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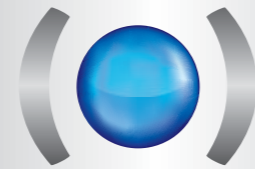
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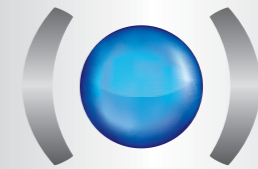
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**INTEGRAL+**  
Integrated control



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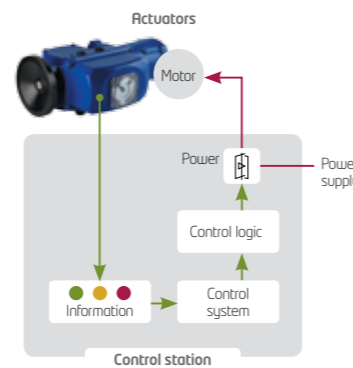


# Why integrating controls into the actuators?

*INTEGRAL+ is a turn-key solution which eases the design and implementation of the actuator control system.*

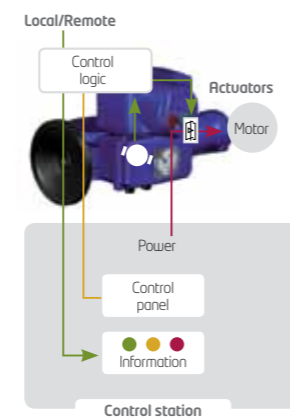
## > Standard version

The control system is external. Design, installation and operation of the control logic are totally managed by the client.



## > Integrated control

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



### Advantages of Integrated Controls

**SIMPLE**

Turn-key solution

**DEPENDABLE**

Long experience & large installed base

**ECONOMICAL**

Time and money saver at the design and commissioning stages





# INTEGRAL+

## Advanced integrated control

*INTEGRAL+ is a an integrated control package which can be fitted to all BERNARD CONTROLS weatherproof actuators.*

### > INTEGRAL+ presentation

INTEGRAL+ controls include:

- > a configurable logic control unit managing the travel limit device, the torque limiter, the motor thermal protection
- > power contactors
- > signalling relays
- > local control selectors
- > configuration panel
- > positioner on option

*Depending on actuator range, the box is designed in shape of "L" (view above) or in shape of "I" (controls on end).*



### > Advanced functions

- Emergency Shut Down (ESD), remote emergency control with priority over all other controls
- Flexible and configurable: remote indication of position, status and alarms can be configured

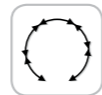


### 2 configurations adapted to different operating conditions

**INTEGRAL+** On-Off  
Carry out complete operations of opening and closing



**POSIGAM+** Class III  
Reach intermediate positions with good precision (better than 2%)



To get more information about the operating types, please refer to the User's Guide (A104).  
For modulating Class II applications, refer to INTELLI+ catalogue (A116).

### > Double-sealing protection

Two barriers fitted with O-rings insure an optimum protection against water ingress into the electronic compartment.

This protection remains effective even if the cover has not been closed properly or if the cable glands have not been tightened.

Protection is also insured for the local control selectors thanks to internal reed switches which prevent moisture ingress.



### INTEGRAL+ advantages

#### AT THE ENGINEERING PHASE

- > Turn-key proven controls solutions designed by a specialist
- > Simplification and standardisation of wiring diagrams
- > Selection of important functions before installation
  - > Reduced wiring and installation costs (external control cabinet is not required)
- > Built-in safety features protect the valve and process

#### ON-SITE

- > Easy commissioning thanks to local controls
- > Commissioning only requires the power supply
- > Installation of additional functions on site at lower costs (fieldbus board, positioner)
  - > Easy to use thanks to local settings and controls
- > Local controls lockable in various positions for increased security

# INTEGRAL+ functions

## > Signalling

In standard, 5 relays are included: one fault relay and 4 indication relays (electrically isolated from each other).

