

User manual

INTELLI+ SIL OMM



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1. FOREWORD

This document is intended for technicians who install, commission and maintain BERNARD CONTROLS actuators equipped with SIL level INTELLI+ interface.

By observing procedures detailed in this document, technician must ensure the full compatibility of BERNARD CONTROLS actuator with the operating requirements.

2. PRESENTATION

2.1. BERNARD CONTROLS ACTUATORS

BERNARD CONTROLS actuators are mainly designed to operate industrial valves.

According to the valve, they can provide two types of movements:

- Quarter turn (SQ and SQX ranges)
- Multi-turn (ST, STX and ASM ranges)

They can be used in demanding conditions such as wet areas (SQ, ST, ASM weatherproof actuators) or explosive atmospheres (explosion-proof ST175 and ST220 ATEX actuators, STX, SQX).

Thus, there is a wide range of models covering the different torque levels.

Whatever their application and operating condition, BERNARD CONTROLS actuators introduced in this document have a common electronic control called INTELLI+, managing numerous advanced features.

Some of these functions were specifically developed to meet the requirements of IEC 61508 related to the operating reliability.

2.2. SIL ACTUATORS

BERNARD

2.2.1. CE directives compliance

The actuators comply with the following directives:

- EMC 2004/108/EC: Electromagnetic Compatibility
- LV 2006/95/EC: low voltage electricity
- SIL CEI 61508: Operating Safety
- SIL IEC 61511: Instrumented Safety System
- SIL IEC 61512: Instrumentation and Control of batch manufacturing processes

and to following harmonised standards:

- EN 61000-6-4: Generic standard. Emission standard for industrial environments.
- EN 61000-6-2: Generic standard. Immunity standard for industrial environments.
- EN 60034-1: Rotating electrical machines
- EN 60529: Degrees of protection provided by enclosures (IP code)
- EN 60079-0/1/7/31: Electrical apparatus for potentially explosive atmospheres
- NF EN ISO 5210: Connection of multi-turn valve actuator attachments
- NF EN ISO 5211: Connection of part-turn valve actuator attachments

2.3. INTELLI+

INTELLI+ configurable control allows full actuator control including status reports, fault processing, protections and command processing.

In addition, local controls can be locally disabled (padlock) or remotely (if BUS board is present).

The inverter switches are built into control compartment.

The INTELLI+ control allows non-intrusive configuration and settings. It includes a LCD display and tools for preventive maintenance.



2.4. Safety Integrity Level (SIL)

In 1998, knowledge-sharing resulted in the publication of the series of standards IEC 61508 "Functional Safety of Electrical / Electronic / Programmable Electronic Safety-related Systems." These standards introduce for the first time the concept of Safety Integrity Level (SIL).

The Safety Integrity Level (SIL) is a measure of the level of safety provided by a technical risk management measure in an industrial environment.

SIL is qualified on a specific feature called Safety Instrumented Function (SIF) or on a safety system gathering several instrumented safety functions. This is called "Safety Instrumented System" (SIS). IEC 61511 standard specifically details SIS requirements.

Safety Expressions and Abbreviations

SIL	PFD Probability of Failure on Demand					
PFH	« Probability of dangerous Failure per Hour » : probability of a dangerous random equipment failure per hour					
PFD	« Probability of Failure on Demand »					
SIL	Safety Integrity Level					
HFT	Hardware Fault Tolerance					

Characteristic values

SIL	PFD Probability of Failure on Demand	RRF Risk Reduction Factor	PFH Probability of dangerous Failure per Hour
1	10 ⁻¹ to 10 ⁻²	10 to 100	10 ⁻⁵ to 10 ⁻⁶
2	10 ⁻² to 10 ⁻³	100 to 1,000	10 ⁻⁶ to 10 ⁻⁷
3	10 ⁻³ to 10 ⁻⁴	1,000 to 10,000	10 ⁻⁷ to 10 ⁻⁸
4	10 ⁻⁴ to 10 ⁻⁵	10,000 à 100,000	10 ⁻⁸ to 10 ⁻⁹

RRF=1/PFD



Actuators of the Intelli+ SIL range are SIL2-certified (SIL3 in the case of a 1002 redundancy) for the following safety features:

- FS1: Position indication via relay (open valve, closed valve)
- FS2: Emergency Stayput (Emergency closing, Emergency stop and Opening position according to configuration)
- FS3: 4/20mA current loop proportional position signal

Upon detection of a fault that can alter security features, fault relays indicate the presence of the fault. The list of faults and involved relays can be found in "SIL Functions" section.

The Intelli+ system is B-type with a 0 tolerance of hardware fault. The evaluation of the safety integrity was performed by applying the 1h course from 61508-2 d standard. Complying to the standard, an analysis of failure modes, of their effects and their cause (FMEDA) allowed to calculate reliability data shown in the following table.

Function description	Function	Demand	HFT	SD (FIT)	SU (FIT)	DD (FIT)	DU (FIT)	SFF (%)	PFD *	PFH	SIL Level
Valve status	FS1	strong	0	457.86	2452.89	9496.61	163.50	98.6	-	1,962E-07	2
ESD opening	FS2	weak	0	457.86	6270.18	14392.96	160.61	99.2	4,455E-03	-	2
ESD closing	FS2	weak	0	457.86	6270.18	14392.96	160.61	99.2	4,455E-03	-	2
ESD Stayput	FS2	weak	0	457.86	6270.18	14392.96	160.61	99.2	4,455E-03	-	2
Valve position	FS3	strong	0	87.53	158.55	1121.14	127.58	91.6	-	1,927E-07	2

*PFH is valid for a year. For longer intervals between the maintenance interventions, please refer to periodic audits section.



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2.5. SIL requirements

SIL capability requires safety checks during installation and maintenance of our equipment. We will call SIL requirements, requirements necessary to reach the desired SIL level. They will be listed in a red box with a requirement number. User will imperatively have to follow them during installation or maintenance of the device. Please find below a summary of the requirements mentioned in the user manual.

SIL requirement - EX_SEC_D202_0_14

In three-phase, it is essentiel to respect the direct order of the phases. If this order is not observed, direction of rotation will be reversed and a SIL error will be indicated. In addition, if you disconnect and reconnect a servomotor, it is compulsory to remake a SIL validation (see §4.5.2) to check whether the rotation is in the expected direction, and launch an ESD command to validate wiring.

-L1 on item 1

-L2 on item 2 -L3 on item 3

SIL requirement - EX_SEC_D200_LOG11

Each modification must be followed by a check conducted by an qualified person. In case the procedure fails, the system does not take into account the new setting but retains the previous one.

SIL Requirement - EX_SEC_AMDEC_4

A "SIL Error" is indicated via terminals 21 and 23. When no error is present, the contact between these terminals is closed.

SIL Requirement - EX_SEC_RV_20120110_1 ·

The activity recorder must be kept, so if the board is replaced, the EEPROM must be retrieved from the old main board. If the EEPROM is inoperative, the main board and the contactors must be replaced.

SIL Requirement - EX_SEC_AMDEC_MECA_1 -

Beyond 10,000 cycles, a maintenance operation must be carried out on the wheel/screw.

SIL Requirement - EX_SEC_AMDEC_MECA_2

User has to ensure that motor surface temperature (excluding motor heating) does not exceed specified ambient temperature range. Measures provinding protection from heat sources and special paints must be specified by the user according to the environment and application.



SIL Requirement - EX_SEC_REG_20130726_1 ·

Safety functions "Emergency close" ESD, "Emergency open" ESD and "Stayput" ESD fit in this framework.

Bernard Controls demands a time interval shorter or equal to 2 years between 2 periodical tests of FS2 security function (ESD), to comply with the SIL2 level.

User must comply with the frequency of checks specified for the complete loop of the instrumented safety system in which the actuator will be integrated. Please find in the table below the evolution of PFD according to T1 checking interval:

Function	T1	PFD
ESD (FS2)	1 year	4,455E-03
ESD (FS2)	2 years	8,900E-03
ESD (FS2)	5 years	2.224E-02
ESD (FS2)	10 years	4.447E-02

SIL Requirement - EX_SEC_AMDEC_MECA_3 ·

User is responsible to ensure that valve is sized to handle torque in complete safety.



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2.6. MODELS PRESENTATION

The range of actuators offering a SIL capability is:

- Explosion-proof version
 <u>Multi-turn:</u>
 STX6 to STX140 (built-in electronics)
 - explosion-proof ST175 and ST220 (built-in electronics)
- <u>Quarter turn</u>: SQX18 to SQX80 (built-in electronics)
- <u>Control box</u>: FPx casing with electronics, separate
 - Weatherproof version
- <u>Multi-turn:</u> ST6 to ST70 (electronics in adjacent FPi casing) ST175 and ST220 (built-in electronics) ASM0 to ASM3 (electronics in adjacent FPi casing)
- <u>Quarter turn</u>: SQ20 to SQ80 (electronics in adjacent FPi casing)
- <u>Control box</u>: FPi casing with electronics, separate
 - Actuator + reduction gear

Weatherproof and explosion-proof multi-turn actuators can be coupled to a gearbox.





2.7. Explosion-proof range

2.7.1. STX6 to STX140 (built-in electronics)





F

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2.7.2. ST175 to ST220 ADF (built-in electronics)



2.7.3. SQX18 to SQX80 (built-in electronics)



2.7.4. FPx casing with electronics, separate





2.8. Weatherproof range

2.8.1. ST6 to ST220 (electronics in adjacent FPi casing)





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2.8.2. SQ20 to SQ80 (electronics in adjacent FPi casing)



2.8.3. ASMO to ASM3 (electronics in adjacent FPi casing)



2.8.4. FPi casing with electronics, separate





2.9. Actuators characteristics

2.9.1. Environmental characteristics

• <u>Ambient temperature</u>: the actuators are designed to operate at an ambient temperature between -20 °C to + 40 °C. Temporarily and depending on options, they should be able to operate at -40 °C and +70 °C.

Severity: -20 $^{\circ}$ C and optional - 40 $^{\circ}$ C. Duration: 16h. This duration is due to the high inertia of a servomotor.

