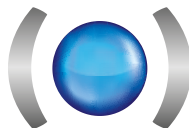


BERNARD CONTROLS

ELECTRIC ACTUATOR GUIDE



BERNARD®
CONTROLS

Invest in Confidence



Solutions always by your side

2 labels: total solutions for your applications

The automation of industrial machinery and equipment addresses human and financial challenges of security and productivity.

Our leadership in the nuclear market with more than 120 reactors installed worldwide and our continuous experience from the 70's have shaped our expertise and our control of processes.

Our understanding of industrial processes drives the design and manufacturing of our electrical actuators. Our vision of controls furthers the appearance of solutions fully adapted to markets' evolutions and to our customers' budgetary and technological requirements.

That is why our electromechanical profile has developed into an expertise in the management of evermore complex systems.

BERNARD CONTROLS propose 2 labels which federate well different ranges of actuator solutions:



SIMPLE, STURDY, ECONOMICAL

In order to fulfill the need for actuators that are both simple and sturdy, we have created the **FIRST BC** label.

This label guarantees quality and security to installations' electric actuation solutions in the case of **moderate environmental and operational constraints**.

DEDICATED SOLUTIONS

To fulfill the need for reliable, high performance and innovative actuators, we have defined the **BC PREMIUM** label.

The **BC PREMIUM** label is the guarantee of quality and security for installations' actuation in the case of **demanding environmental and operational constraints**.

Contents

Solution always by your side	>	2	Range Overview with		
Innovation always by your side	>	3	Duty and Modulating Classification	>	14
A dedicated guide to define your model of actuator	>	4	Focus on		
Focus on Operation	>	6	BC Technologies & Services	>	16
			Specifications	>	18

Innovation always by your side

GPS Actuator

➤ The best way to find your electric actuation solution

GPS Actuator is the web application developed by BERNARD CONTROLS that helps you find your way to your electric actuation solution.

As suggested by its name, the GPS function of this application simply drives you to the best solution to your needs, following 5 key steps.

www.gpsactuator.com



Flash this QR code and access BC GPS Actuator!





A dedicated Guide

to define your model of actuator

Using the GPS actuator, you will end up with a range of BERNARD CONTROLS' electric actuators.

This Guide continues the selection process and helps you to finalize your request taking into account all parameters and options.

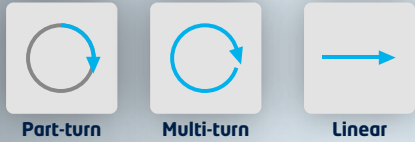
Review each step of the GPS Actuator selection with comments on the right page. Then, read through data and additional explanations on next pages and fill in the detachable specification sheet at the end of the document.

You will be sure to consider all criteria to select the appropriate actuation solution.

At any time, BERNARD CONTROLS teams are available for support. From basic quotation to specific design or project design, do not hesitate to contact our sales teams. They can help you to fill in the form and inform about only options or technologies.

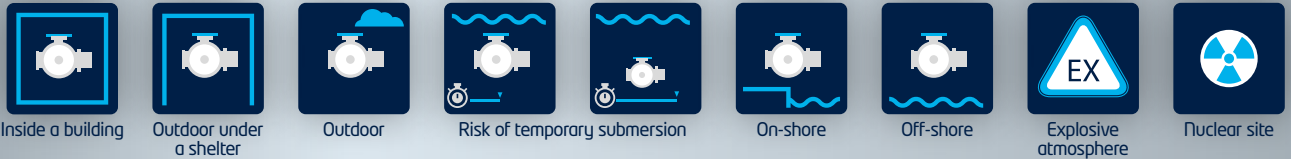


1 Movement to operate the valve



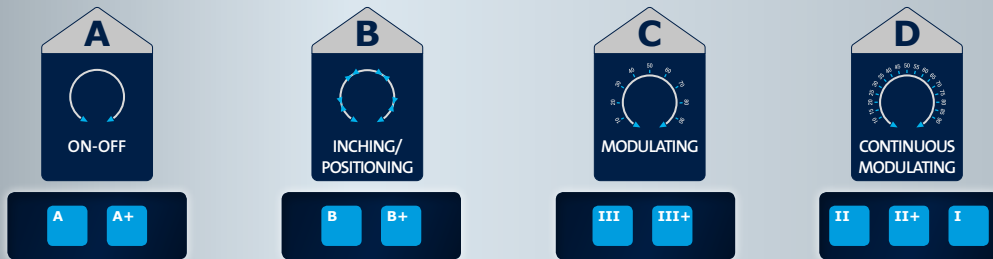
> Movement selection has to be completed with data about your valve to ensure good fitting of the actuator to your valve.

2 Environment



> Location and working environment impose to specify watertightness level, enclosure protection...

3 Operation



> BC GPC Actuator presents Duty and Modulating Classification. More information on pages 6 to 15.

4 Security



5 Control



> Choice of controls has to be completed with options, security requirement, electric connections, signaling information ...



Additional options and information to be selected on the specification sheet at the end.





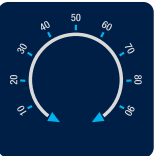

Focus on Operation

Actuator Duty & Modulating Classification

Operation is a decisive step in your electric actuator selection. Looking carefully at your process requirement will make the difference.

> Actuator Duty

The EN 15714-2 Standard defines 4 actuator duties with basic design requirements per movement to operate the valve: part-turn, multi-turn and linear.

 <p>Class A On-Off</p> <p>The actuator is required to drive the valve through its entire travel from the fully open position to the fully closed position or vice-versa.</p>	 <p>Class B Inching / Positioning</p> <p>The actuator is required to occasionally drive the valve to any position.</p>	 <p>Class C Modulating</p> <p>The actuator is required to frequently drive the valve to any position between fully open and fully closed.</p>	 <p>Class D Continuous modulating</p> <p>The actuator is required to continuously drive the valve to any position between fully open and fully closed.</p>
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Relying on its experience and on years of customers' feedbacks, BERNARD CONTROLS considers that these 4 types of operation must be specified with key criteria in order to define the unique appropriate solution to the process requirement of each customer.

> On-Off & Positioning: Increase ENDURANCE

Considering On-Off applications (Class A) and Inching/Positioning applications (Class B), process requirements imply to set ENDURANCE as the decisive criteria. Number of cycles, i.e. life time of the actuator, will make the difference for the customer and his application.

