BIFFI
tyco flow control

ICON 2000

ELECTRIC ACTUATOR

Section 618/5

Operating and configuration

Optional module #1 (AOC)

- 7 additional output contacts (AS5,…,AS11)

Optional module #2 (APTM)

- 4-20mA output + 3 additional output contacts (AS5, AS6, AS7) + 2 interlock inputs

Optional module #3 (PSM)

- 4-20mA output + 4-20mA input + 3 additional output relays (AS5, AS6, AS7) + 2 interlock inputs

Optional module #4 (LON)

- LonWorks fieldbus interface

Optional module #5 (PRO-DP)

- Profibus DP fieldbus interface

Optional module #6 (MOD-RTU)

- Modbus RTU fieldbus interface

Optional module #7 (APTM1)

- 4-20mA output + 3 additional output relays (AS5, AS6, AS7) + 1 changeover output contact (AS8) + 2 interlock inputs

Optional module #8 (PSM1)

- 4-20mA output + 4-20mA input + 3 additional output contacts (AS5, AS6, AS7) + 1 changeover output contact (AS8) + 2 interlock inputs

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Contents may change without notice

NOTES:

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REVISION LIST

3	29-04-02	Interlock with local (base SW ver. >2.5)	G. R.	A. A.
2	11-10-01	Lon variables	G. R.	A. A.
1	05-09-01	issue	G. R.	A. A.
Rev.	Date	Description	Prepared	Approved

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Contents may change without notice

1. BASE VERSION

The **base version** of **ICON 2000** is provided with the following input and output lines available for remote control and signalling:

- **Output contacts**
  - **1** Changeover contact of monitor relay MR
  - **4** Contacts AS1, AS2, AS3, AS4 of latching relays
- **Input controls**
  - **1** Input for remote STOP control
  - **1** Input for remote OPEN control
  - **1** Input for remote CLOSE control
  - **1** Input for remote AUTO/MAN or BUS ENABLE control
  - **1** Input for remote ESD control

Features and configuration procedures of the above controls are described in the ICON 2000 instruction handbook MAN 618, section 2.

OPTIONAL MODULES can be installed on **ICON 2000** to

- increase the number of output contacts
- add the INTERLOCK controls
- add the 4-20 mA input
- add the 4-20 mA output
- add BUS control capability

The following **OPTIONAL MODULES** are available:

- **Optional module #1 (AOC)** to add **:** 7 additional output contacts (from AS5 to AS11)
- **Optional module #2 (APTM)** to add : 4-20mA output , 3 additional output contacts (AS5, AS6, AS7) , 2 interlock inputs
- **Optional module #3 (PSM)** to add : 4-20mA output , 4-20mA input , 3 additional output relays (AS5, AS6, AS7) , 2 interlock inputs
- **Optional module #4 (LON)** to add : LonWorks fieldbus interface
- **Optional module #5 (PRO-DP)** to add : Profibus DP fieldbus interface
- **Optional module #6 (MOD-RTU)** to add : Modbus RTU fieldbus interface
- **Optional module #7 (APTM1)** to add : 4-20mA output , 3 additional output relays (AS5, AS6, AS7) , 1 changeover output contact (AS8) , 2 interlock inputs
- **Optional module #8 (PSM1)** to add : 4-20mA output , 4-20mA input , 3 additional output contacts (AS5, AS6, AS7) , 1 changeover output contact (AS8) , 2 interlock inputs

The following chapters give operating and configuration instructions relevant to the above optional modules.

2. OPTIONAL MODULE #1 (AOC)

• additional output contacts (AS5,…,AS11)

The standard version of ICON 2000 provides **4 auxiliary output contacts.** By this module, **further 7 output contacts** are available on the terminal board of the actuator. Each contact is controlled by a latching relay. Each relay is configurable to "make" or "break" the output contact when a configurable condition occurs. The contact rating of each relay is the same of AS1, AS2, AS3, AS4 (see section 618/2, chapter E , par. 6.2 Output contacts).
The procedure to configure the action of the contact and the condition associated to the relay is described in the manual 618 section 2, chapter I , par. 1.6 , Auxiliary relays AS1, 2, 3, 4 .
With the AOC module, the **output contacts** available on the actuator terminal board are:

- **1 :** Changeover contact of monitor relay
- **11 :** Contacts AS1, AS2,…, AS11 of latching relays

If the actuator is provided with **alkaline battery** (or supplied by the auxiliary 24VDC) and if the condition associated to relays is one off "open limit, close limit, position <xx% , position <xx%, mid-travel position, low battery, manual operation", the status of AS1,…,AS11 contacts will be updated also if the **main voltage fails**.
The following tables show the configuration of relays when **default # 1** or **default # 2** is selected:

DEFAULT # 1

Auxiliary relays

AS1 : open limit ; make	*AS7 : remote selected ; make*
AS2 : close limit ; make	*AS8 : overtorque in OP; make*
AS3 : position > 90% ; make	*AS9 : overtorque in CL; make*
AS4 : position < 10% ; make	*AS10 : jammed valve ; make*
AS5 : local selected ; make	*AS11 : ESD ; make*
AS6 : motor running ; make	

DEFAULT # 2

Auxiliary relays

AS1 : open limit ; break	*AS7 : warning ; make*
AS2 : close limit ; break	*AS8 : local selected ; make*
AS3 : position > 95% ; break	*AS9 : jammed valve ; make*
AS4 : position < 5% ; break	*AS10 : overtorque ; make*
AS5 : motor running ; make	*AS11 : motor overtemp. ;make*
AS6 : remote selected ; make	

3. OPTIONAL MODULE #2 (APTM)

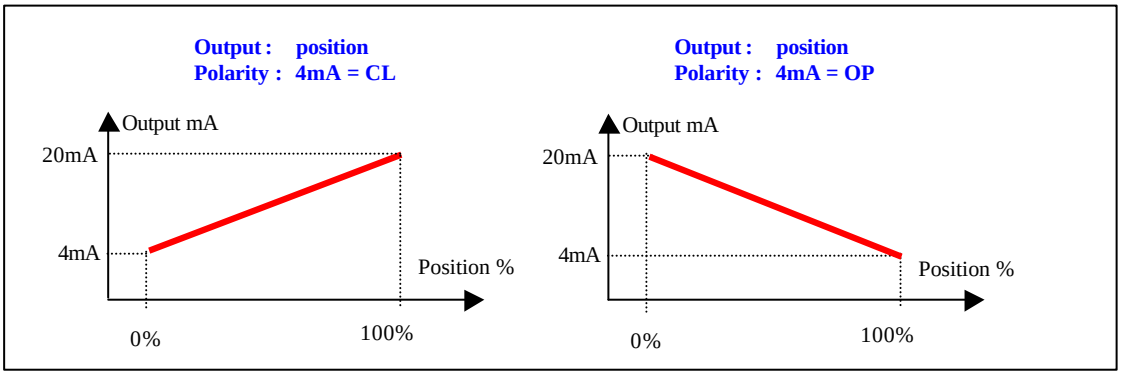
• 4-20mA output + 3 additional output contacts (AS5, AS6, AS7) + 2 interlock inputs

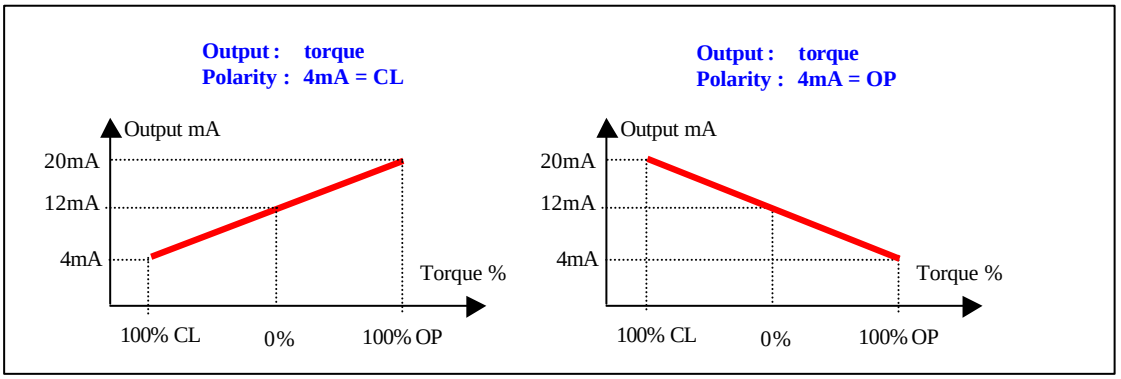
By the above module the following inputs and outputs are available on the actuator terminal board:

- 1 4-20mA output
- 3 additional output contacts AS5, AS6, AS7
- 2 interlock inputs

3.1. 4-20mA output

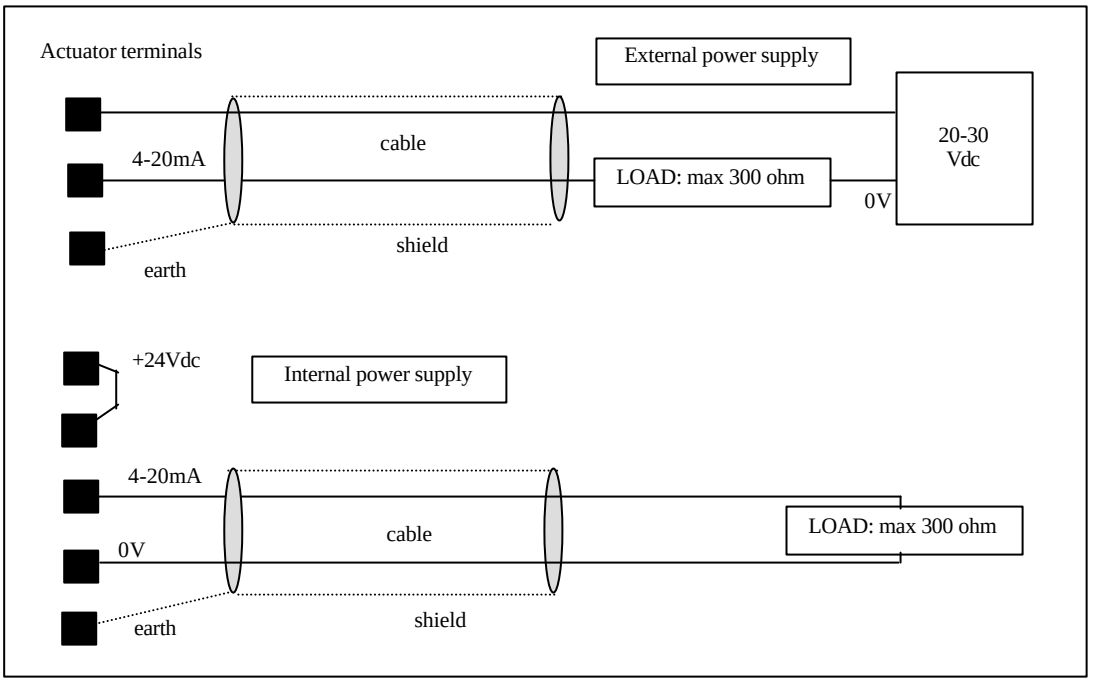
The 4-20mA output can be configured to provide a signal proportional to either "position" or "torque". The polarity option allows choosing the current value, which corresponds to open and close direction, according to the following diagrams.





The maximum load, including the cable resistance, should be less than 300 ohm. In both cases when the mains fails, the 4-20mA output fall down to 0.
The 4-20mA output is opto-coupled. It should be powered by a 20-30 Vdc voltage , externally or internally generated. In both cases, **when the main voltage fails, also the 4-20mA output drops to 0.** The correct output will be restored when the main voltage returns.

