



**BERNARD®
CONTROLS**

Invest in Confidence

PROFIBUS FOR LOGIC AND INTELLI v3

Instructions for start-up

SUG_18008_EN - ind. A
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1 INTRODUCTION

Profibus DP is an industrial Fieldbus which allows connecting actuators and other devices (such as sensors) to a Distributed Control System (DCS) or a Programmable Logic Controller (PLC). Many actuators and other devices can be connected on a single or redundant Fieldbus line provided they are all equipped with a compatible Profibus interface.

The Profibus DPV1 interface described in this document has been specially designed for the Bernard Controls actuators with Logic and Intelli+ controls. This interface is compliant with Profibus DP (V0) and Profibus DPV1. Profibus DP (V0) runs cyclic communication when Profibus DPV1 runs in addition acyclic messages.

Redundant communication (Intelli+ control only)

Redundant version is especially interesting to ensure a communication continuity even if one line disrupted or if one interface board is out of order for any reason. In case of a redundant Fieldbus, the PLC must be able to manage 2 Fieldbus lines. Two Profibus interface boards are built in the actuator with isolated connections to the Profibus lines.

In case of failure along a line, the PLC can still communicate through the other line. Redundancy is also available with specific monitoring "RedCom with redundancy extensions" that can be used if the PLC can support the same extensions.

2 TECHNICAL SPECIFICATIONS

2.1 Specifications

The PROFIBUS interface, a PROFIBUS-DPV1 slave module, can be controlled by a master PROFIBUS-DP: PLC, PC, DCS or other interface boards from various suppliers (must comply with International Open Standard).

It has the following specifications.

- Hardware communication standard: RS 485
- Automatic speed selection: 9.6k to 1.5M bauds
- Actuator addresses from 2 to 125 (one address is used by the master)
- Maximum number of actuators by line: 31 (up to 124 with repeaters)
- Temperature working range is the same as the actuator one.

It conforms CE requirements.

Fieldbus is electrically totally isolated from the actuator circuitry. A loss of actuator power supply does not lead to a fieldbus disruption.

2.2 Versions

Profibus is available in 2 versions:

- single channel (Logic or Intelli+)
- redundant channel (available for Intelli+ version only)

In case of a redundant version, each input is electrically isolated from the actuator circuitry and are isolated from each other.

2.3 Configuration files

It uses the following GSD files:

- **For single line board:** BCVS10E8.GSD
- **For redundant line board**
Classical redundancy line: BCVR10E8.GSD
RedCom with redundancy extensions: BCRE10E8.GSD

3 PROFIBUS INTERFACE

3.1 HARDWARE DESCRIPTION

The Profibus module located in the actuator is plugged on to the main board. No access is necessary.

3.1.1 Cable type

Use exclusively special A type PROFIBUS cable conforming to the EN50170-2 standard.

Its specifications are:

- Nominal impedance 135 to 165 ohms at a frequency of 3 to 20 Mhz
- Nominal capacitance between conductors of a pair < 30pF /m
- Cable diameter > 0.64mm
- Cross section > 0.34mm² corresponds to 22AWG
- Resistance < 110 ohm/km
- Shield type: copper shielding braid or braid and foil

Example of an armoured cable (galvanised steel wire armour serve, 1 pair Profibus cable, 22AWG): Belden ref 3079ALS

3.1.2 Wiring

Profibus cable has to be separated from the other cables with a distance of at least 20 cm. It must use a specific cable path and be connected to the earth.

It is also necessary to check that all actuators are at the same earth electrical potential.

3.2 FIELDBUS CONNECTION

3.2.1 First BC range

The following applies to AQ range and AT range.

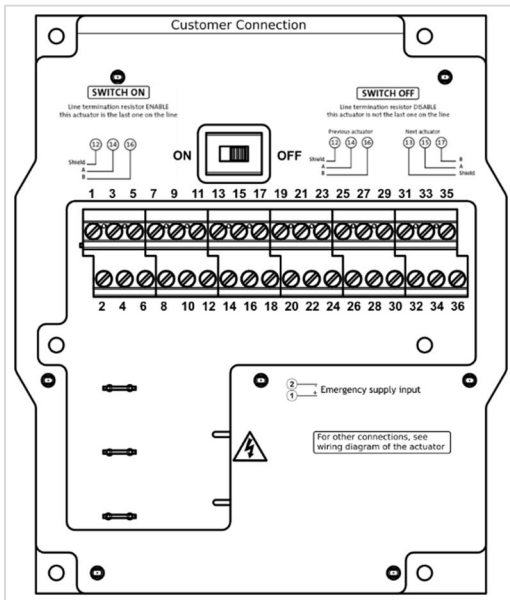
How to connect an actuator

1. Remove the cover of the actuator (see procedure in §3.2 section of the start-up guide of your actuator).



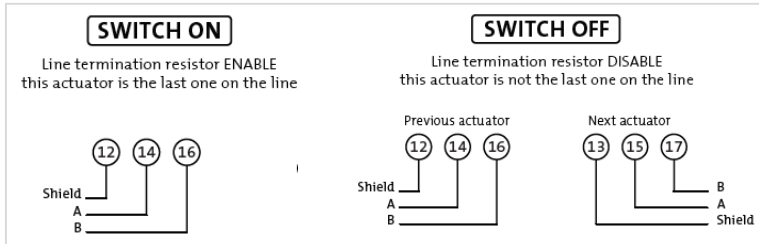
When removing the cover, unplug the control panel cable from the main board in order to avoid to damage actuator components.

You will find the terminals on the following side.



2. If not already done, install the cable gland on your actuator and pass your shielded cable through it (see procedure in §3.2 section of the start-up guide of your actuator)
3. If the actuator you are connecting is at the end of the line, set the switch on **ON**, else set it on **OFF**.

4. Connect the Fieldbus wires and shield as following.



Generally A is a **green** wire and B is a **red** wire.

5. Once finished, reassemble the cover on the actuator to close the control compartment.

End of line termination

A termination has to be installed at each end of line.



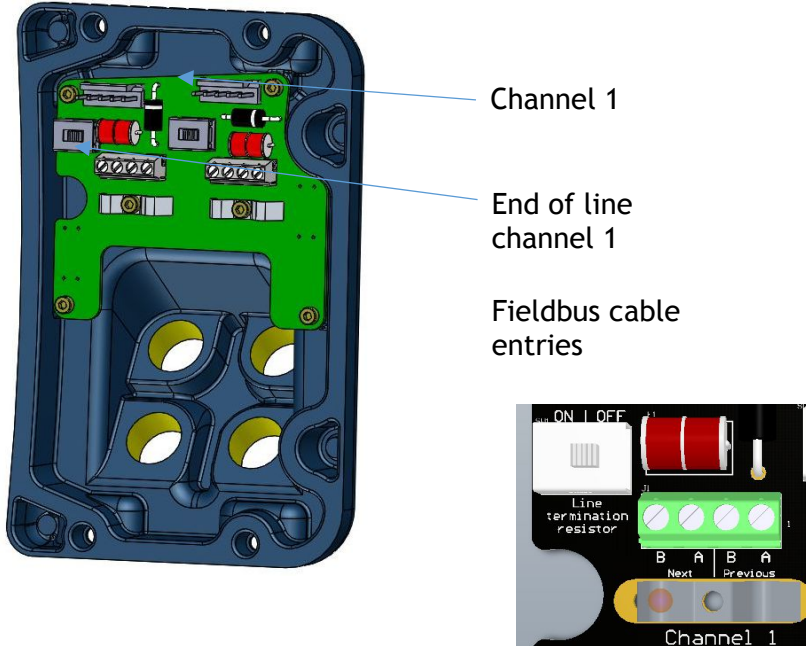
To activate the termination, connect only 1 cable (input) on terminals 12, 14, 16 and place the switch in the ON position, this automatically disconnects the output.

