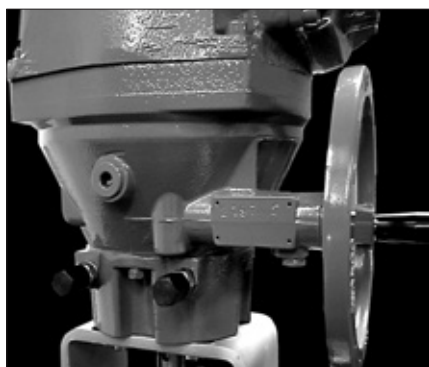


BIFFI



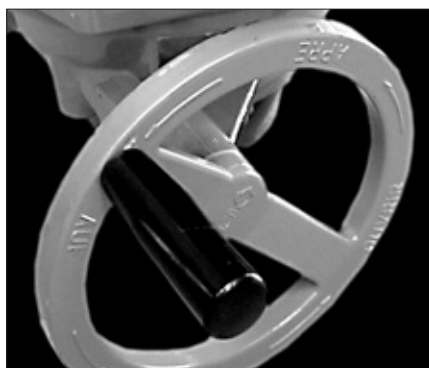
General instructions for installation



Operation and configuration



Maintenance and trouble-shooting



Spare parts and drawings

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1. General safety instructions

This Instruction Manual applies to F01-2000 electric actuators, designed for use in heavy industrial, chemical, petrochemical plants.

The noise emitted by the electric actuator in normal working conditions is less than 66 dB (A) with peak value 115 dB (C). Standard reference ISO 11202 (1st ed., 1995-12-15).

The electric actuators are designed in accordance with the applicable International Rules and Specifications but the following Regulations must be observed in any case:

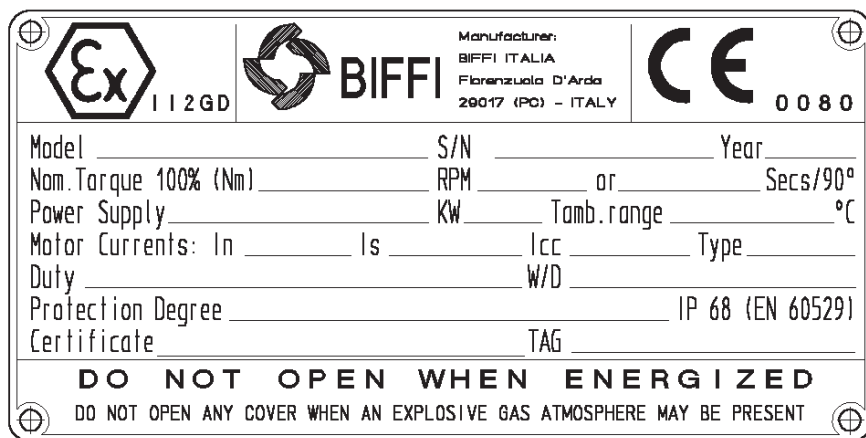
- the general installation and safety regulations
- the plant specific regulations and requirements
- the proper use of personal protective devices (glasses, clothing, gloves)
- the proper use of tools, lifting and transport equipment

1.1 Safety instructions for installation in hazardous area

Electric actuators F01-2000 have been designed and manufactured according to EN 50014 / 50018 / 50281-1-1 standards, type of protection EEx d IIB T4. They are suitable for use in hazardous area classified against the risk of explosion due to the presence of gas and dust.

Actuators have IP 68 degree of protection according to EN 60529.

1.1.1 Marking



- XX ATEX ZZZZ = ATEX REFERENCE CERTIFICATE
- 0080 = notified body for ATEX quality assurance (INERIS)
- II = group II (surface)
- 2 = category 2 apparatus
- G = explosive atmospheres caused by gas, mists or vapors
- D = explosive atmospheres caused by dusts
- IP 68 = degree of protection

Warning

It is assumed that the installation, setting, commissioning, maintenance and repair works are carried out by qualified personnel and checked by responsible Specialists.

Warning

In case the electric actuator must be installed in an HAZARDOUS AREA, as defined by the local Rules, it is mandatory to check if the nameplate of the electric actuator specifies the appropriate degree of protection. Maintenance and repair works must be carried out by qualified personnel and checked by responsible Specialists.

Hazardous zone		Categories according to 94/9/CE Directive
Gas, mists or vapours	Zone 0	1G
Gas, mists or vapours	Zone 1	2G
Gas, mists or vapours	Zone 2	3G
Dust	Zone 20	1D
Dust	Zone 21	2D
Dust	Zone 22	3D

1.2 Applicable standards and regulations

EN 292/1: Safety of machinery - Basic concepts, general principles for design.

Part 1-Basic terminology, methodology.

EN 292/2: Safety of machinery - Basic concepts, general principles for design.

Part 2-Technical principles and specification.

En 60204/1: Electrical equipment of industrial machines. Part 1- General requirements.

EEC 98/37: Machinery directive.

EEC 73/23: Low voltage directive.

EEC 89/336: EMC Directive

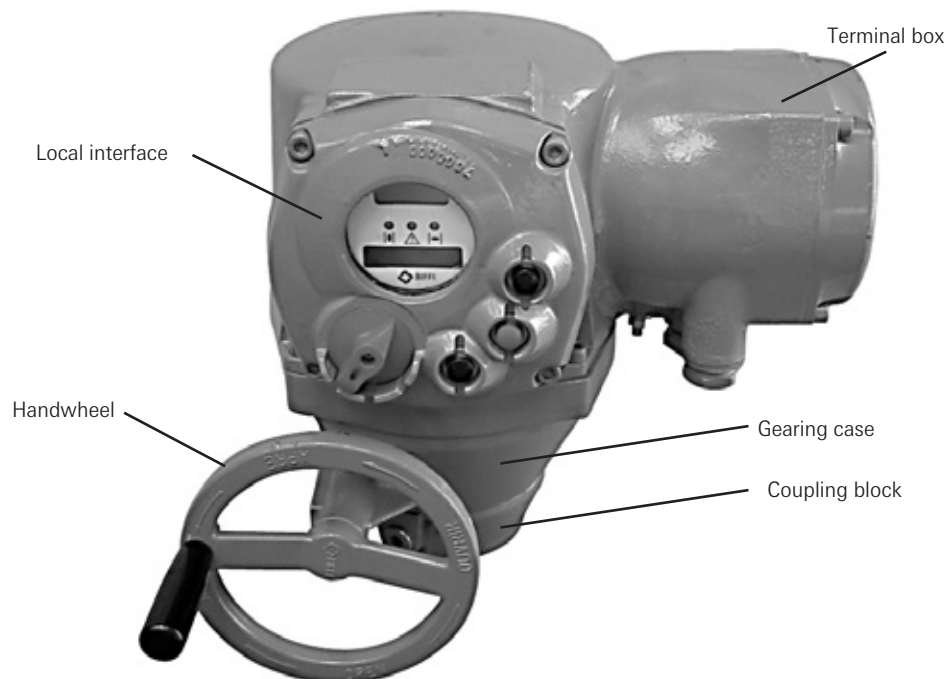
ATEX 94/9 EEC Directive

1.3 Terms and conditions

Biffi guarantees each single product to be free from defects and to conform to current goods specifications. The warranty period is one year from the date of installation by the first user, or eighteen months from the date of shipment to the first user, whichever occurs first.