The below figure shows the wiring diagram:



Configuration procedure:

- *Move the local selector to OFF and then press simultaneously OPEN and STOP. Select the language and then enter the password according to the instructions "entering the set-up mode". When the message of display is "SET-UP MODE OK?" press YES. Press YES to select actuator set-up menu, press NO to scroll the list of available routines and then press YES to select* ***Out 4-20 mA.***
- *Press YES if the output is correct (POSITION or TORQUE), or press NO to change, then press YES.*
- *Press YES if the polarity is correct, or press NO to change, then press YES.*

View procedure:

- *Move the local selector to OFF and then press simultaneously OPEN and STOP. Select the language and then enter the password according to the instructions "entering the view mode". When the message of display is "VIEW MODE OK?" press YES. Press YES to select actuator set-up menu, press NO to scroll the list of available routines and then press YES to select* ***the routine (OUT 4-20 mA)*** *.*
- *Press YES to scroll the list of parameters.*

3.2. Additional output contacts AS5, AS6, AS7

The standard version of ICON 2000 provides **4 auxiliary output contacts**. By this module **further 3 output contacts** are available on the terminal board of the actuator. Each contact is controlled by a latching relay. Each relay is configurable to "make" or "break" the output contact when a configurable condition occurs. The contact rating of each relay is the same

of AS1, AS2, AS3, AS4 (see section 618/2, chapter E , par. 6.2 Output contacts).
The procedure to configure the action of the contact and the condition associated to the relay is described in the section 618/2, chapter I , par. 1.6 , Auxiliary relays AS1, 2, 3, 4 .
With he APTM module, the **output contacts** available on the actuator terminal board are:

- **1 :** Changeover contact of monitor relay
- **7 :** Contacts AS1, AS2,…, AS7 of latching relays

If the actuator is provided with **alkaline battery** (or supplied by the auxiliary 24VDC) and if the condition associated to relays is one off "open limit, close limit, position <xx% , position <xx%, mid-travel position, low battery, manual operation", the status of contacts will be updated also if the **main voltage is off.**
The following tables show the configuration of relays when **default # 1** or **default # 2** is selected:

3.3. Default #1 and #2 setting

DEFAULT # 1

Auxiliary relays

AS1 : open limit	*; make*	*AS5 : motor running*	*; make*
AS2 : close limit	*; make*	*AS6 : overtorque*	*; make*
AS3 : position > 90%	*; make*	*AS7 : ESD*	*; make*
AS4 : position < 10%	*; make*		

DEFAULT # 2

Auxiliary relays

AS1 : open limit	*; break*	*AS5 : motor running*	*; make*
AS2 : close limit	*; break*	*AS6 : remote selected*	*; make*
AS3 : position > 95%	*; break*	*AS7 : warning*	*; make*
AS4 : position < 5%	*; break*		

3.4. Interlock inputs

Two additional inputs are available to inhibit actuator movement in open or close direction. The controls are momentary, it means that the inhibit action continues until the relevant signal is present.
The ESD control overrides the interlock controls. The following options can be configured:

- interlock OP : active when signal is *PRESENT* , active when signal is *ABSENT*, no action (*OFF)*
- interlock CL : active when signal is *PRESENT* , active when signal is *ABSENT*, no action (*OFF)*

The interlock inputs are opto-coupled. The circuits associated to the inputs can be supplied by the internally generated 24VDC or by an external 20-125VDC or 20-120VAC (50/60Hz).
The signal levels are the following:

- Minimum ON signal > 20 VDC or 20 VAC (50/60Hz)
- Maximum ON signal < 125 VDC or 120 VAC (50/60Hz)
- Maximum OFF signal < 3 VDC or VAC
- Minimum signal duration > 300 ms.
- Total current drawn from remote controls < 20mA

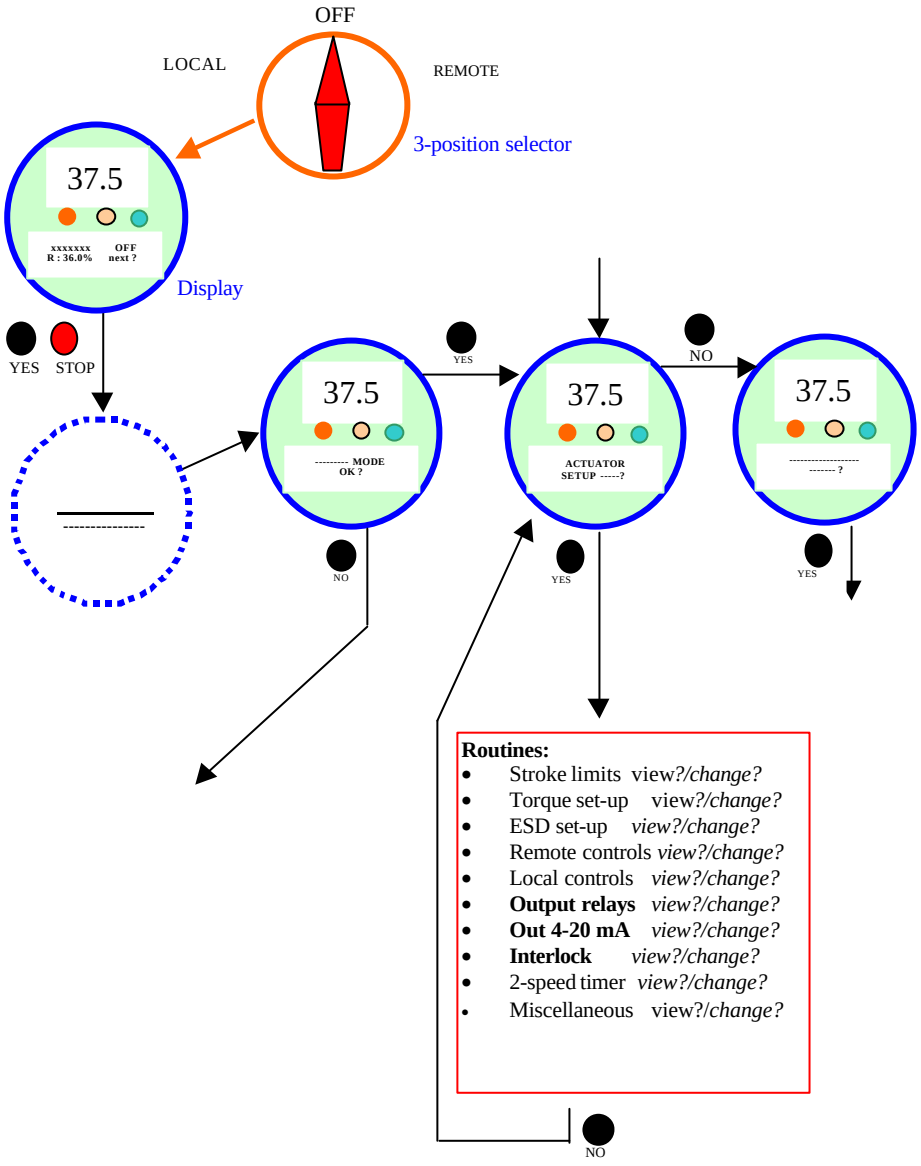
Configuration procedure:

- *Move the local selector to OFF and then press simultaneously OPEN and STOP. Select the language and then enter the password according to the instructions "entering the set-up mode". When the message of display is "SET-UP MODE OK?" press YES. Press YES to select actuator set-up menu, press NO to scroll the list of available routines and then press YES to select* ***INTERLOCKS****.*
- *Press YES if the configured value of the Open Interlock is correct (PRESENT, ABSENT, OFF), or press NO to change, then press YES.*
- *Press YES if the configured value of the Open Interlock is correct (PRESENT, ABSENT, OFF), or press NO to change, then press YES.*

View procedure:

- *Move the local selector to OFF and then press simultaneously OPEN and STOP. Select the language and then enter the password according to the instructions "entering the view mode". When the message of display is "VIEW MODE OK?" press YES. Press YES to select actuator set-up menu, press NO to scroll the list of available routines and then press YES to select* ***the routine (INTERLOCKS)*** *.*
- *Press YES to scroll the list of parameters.*

The figure below shows the list of routines available in the actuator setup function of the ICON 2000 **view or setup menu** when OPTIONAL MODULE #2 is used. (see: man 618, section 2, chap H/G, view and setup menu).



4. OPTIONAL MODULE #3 (PSM)

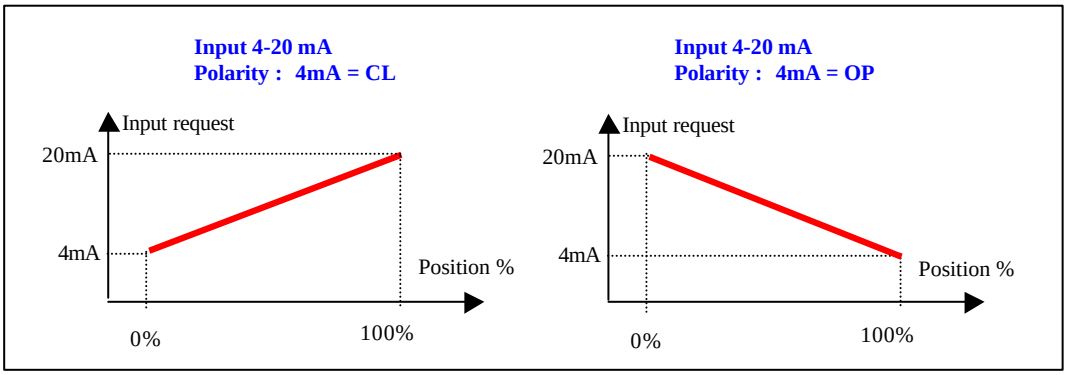
- **4-20mA input + 4-20mA output + 3 additional output relays (AS5, AS6, AS7) + 2 interlock inputs**

In comparison with the OPTIONAL MODULE #2 , the OPTIONAL MODULE #3 has an additional **4-20mA input.** This is used as input of the **position request** signal in **modulating** actuators. **4mA** corresponds to request **R% = 0%** = valve closed and **20mA** corresponds to request **R%= 100%** = valve open. The relationship between **position** and **request signals** can be reversed by the "Polarity" function. Here below are described the functions available with the module.

4.1. Positioner function

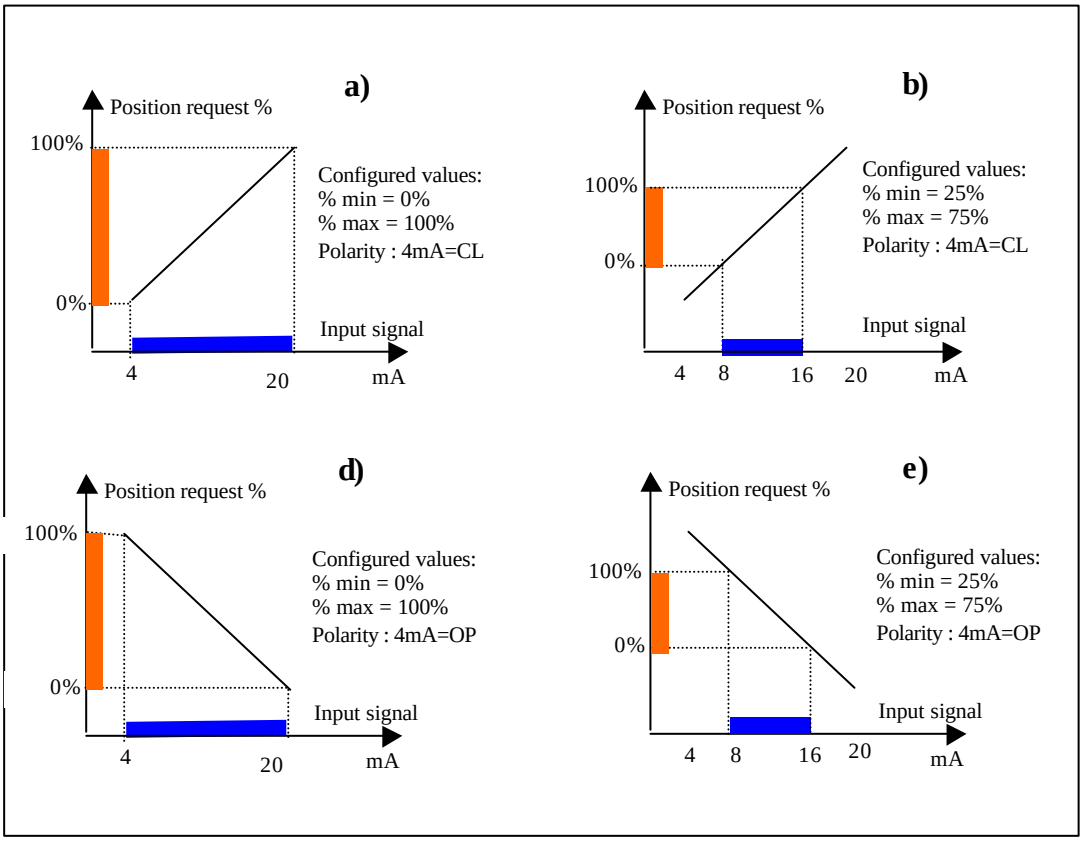
The positioning function of the ICON 2000 compares the **present actuator position %** with the **position request R%** and if the difference is greater than the **dead band** , the actuator is driven to reach the new requested position. The following options can be configured via local operator interface:

- dead band: configurable from 0.1% to 25.5% of the maximum position error (difference among position request % and present position %). The configured value should be great enough to avoid "hunting" effect of the actuator.
- Polarity of the 4-20mA position request signal: it allows to choose the current value which corresponds to a **request** to fully open or fully close the valve , according to the following diagrams.



- Motion inhibit time: it allows to adjust the length of the delay time between two cycle of the motor . It can be configured from 1 to 255 sec and allows to set the maximum number of start / hour of electrical motor.
- 4-20 mA input signal range (% min and % max): it allows to change the relationship between the input signal and the **position request %**. This function is useful when a single 4-20ma signal is used to control the position of 2 valves (e.g. : split range applications). The below curves clarify the use of the function:

example a): with input signal = 4 mA , the position request is 0% and the actuator is driven to close. With input signal = 20 mA, the position request is 100% and the actuator is driven to open. With input signal = 12 mA the position request is 50% and the actuator is driven to reach the position 50%.
example b): with input signal < 8 mA , the position request is 0% and the actuator is driven to close. With input signal = 16 mA, the position request is 100% and the actuator is driven to open. With input signal = 12 mA the position request is 50% and the actuator is driven to reach the position 50%.
example c): with input signal = 4 mA , the position request is 100% and the actuator is driven to open. With input signal = 20 mA , the position request is 0% and the actuator is driven to close. With input signal = 12 mA the position request is 50% and the actuator is driven to reach the position 50%.
example d): with input signal < 8 mA , the position request is 100% and the actuator is driven to open. With input signal = 16 mA , the position request is 0% and the actuator is driven to close. With input signal = 12 mA the position request is 50% and the actuator is driven to reach the position 50%.