- **Fault relay** (SPDT normally energized)

The fault relay is activated in case of:

- > Power supply failure or blown fuse
- > Loss of a phase (3 phase supply)
- > Thermal motor protection tripped

Additional defaults can be detected (configurable)

- > Torque limiter open / close tripped
- > Selector on "LOCAL" or "OFF" position
- > Loss of 4-20 mA input signal

- **Indication relays** (normally open or normally closed contact configuration)

> 4 available relays can be set as follows:

**Relay 1:** open travel limit switch or open torque limit switch

**Relay 2:** closed travel limit switch or closed torque limit switch

**Relay 3:** open travel limit switch or open torque limit switch or selector on remote or selector on local or actuator opening or actuator operating

**Relay 4:** closed travel limit switch or closed torque limit switch or selector on remote or selector on local or actuator closing direction or active ESD remote command

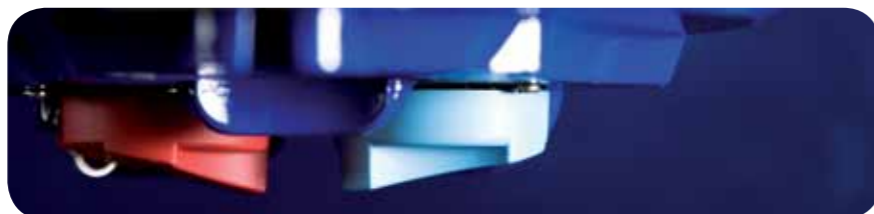
> Additional 3 relay board (option): Open/Closed/Power on

- **Local LED indication (option)**

> 3 LED's for Open/Closed/Power on

- **Position transmitter (on POSIGAM+)**

4-20 mA proportional position feedback signal whatever the control signal is (0-20 mA or 4-20 mA). A fully isolated position transmitter can be added.



## > Protections

- **Torque limiter**

The electronic board memorises the torque limiter tripping and prohibits restarting in the same rotational direction.

- **Phase correction**

Protects against incorrect 3 phase power supply connection. Includes an automatic phase correction.

- **Fuses**

Protection against short circuit.

- **Motor temperature sensor**

If the temperature in the winding is too high, the motor supply is switched off. Restarting is possible only after the motor has cooled down.

## > Remote control

- **Remote control**

> Dry contacts (24 VDC power internally supplied)

> Voltage signal (10-250 VAC/VDC)

> Pulse signal: one pulse for open, close or stop

> Maintained signal: actuator continues to function as long as the signal is maintained and stops when released

- **Proportional (with positioner)**

> By current: 4-20 mA, 0-20 mA, 4-12 mA, 12-20 mA,

> By voltage: 0-10 V

> Remote selection of AUTO / ON-OFF mode

> In case of loss of the 4-20 mA input signal, the actuator can either stay-put or go to closed or open position (configurable)

- **ESD (Emergency Shut Down)**

It is a remote emergency control, with priority over all other controls. According to the valve operation, ESD can be set as an open command or a close command. To increase the availability of the actuator in extreme conditions, ESD can also override the motor thermal sensor.

- **Timing control (optional)**

This optional card will allow extension of the valve travelling time, in order to avoid the pressure surge. One part of the stroke can be performed at a normal operating speed and the other part at a lower speed. Adjustments are independent in both open and close direction.

- **Local control on the actuator**

> By pulse signal: one pulse for open, close or stop

> By maintained signal: actuator continues to function as long as the signal is maintained and stops when released

