3.5	88.9	916	415
G3003.0-SR2-CW	65.5	1663.7	22.6	574.0	32.1	815.3	80.1	2034.5	3.5	88.9	945	429
G4003.0-SR4-CW	76.2	1935.5	27.7	703.6	31.7	805.2	85.9	2181.9	4.3	109.2	1229	557
G4003.5-SR2-CW	76.2	1935.5	27.7	703.6	31.7	805.2	85.9	2181.9	4.3	109.2	1313	596
G5004.5-SR4-CW	89.0	2260.6	31.1	789.9	35.9	911.9	93.9	2385.1	5.5	139.7	1970	894
G5005.0-SR2-CW	89.0	2260.6	31.1	789.9	35.9	911.9	93.9	2385.1	5.5	139.7	2099	952
G7005.0-SR3-CW	105.6	2682.2	35.7	906.8	42.4	1077.0	103.0	2616.2	6.8	172.7	3238	1469
G7005.0-SR4-CW	105.6	2682.2	35.7	906.8	42.4	1077.0	103.0	2616.2	6.8	172.7	3325	1508
G7006.0-SR4-CW	105.6	2682.2	35.7	906.8	42.4	1077.0	103.0	2616.2	6.8	172.7	3312	1502
G8007.0-SR2-CW	139.7	3548.4	36.9	937.3	43.1	1094.7	131.0	3327.4	8.0	203.2	5447	2471
G8007.0-SR3-CW	139.7	3548.4	36.9	937.3	43.1	1094.7	131.0	3327.4	8.0	203.2	5427	2462
G10009.0-SR4-CW	168.6	4282.4	39.4	1000.8	45.3	1150.6	148.0	3759.2	10.5	266.7	7497	3401

Dimension

Spring-Return Actuator

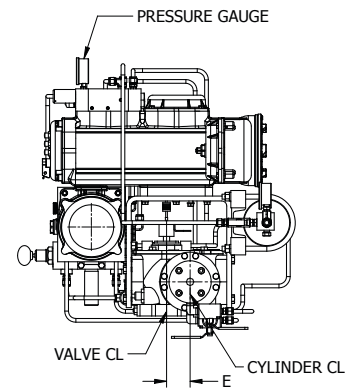
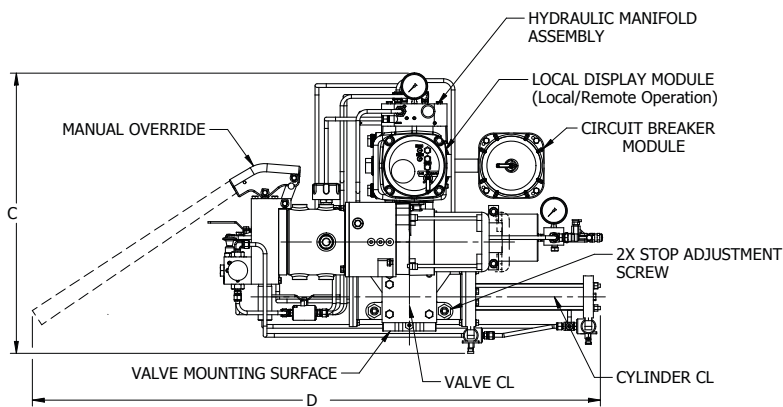
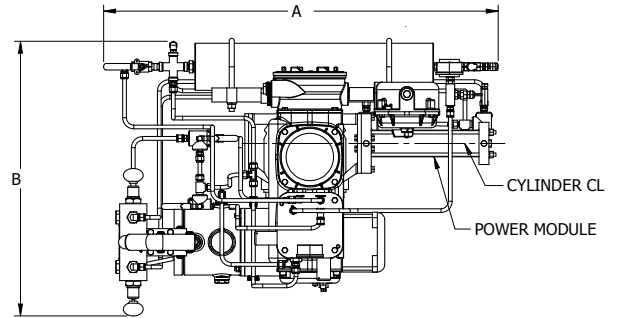
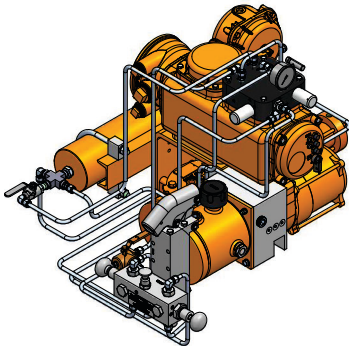


