



MULTI-TURN ELECTRIC ACTUATORS



ST RANGE

B BERNARD CONTROLS INC.

Contents

L. Bernard has drawn on fifty years of experience to design the new ST Range. These products offer customers the best combination of:

- reliability of all actuator components
- flexibility of user-oriented programmable electronic controls
- advanced interactive communication capabilities offered by fieldbus technology

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L. BERNARD,

the electric actuator specialist

With several decades of experience in actuator technology and unrivalled knowledge in the use of these systems in industry, L. Bernard is ideally placed to offer comprehensive solutions for valve automation applications.

Innovation & international presence

L. Bernard is an international company which specializes in the design and manufacture of electric actuators and employs an innovative development program to bring constant improvement to its product range.

The company's actuators incorporate the latest design concepts and specifications to ensure they are both easy to use and meet the most demanding industrial standards and environmental requirements.

Over forty subsidiaries, offices and agencies help our customers with the design, installation, commissioning and maintenance of their systems.

Our flexible approach and efficient service allow us to develop and maintain a relationship of trust with our customers.

Certification

L. Bernard appreciates the importance of Quality at all stages of the production process, and has put in place and maintains a Quality Management System in accordance with ISO 9001-2000 (certification no.: QUAL/1997/8657b).

The quality of Bernard products has been approved and recognized by a number of international certifying bodies, including ABS, CSA, NEMA, ATEX, IEEE, LCIE, Germanischer Lloyd, GOST Russia, INERIS and others.



Services

Our certified technical centers ensure that quality technical support is on hand for all of our customers.

Installation and commissioning

The process of commissioning electric actuators calls for special expertise, particularly in cases where the motorized valve is controlled by a complex system like a fieldbus.

Our specialists can therefore provide assistance to our customers in the following operations:

- fitting the actuator to the valve
- installation
- set-up
- commissioning

Maintenance and repairs

Our technicians can visit your site at any time to:

- conduct periodic checks on the operation of actuators
- perform preventive maintenance
- troubleshoot problems and carry out repairs

Training

We arrange training sessions for our customers on a regular basis. The sessions can either be held at our head office in France or on site.

Subjects which are most in demand include actuator technology, settings, operation and maintenance.

Overview of ST range

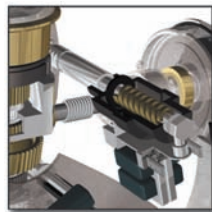
ST actuators are designed to operate valves in ON/OFF service or in modulating Class III operation.

Trouble-free operation

- Gearing is self-locking at all speeds
- Continuous gear drive between motor and valve
- Thermal cut-out on motor
- Unaffected by vibration on main mechanical parts
- Requires no preventive maintenance. Gearing has life-long lubrication

Innovative sensors

- Direct torque and position measurement is on the output shaft making it unnecessary to process signals
- Position measurement using movement reading with direct mechanical link on the output shaft
- Torque measured by a dynamometer with calibrated springs are on the actuator output. The control system receives data on the actual torque transmitted to the valve instantly. The exceptionally short response time means that the system can be shut down rapidly, and the overtorque effect applied to the valve is reduced
- Easy adjustment for all control systems: program with INTELLI+ or simple cam adjustment (travel limit devices) and torque limiter using only a screwdriver on other versions



- With INTELLI+ control systems, absolute sensors are used to measure both position and torque data. This means that there is no possibility of the position being lost even if a power failure occurs. There is therefore no need to include a backup battery

Power to spare

- Asynchronous motor with high starting torque
- Excellent starting torque / nominal torque ratio
- On/Off operation: 30% duty rating for peak service conditions of up to 360 starts per hour
- Modulating class III: 50% duty rating for peak service conditions of up to 1,200 starts per hour
- Motors easy to remove with sealed ball bearings fitted at front and rear



Handwheel without clutch release

- Patented manual override system
- Differential geardrive allows the handwheel to be operated without declutching (except for very low torque model ST6)
- The handwheel can therefore be operated under all conditions, even when the valve is blocked by the torque limiter

Weatherproof version with integral control system

- Watertight to IP68 & NEMA 6P: housings withstand pressure of 10 meters WC for 96 hours
- Controls available: INTEGRAL+ or INTELLI+ (see following pages for further details)
- Integrated SPDT switches and control logic
- Non-intrusive local control selector knobs
- Electronic components protected against water ingress: double-seal with two O-ring barriers between the electrical terminal compartment and the electronic components. The control knob spindles do not penetrate the enclosure.



