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//////////////////// Invest in Confidence ////////////////////////////////////// Invest in Confidence //////////////////////////////////////

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User's Guide  
Electric Actuators



**75 YEARS OF KNOW-HOW AND CONTINUOUS EXPERIENCE.**

**BERNARD CONTROLS OFFERS COMPLETE SOLUTIONS**

**FOR THE AUTOMATION OF INDUSTRIAL VALVES**

**AND EQUIPS THE MOST DEMANDING INDUSTRIES.**

**INVEST IN CONFIDENCE.**

# A unique specialty: electric actuation of industrial valves.



**7**  
subsidiaries  
worldwide

More than **40**  
agents throughout  
the world

**350**  
employees

**BEYOND THE WORD, CONTROLS IS A BUSINESS IN ITS OWN RIGHT. AND BEYOND OUR BUSINESS AS DESIGNERS AND MANUFACTURERS OF ACTUATORS, THIS INVOLVES AN OVERARCHING UNDERSTANDING OF INDUSTRIAL PROCESSES WHICH IMPLY BOTH HUMAN AND FINANCIAL CHALLENGES OF SAFETY AND PRODUCTIVITY.**

**OUR BUSINESS VISION MUST BE GLOBAL, WHICH IS WHY OUR ELECTROMECHANICAL PROFILE HAS DEVELOPED INTO AN EXPERTISE IN THE MANAGEMENT OF EVERMORE COMPLEX SYSTEMS.**

**OUR KNOW-HOW AND EXPERIENCE HAVE ALREADY HELPED US ESTABLISH OUR NAME IN THE INTERNATIONAL MARKETPLACE, WE CAN NOW RELY ON THEM TO LOOK AT THE FUTURE IN FULL CONFIDENCE AND CONFIRM OUR AMBITIONS. THIS IS WHY OUR COMPANY HAS FURTHER ASSERTED ITS COMMITMENT TO CONTROL PROCESSES AS ITS CORE BUSINESS BY CHOOSING A NEW IDENTITY BETTER EQUIPPED TO CONVEY THIS AIM.**



Power Generation



Industries, HVAC & Marine



Water



Oil & Gas

## Expertise and Innovation

Expertise is our business specialty. Our credo follows from the technical requirements of our products' fields of application. Our products are qualified and approved by the largest prime contractors and industrial players in France and abroad. By improving our competencies and the efficiency of our processes, we enhance the quality of our products and services.

## Performance and Security

The nuclear market has shaped our expertise, our commitment to quality and to the control of your processes. By fulfilling these requirements, we undertake to make no compromise on security.

## Controls and Confidence

BERNARD CONTROLS is an international industrial technological company acknowledged for its know-how and expertise in the most demanding markets. The control of processes is our business and the cornerstone of your confidence.



# Specialists always available

## Installation and commissioning

Commissioning electric actuators requires specific and careful expertise. This is specially true when the motorised valve is controlled by a complex system such as a fieldbus. That is the reason why our specialists are available to provide the adequate support to our customers for:

- adaptation on the valve
- installation
- set-up
- start-up

## Maintenance and repair

Everyday, our technicians are available to quickly go on site for:

- periodic actuator functional check-up
- preventative maintenance operations
- diagnosis and repair

## Training

Regular training sessions are organised for our customers and our distribution network. These sessions are held either in France, at our local service centre or at customer site. Actuator technology, setting, operating and maintenance are among the most popular topics covered.

**BERNARD CONTROLS ACTUATORS  
EQUIP THE MOST CHALLENGING  
INDUSTRIES SUCH AS:**

- THERMAL AND NUCLEAR ENERGY
- MARINE & INDUSTRY AUTOMATION
- WATER TREATMENT
- OIL & GAS

**THE ELECTRIC ACTUATOR, INITIALLY DESIGNED  
TO OPERATE VALVES AND DAMPERS, HAS  
NOW ALSO EVOLVED INTO  
A MAINTENANCE AND CONTROL TOOL.**

**THIS USER'S GUIDE WILL SUPPORT YOU TO  
CHOOSE THE RIGHT PRODUCT RANGE MOST  
SUITABLE FOR YOUR NEEDS THANKS TO THE  
FOLLOWING CRITERIA :**

- TYPE OF MOVEMENT FOR THE DEVICE  
TO BE DRIVEN
- TYPE OF ENVIRONMENT
- TYPE OF OPERATION
- SAFETY POSITION
- TYPE OF CONTROL

**FROM INNOVATIVE TECHNOLOGY,  
BERNARD CONTROLS PRODUCTS MEET  
ALL CRITERIA OF QUALITY CERTIFICATION  
AND ARE PRODUCED TO MATCH YOUR  
REQUIREMENTS WITHOUT COMPROMISE ON  
QUALITY AND WITH COMPETITIVE PRICES.**