OUTLINE DIMENSION AND DETAILS

Actuator	A		B		C		D		E		Approximate Weight	
	inch	cm	inch	cm	inch	cm	inch	cm	inch	cm	lbs	kg
E35 DSRH-100	32.0	81.3	22.6	57.4	28.1	71.4	50.0	127.0	1.4	3.5	515	234
E50-DSRH-100	48.5	123.2	22.6	57.4	28.1	71.4	67.0	170.2	2.2	5.6	565	259
E60-DSRH-100	54.0	137.2	22.6	57.4	30.1	76.5	72.0	182.9	2.4	6.1	625	284

Dimension

Double-Acting Actuator



OUTLINE DIMENSION AND DETAILS

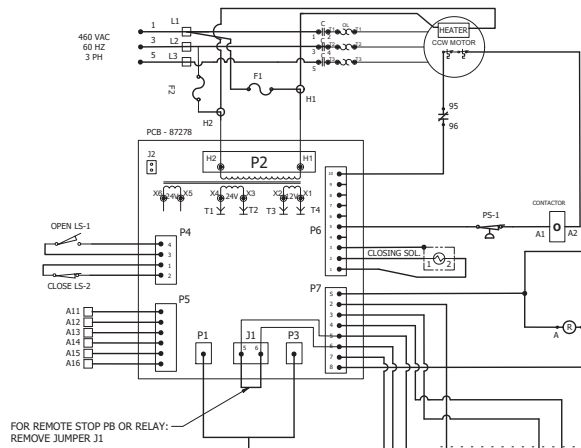
Actuator	A		B		C		D		E		Approximate Weight	
	inch	cm	inch	cm	inch	cm	inch	cm	inch	cm	lbs	kg
G01002.0	39.8	101.09	27.7	70.36	28.3	71.88	57.9	147.07	2.4	6.10	513	232.69
G2002.2	40.6	103.12	28.7	72.90	29.0	73.66	58.3	148.08	2.9	7.37	546	247.66
G3004.0	46.8	118.87	30.1	76.45	32.5	82.55	61.5	156.21	3.5	8.89	626	283.95
G4003.0	52.0	132.08	34.5	87.63	31.9	81.03	66.8	169.67	4.3	10.92	770	349.27
G4004.0	53.0	134.62	35.5	90.17	32.9	83.57	67.8	172.21	5.3	13.46	783	355.16
G5004.0	58.3	148.08	37.4	95.00	34.8	88.39	73.2	185.93	5.5	13.97	1,141	517.55
G5005.0	59.3	150.62	38.4	97.54	35.8	90.93	74.2	188.47	6.5	16.51	1,300	589.67
G7005.0	64.3	163.32	40.4	102.62	39.7	100.84	81.6	207.26	6.8	17.27	1,786	810.12
G7008.0	65.3	165.86	41.4	105.16	40.7	103.38	82.6	209.80	7.8	19.81	1,829	829.62
G8008.0	76.5	194.31	42.7	108.46	39.5	100.33	87.5	222.25	8.0	20.32	2,461	1,116.29
G10008.0	93.6	237.74	46.9	119.13	43.6	110.74	99.4	252.48	10.5	26.67	3,754	1,702.78