ST actuator with INTEGRAL+ control

Explosion-proof version with INTELLI+

- Our actuators are certified for use in explosive atmospheres to ATEX, NEMA 7 & 9, IEC-EX, GGTN and other standards
- Multilingual digital graphical display unit
- Non-intrusive commissioning and adjustment without need for special tools or opening the actuator housing
- The actuator position and torque settings are logged and stored in the control unit's non-volatile memory to provide total immunity from power outages without the need for a backup battery
- The actuator's torque limit can be programmed for a particular operating range. The actual torque value transmitted to the valve is then monitored by continuous proportional measurement
- The valve torque curve can be displayed during opening and closing operations
- Longer operating times can be programmed to prevent hammerblow effect in the pipes
- Self-diagnostics and alarm display
- Actuator operations logged (number of starts, operating time, action during previous 12 hours and more)



Explosion-proof ST actuator with INTELLI+ control

- Compatibility with field bus system limits cabling costs and gives full access to all of the data & functions available in the INTELLI+
- Software for use on a laptop or pocket computer (option) for an even more user-friendly actuator and valve commissioning plus diagnostics

Wide choice of controls

You can decide on local or remote control to meet the requirements of your particular system and the environment in which the actuators are to be used. The BERNARD range of control systems lets you choose the solution which best suits your needs.

Standard version

The customer provides the control logic to handle all the data received from the actuator's electric contacts. The reversing starters are housed in the customer's own enclosure.

INTEGRAL+ control

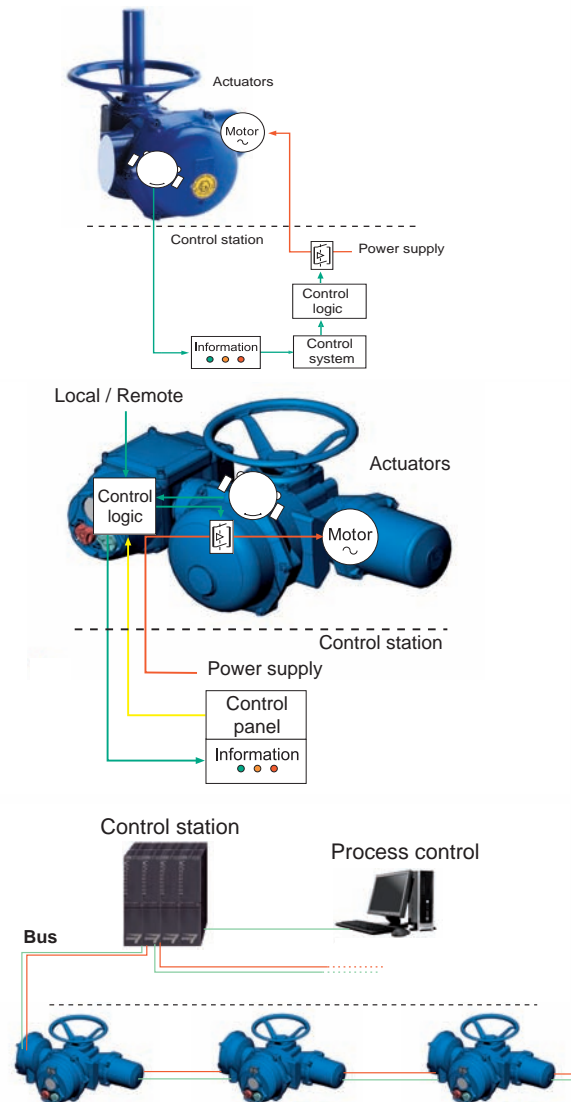
The INTEGRAL+ control system is fully configurable and can perform all actuator control functions, including production of status reports, fault handling, protection systems and command processing. Local controls can be disabled either locally or from a remote location. The reversing starters are incorporated in the control unit.

INTELLI+ control

As well as the functions offered by INTEGRAL+, the INTELLI+ also allows the system to be set up and programmed without opening the unit. It includes a graphical LCD screen plus tools for preventive maintenance.

Fieldbus control

Fieldbus systems are compatible with L. Bernard integrated controls and allow you to control a large number of actuators or other devices and transmit/receive a great deal of data over a single two-wire serial link.



See the "Specifications" section of this brochure for further details.