> Modulating & Continuous Modulating: Improve PERFORMANCE

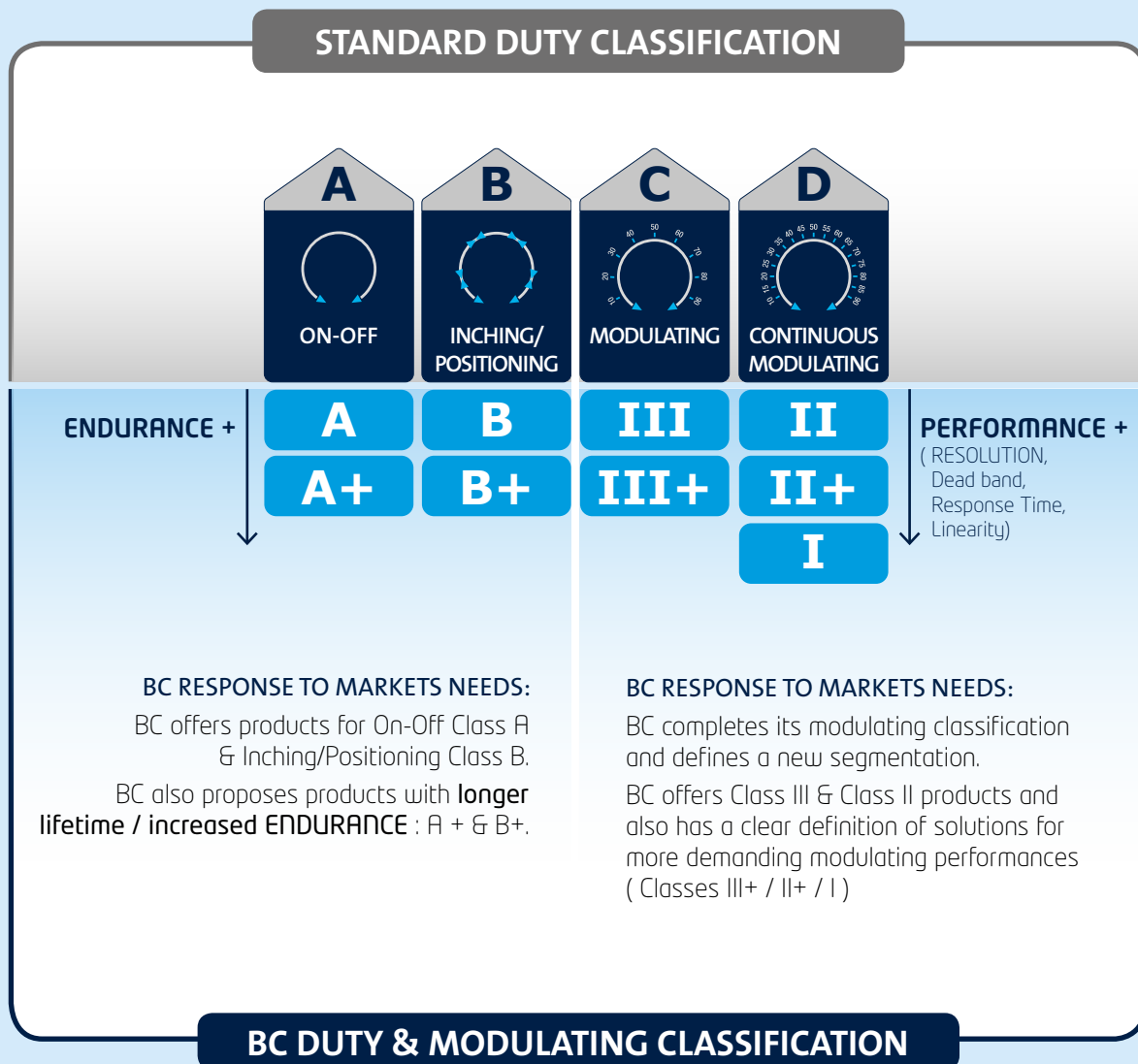
Modulating and Continuous Modulating applications require specific expertise to define the most appropriate solution. For many years BERNARD CONTROLS has been a leader in electric actuation and a forerunner in modulating technology. Our modulating classification (Class III which complies with EN15714-2 Modulating and Classes II & I which comply with EN15714-2 Continuous modulating) is now well-known from our customers and has, in fact, inspired the EN 15714-2 Standard.

Duty PERFORMANCE is the main criterion to fully address modulating process requirements, but needs to be specified and completed with additional performance criteria.

BERNARD CONTROLS sets 4 additional performance criteria to EN15714-2 basic design requirements:

- + RESOLUTION *
- + Response Time *
- + Dead Band *
- + Linearity *

These criteria determine the efficiency of the modulating process.



Find detailed data per movement and classes on next pages and BERNARD CONTROLS product offer with available classes on pages 14 & 15.

DEFINITIONS*

- **RESOLUTION:** the smallest achievable step at the output shaft of the electric actuator.
- **DEAD BAND:** the range through which an input signal may vary, upon reversal of direction, without triggering any observable change in the position of the valve.
- **RESPONSE TIME:** the time needed by the actuator to reach position following an input signal change.
- **LINEARITY:** the percentage of change in input signal must approximate the percentage of the change at the output of the actuator.



Part - Turn Actuator



Class A On - Off



Class B Inching / Positioning

Actuator duty
STANDARD CLASSIFICATION

ON - OFF EN 15714 - 2
Standard Duty Class A

Torque Nm	Duty Performance cycles per hour	Endurance ⁽¹⁾ number of cycles
<126	15	10 000
126 - 1 000	10	10 000
1 001 - 4 000	5	5 000
4 001 - 32 000	5	2 500
> 32 000	5	1 000

(1) Endurance Test Requirement Standard EN 15714 - 2

INCHING / POSITIONING EN 15714 - 2
Standard Duty Class B

Torque Nm	Duty Performance starts per hour	Endurance ⁽¹⁾ number of cycles
<126	120	10 000
126 - 1 000	60	10 000
1 001 - 4 000	30	5 000
4 001 - 32 000	15	2 500
> 32 000	5	1 000

(1) Endurance Test Requirement Standard EN 15714 - 2

Process Requirements
BC DUTY & MODULATING CLASSIFICATION

ENDURANCE CRITERIA

A

ON - OFF Endurance Class A

Torque Nm	Duty Performance cycles per hour	Endurance ⁽¹⁾ number of cycles
<126	15	10 000
126 - 1 000	10	10 000
1 001 - 4 000	5	5 000
4 001 - 32 000	5	2 500
> 32 000	5	1 000

(1) Endurance Test Requirement Standard EN 15714 - 2

A+

ON - OFF Endurance Class A+

Torque Nm	Duty Performance cycles per hour	Endurance ⁽²⁾ number of cycles
<126	15	100 000
126 - 1 000	10	30 000
1 001 - 4 000	5	10 000
4 001 - 32 000	5	5 000
> 32 000	5	2 000