The above function is useful when a single 4-20ma signal is used to control the position of 2 valves (e.g. : split range applications)

Configuration procedure:

- *Move the local selector to OFF and then press simultaneously OPEN and STOP. Select the language and then enter the password according to the instructions "entering the set-up mode". When the message of display is "SET-UP MODE OK?" press YES. Press YES to select actuator set-up menu, press*

*NO to scroll the list of available routines and then press YES to select **POSITIONER**.*

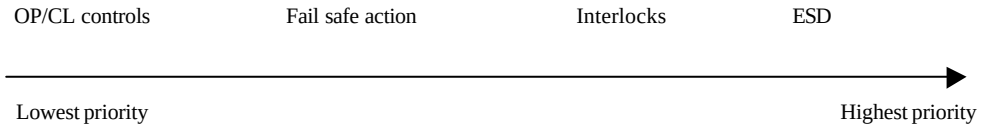
- *Press YES if the configured value of the Dead Band is correct (from 0 to 25.5%), or press NO to change, then press YES.*
- *Press YES if the configured value of the Polarity is correct (4mA=CL or 4mA=OP), or press NO to change, then press YES.*
- *Press YES if the configured value of the Motion Inhibit Time is correct (from 0 to 255 sec), or press NO to change, then press YES.*
- *Press YES if the configured value of the R% MIN is correct (from 0 to 75%), or press NO to change, then press YES.*
- *Press YES if the configured value of the R% MAX is correct (from 25 to 100%), or press NO to change, then press YES. The difference among R% MAX and R% MIN should be greater than 25%*

View procedure:

- *Move the local selector to OFF and then press simultaneously OPEN and STOP. Select the language and then enter the password according to the instructions "entering the view mode". When the message of display is "VIEW MODE OK?" press YES. Press YES to select actuator set-up menu, press NO to scroll the list of available routines and then press YES to select **the routine (POSITIONER)** .*
- *Press YES to scroll the list of parameters.*

4.2. Fail safe function

This function configures the action of the actuator in case of loss of the 4-20 mA input signal. The action takes place only if the local selector is in REMOTE and if the positioning function is operating. When the 4-20 mA signal restores, also the actuator restores at its normal functioning. The Interlock and ESD controls override the Fail Safe action according to the following diagram.



The following options can be configured:

- Fail safe action: open, close, stay-put, go to position %, no action (OFF)
- Length of the delay time before than the fail safe action takes place

Configuration procedure:

- *Move the local selector to OFF and then press simultaneously OPEN and STOP. Select the language and then enter the password according to the instructions "entering the set-up mode". When the message of display is "SET-UP MODE OK?" press YES. Press YES to select actuator set-up menu, press NO to scroll the list of available routines and then press YES to select **FAIL SAFE**.*
- *Press YES if the configured ACTION is correct (open, close, stay-put, go to position xx% , off), or press NO to change, then press YES.*

- *Press YES if the configured value of the DELAY is correct (from 0 to 255 sec), or press NO to change, then press YES.*

View procedure:

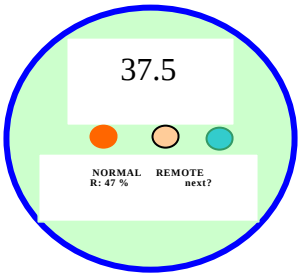
- *Move the local selector to OFF and then press simultaneously OPEN and STOP. Select the language and then enter the password according to the instructions "entering the view mode". When the message of display is "VIEW MODE OK?" press YES. Press YES to select actuator set-up menu, press NO to scroll the list of available routines and then press YES to select* ***the routine (FAIL SAFE)*** .
- *Press YES to scroll the list of parameters.*

4.3. Out. 4-20 mA, aux. out. contacts, interlock inp.

The features of these functions are described in the "OPTIONAL MODULE #2" (APTM).

4.4. LED and display indication

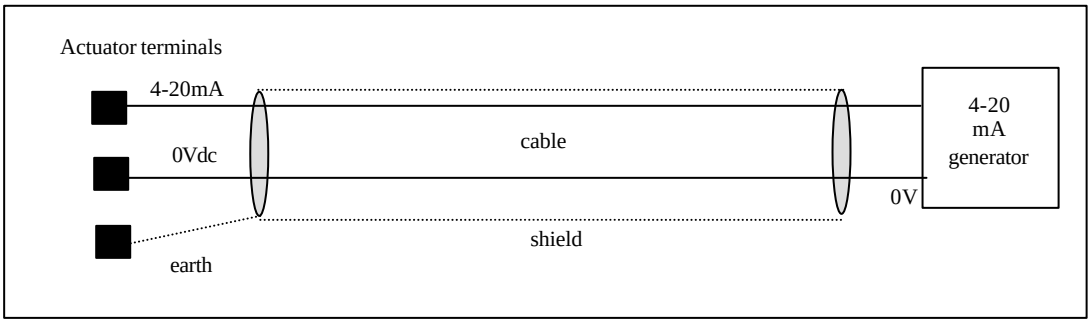
When the positioning function is working, the **alpha-numeric display** indicates the value of the **position request in % (R%: xx.x)**



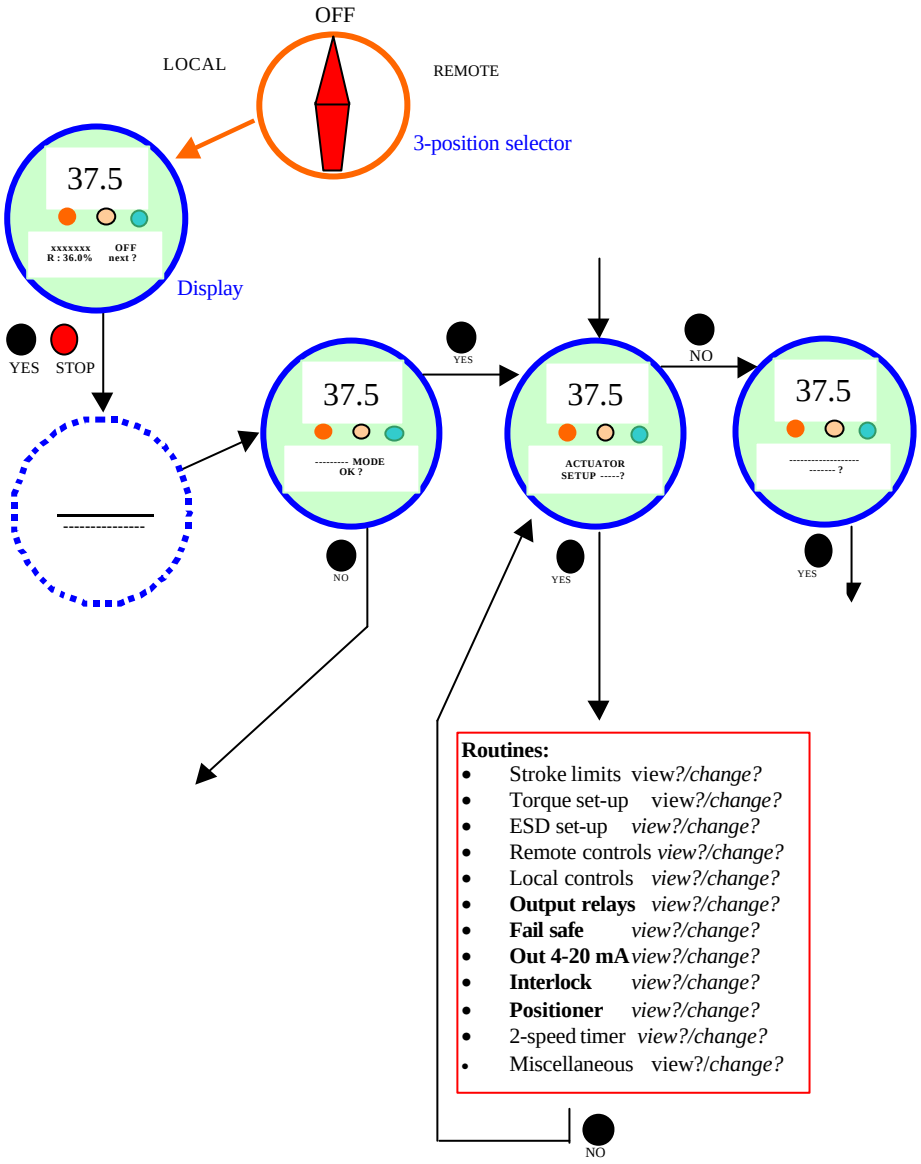
The loss of the position request signal is indicated as follows:

- Change-over of the monitor relay
- Alarm LED on
- List of ALARMS (see Man 618, section 2 chap.F, Local operator interface)
- Alarm log

The 4-20 mA input is opto-coupled. The input impedance is less than 250 ohm. The figure below shows the wiring diagram:



The figure below shows the list of routines available in the actuator setup function of the ICON 2000 **view or setup menu** when OPTIONAL MODULE #3 is used. (see man 618, section 2, chap H/G, view and setup menu).



5. OPTIONAL MODULE #4 (LON)

• LonWorks Interface

The LonWorks interface is an additional module that allows to connect the **ICON 2000 to a LonWorks fieldbus**. The module can be used with either the **base version** or one off **"OPTION#1, #2, #3, #7, #8**" of ICON 2000. Here below are described only the features available by the **view and setup** menu of ICON 2000. See instruction manuals of **DCM master station** for the information about the exchanged data and LonWorks bus operations. Bus configuration can be done via DCM. The following operation (FDI control) is necessary only if the FDI function has been triggered.

5.1. FDI control

- Node type: Master A, Master B, Slave
- Address mode: Domain Wide, Domain 2 Wide, Domain Subnet Wide, Domain 2 Subnet Wide Loop
- Time : from 100 to 1000
- Control mode: FDI enable all, FDI disable all, FDI disable, FDI enable
- Relay status :

  Network A : ON Net, ON Term
  Network B : ON Net, ON Term

Restoring procedure:

- *Move the local selector to OFF and then press simultaneously OPEN and STOP. Select the language and then enter the password according to the instructions "entering the set-up mode". When the message of display is "SET-UP MODE OK?" press YES. Press YES to select actuator set-up menu, press NO to scroll the list of available routines and then press YES to select* ***FDI CONTROL****.*
- *Press YES if the NODE TYPE is correct, or press NO to change, then press YES.*
- *Press YES if the ADDRESS MODE is correct, or press NO to change, then press YES.*
- *Press YES if the LOOP TIME is correct, or press NO to change, then press YES.*
- *Press YES to change the CONTROL MODE or press NO to skip to RELAYS status.*
- *Press YES or NO to select the correct FDI option*
- *Press YES to change the RELAY status or NO to return to FDI CONTROL.*
- *Press YES or NO to select the correct RELAY option*

View procedure:

- *Move the local selector to OFF and then press simultaneously OPEN and STOP. Select the language and then enter the password according to the instructions "entering the view mode". When the message of display is "VIEW MODE OK?" press YES. Press YES to select actuator set-up menu, press NO to scroll the list of available routines and then press YES to select* ***FDI CONTROL****.*

- *Press YES to scroll the list of FDI CONTROL parameters*

5.2. Positioner function

The function is available only on the **modulating actuators**. The **value 0** of position request, received from bus, corresponds to the request **R%** = 0% = valve fully closed , and the **value 1000** corresponds to the request **R%** = 100% = valve fully open. The ICON 2000 compares the **present position %** of the actuator with the **position request R%, received from the bus**, and if the difference is greater than the **dead band** , the actuator is driven to reach the new requested position.
The following options can be configured via either bus or local operator interface:

- dead band: configurable from "position resolution%" to 25.5% of the maximum position error (difference among position request % and present position %). The configured value should be great enough to avoid "hunting" effect of the actuator.
- Motion inhibit time: it allows to adjust the length of the delay time between two cycle of the motor . It can be configured from 1 to 255 sec and allows to set the maximum number of start / hour of electrical motor.