Benefits of Integrated control systems

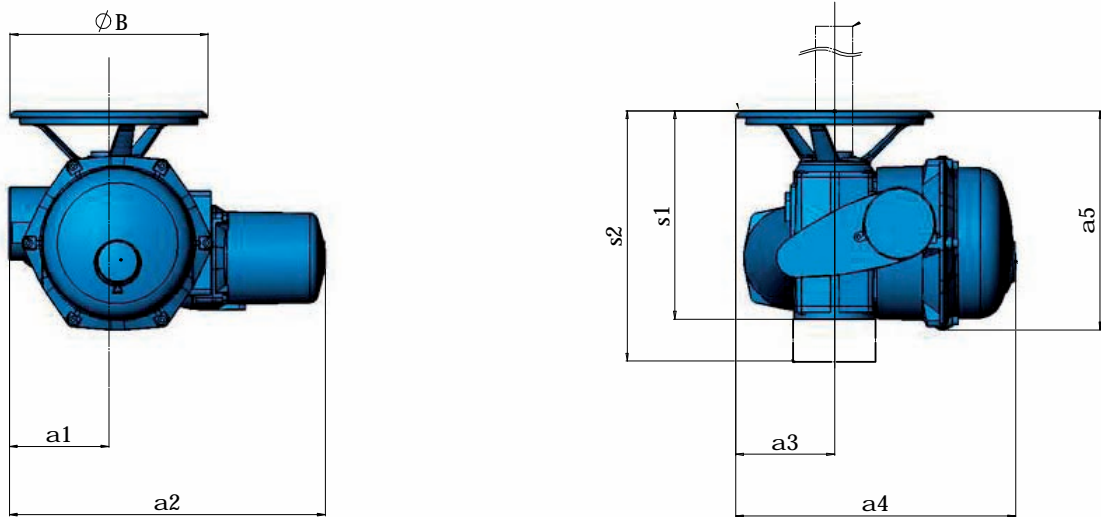
- **Simple:** ready-to-use turnkey solution.
- **Safe:** proven system incorporating many safety features.
- **Economical:** saves time and money at the design and installation stages.
- **Intelligent:** remote management of a large volume of data and optimized preventive maintenance using our digital solutions in conjunction with the fieldbus.

		INTEGRAL+	INTELLI+
OPERATING CLASS	ON/OFF	Integral+	Intelli+
	Modulating class III	Posigam+	Intelli+
REMOTE CONTROL	Pulse command	■	■
	Maintained signal	■	■
	ESD (Emergency ShutDown)	■	■
	Auxiliary	■ (Overrides local command)	2 commands 9 options
	Timer	Option	■
LOCAL COMMANDS	Lockable selector knobs	■	■
	Digital display	-	■
	Indicator lights	Option	■
INTERNAL PROTECTION	Fuses	■	■
	Automatic phase monitoring (3-phase)	■	■
	Motor thermal cut-out	■	■
	Torque limiter protection	■	■
SIGNALLING	Number of signal relays	4 + 3 (option)	4 + 3 (option)
	Data items	16	23
	Number of fault relays	1	1
	Number of listed faults	8	12
	Analog position feedback	Option (Standard)	Option
CONFIGURATION	Configuration setting	Internal (with jumpers)	External Local command knob Fieldbus Pocket PC Laptop
	Torque/position setting method	Mechanical	Digital
	Travel limit stop	On position On torque	On position On torque
	Full configuration upload	-	Via fieldbus Via pocket PC Via laptop
MONITORING	Self-diagnostics	-	■
	Torque / position curve	-	■
	Actuator operating log	-	■
	Partial stroking	-	■
FIELDBUS	Profibus DP (single or redundant)	Option	Option
	Foundation fieldbus	-	Option
	Modbus RTU	-	Option

See INTEGRAL+ (U115) and INTELLI+ (U116) catalogs for further information on controls.