(2) Endurance Higher Level than Standard EN 15714 - 2

ENDURANCE CRITERIA

B

INCHING / POSITIONING Endurance Class B

Torque Nm	Duty Performance starts per hour	Endurance ⁽¹⁾ number of cycles
<126	120	10 000
126 - 1 000	60	10 000
1 001 - 4 000	30	5 000
4 001 - 32 000	15	2 500
> 32 000	5	1 000

(1) Endurance Test Requirement Standard EN 15714 - 2

B+

INCHING / POSITIONING Endurance Class B+

Torque Nm	Duty Performance starts per hour	Endurance ⁽²⁾ number of cycles
<126	120	100 000
126 - 1 000	60	30 000
1 001 - 4 000	30	10 000
4 001 - 32 000	15	5 000
> 32 000	5	2 000

(2) Endurance Higher Level than Standard EN 15714 - 2

DEFINITIONS

- Torque is based on EN ISO 5211
- One cycle consists of nominal 90° angular travel in both directions (i.e. 90° to open + 90° to close), based on an average load of at least 30 % of the rated torque with the ability to transmit 100 % of the rated torque for at least 5 % at each end of travel. For angular travel other than 90°, the endurance shall be agreed between the purchaser and the manufacturer/supplier.
- One start consists of a movement of at least 1 % in either direction, with a load of at least 30 % of the rated torque.
- TBA: To be agreed between manufacturer / supplier and purchaser.

Design requirements per classes

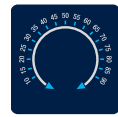


Class C Modulating

MODULATING EN 15714 - 2 Standard Duty Class C

Torque Nm	Duty ⁽¹⁾ Performance starts per hour	Endurance number of starts
<126	1 200	1 800 000
126 - 1 000	600	1 200 000
1 001 - 4 000	300	500 000
4 001 - 32 000	60	250 000
> 32 000	30	T. B. A.

(1) Duty Performance Standard EN 15714 - 2



Class D Continuous Modulating

CONTINUOUS MODULATING EN 15714 - 2 Standard Duty Class D

Torque Nm	Duty ⁽¹⁾ Performance starts per hour	Endurance number of starts
<126	3 600	10 000 000
126 - 1 000	1 800	10 000 000
1 001 - 4 000	600	5 000 000
4 001 - 32 000	N.A.	T. B. A.
> 32 000	N.A.	T. B. A.

(1) Duty Performance Standard EN 15714 - 2

PERFORMANCE CRITERIA

III

MODULATING Performance Class III			Additional performance criteria			
Torque Nm	Duty ⁽²⁾ Performance starts per hour	Endurance number of starts	Resolution % and Number step mini	Dead band % Maxi	Reponse time sec	Linearity %
<126	1 200	1 800 000	<2% 50	±1%	<2s	2%
126 - 1 000	1 200	1 200 000	<2% 50	±1%	<2s	2%
1 001 - 4 000	1 200	500 000	<2% 50	±1%	<2s	2%
4 001 - 32 000	1 200	250 000	<2% 50	±1%	<2s	2%
> 32 000	1 200	T. B. A.	<2% 50	±1%	<2s	2%

(2) Duty Performance Higher Level than Standard EN 15714 - 2

III+

MODULATING Performance Class III+			Additional performance criteria			
Torque Nm	Duty ⁽²⁾ Performance starts per hour	Endurance ⁽²⁾ number of starts	Resolution % and Number step mini	Dead band % Maxi	Reponse time sec	Linearity %
<126	1 200	3 000 000	<1% 100	±0.5%	<2s	2%
126 - 1 000	1 200	2 000 000	<1% 100	±0.5%	<2s	2%
1 001 - 4 000	1 200	1 000 000	<1% 100	±0.5%	<2s	2%
4 001 - 32 000	1 200	500 000	<1% 100	±0.5%	<5s	2%
> 32 000	1 200	T. B. A.	<1% 100	±0.5%	<10s	2%

(2) Duty Performance and Endurance Higher Level than Standard EN 15714 - 2

PERFORMANCE CRITERIA

II

CONTINUOUS MODULATING Performance Class II			Additional performance criteria			
Torque Nm	Duty ⁽²⁾ Performance starts per hour	Endurance number of starts	Resolution % and Number step mini	Dead band % Maxi	Reponse time sec	Linearity %
<126	3 600	10 000 000	<1.5% 67	±0.75%	<2s	2%
126 - 1 000	1 800	10 000 000	<1.5% 67	±0.75%	<2s	2%
1 001 - 4 000	1 800	5 000 000	<1.5% 67	±0.75%	<2s	2%
4 001 - 32 000	N.A.	T. B. A.	<1.5% 67	±0.75%	<2s	2%
> 32 000	N.A.	T. B. A.	<1.5% 67	±0.75%	<2s	2%

(2) Duty Performance Higher Level than Standard EN 15714 - 2

II+

CONTINUOUS MODULATING Performance Class II+			Additional performance criteria			
Torque Nm	Duty ⁽²⁾ Performance starts per hour	Endurance ⁽²⁾ number of starts	Resolution % and Number step mini	Dead band % Maxi	Reponse time sec	Linearity %
<126	3 600	20 000 000	<1% 100	±0.5%	<2s	2%
126 - 1 000	1 800	20 000 000	<1% 100	±0.5%	<2s	2%
1 001 - 4 000	1 800	5 000 000	<1% 100	±0.5%	<2s	2%
4 001 - 32 000	1 200	T. B. A.	<1% 100	±0.5%	<5s	2%
> 32 000	1 200	T. B. A.	<1% 100	±0.5%	<10s	2%

(2) Duty Performance and Endurance Higher Level than Standard EN 15714 - 2

I

CONTINUOUS MODULATING Performance Class I			Additional performance criteria			
Torque Nm	Duty ⁽²⁾ Performance starts per hour	Endurance ⁽²⁾ number of starts	Resolution % and Number step mini	Dead band % Maxi	Reponse time sec	Linearity %
<126	3 600 ↗	50 000 000	<0.25% 400	±0.13%	<1s	2%
126 - 1 000	1 800 ↗	50 000 000	<0.25% 400	±0.13%	<1s	2%
1 001 - 4 000	1 800 ↗	20 000 000	<0.25% 400	±0.13%	<1s	2%
4 001 - 32 000	N.A.	T. B. A.	<0.25% 400	±0.13%	<2s	2%
> 32 000	N.A.	T. B. A.	<0.25% 400	±0.13%	<3s	2%

(2) Duty Performance and Endurance Higher Level than Standard EN 15714 - 2



Multi - Turn Actuator



Class A On - Off



Class B Inching / Positioning

Actuator duty
STANDARD CLASSIFICATION

ON - OFF EN 15714 - 2 Standard Duty Class A

Torque Nm	Duty Performance running time/hour	Endurance ⁽¹⁾ number of cycles
<101	15	10 000
101 - 700	15	10 000
701 - 2 500	15	5 000
2 501 - 10 000	15	2 500
> 10 000	15	1 000