3.2.2 Premium BC range

This applies to BT range actuator.

Junction box terminals

These terminals are located in the cover of the junction box or connector cover, use the cable entries located on this cover.



Connect the Profibus cable to the corresponding terminals (see wiring diagram) and connect the shield with the stirrup.

A (green wire), B (red wire):

End of line termination

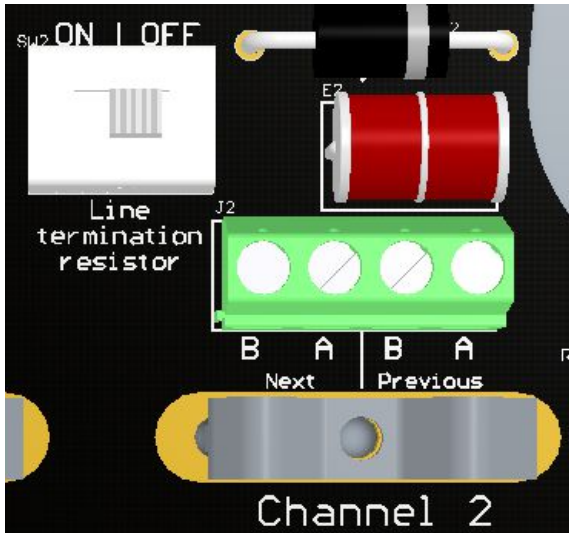
A termination has to be installed at each end of line.



To activate the termination, connect only 1 cable on **Previous** and place the **Line termination resistor** switch in the **ON** position, this automatically disconnects the output (**Next**).

Redundant version (only for Intelli+ with option redundant communication)

Connect the cable to the channel 2 side.



If the actuator is the last of the line, place the corresponding switch (SW2) in the ON position to enable the end of line termination.

3.3 Profibus Set-Up

The Profibus can be set using the control panel of the actuator (see how to access in the actuator start-up guide).

To access the **Profibus** menu, enter the menu than go to **Settings > Profibus**.

Profibus menu includes the following settings.

Command type

This is used for selecting **By hardwire** or **By Fieldbus** (default setting). If **By hardwire** is selected, Profibus transmits the indication only, and not the commands.

If this value cannot be changed, verify that an auxiliary command does not override this setting.

Slave number

The Profibus interface module is only acting as a Profibus slave. The default setting address is 02

You can set this value can be set between 2 and 246.

Position on Loss of communication

Position on Loss of Commu...	
<input checked="" type="radio"/>	Open
<input type="radio"/>	Close
<input type="radio"/>	Stayput
Save	

In case of loss of communication, the actuator operates at the Close position, Open position or stays on its current position (Stayput).

Positioner Activation

Positioner Activation	
<input checked="" type="radio"/>	Enable
<input type="radio"/>	Disable
Save	

This menu is only available for the modulating actuator.

If the positioner is activated, the command must be done by Control address 2&3 (see table § 4.1); otherwise, it must be done by address 0 (see table § 4.1). This menu can be overridden by command address 1 bit 2&3 (see table § 4.1).

Emergency shut down (ESD)

Emergency Shut Down (ESD)	
Actuator action in case of ESD command [Close]	
Set ESD degraded mode [--]	
Save	

This menu is only available in the Intelli+ version.

This is used for setting the action of the control address 1 bit 6 (ESD command). For further explanation, refer to the Intelli+ manual.

Partial Stroke

Partial Stroke	
Stroke	
010	▾
Authorized Start Position	
Valve Open	▾
Save	

This menu is only available in the Intelli+ version. This is used for setting the partial stroke command (control Address 1 bit 7). For further explanation, refer to the Intelli+ manual.

Dead band

Deadband
0.80% deadband min
5.00%
Save

This menu is only available for the modulating actuator. For further explanation, refer to the Intelli+ manual.

Automatic Positioning Mode




Automatic Positioning Mode
<input checked="" type="radio"/> NO
<input type="radio"/> YES
Save

This menu is only available on the modulating or positioning actuator with Intelli+ version. For further explanation, refer to the Intelli+ manual

3.4 DISPLAY INDICATION OF FIELDBUS COMMUNICATION STATUS







An indication of the fieldbus communication status is available on the actuator display. This is located on first line of the main display.

Single channel board

No data exchange, wait for communication	
Data exchange	
Fault	

Redundant channel board

Two icons appear on the status line, the left one is for channel 1 status, the right one for channel 2 status.

Waiting for communication	 
Data exchange on channel 1, wait for communication on channel 2	
Data exchange on channel 1 and 2, channel 1 is primary, 2 is backup	
Data exchange on channel 1 and 2, channel 2 is primary, 1 is backup	
Data exchange on channel 1, channel 2 is in fault	

3.5 EMERGENCY SUPPLY

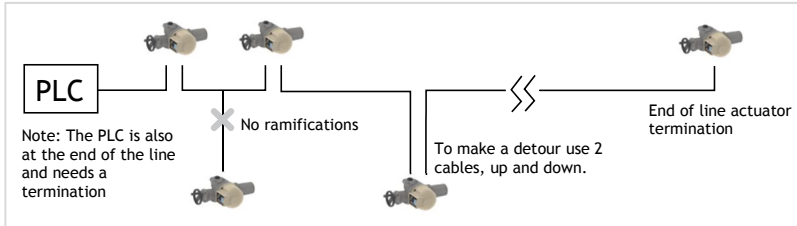
The actuator Logic and Intelli+ are normally supplied by the mains but in case of loss of power supply, an emergency supply could be used to continue to communicate through the fieldbus. This emergency supply needs 24V DC current 4W.

3.6 PROFIBUS DP ARCHITECTURE

Single line

The Profibus cable coming from the PLC is connected to the first actuator then the Profibus cable links this actuator with the next one and so on. All actuators are connected to the line one after the other until the last one. No return to the PLC is required.

To avoid reduced performance in transmission don't add ramifications on the line.



- Maximum line length is 1200m (3600ft). Maximum number of actuators by line is 31.
- Maximum line length is reduced according to the communication speed:

Transmission baud rate (kbit/s)	≤93.75	187.5	500	1500
Maximum line length (m)	1200	1000	400	200

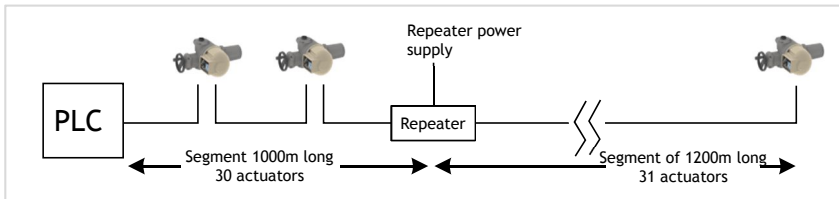
An end of line termination must be connected at each end of line actuator (see § 3.3).