Specifications for standard weatherproof version

Overall dimensions



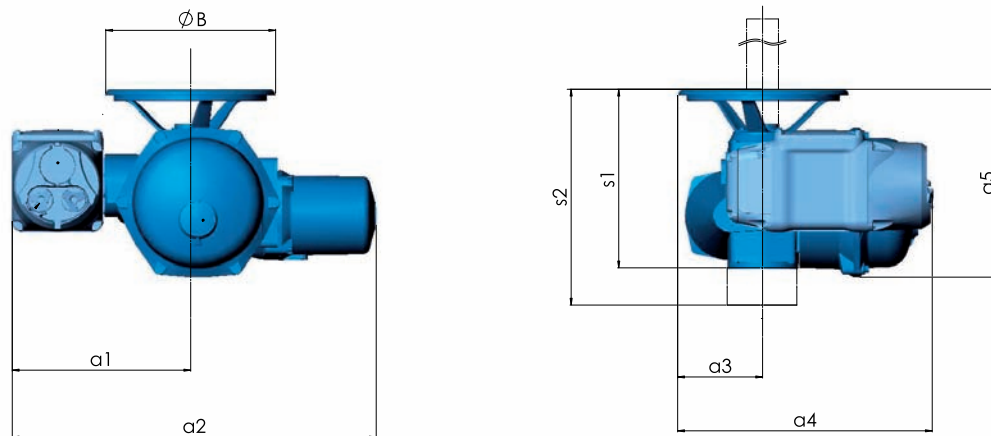
	Wt (lbs)	Ø B	a1	a2 max.	a3	a4	a5	s1 B3/C type	s2 A type	s2 B1 type
ST6	55	11.81	5.94	18.58	5.90	17.55	12.32	11.14	13.42	13.42
ST14	72	11.81	5.64	18.85	5.90	16.69	13.07	12.48	14.76	14.76
ST30	119	17.71	5.70	22.75	8.85	21.41	--	14.33	17.36	17.71
ST70	172	21.65	5.23	24.19	10.82	24.09	17.75	17.59	21.53	21.53

Technical specifications

Max. torque	ST6 = 44 ft-lbs ST30 = 221 ft-lbs ST14 = 103 ft-lbs ST70 = 516 ft-lbs Contact our marketing dept. for higher torque values ST175 = 1,291 ft lbs See "Performance data" section for further details ST220 = 1,623 ft lbs
Type of service	ON/OFF - Modulating class III
Casing	<ul style="list-style-type: none"> • Cast aluminium • Casings are watertight to IP68 & NEMA 6P and can withstand pressure of 10 meters WC for 96 hours
Motor technology	Totally-enclosed, squirrel cage 3-phase or 1-phase motor, class F insulation with integral thermal overload protection. Motors easy to remove with sealed ball bearings fitted at front and rear
Motor duty rating	<ul style="list-style-type: none"> • S4 motor service (intermittent service on start-up) to IEC 34-1 • S4 - 30% for ON/OFF operation - up to 360 starts per hour • S4 - 50% for Modulating class III - up to 1,200 starts per hour
Ambient operating temperature	<ul style="list-style-type: none"> • Standard version: -20 °C ...+70 °C (-4 °F ... +158 °F) • Low temperature version: -40 °C ...+70 °C (-40 °F ... +158 °F) • High temperature version: +0 °C ... +90 °C (+32 °F ... +194 °F)
External corrosion protection	Standard paint system: Zinc rich primer, epoxy undercoat and RAL5002 blue polyurethane top coat. Special anti-corrosion protection for marine, aggressive or abrasive environments available on request
Vibration resistance	2.2 x 10 ⁻³ lb (9.8 m/s ²) at 10-500 Hz (Contact our marketing dept. for higher vibration levels)
Lubrication	ST actuators are lubricated for the product lifetime and do not require any special service
Manual control	<ul style="list-style-type: none"> • By handwheel which does not rotate when electrical operation system in service • Switch between manual and electrical operation automatically without clutch release lever (except for ST6 models). Electrical control always has priority • Manual gear ratios: ST6 1:1, ST14/ST30 1:2, ST70 1:21, ST175/ST220 1:31
Power supply	ST actuators can operate on a wide variety of power supplies: <ul style="list-style-type: none"> • single-phase or 3-phase, DC • up to 690 V (depending on version) • 50 or 60 Hz, etc...
Output flange	ST actuator flanges comply with ISO 5210 See "Mounting flange specifications" section for further details
Conduit entries	Standard configuration: 2 x 3/4" NPT Other cable entry configuration options available on request
Travel limit systems	<ul style="list-style-type: none"> • Position: movement reading on output shaft • Range: 1.5 to 1,080 turns • 2 contacts as standard (6 as option) ; 16A to 250V under resistive load
Torque limiting systems	<ul style="list-style-type: none"> • Torque: dynamometer measuring torque transmitted • The torque limiting system is calibrated at the factory to the torque setting selected by the customer • 2 contacts as standard; 16A to 250V under resistive load
Visual position indicator	<ul style="list-style-type: none"> • Graduated indicator showing position at all times, even if no power supply present
Remote position indication (options)	<ul style="list-style-type: none"> • 1000 Ohm potentiometer, 0.3W - wiper current = max. 1 mA. • TAM position transmitter: 4-20mA (12, 24 or 32V power supply for maximum permissible load of 150, 750 or 1,050 Ohms) • Intermediate positions given by SPDT switches • Others on request
Compliance with EC Directives	Weatherproof version ST actuators comply with: <ul style="list-style-type: none"> • directive 89/336/EEC, as amended by 93/68/EEC: Electromagnetic compatibility • directive 73/23/EEC, as amended by 93/68/EEC: Low voltage • the following harmonised standards: EN 61000-6-4: Generic emissions standard for industrial environments; EN 61000-6-2: Generic immunity standard for industrial environments; EN 60034-1: Rotating electrical machines; EN 60529: Degrees of protection provided by enclosures (IP ratings code)