Test according to the IEC 68-2-1 - Cold test Dry test according to the IEC 68-2-2 - Heat test

SIL Requirement - EX_SEC_AMDEC_MECA_2

User has to ensure that motor surface temperature (excluding motor heating) does not exceed specified ambient temperature range. Measures provinding protection from heat sources and special paints must be specified by the user according to the environment and application.

Duty cycle:

Operation must be intermittent (S4 intermittent duty). Electric motors fitted to our servomotors have a 30% duty cycle, which means that after each operation (opening and closing), downtime of at least 2 or 3 times of the operating time must be observed. As duty cycle, ambient temperature is relevant to determine the maximum number of starts/hour.

Ambient temperature	Starts/hour
-20°C to +40°C	360
-40°C to +60°C	190
-60°C to +68°C	155

• <u>Sealing</u>: The minimum required tightness level is IP67. Tightness level is not intended for the immersion of the actuators but to improve protection to moisture (see below). A higher level could be chosen, for example 5 m/72 h or 10 m/ 96 h IP68 depending on the type of actuator.

Severity: (see standard) Test according to IEC 60529 - IP code

• <u>Wet heat</u>: as electronics are not compatible with a wet atmosphere, it is required to ensure that the casing provides adequate protection from moisture. Moisture could get in the electronics compartment because of an effect of pump due to temperature variations. Hot/wet cycles are carried out for this test.

Test according to IEC 68-2-3 - Continuous wet heat test



• <u>Vibrations</u>: As an actuator is mounted on a valve or a louver, vibrations can disturb the its correct operation.

Test according to IEC 60068-2-6 - Sinusoidal vibrations 2g $(19.6m/s^2)$ from 10 to 500 Hz

• Electromagnetic compatibility

For SIL safety, only immunity has to be taken in account. Test according to IEC 61000-6-2 - Standard generic / Immunity for industrial environment

• <u>Lightning</u>: See EN 61000-6-2 above which refers to EN 61000-4-5 - Shock waves (caused by lightning).

The intense magnetic field test is not taken into account : only ILS are sensitive to it but without affecting SIL functions.

- <u>Field of application</u> Actuator can operate in:
 - On-Off: A class | S4-30% and S2-15mn
 - Modulating class: Class III | S4-50%
- Power supplies

SIL functions	Single phase 50 Hz or 60 Hz	Three-phase 50 Hz or 60 Hz
ESD STAYPUT	YES (diagram on request)	YES
ESD OPEN	NO	YES
ESD CLOSE	NO	YES
SIGNALING RELAY	YES (diagram on request)	YES
PROPORTIONAL SIGNALING OPTION (4-20mA)	YES (diagram on request)	YES

2.9.2. Devices

- Backlit graphic display with choice of language
- Power take-off with encoder
- Torque limiter with sensor

Switching from one mode to another (manual - electric) is automatic without clutch lever (except ST6/ASM). Electrical control has always priority on manual control.

• One clutch handle for ST6 handwheel



- 2.9.3. Grease
- ST+FPx and ST175/220 ADF range

-	Grease > Shell GADUS S5 V142 00 or Shell TIVELA COMPOUND A : Grease > Total MARSON SY00:	Operating temperature: -40°C to +68°C Operating temperature: -40°C to +68°C
	• STX6 to STX140 range	
-	Oil > CONDAT SY320: Huile > MOTUL GEAR 300:	Operating temperature: -20°C to +68°C Operating temperature: -50°C to +68°C «I ow temperature»
-	Grease > Imperator LIPRO EP2:	Grease used for anti backing-off devices
	<u>ASM/SQ/SQX and STX6 range</u>	
-	Grease > Total N31272: Grease > Condat GR40:	Operating temperature: -20°C to +68°C Operating temperature: -50°C to +68°C "Low temperature" Wheel and worm
-	Grease > Fuchs Wynns V1800:	Grease film to use on primary reduction
		Important
	One grease c	annot be mixed with another.

2.9.4. Separate casing

The use of a separate FPi or FPx box type is possible provided that:

- a maximum distance of 50m is observed
- a control cable shielded with a copper braid and a minimum section of 0,5mm² is used



REFERENCE DOCUMENTATION 2.10.

Model	Drawing numbers	Model	Drawing numbers
ST6	Z2201/00	STX6	Z1654/02
ST14	Z2206/00	STX10	Z1671/02
ST30	Z2211/00	STX20	Z1672/05
ST70	Z2216/00	STX40	Z1673/03
ST175	Z2221/00	STX60	Z1675/08
ST220	Z2226/00	STX100	Z1674/03
ASM0	Z2116/00	STX140	Z1681/00
ASM1	Z2116/00	ST175 Explosion-proof	Z2223/00
ASM2	Z2121/00	ST220 Explosion-proof	Z2228/00
ASM3	Z2121/00	SQX25	Z1684/00
SQ20	Z2153/00	SQX50	Z1654/05
SQ25	Z2154/00	SQX80	Z1682/00
SQ50	Z2156/00	FPX	Z2805/00
SQ80	Z2159/00		
FPi	Z2800/00		

Dimensional drawings: BERNARD CONTROLS

Internal wiring diagram

Model	Drawing numbers
Standard diagram	On request according to the actuator

Test sheet and declaration of conformity:

A test sheet (IMP094 form) is supplied with each SIL device.

- Following information is recorded on this test sheet:
 - Identification of the device
 - Check of the characteristics of the device •
 - SIL parameters configuration •
 - Test of the SIL configuration
 - Declaration of compliance with the IEC 61 508 standard •



2.11. SAFETY

This device meets the safety standards in force. However, only installation, maintenance, and operation carried out by trained and qualified staff can ensure an adequate level of security. Technicians must be certified by BERNARD CONTROLS.

- Important

Before installation and start-up, please read carefully whole document.

3. TRANSPORT AND INSTALLATION

3.1. ON-SITE SAFETY

Before any intervention, you must be familiar with site regulations:

Examples:

- Always work with power removed
- Personal protective equipment (PPE) must be worn on site

3.2. NECESSARY EQUIPMENT



Danger

Sous tension

Avant tout travail

The list of equipments is given in each of the relevant sections. The equipment is recommended but not supplied with the actuator. Before starting an assembly, disassembly or adjustment procedure: make sure that you have all the required equipment.

3.3. STANDARD PACKAGINGS

Packages are identical for transport by road, air or sea (unless otherwise stipulated in the contract). They consist of a box with double thickness cardboard mounted on a pallet and whole strapped. For some countries outside EU or on request, pallets have been treated at high temperature according to the NIMP 15 standard and carry the IPPC stamp.





3.4. STORAGE

3.4.1. Storage conditions

An actuator is composed of electrical elements and mechanical parts lubricated with grease. Despite the tightness of the envelope of the assembly, oxidation and seizure can occur during the actuator commissioning if it was not properly stored.

The actuators must then be stored in their original packaging, in a sheltered area that is clean, dry and protected from successive temperature variations. Avoid storing them on the floor.

Caution

Never lay the actuator on its handwheel, actuator weight could cause damage.

Check that threaded plugs are fitted in cable entry slots. To ensure sealing, check that the cover is correctly mounted and the screws are correctly tightened.

For a storage longer than 1 year, do at least one full manual operation in both directions per year. This operation is used to avoid alteration in consistency of the grease and its drying on parts where its thickness is low.

3.4.2. Storage requirements

Storage	•Sheltered, dry and dust free	
Temperature range	•from + 4° C to + 40° C	
Environment	 Protect from all splashes or shocks 	



3.5. INSTALLATION PROCEDURE SYNOPTIC





3.6. UNPACKING CHECKS

3.6.1. Before unpacking

Check the information of the certificate of compliance against the customer order.

Information						
Customer company name / Factory	Reduction gear Catalogue number or Type					
Order number or contract number	Quantity					
Reference of any waivers granted	Serial number or batch number					
Reduction gear description code	Other Information					

3.6.2. After unpacking

Caution

Never carry an actuator by its handwheel, its own weight could cause it damages.

- Check the general external condition of the device (no signs of impact, twisted parts or damaged paint)
- Ensure that the information marked on the actuator identification plate are those expected.
- Ensure that the following references and characteristics marked on the actuator label mounted on the rear match the order:

Motor	Actuator	
Rated power	Actuator type code	
Rated voltage	Opening torque	
Number of phases	Closing torque	
Service	Output speed (rpm)	
Rated current	Number of turns per operation	
Current frequency	Serial number	



3.6.3. SIL marking

A SIL marking is present under the actuator display



3.6.4. ST/SQ/ASM marking

The identification plate is secured to the actuator casing with two rivets.





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3.6.5. ST175/ST220 explosion-proof versions marking

The identification plate is secured to the actuator casing with two rivets.



In the connection box, a label specifies the type of thread (NPT):





On each cover, there is a safety label. The label is self-adhesive plastic.



In the connection box, a label is attached to the cable entries:



When the connection box cover is separated from the actuator and mounted on a BU base (see NR1207) this case thus formed bears the marking provided on the original cover and a marking on the base. It shows the characteristics of the BU box.

3.6.7. Separate FPx casing marking

The identification plate is on the body of the FPX housing connection box of the in the case of a separate housing. The plate is fixed with two rivets.



An additional plate of the same size is stamped with the following wording:

- Date of manufacture
- Base
- Motor: CL F
- Rated and startup current

<u>Warning</u>: The marking is done according to the manufactured actuator.





3.7. MECHANICAL INSTALLATION

3.7.1. Installation compliance

The actuators meet the quality, safety and reliability requirements .

Because they are integrated in centralised control systems, electric actuators can safely actuate valves from an electrical signal and under specific environmental conditions.

3.7.2. Handwheel

Our actuators are equipped with a handwheel. Le direction of operation is usually indicated on the handwheel with closing in clockwise direction and opening in counter-clockwise direction.

ASM/ST6 actuators are equipped with a handwheel clutch handle.

Others actuators have automatic clutch release.

Without power supply, a actuator can be actuated using the handwheel.

How to switch to manual mode on an ASM/ST6

- 1) Depending on the position of the handle, turn the handle 90 $^{\circ}$ counterclockwise or clockwise to align the mark on the handle with the one on the housing.
- 2) If you can not fully align marks, turn the handwheel a few degrees to release the dogs. Then, re-engage the clutch handle to fully align the two marks.