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# Type of environment

## > Actuator enclosure design changes according to working environment

| Sites of installation  | Actuator enclosure protection  |
|--|--|
|  Inside a building  | Weatherproof to IP 65 or NEMA 4  |
|  Outdoor under a shelter  | Weatherproof to IP 65 or NEMA 4 +   |
|  Outdoor  | Weatherproof to IP 67 or NEMA 6 +  + Epoxy paint + Polyurethane finishing |
|  Risk of temporary submersion (less than 30 min and less than 1 m deep) | Weatherproof to IP 67 or NEMA 6 +   |
|  Risk of temporary submersion (time lapse and depth to be defined)    | Weatherproof to IP 68 or NEMA 6P +                                      |
|  On-shore   | Weatherproof to IP 67 or NEMA 6X +  + marine protection                 |
|  Off-shore  | Weatherproof to IP 67 or NEMA 6X +  + offshore protection               |



Anti-condensation heater 

## > Special environments

| Sites of installation   | Type of protection                            |
|---|---|
|  Hazardous areas   | Explosion proof ATEX or NEMA                  |
|  Nuclear sites   | Actuator qualified according to RCC-E or IEEE |
|  Corrosive environment (chemical products, alumina, etc,...) | Special                                       |

## > Protection for hazardous areas

The European directive 94/9/CE states the conditions to be met for equipment items used under potentially explosive atmosphere. It classifies the installation areas according to groups and categories:


| Ex ed  | or | Ex d   | II B  | T4  |
|--|----|--|---|---|
| Equipment with electric connection in increased safety "e" (tight terminal box). The remaining parts of the electric equipment are in explosion proof "d" enclosure. |    | Protection by explosion proof enclosure. Connection is achieved inside the enclosure. Enclosure is resistant to internal explosion without flame path. | <b>Group I :</b><br>Equipment for underground mining.<br><br><b>Group II :</b><br>Equipment for explosive atmosphere other than mining.<br><br><b>A:</b> butane, propane,...<br><b>B:</b> ethylene,...<br><b>C:</b> hydrogen, acetylene | Maximum surface temperature.<br><br>T1 = 450 °C<br>T2 = 300 °C<br>T3 = 200 °C<br>T4 = 135 °C<br>T5 = 100 °C<br>T6 = 85 °C |
|   |    |   |   |   |
| Explosion proof actuator.<br><b>Ex ed</b>  |    | Explosion proof actuator.<br><b>Ex d</b>   |   |   |

ATEX European Directive

Our explosion proof products have been designed for use in GROUP II, Category 2 G (D) areas. These products shall, among other requirements, undergo a CE type examination corresponding to the sections of the CENELEC standards EN 60079, 61241, 13463 applicable for each product.

**BERNARD CONTROLS can offer different levels of protection such as :**

**Ex ed, Ex d, IIB, IIC, T4, T5, T6.**







| NEMA | Class                              | Group   | Division   | T  |
|------|------------------------------------|---|--|--|
| 7    | I<br>Combustible gases and vapours | Group B: Hydrogen<br>Group C: Ether, Ethylene,...<br>Group D: Butane, Propane,...     | 1<br>Normal conditions                           | Maximum surface temperature.   |
| 9    | II<br>Combustible dusts            | Group E: Metal dust<br>Group F: Coal dust<br>Group G: Flour and other dusts           | 2<br>Abnormal conditions                         | T1 = 842 °F<br>T2 = 572 °F<br>T3 = 392 °F<br>T4 = 275 °F<br>T5 = 212 °F<br>T6 = 185 °F |
|      |                                    |  | Explosion proof actuator <b>NEMA 7 or NEMA 9</b> |  |

North American standards: NEMA ratings



# Type of movement of the device to be driven

➤ The type of device to be driven influences the choice of the actuator.

| Type of device  | Movement          |
|---|-------------------|
|  Butterfly valve                   | Quarter-turn      |
|  Ball and plug valves              | Quarter-turn      |
|  Dampers and louvers              | Quarter-turn      |
|  Globe valves                    | Multi-turn/Linear |
|  Pinch and diaphragm valves      | Multi-turn        |
|  Gate, knife and penstock valves | Multi-turn        |



## ➤ Gear systems

Quarter-turn

Often installed in enclosed spaces, the quarter-turn electric actuator must be as compact as possible.

The actuator shall be selflocking to maintain valves position even when the power supply is switched off.

Moreover, for operation in environments generating strong vibrations, it is essential that the gear modules be well sized for better resistance. Lastly, even if the travel limitation provides for the stopping of the actuator, it shall also be equipped with mechanical stops in order to protect the driven device in the event of manual operation of the handwheel.



**Our choice:**

- Compact
- Self-locking with a worm/ quadrant gear
- Large gear modules
- Adjustable mechanical stops

Linear

The BERNARD CONTROLS range of linear actuators is obtained by adding a special movement conversion system to the multi-turn actuator.

The system works then like a thrust unit. This type of actuator equips globe valves for modulating applications.




Multi-turn

The multi-turn electric actuators can either be mounted directly or with additional reduction gears.

In order to meet the requirements of numerous applications, a wide range of torque and speed values are required. Self-locking shall be secured whatever the operating speed, in order to maintain the valve position after the motor has been stopped.

For user's safety, it is highly recommended that the handwheel does not rotate; priority must also be given to the electric operation.