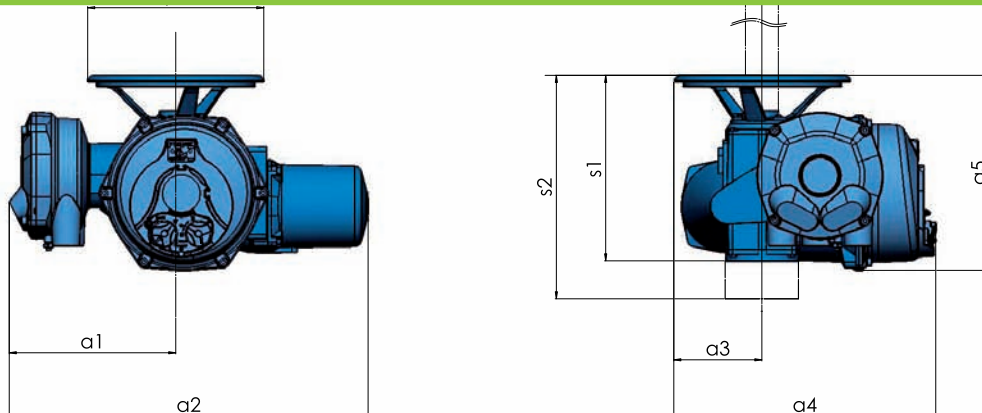
Specifications for weatherproof version with integrated control

Overall dimensions - ST6 to ST70 with INTEGRAL+ or INTELLI+



	Wt (lbs)	Ø B	a1	a2 max.	a3	a4	a5	s1 B3/C form	s2 A form	s2 B1 form
ST6	154	11.81	12.40	25.03	5.90	18.58	12.32	11.14	13.42	13.42
ST14	194	11.81	12.40	25.27	5.90	17.71	13.07	12.48	14.76	14.76
ST30	295	17.71	12.16	29.25	8.85	22.44	--	14.33	17.36	17.71
ST70	412	21.65	11.69	30.74	10.82	25.11	17.75	17.59	21.53	21.53

Overall dimensions - ST175 & ST220 with INTELLI+



	Wt (lbs)	Ø B	a1	a2 max.	a3	a4	a5	s1 B3/C form	s2 A form	s2 B1 form
ST175	1,428	31.49	14.84	43.26	19.68	34.72	--	20.66	26.02	26.02
ST220	1,530	39.37	14.84	43.26	19.68	34.72	--	20.66	26.02	26.02