(1) Endurance Test Requirement Standard EN 15714 - 2

INCHING / POSITIONING EN 15714 - 2 Standard Duty Class B

Torque Nm	Duty Performance starts per hour	Endurance ⁽¹⁾ number of cycles
<101	30	10 000
101 - 700	20	10 000
701 - 2 500	15	5 000
2 501 - 10 000	10	2 500
> 10000	5	1 000

(1) Endurance Test Requirement Standard EN 15714 - 2

Process Requirements
BC DUTY & MODULATING CLASSIFICATION

ENDURANCE CRITERIA

A

ON - OFF Endurance Class A

Torque Nm	Duty Performance running time/hour	Endurance ⁽¹⁾ number of cycles
<101	15	10 000
101 - 700	15	10 000
701 - 2 500	15	5 000
2 501 - 10 000	15	2 500
> 10 000	15	1 000

(1) Endurance Test Requirement Standard EN 15714 - 2

A+

ON - OFF Endurance Class A+

Torque Nm	Duty Performance running time/hour	Endurance ⁽²⁾ number of cycles
<101	15	20 000
101 - 700	15	20 000
701 - 2 500	15	10 000
2 501 - 10 000	15	5 000
> 10 000	15	2 000

(2) Endurance Higher Level than Standard EN 15714 - 2

ENDURANCE CRITERIA

B

INCHING / POSITIONING Endurance Class B

Torque Nm	Duty Performance starts per hour	Endurance ⁽¹⁾ number of cycles
<101	30	10 000
101 - 700	20	10 000
701 - 2 500	15	5 000
2 501 - 10 000	10	2 500
> 10000	5	1 000

(1) Endurance Test Requirement Standard EN 15714 - 2

B+

INCHING / POSITIONING Endurance Class B+

Torque Nm	Duty Performance starts per hour	Endurance ⁽²⁾ number of cycles
<101	30	20 000
101 - 700	20	20 000
701 - 2 500	15	10 000
2 501 - 10 000	10	5 000
> 10000	5	2 000

(2) Endurance Higher Level than Standard EN 15714 - 2

DEFINITIONS

- Torque is based on EN ISO 5210
- One cycle consists of 25 turns in both directions (i.e. 25 turns to open + 25 turns to close), based on an average load of at least 30 % of the rated torque with the ability to transmit 100 % of the rated torque for at least 10 % of the travel.
- One start consists of a movement of at least 1 % of travel in either direction, with a load of at least 30 % of the rated torque.
- TBA: To be agreed between manufacturer / supplier and purchaser.

Design requirements per classes



Class C Modulating

MODULATING		EN 15714 - 2
Standard Duty Class C		
Torque Nm	Duty ⁽¹⁾ Performance starts per hour	Endurance number of starts
<101	1 200	1 800 000
101 - 700	600	1 200 000
701 - 2 500	300	500 000
2 501 - 10 000	60	250 000
> 10 000	30	T. B. A.

(1) Duty Performance Standard EN 15714 - 2



Class D Continuous Modulating

CONTINUOUS MODULATING		EN 15714 - 2
Standard Duty Class D		
Torque Nm	Duty Performance starts per hour	Endurance ⁽¹⁾ number of starts
<101	3 600	10 000 000
101 - 700	1 800	10 000 000
701 - 2 500	600	5 000 000
2 501 - 10 000	N.A.	T. B. A.
> 10 000	N.A.	T. B. A.

(1) Endurance Test Requirement Standard EN 15714 - 2

PERFORMANCE CRITERIA

III

MODULATING		Additional performance criteria					
Performance Class III							
Torque Nm	Duty ⁽²⁾ Performance starts per hour	Endurance number of starts	Resolution % and Number step mini	Dead band % Maxi	Reponse time sec	Linearity %	
<101	1 200	1 800 000	<2%	50	±1%	<2s	2%
101 - 700	1 200	1 200 000	<2%	50	±1%	<2s	2%
701 - 2 500	300	500 000	<2%	50	±1%	<2s	2%
2 501 - 10 000	60	250 000	<2%	50	±1%	<2s	2%
> 10 000	30	T. B. A.	<2%	50	±1%	<2s	2%

(2) Duty Performance Higher Level than Standard EN 15714 - 2

III+

MODULATING		Additional performance criteria					
Performance Class III+							
Torque Nm	Duty ⁽²⁾ Performance starts per hour	Endurance ⁽²⁾ number of starts	Resolution % and Number step mini	Dead band % Maxi	Reponse time sec	Linearity %	
<101	1 200	3 000 000	<1%	100	±0.5%	<2s	2%
101 - 700	1 200	2 000 000	<1%	100	±0.5%	<2s	2%
701 - 2 500	300	1 000 000	<1%	100	±0.5%	<2s	2%
2 501 - 10 000	60	500 000	<1%	100	±0.5%	<5s	2%
> 10 000	30	T. B. A.	<1%	100	±0.5%	<10s	2%

(2) Duty Performance and Endurance Higher Level than Standard EN 15714 - 2

PERFORMANCE CRITERIA

II

CONTINUOUS MODULATING		Additional performance criteria					
Performance Class II							
Torque Nm	Duty Performance starts per hour	Endurance ⁽²⁾ number of starts	Resolution % and Number step mini	Dead band % Maxi	Reponse time sec	Linearity %	
<101	3 600	10 000 000	<1.5%	67	±0.75%	<2s	2%
101 - 700	1 800	10 000 000	<1.5%	67	±0.75%	<2s	2%
701 - 2 500	600	5 000 000	<1.5%	67	±0.75%	<2s	2%
2 501 - 10 000	N.A.	T. B. A.	<1.5%	67	±0.75%	<2s	2%
> 10 000	N.A.	T. B. A.	<1.5%	67	±0.75%	<2s	2%

(2) Endurance Test Requirement Standard EN 15714 - 2

II+

CONTINUOUS MODULATING		Additional performance criteria					
Performance Class II+							
Torque Nm	Duty Performance starts per hour	Endurance ⁽²⁾ number of starts	Resolution % and Number step mini	Dead band % Maxi	Reponse time sec	Linearity %	
<101	3 600	20 000 000	<1%	100	±0.5%	<2s	2%
101 - 700	1 800	10 000 000	<1%	100	±0.5%	<2s	2%
701 - 2 500	600	5 000 000	<1%	100	±0.5%	<2s	2%
2 501 - 10 000	N.A.	T. B. A.	<1%	100	±0.5%	<5s	2%
> 10 000	N.A.	T. B. A.	<1%	100	±0.5%	<10s	2%