Configuration procedure:

- *Move the local selector to OFF and then press simultaneously OPEN and STOP. Select the language and then enter the password according to the instructions "entering the set-up mode". When the message of display is "SET-UP MODE OK?" press YES. Press YES to select actuator set-up menu, press NO to scroll the list of available routines and then press YES to select* ***POSITIONER****.*
- *Press YES if the configured value of the Dead Band is correct (from position resolution% to 25.5%), or press NO to change, then press YES.*
- *Press YES if the configured value of the Motion Inhibit Time is correct (from 1 to 255 sec), or press NO to change, then press YES.*

View procedure:

- *Move the local selector to OFF and then press simultaneously OPEN and STOP. Select the language and then enter the password according to the instructions "entering the view mode". When the message of display is "VIEW MODE OK?" press YES. Press YES to select actuator set-up menu, press NO to scroll the list of available routines and then press YES to select* ***the routine (POSITIONER)*** *.*
- *Press YES to scroll the list of parameters.*

5.3. Viewing transmission info

The following procedure allows to see the most significant info relevant to bus data transmission:

- Neuron ID — 6-byte unique identifier assigned by the manufacturer of the Neuron Chip
- Transmit Error — number of CRC errors detected during packet reception
- Transaction Timeout — number of times that the node failed to receive expected responses
- Received Transaction Full — number of time that an incoming packet was discarded
- Lost Messages — number of time that an incoming packet was discarded due to slow processing
- Missed Messages — number of time that an incoming packet was discarded due to excess traffic
- Reset Cause — Code of the last reset cause:

Clear	0
Power up	1
External reset	2
Watchdog	12
Software reset	20

- Node State — Code of the current node state:

Unconfigured	2
Applicationless	3
Configured on-line	4
Configured, hard off-line	6
Configured, soft off-line	12
Configured, bypass off-line	140

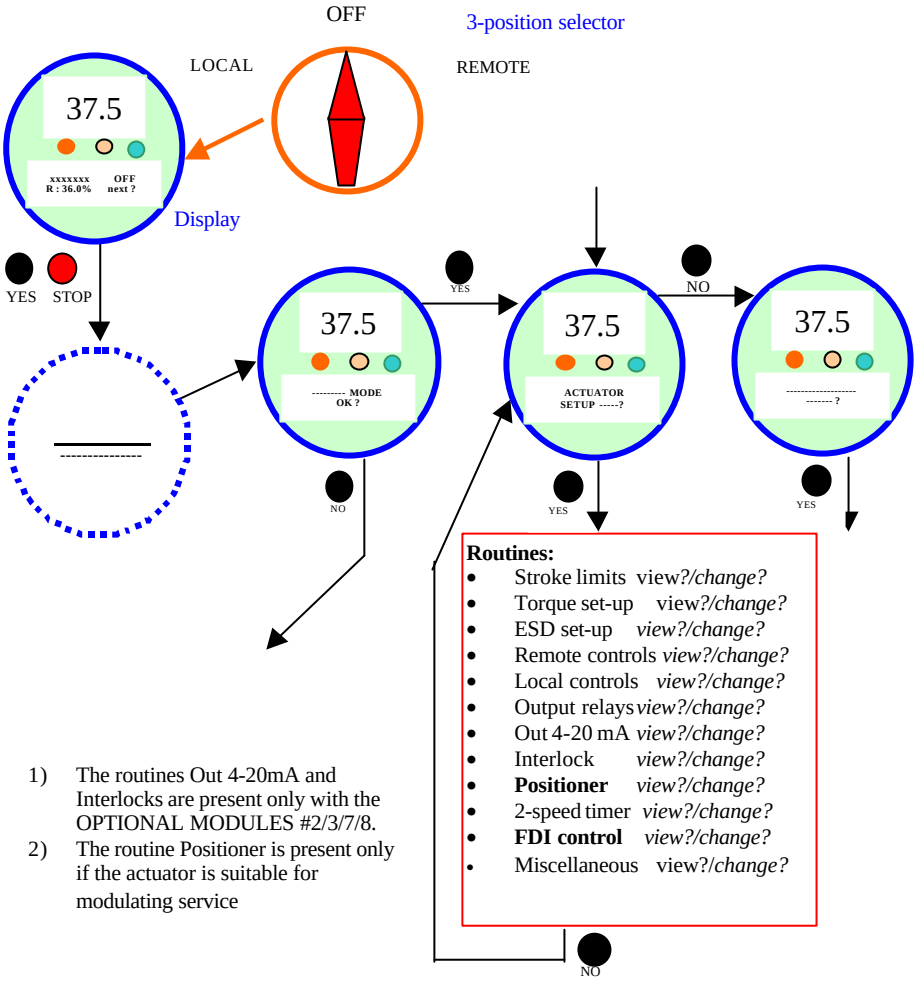
- Last Error Log — Code of the last error detected

No error	0

- Model Number — Set to 0

- *Move the local selector to OFF or REMOTE and then press YES until the display shows NODE REPORT. Press NO to skip to FDI report or press YES to scroll the list of transmission info. Press YES to **reset** the bus interface card or press NO to skip. Press YES to **clear** the node status or press NO to skip.*
- *Press YES to scroll the FDI report or press NO to exit*

The figure below shows the list of routines available in the actuator setup function of the ICON 2000 **view or setup menu** when OPTIONAL MODULE #4 is used. (see man 618, section 2, chap H/G, view and setup menu).



1) The routines Out 4-20mA and Interlocks are present only with the OPTIONAL MODULES #2/3/7/8.
2) The routine Positioner is present only if the actuator is suitable for modulating service

5.4. Local controls of bus interface

- Service pin: place the selector in REMOTE and then push STOP

5.5. Communication variables

The following tables describe the Communication profile of the ICON200 LonWorks interface. It has been designed to make it interchangeable with the previous ICON actuator and for this reason a few communication objects that are still present in the communication profile are not applicable.

- Actuator runtime input variables

Types, units, ranges and definition

nv #	nv name	nv type	Units	Min	Max	Comments
0	nviDriveOpen	SNVT_lev_disc	-	ST_OFF	ST_ON	OPEN command will be initiated on a transition from ST_OFF to ST_ON
1	nviDriveClose	SNVT_lev_disc	-	ST_OFF	ST_ON	CLOSE command will be initiated on a transition from ST_OFF to ST_ON
2	nviStop	SNVT_lev_disc	-	ST_OFF	ST_ON	STOP command will be initiated on a transition from ST_OFF to ST_ON
3	nviOpenInterlock	SNVT_lev_disc	-	ST_OFF	ST_ON	Not Applicable
4	nviClosInterlock	SNVT_lev_disc	-	ST_OFF	ST_ON	Not Applicable
5	nviESD	SNVT_lev_disc	-	ST_OFF	ST_ON	ST_ON = Emergency Shut Down ST_OFF = Normal operation
6	nviSetpoint	SNVT_lev_percent	%	0.0	100.0	Setpoint input (active in inching mode only)

- Actuator output variables

Types, units, ranges and definition

nv #	nv name	nv type	Units	Min	Max	Comments
7	nvoValveOpen	SNVT_lev_disc	-	ST_OFF	ST_ON	ST_ON when valve fully open, else ST_OFF
8	nvoValveClosed	SNVT_lev_disc	-	ST_OFF	ST_ON	ST_ON when valve fully closed, else ST_OFF
9	nvoOpening	SNVT_lev_disc	-	ST_OFF	ST_ON	ST_ON when valve opening, else ST_OFF
10	nvoClosing	SNVT_lev_disc	-	ST_OFF	ST_ON	ST_ON when valve closing, else ST_OFF
11	nvoMonitorRelay	SNVT_lev_disc	-	ST_OFF	ST_ON	ST_ON when monitor relay closed, else ST_OFF
12	nvoAlarmActive	SNVT_lev_disc		ST_OFF	ST_ON	ST_ON if any of the alarm conditions is present, else ST_OFF
13	nvoPosition	SNVT_lev_percent	%	0.0	100.0	Current valve position, in % of full position
14	nvoTorque	SNVT_lev_percent	%	-150.0	150.0	Current valve torque, in %. Updated only when motor running
15	nvoActuatorState	SNVT_state	-	-	-	See table 1 below.
16	nvoWarning	SNVT_state	-	-	-	Bits set for appropriate warnings. See table 2 below.
17	nvoAlarm	SNVT_state	-	-	-	Bits set for appropriate alarms. See table 3 below.

TABLE 1 - Status flags in nvoActuatorState

Bit Number	Value
Bit 0	FDI flag: Good_B
Bit 1	FDI flag: Good_A
Bit 2	FDI flag: Fault.detect
Bit 3	FDI flag: No Master
Bit 4	FDI flag: Heartbeat
Bit 5	FDI flag: Loop Check
Bit 6	FDI flag: Relay B connected to the Network
Bit 7	FDI flag: Relay A connected to the Network
Bit 8	0 (Reserved for future use)
Bit 9	FDI flag: Function active
Bit 10	Not Applicable
Bit 11	ESD Command in progress
Bit 12	ICON on Local Configuration mode
Bit 13	Local selector on REMOTE
Bit 14	Local selector on LOCAL
Bit 15	Local selector on OFF

TABLE 2 - Warning flags in nvoWarning

Bit Number	Value
Bit 0	STOP depressed during remote
Bit 1	Not Applicable
Bit 2	Near torque limit exceeded, closing direction
Bit 3	Near torque limit exceeded, opening direction
Bit 4	Electronic card temperature exceeded
Bit 5	0 (Reserved for future use)
Bit 6	Not Applicable
Bit 7	0 (Reserved for future use)
Bit 8	0 (Reserved for future use)
Bit 9	0 (Reserved for future use)
Bit 10	0 (Reserved for future use)
Bit 11	0 (Reserved for future use)
Bit 12	0 (Reserved for future use)
Bit 13	Fault isolated elsewhere
Bit 14	Fault at Network B
Bit 15	Fault at Network A

TABLE 3 - Alarm flags in nvoAlarm

Bit Number	Value
Bit 0	Incorrect pushbutton coding
Bit 1	Not Applicable
Bit 2	Torque limit exceeded, closing direction
Bit 3	Torque limit exceeded, opening direction
Bit 4	Not Applicable
Bit 5	Phase failure (third phase missing)
Bit 6	Close contactor failure
Bit 7	Open contactor failure
Bit 8	Motor overheating
Bit 9	Motor stalled (valve jammed)
Bit 10	Torque sensor failure
Bit 11	Position sensor failure
Bit 12	Power failure
Bit 13	0 (Reserved for future use)
Bit 14	0 (Reserved for future use)
Bit 15	Not Applicable

- Actuator setup and configuration variables

Types, units, ranges, defaults and definition

nv #	nv name	nv type	Units	Min	Max	Default value	Comments
18	nviHeartbeat	SNVT_time_sec	s	0.0	60.0	50.0	Heartbeat value for all output nv's 0.0 = Heartbeat disabled
19	nviPosSensitivty	SNVT_lev_percent	%	0.0	100.0	2.0	Position sensitivity, in %
20	nviTrqSensitivty	SNVT_lev_percent	%	0.0	100.0	5.0	Torque sensitivity, in %
21	nviESDAction	SNVT_hvac_overid	-	HVO_OFF	HVO_NUL	HVO_OFF	Action to take when an ESD condition occurs. See table 4 below
22	nviESDTrqAlrmOvr	SNVT_lev_disc	-	ST_OFF	ST_ON	ST_OFF	ST_ON = ESD torque alarm override ST_OFF = No override
23	nviCloseOnPos	SNVT_lev_disc	-	ST_OFF	ST_ON	ST_ON	Only in reading ST_ON = Close on Position ST_OFF = Close on Torque
24	nviOpenOnPos	SNVT_lev_disc	-	ST_OFF	ST_ON	ST_ON	Only in reading ST_ON = Open on Position ST_OFF = Open on Torque
25	nviTorqueBand	SNVT_lev_percent	%	0.0	8.0	4.0	Torque band, defines the vicinity of the extreme position where a torque end of travel can occur
26	nviCWToClose	SNVT_lev_disc	-	ST_OFF	ST_ON	ST_ON	Only in reading ST_ON = Clockwise to Close ST_OFF = Anticlockwise to Close
27	nviHighTurns	SNVT_lev_disc	-	ST_OFF	ST_ON	STOFF	Not Applicable Fixed to ST_OFF
28	nviFixPhaseError	SNVT_lev_disc	-	ST_OFF	ST_ON	ST_ON	Not Applicable Fixed to ST_ON
29	nviClampPosition	SNVT_lev_disc	-	ST_OFF	ST_ON	ST_ON	Not Applicable Fixed to ST_ON
30	nviDisplayPos	SNVT_lev_disc	-	ST_OFF	ST_ON	ST_ON	Not Applicable Fixed to ST_ON
31	nviInchingMode	SNVT_lev_disc	-	ST_OFF	ST_ON	ST_OFF	ST_ON = Inching remote control mode ST_OFF = On/Off remote control mode
32	nviDeadband	SNVT_lev_percent	%	0.1	10.0	10.0	Deadband, used in inching mode
33	nviFeedbackDelay	SNVT_time_f	s	1.0	60.0	1.0	Feedback Delay (delay between interventions, used in inching mode only, motion inhibit time)
34	nviReversalTime	SNVT_time_f	s	1.0	10.0	0.5	Reversal Time
35	nviJammedValveTO	SNVT_time_f	s	2.0	100.0	2.0	Jammed Valve Timeout
36	nviTimerControl	SNVT_lev_disc	-	ST_OFF	ST_ON	ST_OFF	ST_OFF (0) = Timer not active ST_LOW (1) = Timer active when closing only ST_MED (2) = Timer active when opening only ST_HIGH (3), ST_ON (4) = Timer active in both directions
37	nviTimerOnTime	SNVT_time_f	s	1.0	10.0	1.0	Timer ON Time
38	nviTimerOffTime	SNVT_time_f	s	1.0	100.0	10.0	Timer OFF Time
39	nviTmrStrtPosOpn	SNVT_lev_percent	%	0.0	100.0	100.0	Timer stop position, opening direction
40	nviTmrStrtPosCls	SNVT_lev_percent	%	0.0	100.0	100.0	Timer start position, closing direction
41	nviTrqLimOpening	SNVT_lev_percent	%	0.0	100.0	75.0	Torque limit value, opening direction. Exceeding this value will trigger an alarm
42	nviTrqLimClosing	SNVT_lev_percent	%	0.0	100.0	75.0	Torque limit value, closing direction. Exceeding this value will trigger an alarm
43	nviTrqAlrmBypass	SNVT_lev_percent	%	1.0	8.0	5.0	Torque alarm bypass distance, in % of full range from both ends
44	nviCalPosition	SNVT_lev_disc	-	ST_OFF	ST_ON	-	Not Applicable

TABLE 4 - ESD action

Value of nviESDAction.state	ESD Action
0: HVO_OFF	Not Active (ICON 2000 only)
1: HVO_POSITION	Go to the position specified in nviESDAction.percent
2: HVO_FLOW_VALUE	X
3: HVO_FLOW_PERCENT	X
4: HVO_OPEN	Open valve
5: HVO_CLOSE	Close valve
6: HVO_MINIMUM	X
7: HVO_MAXIMUM	X
8 - 0xFE: (invalid)	Stay put
0xFF: HVO_NUL	Stay put

Note: X = Do not care.