Repeaters

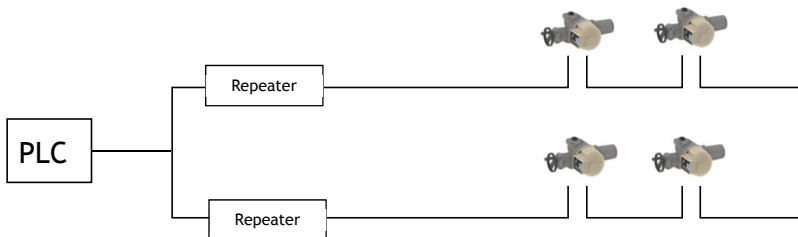
Adding repeaters modules enables the increase of both the number of actuators on the line and the total line length. Each repeater uses one connection point; therefore, this limits the number of actuators by segment to 30 units, and allows to lengthen the line by 1000m. According to the type of repeater, it is possible to use up to 9 repeaters and to extend the line by 10 km.

The maximum number of actuators depends on the PLC capacity, the addressing capacity and the number of segments with repeaters. The maximum for one Profibus line is 124.

The important advantage of the repeater compared to other technologies is to keep the communication speed unaffected and therefore to get a very short response time.



Repeaters can also be used to get additional fieldbus lines at a low cost if placed at PLC output. Each line is independent from the others and therefore a problem on a line does not affect the others.



BERNARD CONTROLS can supply weatherproof or explosion proof repeaters.

Redundancy (only with Intelli+ control)

Redundancy of the Fieldbus system is to continue to communicate with the actuators even if a line fails. In order to achieve this function, all the communication system is doubled.

The PLC uses two output Profibus ports, the Fieldbus line is doubled and the actuator interface board is doubled.

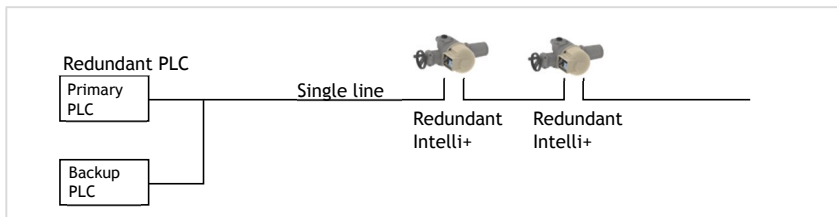
If repeaters are required, the repeaters are doubled.

The redundant Profibus interface module is designed according to Profibus Guide Line "Specification Slave Redundancy" N° 2212, that includes a redundancy communication channel (RedCom) and special redundancy extensions. One of the slave modules acts as primary and the other one as backup.

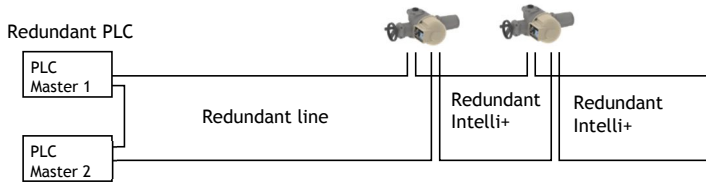
Profibus system enables different levels of redundancy:

- **Flying redundancy** is a redundancy of the connection point, the actuator interface is doubled and also the PLC interface. The line (Profibus cable) is a single line.

The redundant actuator interface has 2 channels, each one is connected to the Profibus line. The address is not the same for each channel. One address is chosen from 2 to 125, the other one is this address + 64.



- **System redundancy** is the most common system with all communication system doubled as described first.



For one actuator the address is the same on both lines. When the actuator is powered on, the Profibus interface module tries to get the communication on a first line and toggles between both lines until to find the communication. It is the Profibus interface module that decides to communicate with one line or the other.

Like this, all the actuators are not obliged communicating one the same line and both lines are working simultaneously. There is not a main line and a backup line, each line has the same level. On the other hand, the actuator interface has a primary channel (the one that got a data exchange state) and a backup channel.

Information supplied by the primary or the backup channel:

- This channel (or slave) is primary or this channel is backup
- 2 channels available or only one.
- FR mode (Flying redundancy) or SR mode (System redundancy). See details at § "Command and Signalling"

Redundancy management must be performed by the PLC. To manage the line redundancy a PLC could be used with different level of equipment.

- One PLC with 2 Profibus DPV1 Interface. For example, a CPU 317-2 DP from Siemens that includes 2 Profibus DPV1 interfaces. The PLC is single and interface is doubled.

PLC should be programmed to manage the redundancy.

If the PLC doesn't support the special redundancy extensions of the Profibus Guide Line "Slave redundancy" then Profibus interface module will be used as a classical redundancy. To do that, there is to load in the PLC the appropriate GSD file for classical redundancy: BCVR10E8.GSD

- Two PLC with each a Profibus DPV1 interface. A link between both PLC through an auxiliary communication port allows the redundancy monitoring. Example 2 CPU 317-2 DP from Siemens. PLC should be programmed to manage the redundancy.

If the PLC doesn't support the special redundancy extensions of the Profibus Guide Line "Slave Redundancy" then Profibus interface module will be used as a classical redundancy. To do that, there is to load in the PLC the appropriate GSD file for classical redundancy: BCVR10E8.GSD

- Two PLC fault tolerant like the CPU 414 H from Siemens and optic fibre between them. In that case no programming is necessary to manage the redundancy.

This PLC supports the special redundancy extensions. The Profibus interface module will be used with RedCom and extensions, and to do that there is to load the appropriate GSD file in the PLC: BCRE10E8.GSD.

4 CONTROLS AND INDICATIONS

The Profibus DPV1 system has a cyclic communication (compatible with Profibus DP) and acyclic communication.

The cyclic communication is mainly use for the Process. Data are read and written in a well-defined timing. The useful data are selected in the list below and transmitted in a cyclic way. The selection of only a few data also increases the communication speed. The acyclic communication is mainly use for maintenance. The data are collected only on request that avoid to reduce the cyclic communication speed. See below "§ 5 Acyclic communication"

4.1 CONTROLS

Valve control by the Profibus fieldbus is possible only if the actuator rotating selector is in the "remote" position. Conditions which can prevent a command to be executed:

- Actuator rotating selector on "local" or "OFF"
- Alarm tripped (motor thermal overload)
- Emergency command received (ESD)
- Command is set by hardwire

4.1.1 Control byte description

Actuators controls are located at the addresses 0 to 4 on the Profibus interface module. These controls are:

Address 0: ON-OFF control

Bit N°	Value	Description
BIT 0	0	NO COMMAND
	1	OPEN COMMAND
BIT 1	0	NO COMMAND
	1	CLOSE COMMAND
BIT 2	0	STOP (OR MAINTAINED COMMAND MODE)
	1	NO STOP (OR PULSE COMMAND MODE)
BIT 3 TO 6		NOT USED
BIT 7	0	NO LOCAL COMMAND INHIBITION
	1	LOCAL COMMAND INHIBITION

OPEN/CLOSE

Open and close command. According to the actuator configuration, it is possible to select a priority to the opening or to the closing command (refer to the actuator's manual). By default, there is no priority given to either opening or closing.

Priority can be used to:

- Allow to reverse the actuator rotation direction during a manoeuvre without having to use the stop command. In this case it is necessary to set a priority to the opening or to the closing direction.
- Give priority to one or the other rotation direction: if the actuator receives the open and close commands simultaneously and the priority has been given to the opening, the actuator will run the open position.

STOP

If this command is maintained at 0 (most common case), the open and close commands have to be maintained. If this command is set to 1, a short duration open / close command pulse is sufficient to drive the valve to the open or closed position. In this case, the stop command (0) can be used to stop the actuator during the travel in its current position.

LOCAL COMMAND INHIBIT

The local command inhibit is remotely controlled. This command inhibits the local opening and closing commands, and enables remote commands, even if the local/remote selector of the actuator is set to local.