Return to electric mode on ASM / ST6

On start-up, the motor automatically switches to electrical mode, or manually if preferred: turn the handle 90° to disengage the clutch.



3.7.3. Lifting

The actuators are lifted using slings (see figures below).

The characteristics of these slings must be adapted to actuators weights (allow 50% extra). When an actuator is installed in a valve, it is the weight of the assembly that must be taken into account.

Caution When an actuator is installed on a valve, the slings are to be mounted on the valve and not to the actuator.

Depending on the weight of the valve, make sure that the new center of gravity do not make the whole overturn.





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SQX

STX



ST175-220



3.7.4. Coupling types

It is advisable to check the type of coupling before starting to install the actuator. Visually check the compatibility of the valve head with the outlet of the actuator (square, flat, rising stem, bore ...)

<u>For SQ/SQX range</u>: a **removable bushing** is delivered machined for coupling with three different types of machining according to the configuration desired by the customer. See figures below. It can also be machined on site.



<u>For ASM range</u>: For the ASM0 and ASM1, the the actuator shaft is directly machined with a \emptyset 20 keyed bore. It is possible as an option to put a removable sleeve that can be machined with a \emptyset 20 max keyed bore. For the ASM2 and ASM3, there is a removable sleeve that can be machined with a \emptyset 30mm max keyed bore.

Keyed shaft ASM0 and ASM1

Removable sleeve ASMO and ASM1 (optional) ASM2 and ASM3







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For ST/STX ranges, there are 4 types of outputs:

The **C** form is the standard simplest manufactured shape for actuators for coupling with a valve stem. This is the form represented on all drawings. The drive tube has 2 notches where the 2 tenons of the valve stem come engage. But there are additional coupling types:

Actuator





The B3-B4 form for small diameters of stems slips inside the C shape. It has side tenons that engage in its notches. The inner longitudinal groove is shaped for a stem key. The driving is rotary, and there should not be any axial force.

The B1-B2 form is fixed on the flange of the actuator with his studs that engage in the notches of the C form. The inside is machined by the customer according to the end of its valve stem.L'intérieur est usiné par le client to the la terminaison de la stem de sa valve. The driving is also rotary, and there should not be any axial force.





A form is also fixed on the flange of the actuator with his studs who engage in the notches of the C form. The inside is also machined by customer based on screw pitch of the valve stem. Driving is longitudinal, and for this reason the central part named nut is captive and guided by one bearing on each side. Greasing has to be convieniently done by end user in order to ensure adequate lubrication between form A nut and valve stem.



3.7.5. Valve installation

The actuator is fixed on the flange of the device to drive. Bernard Controls actuators can operate in any position.

Caution

However, when outside, cable glands must not be directed upwards (waterproofing). If not possible, contact BERNARD CONTROLS company to find a solution. The actuators must not be raised by the handwheel otherwise you could damage the handwheel or internal mechanics.

Parts required:

8.8 class screws, normal tension (x4 ou x8 according to the flange of the actuator)
 For the size of the screws, see the table on the next page

Tools required:

• Wrench fitting the coupling screw

Procedure

- 1) Check that the support flange of the valve is clean and is not damaged.
- 2) Remove the protection from the flange and coupling of the actuator.
- 3) While following the instructions recommended for transport and handling of the actuators, carefully mount the actuator on the flange to get correct coupling to the valve stem.
- 4) Check the two flanges are in contact on whole circumference.
- 5) Insert the screws through the flange of the valve.
- 6) Tighten them to the torque indicated in the following table while controlling deformation of the flanges, following the opposite screws: 1, 2, 3 & 4 for the 4 screws flange, or 1, 2, 3, 4, 5, 6, 7 & 8 for the 8 screws flange .



F10-F14-F16





Coupling screws:

Flange ISO	Screw	Nominal tightening torque	Maximum tightening torque.	L
F10	4 x M10	19 Nm	21 Nm	10 <l<15< th=""></l<15<>
F14	4 x M16	82 Nm	98 Nm	16 <l<24< th=""></l<24<>
F16	4 x M20	172 Nm	206 Nm	20 <l<30< th=""></l<30<>
F25	8 x M16	82 Nm	98 Nm	16 <l<24< th=""></l<24<>
F30	8 x M20	172 Nm	206 Nm	20 <l<30< th=""></l<30<>

L: length of engagement 8.8 class screws or equivalent Screw head: H or CHC

Note

It is strongly recommended to lock the rotation of the screw. (Mechanical brake, threadlocker,...)



3.8. ELECTRICAL CONNECTION - WEATHERPROOF RANGE

For the sealed range, a box (type FPi) is secured to the actuator. Connections are made to the terminal board located in the connection box, and access to the Intelli+ board is obtained by dismantling the selector cover.



Note:

For a separate casing, there are two connection boxes:

- One customer cable inlet box
- One outlet box for cables connecting to the actuator



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3.8.3. Orientation

The standard orientation of the box in our range is:



In line on ST/ASM/SQ (PE facing down)



In an L configuration on (PE to the rear)

Note: The orientation of the elements can be modified. To request this, contact us.

3.8.4. Selector cover




3.8.5. ST/SQ/ASM connection

Parts required :

- 8860403 (Screw-set)

Tools required :

- Crosshead screwdriver 3x50
- 10mm open-ended spanner
- 6mm Allen key

Flat screwdriver

1.5x10, 1x5.5 et 1.2x8

Procedure:

1) Begin by obtaining the appropriate wiring diagram for the installation. To do this, loosen the four captive screws (1) and then remove the cover (2). (Choice of screwdriver or key)



- 2) Check the condition of the O-ring (3). If the seal is damaged during dismantling, it must be replaced to preserve watertightness. (Seal kit)
- 3) Take the Screw-set 8860403 supplied with the device. (It can be found in the connection box after removing the cover)



Contents of the set

First set: Power 4 x Flat washer 4x8x0.8 ZING 4 x Screw C 4x8 Class 4.6 ZING

Second set: Control 36 x Flat washer 3x8x0.8 ZING 36 x screw C 3x8 Class 4.6 ZING



4) Remove the warning plate (4) to make the connections. (If necessary, loosen the two mounting screws (5) using a crosshead screwdriver.)



- Connect the power cables to Items 1-2-3 (for three-phase).
- Connect the earthing cable to the earthing point.
- 7) Using screws, washers, and ring terminals (not supplied)

Connect the instrumentation and control cables to Items 4 to 39 (according to the diagram).



- 8) Reinstall the warning plate (4) (if necessary, retighten the two mounting screws (5) using a crosshead screw)
- 9) Tighten the stuffing boxes to ensure a good seal.
- 10) Reinstall the cover (2) and tighten the four captive screws (1).



3.8.6. ST175/ST220 connection

For ST175-220, we use a connection box and a selector cover secured directly to the actuator. The electronics is built into the actuator. The procedure is exactly the same as the procedure for the weatherproof range:

- Connection to a terminal plate
- Access to the Intelli+ board by removing the selector cover



- 1) Begin by obtaining the appropriate wiring diagram for the installation.
- 2) To do this, loosen the four captive screws (1) and then remove the cover (2). (Use a 6-mm hex key)
- 3) Check the condition of the O-ring (3). If the seal is damaged during dismantling, it must be replaced to preserve watertightness. (Seal kit)
- 4) Repeat steps 3 to 10 of the ST/SQ/ASM connection box procedure

3.8.7. Separate FPi casing

The Intelli+ version can be supplied in a separate weatherproof FPi casing. The maximum distance between the actuator and the FPi casing is 50 m. A control cable shielded with a copper braid and a minimum cross-section of 0.5 mm2 must be used.





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3.9. ELECTRICAL CONNECTION - EXPLOSIONPROOF RANGE

For the explosionproof range, the electronics is built into the actuator. Access to the terminal board is obtained by removing the cover from the connection box, and access to the Intelli+ board is obtained by removing the selector cover.

3.9.1. Presentation



3.9.2. Connection box





3.9.3. Electrical connection

<u>Cable entry slots:</u> Connections are made directly in the connection box, on an explosionproof terminal board. The cable entry slots $(2x1" + 1x1"\frac{1}{2} \text{ as standard})$ allow a watertight connection to be created in the box without opening the main cover. On the cover of the connection box, it is possible to have up to four 3/4" inlets to connect a bus. As standard, the cover is delivered solid, without any cable inlet slot.

As standard, the cable inlet slots are blanked off by non-ADF plastic plugs. A reminder to blank off each cable entry slot is marked thereon. Stuffing boxes, plugs, and adapters can be supplied separately on request. Adapters are ATEX and IECEx certified, and are available with other threads of the following types:

NPT 1"¼,1", ¾", ½" or ¼".

Because the thread on NPT stuffing boxes is IP68, they must be installed with a thread sealant compound such as Loctite 577 (Henkel). For ISO threads, the seal must be provided by an O-ring or thread sealant compound as indicated above. N.B.: On Ex d enclosures, the type of thread used (NPT or ISO) is indicated on the electrical connection box.

Parts required:

- 8860403 (Screw-set)

Tools required:

- Crosshead screwdriver 3x50
- 10mm open-ended spanner

- Flat screwdriver
 - 1.5x10, 1x5.5 et 1.2x8

- 6mm Allen key
 - 1) Begin by obtaining the appropriate wiring diagram for the installation.
 - 2) To do this, loosen the four captive screws (1) and then remove the cover (2). (Use a 6-mm hex key)
 - 3) Check the condition of the O-ring (3). If the seal is damaged during dismantling, it must be replaced to preserve watertightness. (Seal kit)
 - 4) Take the Screw-set 8860403 supplied with the device. (It can be found in the connection box after removing the cover)



Contents of the set

First set: Power 4 x Flat washer 4x8x0.8 ZING 4 x Screw C 4x8 Class 4.6 ZING

Second set: Control 36 x Flat washer 3x8x0.8 ZING 36 x screw C 3x8 Class 4.6 ZING



5) Remove the warning plate (4) to make the connections. (If necessary, loosen the two mounting screws (5) using a crosshead screwdriver.)