Standard EHO

Electrical Connection Diagram

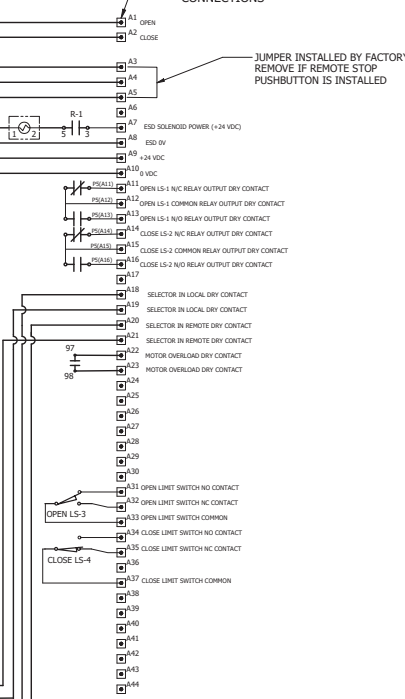
	Two-Wire control Maintain Contact to Open	Three-Wire control Maintain Contacts	Four-Wire control Maintain Contacts	ESD Input
Internal Power Supply				NOT APPLICABLE
External Power Supply 24 VDC				NOTE: DO NOT USE INTERNAL 24 VDC POWER SOURCE (EX. FROM A9, A10)

CUSTOMER MAIN POWER CONNECTION



FOR REMOTE STOP PB OR RELAY: REMOVE JUMPER J1

STC CUSTOMER CONNECTIONS



JUMPER INSTALLED BY FACTORY REMOVE IF REMOTE STOP PUSHBUTTON IS INSTALLED

LIMIT SWITCH CONTACT DEVELOPMENT

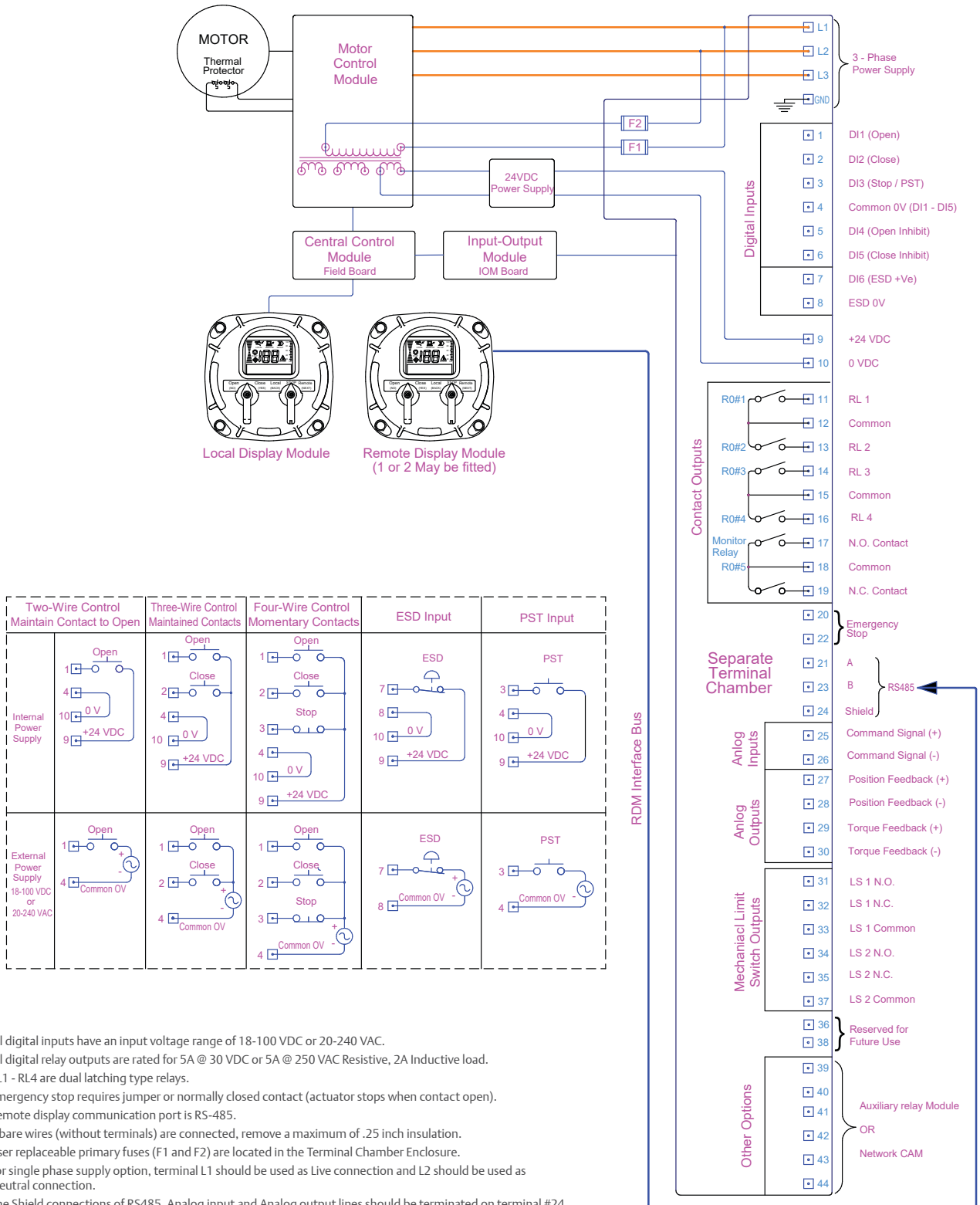
LIMIT SWITCH	CONTACT	VALVE POSITION		
		FULLY OPEN	MID POSITION	FULLY CLOSED
LS-2 & 4	N.C.	—	—	—
	N.O.	—	—	—
LS-1 & 3	N.C.	—	—	—
	N.O.	—	—	—