No warranty is given for products or components (such as electric or pneumatic mechanisms) manufactured by third-party companies, or for goods which have been subject to misuse, improper installation, corrosion, or which have been modified or repaired by unauthorised personnel. Repair work due to improper use will be charged at standard rates.

1.4 Identification of the main parts



2. Storage and pre-installation

2.1 Tests to be carried out when the actuator is received

If the actuator is received already mounted on the valve, all operations should have already been performed during valve/actuator assembly.

- Check that the display is active.
- Turn the handwheel until the valve is in a completely open position;
- check that the display reads 100% indicating that the valve is completely open;
- rotate the handwheel clockwise and bring the valve to a completely closed position;
- check that the display reads 0% indicating that the valve is completely closed.

If the test result is satisfactory, the actuator has already been adjusted and you can proceed with the electrical connection.

If the actuator is delivered separately from the valve, or the above procedure shows that the position is incorrect, all operations described in this manual must be carried out.

- Check that no damage has occurred during transport, especially to the push-buttons, the display area glass and the selector.
- Check the information on the nameplate: serial number and performance data (nominal torque, operation speed, protection class, motor supply voltage, etc.), and verify the corresponding data on the display (see chapter 10, View routines).

Make sure all accessories have been received with the shipment, as described in the delivery documentation.

2.2 Storage procedure

2.2.1 General

The actuator leaves the factory in perfect condition, as guaranteed by an individual test certificate. In order to maintain these characteristics until the actuator is installed on site, proper procedures must be taken for preservation during the storage period.

BIFFI actuators are weatherproof to IP 68. This condition can only be maintained if the units are correctly installed/connected on site and if they have been correctly stored.

The standard plastic plugs used to close the cable entries are not weatherproof, they just prevent the entry of undesired objects during transport.

2.2.2 Storage for a brief period (less than one year):

2.2.2.1 Indoor storage

- make sure that the actuators are kept in a dry place, laid on a wooden pallet and protected from dust.

2.2.2.2 Outdoor storage

- make sure that the actuators are protected from the direct action of weather agents (protection by a canvas tarp or similar cover);
- place the actuators on a wooden pallet, or some other raised platform, so that they are not in direct contact with the ground;
- if the actuators are supplied with standard plastic plugs, remove them from the cable entries and replace them with weatherproof plugs.

2.2.3 Long period storage (more than one year):



Important

Not performing the following procedures will invalidate the product guarantee.



2.2.3.1 Indoor storage

(In addition to the instructions at point 2.2.1)

- if the actuators are supplied with standard plastic plugs, replace them with weatherproof plugs.
- In case the actuator is provided with an alkaline battery, remove it and store in dry and clean place (see chapter 11.3, Maintenance - Alkaline battery change)

2.2.3.2 Outdoor storage

(In addition to point 2.2.2):

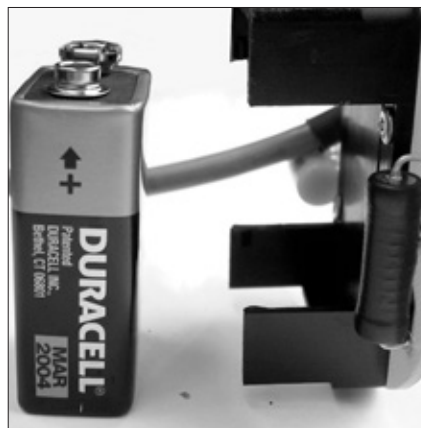
- check the general conditions of the actuator, paying particular attention to the terminal board, fuse enclosure and local display glass.
- In case the actuator is provided with an alkaline battery, remove it and store in dry and clean place (see chapter 11.3, Maintenance - Alkaline battery change)

2.3 Checks to be performed before installation

- Make sure the valve to be motorised is the appropriate one for coupling to the actuator
- The electrical supply cables must be suitable for the power rating (see the test certificate that comes with the actuator).
- Gather the right tools for the assembly and for setting the actuator controls.

If a long storage period has occurred, before reinstalling the actuator, please:

- check the status of the O-ring seals;
- check the installation of the plugs or cable glands on the cable entries;
- check whether the enclosure covers or the actuator body are cracked or broken;
- check the oil level in the actuator and top up if necessary;
- put the batteries back into place (see chapter 11.3, Maintenance - Alkaline battery change).



3. Installation

3.1 Working condition

The standard actuators are suitable for the following environment temperatures:

-30°C +85°C (-22°F to +185°F)

Special versions are available for extreme environment temperatures:

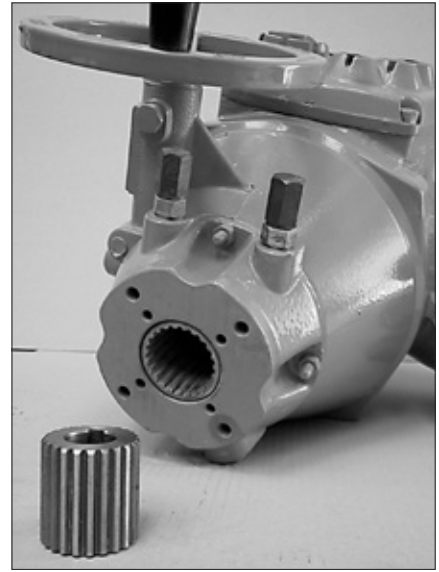
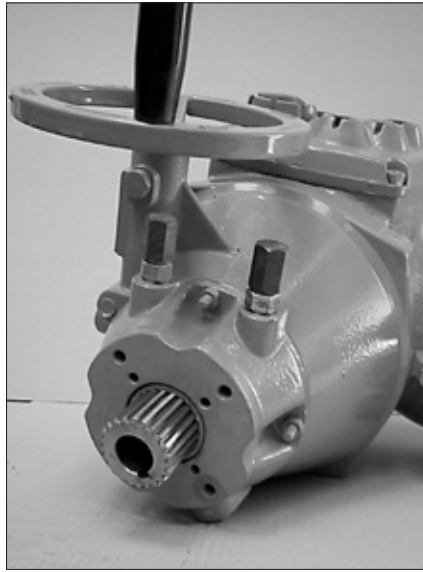
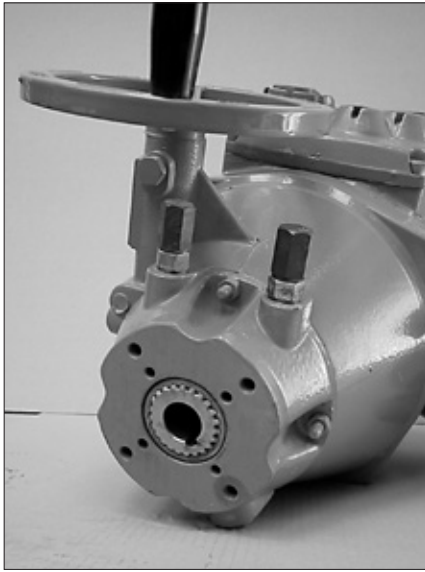
-40°C +70°C (-40°F to +158°F)

-55°C +70°C (-67°F to +158°F)

3.2 Coupling block: disassembly from the actuator

The bushing is delivered already assembled to the drive sleeve, even when it is unmachined. In order to perform the necessary machining, remove the bushing from its housing.