Address 1: Auxiliary commands

Bit N°	Value	Description
BIT 1 & 0		00 : ACTUATOR CONTROL THE LOCAL/REMOTE ; 01= REMOTE ; 10 LOCAL ; 11=LOCAL+ REMOTE
BIT 3 & 2		00 (OR 11) = ACTUATOR CONTROL THE PROPORTIONAL/DIGITAL; 10= CONTROL BY THE ADDRESS 0; 01= CONTROL BY THE ADDRESS 2 OR 3)
BIT 4		OPENING INHIBIT
BIT 5		CLOSING INHIBIT
BIT 6*	0	NO ESD COMMAND
	1	ESD COMMAND
BIT 7*	0	NO PARTIAL STROKE COMMAND
	1	PARTIAL STROKE COMMAND

* Only available with Intelli+ control

Bit 1 & 0: This is used to force the local remote of the actuator, if these two bits are set to zero, the local remote is given by the actuator selector, if set to 01, 10 or 11 the value overrides the selector (the selector has no effect).

Bit 3 & 2: This can only be used if the actuator is a positioning or modulating actuator. This is used to force the positioner activation or not (see § 3.4 setup). If the value of the bits is set to 00, the menu indicates the type of command (on-off or positioning), if you send 1 in the bit 3 and 0 in the bit 2, the control is by command on-off.

LOCAL or REMOTE: substitutes for the local/remote selector of the actuator and is used to remotely enable either remote control or local control.

LOCAL+REMOTE: same definition as above, but local and remote control can be enabled simultaneously.

OPEN, CLOSE INHIBIT: this command is used to inhibit opening or closing of the actuator.

PROPORTIONAL/DIGITAL: for an actuator used in modulation with positioner function, it is possible to issue remote commands via proportional control (equivalent to 4-20mA) or via opening/closing/stop commands. The PROPORTIONAL/DIGITAL command is used to switch over from one type of command to another.

ESD: the ESD (Emergency Shut Down) is configured by the menu.

PARTIAL STROKE: This command performs automatically a test to confirm that the actuator is still operational. The test consists to operate the actuator on a partial stroke and return. The start position and the stroke % can be configured. An alarm is emitted if the stroke is not performed in a predetermined delay. This delay is worked out from the rated operating time.

Address 2 and 3: Proportional control (set-point), only on modulation actuator

Address N°	Bit N°	Value	Description
2	BIT 0 TO 7	MSB	INCREMENT 0.01%. RANGE 0 TO 1000. 0= CLOSED, 10000= OPEN
3	BIT 0 TO 7	LSB	

To choose between proportional and ON-OFF control, set the menu positioner activation on 'Enable' for proportional command (see §3.4 setup) or send address 1 bit 3&2 to 01.

Address 4: Relay output

Bit N°	Value	Description
BIT 0	0	RELAY 1 CONTACT OPEN
	1	RELAY 1 CONTACT CLOSED
BIT 1	0	RELAY 2 CONTACT OPEN
	1	RELAY 2 CONTACT CLOSED
BIT 2	0	RELAY 3 CONTACT OPEN
	1	RELAY 3 CONTACT CLOSED
BIT 3*	0	RELAY 4 CONTACT OPEN
	1	RELAY 4 CONTACT CLOSED
BIT 4*	0	RELAY 5 CONTACT OPEN
	1	RELAY 5 CONTACT CLOSED
BIT 5*	0	RELAY 6 CONTACT OPEN
	1	RELAY 6 CONTACT CLOSED
BIT 6*	0	RELAY 7 CONTACT OPEN
	1	RELAY 7 CONTACT CLOSED
BIT 7		NOT USED

* Bit 3 to bit 6 is optional.

The relays could be used to have an output indication (wired as a non fieldbus actuator) or to drive outside devices through Profibus. These optional relays could be configured in Logic/Intelli+ menu for actuator indication or output controls.

4.2 ACTUATOR FEEDBACK INDICATION

4.2.1 Indication byte description

The first five words of the Profibus interface give the actuator status.

Address 0: Indications

Bit N°	Value	Description
BIT 0	0	VALVE NOT OPEN
	1	VALVE OPEN
BIT 1	0	VALVE NOT CLOSED
	1	VALVE CLOSED
BIT 2	0	NO ACTION
	1	TORQUE LIMITER ACTION IN OPEN DIRECTION
BIT 3	0	NO ACTION
	1	TORQUE LIMITER ACTION IN CLOSE DIRECTION
BIT 4	0	ACTUATOR NOT TO LOCAL MODE
	1	ACTUATOR TO LOCAL MODE
BIT 5	0	ACTUATOR NOT TO REMOTE MODE
	1	ACTUATOR TO REMOTE MODE
BIT 6	0	ACTUATOR NOT TO OFF MODE
	1	ACTUATOR TO OFF MODE
BIT 7	0	POWER OFF (ABSENCE OF MAIN POWER SUPPLY OR TOO LOW)
	1	POWER ON (PRESENCE OF MAIN POWER SUPPLY)

- VALVE OPEN/CLOSE: confirms the valve is open or closed
- TORQUE LIMITER ACTION OPEN/CLOSE: torque limiter action in opening/closing direction. This information is transmitted even if the valve stops normally on torque.
- ACTUATOR TO LOCAL MODE: No command allowed from Profibus. Indications are always available.
- ACTUATOR TO REMOTE MODE: command allowed from Profibus. Indications are always available.
- ACTUATOR TO OFF MODE: no command allowed in local or from Profibus. Indications are always available.
- POWER ON: The actuator is normally powered.

Address 1: Indications

Bit N°	Value	Description
BIT 0	0	ACTUATOR NOT OPENING
	1	ACTUATOR OPENING
BIT 1	0	ACTUATOR NOT CLOSING
	1	ACTUATOR CLOSING
BIT 2	0	NO HANDWHEEL ACTION
	1	HANDWHEEL ACTION
BIT 3*	0	NO ESD COMMAND
	1	ACTUATOR RECEIVES AN EMERGENCY COMMAND ESD
BIT 4	0	THE ACTUATOR IS NOT RUNNING
	1	ACTUATOR RUNNING
BIT 5	0	ACTUATOR AVAILABLE
	1	ACTUATOR FAULT INDICATION
BIT 6	0	NO POSITION SENSOR FAULT
	1	POSITION SENSOR FAULT
BIT 7	0	NO TORQUE SENSOR FAULT
	1	TORQUE SENSOR FAULT

* Only available with Intelli+ control

- **ACTUATOR OPENING/CLOSING:** the actuator is operated in opening/closing direction.
- **HANDWHEEL ACTION:** the handwheel has been actuated since the last electrical operation.
- **ACTUATOR RECEIVES AN EMERGENCY COMMAND ESD:** The actuator is not available because it receives an emergency command which overrides all other commands.

- **ACTUATOR RUNNING:** the actuator is operated in opening or closing direction.
- **ACTUATOR FAULT INDICATION:** The actuator is not available due to a following event, motor thermal overload, lost phase (in case of 3ph supply) or locked rotor. Including additional faults (refer to the control manual to configure).
- **POSITION OR TORQUE POWER FAULT:** Intelli+ receives no information from the position or torque sensor.