- 6) Route the various cables via the stuffing boxes. (see appendix)
- 7) Using screws, washers, and ring terminals (not supplied)

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In three-phase, it is essential to observe the direct order of the phases. During motor startup, if the direction of the phases is not observed, the actuator direction of rotation will be reversed, and a SIL error will be indicated. In addition, if an actuator is disconnected and reconnected, it is essential to repeat a SIL validation (see §4.5.2) to check whether the direction of rotation has been observed, and launch an ESD command to validate the wiring.

-L1 on Item 1

-L2 on Item 2

-L3 on Item 3

- Connect the power cables to Items 1-2-3 (for three-phase).
- Connect the earthing cable to the earthing point.
- 8) Using screws, washers, and ring terminals (not supplied)

Connect the instrumentation and control cables to Items 4 to 39 (according to the diagram).



- Reinstall the warning plate (4) (if necessary, retighten the two mounting screws (5) using a crosshead screwdriver.
- 10) Tighten the stuffing boxes to ensure a good seal.
- 11) Reinstall the cover (2) and tighten the four captive screws (1).



3.9.4. BU casing

A connection board located in the cover facilitates the connection of fieldbus cables. The cover + board assembly can be mounted on a BU board to guarantee the continuity of the bus during actuator maintenance or replacement phases.





3.9.6. Separate FPX casing

The Intelli+ version can be supplied in a separate explosionproof FPx casing. The actuator must be equipped with position and torque sensors. The maximum distance between the actuator and the FPx casing is 50 m. A control cable shielded with a copper braid and a minimum cross-section of 0.5 mm2 must be used.



3.10. POWERING UP

On leaving the factory, shunts are wired between terminals 5-6, 7-11 and 11-12 to inhibit the ESD controls and allow the device to be adjusted off site (e.g.: plumber). It is therefore essential to remove them in order to wire the actuator according to the diagram supplied with it.

It is essential that the ESD controls be connected and powered before switching on the actuator (see §4.19). Otherwise, the actuator carries out its emergency command.



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4. SIL SETUP AND COMMISSIONING



Adjustment on valve procedure

Each actuator equipped with INTELLI+ is configured and inspected in the factory before shipping. If the actuator is supplied pre-installed on a valve, the open and closed positions and the maximum torque values should have been set by the plumber at the factory.

If an adjustment on valve must be performed or altered, this may be performed with only the electrical power supply connected. All settings and configurations are then performed from the outside, non-intrusively, using the blue and red rotary selectors and the graphical display unit.

The following chapters provide the knowledge required to adjust the actuator on a valve:

- \$4.1 HOW TO NAVIGATE IN THE MENUS
- \$4.2 SELECTING THE DISPLAY LANGUAGE
- \$4.5 HOW TO ADJUST AN ACTUATOR ON THE VALVE
- \$4.6 HOW TO ADJUST AND READ THE TORQUE



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4.1. HOW TO NAVIGATE IN THE MENUS

The selector control used for the electrical control of the actuator is also used to navigate in the menus and access the INTELLI+ functions.

4.1.1. Presentation of selectors

- Blue selector (right)
 Select choice
- Red selector (left)
- Position OK: confirm choice
- Position OFF: quit the menu at any time (except the SIL validation sub-menu)

4.1.2. Going to the main menu

- Set the red selector to local,
- Turn the red selector to local stop and hold; at the same time, turn the blue selector up and then down.

The main menu is displayed :





• Release the red selector; it positions itself in front of "local".

To read the MENU items, turn the blue selector up or down.

4.1.3. Select a menu or section



Once the item has been displayed with the blue selector, turn the red selector downwards. The item is then displayed in capitals on the first line and the sub-menu list is displayed on the second line.



4.1.4. Save modifications

A modification will not be taken into account until approved. Quit the menus by selecting Return until you see the following message: (Change ok?). Each modification must be followed by a check performed by a qualified person according to a pre-established procedure (See §4.5.2)



4.1.5. Quit the menu at any time

You can quit the MENU at any time by setting the red selector to OFF. This action is used to abort adjustments and modifications

4.1.6. Description of the main menu

Language : selects the display language Check: to read all the parameters and the actuator configuration.

Change: Modifies the actuator configuration. If a password has been saved, this password is required for access.

SIL Setup: To adjust the actuator on the valve. If a password has been saved, this password is required for access.

SIL Validation: This menu appears only when the SIL configuration changes, obtained from the SIL Setup menu.

Refer to the organisational chart of the MENU (§4.4) for a presentation of the menus:

Check, Change, SIL Setup and SIL Validation.

4.2. SELECT THE MENU LANGUAGE

Select the language from the MENU and confirm with OK. Select the desired language and confirm with OK.







4.3. PASSWORD

A password is requested for access to the Change or SIL Setup menus. The password is blank by default; confirm with OK to enter the Change or SIL Setup menus. The user can choose to create a password to protect access to modifications. The password for SIL Validation is different (see §5.5.2).

• Enter password

To enter the password at the CODE? prompt: Enter the first digit using the blue selector, and then OK to confirm. Enter the second digit using the blue selector, and then confirm. Enter the third digit using the blue selector, and then confirm.

If the code is correct, access is authorised. Confirm by setting the red selector to the OK position.

• <u>How to create or change the password</u> (does not apply to the SIL Validation password)

Select "Change" from the MENU and confirm with OK. Select Technical data sheet from the CHANGE menu, and then OK. Select Entry code in the Technical data sheet menu, and then OK. Enter the first digit using the blue selector. Confirm with OK. Enter the second digit using the blue selector. Confirm with OK. Enter the third digit using the blue selector. Confirm with OK.

The new code will not be taken into account until you have quit the CHANGE menu and confirmed the request (modif ok?). Be sure to remember this code, for future access to the CHANGE menu.

• <u>In cases where the code cannot be found:</u> (does not apply to the SIL Validation password)

Remove power from the unit and open the control housing for access to the INTELLI+ board (this is the board that holds the display unit). Move the jumper on the electronic board from position A to position B, and then reapply power. This procedure resets the password. Return the jumper to its original position.

If the jumper remains in position B, a new password can be entered, but the password will be reset the next time the unit is switched on.











4.4. ORGANISATIONAL CHART

4.4.1. Organisational chart of the CHECK menu





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4.4.2. Organisational chart of the CHANGE menu





4.4.3. Organisational chart of the SIL SETUP and SIL VALIDATION menu





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4.4.4. Organisational chart of the BUS SUB-MENU

The Bus menu is displayed according to the bus configured or detected. If you have no bus, only No bus is displayed (see §4.17).





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4.5. HOW DO YOU ADJUST AN ACTUATOR ON A VALVE ?

4.5.1. SIL SETUP

The SIL SETUP menu is used to adjust the open and closed positions when the actuator is installed on the valve. Adjustments can be performed manually by selecting the open and closed positions

Select SIL SETUP from the MENU and confirm with OK.

- Select Closing mode from the SIL SETUP menu and confirm with OK. Choose whether to close the valve on Torque or on position and confirm.
- Select Close direction and confirm. Choose the normal closing direction (usually clockwise) and confirm with OK.
- Select ESD Command and confirm. Select the type of remote emergency control. It will take priority over any other Opening, Closing, or Stayput command.
- Select Backup supply and confirm.
 - Choose YES if the emergency power supply is present. This configuration allows it to be monitored and returns an error signal if this power supply is lost.
 - Choose NO if it is not present.

Note

An emergency power supply powers the board in the absence of power so that signaling can be maintained. ESD control will not be possible, but signaling will remain operational (the SIL global error relay will be open). This power supply will be monitored but is not mandatory. A configuration must therefore be performed if the absence of this power supply (in the presence of the main power supply) leads to the changeover of the SIL global error relay.

SIL SETUP Return Closing mode Close direction ESD Command Backup supply Position setting Return





• Select Position setting and confirm. Select Valve closed? to adjust the closure, and confirm with OK.

When (no) is displayed, confirm with OK.



Note

At this stage of adjustment, the selectors that were used to navigate in the menu become re-enabled to control the actuator. The selector must be held until the desired position. There is no self-holding during adjustment.

Take the valve to the closed position using either the handwheel or the electrical control. Use the type of closure previously chosen; in other words, close as far as the force limiter for torque closure, and without triggering the force limited for position closure. When the position is reached, perform a LOCAL STOP to return to the MENU.

When (yes) is displayed, confirm. In case of doubt, select (no) and repeat the procedure. Position adjusted is displayed. Confirm with OK to continue.

The next step is to adjust the open position. When Valve open? is displayed Confirm with OK. When (no) is displayed, confirm with OK.

Take the valve to the open position using either the handwheel or the electrical control. Check that the actuator is not at risk of reaching the mechanical stop. When the position is reached, perform a local stop to return to the menu. When (yes) is displayed, confirm. In case of doubt, select (no) and repeat the procedure. Position adjusted is displayed. Confirm to continue. The adjustment ends with the travel being displayed. Return to control mode after confirming with OK.



The displayt unit shows :

Position adjusted





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4.5.2. SIL VALIDATION

After the adjustment has been performed, you are invited to confirm it. This phase is used to ensure that the parameters configured above comply with requirements. This confirmation of the configuration and the settings comes in the form of a checklist including an open/close cycle.

Each modification must be followed by a check performed by a qualified person. In the event of failure of the procedure, the system ignores the

new configuration and keeps the old one.

To begin the validation steps, enter the following password: **4321 (non-modifiable)** If the password does not match, the message "incorrect code" appears, and the program quits the menu. To abort SIL confirmation at any time, select **abort** using the blue button, and confirm with OK using the red button. For information: the OFF position of the red button cannot be used to abort SIL confirmation. The checklist is as follows:



The actuator closes until reaching the closed position and the display indicates:



SIL confirmation is complete; select yes to confirm, no to abort.



4.6. LOCAL COMMAND

4.6.1. Presentation of local controls

Local control using selectors is available on the actuator. The red selector is used to choose remote control, local control, or lockout (off). The local open and close control selector (blue) is used to operate the actuator in the desired direction. Local stop is performed by briefly rotating the red local/remote selector.



4.6.2. Local control

The local control is self-held by default (one press is enough to perform an Open or Closed command). To disable self-holding (the open or closed control must be held throughout the operation)

Select CHANGE from the MENU and confirm with OK. Select Commands from the CHANGE menu and confirm with OK. Select Local command from the Controls menu and confirm with OK. Choose (Maintained) and confirm with OK.