- Maintenance variables

Types, units, ranges, defaults and definition

nv #	nv name	nv type	Units	Min	Max	Default value	Comments
45	nviResetActuator	SNVT_lev_disc	-	ST_OFF	ST_ON	-	When any value different from ST_OFF is written to this nv, it will cause a reset of the interface card; further if ST_MED (0x02) is written, the nv #18, #19 and #20 will be reset to the default value.
46	nviComissDate	SNVT_time_stamp	-	-	-	-	User settable date. Not used by firmware
47	nviMaintDate	SNVT_time_stamp	-	-	-	-	User settable date. Not used by firmware
48	nvoPeakTorque	SNVT_lev_percent	%	-150.0	150.0	0	Peak torque recorded during last stroke Closing = +ve Opening = -ve
49	nvoPeakTorquePos	SNVT_lev_percent	%	0.0	100.0	0	Position at which peak torque was recorded
50	nvoAverageTorque	SNVT_lev_percent	%	-150.0	150.0	0	Average normal torque (cumulative 1,000% travel)
51	nvoCycleCounter	SNVT_count_f	-	0.0	2^{24}-1	-	Number of combined Contactor Cycles

- Factory commissioning variables (Read only)

Types and definition

nv #	nv name	nv type	Comments
52	nviActuatorSize	struct	Actuator size, 24 characters. Not used by firmware
53	nviSerialNumber	struct	Serial number, 16 characters. Not used by firmware
54	nviMotorSupply	struct	Motor supply, 16 characters. Not used by firmware
55	nviNamePlate	struct	Name plate. See table 5 below.
56	nviCalTorque	unsigned	Not Applicable

TABLE 5 - Fields in nviNameplate

Bit	Field Name	Field Type	Field is False	Field is True
0-3	HardwareRev	char[4]	-	-
4-7	SoftwareRev	char[4]	-	-
8-11	NominalTorque	float_type	-	-
12-15	ActuatorRPM	float_type	-	-
16-22	ConfigTime	SNVT_time_stamp	-	-
23	IsThreePhase	boolean	Single Phase	Three Phase
24	ActuatorType	boolean	C (multiturn)	QTC (Quarter_turn)

- Fault detection function configuration

Types and definition			
nv #	**nv name**	**nv type**	**Comments**
57	nviFdiCmd	SNVT_count	FDI Commands: see Table 6 below.
58	nviFdiConfig	struct	FDI Configuration: see Table 7 below.

TABLE 6- Commands in nviFdiCmd

Value	Command	Description
1	Disable	Disables FDI algorithms for the particular node and resets the node's relays to their default state.
2	Enable	Enables FDI algorithms for the particular node and awaits proper communication to trigger the FDI system.
3	Disable All	Relays a Disable Command to all nodes connected to the network.
4	Enable All	Relays an Enable Command to all nodes connected to the network.
5	Connect Network A	Manual connect to Network A.
6	Disconnect Network A	Manual disconnect from Network A.
7	Connect Network B	Manual connect to Network B.
8	Disconnect Network B	Manual disconnect from Network B.

TABLE 7- Fields in nviFdiConfig

Field Name	Field Type	Value	Description
Node Id	integer	0	Passive node
		1	Master Node connected to Network A
		2	Master Node connected to Network B
AddrMode	integer	1	Domain Wide
		2	Domain 2 Wide
		3	Domain Subnet Wide
		4	Domain 2 Subnet Wide
TimerInt	unsigned long	-	This parameter controls the speed of the fault detection process and is expressed in time units referred to the internal clock. A lower value increases the network traffic by the FDI nodes, while a higher value decreases network traffic. Typical values fall in the range of 100 to 1000.

6. OPTIONAL MODULE #5 (PRO-DP)

• PROFIBUS DP Interface

The Profibus DP interface "**ICON_2000_PRO_DP_MOD**" is an additional module that allows **to connect the ICON 2000 to a Profibus DP fieldbus.** The module can be used with either the **base version** or one of **"OPTION#1, #2, #3, #7, #8"** of ICON 2000. Here below are described only the features available by the **view and setup menu** of ICON 2000. See the instruction manual **MAN 618/6** to see the exchanged data and Profibus DP fieldbus operations.

6.1. BUS control

- DIN1,…, DIN6: by this routine it is possible to choose the condition that sets the status of bits DIN1,…,DIN6. The above status are available as communication variables. Here below there is the list of the available conditions:

STATUS		ALARM	
• open limit	• mid-travel position	• motor over-temperature	• valve jammed in OP
• closed limit	• local selected	• over-torque	• valve jammed in CL
• position >= xx %	• remote selected	• over-torque in OP	• low alkaline battery (if present)
• position <= xx %	• local stop active	• over-torque in CL	• mid travel alarm in CL/OP
• closing	• ESD signal on	• valve jammed	
• opening	• manual operation	• warnings	
• motor running			
• blinker			

The factory setting is the following:

DIN 1: mid-travel position
DIN 2: local stop active
DIN 3: motor over-temperature
DIN 4: over-torque
DIN 5: valve jammed
DIN 6: mid-travel alarm

- Node address: this function is used to enter the address of the node (from 1 to 126).
- Termin.1 status: by this routine the internal termination of channel 1 can be connected/disconnected to the bus line (ON / OFF)
- Termin.2 status: by this routine the internal termination of channel 2 can be connected/disconnected to the bus line (ON / OFF)
- Mode: normally **channel 1** should be set. The option **channel 2** or **auto** is used only when redundant bus is present.

Configuration procedure:

- *Move the local selector to OFF and then press simultaneously OPEN and STOP. Select the language and then enter the password according to the instructions "entering the set-up mode". When the message of display is "SET-UP MODE OK?" press YES. Press YES to select actuator set-up menu, press NO to scroll the list of available routines and then press YES to select* ***BUS CONTROL****.*
- *Press YES if the condition linked to DIN1 is correct, or press NO to change, then press YES.*

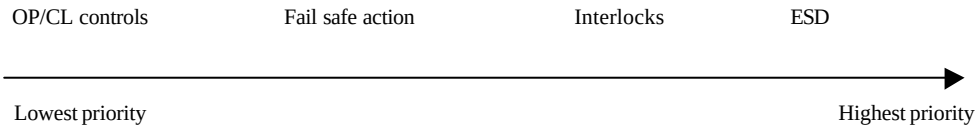
- *Repeat the previous step for DIN2, DIN3,…,DIN6*
- *Press YES if the configured status of termination 1 (TERMIN.1) is correct (ON / OFF), or press NO to change, then press YES.*
- *Press YES if the configured status of termination 2 (TERMIN.2) is correct (ON / OFF), or press NO to change, then press YES.*
- *Press YES if the selected channel (MODE) is correct (CH 1 or CH2 or AUTO), or press NO to change, then press YES.*

View procedure:

- *Move the local selector to OFF and then press simultaneously OPEN and STOP. Select the language and then enter the password according to the instructions "entering the view mode". When the message of display is "VIEW MODE OK?" press YES. Press YES to select actuator set-up menu, press NO to scroll the list of available routines and then press YES to select* ***BUS CONTROL****.*
- *Press YES to scroll the list of BUS CONTROL parameters*

6.2. Fail safe function

This function configures the action of the actuator in case of loss of the bus signal. The action takes place only if the local selector is in REMOTE and if bus is operating. When the bus signal restores, also the actuator restores at its normal functioning. The fail safe function can be configured via either bus or local menu operation.
The hard-wired controls **ESD** and **INTERLOCKS** override the **Fail Safe** action according to the following diagram (the hard-wired controls INTERLOCKS are available only if one off OPTION MODULE #2/3/7/8 is present).



The following options can be configured:

- Fail safe action: open, close, stay-put, go to position %, no action (OFF)
- Length of the delay time before than the fail safe action takes place

The fail safe function can be configured via either bus or local operator interface.

Configuration procedure:

- *Move the local selector to OFF and then press simultaneously OPEN and STOP. Select the language and then enter the password according to the instructions "entering the set-up mode". When the message of display is "SET-UP MODE OK?" press YES. Press YES to select actuator set-up menu, press NO to scroll the list of available routines and then press YES to select* ***FAIL SAFE****.*
- *Press YES if the configured ACTION is correct (open, close, stay-put, go to position xx% , off), or press NO to change, then press YES.*
- *Press YES if the configured value of the DELAY is correct (from 0 to 255 sec), or press NO to change, then press YES.*

View procedure:

- *Move the local selector to OFF and then press simultaneously OPEN and STOP. Select the language and then enter the password according to the instructions "entering the view mode". When the message of display is "VIEW MODE OK?" press YES. Press YES to select actuator set-up menu, press NO to scroll the list of available routines and then press YES to select* ***the routine (FAIL SAFE)*** .
- *Press YES to scroll the list of parameters.*

6.3. Positioner function

The function is available only on the **modulating actuators**. The **value 0** of position request, received from bus, corresponds to the request **R%** = 0% = valve fully closed " and the **value 1000** corresponds to the request **R%** " = 100% = valve fully open". The ICON 2000 compares the **present position %** of the actuator with the **position request %, received from the bus**, and if the difference is greater than the **dead band** , the actuator is driven to reach the new requested position.
The following options can be configured via either bus or local operator interface:

- dead band dead band: configurable from "position resolution%" to 25.5% of the maximum position error (difference among position request % and present position %). The configured value should be great enough to avoid "hunting" effect of the actuator.
- Motion inhibit time: it allows to adjust the length of the delay time between two cycles of the motor . It can be configured from 1 to 255 sec and allows to set the maximum number of start / hour of electrical motor.

Configuration procedure:

- *Move the local selector to OFF and then press simultaneously OPEN and STOP. Select the language and then enter the password according to the instructions "entering the set-up mode". When the message of display is "SET-UP MODE OK?" press YES. Press YES to select actuator set-up menu, press NO to scroll the list of available routines and then press YES to select* ***POSITIONER***.
- *Press YES if the configured value of the Dead Band is correct (from 0 to 25.5%), or press NO to change, then press YES.*
- *Press YES if the configured value of the Motion Inhibit Time is correct (from 0 to 255 sec), or press NO to change, then press YES.*

View procedure:

- *Move the local selector to OFF and then press simultaneously OPEN and STOP. Select the language and then enter the password according to the instructions "entering the view mode". When the message of display is "VIEW MODE OK?" press YES. Press YES to select actuator set-up menu, press NO to scroll the list of available routines and then press YES to select* ***the routine (POSITIONER)*** .
- *Press YES to scroll the list of parameters.*

6.4. Viewing transmission info

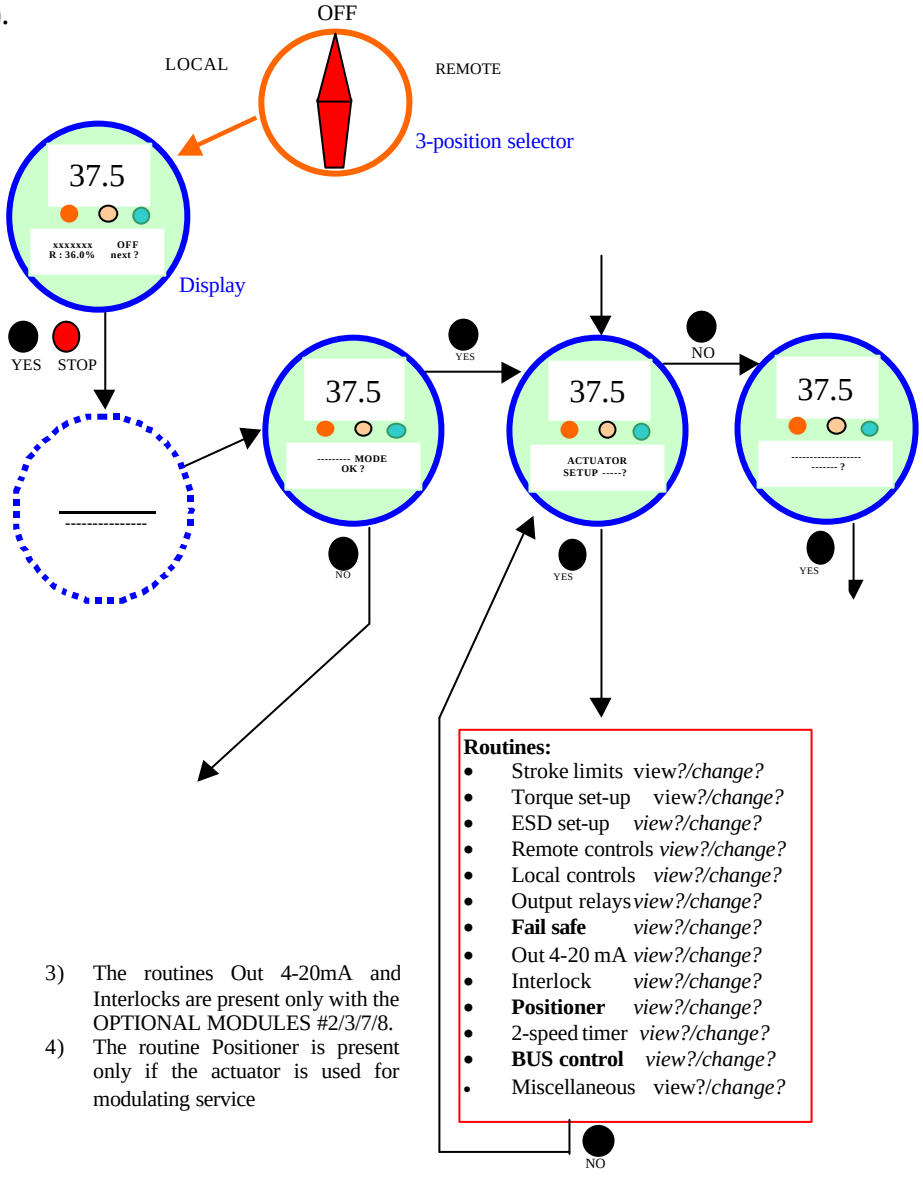
The following procedure allows to see the most significant info relevant to bus data transmission:

- *Move the local selector to OFF or REMOTE and then press YES until the display shows NODE REPORT. Press NO to exit or press YES to scroll the list of transmission info*

6.5. Bus signal failure indication

In case of loss of bus signal a warning is generated. It is signalled by the flashing of the relevant ALARM/WARNING LED and by indication on the local 2lines /16 char. display .