Actuator view from the coupling side, with the bushing separated from the drive shaft.

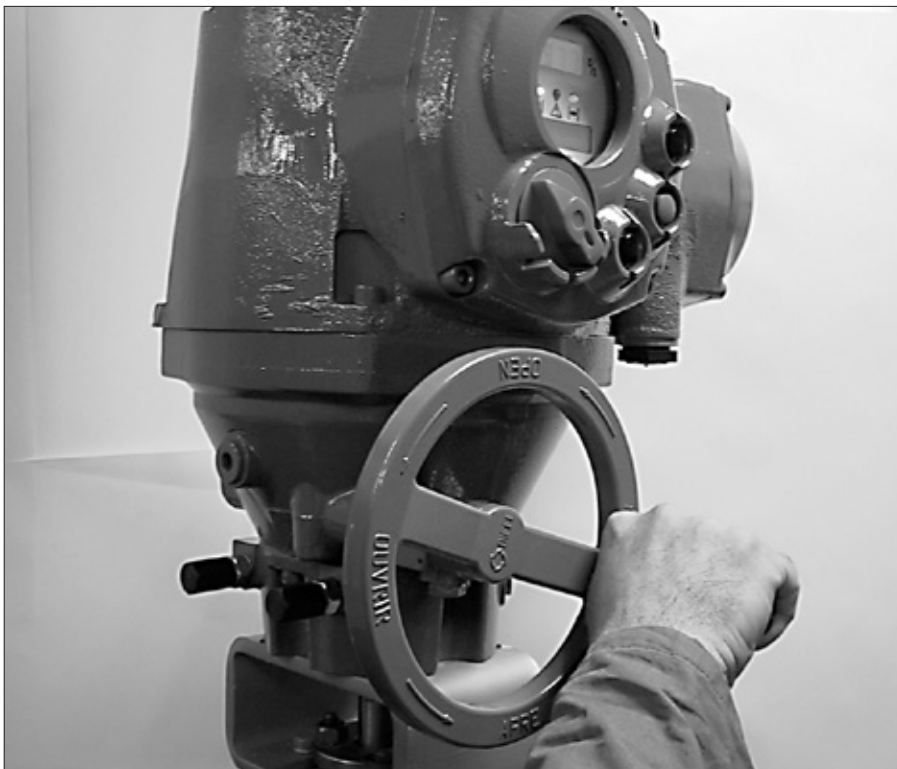


Important

Check the “temperature environment range” embossed on the nameplate, for the correct utilisation with respect to the environment temperature.

3.3 Manual operation

To manually operate the actuator it is sufficient to turn the handwheel in the desired direction.



Warning

Do not manually operate the actuator with devices other than the handwheel. Using cheater bars, wheel wrenches, pipe wrenches, or other such devices on the actuator handwheel may cause serious personal injury and/or damage to the actuator or valve



Warning

Never lift the valve/actuator assembly without securing slings to both the valve and the actuator.

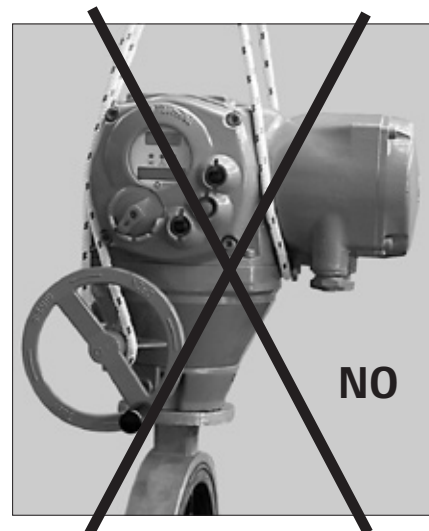
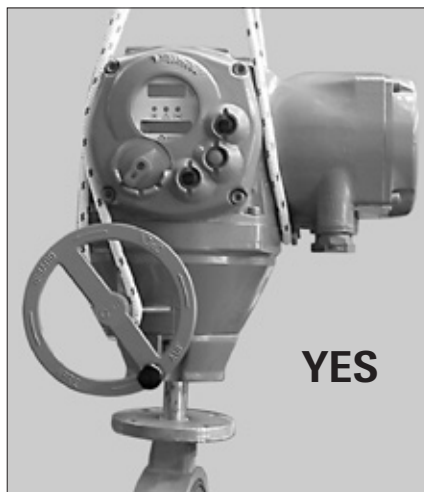
3.4 Mounting the actuator onto the valve

Lubricate the valve stem.

Thoroughly clean the coupling surfaces of the valve and actuator flanges, degreasing them carefully since torque is transmitted by friction.

Lift the actuator with slings suitable for its weight.

Size	Max. weight
F01-2000/150	26 Kg
F01-2000/300	26 Kg
F01-2000/600	28 Kg



Check the dimensions of the valve mounting details, paying particular attention to the protrusions of the valve stem in order to avoid any axial thrusts to the internal parts of the actuator or the valve when the screws are tightened.

Place the actuator vertically on the valve stem. Carry out the coupling operations (if necessary with the help of manual operation); make sure no mating parts are forced.

3.4.1 Actuator fixing

Model	Tightening torque
F01-2000/150	40 Nm
F01-2000/300	40 Nm
F01-2000/600	80 Nm



Important

In case the actuator is supplied without stud bolts and nuts the following materials must be used as a minimum:

- ISO class 8.8 for studs bolts and nuts or
- ASTM A 320 Grade L7 (or L7M) for studs bolts
- ASTM A 194 Grade 4 for nuts



Important

All the accessories (in particular cable glands) must be certified. As of 30 June 2003, the above accessories must carry the CE certification conforming with 94/9/CE Directive.

3.5. Electrical connections

Before powering to the actuator check that the supply voltage details on the nameplate are correct for the plant. Access to terminals for electrical connections and commissioning is through the terminal cover, since all settings are non-intrusive. The removal of any other covers without Biffi's approval will invalidate the warranty.

Biffi will not accept any responsibility for any damage or deterioration that may be caused.