(2) Endurance Higher Level than Standard EN 15714 - 2

I

CONTINUOUS MODULATING		Additional performance criteria					
Performance Class I							
Torque Nm	Duty Performance starts per hour	Endurance ⁽²⁾ number of starts	Resolution % and Number step mini	Dead band % Maxi	Reponse time sec	Linearity %	
<101	3 600	50 000 000	<0.25%	400	±0.13%	<1s	2%
101 - 700	1 800	20 000 000	<0.25%	400	±0.13%	<1s	2%
701 - 2 500	600	5 000 000	<0.25%	400	±0.13%	<1s	2%
2 501 - 10 000	N.A.	T. B. A.	<0.25%	400	±0.13%	<2s	2%
> 10 000	N.A.	T. B. A.	<0.25%	400	±0.13%	<3s	2%

(2) Endurance Higher Level than Standard EN 15714 - 2



Linear Actuator

Actuator duty
STANDARD CLASSIFICATION



Class A On - Off

ON - OFF		EN 15714 - 2
Standard Duty Class A		
Thrust kN	Duty Performance running time/hour	Endurance ⁽¹⁾ number of cycles
<21	15	10 000
21 - 70	10	10 000
71 - 150	5	5 000
151 - 325	5	2 500
> 325	5	1 000

(1) Endurance Test Requirement Standard EN 15714 - 2



Class B Inching / Positioning

INCHING / POSITIONING		EN 15714 - 2
Standard Duty Class B		
Thrust kN	Duty Performance starts per hour	Endurance ⁽¹⁾ number of cycles
<21	30	10 000
21 - 70	15	10 000
71 - 150	10	5 000
151 - 325	10	2 500
> 325	10	1 000

(1) Endurance Test Requirement Standard EN 15714 - 2

Process Requirements
BC DUTY & MODULATING CLASSIFICATION

ENDURANCE CRITERIA

A

ON - OFF		Endurance Class A
Thrust kN	Duty Performance running time/hour	Endurance ⁽¹⁾ number of cycles
<21	15	10 000
21 - 70	10	10 000
71 - 150	5	5 000
151 - 325	5	2 500
> 325	5	1 000

(1) Endurance Test Requirement Standard EN 15714 - 2

A+

ON - OFF		Endurance Class A+
Thrust kN	Duty Performance running time/hour	Endurance ⁽²⁾ number of cycles
<21	15	20 000
21 - 70	10	20 000
71 - 150	5	10 000
151 - 325	5	5 000
> 325	5	2 000

(2) Endurance Higher Level than Standard EN 15714 - 2

ENDURANCE CRITERIA

B

INCHING / POSITIONING		Endurance Class B
Thrust kN	Duty Performance starts per hour	Endurance ⁽¹⁾ number of cycles
<21	30	10 000
21 - 70	15	10 000
71 - 150	10	5 000
151 - 325	10	2 500
> 325	10	1 000

(1) Endurance Test Requirement Standard EN 15714 - 2

B+

INCHING / POSITIONING		Endurance Class B+
Thrust kN	Duty Performance starts per hour	Endurance ⁽²⁾ number of cycles
<21	30	20 000
21 - 70	15	20 000
71 - 150	10	10 000
151 - 325	10	5 000
> 325	10	1 000

(2) Endurance Higher Level than Standard EN 15714 - 2

DEFINITIONS

- Thrust is based on EN ISO 5210
- One cycle consists in a stroke of 40 mm, or in a minimum stroke (H) given in Table 5, in both directions (i.e. 40 mm to open + 40 mm to close), based on an average load of at least 30 % of the rated thrust with the ability to transmit 100 % of the rated thrust for at least 10 % of the travel.
- One start consists of a movement of at least 1 % of the stroke in either direction, with a load of at least 30 % of the rated thrust.
- TBA: To be agreed between manufacturer / supplier and purchaser.

Design requirements per classes



Class C Modulating

MODULATING		EN 15714 - 2
Standard Duty Class C		
Thrust kN	Duty ⁽¹⁾ Performance starts per hour	Endurance number of starts
<21	1 200	1 800 000
21 - 70	600	1 200 000
71 - 150	60	500 000
151 - 325	60	250 000
> 325	60	T. B. A.

(1) Duty Performance Standard EN 15714 - 2



Class D Continuous Modulating

CONTINUOUS MODULATING		EN 15714 - 2
Standard Duty Class D		
Thrust kN	Duty Performance starts per hour	Endurance ⁽¹⁾ number of starts
<21	3 600	10 000 000
21 - 70	1 800	10 000 000
71 - 150	T. B. A.	5 000 000
151 - 325	T. B. A.	T. B. A.
> 325	T. B. A.	T. B. A.

(1) Endurance Test Requirement Standard EN 15714 - 2

PERFORMANCE CRITERIA

III

MODULATING		Additional performance criteria					
Performance Class III							
Thrust kN	Duty ⁽²⁾ Performance starts per hour	Endurance number of starts	Resolution % and Number step mini	Dead band % (Maxi)	Reponse time sec	Linearity %	
<21	1 200	1 800 000	<2%	50	±1%	<2s	2%
21 - 70	1 200	1 200 000	<2%	50	±1%	<2s	2%
71 - 150	300	500 000	<2%	50	±1%	<2s	2%
151 - 325	60	250 000	<2%	50	±1%	<2s	2%
> 325	60	T. B. A.	<2%	50	±1%	<2s	2%

(2) Duty Performance Higher Level than Standard EN 15714 - 2

PERFORMANCE CRITERIA

II

CONTINUOUS MODULATING		Additional performance criteria					
Performance Class II							
Thrust kN	Duty Performance starts per hour	Endurance number of starts	Resolution % and Number step mini	Dead band % (Maxi)	Reponse time sec	Linearity %	
<21	3 600	10 000 000	<1.5%	67	±0.75%	<2s	2%
21 - 70	1 800	10 000 000	<1.5%	67	±0.75%	<2s	2%
71 - 150	T. B. A.	5 000 000	<1.5%	67	±0.75%	<2s	2%
151 - 325	T. B. A.	T. B. A.	<1.5%	67	±0.75%	<2s	2%
> 325	T. B. A.	T. B. A.	<1.5%	67	±0.75%	<2s	2%

(2) Endurance Test Requirement Standard EN 15714 - 2

III+

MODULATING		Additional performance criteria					
Performance Class III+							
Thrust kN	Duty ⁽²⁾ Performance starts per hour	Endurance ⁽²⁾ number of starts	Resolution % and Number step mini	Dead band % (Maxi)	Reponse time sec	Linearity %	
<21	1 200	3 000 000	<1%	100	±0.5%	<2s	2%
21 - 70	1 200	2 000 000	<1%	100	±0.5%	<2s	2%
71 - 150	300	1 000 000	<1%	100	±0.5%	<2s	2%
151 - 325	60	500 000	<1%	100	±0.5%	<5s	2%
> 325	60	T. B. A.	<1%	100	±0.5%	<10s	2%