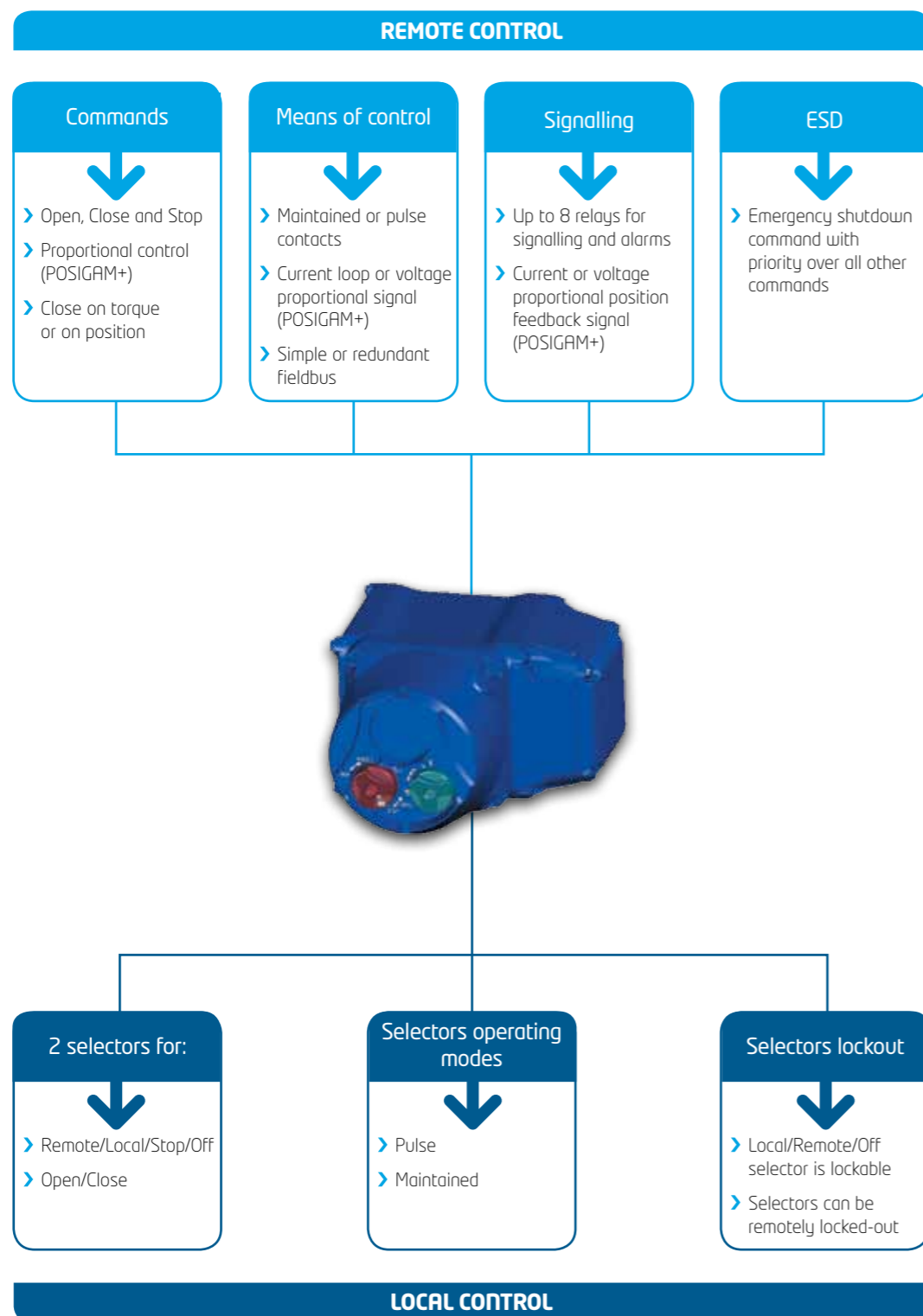
> Local/Remote/Off selector lockable in all 3 positions