For high torque values, our SERMATIC system combined with a differential gear on the output shaft enables driving either by a motor or a handwheel without any clutch system, thus providing for considerable enhancement and simplification of the geardrive.







**Our choice:**

- Wide range of speed and torque values
- Easy-to-use
- Self-locking at all speed
- Non-rotating handwheel with priority to electric control
- Dec clutch-free manual override



# Type of operation of the device to be driven

| Type of operation   | Modulating class     |
|---|----------------------|
|  Open or close the full stroke, on average 20 to 30 times/day.   | On-Off               |
|  Select intermediate positions, with good precision (better than 2 %) on average 360 times/day.                  | CLASS III modulating |
|  Select intermediate positions, with high precision (better than 1 %) on a permanent basis every 2 or 3 seconds. | CLASS II modulating  |
|  Fast positioning with an excellent precision (0.5 % or better) and continuous movement.                        | CLASS I modulating   |



## What are the classes of modulating?

A modulating actuator has to be fully adapted to the operating duty of the modulating loop. Two points are important for enhancing the reliability of the actuator:

- The lifetime of equipment is related to the number of operations (motor, mechanism, electronic...) or to the change of positions,
- The motor must stand up to overheating.





**Although the electric motor is important, it is not the only element to take into account when choosing an actuator. Therefore, BERNARD CONTROLS proposes a classification of actuators according to four types of operations named MODULATING CLASSES. It has deeply inspired the classification used in the European electric actuator standard EN 15714-2.**

## > Modulating classes

Durability and accuracy are the most important criteria during valve modulating. Depending on operation frequency and accuracy of positioning, BERNARD CONTROLS has defined four modulating classes.




|   | MODULATING CLASS  |                               |   |  |
|---|---|-------------------------------|---|--|
|   | ON/OFF  | Class III Modulating          | Class II Modulating   | Class I Modulating   |
| Maximum operation frequency recommended to ensure the life time | 20-30 per day   | 360 per day                   | Every 2-3 seconds   | Continuous   |
| Motor duty cycle  | S4 - 30 %   | S4 - 50 %                     | S4 - 100 %  | S4 - 100 %   |
| Maximum motor starts rate at peaks of operation                 | 360 starts/h (AC)<br>60 starts/h (DC)   | 1200 starts/h                 | 1800 starts/h   | No limit   |
| Specific technology   |   | • Motor under limited heating | • High mechanical efficiency<br>• Low inertia motor<br>• Solid state contactors | • High mechanical efficiency<br>• DC Brushless Motor with continuous speed control |
| General characteristics of AC motors                            | • SQUIRREL CAGE type<br>• Insulation CLASS F<br>• Weatherproof enclosure<br>• Built-in thermal protection |                               |   |  |

The choice of an operation type determines the selection of a motor for each function. According to IEC 34 Standard defining the electric motors standard duty cycles, BERNARD CONTROLS has chosen the S4 duty rating, because it is the most representative duty cycle for actuators operations.

| DUTY CYCLES ACCORDING TO IEC 34 STANDARD  |   |   |
|---|---|---|
| S1  | CONTINUOUS DUTY<br>Operation with constant load over a sufficient duration for reaching a thermal equilibrium.  |  |
| S2  | SHORT TIME DUTY<br>Short time operation, total cooling between each start.  |  |
| S3  | INTERMITTENT PERIODIC DUTY<br>The starting current has no significant effect on temperature rise. To be followed by the maximum operating time.   |  |
| S4  | INTERMITTENT DUTY WITH STARTING<br>Repetition of cycles including:<br>• starting period D<br>• period of constant speed Π<br>• rest period R<br>To be followed by the duty factor in %, as well as the number of starts per hour. |  |
| Our choice: S4 - The only representative duty cycle for actuator operation is S4. |   |   |



# Safety position

| Safety requirement  | Type of actuator           |
|---|----------------------------|
|  In case of loss of power supply, the valve can stay put without any danger.                               | Standard                   |
|  In case of loss of control signal, the actuator will move the valve automatically to the safety position. | With integrated positioner |
|  In case of loss of power supply, the valve has to move automatically to the safety position.              | Fail safe                  |

## > Technical solution

### What is Fail Safe?

The activation of an emergency signal triggers the immediate opening or closing of the backup device, without the need of any external power source.

This signal can be activated following:

- an abnormal event (fire, overflow ...)
- an automatic control
- an operator's action
- or the lack of power supply