The figure below shows the list of routines available in the actuator setup function of the ICON 2000 **view or setup menu** when OPTIONAL MODULE #5 is used. (see man 618, section 2, chap H/G, view and setup menu).



3) The routines Out 4-20mA and Interlocks are present only with the OPTIONAL MODULES #2/3/7/8.
4) The routine Positioner is present only if the actuator is used for modulating service

7. OPTIONAL MODULE #6 (MOD-RTU)

• MODBUS RTU Interface

The Modbus RTU interface **"ICON 2000_MOD_RTU_MOD"** is an additional module that allows to connect the ICON 2000 to a **Modbus RTU** fieldbus. The module can be used with either the **base version** or one off **"OPTION#1, #2, #3, #7, #8)"** of ICON 2000. Here below are described only the features available by the **view and setup menu** of ICON 2000. See the instruction manual **MAN 618/7** to see the exchanged data and Modbus RTU fieldbus operations.

7.1. BUS control

- DIN1,…, DIN6: by this routine it is possible to choose the condition that sets the status of bits DIN1,…,DIN6. The above status are available as communication variables. Here below there is the list of the available conditions:

STATUS		ALARM	
• open limit	• mid-travel position	• motor over-temperature	• valve jammed in OP
• closed limit	• local selected	• over-torque	• valve jammed in CL
• position >= xx %	• remote selected	• over-torque in OP	• low alkaline battery (if present)
• position <= xx %	• local stop active	• over-torque in CL	• mid travel alarm in CL/OP
• closing	• ESD signal on	• valve jammed	
• opening	• manual operation	• warnings	
• motor running			
• blinker			

The factory setting is the following:

DIN 1: mid-travel position
DIN 2: local stop active
DIN 3: motor over-temperature
DIN 4: over-torque
DIN 5: valve jammed
DIN 6: mid-travel alarm

- Baud rate: by this function it is possible to set the transmission speed.
- Parity: this routine allows to choose the parity in the MODBUS RTU message (ODD, EVEN, NO PARITY)
- Node: by this function it is possible to enter the address of the node (from 1 to 247)
- Termin.1 status: by this routine the internal termination of channel 1 can be connected /disconnected to the bus line (ON / OFF)
- Termin.2 status: by this routine the internal termination of channel 2 can be connected/disconnected to the bus line (ON / OFF)
- Channel selection: normally **channel 1** should be set. The option **channel 2** or **auto** is used only when redundant bus is present.

Configuration procedure:

- *Move the local selector to OFF and then press simultaneously OPEN and STOP. Select the language and then enter the password according to the instructions "entering the set-up mode". When the message of display is "SET-UP MODE OK?" press YES. Press YES to select actuator set-up menu, press*

*NO to scroll the list of available routines and then press YES to select **BUS CONTROL**.*

- *Press YES if the condition linked to DIN1 is correct, or press NO to change, then press YES.*
- *Repeat the previous step for DIN2, DIN3,…,DIN6*
- *Press YES if the configured transmission speed (BAUD RATE) is correct, or press NO to change, then press YES*
- *Press YES if the configured parity (PARITY) is correct (ODD, EVEN, NONE), or press NO to change, then press YES*
- *Press YES if the configured value of the node address (NODE) is correct (from 1 to 247), or press NO to change, then press YES*
- *Press YES if the configured status of termination 1 (TERMIN.1) is correct (ON / OFF), or press NO to change, then press YES.*
- *Press YES if the configured status of termination 2 (TERMIN.2) is correct (ON / OFF), or press NO to change, then press YES.*
- *Press YES if the selected channel (MODE) is correct (CH 1 or CH2 or AUTO), or press NO to change, then press YES.*

View procedure:

- *Move the local selector to OFF and then press simultaneously OPEN and STOP. Select the language and then enter the password according to the instructions "entering the view mode". When the message of display is "VIEW MODE OK?" press YES. Press YES to select actuator set-up menu, press NO to scroll the list of available routines and then press YES to select **BUS CONTROL**.*
- *Press YES to scroll the list of BUS CONTROL parameters.*

7.2. Positioner function

The function is available only on the **modulating actuators**. The **value 0** of position request, **received from bus**, corresponds to the request **R%** = 0% = valve fully closed, and the **value 1000** corresponds to the request **R%** = 100% = valve fully open. The ICON 2000 compares the **present position %** of the actuator with the **position request %, received from the bus**, and if the difference is greater than the **dead band** , the actuator is driven to reach the new requested position.
The following options can be configured via either bus or local operator interface:

- dead band dead band: configurable from "position resolution%" to 25.5% of the maximum position error (difference among position request % and present position %). The configured value should be great enough to avoid "hunting" effect of the actuator.
- Motion inhibit time: it allows to adjust the length of the delay time between two cycles of the motor . It can be configured from 1 to 255 sec and allows to set the maximum number of start / hour of electrical motor.

Configuration procedure:

- *Move the local selector to OFF and then press simultaneously OPEN and STOP. Select the language and then enter the password according to the instructions "entering the set-up mode". When the message of display is "SET-*

UP MODE OK?" press YES. Press YES to select actuator set-up menu, press NO to scroll the list of available routines and then press YES to select ***POSITIONER****.*

- *Press YES if the configured value of the Dead Band is correct (max 25.5%), or press NO to change, then press YES.*
- *Press YES if the configured value of the Motion Inhibit Time is correct (from 1 to 255 sec), or press NO to change, then press YES.*

View procedure:

- *Move the local selector to OFF and then press simultaneously OPEN and STOP. Select the language and then enter the password according to the instructions "entering the view mode". When the message of display is "VIEW MODE OK?" press YES. Press YES to select actuator set-up menu, press NO to scroll the list of available routines and then press YES to select* ***the routine (POSITIONER)*** *.*
- *Press YES to scroll the list of parameters.*

7.3. Fail safe function

This function configures the action of the actuator in case of loss of the bus signal. The action takes place only if the local selector is in REMOTE and if bus is operating. When the bus signal restores, also the actuator restores at its normal functioning. The fail safe function can be configured via either bus or local menu operation.
The hard-wired controls **ESD** and **INTERLOCKS** override the **Fail Safe** action according to the following diagram (the hard-wired controls INTERLOCKS are available only if one off OPTION MODULE #2, #3, #7, #8 is present).

The following options can be configured:

- Fail safe action: open, close, stay-put, go to position %, no action (OFF)
- Length of the delay time before than the fail safe action takes place

The fail safe function can be configured via either bus or local menu operator interface.

Configuration procedure:

- *Move the local selector to OFF and then press simultaneously OPEN and STOP. Select the language and then enter the password according to the instructions "entering the set-up mode". When the message of display is "SET-UP MODE OK?" press YES. Press YES to select actuator set-up menu, press NO to scroll the list of available routines and then press YES to select* ***FAIL SAFE****.*
- *Press YES if the configured ACTION is correct (open, close, stay-put, go to position xx% , off), or press NO to change, then press YES.*

- *Press YES if the configured value of the DELAY is correct (from 0 to 255 sec), or press NO to change, then press YES.*

View procedure:

- *Move the local selector to OFF and then press simultaneously OPEN and STOP. Select the language and then enter the password according to the instructions "entering the view mode". When the message of display is "VIEW MODE OK?" press YES. Press YES to select actuator set-up menu, press NO to scroll the list of available routines and then press YES to select* ***the routine(FAIL SAFE)*** .
- *Press YES to scroll the list of parameters.*

7.4. Viewing transmission info

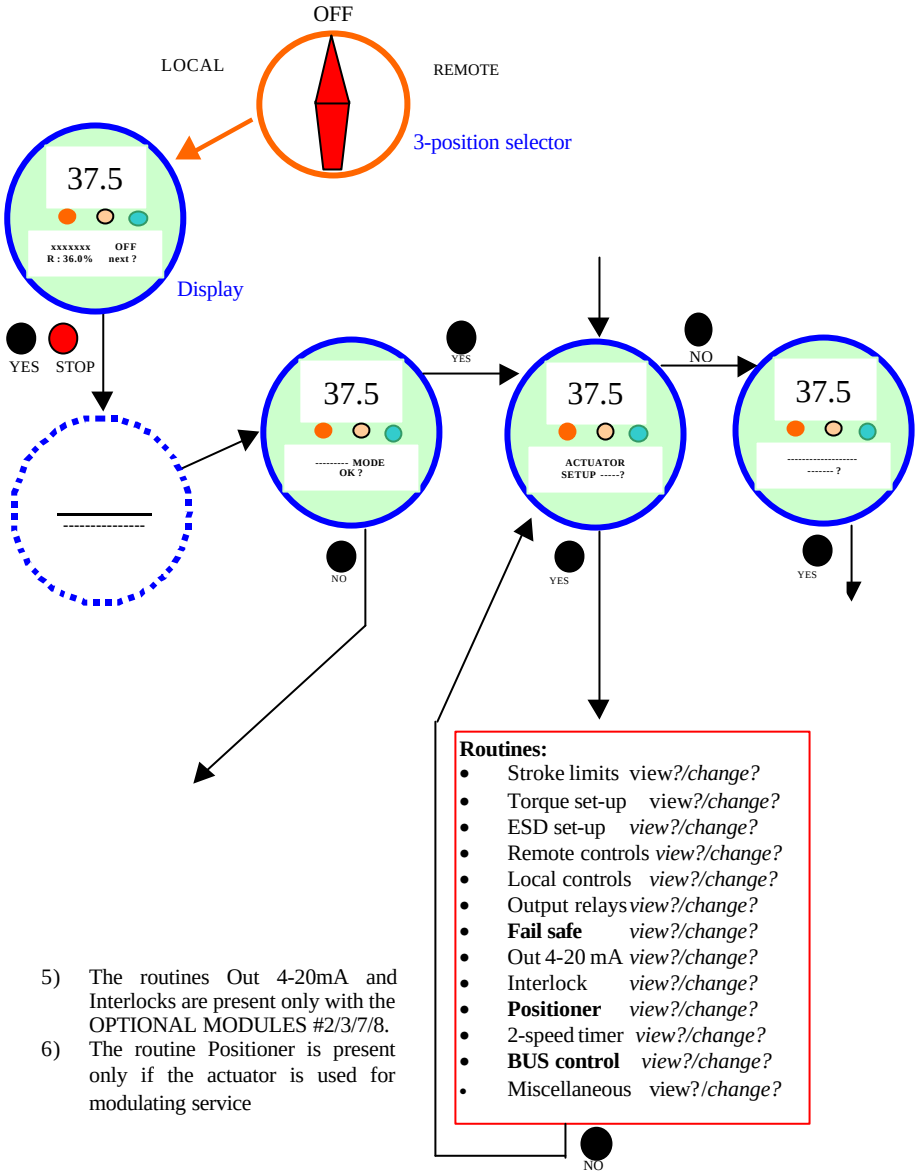
The following procedure allows to see the most significant info relevant to bus data transmission:

- *Move the local selector to OFF or REMOTE and then press YES until the display shows NODE REPORT. Press NO to exit or press YES to scroll the list of transmission info*

7.5. Bus signal failure indication

In case of loss of bus signal a warning is generated. It is signalled by the flashing of the relevant ALARM/WARNING LED and by indication on the local 2lines /16 char. display .

The figure below shows the list of routines available in the actuator setup function of the ICON 2000 **view or setup menu** when OPTIONAL MODULE #6 is used. (see man 618, section 2, chap H/G, view and setup menu).