(2) Duty Performance and Endurance Higher Level than Standard EN 15714 - 2

II+

CONTINUOUS MODULATING		Additional performance criteria					
Performance Class II+							
Thrust kN	Duty Performance starts per hour	Endurance ⁽²⁾ number of starts	Resolution % and Number step mini	Dead band % (Maxi)	Reponse time sec	Linearity %	
<21	3 600	20 000 000	<1%	100	±0.5%	<2s	2%
21 - 70	1 800	10 000 000	<1%	100	±0.5%	<2s	2%
71 - 150	T. B. A.	5 000 000	<1%	100	±0.5%	<2s	2%
151 - 325	T. B. A.	T. B. A.	<1%	100	±0.5%	<5s	2%
> 325	T. B. A.	T. B. A.	<1%	100	±0.5%	<10s	2%

(2) Endurance Higher Level than Standard EN 15714 - 2

I

CONTINUOUS MODULATING		Additional performance criteria					
Performance Class I							
Thrust kN	Duty Performance starts per hour	Endurance ⁽²⁾ number of starts	Resolution % and Number step mini	Dead band % (Maxi)	Reponse time sec	Linearity %	
<21	3 600	50 000 000	<0.25%	400	±0.13%	<1s	2%
21 - 70	1 800	20 000 000	<0.25%	400	±0.13%	<1s	2%
71 - 150	T. B. A.	5 000 000	<0.25%	400	±0.13%	<1s	2%
151 - 325	T. B. A.	T. B. A.	<0.25%	400	±0.13%	<2s	2%
> 325	T. B. A.	T. B. A.	<0.25%	400	±0.13%	<3s	2%

(2) Endurance Higher Level than Standard EN 15714 - 2

BC Ranges Overview with



SIMPLE, STURDY, ECONOMICAL



DEDICATED SOLUTIONS

BC SPECIFIC DESIGN & EXPERTISE

FOCUS ON



New 2014 EZ LOGIC

Proven reliability with new integrated control

→ **Nuclear Actuators:**
NUCLEAR QUALIFIED RANGES



SN

Please consult our Nuclear Actuators catalogue for detailed information about SN and other qualified ranges.

WEATHERPROOF RANGES

→ **Weatherproof Quarter-Turn Actuators:**
EZ RANGE



EZ

ON-OFF	INCHING/ POSITIONING
A	B

WEATHERPROOF & EXPLOSIONPROOF RANGES

→ **Weatherproof Quarter-Turn Actuators:**
SQ RANGE



SQ

ON-OFF	INCHING/ POSITIONING	MODULATING
A	B⁽¹⁾	III⁽¹⁾
A+	B+⁽¹⁾	

⁽¹⁾Long operating time (min 25s)

→ **Weatherproof Multi-Turn Actuators:**
Mid 2015



ON-OFF	INCHING/ POSITIONING
A	B

→ **Weatherproof Multi-Turn Actuators:**
ST & ASM RANGES



ST



ASM

ON-OFF	INCHING/ POSITIONING	MODULATING
A	B⁽²⁾	III⁽²⁾
A+	B+⁽²⁾	

⁽¹⁾Low speed motor (max 1 500 rpm)

Duty & Modulating Classification



→ Failsafe Actuators: FQ RANGE



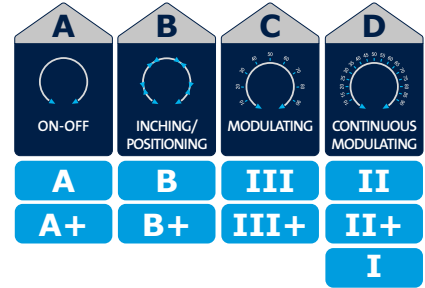
FQ



⁽¹⁾ Low speed motor (max 1 500 rpm)

→ Special Actuator & Customisation

- Special Actuators for severe environments
- Hydraulic Multi-turn Actuators for LNG carriers & Offshore applications
- Customized Design & Projects

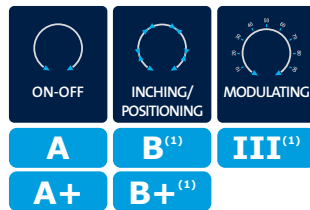


All Classes available on demand

→ Explosionproof Quarter-Turn Actuators: SQX RANGE



SQX



⁽¹⁾ Long operating time (min 25s)

→ Continuous Modulating Actuators: BC MODULATING RANGE

OAP, MA, MB, MAS, MBS, SQXM & STXM MODELS



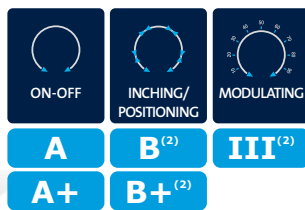
MAS



→ Explosionproof Multi-Turn Actuators: STX RANGE



STX



⁽¹⁾ Low speed motor (max 1 500 rpm)

FOCUS ON



Intelli+® Intelligent control

User-friendliness and advanced functions such as ESD, Partial Stroking, Timer ...



FOCUS ON

BC Technologies & Services

BERNARD CONTROLS technologies are the result of years of return on experience and customer feedbacks. These have led to actuators with heavy-duty mechanical design and increased security through performing electronics.

> Gear transmission system

High transmission efficiency & self-locking capacity

Electric actuators generally use a worm drive because of its advantages of high drive ratio and self-locking. The mechanical design of BC actuators combines worm drive and high transmission efficiency planetary, in order to reduce the motor's power consumption, optimize handwheel transmission and to be self-locking at all speed.



> Travel limitation systems

User-friendly & reliable travel limitation system

Bernard Controls proposes a patented cam block system, which offers the following advantages:

- > Fast & easy setting
- > Vibration proof
- > Precise indication



> Torque limiters

User-friendly & reliable torque limitation system

Bernard Controls design of torque limiters is using proven technology offering:

- > Full reliability
- > Ease of adjustment
- > High precision & repeatability



> Manual override

Easy maintenance with BC manual override technology

Depending on the markets and types of facilities, the features of emergency manual control - key functions of the actuator - can be very different. However, several features have a prime significance: it must be possible to operate the handwheel at any time & the number of turns on the handwheel must not be too high.

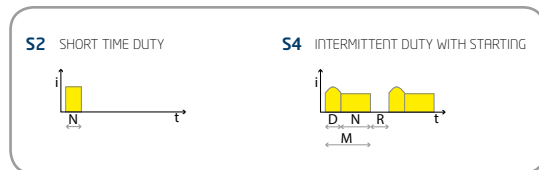
> S4 Motor Duty cycle

The only representative duty cycle for electric actuator operation

The IEC 34 standard defines the electric motors' standard duty cycles. S2 duty rating is short time duty: motors adapt to constant load. Temperature rises fast during the operation and quickly reaches its limit. Motor needs long stop for total cooling between each start.