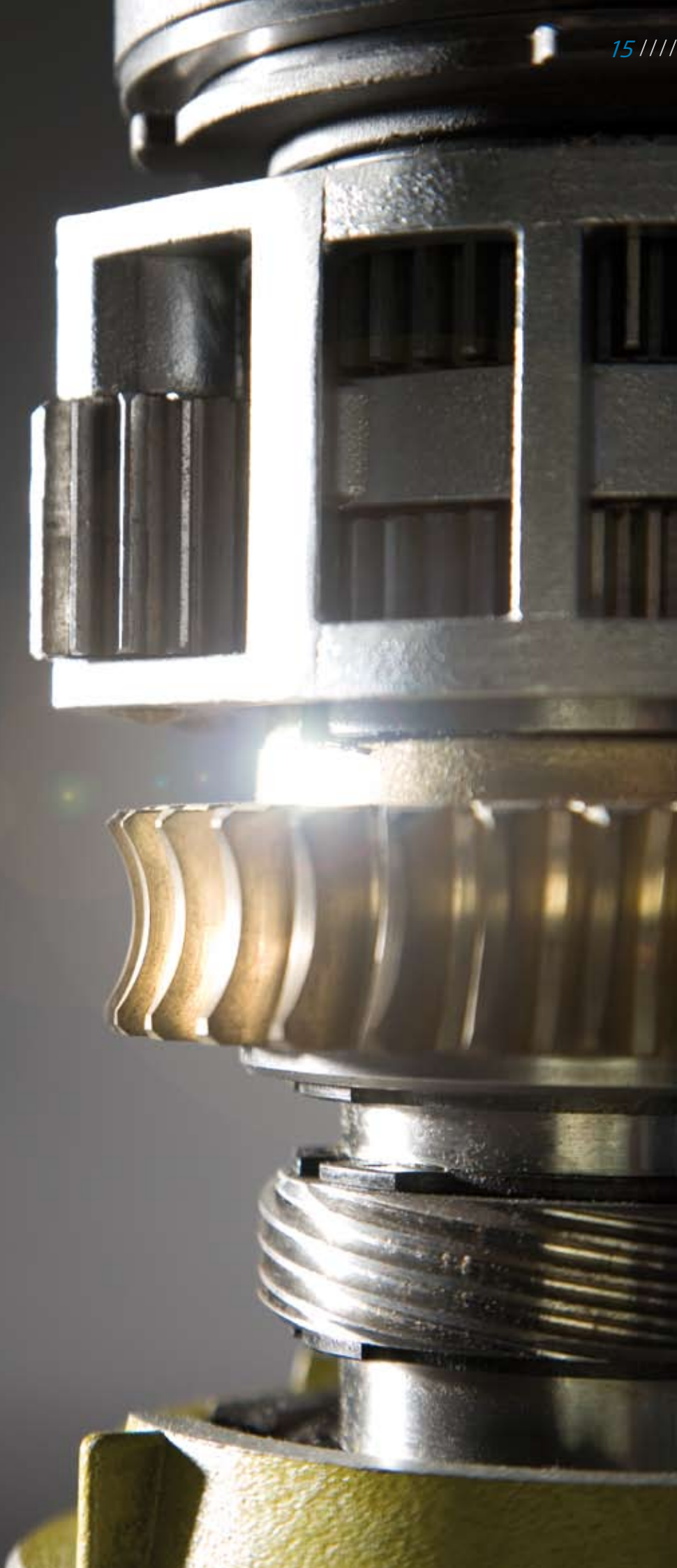
Examples of applications: storage and distribution of gas and dangerous liquids, fire protection systems, protection of chemical facilities, air conditioning and ventilation of hazardous areas.

### Spring return actuator

Under normal conditions, the actuator operates electrically. Its motor simultaneously drives the valve or damper as well as a high resistance spiral spring.

A solenoid which is continuously power supplied releases the device + spring assembly when its power supply is interrupted, for whatever reason.

When power is restored, the actuator automatically returns to its position, according to the commands received.





# Choosing the controls

## 3 levels of performances

For installation, the user can choose between a control box integrated in the actuator, or to design his own control logic. Whatever the actuator range, different types of controls are available. Integrated versions, for on-off or modulating, are fitted with local controls buttons.

The intelligent versions combine the advantages of the traditional integrated controls together with the flexibility of microprocessor and absolute position encoders: user friendly interface, non-intrusive setting...

The communication with fieldbuses is available whatever the range for the type of control chosen.

### Advantages of Integrated Controls

#### SIMPLE

Turn-key solution.

#### RELIABLE

Long experience and large installed base.

#### ECONOMICAL

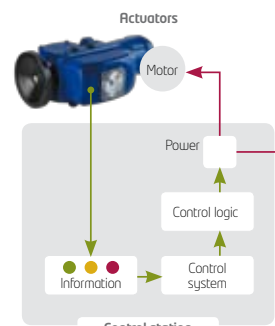
Time and money saver at the design and commissioning stages.

#### INTELLIGENT

Our digital solutions combined with fieldbus allow remote access to all the available information, as well as optimization of valves' preventative maintenance.

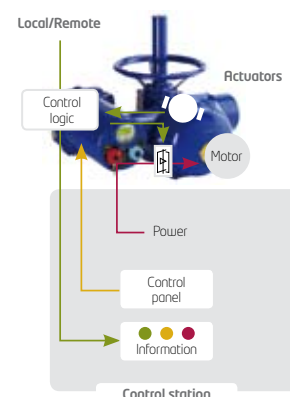
### STANDARD control

The control unit is designed by the customer and located in a remote cabinet. All information sent by the actuator sensors (travel limit, torque limit, thermal overload, position feedback, ...) have to be processed by user's control logic.