3.5.1 Plants requirements

Protection devices (overcurrent breakers, magneto-thermal switches or fuses) should be provided on the plant at Customer care, to protect the mains line in case of motor overcurrent or loss of insulation between phases and earth.

3.6. Removing the electrical enclosures' covers

3.6.1 Terminal board enclosure



Using a 8mm Allen key, loosen the four screws and remove the cover.

3.7 Cable entries

The sealing of cables and conduit entries should be carried out in accordance with National Standards or the Regulatory Authorities that have certified the actuators. This is particularly true for units that are certified for use in hazardous areas where the method of sealing must be to an approved standard, and cable glands, reducers, plugs and adapters must be approved and separately certified.

Certified cable entries:

- standard Rc ISO7/1 (cable entries 2x1" + 1x1 1/2" + (optional) 1x3/4")
- standard ASA/NPT (cable entries 2x1" + 1x1 1/2")
- metric BS 3643 (cable entries 2xM32 + 1xM40)
- Pg DIN 40430 (cable entries 2xPg21 + 1xPg29)

Remove the cable entry plugs.

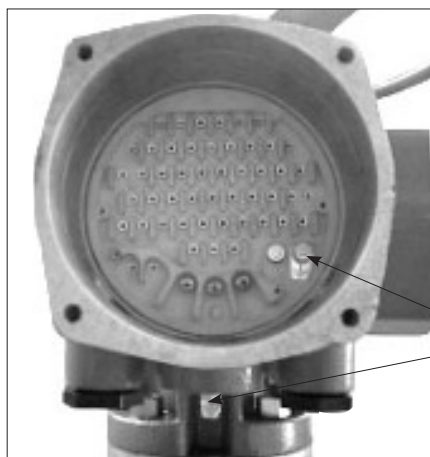
To guarantee weatherproof and explosionproof fit, screw the cable glands tightly (at least 5 turns) and block them with a thread sealant. The use of a thread sealant is necessary in case of explosionproof application.

If some parts of the cable glands have been removed while working on the cable entries put them back into place now to avoid losing the dismantled parts.

Unused entries:

- for explosionproof construction: unused entries must be plugged with metal explosionproof plugs and blocked with a thread sealant
- for weatherproof construction: replace the plastic standard protection plugs supplied with the actuator with metal plugs.

3.8 Terminal board



Ground studs



Warning

Do not damage the mating surface of the cover.



Important

In case the screws of the cover must be replaced, a Stainless Steel AISI 316 must be used with minimum yield strength of 450Nm²



Important

- to prevent any water infiltration through the line cable conduits, make sure the cable glands have the minimum protection degree required by the plant.
- if rigid conduits are used, we suggest placing a flexible pipe connection between the conduit and the terminal board.



Important

The removal of any other covers without Biffi's approval will invalidate the warranty. Biffi will not accept any responsibility for any damage or deterioration that may occur as a result of cover removal.



Terminate the ground connections to the ground stud marked \perp . One internal and one external ground studs are provided.

Check the wiring diagram (always enclosed with the actuator) and the layout displayed on the back of the terminals enclosure cover, to ensure a correct electrical connection. All terminations should be made by insulated ring or spade connectors using the appropriate crimping tool. This operation will ensure easy and correct electrical connection.

Connect the motor supply cable previously sized in accordance with:

- the absorbed current correspondent to the actuator nominal torque with the torque limiting device set at 100 percent (see the test certificate attached to the actuator)
- the applicable plant and safety norms.

Assemble the power terminals protective barrier, located in the terminal board compartment, using the enclosed screws.

The control circuit (controls and signals) must be connected by means of a multicore cable to the corresponding numbered terminals according to the wiring diagram.

The internal cables of the actuator are also numbered according to the wiring diagram.

Actuators are always delivered with the motors wound and connected in accordance to customer requests. Voltage and frequency values are stated on the motor name-plate.



Important

Electric actuator F01-2000 shall be installed and maintained according to the applicable rules regarding the electrical installations in hazardous area (other than mines) classified as zone 1 (gas); example: EN 60079-10 (hazardous area classification), EN 60079-14 (electrical installation), EN 60079-17 (maintenance), and/or other national standards.



Warning

Do not operate the actuator electrically when the electrical enclosures are removed. Operating the unit with the electrical enclosures removed could cause personal injury.



Important

Electric actuator F01-2000 shall be installed and maintained according to the applicable rules regarding the electrical installations in hazardous area (other than mines) classified as zone 21 (dust); example: EN 50281-1-2 (dust) and/or other national standards.

3.9 Instructions for the explosionproof enclosures

During the dismantling and subsequent reassembling of the explosionproof enclosures (covers, cable glands, joints) be careful to bring these enclosures back to their original condition to maintain their integrity. In particular, be sure the joint surfaces of all enclosures are spread with a film of recommended grease (see chapter 4, Lubrication).

So please:

- Do not damage the explosionproof mating surfaces on the housing and on the electrical enclosures covers.
- Reinstall all the screws that go with the dismantled parts, and block them with a thread sealant after spreading them with a film of copper- or molybdenum-based grease. This will keep screws from sticking and make maintenance operations easier.
- Check that the bolts and screws are the same dimension and quality as the original ones (as stated on the nameplate), or of a better quality.
- Replace the weatherproof seals that may have been removed (O-ring for the covers, O-ring for the explosionproof joint of the motor).

3.10 Installation in environment with explosive dusts

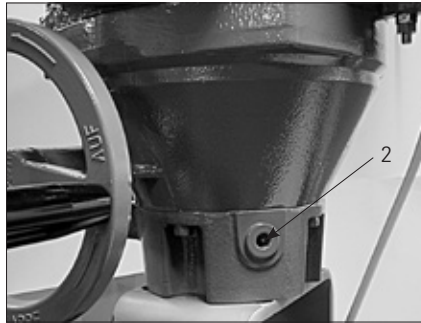
Please make sure that:

- the joint surfaces are greased with silicon oil or equivalent before assembly
- the cable glands have minimum protection degree IP6X (EN 60529)
- periodically verify the quantity of dust deposited on the enclosure and clean it if more than 5mm.

4. Lubrication

4.1 Lubrication inspection

The actuator is lubricated for life, therefore under normal working conditions it is not necessary to replace or refill the oil. However it is recommended to check the oil level every 3-5 years using holes 1 or 2 depending on mounting position.



The actuator is fitted with oil plugs (parts 1, 2), so that any assembly on the valve has at least one oil plug on the upper part of the housing and one on the lower part.

The actuator is supplied with oil and greased where necessary.