- **Local internal control (positioner)**

> For commissioning or test purpose

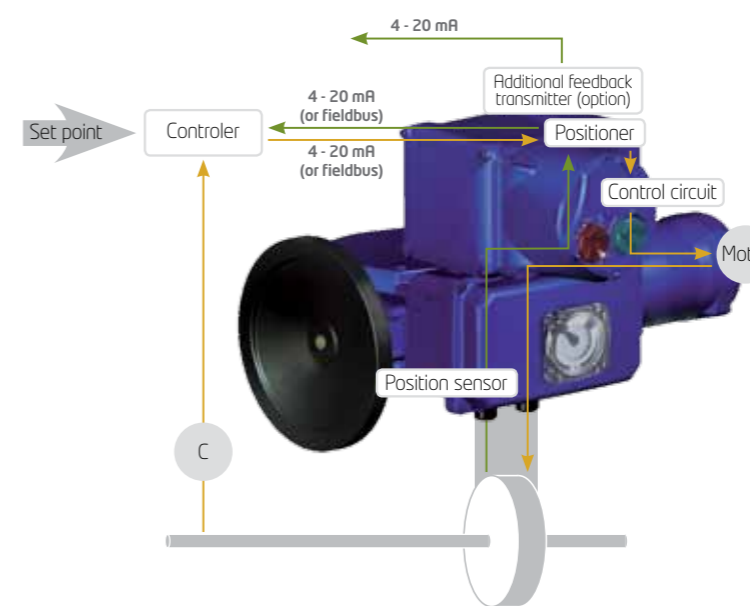
> Automatic calibration according to selected signal

# Remote & local control



# Integrated positioner

The POSIGAM+ control (Class III actuators) includes a positioner function. The control of the actuator and the position feedback use proportional signals which can be either analogue (4-20 mA current loop i.e) or digital (Profibus DP).



## Advantages of the Integrated Positioner

- The integrated control loop described above allows to reach a given position with a good precision and hysteresis. It also avoids the hunting effect as the motor inertia is taken into consideration by the control circuit.
- While positioning is made locally via the internal control loop, the risk of electromagnetic interferences is dramatically reduced. Thus modulating is more stable and precise.
- A precise setting of the valve position with respect to the value of the incoming control signal is required for proper operation. The positioner can be isolated from the remote controller and setting performed locally by a single operator.

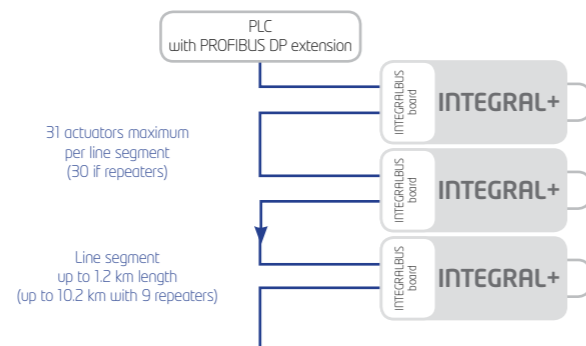


# Fieldbus communication

*By the simple addition of the optional INTEGRALBUS board, INTEGRAL+ can be connected to a fieldbus. Fieldbus allows control of multiple units via a single pair of wires thus reducing on-site wiring costs while increasing the number of information transmitted.*

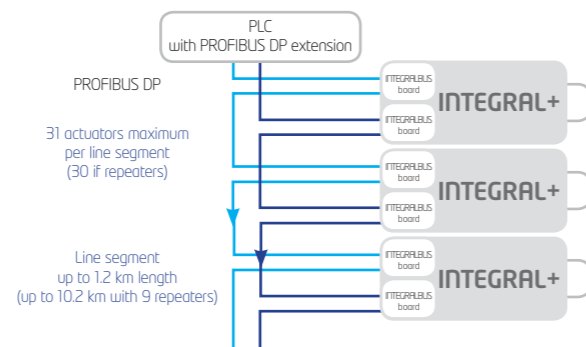
## > Simple Profibus DP

Simple Profibus DP as any other fieldbus is a serial link (based on RS485) and all actuators are connected to the same pair of wires.



## > Redundant Profibus DP

Redundancy helps overcoming the risk of cut wires by doubling the pairs of wires. The redundancy function is also secured by the implementation of two Profibus boards in the INTEGRAL+ box. If the first one fails, the communication automatically switches to the second board.