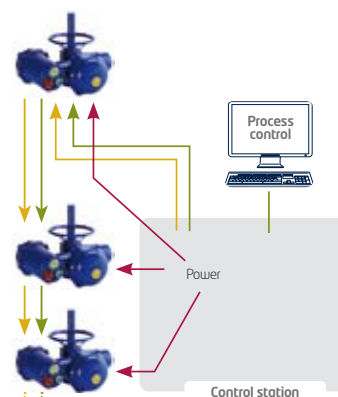
### INTEGRATED control

The control unit and power contactors are an integrated part of the actuators. It executes orders from the supervisor. In addition, it offers local controls that can be disabled locally or remotely. It can also be managed by fieldbus.



### FIELDBUS control

Fieldbus controls allow you to manage a large number of actuators and other equipments, and exchange a lot of information by a simple two wires serial connection. Fieldbus communication also provides solutions for easy and effective preventative maintenance of installations.



## > Comparative

All BERNARD CONTROLS actuators can feature standard or integrated controls, as well as standard (point-to-point) or advanced (fieldbus) communication. The table below shows the various available control configurations, their characteristics, principles and advantages.

|                      |                      | STANDARD  | INTEGRATED  | INTELLIGENT   |
|----------------------|----------------------|---|---|---|
| Operating principles | Position information | Contacts (ON/OFF)<br>Potentiometer (modulating)   | Contacts (ON/OFF)<br>Potentiometer (modulating)   | Absolute sensors  |
|                      | Control logic        | External<br>(achieved by the client)  | Integrated, analog  | Integrated, digital   |
|                      | Power contactors     | External  | Integrated  | Integrated  |
|                      | Actuator protection  | Torque limit switches,<br>motor thermal switch ...<br>managed by the customer<br>control logic. | Integrated and managed<br>(torque limit switches,<br>motor thermal switch,... ).  | Integrated and managed<br>(torque limit switches,<br>motor thermal switch,... )<br>Auto-diagnosis functions.  |
| Type of control      | Hardwired            |   |   |   |
|                      | Fieldbus             | Not applicable  |   |   |
| Advantages           |                      | Adapted for operation under extreme conditions (temperature, vibrations...).                    | <ul style="list-style-type: none"><li>Economical turn-key solution</li><li>Proven reliability</li><li>Time and wiring saving during installation</li><li>Easy commissioning by local controls</li></ul> | <ul style="list-style-type: none"><li>User friendly multi-language interface</li><li>Non intrusive settings</li><li>Absolute sensor for accurate and reliable control</li><li>Numerous data remotely available by fieldbus.</li></ul> |




















# Choosing the range





Regarding to the type of the movement of the device to be driven, the type of environment, the operation type and the required safety mode, BERNARD CONTROLS offers a large choice of actuators to fit your needs.



## WITHOUT FAIL SAFE POSITION

| WITHOUT FAIL<br>SAFE POSITION |                    |   | MOVEMENT                            |   |  |   |   |
|-------------------------------|--------------------|---|-------------------------------------|---|--|---|---|
|                               |                    |   | QUARTER-TURN                        |   | MULTI-TURN   | LINEAR  |   |
|                               |                    |   | Torque<br>< 10 000 N.m.             | Torque<br>> 10 000 N.m.   |  |   |   |
| Environment                   | Weather<br>proof   | Function  | On/off<br>& Class III<br>Modulating | SD Range<br>         | ST Range<br>+ gearbox<br> | ST Range<br>         | ST Range<br>         |
|                               |                    |   | Class II & I<br>modulating          | Modulating Range<br> | Modulating Range<br>      | Modulating Range<br> | Modulating Range<br> |
|                               | Explosion<br>proof | Function  | On/off &<br>class III<br>modulating | SD Range<br>         | ST Range<br>+ gearbox<br> | ST Range<br>         | ST Range<br>         |
|                               |                    |   | Class II<br>modulating              | Modulating Range<br> | Modulating Range<br>      | Modulating Range<br> | Modulating Range<br> |
|                               | Nuclear            | Nuclear Range<br> |                                     |   |  |   |   |
|                               |                    |   |                                     |   |  |   |   |

## WITH FAIL SAFE POSITION

|             |                    | MOVEMENT                |   |
|-------------|--------------------|-------------------------|---|
|             |                    | QUARTER-TURN            |   |
|             |                    | Function                |   |
| Environment | Weather<br>proof   | On/Off                  |  |
|             |                    | Class III<br>modulating |  |
|             | Explosion<br>proof | On/Off                  |  |
|             |                    | Class III<br>modulating |  |

# FOCUS on BERNARD CONTROLS technologies

*BERNARD CONTROLS offers innovative technical solutions for manual control clutches, limit switch system for position and torque; many points to take into account for choosing an actuator.*

## > Manual override

Depending on the markets and types of facilities, the features of emergency manual control, key functions of the actuator, can be very different. However, several features have a prime significance.

### Manual override specifications:

Manual override with electrical priority is required in most of the technical specifications. However, the following two principles must be adhered to:

- it must be possible to operate the handwheel at any time
- the number of turns on the handwheel must not be too high.

### Example 1

On a pressurised steam circuit, the valve closes on torque. When the torque is high, the use of a dog

coupling is not safe enough as the force to be applied to the clutch lever for switching to manual mode is high.