In case of maintenance the following oils are recommended:

Ambient Temperature from -30°C to +85°C

- SHELL - TIVELA OIL SC320
- Other equivalent:
- EXXON TERESSTIC SHP320
- MOBIL OIL - GLYGOYLE HE 320
- KLUBER LUBRICATION - KLUBERSYNTH EG4-320

Ambient Temperature from -55°C to +65°C

- SHELL - MADRELA OIL 46
- Other equivalent:
- SYNECO - WINTER PLUS

In case of maintenance the following greases are recommended:

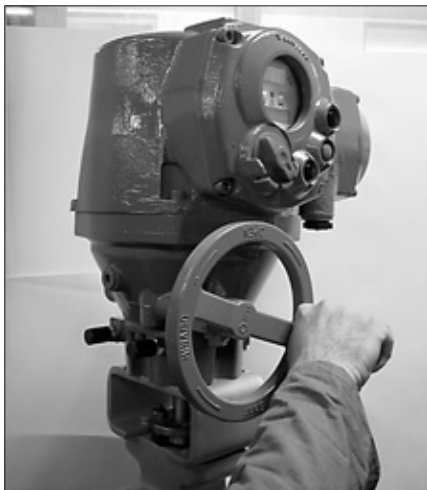
Ambient Temperature from -30°C to +85°C

- ISO viscosity grade X1 (EP1)
- Other equivalent:
- ESSO BEACON EP1
- AGIP GR MU/EP1

Ambient Temperature from -55°C to +65°C

- FUCHS FN20
- Other equivalent:
- TEXACO low temperature grease EP
- AGIP FN20/00

Actuator Size	Oil quantity (l)
F01-2000/150	0.7
F01-2000/300	0.7
F01-2000/600	0.8



Warning

Do not manually operate the actuator with devices other than the handwheel. Using cheater bars, wheel wrenches, pipe wrenches, or other such devices on the actuator handwheel may cause serious personal injury and/or damage to the actuator or valve.

5. Operating the F01-2000

5.1 Operation by handwheel

To manually operate the actuator it is sufficient to turn the handwheel in the desired direction. The manual operation is always possible without any clutching mechanism.

5.2. Setting of mechanical stops

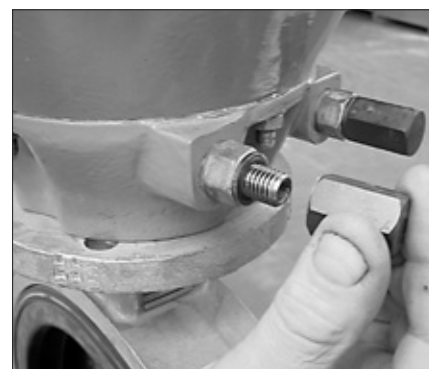
Necessary equipment : a 3 mm hexagonal key.

According to the type of valve to be operated, the actuator can be stopped by means of torque or position limit switches, as detailed in the following table:

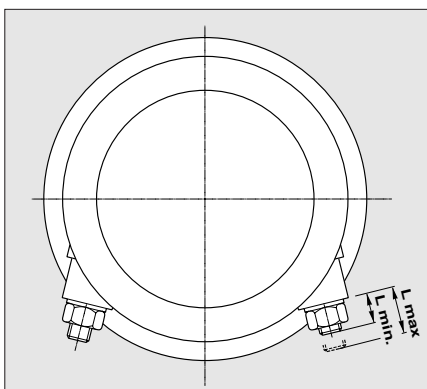
Valve type: metal seated butterfly valve Valve type: ball valve, butterfly valve, plug valve

Closing: torque
Opening: position

Closing: position
Opening: position



Before any setting operation, it is necessary to unscrew the adjustable mechanical stops. Hold the lock nut and remove the mechanical stop protection by unscrewing it. Remove the seal washer.



Hold the mechanical stop by means of a suitable Allen key and in the same time loosen the lock nut by one turn.

Screw the closing or opening mechanical stop until it reaches the end stroke. From here unscrew it by half a turn and lock it with the lock nut.

Check the protrusion of the mechanical stop: for a stroke of $90^\circ \pm 5^\circ$, length "L" should be within the following values:

Size	L max	Lmin
F01-2000/150	24 mm	6 mm
F01-2000/300	24 mm	6 mm
F01-2000/600	29 mm	8 mm

5.3 Electrical operation

Before connecting power to the actuator check that the voltage is correct and according to the indications on the nameplate. Wrong power supply could cause a permanent damage to the electrical components. Check of phase rotation is not necessary since the unit is provided with automatic phase rotation correction. Place the 3-position selector in OFF and then switch on the power. Do not operate the actuator without first checking that the configuration is according to the required application. Using the "VIEW and SET-UP" features can do this (see chapter 6.4, Local controls - Entering the set-up mode)



5.4 Local control

After configuring the actuator, if no alarm is present, place the 3-position selector in LOCAL and control the actuator by OPEN, CLOSE and STOP push-buttons.

If "push-to-run" was selected the actuator can be driven to the desired position by pressing and holding the OPEN/YES or CLOSE push-button. As the push-button is released, the motor is de-energised.

If "latched" was selected, as the OPEN or CLOSE push-button is pressed the motor is energised, and it runs on after the control is released. To stop the motor, press the STOP push-button. To reverse the direction, press the STOP push-button and then press the push-button relevant to the opposite direction.

In "latched with instant reverse" mode, the local controls work as in the "latched" mode, but to reverse the motor direction you only need to press the push-button relevant to the opposite direction.



5.5 Local indication

The upper display (3_ LCD) indicates the valve position as a percentage of opening (open = 100%). The lower display has two alphanumeric lines.

The upper line indicates the actuator status and the 3-position selector status. The lower line indicates the actuator operation.

Two LED's indicate the actuator position / operation, while a third LED indicates alarms.



5.6 Lock of the 3-position selector

The 3-position selector can be locked in any of its three positions by means of a padlock.

5.7 Remote control

Place the 3-position selector in REMOTE to transfer the actuator control to a remote device. Local OPEN or CLOSE operation will be inhibited. Only local STOP control remains active.

Using the "VIEW and SET-UP" features may configure different control modes. The remote controls are opto-coupled.

A non-regulated 24VDC voltage (variable from 23 to 27 Vdc, max. 4W) is available on the actuator terminal board to supply the remote controls or external devices.



5.8 Operating the F01-2000 for the first time

Before attempting to operate the F01-2000 for the 1st time, check that the actuator is correctly mounted on the valve. Place the 3-position selector in OFF and switch the power on. Check that the indication in the upper row of the alphanumeric display is "NORMAL OFF". If the display shows "ALARM OFF", remove the alarm before proceeding (see chapter 12, Troubleshooting).