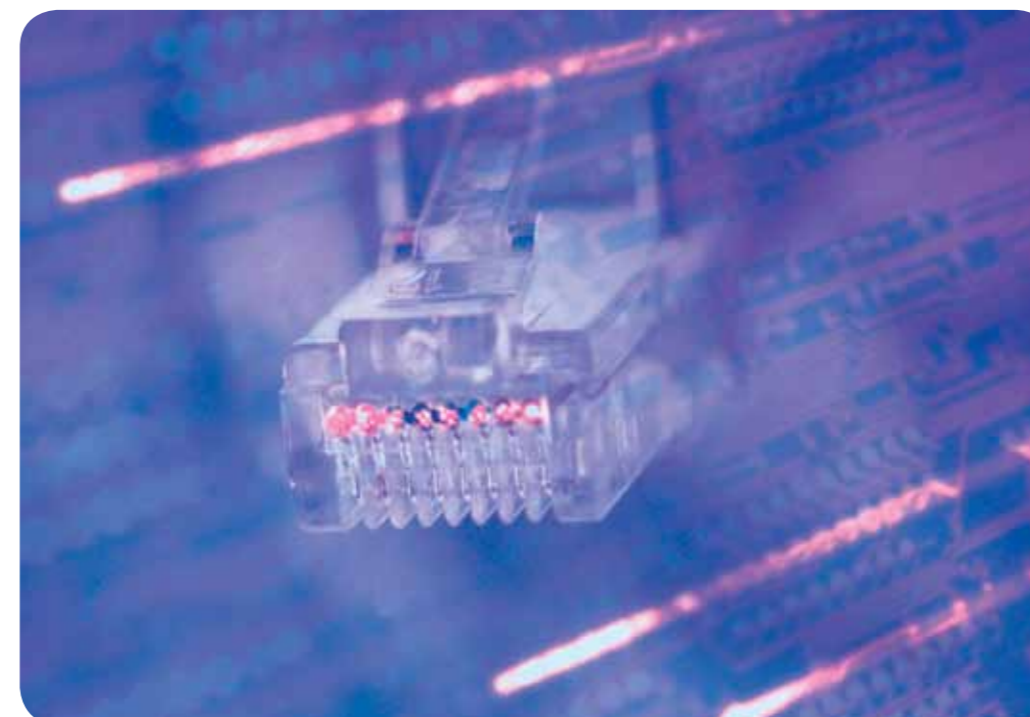


## > INTEGRALBUS board specifications

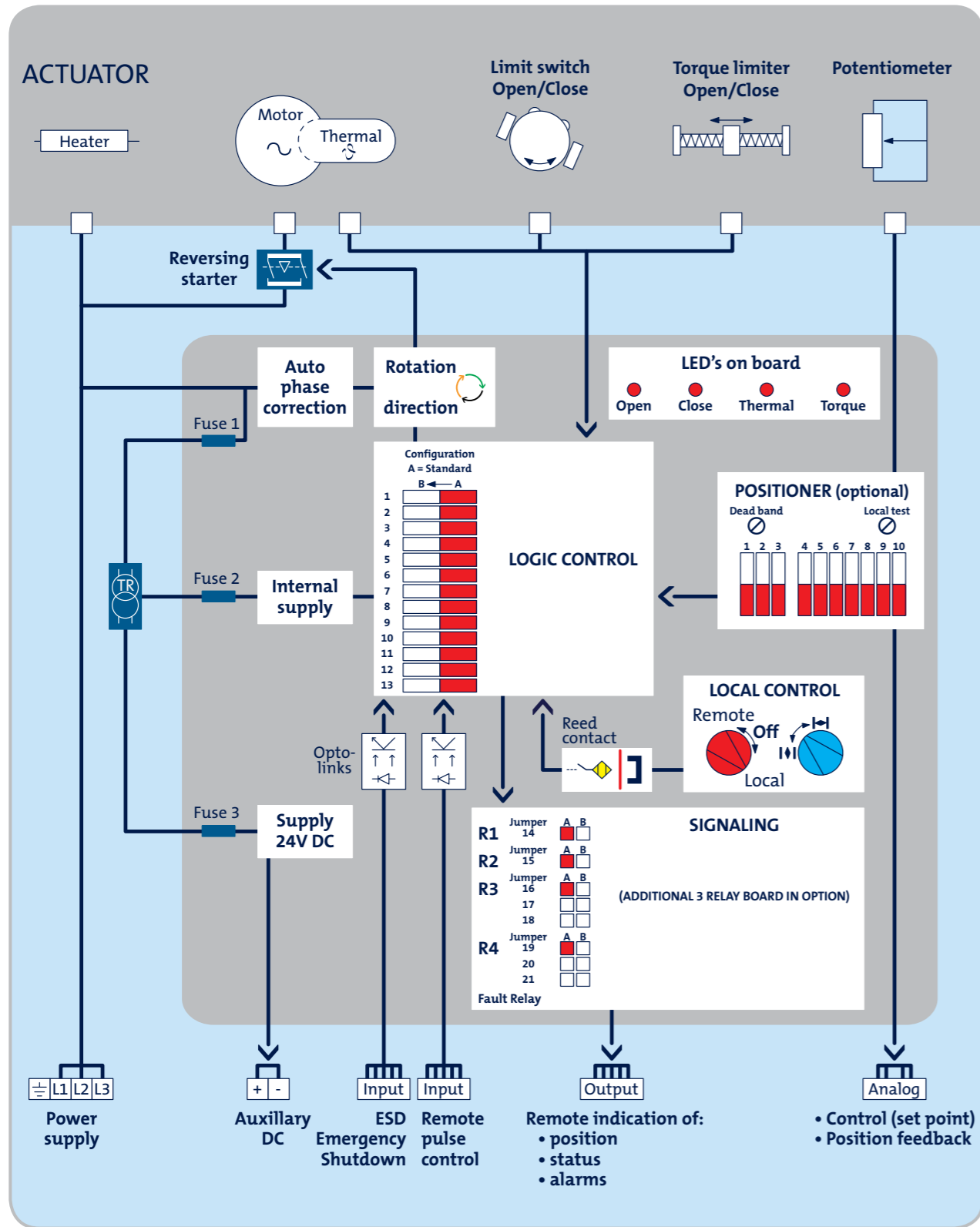
- Link type: RS485
- Communication protocol: PROFIBUS-DP slave-cyclic
- Type of connection: single (standard) or redundant (option)
- Cable specification: Profibus certified cable only
- Line connection
  - > Actuators per line without repeater: 31 max.
  - > Actuators per line with repeater: 30/segment max.
  - > Line length without repeater: 1.2 km max. (0.75 mi)
  - > Number of repeaters per line: 9 max.
  - > Actuators per line with 4 repeaters or more: 99 max.
  - > Line length with 9 repeaters: 10.2 km max.
- Scan speed (30 units & 1.2 km): 0.1s (bus at 93.75 kbit/s)
- Transfer speed: 9.6 kbit/s up to 1,5 Mbit/s
- Power supply: internal via INTEGRAL+ transformer, 24VDC external backup
- Technical approval: operability approved by PNO (Profibus Nutzer Organisation)

## > Power supply backup

In case of loss of power supply, the Profibus communication is lost. The external power supply backup enables the user to get the signalling and alarm information on the Profibus even when the main power supply is shut-off. This power supply is only available with INTEGRALBUS interface.