S4 duty cycle is intermittent duty with starting. Motors start with a large output torque. Temperature slowly decreases once operating torque has been reached. Therefore, the motor can be restarted shortly after shutdown.

BC has chosen the S4 duty rating because it is the most representative duty cycle for actuators operations.



IEC 34 S2 & S4 Motor Duty Cycles

> INTELLI+® control



INTELLI+® is an intuitive and intelligent integrated control which offers key benefits to end users:

- **Non-intrusive settings**
- **Intuitive interface** with local LCD display and easy-to-use menu
- **Accurate information** with absolute sensors, which constantly measure the position and torque of the valve
- **Increased security** with constant self-monitoring, ESD, Partial Stroke Test (PST), Alarms indication, signaling continuity...
- **Preventive maintenance:** INTELLI+® continuously monitors its components as well as the actuator status and measures some important valve parameters. It provides users with a great deal of information to help with system diagnosis, aid in scheduling their valves preventative maintenance and maximize process availability by reducing maintenance downtime. INTELLI+® permanently monitors the required torque necessary to operate the valve, memorizing these torque values generated during the last open and close operations.
- **Infra-red/Bluetooth communication** with PC and tablet via INTELLISOFT software to collect data, implement settings/configuration...

> Open fieldbus systems

Easy site management

BC chooses the «open» fieldbus system for all its fieldbus solutions.

Our actuators can be connected to most of the standard fieldbus available on the market: PROFIBUS DP, FOUNDATION FIELDBUS, MODBUS RTU, HART and other fieldbus on demand.

For more security, redundant fieldbus ensures continuous operation, even in case of a bus line disruption.

> ESD

Increased security on site

ESD (Emergency Shut Down) is a remote emergency control signal with priority over all other commands in order to protect the pipeline and equipment from damage. Depending upon the valve operation, **ESD can be configured as an Open, Close or Stop command.**

> SIL Design



More than safety commands, SIL certified signaling functions

The SIL - Safety Integrity Level - is a measure of the level of security provided by a technical measurement of a risk control system (cf. IEC 61508 & 61511 standards). BC offers weatherproof & explosionproof quarter-turn and multi-turn actuators specially designed (fully dedicated control board and absolute position encoder with built-in self-test) and SIL certified according to the latest & more demanding revision of the standard (Ed 2).

> Recognised expertise

Our company has been **approved by major end users and engineering companies:**

- ADNOC, ALSTOM POWER, AREVA, BLUE CIRCLE, ENEL, EDF, ESKOM, GAZ DE FRANCE, KNPC, KOC, LAFARGE, NIOC, PETROBRAS, QATAR PETROLEUM, SAUDI ARAMCO, SHELL, SOFRESID, TRACTEBEL, TECHNIP, TOTAL (...)

Our products and organization have been **certified by major international bodies and according to main standards:**

- ISO 9001, ISO 14001, OHSAS 18001
- ATEX, NEMA, IEEE, RCC-E, SIL (...)
- ABS, CSA, BUREAU VERITAS, GERMANISCHER LLOYDS, GOST, INERIS, TÜV (...)

> Strong Customer Support

From the design stage to installation, commissioning,



maintenance and training, BERNARD CONTROLS teams are truly dedicated to your satisfaction and commits to delivering **strong customer support everywhere around the globe.**



> General specifications

		EZ	SQ
VALVE	Type of valves (max. torque) Butterfly, ball valves Sluice, knife, gate valves	10 000 Nm -	40 000 Nm -
	Location Indoors Outdoors Risk of submersion (5 metres, 72 hours) In an explosive atmosphere	IP67 IP67 - -	IP67 IP67 IP68 -
ENVIRONMENT	Operating temperature Standard High temperature version Low temperature version Humidity	-20...+60° C - - Heater	-20...+70° C 0...+90° C -40...+50° C Heater
	Enclosure corrosion protection Indoor Outdoors highly corrosive industrial Very highly corrosive industrial or off-shore	● - -	● ● ●
	Conditions of vibration 10-500 Hz	<1g	<1g
	Duty & Modulating Classification Comply with EN15714-2 Class A: On-Off Comply with EN15714-2 Class B: Inching/Positioning Comply with EN15714-2 Class C: Modulating Comply with EN15714-2 Class D: Continuous Modulating	A B - -	A/A+ B/B+ III -
MOTOR & TECHNOLOGY	Motor technology Insulation class	F	F
	Operating motor duty cycle BC Classes A & A+ complying with EN15714-2 Class A BC Classes B & B+ complying with EN15714-2 Class B BC Classes III & III+ complying with EN15714-2 Class C BC Classes II, II+ & I complying with EN15714-2 Class D	S4-25% S4-25% - -	S4-30% S4-30% S4-50% -
	Actuator technology/material Self-locking drive gears Housing Manual override with priority to electric drive Declutch-free manual override Adjustable mechanical end stops (90°+/-2°)	● Alloy ● ● ^(B) ●	● Alloy/Aluminium ● ● ^(B) ●
	Power supply 3PH 400VAC-50Hz / 460VAC-60Hz 1PH 230VAC-50Hz / 115 VAC-60Hz 24VDC Other supply voltage	● ● ● -	● ● ● On request
	Valve-actuator standard interface Standard cable entries (other on request)	ISO 5211 2 x ISO M20	ISO 5211 2 x ISO M20
CONTROLS	Type of controls Electromechanical SWITCH Integrated controls Intelligent controls	● LOGIC -	● INTEGRAL+/POSIGAM+ INTELLI+®
	Fieldbus communication / Integrated controls INTEGRAL+ (Profibus DP)	-	●
	Fieldbus communication / Intelligent controls INTELLI+® (Modbus, Profibus DPV1, Fieldbus Foundation, Hart...)	-	●