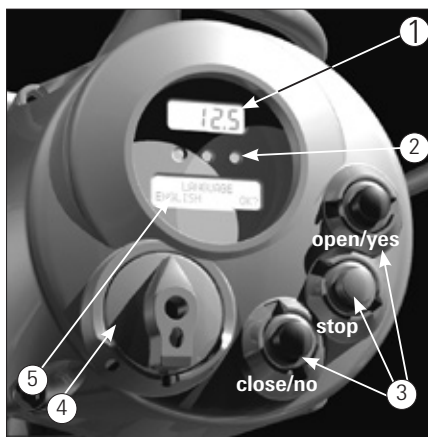
Do not operate the actuator without first checking that the configuration is according to the required application (through the "VIEW and SET-UP" features (see chapter 6.3, Local controls - Entering the view mode). Set torque limits, position limits and close direction by means of the "stroke limits routine" of the "actuator set-up" menu (see chapter 6.3, Local controls - Entering the view mode; and chapter 9.1, Set-up routines - Actuator set-up). When the strokes limits and the configurations are correct, bring the 3-position selector to LOCAL and drive the actuator to either open or closed position (see chapter 5.3, Operating the F01-2000 - Electrical operation).

5.9 Optional modules

Additional modules can be installed to provide the following functions:

- fieldbus interface for remote control via FIELDBUS
- 3 auxiliary relays (AS5, AS6, AS7)
- 4-20 mA position and torque retransmission
- 4-20 mA position servoamplifier

Refer to the specific instruction manuals for the setting of the above modules



6. Local controls

6.1 Description of the local operator interface

The following functions are available by the F01-2000 local operator interface:

- actuator control
- actuator configuration
- actuator status visualisation

The figures on the following pages describe the function of each component of the local operator interface

Local operator interface

1 Numeric display

To indicate the present valve position as a % of the opening

2 Three LED's

To indicate the actuator status according to the following logic:

- green ON/ red OFF: the actuator is stopped in open position
- green OFF/ red ON: the actuator is stopped in closed position
- green OFF/ red flashing: the actuator is running in closing direction
- green flashing/ red OFF: the actuator is running in opening direction
- green ON/ red ON: the actuator is stopped in intermediate position
- yellow ON: alarm
- yellow flashing: warning

The above colour combination is supplied as standard, but it may be changed (red with green, green with red, and yellow with red), during actuator setting operations

3 Local controls

Local controls: OPEN/YES, CLOSE/NO, and STOP push-buttons.

The STOP push-button resets any existing command and is active both in local and remote.

If the 3-position selector is in LOCAL, the OPEN / YES, and CLOSE / NO push-buttons work as OPEN and CLOSE commands.

If the 3-position selector is in REMOTE or in OFF, the OPEN / YES and CLOSE / NO push-buttons work as YES and NO to answer the prompt (next? OK? view?, change? exit?) of the alphanumeric display.

In OFF, the OPEN / YES and CLOSE / NO push-buttons allow to scroll down the menu, to view and change the actuator configuration or to scroll the list of variables, status, and alarms.

In REMOTE, the above push-buttons allow scrolling the list of variables, status, and alarms, but the actuator configuration cannot be viewed or changed.

4 3-position selector

To set the following operation modes:

- LOCAL: for local control only
- OFF: no control is active but the actuator is still connected to the mains
- REMOTE: for remote control only

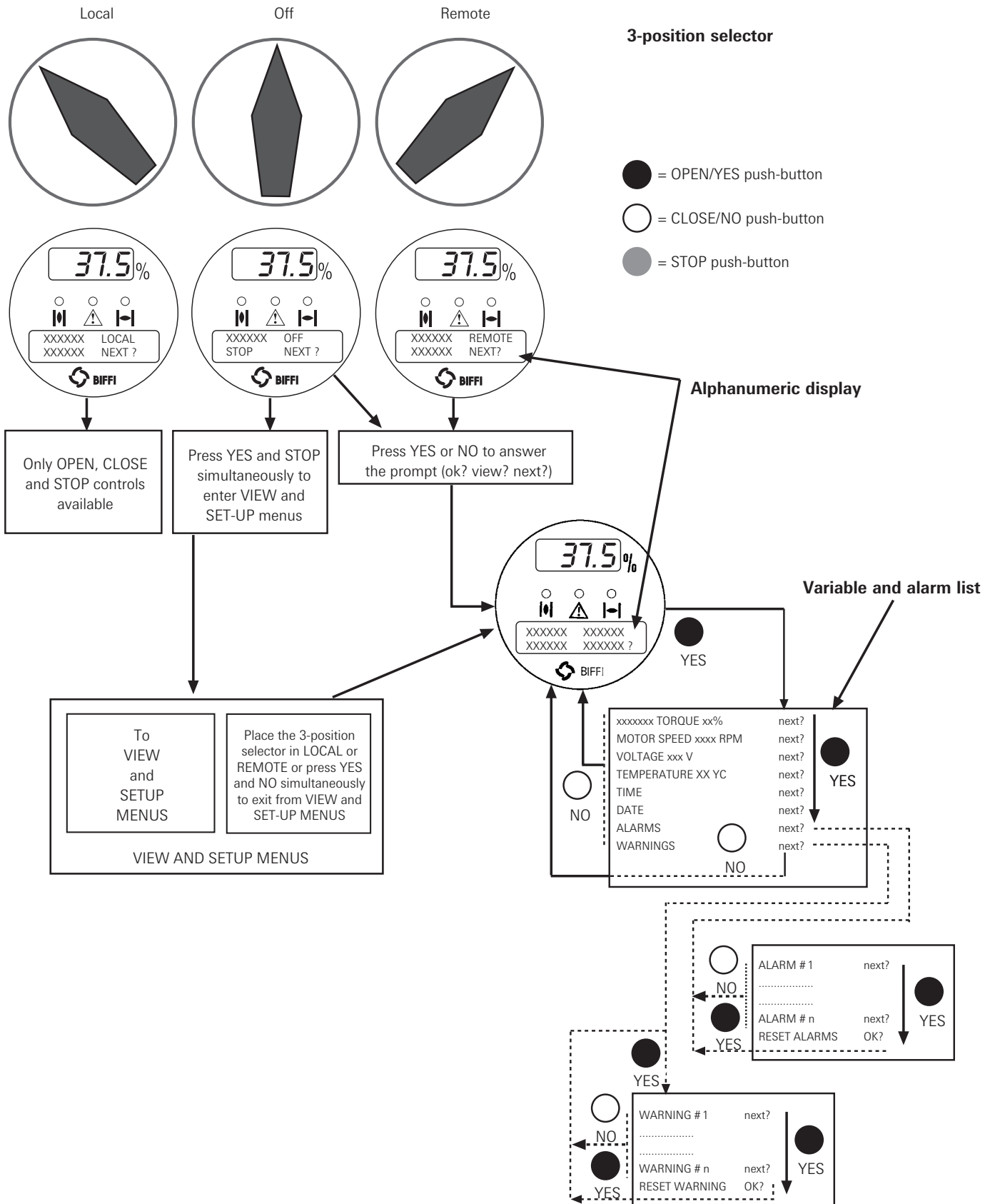
5 Alphanumeric display

During normal operation the alphanumeric display shows the present status (NORMAL, ESD ON, ALARM, WARNING), the 3-position selector status (LOCAL, OFF, REMOTE) and the actuator action (OPEN, OPENING, CLOSED, CLOSING, STOP). If the local selector is in OFF or REMOTE, pressing the YES push-button it is possible to scroll the list of variables and alarms below:

- output torque
- motor speed
- main voltage supply
- motor current
- temperature inside the actuator enclosure
- time
- date
- alarm list
- warning list

The warning condition occurs when a variable reaches a critical value and/or a maintenance action is required, but the actuator control functions are still available. The alarm condition occurs when a variable is out of the acceptable range and the actuator control functions are not available. The alarm and warning lists contain the present alarms and warnings. When the fault condition disappears, the corresponding alarm or warning disappears from the list. A reset routine is provided to clear the alarm / warning that are memorised (over-torque, jammed valve, etc.).