# INTEGRAL+ layout



# Technical specifications

<b>Models</b>	<ul style="list-style-type: none"> <li>Two versions according to operating modes:                     <ul style="list-style-type: none"> <li>INTEGRAL+ for ON/OFF</li> <li>POSIGAM+ for Class III modulating</li> </ul> </li> </ul> <p><b>INTEGRAL+ includes:</b></p> <ul style="list-style-type: none"> <li>Terminal compartment</li> <li>Power contactors</li> <li>Logic control</li> <li>Configuration panel</li> <li>Signalling relays</li> <li>Local control selectors</li> </ul> <p><b>POSIGAM+ includes:</b></p> <ul style="list-style-type: none"> <li>All INTEGRAL+ features</li> <li>Positioner board</li> <li>Precision feedback potentiometer, linearity &lt;0.5%</li> </ul>
<b>Enclosure protection</b>	<ul style="list-style-type: none"> <li>FPI box (weatherproof design)</li> <li>Standard: IP67 / NEMA 4</li> <li>On request: IP68 / NEMA 6P (are able to withstand to the pressure of 5m of water for 72 hours)</li> </ul>
<b>Temperature</b>	Ambiant operating temperature range: -40°C ... +70°C ( -40°F ... +158°F)
<b>External corrosion protection</b>	Paint system and colour are the same as the actuator on which INTEGRAL+ is mounted
<b>Double-sealing protection</b>	For the protection of the electronics, the control compartment of the actuator is fully isolated from the wiring compartment.
<b>On-off control</b>	<ul style="list-style-type: none"> <li>Isolated by opto-couplers</li> <li>Voltage: 10 to 250 V DC/AC</li> <li>Current: 10 mA at 24V</li> <li>Dry contacts (uses INTEGRAL+ auxiliary DC supply)</li> <li>Minimum pulse duration: 100ms</li> <li>Time of rotational direction change: 50ms or 200ms</li> </ul>
<b>Modulating control</b>	<ul style="list-style-type: none"> <li>Standard input signal: 4-20 mA - output signal: 4-20mA</li> <li>Input signal: 0-20 mA - output signal: 0-20 mA</li> <li>Input signal: 0-10 V - output signal: 0-20 mA</li> </ul>
<b>Signalling relays</b>	<ul style="list-style-type: none"> <li>4 relays: four information can be freely selected among a total of 16 available information (250 VAC-5A max.)</li> <li>Contact configuration: normally open or normally closed</li> </ul>
<b>Default relay</b>	• SPDT contact normally energised
<b>Power supply</b>	Same power supply as the actuator
<b>Electrical connection</b>	Ring tongue terminals
<b>Cable entries</b>	Standard configuration (other on request): 3xM20 (2 for signalling, 1 for power supply)
<b>Vibration resistance</b>	1g (9.8 m/s²) at 10-500 Hz
<b>EU conformity</b>	<p>INTEGRAL+ controls comply with:</p> <ul style="list-style-type: none"> <li>The 2004/108/EC electromagnetic compatibility</li> <li>The 2006/95/EC Low Voltage</li> </ul> <p>The following harmonized standards: Generic emission standard-Industrial environment EN 61000-6-4                      Generic immunity standard - Industrial environment EN 61000-6-2 ; Rotating electrical machines EN 60034-1, Degrees of protection provided by enclosures (IP code) EN 60529</p>
<b>Fieldbus interface (option)</b>	<p>Profibus DP (simple or redundant)</p> <ul style="list-style-type: none"> <li>PROFIBUS-DP slave - RS 485</li> <li>Baudrate: autodetection</li> <li>Total number of master and slave modules on the same line: 31 max. up to 99 with repeaters</li> <li>PROFIBUS operability approved by PNO (Profibus Nutzer Organisation)</li> <li>External power supply backup</li> </ul> <p>Other fieldbus on request</p>
<b>Options</b>	<ul style="list-style-type: none"> <li>LED indication board (closed, open, power on)</li> <li>Additional 3 relays board</li> <li>Timer board</li> <li>Separated box</li> <li>Additional position feedback transmitter isolated from the other output signals</li> </ul>