For local control by increments from 0 to 100% choose (0 - 100%).

In this case, the control takes the value of the current position and is displayed under the position. The selector on the right is then used to change the control value in increments of 1%.

4.6.3. Local stop

As standard, a local actuator stop can be performed, even if the actuator is in remote control mode. To prohibit a local stop when the selector is in remote mode, select Local stop from the Commands menu, and then select (NO).



4.7. REMOTE COMMAND

Remote control of the INTELLI+ actuator can be performed from an external power supply or a built-in power supply. The input circuit is totally isolated by optocouplers. The momentary control (with self-holding) needs four connection wires on the customer terminal block: common, stop, open, and close. If the stop button is not used, do not connect the STOP connection. The open (or closed) contact must be held to actuate the actuator.

Three remote controls are provided:

- An Open control
- A Close control
- A Stop control with configurable direction

The control voltages for the Open, Close, and Stop controls are:

- <u>In external voltage:</u> DC or AC: 10 to 55 V with common at terminal 5 DC or AC: 90 to 250V with common at terminal 4
- <u>By contact:</u> 24-V DC supplied by the actuator

Operation of the open/close controls

- Close/Open/Stop (by opening or closing the stop contact) momentary controls
- Close/Open
 hold-down controls

Choose momentary/hold-down by connecting or not connecting terminal 8.

4.7.1. Auto / On-Off settings

One input for an analogue control is provided as an option:

This input accepts the following signals: 4-20mA, 0-20mA, 0-10V, 4-12mA, 12-20mA. 0-10V This input is used only if you wish to control using an analogue signal. The CI3801 board must be configured in order to use this input instead of the digital inputs for control.

Select CHANGE from the MENU and confirm with OK. Select Commands from the CHANGE menu and confirm with OK. Select Auto/on-off from the Commands menu and confirm with OK.

• AUTO/ON OFF: For an actuator used in modulation with the positioner function, remote commands can be sent via a DC signal (e.g. 4- 20 mA) or via open/close/stop commands. The Auto/On-Off command is used to switch from one type of control to the other.

AUTO/ON-OFF Auto	Î
On/Off	↓



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4.7.2. Contact command

In contact control, a shunt must be placed on customer terminals 5-6.



4.7.3. Voltage command

Remote control can be performed equally well with DC or AC.

- For low voltages from 10 to 55 V, use terminal 5 common.
- For high voltages of 90 to 160 V, or optional 250 V (reinforced insulation STX/SQX), use terminal 4 common.





BERNARD

The actuator can be controlled via a single external contact.

- Contact closed: open valve
- Contact open: close valve

The actuator must be configured with priority to opening.

Reverse control is possible:

- Contact closed: close valve
- Contact open: open valve



The actuator must be configured with priority to closure.

4.7.5. Remote stop

As standard, the stop distance command is given by opening a contact (whereas the open or close command is given by closing a contact). To control the Remote stop like opening or closing, select Remote stop from the Commands menu and then choose CONTACT (C)=STOP.



Note: The open and close commands have priority over stop.



4.7.6. Priority to opening or closing

As standard, there was no priority to opening or closing.

The priorities are used to:

- reverse the running direction during operation without using a stop command. In this case, priority must be given to opening and closing.
- give priority to a direction of rotation: if the actuator receives two simultaneous orders for opening and closing, and priority to opening has been chosen, then the actuator will open.
- apply single-contact commands.

Select CHANGE from the MENU and confirm with OK. Select Commands from the CHANGE menu and confirm with OK. Select Priority from the Commands menu and confirm with OK. Choose (OPEN), (CLOSE) or (OPEN AND CLOSE) and confirm with OK.



4.8. HOW DO YOU READ AND ADJUST THE TORQUE ?

4.8.1. Torque setting

Note

To look without modifying, select CHECK

instead of CHANGE from the main menu.

The actuator is delivered with a torque limiting system adjusted according to the order. If the torque limiter is actuated during operation, check that:

- the valve stem is clean and well greased,
- the valve stem does not seize in the operating nut,
- the valve stuffing box is not too tight.

If an increase in torque is necessary, and following agreement by the valve supplier, proceed as described below.

Select CHANGE from the MENU and then OK. Select Torque from the CHANGE menu, and then OK. Select Torque setting from the Torque menu, and then OK.

Select the desired setting and confirm with OK. Increment or decrement the value using the blue selector. The minimum setting is 40%. The number scrolling speeds up if you hold down the selector.

TORQUE SETTING Return closing %	Î
close tight %	
open breakout %	
opening %	п
return	↓ ↓



Description of torque limitations

All torques are given as a percentage. 100% corresponds to the maximum actuator setting. The corresponding value in Nm is indicated on the actuator identification plate.

- closing %: limits the torque during closing
- close tight %: For a closure on torque, the sealing torque applied to the valve seat can be different from the torque limitation during closing.
- Open breakout %: For a closure on torque, the torque at the time of separation of the seat from the valve can be different (usually higher) from the torque limitation during opening. If the setting is greater than 100%, the display indicates without limitation what amounts to a shunt of the force limiter at the start of opening.
- opening %: limits the torque during opening.



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Note

Following modification of the sealing torque setting (valves closing on torque), the actuator must be readjusted.

<u>Reminder:</u> To save the modifications, quit the menus by selecting Return until you obtain the following message: (change Ok?)

4.8.2. Read the measured torque values and compare them to the original torque values

At each electrical operation, the maximum resisting torques are measured and can be consulted. The torque values of an operation can be stored in the memory so that they can later be compared to the torques from the last electrical operation.

Select MODIFY from the MENU and then OK. Select Torque from the MODIFY menu, and then OK. Select Measured torque values from the Torque menu, and then OK. Select the desired torque and confirm with OK.

The display shows the maximum torque measured during the last electrical operation. (Note: operations during adjustment are not recorded) If the torques from a previous electrical operation were memorised, they can be read on the next line for reference.

<u>Example:</u> In the case shown opposite, the torque recorded during an initial operation was 12% and the torque of the last operation is 18%. These two values can be compared, so that any necessary preventive maintenance arrangements can be made.

Memorise the torque values of an electrical operation

CLOSING %

18

Réf.12

To memorise the torque values of an electrical operation, select Memorise from the menu, and then choose: torque => ref (yes).

The torques marked as ref. then take on the value of the torques from the last electrical operation. In case of error, select torque => ref (no), and the torque reference values will be restored. Memorisation will not take effect until you have quit the CHANGE menu and confirmed (change ok?).







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Display the torque - position curve from the last electrical operation

From the Torque menu, select Torque curve and confirm with OK. Select Open or close movement and then confirm with OK.

The curve is displayed on the graphical screen, with position from 0 to 100% and torque from 0 to 100% (100% is the maximum torque indicated on the actuator).





4.9. SIGNALISATION

4.9.1. Presentation of the display unit

- In intermediate position, the display indicates the valve position in terms of % open.
- Valve closed, the display says "closed"
- Valve open, the display says "open"
- According to the configuration, the display can indicate the instantaneous operating torque as a % of the maximum actuator torque. Under 10%, the display indicates < 10%.



Symbols that can appear on the display:

ĩ	The actuator receives a local control prohibit command (see §4.17)
ESD	The actuator receives an emergency command (see §4.19)
IR ▲ 0%★	An infrared link is detected (see §4.12) This symbol indicates the presence of an alarm. (see §4.15 to read the alarm type) 0% This icon indicates proportional control and the value of the input signal is
в∪ѕ□	shown as a %. The abbreviation BUS indicates the presence of a bus communication board. The abbreviation is followed by a square indicating the communication status. (refer to the specific documents for the bus installed).
1020	1 and 2 indicate the presence of a redundant bus communication board (two communication channels). The number is followed by a square indicating the status of each communication channel (refer to the specific documents for the bus installed).
SIL	SIL symbol, appears when a SIL error or SIL position error occurs.
!	The ! symbol appears when a SIL setting has not been confirmed.
*	Bluetooth symbol, appears when the Bluetooth connection has been established.



4.10. HOW TO CUSTOMISE THE INDICATIONS?

4.10.1. Local Indication

The local display can be configured in the following ways:

• Opposite display

Possibility of reversing the display (1/2-turn rotation). Select MENU > CHANGE and then Signalisation followed by Local indication and then opposite display (yes)

• Torque display

Select this option for a continuous display of the instantaneous torque simultaneously with the position on the actuator display unit.

Select MENU > CHANGE and then Signalisation followed by Loc indication and Torque display (yes)

• Colour of indicator lights

LOC INDICATION Return Opposite display Torque display Lights Return

Torque 60%

As standard, the red indicator light is assigned to "Valve closed" and the green light is for "valve open". The assignment can be changed so that the red light means "Valve open" and the green light means "Valve closed".

Select MENU > CHANGE and then Signalisation followed by Local indication and then Lights: Red=(open)

To keep the open valve and closed valve symbols in the correct position on the indicator, the cover with the viewing panel must also be opened and the indicator plate on the display must be turned over.

4.10.2. Remote signalisation

The intelli+ is equipped with four non-configurable SIL signals (SIL open signalisation relay (R1+R2) valve open, SIL close signalisation relay (R3+R4) valve closed, SIL error relay, SIL position error relay) and two configurable signals (R6 and R7). R6 and R7 are configurable according to a list of available options. To modify them, apply the following procedure.

Select CHANGE from the MENU and then OK. Select Signalisation from the CHANGE menu, and then OK. Select Remote indication from the Signalisation menu, and then OK. Select the relay from the Signalisation menu, and then OK. Select the contact type i.e. the state of the actuated contact, and confirm with OK.





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Select the desired function(s)

Several selections can be made for one relay. For each selection made, the parentheses disappear and a star * appears in front of the selection. To cancel the selection, confirm again with OK.