### Example 2

Depending on the technology used, the number of turns on the handwheel can vary from 30 to more than 500 turns, in order to drive a DN500 quarter-turn valve with a torque of approximately 2500 Nm. Thus, the stacking of reduction gears can inhibit the safety function of the manual control.

**In conclusion, there is not one solution for all the applications but different techniques adapted to the real needs.**

## Correct sized handwheel gearing

| QUARTER-TURN  |                 |
|---------------|-----------------|
| Type          | Number of turns |
| OA ≤ 150 Nm   | 9 - 21          |
| AS < 800 Nm   | 8 - 11          |
| AS > 1 000 Nm | 50 - 216        |
| BS            | 14              |
| UX            | 8 - 11          |
| ST+ Gearbox   | 1/*             |

| MULTI-TURN |      |
|------------|------|
| Torque     | Rate |
| < 60 Nm    | 1/1  |
| < 300 Nm   | 1/2  |
| > 300 Nm   | 1/*  |

\* according to torque

## Safety

|   |   |
|---|---|
| QUARTER-TURN                            | <ul style="list-style-type: none"><li>• Rotating handwheel (for low torque)</li><li>• Non rotating handwheel, with electrical priority, for high torque values.</li></ul> |
| MULTI-TURN<br>CLASSES II & I MODULATING | <ul style="list-style-type: none"><li>• Non rotating handwheel, with electrical priority and without declutch*.</li></ul>   |

\*Except for ST6

## > Travel limitation

The use of a patented cam block system brings the following advantages:

- Easy setting without any special tool
- Vibrationproof
- Precise adjustment of cams

The large diameter cam block includes until six cams which can be adjusted separately on the overall travel. By simply pushing the appropriate adjusting slot with a screwdriver, the cam is released and can be freely positioned (300 separated positions).



When the adjusting slot is released, the cam is automatically locked. As no screw tightening is needed, the system is not sensitive to vibration. In INTELLI+ versions, the cam block is replaced by an optical absolute position encoder.



## > Torque limiters

BERNARD CONTROLS design of torque limiters is using proven technology offering:

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

The torque is always measured on non moving parts, thus avoiding risk of wear. In the case of gear systems with planetary gear drives, the torque is measured on the external crown by calibrated helical springs. The torque is no longer applied when the motor is stopped, thus releasing the mechanical parts. If the signal must be maintained, electrical or mechanical memorisation is available as an option.

In the case of differential gears, the torque is higher and will be measured directly on the actuator shaft, on the handwheel end.

On the ST range actuators, the torque limiter is always memorised mechanically and a proportional torque adjustment system which can be adjusted locally or remotely is available, depending on the type of control chosen.



Note: the memorised torque limiter function is always included in all our integrated controls, such as INTEGRAL+, POSIGAM+ and INTELLI+ and remains in all cases a mechanical measure (that is to say not obtained from electrical data).



# Integrated controls

*BERNARD CONTROLS proposes turn-key solutions for actuator controls in order to ease the design of the valve control logic and to provide additional features (see the table of main features next page).*



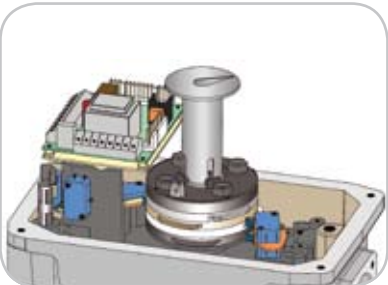
## > MINIGRAL+

This control, fully integrated in the actuator, allows to control single-phase actuators with a power less than 300 W.

- > ON/OFF control: MINIGRAL+
- > Version Class III modulating: MINIGAM+ version

**MINIGRAL+ & MINIGAM+ common functions :**

- Stop on travel or torque limit switches (prohibits restarting)
- Open/Close signal
- Configurable rotation direction (CW/CCW)



## > INTEGRAL+

This control allows to manage the actuator and offers a large choice of functions whatever the type of actuator power.

- > ON / OFF control: INTEGRAL+ version
- > Class III modulating: POSIGAM+ version

**Common functions for INTEGRAL+ & POSIGAM+**

- Stop on travel or torque limit switches (prohibits restarting)
- Signalling: up to 7 configurable relays
- Configurable fault relay
- Automatic phase monitoring
- Configurable direction of rotation



## > INTELLI+

The INTELLI+ control allows easy commissioning thanks to its user friendly interface and the non-intrusive setting. Numerous functions are available to the users helping them in their diagnostics and to schedule their valve maintenance operations. INTELLI+ also guarantees to the users an optimum availability of their industrial facilities.