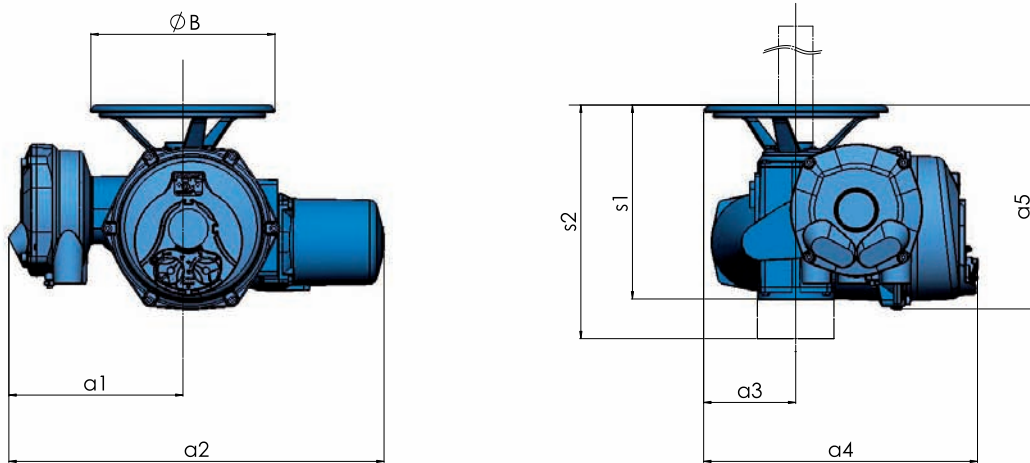
Technical specifications

Max. torque	ST6 = 44 ft-lbs ST14 = 103 ft-lbs ST30 = 221 ft-lbs ST70 = 516 ft-lbs ST175 = 1,291 ft-lbs ST220 = 1,623 ft-lbs Contact our marketing dept. for higher torque values See "Performance data" section for further details
Type of service	ON/OFF - Modulating class III
Casing	<ul style="list-style-type: none"> • Cast aluminium. Cast DI for models ST175/ST220 • Casings are watertight to IP68 & NEMA 6P and are C.S.A NRTL certified They can withstand pressure of 10 meters WC for 96 hours
Motor technology	Totally-enclosed, squirrel cage 3-phase or 1-phase motor, class F insulation with integral thermal overload protection. Motors easy to remove with sealed ball bearings fitted at front and rear
Motor duty rating	<ul style="list-style-type: none"> • S4 motor service (intermittent service on start-up) to IEC 34-1 • S4 - 30% for ON/OFF operation - up to 360 starts per hour • S4 - 50% for Modulating class III - up to 1,200 starts per hour
Ambient operating temperature	<ul style="list-style-type: none"> • Standard version: -20 °C ... +70 °C (-4 °F ... +158 °F) • Low temperature version: -40 °C ... +70 °C (-40 °F ... +158 °F)
External corrosion protection	Standard paint system: Zinc rich primer, epoxy undercoat and RAL5002 blue polyurethane top coat. Special anti-corrosion protection for marine, aggressive or abrasive environments available on request
Double seal protection	The control section of the actuator is totally isolated from the terminal compartment to protect electronic components
Vibration resistance	2.2 x 10 ⁻³ lb (9.8 m/s ²) at 10-500 Hz. (Contact our marketing dept. for higher vibration levels)
Lubrication	ST actuators are lubricated for the product lifetime and do not require any special service
Manual control	<ul style="list-style-type: none"> • By handwheel which does not rotate when electrical operation system in service • Switch between manual and electrical operation automatically without clutch release lever (except for ST6 models). Electrical control always has priority • Manual control gear ratios: ST6 1:1 - ST14/ST30 1:2 - ST70 1:21 - ST175/ST220 1:31
Power supply	ST actuators can operate on a wide variety of power supplies: <ul style="list-style-type: none"> • single-phase or 3-phase, DC • up to 690 V (depending on version) • 50 or 60 Hz, etc...
Output flange	ST actuator flanges comply with ISO 5210 See "Mounting flange specifications" section for further details
Conduit entries	3 x 1/2" NPT (ST6, ST14, ST30, ST70), 1 x 1-1/2" NPT + 2 x 1" NPT (ST175/220) Other conduit entry configurations available on request
Installation	Simple commissioning procedure
Travel limit systems	<ul style="list-style-type: none"> • Position: movement reading on output shaft • Range: 1.5 to 900 turns
Torque limiting systems	<ul style="list-style-type: none"> • Torque: dynamometer measuring torque transmitted • The torque limiting system is calibrated at the factory to the torque setting selected by the customer
Visual position indicator	<ul style="list-style-type: none"> • INTEGRAL+: graduated indicator showing position at all times • INTELLI+: back-lit graphics display with language selection
Options	<ul style="list-style-type: none"> • Remote position indication: position transmitter (4-20 mA) • Positioned: proportional control • Fieldbus: PROFIBUS, MODBUS or Foundation Fieldbus, depending on type of command
Compliance with EC Directives	Weatherproof version ST actuators comply with: <ul style="list-style-type: none"> • directive 89/336/EEC, as amended by 93/68/EEC: Electromagnetic compatibility • directive 73/23/EEC, as amended by 93/68/EEC: Low voltage • the following harmonised standards: EN 61000-6-4: Generic emissions standard for industrial environments; EN 61000-6-2: Generic immunity standard for industrial environments; EN 60034-1: Rotating electrical machines; EN 60529: Degrees of protection provided by enclosures (IP ratings code)

See INTEGRAL+ (U115) or INTELLI+ (U116) catalogs for further information on control functions.