5) The routines Out 4-20mA and Interlocks are present only with the OPTIONAL MODULES #2/3/7/8.
6) The routine Positioner is present only if the actuator is used for modulating service

8. OPTIONAL MODULE #7 (APTM1)

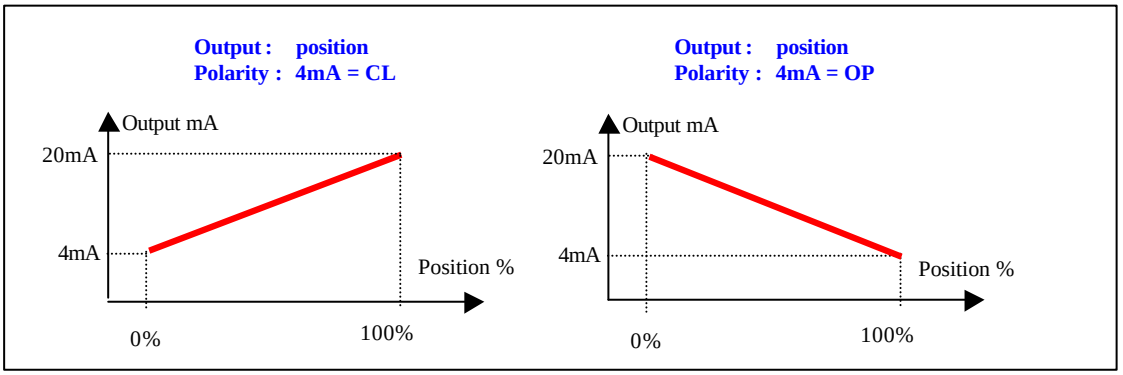
- **4-20mA output + 3 additional output contacts (AS5, AS6, AS7) + 1 additional changeover output contact (AS8) + 2 interlock inputs**

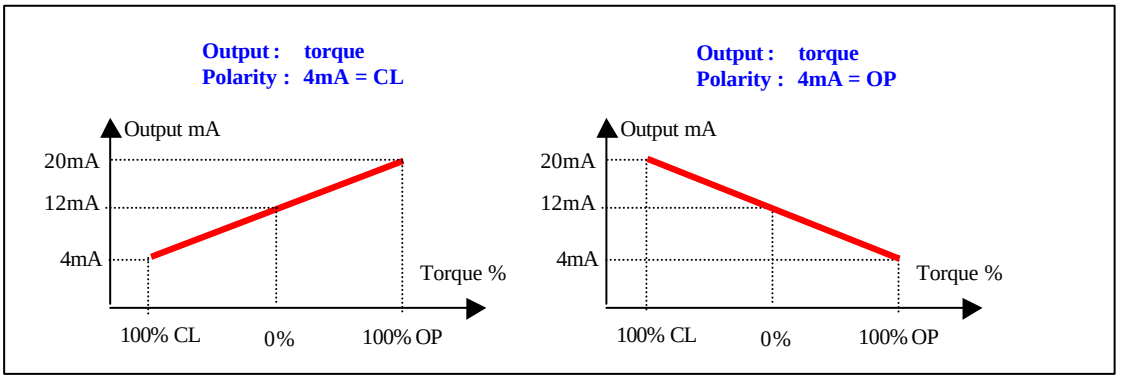
By the above module the following input and outputs are available on the actuator terminal board:

- 1 4-20mA output (active or passive loop)
- 3 additional output contacts AS5, AS6, AS7
- 1 additional changeover output contact AS8
- 2 interlock inputs

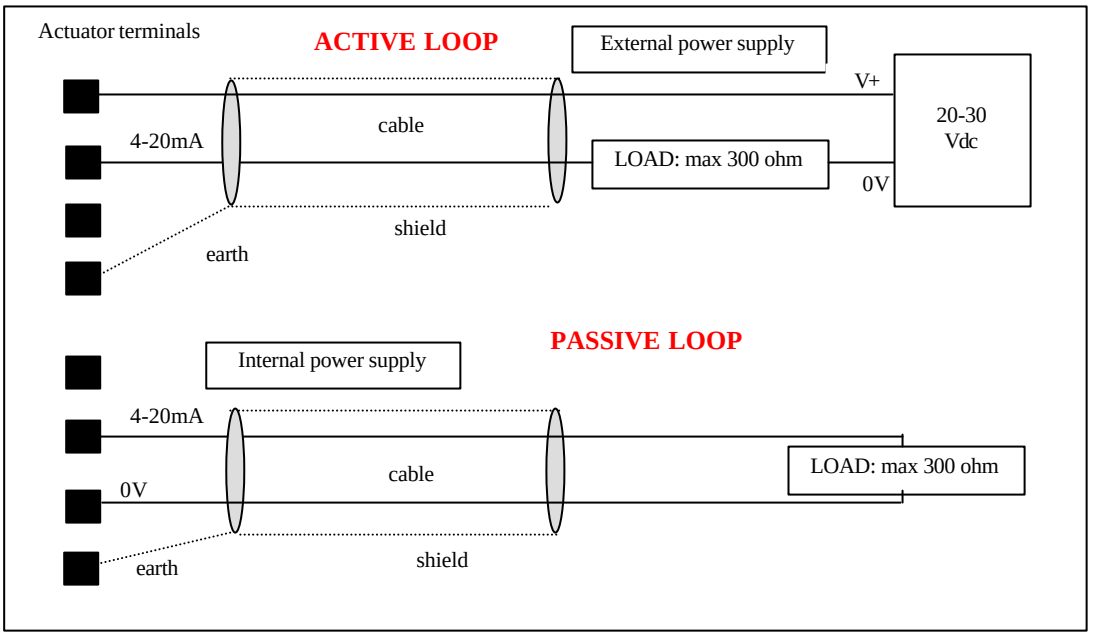
8.1. 4-20mA output

The 4-20mA output can be configured to provide a signal proportional to either "**position**" or "**torque**". The **polarity** option allows to choose the value of current which corresponds to the open and close position or torque, according to the following diagrams.





The 4-20mA output is opto-coupled. It should be powered by a 20-30 Vdc voltage (externally or internally generated) and the maximum load, including the cable resistance, should be less than 300 ohm.
The below figure shows the wiring diagram:



The behaviour in case of **loss of main voltage** is different if the power supply of the 4-20mA output stage is internally or externally generated:

- **Internal power supply (or passive loop) :**
  - In case of loss of main voltage the output 4-20 mA drops to 0. The correct output will be restored when the main voltage returns
- **External power supply (or active loop) :**
  - If the actuator is provided with **alkaline battery** (or supplied by the **auxiliary 24VDC**) and if the main voltage fails, the output 4-20mA maintains the last value. If the actuator is moved by handwheel , the output 4-20mA **will be updated**
  - If the actuator is **not** provided of **alkaline battery** (or not supplied by the **auxiliary 24VDC**) and if the main voltage fails, the output 4-20mA maintains the last value. If the actuator is moved by handwheel , the output 4-20mA **will not be updated**

Configuration procedure:

- *Move the local selector to OFF and then press simultaneously OPEN and STOP. Select the language and then enter the password according to the instructions "entering the set-up mode". When the message of display is "SET-UP MODE OK?" press YES. Press YES to select actuator set-up menu, press NO to scroll the list of available routines and then press YES to select* ***Out 4-20 mA.***
- *Press YES if the output is correct (POSITION or TORQUE), or press NO to change, then press YES.*
- *Press YES if the polarity is correct, or press NO to change, then press YES.*

View procedure:

- *Move the local selector to OFF and then press simultaneously OPEN and STOP. Select the language and then enter the password according to the instructions "entering the view mode". When the message of display is "VIEW MODE OK?" press YES. Press YES to select actuator set-up menu, press NO to scroll the list of available routines and then press YES to select* ***the routine (OUT 4-20 mA)*** .
- *Press YES to scroll the list of parameters.*

8.2. Additional output contacts AS5, AS6, AS7

The standard version of ICON 2000 provides **4 auxiliary output contacts (AS1, AS2, AS3, AS4).** By this module **further 3 output contacts (AS5, AS6, AS7)** are available on the terminal board of the actuator. Each contact is controlled by a latching relay. Each relay is configurable to "**make**" or "**break**" the output contact when a configurable condition occurs. The contact rating of each relay is the same of AS1, AS2, AS3, AS4 (see section 618/2, chapter E , par. 6.2 Output contacts).
The procedure to configure the action of the contact and the condition associated to the relay is described in the section 618/2, chapter I , par. 1.6 , Auxiliary relays AS1, 2, 3, 4 .
If the actuator is provided with **alkaline battery** and if the condition associated to relays is one off "open limit, close limit, position <xx% , position <xx%, mid-travel position, low battery, manual operation", the status of contacts will be updated also if the main voltage fails.

8.3. Additional changeover output contact AS8

A further **changeover** output contact **AS8** is available on the terminal board of the actuator. The contact is controlled by a relay and the condition that causes the switchover of the contact is configurable. The contact rating of each relay is the same of AS1, … ,AS7 (see section 618/2, chapter E , par. 6.2 Output contacts).
The procedure to select the condition associated to the relay is described in the section 618/2, chapter I , par. 1.6 , Auxiliary relays AS1, 2, 3, 4 .

8.4. Default #1 and #2 setting

The total number of output contacts available on the terminal board is:

- **1 changeover contact of monitor relay MR**
- **7 contacts AS1, … , AS7 (from latching relays)**
- **1 changeover contact AS8**

The following tables show the configuration of relays when **default # 1** or **default # 2** is selected:

DEFAULT # 1

Auxiliary relays

AS1 : open limit	*; make*	*AS5 : motor running*	*; make*
AS2 : close limit	*; make*	*AS6 : overtorque*	*; make*
AS3 : position > 90%	*; make*	*AS7 : ESD*	*; make*
AS4 : position < 10%	*; make*	*AS8: motor overtemperature*	

DEFAULT # 2

Auxiliary relays

AS1 : open limit	*; break*	*AS5 : motor running*	*; make*
AS2 : close limit	*; break*	*AS6 : remote selected*	*; make*
AS3 : position > 95%	*; break*	*AS7 : warning*	*; make*
AS4 : position < 5%	*; break*	*AS8 : local selected*	

8.5. Interlock inputs

Two additional inputs are available to inhibit actuator movement in open or close direction. The controls are momentary, it means that the inhibit action continues until the relevant signal is present. The interlock controls work when the local selector is in **LOCAL** or in **REMOTE**. The ESD control overrides the interlock controls. The following options can be configured:

- interlock OP : active when signal is *PRESENT* , active when signal is *ABSENT*, no action (*OFF)*
- interlock CL : active when signal is *PRESENT* , active when signal is *ABSENT*, no action (*OFF)*

The interlock inputs are opto-coupled. The circuits associated to the inputs can be supplied by the internally generated 24VDC or by an external 20-125VDC or 20-120VAC (50/60Hz).
The signal levels are the following:

- Minimum ON signal > 20 VDC or 20 VAC (50/60Hz)
- Maximum ON signal < 125 VDC or 120 VAC (50/60Hz)
- Maximum OFF signal < 3 VDC or VAC
- Minimum signal duration > 300 ms.
- Total current drawn from remote controls < 20mA

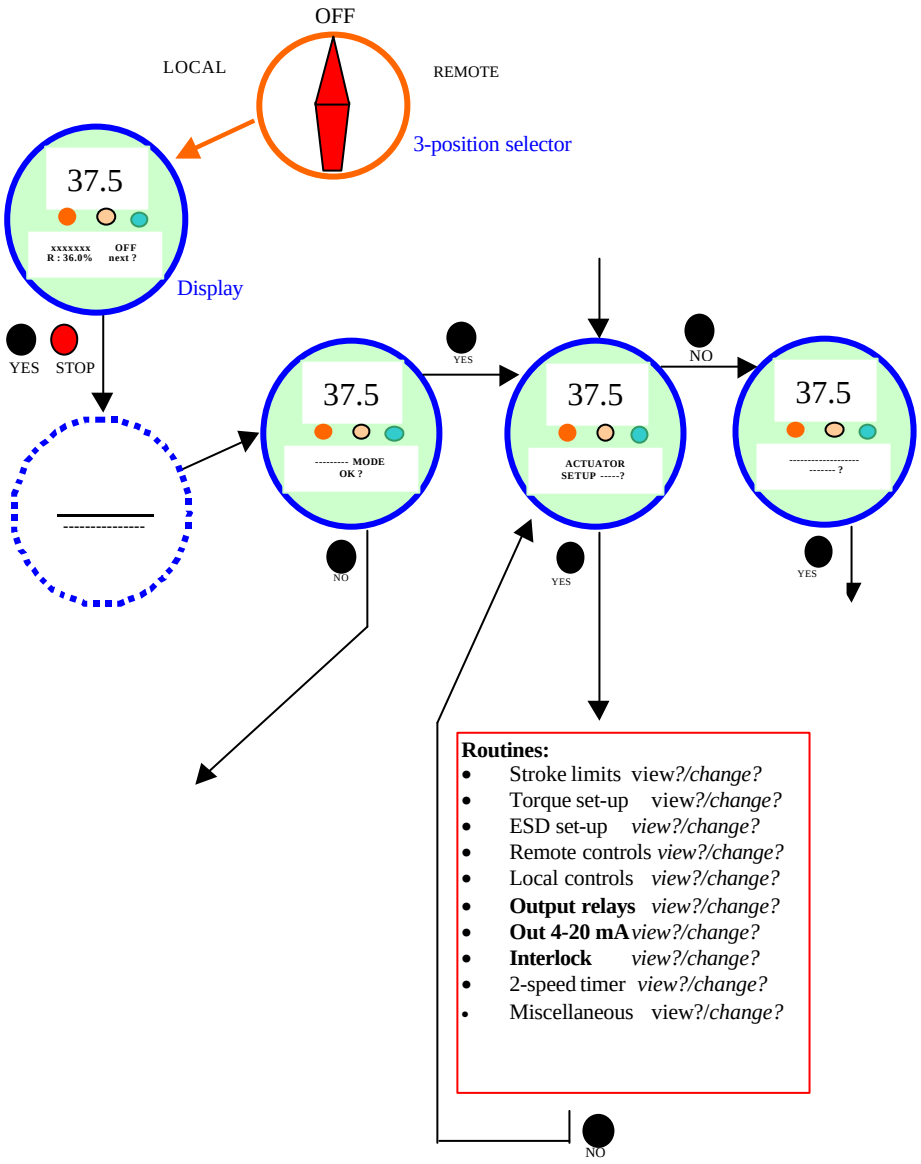
Configuration procedure:

- *Move the local selector to OFF and then press simultaneously OPEN and STOP. Select the language and then enter the password according to the instructions "entering the set-up mode". When the message of display is "SET-UP MODE OK?" press YES. Press YES to select actuator set-up menu, press NO to scroll the list of available routines and then press YES to select* ***INTERLOCKS****.*
- *Press YES if the configured value of the Open Interlock is correct (PRESENT, ABSENT, OFF), or press NO to change, then press YES.*
- *Press YES if the configured value of the Open Interlock is correct (PRESENT, ABSENT, OFF), or press NO to change, then press YES.*

View procedure:

- *Move the local selector to OFF and then press simultaneously OPEN and STOP. Select the language and then enter the password according to the instructions "entering the view mode". When the message of display is "VIEW MODE OK?" press YES. Press YES to select actuator set-up menu, press NO to scroll the list of available routines and then press YES to select* ***the routine (INTERLOCKS)*** *.*
- *Press YES to scroll the list of parameters.*

The figure below shows the list of routines available in the actuator setup function of the ICON 2000 **view or setup menu** when OPTIONAL MODULE #7 is used. (see: man 618, section 2, chap H/G, view and setup menu).