Address 2: Alarms

Bit N°	Value	Description
BIT 0	0	NO LOCKED MOTOR OPEN ALARM
	1	LOCKED MOTOR OPEN
BIT 1	0	NO LOCKED MOTOR CLOSE ALARM
	1	LOCKED MOTOR CLOSE
BIT 2	0	NO MOTOR THERMAL OVERLOAD
	1	MOTOR THERMAL OVERLOAD
BIT 3	0	NO LOST PHASE ALARM
	1	LOST PHASE
BIT 4	0	NO OVERTRAVEL ALARM
	1	OVERTRAVEL ALARM
BIT 5	0	NO DIRECTION OF ROTATION OPEN ALARM
	1	DIRECTION OF ROTATION OPEN ALARM
BIT 6	0	NO DIRECTION OF ROTATION CLOSE ALARM
	1	DIRECTION OF ROTATION CLOSE ALARM
BIT 7*	0	NO RTC BATTERY FAULT
	1	RTC BATTERY LOW

* Only available with Intelli+ control

- **LOCKED MOTOR OPEN/CLOSE:** The actuator locked in the opening/closing direction.
- **MOTOR THERMAL OVERLOAD:** The motor thermal contact tripped. The actuator will be again available as soon as the motor will cool.
- **LOST PHASE:** In 3-phase, a phase is missing. No start allowed.

- **OVERTRAVEL ALARM:** Position overshoot > 5% after motor shut down.
- **DIRECTION OF ROTATION OPEN/CLOSE:** Opening/closing direction of rotation discrepant
- **BATTERY LOW OR IS NOT PRESENT:** The battery should be replaced because of low voltage or the battery is missing (refer to the Intelli+ manual).

Address 3: Running torque in%

Bit N°	Value	Description
BIT 0 TO 7	0-150	RUNNING TORQUE IN %

- **RUNNING TORQUE:**

Indication of the instantaneous torque. 100% is the maximum actuator rated torque

Address 4-5: Actuator position feedback

Address	Bit N°	Value	Description
2	BIT 0 TO 7	MSB	INCREMENT 0.01%. RANGE 0 TO 10000. 0= CLOSED, 10000= OPEN.
3	BIT 0 TO 7	LSB	

- **ACTUATOR POSITION FEEDBACK:**

0,00%= closed, 100,00%= open

Address 6: Indication

Bit N°	Value	Description
BIT 0	0	NO HUNTING
	1	ACTUATOR HUNTING
BIT 1	0	HMI COMMUNICATION IS RUNNING
	1	HMI COMMUNICATION IS IN FAULT
BIT 2	0	POSITION IS CORRECT
	1	POSITION IS IN FAULT (<-10% OR >110%)
BIT 3	0	NO ACTIVITY MEMORY FAULT
	1	ACTIVITY MEMORY FAULT
BIT 4	0	NO STOP MID TRAVEL
	1	STOP MID TRAVEL
BIT 5	0	NO LOST SIGNAL
	1	LOST SIGNAL 4-20MA
BIT 6*	0	NO PARTIAL STROKE IN PROGRESS
	1	PARTIAL STROKE IN PROGRESS
BIT 7*	0	NO PARTIAL STROKE FAULT
	1	PARTIAL STROKE FAULT

* Only available with Intelli+ control

- **ACTUATOR HUNTING:** positioning is unstable.
- **HMI:** Communication between the HMI and the base board.
- **POSITION:** Error due to a positioning measurement out of the normal range (-10% 110%).
- **STOP MID TRAVEL:** The actuator is at a stop, neither open nor closed.
- **LOST SIGNAL:** 4 to 20mA lost signal (In case of analogue and hardwired input signal)

- **PARTIAL STROKE IN PROGRESS:** A partial stroke command has been issued and this test is not ended.
- **PARTIAL STROKE FAULT:** The partial stroke test has detected a fault. The actuator is not fully available.

Address 7: Alarms

Bit N°	Value	Description
BIT 0*	0-1	NAMUR NE107 MAINTENANCE REQUIRED
BIT 1*	0-1	NAMUR NE107 OUT OF SPECIFICATION
BIT 2*	0	NAMUR NE107 FUNCTION CHECK
BIT 3*	0	NAMUR NE107 FAILURE
BIT 4*	0	TORQUE NOT APPROCHING THE LIMIT
	1	TORQUE APPROCHING THE LIMIT
BIT 5	0	NO ERROR ENTRY AUX2 (BIT 10 ADDRESS 3)
	1	ERROR HW ENTRY AUX2
BIT 6	0	NOT TOO MANY START LAST HOUR
	1	TOO MANY STARTS IN THE LAST HOUR
BIT 7	0	24V AUX PRESENT
	1	LOST OF 24V AUXILLIARY

* Only available with Intelli+ control

- **Namur NE107:** The NE107 recommendation defines that detailed device-specific diagnostics are summarised as four simple status signals. These signals ensure that the plant operator is not inundated with device troubleshooting details and cryptic error codes. The NAMUR NE107 recommendation harmonises the display of status for devices. Each fault or warning can be assigned to one signalling, please refer to the Intelli+ manual for configuration of this signalling.
- **TORQUE APPROCHING THE LIMIT:** This indicates that, during the travel, the torque is approaching the limit. This is only a warning and does not stop the actuator.

- **ERROR HW ENTRY AUX2:** A hardware error is detected on the main board on the Aux 2 entry. The main board should be replaced.
- **TOO MANY STARTS IN THE LAST HOUR:** Starting rate exceeding the actuator class average.
- **LOST OF 24V AUXILLIARY:** Auxiliary power supply fault for external circuits.

Address 8: Information

Bit N°	Value	Description
BIT 0*	0	CHANNEL IS BACKUP (REDUNDANCY OPTION)
	1	CHANNEL IS PRIMARY (REDUNDANCY OPTION)
BIT 1*	0	1 CHANNEL AVAILABLE (REDUNDANCY OPTION)
	1	2 CHANNELS AVAILABLE (REDUNDANCY OPTION)
BIT 2*	0	SR MODE (SYSTEM REDUNDANCY) (REDUNDANCY OPTION)
	1	FR MODE (FLYING REDUNDANCY) (REDUNDANCY OPTION)
BIT 3	0	NO BASE BOARD SERIAL COMMUNICATION FAULT
	1	BASE BOARD SERIAL COMMUNICATION FAULT
BIT 4	1	FIELD BUS HAVE COMMAND
	0	HARDWIRED COMMAND
BIT 5*	0	REDONDANT COMMUNICATION
	1	IN CASE OF REDUNDANT BOARD THE COMMUNICATION IS NOT REDONDANT
BIT 6	0-1	VALVE JAMMED
BIT 7	0-1	LOCAL COMMAND INHIBIT

* Only available with Intelli+ control and with redundant board

- **CHANNEL IS PRIMARY/BACKUP:** For a redundant communication the Profibus interface has 2 channels connected to the Profibus line. The one that got a data exchange state is named primary channel and the other one backup channel.

- **1 or 2 CHANNELS AVAILABLE:** Indication of how many channels are available.
- **SR/FR MODE:** SR mode uses a redundant fieldbus with 2 lines, FR mode uses a redundant fieldbus with only one line.
SR mode is the default configuration.
- **BASE BOARD SERIAL COMMUNICATION FAULT:** An error occurs on the communication between the base board and the fieldbus Board. The signalling is not refreshed.
- **FIELDBUS HAVE COMMAND / HARDWIRED COMMAND:** Depending on the configuration of the type of control (see § 3.4 setup).
- **VALVE JAMMED:** Actuation could not be completed due to excess torque.
- **LOCAL COMMAND INHIBIT:** A local command inhibit is currently present, as a consequence of sending the following command: LOCAL COMMAND INHIBITION (Address 0 bit 7 of the control byte). A key is on the LCD screen for signalling this command in local.