Specifications for explosion-proof version with INTELLI+

Overall dimensions



	Wt (lbs)	ϕB	a1	a2 max.	a3	a4	a5	s1 B3/C form	s2 B1 form	s2 A form
ST6	158	11.81	11.18	23.81	5.90	18.42	12.32	11.14	13.42	13.42
ST14	198	11.81	11.18	24.05	5.90	17.55	13.07	12.48	14.76	14.76
ST30	299	17.71	10.94	27.99	8.85	22.28	--	14.33	17.71	17.36
ST70	416	21.65	10.47	29.48	10.82	24.96	21.29	17.59	21.53	21.53
ST175	1,433	31.49	13.18	41.57	15.74	31.37	--	20.59	26.02	26.02
ST220	1,534	39.37	13.18	41.57	15.74	31.37	--	20.59	26.02	26.02

Technical specifications

Max. torque	ST6 = 44 ft·lbs ST14 = 103 ft·lbs ST30 = 221 ft·lbs ST70 = 516 ft·lbs ST175 = 1,291 ft·lbs ST220 = 1,623 ft·lbs Contact our marketing dept. for higher torque values See "Performance data" section for further details
Type of service	ON/OFF - Modulating class III
Explosion protection	ATEX Directive 94/9/EC - standard CENELEC EN 60079-0, EN60079-1 As standard: Ex d II B T4 (option T5 or T6) On request: Ex d II C T4 (option T5 or T6) On request: Ex t DA21 IP68 T=135°C (option T=100°C, T=85°C) IEC Ex - standard IEC 60079-0, IEC60079-1 As standard: Ex d II B T4 (option T5 or T6) On request: Ex d II C T4 (option T5 or T6) On request: Ex t DA21 IP68 T=135°C (option T=100°C, T=85°C) NEMA 7 & 9 C.S.A. NRTL - NEMA 6 C.S.A. NRTL certified Class I Group B, C, D div 1&2 - Class II Group E, F, G div 1&2
Casing	<ul style="list-style-type: none"> • Cast aluminium. Cast DI for models ST175/ST220 • Casings are watertight to IP68 & NEMA6P and are C.S.A NRTL certified They can withstand pressure of 10 meters WC for 96 hours
Motor technology	Totally-enclosed, squirrel cage 3-phase or 1-phase motor, class F insulation with integral thermal overload protection. Motors easy to remove with sealed ball bearings fitted at front and rear
Motor duty rating	<ul style="list-style-type: none"> • S4 motor service (intermittent service on start-up) to IEC 34-1 • S4 - 30% for ON/OFF operation - up to 360 starts per hour • S4 - 50% for Modulating class III - up to 1,200 starts per hour
Ambient operating temperature	<ul style="list-style-type: none"> • Ex d II B T4: -20°C to +70°C (-4°F to +158°F) - (-40°C and -50°C as option) • Ex d II C T4: -20°C to +70°C (-4°F to +158°F)
External corrosion protection	Standard paint system: Zinc rich primer, epoxy undercoat and RAL5002 blue polyurethane top coat. Special anti-corrosion protection for marine, aggressive or abrasive compartment to protect electronic components
Double seal protection	The control section of the actuator is totally isolated from the terminal compartment to protect electronic components
Vibration resistance	2.2 x 10 ⁻³ lb (9.8 m/s ²) at 10-500 Hz. (Contact our marketing dept. for higher vibration levels)
Lubrication	ST actuators are lubricated for the product lifetime and do not require any special service
Manual control	<ul style="list-style-type: none"> • By handwheel which does not rotate when electrical operation system in service • Switch between manual and electrical operation automatically without a clutch release lever (except for ST6 models). Electrical control always has priority • Manual control gear ratios: ST6 1:1 - ST14/ST30 1:2 - ST70 1:21 - ST175/ST220 1:31
Power supply	ST actuators can operate on a wide variety of power supplies: <ul style="list-style-type: none"> • single-phase or 3-phase, DC • up to 690 V (depending on version) • 50 or 60 Hz, etc...
Output flange	ST actuator flanges comply with ISO 5210 See "Mounting flange specifications" section for further details
Cable entries	1 x 1-1/2"NPT + 2 x 1"NPT Other cable entry configurations available on request
Installation	Can be commissioned without opening unit
Travel limit systems	<ul style="list-style-type: none"> • Position : movement reading on output shaft • Range: 1.5 to 900 turns. (Range above 900 turns available as an option)
Torque limiting systems	<ul style="list-style-type: none"> • Torque: dynamometer measuring torque transmitted • The torque limiting system is calibrated at the factory to the torque setting selected by the customer
Position indicator	<ul style="list-style-type: none"> • Back-lit graphics display with language selection
Options	<ul style="list-style-type: none"> • Remote position indication: 4-20mA position indicator • Positioner: proportional control • Fieldbus: MODBUS RTU or PROFIBUS DP V1 or Fieldbus Foundation • Fire protection: 30 minutes at 1,000°C • Battery: to determine and transmit actuator position when power supply not present