9. OPTIONAL MODULE #8 (PSM1)

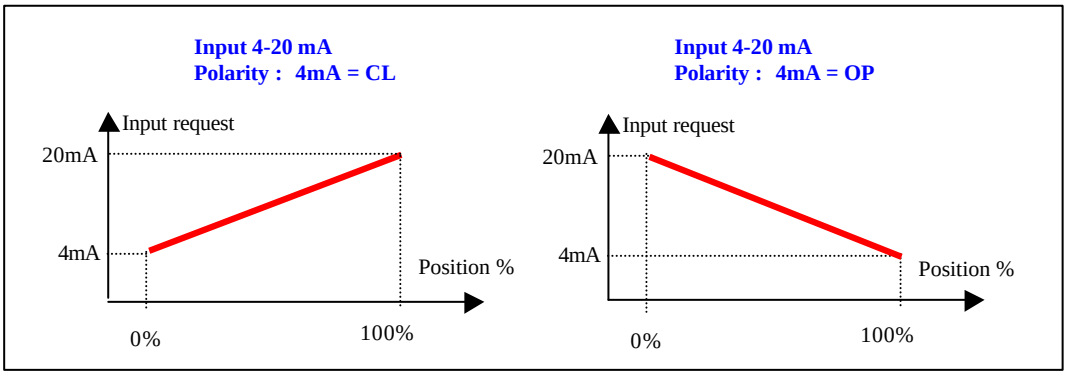
- **4-20mA input + 4-20mA output + 3 additional output relays (AS5, AS6, AS7) + 1 additional changeover output contact (AS8) + 2 interlock inputs**

In comparison with the OPTIONAL MODULE #7 , the OPTIONAL MODULE #8 has an additional **4-20mA input.** This is used as input of the **position request** signal in **modulating** actuators. **4mA** corresponds to request **R% = 0%** = valve closed and **20mA** corresponds to request **R%= 100%** = valve open. The relationship between **position** and **request signals** can be reversed by the "Polarity" function. Here below are described the functions available with the module.

9.1. Positioner function

The positioning function of the ICON 2000 compares the **present position** of the actuator with the **position request** signal and if the difference is greater than the **dead band** , the actuator is driven to reach the new requested position. The following options can be configured via local operator interface:

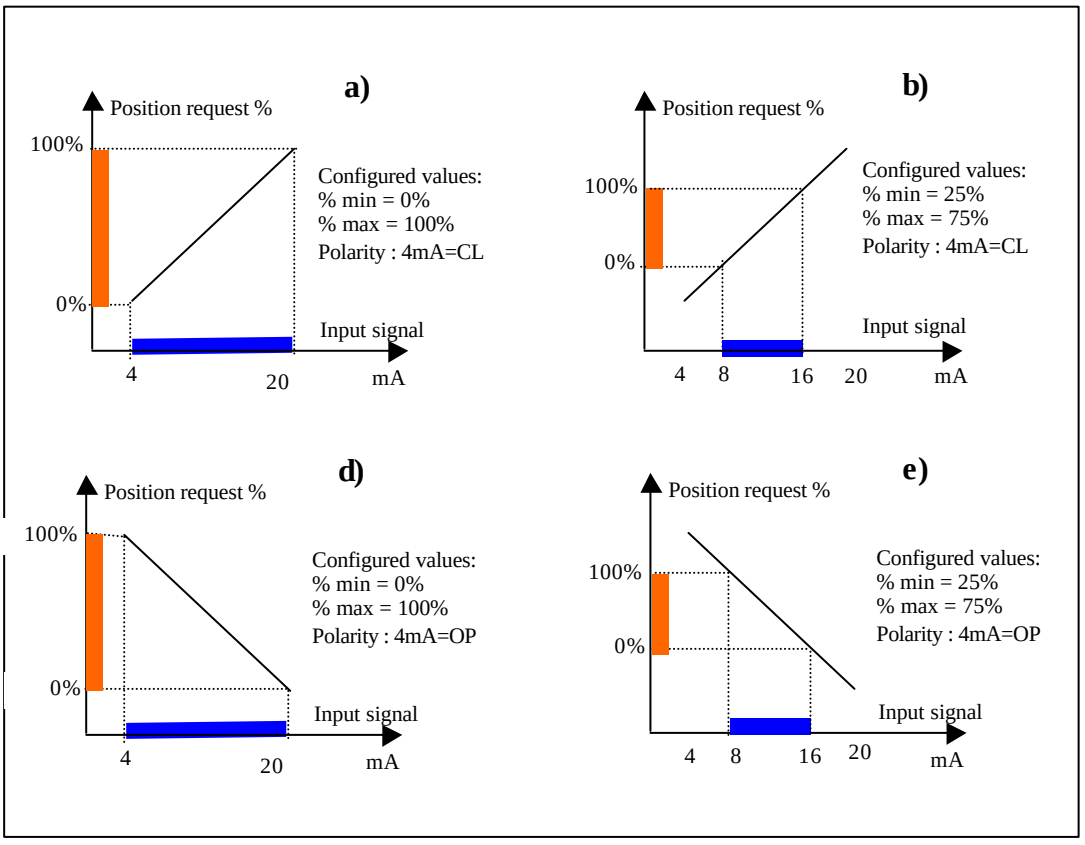
- dead band: configurable from "position resolution%" to 25.5%" of the maximum position error (difference among position request % and present position %). The configured value should be great enough to avoid "hunting" effect of the actuator.
- Polarity of the 4-20mA position request signal: it allows to choose the current value which corresponds to a **request** to open and close , according to the following diagrams.



- Motion inhibit time: it allows to adjust the length of the delay time between two cycles of the motor . It can be configured from 1 to 255 sec and allows to set the maximum number of start / hour of electrical motor.

- 4-20 mA input signal range (%min and %max) : it allows to change the relationship between the input signal and the **position request %**, This function is useful when a single 4-20ma signal is used to control the position of 2 valves (e.g. : split range applications). The below curves clarify the use of the function:

example a): with input signal = 4 mA , the position request is 0% and the actuator is driven to close. With input signal = 20 mA, the position request is 100% and the actuator is driven to open. With input signal = 12 mA the position request is 50% and the actuator is driven to reach the position 50%.
example b): with input signal < 8 mA , the position request % is 0% and the actuator is driven to close. With input signal = 16 mA, the position request is 100% and the actuator is driven to open. With input signal = 12 mA the position request is 50% and the actuator is driven to reach the position 50%.
example c): with input signal = 4 mA , the position request % is 100% and the actuator is driven to open. With input signal = 20 mA , the position request is 0% and the actuator is driven to close. With input signal = 12 mA the position request is 50% and the actuator is driven to reach the position 50%.
example d): with input signal < 8 mA , the position request % is 100% and the actuator is driven to open. With input signal = 16 mA , the position request is 0% and the actuator is driven to close. With input signal = 12 mA the position request is 50% and the actuator is driven to reach the position 50%.



Configuration procedure:

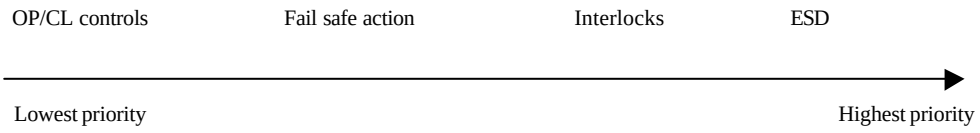
- *Move the local selector to OFF and then press simultaneously OPEN and STOP. Select the language and then enter the password according to the instructions "entering the set-up mode". When the message of display is "SET-UP MODE OK?" press YES. Press YES to select actuator set-up menu, press NO to scroll the list of available routines and then press YES to select* ***POSITIONER****.*
- *Press YES if the configured value of the Dead Band is correct (from position_resoòution% to 25.5%), or press NO to change, then press YES.*
- *Press YES if the configured value of the Polarity is correct (4mA=CL or 4mA=OP), or press NO to change, then press YES.*
- *Press YES if the configured value of the Motion Inhibit Time is correct (from 1 to 255 sec), or press NO to change, then press YES.*
- *Press YES if the configured value of the R% MIN is correct (from 0 to 75%), or press NO to change, then press YES. The normal value is 0.*
- *Press YES if the configured value of the R% MAX is correct (from 25 to 100%), or press NO to change, then press YES. The difference among R% MAX and R% MIN should be greater than 25%. The normal value is 100.*

View procedure:

- *Move the local selector to OFF and then press simultaneously OPEN and STOP. Select the language and then enter the password according to the instructions "entering the view mode". When the message of display is "VIEW MODE OK?" press YES. Press YES to select actuator set-up menu, press NO to scroll the list of available routines and then press YES to select* ***the routine (POSITIONER)*** *.*
- *Press YES to scroll the list of parameters.*

9.2. Fail safe function

This function configures the action of the actuator in case of loss of the 4-20 mA input signal. The action takes place only if the local selector is in REMOTE and if the positioning function is operating. When the 4-20 mA signal restores, also the actuator restores at its normal functioning. The Interlock and ESD controls override the Fail Safe action according to the following diagram.



The following options can be configured:

- Fail safe action: open, close, stay-put, go to position %, no action (OFF)
- Length of the delay time before than the fail safe action takes place

Configuration procedure:

- *Move the local selector to OFF and then press simultaneously OPEN and STOP. Select the language and then enter the password according to the instructions "entering the set-up mode". When the message of display is "SET-UP MODE OK?" press YES. Press YES to select actuator set-up menu, press*

*NO to scroll the list of available routines and then press YES to select **FAIL SAFE**.*

- *Press YES if the configured ACTION is correct (open, close, stay-put, go to position xx% , off), or press NO to change, then press YES.*
- *Press YES if the configured value of the DELAY is correct (from 0 to 255 sec), or press NO to change, then press YES.*

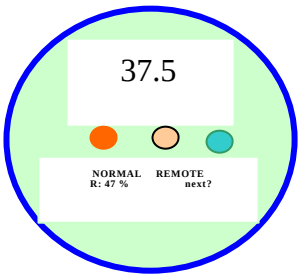
View procedure:

- *Move the local selector to OFF and then press simultaneously OPEN and STOP. Select the language and then enter the password according to the instructions "entering the view mode". When the message of display is "VIEW MODE OK?" press YES. Press YES to select actuator set-up menu, press NO to scroll the list of available routines and then press YES to select **the routine(FAIL SAFE)** .*
- *Press YES to scroll the list of parameters.*

9.3. Out. 4-20 mA, aux. out. contacts, interlock inp.

The features of these functions are described in the "OPTIONAL MODULE #7 (APTM1)".

9.4. LED and display indication

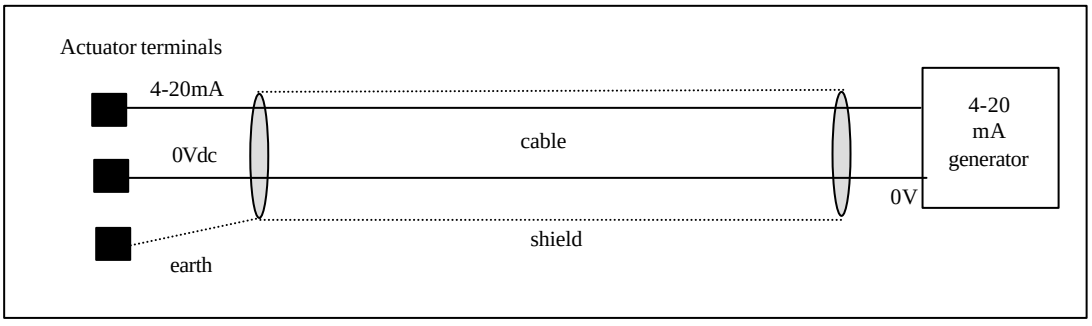


When the positioning function is working, the **alpha-numeric display** indicates the value of the **position request in % (R% : xx.x)**

The loss of the position request signal is indicated as follows:

- Change-over of the monitor relay
- Alarm LED on
- List of ALARMS (see Man 618, section 2 chap.F, Local operator interface)
- Alarm log

The 4-20 mA input is opto-coupled. The input impedance is less than 250 ohm. The figure below shows the wiring diagram:



The figure below shows the list of routines available in the actuator setup function of the ICON 2000 **view or setup menu** when OPTIONAL MODULE #8 is used. (see man 618, section 2, chap H/G, view and setup menu).