Address 9-10: External device analogue input signal

Address	Bit N°	Value	Description
9	BIT 0 TO 7	MSB	INCREMENT 0.1%. RANGE 0 TO 1000. 0= 0MA, 1000= 20MA
10	BIT 0 TO 7	LSB	

- **EXTERNAL DEVICE INPUT SIGNAL:** A hardwired signal (for example 4 to 20mA) is coming from another device and uses the actuator Profibus interface to communicate the value.

Address 11: External device input signal/alarms

Bit N°	Value	Description
BIT 0	0-1	SIGNAL A COMMAND ON STOP HARDWIRED ENTRY
BIT 1	0-1	SIGNAL A COMMAND ON OPEN HARDWIRED ENTRY
BIT 2	0-1	SIGNAL A COMMAND ON CLOSE HARDWIRED ENTRY
BIT 3	0-1	SIGNAL A COMMAND ON AUX1 HARDWIRED ENTRY
BIT 4	0-1	SIGNAL A COMMAND ON AUX2 HARDWIRED ENTRY
BIT 5	0	INTERNAL TEMPERATURE OK
	1	INTERNAL TEMPERATURE OUT OF RANGE
BIT 6*	0	VIBRATION OK
	1	VIBRATION OUT OF RANGE
BIT 7	0	BUTTON OK
	1	BUTTON FAULT

* Only available with Intelli+ control

- **SIGNAL A COMMAND:** Indications of hardwired inputs (enables the communication through Profibus, indications coming from outside devices).
- **INTERNAL TEMPERATURE OUT OF RANGE:** The internal sensor detects that the temperature is too low or too high, please check the temperature range of the actuator.
- **VIBRATION OUT OF RANGE:** The internal vibration sensor detects that the level of vibration is too high, please check the environment.
- **BUTTON FAULT:** The button of the HMI is in fault, please change the HMI board.

Address 12 to 13: Number of starts last hour

Address	Bit N°	Value	Description
12	BIT 0 TO 7	MSB	NUMBER OF STARTS LAST HOUR (2 BYTES)
13	BIT 0 TO 7	LSB	

- **TOTAL NUMBER OF STARTS:** to obtain the accumulated figures since actuator manufacturing.

Address 14 to 17: Number of starts

Address	Bit N°	Value	Description
14	BIT 0 TO 7	MSB	NUMBER OF STARTS (4 BYTES)
17	BIT 0 TO 7	LSB	

- **TOTAL NUMBER OF STARTS:** to obtain the accumulated figures since actuator manufacturing.

Address 18 to 21: Running time

Address	Bit N°	Value	Description
18	BIT 0 TO 7	MSB	RUNNING TIME (4 BYTES)
21	BIT 0 TO 7	LSB	

- **TOTAL RUNNING TIME.**
To obtain the accumulated figures since actuator manufacturing. Unit is in sec.

Address 22 to 25: Partial number of starts

Address	Bit N°	Value	Description
22	BIT 0 TO 7	MSB	PARTIAL NUMBER OF STARTS (4 BYTES)
25	BIT 0 TO 7	LSB	

- **PARTIAL NUMBER OF STARTS:**
Number of starts since the last reset.

Address 26 to 29: Partial running time

Address	Bit N°	Value	Description
26	BIT 0 TO 7	MSB	PARTIAL RUNNING TIME (4 BYTES)
29	BIT 0 TO 7	LSB	

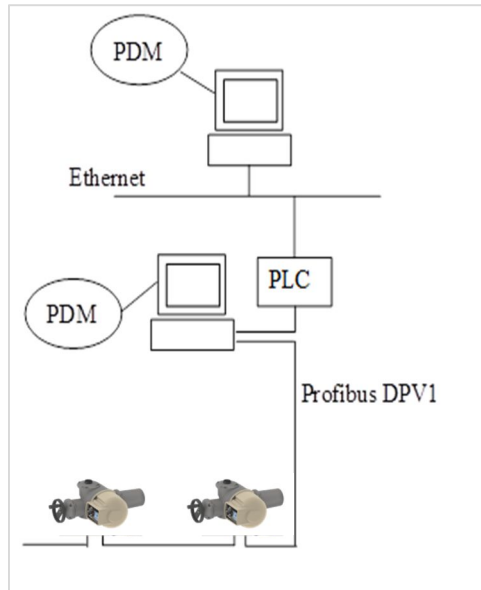
- **PARTIAL RUNNING TIME:** Total running time since the last reset. Unit is in sec.

5 ACYCLIC COMMUNICATION

The Profibus interface supports acyclic communication (extension V1 of the Profibus protocol) which allows to read the actuator's state, to read all its configuration. It can be also reconfigured through the V1 extension.

There is two types of master in the acyclic communication:

- The master class1 which supports cyclic communication. It is normally the same PLC which manages the actuators.
- The master class2 supports all the acyclic communication. It can be included to Profibus without interference. A laptop equipped with a Profibus module and PDM software may be used as a master class2 anywhere on the line.



The Profibus interface supports the Read and Write messages of the master class1 (MSAC1_Read, MSAC1_Write).

For master class 2, this interface supports Initiate, Abort, Read and Write services. Interface board supports a maximum of 2 simultaneous class2 master connections.

The Profibus interface supports the Read and Write messages of the master class1 (MSAC1_Read, MSAC1_Write). For master class 2, this interface supports Initiate, Abort, Read and Write services. Interface board supports a maximum of 2 simultaneous class2 master connections. We advise to use PDM Siemens software to read and configure the actuators with a master class2. We can give you an Electronic Device Description (EDD) which allows you to manage our actuators with PDM.

With PDM and this EDD you can configure and parameterise the actuators and also recover information for diagnostics and maintenance. For example, alarms, activity, torque curves...

To use PDM, not straight to the fieldbus but above the PLC then the PLC must be Siemens S7 400 series.

5.1 In case of a redundant system

The connection of PDM to one fieldbus line, will collect all data including those communicating on the other line.

5.2 Available data through PROFIBUS acyclic communication

Data is organised in slot and index:

5.2.1 Slot = 0

Slot = 0 are read only for manufacturing configuration

Indexes (0 to 47) are listed below.

Index	Data	Description	Byte	Type
0	SERIAL NUMBER	ACTUATOR SERIAL NUMBER	16	STRING
1	PAINT TYPE	PAINT TYPE	16	STRING
2	TYPE OF POWER SUPPLY	(0= 3PH; 1=SINGLE PHASE; 2= DC)	1	BYTE
3	VOLTAGE OF POWER SUPPLY	(IN V)	2	UINT16
4	POWER FREQUENCY	IN HZ	1	UINT8
5	NOMINAL CURRENT	IN A	4	FLOAT 32
6	NOMINAL CURRENT	IN A	4	FLOAT 32
7	MOTOR POWER	IN KW	4	FLOAT 32
8	WIRING DIAGRAM	WIRING DIAGRAM	20	STRING
9	DIMENSIONAL DRAWING	DIMENSIONAL DRAWING	20	STRING
10	LUBRICANT TYPE	LUBRICANT TYPE	20	STRING
11	VOLUME LUBRICANT	(X0.1)	1	UINT8

Index	Data	Description	Byte	Type
12	UNIT OF THE VOLUME	0=LITRE; 1=KG	1	UINT8
13	PROTECTION TYPE	0= WATERPROOF; 1= EXPLOSIONPROOF	1	UINT8
14	IP	0= IP23; 1=IP44; 2=IP55; 3=IP65; 4=IP67; 5=IP68	1	UINT8
15	REGULATION CLASS		1	UINT8
16	RATIO POSITION SENSOR		4	FLOAT 32
17	MAXIMUM TEMPERATURE	IN °C	1	UINT8
18	MINIMUM TEMPERATURE	IN °C	1	SINT8
19	OUTPUT FLANGE ACTUATOR		1	UINT8
20	OUTPUT FORM ACTUATOR		1	UINT8
21	POSITION SENSOR TYPE		1	UINT8
22	PRESENCE OF TORQUE SENSOR		1	UINT8
23	PRESENCE OF BATTERY		1	UINT8
24	LIMIT OF STARTING TORQUE	IN %	1	UINT8