RELAY 6 Return *valve open (closed valve) (torque limit open)

List		Detail
*valve open		Valve open confirmation
(valve closed)		Valve closed confirmation
(torque limiter on opening)		Action of the torque limiter during opening
(torque limiter on closing)		Action of the torque limiter during closing (indicates a force limiting action including if the valve closes normally on force limiter)
(from x% and y%)	(1)	Intermediate limit switch
(selector on local)		State of selector
(selector on remote)		State of selector
(selector on off)		State of selector
(running)	(2)	The actuator is running
(opening)	(2)	The actuator is actuated during opening
(closing)	(2)	The actuator is actuated during closing
(emergency command)		The actuator has received an emergency command
(power on)		The actuator is powered normally
(thermal overload)		The motor thermal protection was triggered
(jammed valve)		The operation could not be completed because of excess torque
(lost phase)		In three-phase, one phase is missing
(lost signal)		Loss of 4-20 mA signal (if positioner option)
(handwheel action)		The handwheel has been actuated since the last electrical operation
(bus command)	(3)	For the fieldbus option, this relay is assigned to an external control.



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Certain selections have additional choices:

(1) (from x% et y%) After confirming with OK, choose the contact operating zone: Select x% and confirm with OK. Increment or decrement the value using the blue selector. Select y% and confirm with OK. Increment or decrement the value using the blue selector. Confirm with OK. FROM X% AND Y% X% **Y%** Return Χ% (100)(0) **Y**% Return (2) (running) • (opening) (closing) RUNNING Hold signal Confirm with OK and then choose whether the

contact should be steady or flashing. Confirm with OK.

Blinked

(Bus command) (3) •

This function is applicable with the fieldbus communication option only. In this case, a relay can be used to control a device external to the actuator. The commands are sent from the control room via the fieldbus and relayed through the actuator (refer to the bus documentation).



4.11. USE AS POSITIONER BASED ON AN ANALOGUE CONTROL SIGNAL (ACCORDING TO THE DEVICE)

4.11.1. Input signal

According to the device, the actuator can operate as a positioner based on a proportional control (analogue signal, e.g. 4-20 mA). The input signal is automatically calibrated on the 0-100% travel of the actuator; consequently the operating range of the actuator does not require adjustment. The input signal is isolated from the digital commands and the position feedback signal. The actuator can still be controlled digitally with the Open, Close, and Stop commands, or in modulation mode with proportional commands. This choice is no longer made via the auxiliary controls, but CHANGE and then Commands and Auto/On-Off.

In AUTO / ON-OFF the type of control can be selected remotely via: AUTO = proportional (analogue control) or ON-OFF = digital control.

Signal	Input impedance (Ohms)
4-20 mA 0-20 mA 4-12 mA	160
12-20 mA	160
0-10V	11000



Control signal:

4 - 20 mA, 0 - 20 mA, 4 - 12mA ,12 - 20 mA or 0 - 10 V

To choose the direction of signal variation and type: Select CHANGE from the MENU and then OK. Select Positioner from the CHANGE menu, and then OK. Select Signal range from the Positioner menu and confirm with OK.

Choose the Direction of signal variation and then OK. Choose the Signal type and confirm with OK.

In addition, for the 0-10 V signal, two contacts are switched to OFF. These contacts are located on the INTELLI+ board (the one that holds the display unit) located in the control box.



SIGNAL (オ) OPENING (4-20mA) (0-20mA)/(0-10V) (4-12mA) (12-20mA)



4.11.2. Adjusting the dead band

The dead band is the maximum deviation tolerated at rest between the signal and the actuator position. This setting is applied in the factory, but the dead band can be adjusted.

If the dead band is too narrow, the actuator is at risk of hunting, which means opening and closing around the expected position, without succeeding in stabilising. If the dead band is too wide, the positioning is less precise.

The dead band is set to 1% by default.

From the **Positioner** menu, select **dead band** % and confirm with OK. Increment or decrement the value using the blue selector, and confirm with OK.

4.11.3. Fallback position

With a 4-20 mA input signal, a fallback position in case of control signal interruption can be configured.

Note, this function is not available with a 0-20mA signal, because an interrupted signal cannot be distinguished from the value 0 mA.

LOST SIGNAL (closing)	Î
(stayput) (opening)	₽

As standard, the function is enabled and the actuator remains in position in the event of a signal interruption. Open or Close can be selected. From the Positioner menu, select Lost signal and confirm with OK. Select the desired function and confirm with OK.

4.11.4. Proportional pulses

The INTELLI+ has an actuator inertia integration positioning mode. When the operating time is too short or the motor has too much inertia, the positioning can be improved by selecting proportional pulse mode.

At each action, the INTELLI+ computes and corrects the motor stop point to reach the expected position, and then, if necessary, applies proportional pulses to the deviation. This mode is used for relatively stable adjustments, to partially compensate for the actuator inertia. The demand on the actuator is greater than via a classic control.

From the Positioner menu, select Proport pulse and confirm with OK. Select (NO) or (YES) and confirm with OK.



4.12. LOCAL COMMUNICATION BY PC

The actuator is equipped with a two-way link (read and write), for communication with a Pocket PC or laptop. This allows instantaneous loading of preset configurations and acquisition of the torque/position curve for the last electrical operation (For additional details, refer to the software manual).

<u>Pocket PC:</u> Ask us about communication compatibility according to the model. BERNARD CONTROLS can supply a robust, weatherproof or explosionproof Pocket PC for use on site. This Pocket PC is supplied with the software installed.

4.12.1. Communication by infrared

To CHANGE or SIL SETUP you must be in local mode (the local /remote selector set to "local"). To communicate with a laptop computer, use INTELLIKIT, which includes an infrared module and the CDROM with INTELLISOFT software. For easy communication, the infrared module can snap onto the actuator viewing panel. This infrared module will be connected to the USB port of the PC. The cable is 2 m long (extension on request).

The INTELLIPOCKET and INTELLISOFT software packages give on-screen access to all of the INTELLI+ functions. The Pocket PC must be equipped with an infrared port, and INTELLIPOCKET software must be installed on it. If necessary, update versions prior to Version 4.0.

As soon as communication is established, the abbreviation Ir (infrared) appears on the actuator display. The infrared link takes priority over the button control.

4.12.2. Communication by bluetooth (option)

From Version 3.01 of INTELLISOFT / INTELLIPOCKET and only if the Bluetooth option was installed on the INTELLI+ control, wireless communication is possible up to a distance of 10 metres.

Comments:

To connect to a PC, use a Class II Version 2.1 Bluetooth key + EDR (minimum). If your computer has an internal Bluetooth connection, disable this option first.

Connection:

By default, the Bluetooth option on the actuator is enabled. The red selection knob must be set to "remote" or "local" to communicate. Intellisoft or Intellipocket can detect the actuator. During connection, both LEDs under the display flash at the same time, and then the Bluetooth symbol appears on screen. The default Bluetooth password for the connection will be 0000. For secure programming, it is strongly advisable to change this password.

- In "local" mode, you can: Consult, Adjust, Modify, Manoeuvre, and Retrieve the torque curves

- In "remote" mode, you can: Consult, Modify, and Retrieve the torque curves



Bluetooth function configuration menu

Select CHANGE from the MENU and confirm with OK.

Select **Bluetooth** from the **CHANGE** menu and confirm with OK.

The PIN code can be modified. It will be requested at each attempt to connect to the actuator. The On/Off option enables or disables the Bluetooth connection. This option is not memorised if the actuator is restarted. It is enabled "on" by default.

<u>Caution:</u> If the Bluetooth function is installed, infrared communication is disabled.





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4.13. HOW TO INTRODUCE A TIME DELAY DURING OPERATION

The INTELLI+ contains a time delay module, which reduces the operating speed of the actuator, for example to protect a pipe system from pressure fluctuations. When an "open" or "close" command is sent, a time delay applies a cadenced on/off command to the motor. The valve operating time can therefore reach very long times and, moreover, can be adjusted on site.

The settings in the opening and closing directions are independent. It is also possible to apply the time delay to only part of the travel, with the remainder of the travel being travelled at normal speed. The adjustment is applied simply by indicating the total desired time. The INTELLI+ then calculates the on and off times itself.

Select CHANGE from the MENU and confirm with OK. Select Timer from the CHANGE menu and OK. Select operating time. and confirm with OK. Indicate the Operating time at normal actuator speed. Increment or decrement the value using the blue selector.

The number scrolling speeds up if you hold down the selector. Confirm with OK.

Select Timer open time and confirm with OK. Indicate the total time for the valve to open, and confirm with OK.

Select Timer close time and confirm with OK. Indicate the total time for the valve to open, and confirm with OK.

To cancel the time delay function, check that the timer opening and closure time are not greater than the travel time.

For a time delay on only part of the travel, select temporized time and confirm with OK.

To start the opening time delay from a certain position, select OPEN: START % and confirm with OK. Increment or decrement the value using the blue selector until the desired position between 0 and 100% is reached, and confirm with OK. Apply the same procedure for the other values to determine an opening time delay zone and a closing time delay zone.

For a time delay on the entire travel, check the default values

open: start % (0)	close: start % (100)
open: end % (100)	close: end % (0)

TIMER Return Operating time Timer open time Timer close time Temporized zone Return **OPERATING TIME** (0)TIMER OPEN TIME (0)**TEMPORIZED ZONE** Return open : start % open : end % close : start % close : end % Return **OPEN :START%** (0)


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4.14. HOW TO SEE THE ACTUATOR ACTIVITY?

Note To look without modifying, select CHECK instead of CHANGE from the main menu.

4.14.1. Activity

Select CHANGE from the MENU and OK Select Activity from the CHANGE menu and then OK.

• Number of starts or Running time tells you the cumulative total since the actuator left the factory.

ACTIVITY Return Number of starts Running time Start last 12h Handwheel action Return



- Start last 12h: This number is the number of times the actuator has been started up during the last 12 hours, and provides an overview of the actuator's recent activity. It is especially useful in finding out whether too much demand is placed on the actuator, for example if it is performing regulation.
- Handwheel action: indicates whether the handwheel was actuated during the last electrical operation. (Only travel deviations of more than 10% are recorded.)

Select **STROKE COUNT** from the **ACTIVITY** menu, and then OK.

- Relay 1&2 and 3&4 give the number of operations of each relay
- Contactor open (or closed) tells you the number of times the contactor has operated in each direction.
- Number of starts gives the total and partial number of starts.

A partial counter is available, and the user can reset it via the menus: Number of starts and running time. Select Total to find out the total number of starts.

To reset the partial counter: Select Reset partial (appears only in the CHANGE menu), and then choose yes or no.