**Main functions:**

- Multilingual interface built-in graphical display, laptop or Pocket PC.
- Actuator setting without any tool and without opening any cover (non-intrusive design)
- Monitoring of real torque transmitted to the valve by absolute sensor
- Signalling: up to 7 configurable relays
- 2 configurable auxiliary controls (example: ESD)
- Configurable fault monitoring relay
- Automatic phase monitoring (3 phase)
- Increase of the operating time
- Actuator auto-diagnosis, record of actuator activity and display of the alarms

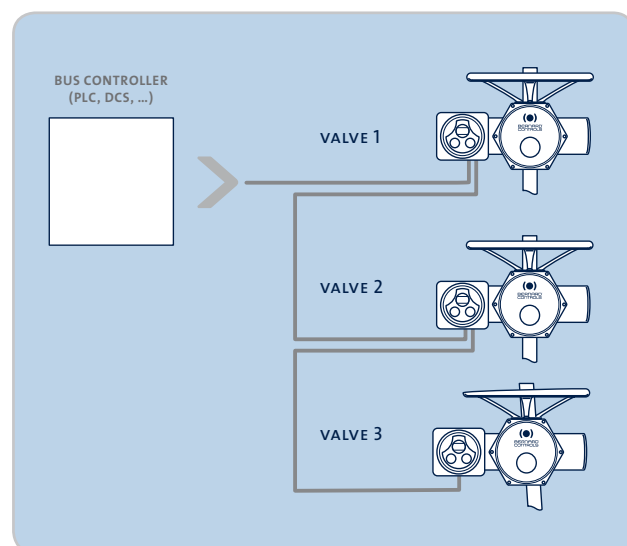


|                            |  | MINIGRAL+                         | INTEGRAL+                         | INTELLI+  |
|----------------------------|--|-----------------------------------|-----------------------------------|---|
| MODULATING                 | On/Off                                       | MINIGRAL+                         | INTEGRAL+                         | INTELLI+  |
|                            | Class III                                    | MINIGAM+                          | POSIGAM+                          | INTELLI+  |
|                            | Class II                                     | Not applicable                    | Not applicable                    | INTELLI+  |
|                            | Class I                                      | Not applicable                    | Not applicable                    | INTELLI+  |
| REMOTE CONTROLS            | Pulse command                                |                                   |                                   |   |
|                            | Maintained signal                            |                                   |                                   |   |
|                            | ESD (emergency command)                      |                                   |                                   |   |
|                            | Auxiliary                                    |                                   | (Local control inhibited)         | 2 controls inhibited<br>9 possibilities   |
|                            | Timer  |                                   | Option                            |   |
|                            | Fieldbus                                     |                                   |                                   |   |
| LOCAL CONTROLS             | Pad-lockable selectors                       |                                   |                                   |   |
|                            | Graphic display                              |                                   |                                   |   |
|                            | Operation indicator                          |                                   | Option                            |   |
| INTERNAL PROTECTIONS       | Fuses  |                                   |                                   |   |
|                            | Automatic phase monitoring                   | Not applicable                    |                                   |   |
|                            | Motor thermal protection                     |                                   |                                   |   |
|                            | Torque limiter                               |                                   |                                   |   |
| SIGNALLING                 | Number of signalling relays                  | 0 (contact at end of operation)   | 4 +3 optional                     | 4 +3 optional   |
|                            | Number of information                        | 2 (optional)                      | 16                                | 23  |
|                            | Number of defaults which can be reported     | 4 (optional)                      | 8                                 | 12  |
|                            | Analogue position feedback                   | Optional<br>Standard for Minigam+ | Optional<br>Standard for Posigam+ | Optional<br>Standard for class III and class II                                       |
| SETTINGS                   | Access to the configuration                  | Intrusive by bridges              | Intrusive by bridges              | Non intrusive<br>By local control buttons<br>By laptop<br>By fieldbus<br>By Pocket PC |
|                            | Setting method for torque and position       | Mechanical                        | Mechanical                        | Digital<br>Non intrusive  |
|                            | Type of end of travel setting                | On position<br>On torque          | On position<br>On torque          | On position, on torque (automatic)  |
|                            | Download of complete setting                 |                                   |                                   | By laptop<br>By fieldbus<br>By Pocket PC  |
| MONITORING AND MAINTENANCE | Auto-diagnosis                               |                                   |                                   |   |
|                            | Memorisation of valve torque/position curves |                                   |                                   |   |
|                            | Actuator activity status                     |                                   |                                   |   |



# Fieldbus

The fieldbus present on a large number of installation is used more and more to communicate information and commands with multiple actuators and contactors wired in series on a single pair of wires. Thus, the number of informations available from each actuator can be multiplied while reducing the overall cost of wiring on the site.



BERNARD CONTROLS actuators can be connected to most of the standard fieldbus available on the market :

- PROFIBUS DP,
- FOUNDATION FIELDBUS,
- MODBUS RTU,
- Other fieldbus on demand.

For more security, redundant fieldbus ensures continuous operation, even in case of a bus line disruption. Indeed, all elements of the bus loop (bus controller, lines, actuators interfaces) are doubled.

## Open versus Proprietary systems :

Two physical concepts of fieldbus are available from various providers.

### > The «Proprietary» so-called system:

This is a technology designed by a device manufacturer for his own needs. A «Proprietary» system always includes the actuators with the specific bus interface, but also the bus controller located at the line head-end. Only the products proposed by the bus controller manufacturer can be installed on the bus.