Index	Data	Description	Byte	Type
25	NATURE OF EXPLOSION PROOF		20	STRING
26	APPROVAL OF EXPLOSION PROOF		20	STRING
27	MANUFACTURING DATE	BYTE[0]=DD; BYTE[1]=MM; BYTE[2]=YYXX; BYTE[3]=XXYY	4	UINT8
28	TORQUE CALIBRATION		8	4*UINT16
29	ACTUATOR MAX TORQUE	IN NM	2	UINT16
30	ACTUATOR NOMINAL SPEED	IN RPM	4	UINT8
31	MEASURE OF TORQUE IN LOCAL COMMAND		1	UINT8
32	PRESENCE OF VARIABLE FREQUENCY DRIVER	0=NO; 1=YES	1	UINT8
33	ETALON INPUT OF 4MA	0-4095	2	UINT16
34	ETALON INPUT OF 20MA	0-4095	2	UINT16
35	CONTACTOR TYPE		1	UINT8
36	NUMBER OF MANUFACTURER CONFIGURATION WRITING		4	UINT32

Index	Data	Description	Byte	Type
37	DATE OF LAST MODIFICATION		4	UINT8
38	MAINBOARD SOFTWARE VERSION		3	UINT8
39	HMI BOARD SOFTWARE VERSION		3	UINT8
40	INTELLI BOARD SOFTWARE VERSION		3	UINT8
41	FIELD BUS BOARD VERSION		3	UINT8
42	ACTUATOR MODEL		20	STRING
43	TYPE OF CONTROL	(1=INTELLI+, 0=LOGIC)	1	UINT8
44	MOTOR SPEED	RPM	2	UINT16
45	MOTOR DUTY		1	UINT8
46	TYPE OF ACTUATOR		1	UINT8
47	POSITIONER ACTIVATION		1	UINT8

5.2.2 Slot =1

Slot =1 are read/write (partial) for user configuration
Indexes (0 to 76) are listed below.

Do not write an illegal value, this can cause a malfunction.

Index	Data	Description	Byte	Type
0	TAG NAME		20	STRING
1	LOCATION OR PROCESS		20	STRING
2	OUTPUT FLANGE REDUCER		1	UINT8
3	OUTPUT FORM REDUCER		1	UINT8
4	REDUCER MECHANICAL ADVANTAGE		4	FLOAT 32
5	REDUCER GEAR RATIO		4	FLOAT 32
6	CONFIGURATION OF AUX COMMAND 1		1	UINT8
7	CONFIGURATION OF AUX COMMAND 1		1	UINT8
9	BAND GAP		4	FLOAT 32
10	POSITIONING TYPE		1	UINT8
13	GEARBOX MAXIMUM TORQUE		1	UINT8
14	SCREWPITCH		4	FLOAT 32

Index	Data	Description	Byte	Type
15	MEASURED STROKE IN DEGREES	(READ ONLY)	4	FLOAT 32
16	UNITS	0=METRIC; 1=IMPERIAL	1	UINT8
17	DATE FORMAT	0:MM/JJ/AAAA 1:JJ/MM/AAAA 2:AAAA/MM/JJ	1	UINT8
18	CONFIGURATION BY PASS IN ESD*	0:NO 1:MOTOROVERH EATED 2:TORQUE MAX 3: BOTH	1	UINT8
19	FAULT RELAY CONFIGURATION*: BIT 0: ERROR CONFIGURATION MEMORY BIT1: ERROR ACTIVITY MEMORY BIT2: VALVE JAMMED BIT3: PARTIAL STROKE FAULT BIT 4: PHASE LOST BIT 5: ERROR POSITION BIT 6: ERROR DIRECTION OF ROTATION, CLOSING BIT 7: ERROR DIRECTION OF ROTATION OPENING BIT 8: ERROR BLOCKING IN CLOSING BIT 9: ERROR BLOCKING IN OPENING BIT 10: ACTUATOR HUNTING BIT 11: RTC BATTERY FLAT BIT 12: ERROR POSITION SENSOR BIT 13:ERROR TORQUE SENSOR		4	UINT32

Index	Data	Description	Byte	Type
		BIT 14: LOST OF 4-20MA BIT 15: OVERTRAVEL BIT 16: ELECTRONIC TEMPERATURE EXCESSIVE BIT 17: COMMUNICATION HMI MAIN BOARD BIT 18: MOTOR THERMAL SWITCH BIT 19: HANDWHEEL COMMAND BIT 20: FIELDBUS REDUNDANCY BIT 21: FIELDBUS COMMUNICATION BIT 22: TOO HIGHT VIBRATION BIT 23: LOST OF 24V AUXILIARY BIT 24: TOO MANY STARTS BIT 25: ERROR INTERNAL AUX2 COMMAND BIT 26: ERROR LOST POWER SUPPLY BIT 27: ERROR HMI BUTTON BIT 28: PHASE NOT CONFORM BIT 29: MODE IS LOCAL BIT 30: MODE IS OFF BIT 31 TORQUE PRE ALERT		
20		RELAY CONFIGURATION 1: BIT 0: VALVE IS OPEN BIT 1: VALVE IS CLOSE BIT 2: LIMIT IN OPENING REACHED BIT 3: LIMIT IN CLOSING REACHED BIT 4: IN OPENING BIT 5: IN CLOSING BIT 6: IN MOVE BIT 7: POSITION BETWEEN X AND Y	4	UINT32

Index	Data	Description	Byte	Type
		BIT 8: ESD PRESENCE* BIT 9: MODE IS OFF BIT 10: MODE IS LOCAL BIT 11: MODE IS REMOTE BIT 12: MID STOP BIT 13: MOTOR OVERHEATED BIT 14: VALVE BLOCKED BIT 15: PHASE LOST BIT 16: PRESENCE OF PRINCIPAL POWER SUPPLY BIT 17: HANDWHEEL COMMAND BIT 18: COMMAND BUS OR HARDWIRED BIT 19: OVERTORQUE BIT 20: BATTERY FLAT* BIT 21: IN PARTIAL STROKE* BIT 22: PARTIAL STROKE FAULT* BIT 23: MAINTENANCE* BIT 24: FUNCTION CHECK* BIT 25: OUT OF SPECIFICATION* BIT 26: FAILURE* BIT 27: ANALOG SETPOINT LOST BIT 28: SENSE OF RELAY (0 NO, 1 NC) BIT 29: BLINKING		
21	RELAY CONFIGURATION 2	IDEM	4	UINT32
22	RELAY CONFIGURATION 3	IDEM	4	UINT32
23	RELAY CONFIGURATION 4	IDEM	4	UINT32