STROKE COUNT Return Number of starts Relay 1&2 Relay 3&4 Contactor open. Contactor closing





4.15. HOW TO LOOK UP AN ALARM?

The alarms can pinpoint an operating error. They are not permanent. They disappear when the error disappears. A flashing triangle appears on the display to indicate the presence of a NON SIL alarm. A flashing SIL symbol appears on the display to indicate the presence of a SIL alarm.

SIL or NON SIL alarms appear in the sub-menus only if the alarms are present. If no alarm is present, no alarm appears.

To read the alarms: Select CHECK from the MENU and confirm with OK. Select Alarms from the CHECK menu and confirm with OK.

Using the selector on the right, scroll through any alarms that are present.

4.15.1. SIL Alarms :

The SIL alarms are found in the SIL FAILURE sub-menu These alarms can indicate that the operation of the actuator's SIL functions may be compromised.

List of details	Details	Case of appearance	Resolution action
Read config.	SIL configuration read error	Software error	Contact Bernard Controls
Serializer	Hardware error on the board	Hardware failure	Replace the main board
Emergency power supply	No emergency power supply present (appears only if configuration = emergency power supply yes)	The emergency power supply has been set to "present", but is not connected	Connect the emergency power supply, or set to "not present"
Main power supply	No main power supply present	The main power supply is not connected	Check the wiring
ESD command	Inconsistency in the ESD command	The actuator receives only one ESD command	Check the wiring
Position error	The position is below - 10% or above 110%	Actuator overtravel	Readjust
Too many operations	The contactors have performed too many operations	The contactors have reached their maximum number of switching operations	Replace Board CI3801 and the contactors
Excessive signaling	Too many signaling relay operations	The signaling relays have reached their maximum number of switching operations	Replace Board CI3801
Dir. rotation open	Direction of rotation for opening is incorrect	The direct three-phase direction is not observed	Check the direction of the phases
Dir. rotation close	Direction of rotation for closure is incorrect	The direct three-phase direction is not observed	Check the direction of the phases
Handwheel control	The actuator has moved by more than 5% without any electrical command.	A handwheel command was applied to more than 5% of the travel	Operate the actuator electrically



Motor thermal protection	Motor thermal triggering	The motor's thermal protection was triggered following excessive use of the device	Wait for the motor to cool down, and observe service type S4 30%
SIL load	The load due to SIL processing was too heavy	Software error	Contact Bernard Controls
Loss of phase	Not all phases are present	One of the phases is not present	Check the wiring
Watchdog	An unexpected reinitialisation has occurred	Software error	Contact Bernard Controls
Position sensor	An error related to the position sensor has been detected. If it is still present, the details appear	An error related to the position sensor has been detected	Correct the error
Sensor LED	LED failure on the position sensor	An LED is inoperative	Replace the sensor and readjust
Phototransistors	Phototransistor failure on the position sensor	A phototransistor is inoperative	Replace the sensor and readjust
Position continuity	A position sensor code variation error is detected	Hardware failure	Replace the sensor and readjust
Power supply voltage	A board power supply voltage error is present	The actuator power supply is not compliant	Check the power supply voltage
Sensor communication	No sensor communication or incorrect CRC	Communication between the main board and the sensor has been affected or interrupted	Replace the sensor and readjust
Sensor life bit	The sensor life bits no longer move	Communication between the main board and the sensor has been affected or interrupted	Replace the sensor and readjust
Motor lock	The motor no longer moves following a command	A problem is preventing the valve from running	Check that nothing is obstructing the valve
SIL Ana Feedback	The signal measured on the SIL Anaout board is not compliant	The 4/20 mA signal measured does not match the transmitted signal.	Check the board external power supply and the signal.
SIL Activity	A problem reading the SIL (CRC) activities memory	Software error	Contact Bernard Controls
ANAOUTSIL config	The configuration of the position feedback board has changed.	Software error	Contact Bernard Controls



4.15.2. No SIL failure

The NO-SIL alarms are found in the NO SIL FAILURE sub-menu These alarms do not indicate that the operation of the actuator's SIL functions is compromised.

List of details	Details	Case of appearance	Resolution action
Torque sensor	Error related to the torque sensor	The torque sensor is out of range or disconnected	Replace or reconnect the sensor
Config. memory	The user configuration memory has been affected	Software error	Contact Bernard Controls
Activity memory	The activity memory has been affected	Software error	Contact Bernard Controls
Base memory	The manufacturer configuration memory has been affected	Software error	Contact Bernard Controls
Excess starts	The actuator starts up too often	The actuator is in too much demand for its operating class	Reduce the start frequency
Lost signal	Error related to the analogue control signal	The analogue control signal has been lost	Check the connection
Pumping	Error related to positioning	The actuator cannot stabilise	Increase the dead band
24 V auxiliary	The 24 V aux output for the remote controls is absent	The main board or the transformer board is inoperative	Contact Bernard Controls
Valve blocked	A force limiter was triggered during valve operation	The actuator has encountered resistance	Check that the valve is not obstructed



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4.16. HOW TO ACCESS THE TECHNICAL DATA SHEET ?

Note

To look without modifying, select CHECK instead of CHANGE from the main menu.

Select CHANGE from the MENU and confirm with OK. Select DATA SHEET from the CHANGE menu, and confirm with OK.

- Valve tag number: Select Valve tag number to read or write the valve ID. Use the blue selector to change the first character, and confirm with OK. Continue and change each character by the same method. When all characters have been entered, confirm with OK until you are back in the menu.
- Actuator Number: this is the Serial Number of the actuator. This information is input at the factory, and appears in the CHECK menu only.
- Entry code: This is used to create or change the password. See "How to create or change the password" below.
- Characteristics: Parameters allowing the actuator to function properly (see details overleaf).



The following data appear in the **CONSULT** menu only.

- Operating Class: Indicates whether the actuator is intended for On/Off operation, Modulating Class III or Modulating Class II. This selection raises an alarm for an excessive number of starts (excess starts alarm) The starts are counted over the last 12 hours, and the limits are as follows:
 - On/Off: 360 starts / last 12 hours
 - Class III: 1200 starts / last 12 hours

This alarm never prohibits actuator operation.

- Date of manufacture: gives the date of manufacture (factory issue)
- Software version: Revision index of the installed software.



Details from the Characteristics Menu:

CHARACTERISTICS	
Return	
Protection	
Ratio position system	
Ext gear ratio 1/	
Thread mm	
Stroke	— — —
Return	JL

- Thread mm indication of the pitch of a linear system, so that travel can be displayed in mm rather than a number of turns.
- Stroke: indication of the travel measured during adjustment on the valve.

The following data appear in the CHECK menu only.

- **Protection:** weatherproof or explosionproof version. Selecting "explosionproof" prohibits shunting the thermal protection in the Commands/downgraded mode menu.
- Ratio position system: indicates the reduction between the output shaft and the position sensor, so that travel can be displayed as a number of turns (or degrees, for fractions of a turn) (manufacturer data)
- Ext gear ratio 1/: Indication of the reduction of an additional reducing gear. Example for a 1/120 quarter-turn reducing gear stamped 1/120. The travel will then be indicated in degrees.



4.17. USE OF THE FIELDBUS CONTROL (ACCORDING TO THE DEVICE)

The fieldbus interface lets you control and transmit all information via a single line. Dedicated documentation explains how to address each actuator and gives a list of addresses for access to each command or piece of information. The type of bus interface appears in the menu. For additional details concerning fieldbus communication, refer to the specific documents concerned.

- Lost communication: used to configure the fallback position. As standard, the function is enabled and the actuator remains in position in the event of a loss of communication. Open or Close can be selected. Select CHANGE from the MENU and confirm with OK. Select FIELBUS from the CHANGE menu, and then OK. Select Lost communication from the FIELBUS menu and confirm with OK. Select the desired function and confirm with OK.
- **Bus control:** bus control is normally selected. For devices additionally equipped with a classic wired control, this configuration lets you select the type of control: either bus control or wire control
- Slave Number: this allows actuator addressing, since each actuator must have a different address. The default address is 2.



• Partial stroke: For motorised valves subject to little demand, it may be useful to operate them periodically to maintain their operational capabilities. The INTELLI+ has a function used to test actuator functionality on demand. This test consists of performing a partial stroke of the valve (for example, 10% of its travel) and then returning to the start position. The time taken to perform the stroke is monitored, and an alarm is triggered if it overshoots the expected time. The user issues the command via an auxiliary control input of the actuator. The test runs automatically. The partial stroke in progress and partial stroke error signals must be configured on two output relays.

<u>Partial stroke configuration:</u> In the Commands menu, configure "auxiliary control 1 (or 2)" and configure partial stroke

1. Configure one of the auxiliary controls: In the menu, select: CHANGE > Command > Auxiliary control 1 (or 2) > Partial stroke and then choose the type of contact for the control (closed or open contact)

2. Configure the partial stroke parameters: In the menu, select: CHANGE > Command > Partial stroke > Travel time sec. Indicate the operating time in seconds for the entire stroke, for example, valve opening time. Still in Partial stroke, select > Start pos Choose whether the test should start Valve open or valve closed. If the start position is not the expected position, the "partial stroke error" signal is indicated. Finally, select > Stroke%. Indicate the %travel to be performed for the test. (default value 10%)

Aux. command 1 or Aux. command 2 in the Commands menu and confirm with ok. Use the blue selector to choose a control (see details overleaf)



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Details of the Aux. command 1 and 2 menu:

Local/Remote replaces the actuator's local/remote selector and allows either remote control or local control to be authorised remotely. Confirm with OK (red selector)

	Note	
To look without	t modifying, sele NGE from the m	ect CHECK instead of nain menu.

AUX. COMMAND 1 Unallocated local/remote local+remote/remote local command inhibit open inhibit close inhibit auto / on-off Partial stroke

- Local + remote/remote: same definition as above, but possibility of authorising local and remote control at the same time.
- Local command inhibit: "Local control prohibited" is a remote command. This command invalidates open or close commands issued locally and authorises remote commands, even if the local/remote selector of the actuator is set to "local". After confirming, you must choose whether or not to maintain local stayput. As standard, local stop and general stayput remain possible from the actuator. To prohibit local stop and general stop also, select "local stop (no)".



Open/Close inhibit: This command lets you prohibit actuator opening or closing.