### > «Open» systems:

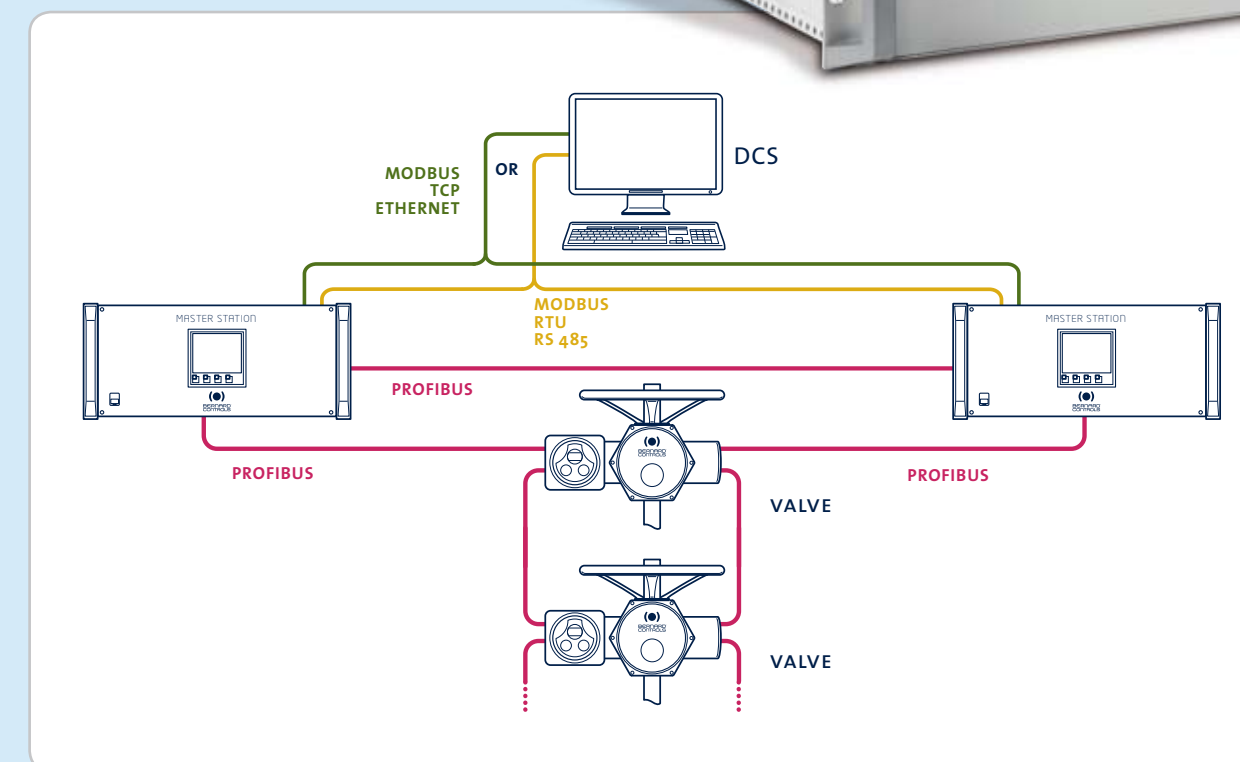
One using standard international fieldbuses so various manufacturers can supply compatible controllers and interfaces. The actuator supplier restricts usually its offer to devices equipped with bus interfaces. The bus controller is usually included in the PLC.

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

# Master Station

The Master Station is a fieldbus communication solution developed by BERNARD CONTROLS. It is a turn-key solution which eases the command and control of large quantities of MOVs through a fieldbus. Overall time of setting up on site is reduced to the minimum.

This system allows not only to set up, command and get information from the actuators easily and rapidly, but it is also a tool for effective and preventative maintenance.



Each Master Station can pilot up to 120 MOVs, at a distance of up to 10km, and within very fast response time.

The Master Station is usually located between the DCS and the actuators. Order coming from the DCS are transferred by the

Master Station to the actuators. Piloting can be done locally as well, thanks to the digital touch screen.

For better availability of the process, the Master Station is conceived to be integrated easily and effectively in a redundant architecture.



# invest in relationship

***BERNARD CONTROLS' EXPANSION OVER THE LAST FEW YEARS HAS ENABLED THE FIRM TO GET POSITIONED IN THE INTERNATIONAL MARKET AS A LEADING PLAYER PAR EXCELLENCE. OUR POSITION IN THE MARKET FIRST AND FOREMOST ALLOWS US TO BE CLOSE TO OUR CUSTOMERS, BY THEIR SIDE, AND THUS BE THE NUMBER ONE IN TERMS OF SERVICE PERFORMANCE.***

***THIS IS A SIMPLE AMBITION, AND IT HAS BEEN OURS EVER SINCE THE FIRM WAS ESTABLISHED. IT IS THIS VERY AMBITION WHICH HAS ALLOWED US TO DEVELOP A RELATION OF TRUST WITHIN OUR TEAMS, WITH OUR CUSTOMERS AS WELL AS WITH OUR PARTNERS. THIS TRUST IS THE CORNERSTONE OF THE REPUTATION WE HAVE BUILT OVER TIME.***