The following drawing shows the use of the **OPEN / YES**, **CLOSE / NO** and **STOP** push-buttons in function of the local selector position.



6.2 Configuration options

The F01-2000 actuator can be totally configured from the local interface by means of a series of menus that can be selected from the alphanumeric display. The operator is guided through the different displays by answering YES or NO to the appropriate prompt (change? OK?, view?, next?, etc.) in the right corner of the lower row of the alphanumeric display.

To access the menus: set the local selector in OFF and then simultaneously press OPEN/YES and STOP. The alphanumeric display will now show the present language. Press YES if the language is correct, press NO to scroll the list of available languages and then YES to select.

After choosing the language, the next step is the selection among view and set-up mode. Use "View" mode to see the actuator configuration, and use "Set-up" mode to change the present configuration. Unauthorised access to the set-up mode is prevented by a 4-character alphanumeric password. The actuator is supplied by BIFFI with the default password " 0 0 0 0 ".

Once the correct password has been entered, the actuator parameters can be configured.

The present password can also be modified by the "set password" routine in the Maintenance menu. After entering the new password, the old one ceases to be valid, so it is important to record the password in a secure location for future retrieval.

The configuration functions (view and set-up mode) are grouped in 4 main menus:

Actuator set-up, Nameplate, Valve data, Maintenance.

Actuator set-up

This menu includes the routines that allow the actuator to be configured according to the requested control mode and to the valve it is mounted on.

List of routines:

- | | | | |
|-----------------|-------------------|------------------|-----------------|
| - stroke limits | - ESD control | - local controls | - 2-speed timer |
| - torque set-up | - remote controls | - output relays | - miscellaneous |

Nameplate

This menu includes a series of data identifying the actuator characteristics, service, and utilisation mode. The data are entered by the manufacturer and can only be viewed.

List of routines:

- | | | | |
|------------------|-----------------|------------------|-----------------|
| - serial number | - motor poles | - test date | - HW version |
| - actuator size | - motor type | - wiring diagram | - SW version |
| - nominal torque | - motor rating | - enclosure | - Torque sensor |
| - actuator speed | - motor current | - certificate | |
| - power supply | - motor duty | - lubricant | |

Valve data

This menu includes a series of data relevant to the valve. The valve manufacturer and end user should enter the data.

List of routines:

- | | |
|------------|-----------------|
| - tag name | - serial number |
|------------|-----------------|

Maintenance

This menu includes all diagnostic and historic data which can help the operator in case of failure or during maintenance operations. The Maintenance menu also includes the "Set password" routine.

List of routines:

- | | |
|--------------------|------------------|
| - set password | - torque profile |
| - alarm log | - operation log |
| - maintenance date | |

The parameters appear on the alphanumeric display in the same order both in view and set-up mode. At the end of each routine the program will automatically return to the beginning of the routine, and the operator can choose to either re-enter (by pressing YES) or to move on to a next routine (by pressing NO).

6.3 Entering the view mode

The existing actuator configuration should be checked before commissioning. The parameters are configured in factory according to a standard setting, or to customer requirements. In view mode, no password is requested, but no change of parameters can be made.

- Ensure the electrical main power is applied.
- Move the 3-position selector to OFF and then simultaneously press OPEN/YES and STOP.
- The display shows the present language. Press YES to confirm or NO to scroll the list of available languages. Press YES to select a new language. Press YES to confirm.
- Press NO to scroll the list of available menus (actuator set-up, nameplate, valve data, maintenance) and then press YES to select the desired menu.
- Press NO to scroll the list of available routines and press YES to select the routine where the parameter to be changed is located.
- Press NO to scroll the list of parameters and press YES to view the value.

6.4 Entering the set-up mode

To change the existing settings or to set the stroke limits it is necessary to enter the correct password.

- Ensure the electrical main power (or the external auxiliary supply) is applied.
- Move the 3-position selector to OFF and then simultaneously press OPEN/YES and STOP.
- The display shows the present language. Press YES to confirm or NO to scroll the list of available languages. Press YES to select. Press YES to confirm the chosen language.
- Press NO when the message is "VIEW MODE OK? ". Press YES to answer prompt "ENTER PASSWORD OK?"
- Enter password. Enter one digit at a time. Press YES if digit is correct, press NO to scroll the list of available characters and then press YES when the character is correct. Enter 4 digits. After entering the last digit, the microprocessor checks the password. If it is correct the messages "PASSWORD CORRECT" and then "SET-UP MODE OK?" appear. Press YES.
- Press NO to scroll the list of available menus (actuator set-up, valve data, maintenance) and press YES to select the desired menu.
- Press NO to scroll the list of available routines and press YES to select the routine where the parameter to be changed is located.
- Press YES and NO to answer the prompt on the display and change the parameter.
- If the password is wrong the message "PASSWORD WRONG" appears and set-up mode will not available.

All settings are automatically saved to a non-volatile memory and retained also if the electrical power is removed from the actuator.