For example, a main valve equipped with a bypass valve should open only if the bypass valve is already open.

A bypass valve opening limit switch can therefore prohibit any opening of the main valve until the limit switch is actuated.

CLOSE INHIBIT Yes No	
OPEN INHIBIT Yes No	



4.18. FUSE PROTECTION

The INTELLI+ power supply includes a transformer and fuses.

- Primary: fuse 6.3 x 32mm 0.5A fast 500 V min. (located on the transformer).
- <u>Secondary:</u> Internal circuits, automatic fuse protection (without intervention)

24-V auxiliary power supply available at the terminal block, Automatic fuse protection (without intervention)

4.19. SIL FUNCTIONS (SIL2 certified)

4.19.1. SIL Signalisation

4 SIL signals are provided:

- Valve open signal
- Valve closed signal
- SIL error signal
- SIL position error signal



• Valve open

The "open valve" signal will be sent via the "SIL open" signaling serial relays (R1 and R2). The number of operations of the signaling relays will be monitored, and if it exceeds 100,000, "SIL error" and "SIL position error" will be signalled.

In the event of a power cut, the relays will remain in position.

• Valve closed

The "closed valve" signal will be sent via the "SIL closed" signaling serial relays (R3 and R4). The number of operations of the signaling relays will be monitored, and if it exceeds 100,000, "SIL error" and "SIL position error" will be signalled.

In the event of a power cut, the relays will remain in position



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• SIL error (SIL general RD relay)

SIL Requirement - EX_SEC_AMDEC_4

A "SIL Error" is indicated via terminals 21 and 23. When no error is present, the contact between those terminals is closed.

The contact between terminals 21 and 23 opens in the following cases:

- Loss of main power supply.
- Loss of emergency power supply if configured to "present".
- Position sensor error.
- Inconsistent ESD commands.
- RAM error, micro flash error, or continuity error.
- Safety configuration error.
- Relay or contactor usage limits reached.
- Detection of an actuator movement without command.
- Detection of a hardware irregularity.
- Triggering of the motor thermal protection.
- Loss of phase 3 in three-phase.
- During configuration validation.
- Error in the 4/20 mA analogue feedback, if present.
 - SIL position error (SIL position RD relay)

Note

A "SIL Position Error" is indicated via terminals 24 and 25. When no error is observed, the contact between those terminals is closed.

The contact between terminals 24 and 25 opens in the following cases:





4.19.2. ESD SIL Commands (SIL2 certified)

Two ESD emergency commands are provided for: an ESD command is used in case of voltage loss on one of the two inputs. Both commands must be used, but they can come from a single control. If a different command is detected, an error is signalled and the ESD command is issued.

The ESD command must be maintained. It will be taken into account as long as no voltage is found on both inputs.

The control voltages for ESD emergency commands are:

- In external DC or 10 to 55 V AC voltage, with the common at terminal 5.
- And DC or 90 to 250V* AC voltage, with the common at terminal 4.

No dry contact commands are possible.



* 250 V max as standard

160 V max for STX/SQX (250V is optional)

• close, open, emergency stop (esd): ESD (Emergency Shut Down) is a remote emergency command, which takes priority over any other command. According to the use of the valve, the emergency command will be Open, Close, or Stayput.



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4.20. SIL POSITION FEEDBACK (SIL2 certified)

According to how the actuator is equipped, a position feedback current signal can be used. No adjustment needs to be applied, because the signal is automatically set to the position setting 0 to 100%. The output signal is 4-20 mA (2 wires).

4 mA = valve closed 20 mA = valve open

In case of a poor connection, or if the voltage is not within the 12 to 32 V range, an error is signalled.



Two-wire connection

This position feedback system requires a 12- to 32-V DC, rectified, filtered, or stabilised power supply. The maximum allowable load is specified in the table.

Power supply (volts)	Max. load Allowable* (ohms)
12	150
34	750
30	1050

*Max. resistance in the current loop

Caution

It is essential to connect and power this output.



4.21. OPERATING ERROR

If the device does not appear to be operating correctly, start by setting the local/remote selector to local, and operate the opening and closing controls...

PROBLEM	CAUSE	SOLUTION
The display is off	Actuator power supply	Check the power supply voltage (terminals L1, L2, L3 in three-phase). The voltage is indicated on the identification plate.
	Fuse disconnected	Check the condition of the fuse and replace it if necessary (the fuse is adjacent to the transformer).
No operation	The display is in MENU mode	Set the local/remote selector to off and then to local to switch to control mode (display: % position)
	An infrared connection is set up	If an infrared connection is set up (abbreviation IR in the upper right-hand part of the display), no commands can be issued via the selectors. Remove the infrared link.
	Triggering of motor thermal protection	A black square appears in the lower middle part of the display to indicate the presence of an alarm. Go to menu / consult / alarms to check for presence of a motor thermal alarm. The actuator will be available again after the motor has cooled.
No operation, a key or the abbreviation ESD is displayed	An order prohibiting local control or emergency control is present.	Check in the BUS / Aux. 1 or 2 control menu whether a prohibition is configured to apply this command remotely. Next, check that the connection to the customer terminal block does not correspond to an emergency command.
The actuator operates locally but not remotely	Local/remote selector set to local or off	Set the local/remote selector to the remote position.
	Contact control: no voltage between terminals 6 and 7	Check that there is a shunt on the customer terminal block between terminals 5 and 6. Check for presence of a 24-V Auxiliary alarm.
	<u>Voltage control:</u> inappropriate voltage for the input	Check the connection in voltage control: Voltage from 10 to 55 volts: terminal 5 Voltage from 55 to 250 volts: terminal 4
The actuator operates remotely but not locally	Local/remote selector set to remote or off	Set the local/remote selector to local
	An order prohibiting local control is present (the key symbol is displayed) or the local/remote selection is made remotely	Check in the BUS / Aux. 1 or 2 control menu whether a prohibition is configured to apply this command remotely.



PROBLEM	CAUSE	SOLUTION
The actuator is not running in the correct direction of rotation	Inappropriate configuration	Check in the ADJUST SIL / Direction to close menu: Clockwise or counter clockwise closure.
Cannot go into the menu	Selector on remote or off or presence of a local prohibition	Access to the menu by the selectors is possible in local mode only, i.e. selector set to local and absence of a local control prohibition. Set the selector to local and see above for the checks to perform on Aux. Controls 1 and 2.
The parameters in the menu cannot be modified	A modification in the menu cannot be applied in the Consult menu	Go to the Modify menu. Certain parameters can only be consulted.
The modifications made have not been taken into account	During modification no change is actually applied. The modification must be confirmed to be saved. Apply the CONFIRM SIL procedure. A ! appears on the display.	When the modifications have been made, go back through the menus by selecting Back and then OK until you see: (modif OK?) Confirm with OK to save the changes. Then apply the CONFIRM SIL procedure (§4.5.2).
Handwheel operation has not been detected	Handwheel operation was detected since the last electrical operation and provided that the actuator remains normally powered. The detection does not indicate any displacement of less than 5% travel.	Repeat the detection under the correct conditions.
A handwheel operation error is signalled.	A handwheel operation of more than 5% travel has occurred.	Launch an electrical operation to acknowledge the error.
The excess starts alarm appears	The INTELLI+ monitors the number of starts made in the last 12 hours and compares it to the figure for the actuator operating class	This alarm does not limit actuator operation, but indicates intensive operation of the actuator. If the rate of starts returns to compliance with the intended usage of the device, the alarm will disappear.
The actuator operates at a paced rate during operation	The time delay function has been configured	This function configured in the time delay menu allows the actuator operating time to be increased, at the request of the user
If the "power supply voltage" alarm appears	The power supply voltage is abnormal	Check the actuator power supply voltage.



5. PERIODIC CHECKS (T1)

5.1. CAS D'APPLICATION

The evaluation of the SIL level of an instrumented safety function must be supplemented by periodic tests. These periodic tests allow the average PFD (Probability of Failure on Demand) level (PFD_{avg}) to be maintained throughout the life of the product.

These periodic tests are applicable to on-demand functions (Low demand mode)





5.2. CHECKS TO BE PERFORMED

The following tests should be performed in order to ensure that the ESD control is operating properly.

- ESD opening check (if the ESD is configured for opened)
 - Send a "close" command
 - Order an ESD
 - The valve closes and no error is indicated by the error relay or the screen.

• ESD closing check (if the ESD is configured for closed)

- Send an "open" command
- Order an ESD
- The valve closes and no error is indicated by the error relay or the screen.

• ESD stayput check (if the ESD is configured for stayput)

- Send an "open" or "close" command
- During operation, order an ESD
- The valve stays put and no error is indicated by the error relay or the screen.

In case of non-compliance, repair the device and then repeat the SIL validation.

If SIL validation is not properly carried out in compliance with this document, the safety functions can no longer be SIL2.



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6. MAINTENANCE

Corrective maintenance must be performed by BERNARD CONTROLS personnel or personnel supervised or trained for this task by our company. Spare part kits are available on request. Certain maintenance procedures can be carried out on site (e.g., encoder), but others require work in the factory (e.g., EEPROM and Wheel /Screw).

For the EEPROM and the Wheel/Screw, there are specific requirements related to the SIL:

6.1. EEPROM

SIL Requirement - EX_SEC_RV_20120110_1

The hour meter must be kept, and so if the board is replaced, the EEPROM must be retrieved from the old main board. If the EEPROM is inoperative, the main board and the contactors must be replaced.

6.2. WHEEL/SCREW

SIL Requirement - EX_SEC_AMDEC_MECA_1

Beyond 10,000 cycles, a maintenance operation must be carried out on the wheel/screw

One cycle corresponds to one complete opening and one complete closure. To find out how many cycles have been performed by the actuator, go to MENU > CONSULT > No. of operations > Relays R1 & R2 and then Relays R3 & R4 The number of cycles performed by the device is equal to: ("Relays R1 & R2" + "Relays R3 & R4") / 2.

6.3. ENCODER

For alarms related to the sensor, the position encoder must be replaced with power removed, and the position adjustments must then be repeated.

Alarms concerned:

- SENSOR LED
- PHOTOTRANSISTORS
- POSITION CONTINUITY
- SENSOR COMMUNICATION
- SENSOR LIFE BIT