SS TABLE

	HAND	OFF	AUTO
SS1	X	O	O
SS2	O	O	X
SS3	O	O	X
SS4	X	O	O

Smart EHO

Electrical Connection Diagram



World Area Configuration Centers (WACC) offer sales support, service, inventory and commissioning to our global customers. Choose the WACC or sales office nearest you:

NORTH & SOUTH AMERICA

19200 Northwest Freeway
Houston TX 77065
USA
T +1 281 477 4100

Av. Hollingsworth
325 Iporanga Sorocaba
SP 18087-105
Brazil
T +55 15 3413 8888

ASIA PACIFIC

No. 9 Gul Road
#01-02 Singapore 629361
T +65 6777 8211

No. 1 Lai Yuan Road
Wuqing Development Area
Tianjin 301700
P. R. China
T +86 22 8212 3300

MIDDLE EAST & AFRICA

P. O. Box 17033
Jebel Ali Free Zone
Dubai
T +971 4 811 8100

P. O. Box 10305
Jubail 31961
Saudi Arabia
T +966 3 340 8650

24 Angus Crescent
Longmeadow Business Estate East
P.O. Box 6908 Greenstone
1616 Modderfontein Extension 5
South Africa
T +27 11 451 3700

EUROPE

Holland Fasor 6
Székesfehérvár 8000
Hungary
T +36 22 53 09 50

Strada Biffi 165
29017 Fiorenzuola d'Arda (PC)
Italy
T +39 0523 944 411

For complete list of sales and manufacturing sites, please visit www.emerson.com/actuationtechnologieslocations or contact us at info.actuationtechnologies@emerson.com

www.emerson.com/bettis

©2019 Emerson. All rights reserved.

The Emerson logo is a trademark and service mark of Emerson Electric Co. Bettis™ is a mark of one of the Emerson family of companies. All other marks are property of their respective owners.

The contents of this publication are presented for information purposes only, and while every effort has been made to ensure their accuracy, they are not to be construed as warranties or guarantees, express or implied, regarding the products or services described herein or their use or applicability. All sales are governed by our terms and conditions, which are available on request. We reserve the right to modify or improve the designs or specifications of our products at any time without notice.