SQX	ST/ASM	STX	Continuous Modulating	FQ
40 000 Nm -	500 000 Nm 20 000 Nm	800 000 Nm 20 000 Nm	30 000 Nm 2 000 Nm	500 Nm -
IP68 IP68 IP68 ATEX, NEMA...	IP68 ⁽¹⁾ IP68 ⁽¹⁾ IP68 ⁽¹⁾ -	IP68 IP68 IP68 ATEX, NEMA...	IP67 IP67 IP68 ATEX, NEMA...	IP67 IP67 IP68 ATEX, NEMA...
-20...+70° C - -60...+70° C Self Heating	-20...+70° C 0...+90° C -40...+50° C Heater	-20...+70° C - -60...+70° C Self Heating	-20...+70° C - -40...+50° C ⁽⁴⁾ Heater ⁽⁵⁾	-20...+70° C 0...+90° C -40...+50° C Heater
• • •	• • •	• • •	• • •	• • •
<1g	<1g	<1g	<1g	<1g
A/A+ B/B+ III -	A/A+ B/B+ III -	A/A+ B/B+ III -	- - - II	A B III -
F	F	F	F	F
S4-30% S4-30% S4-50% -	S4-30% S4-30% S4-50% -	S4-30% S4-30% S4-50% -	- - - S4-100%	S4-30% S4-30% S4-50% -
• Alloy/Aluminium • • •	• ⁽²⁾ Alloy/Aluminium • • ⁽³⁾ •	• Alloy/Aluminium • • •	• Alloy/Aluminium • • •	• Alloy/Aluminium • • •
• • • On request	• • • On request On request	• • • On request	• • • On request	• • • On request
ISO 5211	ISO 5210/5211	ISO 5210/5211	ISO 5210/5211	ISO 5211
2 x NPT 1" + 1 x NPT 1"1/2	2 x ISO M20	2 x NPT 1" + 1 x NPT 1"1/2	3 x ISO M20 ⁽⁶⁾	2 x ISO M20
• - INTELLI+®	• INTEGRAL+/POSIGAM+ INTELLI+®	• - INTELLI+®	• - INTELLI+®	• INTEGRAL+/POSIGAM+ -
•	•	•	•	•
•	•	•	•	•

⁽¹⁾ : Except EZ4-EZ15, SQ4-SQ15, ST6 & ASM ⁽²⁾ : Self - heating for SQXM / STXM models

⁽⁴⁾ : - 60 + 70° C for SQXM / STXM models

⁽⁵⁾ : 2 x ISO M20 + 1 x ISO M25 for MA / MAS SWITCH models. And 2 x NPT 1" + 1 x NPT 1"1/2 for SQXM / STXM models

> Control specifications

Legend

- : Not Available

● : adapted or available (standard or optional)

	STANDARD	LOGIC Integrated	INTEGRAL+ POSIGAM+ Integrated	INTELLI+® Intelligent	
MAIN SPECIFICATIONS	Integrated motor reversing starters	-	●	●	
	Padlockable local controls	-	● (2)	●	
	Integrated or separated control box	-	Integrated Only	●	
	Operating mode				
	On-Off: open or close full stroke on average 20-30 times/day	●	●	INTEGRAL+	INTELLI+®
	Modulating Class III: change position 360 times/day	●	-	POSIGAM+	INTELLI+®
	Intensive Modulating Class II: every 2 or 3 seconds positioning	-	-	-	INTELLI+®
Timer (extended travel time)	-	-	●	●	
Power supply					
3 phase	●	●	●	●	
1 phase	●	●	●	●	
DC	●	●	●	●	
REMOTE CONTROL	On-off command mode (contacts)				
	Maintained contact	●	●	●	
	Pulse command	-	●	●	
	Analogue signal (4-20 mA or 0-10 V)	-	●	●	●
	ESD - Emergency shutdown command	-	-	●	●
Command by fieldbus	-	-	●	●	
SIGNALS	Open / close contacts	●	●	●	
	Proportional feedback signal (4-20 mA i.e)	Potentiometer or transmitter TAM	●	●	●
	Information relay	-	●	●	●
	Fault monitoring relay	-	●	●	●
	Signalling via fieldbus	-	-	●	●
PROTECTION	Fuses	-	●	●	
	Automatic phase detection (3 phases)	-	●	●	
	Motor thermal protection	●	●	●	●
	Adjustable torque limiter	● (1)	● (3)	● (1)	●
FEATURES	Parameter setting	-	Non intrusive display + some intrusive settings	Intrusive with jumpers	Non intrusive display+selectors or PDA+infrared
	Position and torque setting mode	Mechanical	Mechanical	Mechanical	Non intrusive display+selectors or PDA+infrared
	Self-diagnosis	-	●	-	●
	Torque curve	-	-	-	●
	Actuator activity data	-	-	-	●

(1) : Except SQ4-SQ15

(2) : Electrical non Mechanical

(3) : Except EZ4 - EZ15. And non - adjustable torque limiter on higher models.



Specification sheet

Valve and Actuator Technical Data

VALVE DATA

Operating Movement: quarter-turn multi-turn - number of turns to close valve [.....] linear [.....] mm
DN [.....] **Type** [.....] **Pressure class** [.....]
Max. required torque : [.....] Nm **or thrust:** [.....] kN **Safety fact. to be added** [.....] %
Closing: counter clockwise clockwise
Flange: ISO5210 or ISO5211 standard size F [.....] special [.....]
Quarter-turn output shaft: bore + keyway double D inside square special (to be defined)
 Dimensions: [.....] [.....] [.....] [.....]
Multi-turn output shaft: A form B1 form B3 form C form special (to be defined)
 Dimensions: [.....] [.....] [.....] [.....] [.....]
Valve rising stem lift: [.....] mm **Pitch:** [.....] mm **Lead:** single double

ACTUATOR SPECIFICATIONS

> Protection

Installation inside outside **Protection** IP67 IP68
 Corrosive atmosphere Specify [.....] Explosive atmosphere Specify [.....]
 Humidity (anti-condensation heater) Ambient temperature (in °C) [.....] MIN. [.....] MAX.
 Paint Color:

> Operation

On-Off: Class A Class A+
 Inching/positioning: Class B Class B+
 Modulating: Class III Class III+
 Continuous Modulating: Class II Class II+ Class I
 Operating time [.....] seconds

> Motor

Type DC 1 phase 3 phase **Voltage** [.....] VOLTS **Frequency** [.....] Hz
 Incorporated thermal protection Tropicalization Insulation Class F

> Security

Failsafe spring return by loss of power supply
 Manual handwheel Taper square drive shaft instead of handwheel for manual key operation (Multi-turn)

> Control

Switch (reversing starters and control logic in customer cabinet)
 Integrated version with built-in control logic reversing starters and local control
 INTELLI+® version with built-in control logic reversing starters, local control, display
 Proportional control (eg 4-20mA for example)
Command by fieldbus: Profibus DP Profibus DP Red. Foundation Fieldbus Modbus RTU
 HART Other
 ESD - Emergency shutdown command + SIL Certified

> Electric connection

Cable gland x M20 **Number** [.....] **Other to specify** [.....]

> Signaling

	Open	Closed
<input type="checkbox"/> Auxiliary travel limit switches contact	Number [.....]	Number [.....]

 Position feedback signal 4-20 mA + SIL Certified
 Position feedback signal, potentiometer 1000 Ohms
 Fault monitoring relay

VARIOUS

Commissioning support Training

BERNARD CONTROLS GROUP

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