Index	Data	Description	Byte	Type
24	RELAY CONFIGURATION 5	IDEM	4	UINT32
25	RELAY CONFIGURATION 6	IDEM	4	UINT32
26	RELAY CONFIGURATION 7	IDEM		
27	SENSE OF REMOTE COMMANDS		1	UINT8
28	LIMIT BTO TORQUE	40 TO 101	4	UINT32
29	LIMIT RTO TORQUE	40 TO 100	4	UINT32
30	LIMIT ETO TORQUE	40 TO 100	4	UINT32
31	LIMIT BTC TORQUE	40 TO 101	4	UINT32
32	LIMIT RTC TORQUE	40 TO 100	4	UINT32
33	LIMIT ETC TORQUE	40 TO 100	4	UINT32
34	BUS TYPE	(READ ONLY) 0:FIELDBUS BOARD NOT PRESENT 1:MODBUS 2:PROFIBUS SIMPLE 3:PROFIBUS REDUNDANT 4:DEVICENET 5:FF 6:CAN	1	UINT8
35	DISPLAY ORIENTATION	0=0°;1=90°;2=180°;3=270°	1	UINT8
36	DISPLAY LANGUAGE		1	UINT8

Index	Data	Description	Byte	Type
37	CLOSING/OPENING ZONE	3 TO 20	1	UINT8
38	NAMUR CONFIGURATION NE107		20	UINT8
39	PASSWORD 1	FOR READ ONLY (0 TO 999)	2	UINT16
40	PASSWORD 2	FOR READ WRITE (0 TO 999)	2	UINT16
41	START POSITION OF PARTIAL STROKE*	0= OPEN; 1= CLOSE	1	UINT8
42	STROKE PERCENTAGE OF PARTIAL STROKE*	1 TO 100	1	UINT8
43	PRIORITY	PRIORITY 0:NONE 1:OPENING 2:CLOSING 3:BOTH (OPENING AND CLOSING)	1	UINT8
44	SELF LEARNING POSITIONNING	0: DISABLE 1: ENABLE	1	UINT8
45	TIMING IN CLOSING*	IN S	2	UINT16
46	TIMING IN OPENING*	IN S	2	UINT16
47	TYPE OF HALT IN CLOSING	0:TORQUE 1:POSITION	1	UINT8
48	TYPE OF HALT IN OPENING	0:TORQUE 1:POSITION	1	UINT8

Index	Data	Description	Byte	Type
49	DIRECTION OF CLOSING	0: CW 1: CCW	1	UINT8
50	TYPE AND SENSE OF INPUT ANALOG SIGNAL	0: 4-20MA 1: 20-4MA 2: 4-12MA 3: 12-4MA 4: 12-20MA 5: 20-12MA 6: 0-20MA/0-10V 7: 20-0MA/10-0V	1	UINT8
51	TYPE AND SENS OF ANALOG OUTPUT SIGNAL		1	UINT8
52	NUMBER OF USER CONFIGURATION WRITING	(READ ONLY)	4	UINT32
53	DATE OF LAST MODIFICATION OF USER CONFIG.	(READ ONLY)	4	4XUINT8
54	LED COLOR	0=RED-CLOSE; 1=RED OPEN	1	UINT8
55	CONFIG AUTO OR ONOFF	(READ ONLY)	1	UINT8
56	SECURITY POSITION ANALOG LOSS	0: OPEN 1: CLOSE 2: STAYPUT	1	UINT8
57	SECURITY POSITION PROFIBUS LOSS	0: OPEN 1: CLOSE 2: STAYPUT	1	UINT8

Index	Data	Description	Byte	Type
58	START OF TIMING ZONE IN CLOSING*	0-100	1	UINT8
59	END OF TIMING ZONE IN CLOSING*	0-100	1	UINT8
60	START OF TIMING ZONE IN OPENING*	0-100	1	UINT8
61	END OF TIMING ZONE IN OPENING*	0-100	1	UINT8
62	XY CONFIGURATION FOR RELAY 1	X=TAB[0], Y=TAB[1]	2	2XUINT8
63	XY CONFIGURATION FOR RELAY 2	X=TAB[0], Y=TAB[1]	2	2XUINT8
64	XY CONFIGURATION FOR RELAY 3	X=TAB[0], Y=TAB[1]	2	2XUINT8
65	XY CONFIGURATION FOR RELAY 4	X=TAB[0], Y=TAB[1]	2	2XUINT8
66	XY CONFIGURATION FOR RELAY 5	X=TAB[0], Y=TAB[1]	2	2XUINT8
67	XY CONFIGURATION FOR RELAY 6	X=TAB[0], Y=TAB[1]	2	2XUINT8
68	XY CONFIGURATION FOR RELAY 7	X=TAB[0], Y=TAB[1]	2	2XUINT8
69	BUS COMMAND OR HARDWIRED COMMANDS		1	UINT8
70	CONFIG LOCAL COMMAND TYPE		1	UINT8
71	DATE AND TIME*	POSIX FORMAT	4	SINT32

Index	Data	Description	Byte	Type
72	PROFIBUS ADDRESS	(READ ONLY)	1	UINT8
73	TYPE OF HALT ON TORQUE		1	UINT8
74	CONFIGURATION ESD FIELDBUS COMMAND		1	UINT8
75	CONFIGURATION ESD FIELDBUS COMMAND*		1	UINT8
76	CONFIGURATION ESD HW COMMAND*		1	UINT8

* Only available with Intelli+ control

5.2.3 Slot =2

Slot =2 are read only for status
Indexes (0 to 18) are listed below.

Index	Data	Description	Byte	Type
0	INDICATION ADDRESS 0	REPLICATE THE DATA OF THE CYCLIC REGISTER	1	UINT8
1	INDICATION ADDRESS 1	REPLICATE THE DATA OF THE CYCLIC REGISTER	1	UINT8
2	INDICATION ADDRESS 2	REPLICATE THE DATA OF THE CYCLIC REGISTER	1	UINT8
3	INDICATION ADDRESS 3	REPLICATE THE DATA OF THE CYCLIC REGISTER	1	UINT8
4	INDICATION ADDRESS 4-5	REPLICATE THE DATA OF THE CYCLIC REGISTER	2	UINT16
5	INDICATION ADDRESS 6	REPLICATE THE DATA OF THE CYCLIC REGISTER	1	UINT8
6	INDICATION ADDRESS 7	REPLICATE THE DATA OF THE CYCLIC REGISTER	1	UINT8
7	INDICATION ADDRESS 8	REPLICATE THE DATA OF THE CYCLIC REGISTER	1	UINT8
8	INDICATION ADDRESS 9-10	REPLICATE THE DATA OF THE CYCLIC REGISTER	2	UINT16

Index	Data	Description	Byte	Type
9	INDICATION ADDRESS 11	REPLICATE THE DATA OF THE CYCLIC REGISTER	1	UINT8
10	INDICATION ADDRESS 12-13	REPLICATE THE DATA OF THE CYCLIC REGISTER	2	UINT16
11	INDICATION ADDRESS 14-17	REPLICATE THE DATA OF THE CYCLIC REGISTER	4	UINT32
12	INDICATION ADDRESS 18-21	REPLICATE THE DATA OF THE CYCLIC REGISTER	4	UINT32
13	INDICATION ADDRESS 22-25	REPLICATE THE DATA OF THE CYCLIC REGISTER	4	UINT32
14	INDICATION ADDRESS 26-29	REPLICATE THE DATA OF THE CYCLIC REGISTER	4	UINT32
15	OPENING TORQUE CURVE	LAST OPENING TORQUE CURVE	201	UINT8[]
16	CLOSING TORQUE CURVE	LAST OPENING TORQUE CURVE	201	UINT8[]
17	TEMPERATURE LOG	TEMPERATURE LOG H-1 TO H-240	240	UINT8[]
18	TEMPERATURE LOG ACTIVITY LOG	NUMBER OF START PR HOUR LOG H-1 TO H-120	240	UINT16[]

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