See catalog U116 for further information on INTELLI+ control functions.

Performance data

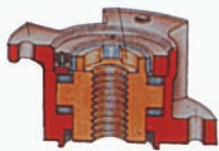
This table shows performance data for 3-phase actuators with a 400/460 VAC power supply
Refer to ST Technical Guide for further details and information for other voltages

Type	3 PH - ON/OFF			3 PH - CLASSE III			
	Nominal torque (ft.lbs)	Output speed 50Hz (rpm)	Output speed 60Hz (rpm)	Instantaneous torque (ft.lbs)	Permanent torque (ft.lbs)	Output speed 50Hz (rpm)	Output speed 60Hz (rpm)
ST6	44	11	13	44	22	11	13
	44	16	19	44	22	16	19
	44	23	28	44	22	23	28
	44	30	36	44	22	30	36
	44	46	55	44	22	46	55
	44	61	73				
	44	92	110				
ST14	103	11	13	103	52	11	13
	103	16	19	103	52	16	19
	103	23	28	103	52	23	28
	103	30	36	-	-	-	-
	103	46	55	-	-	-	-
	103	61	73	103	52	61	73
	103	92	110				
	103	120	144				
ST30	221	16	19	221	111	16	19
	221	23	28	221	111	23	28
	221	30	36	-	-	-	-
	221	46	55	-	-	-	-
	221	61	73	221	111	61	73
	221	92	110				
	221	120	144				
ST70	516	16	19	516	258	16	19
	516	23	28	516	258	23	28
	516	30	36	-	-	-	-
	516	46	55	-	-	-	-
	516	61	73	516	258	61	73
	516	92	110				
	479	120	144				
	331	190	226				
ST175	1,291	36	43				
	1,291	46	55				
	1,291	61	73				
ST220	1,623	16	19				
	1,623	23	28				
	1,623	30	36				
	1,623	36	43				
	1,623	46	55				
	1,623	61	73				
	1,623	92	110				
	1,254	120	144				

Mounting flange specifications

	Flange	Max. stem diameter (inches)			
		Type A (max)	Type B1 (max)	Type B3 (max)	Type C (max)
ST6	F10	1.181	1.653	0.787	1.260
ST14	F10	1.496	1.653	0.787	1.575
ST30	F14	1.653	2.362	1.181	1.772
ST70	F16	2.126	3.150	1.575	2.205
ST175	F25	3.346	3.937	1.969	3.543
ST220	F30	3.543	4.724	2.362	3.543

Type A
STEM NUT



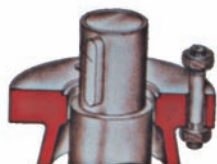
Thrust accepted



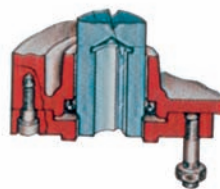
Type B1
LARGE DIA.



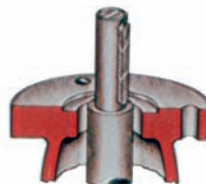
Thrust not accepted



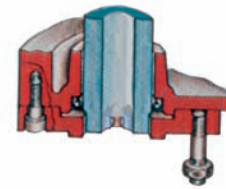
Type B3
SMALL DIA.



Thrust not accepted



Type C
CLAW COUPLING



Thrust not accepted



ISO 5210 requirements

Flange	Max. torque	Max. thrust with stem nut	Mounting bolts
F10	74 ft·lbs	10,000 lbs	4 x M10 / d=4.01 in
F14	295 ft·lbs	22,500 lbs	4 x M16 / d=5.512 in
F16	516.29 ft·lbs	33,750 lbs	4 x M20 / d=6.496 in
F25	885 ft·lbs	50,000 lbs	8 x M16 / d=10.000 in
F30	1,843 ft·lbs	75,000 lbs	8 x M20 / d=11.732 in

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