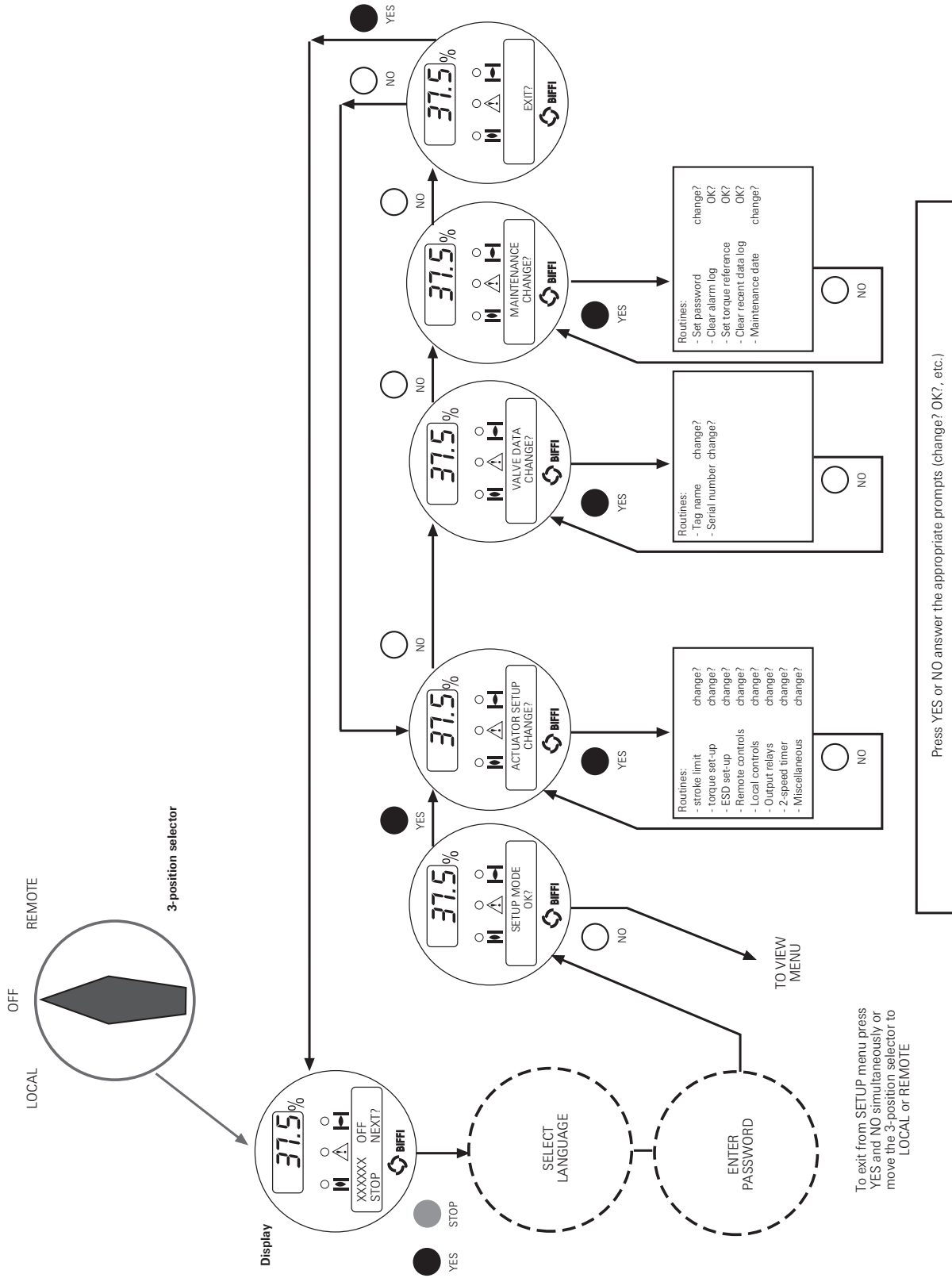
All F01-2000 actuators are configured before shipping with a standard default setting unless alternatives were requested on order. In case of difficulty during commissioning, the default setting can be re-instated by the appropriate function in the routine "miscellaneous" of the actuator set-up menu. The actuator returns to its original configuration and commissioning can be resumed.

6.5 Exit from view and set-up mode

The following conditions cause the exit from view and set-up mode:

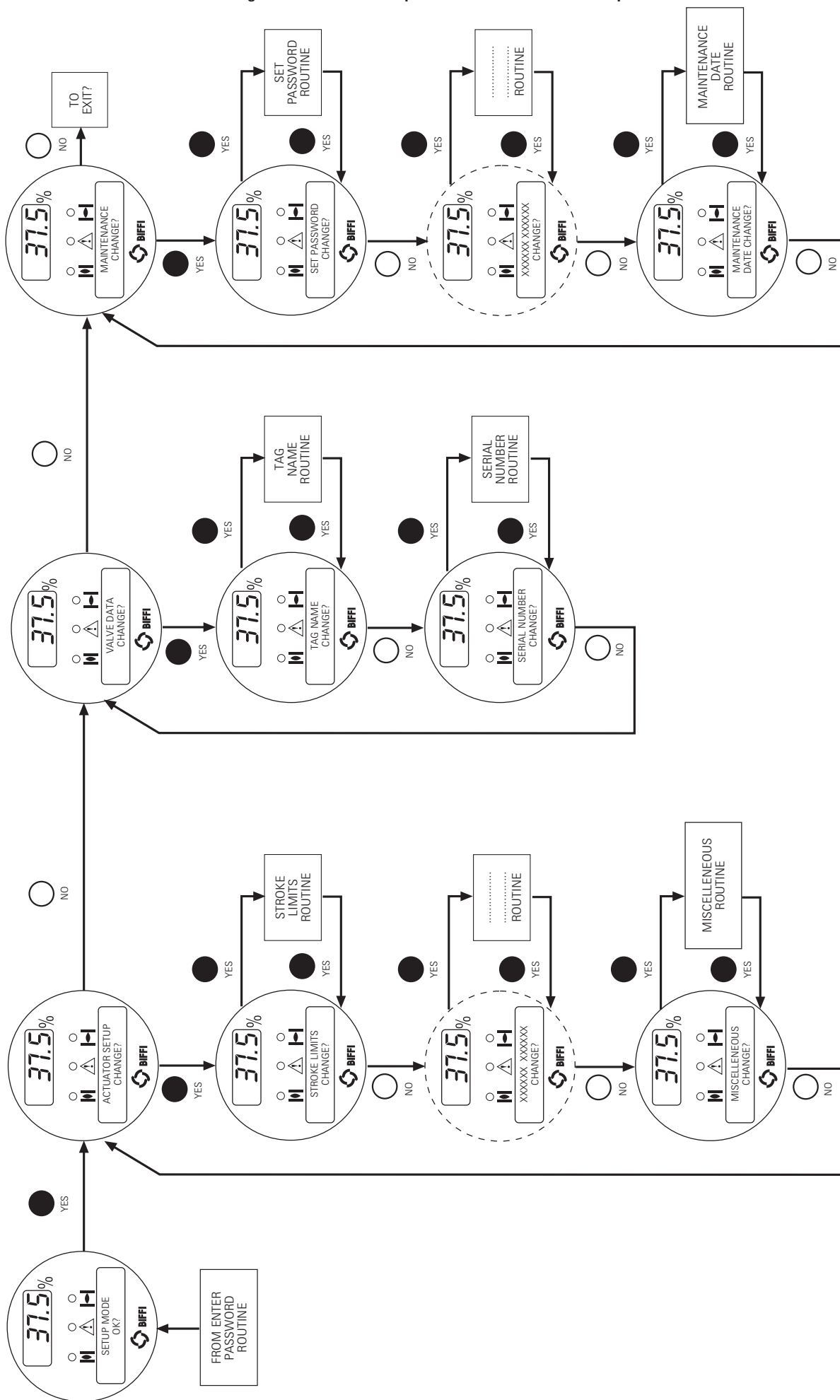
- move the 3-position selector to LOCAL or REMOTE
- answer YES when the display asks "EXIT OK? "
- press YES and NO simultaneously
- automatic exit after 5 minutes without any parameter change or view
- remove the electrical power from the unit

7. Set-up menu

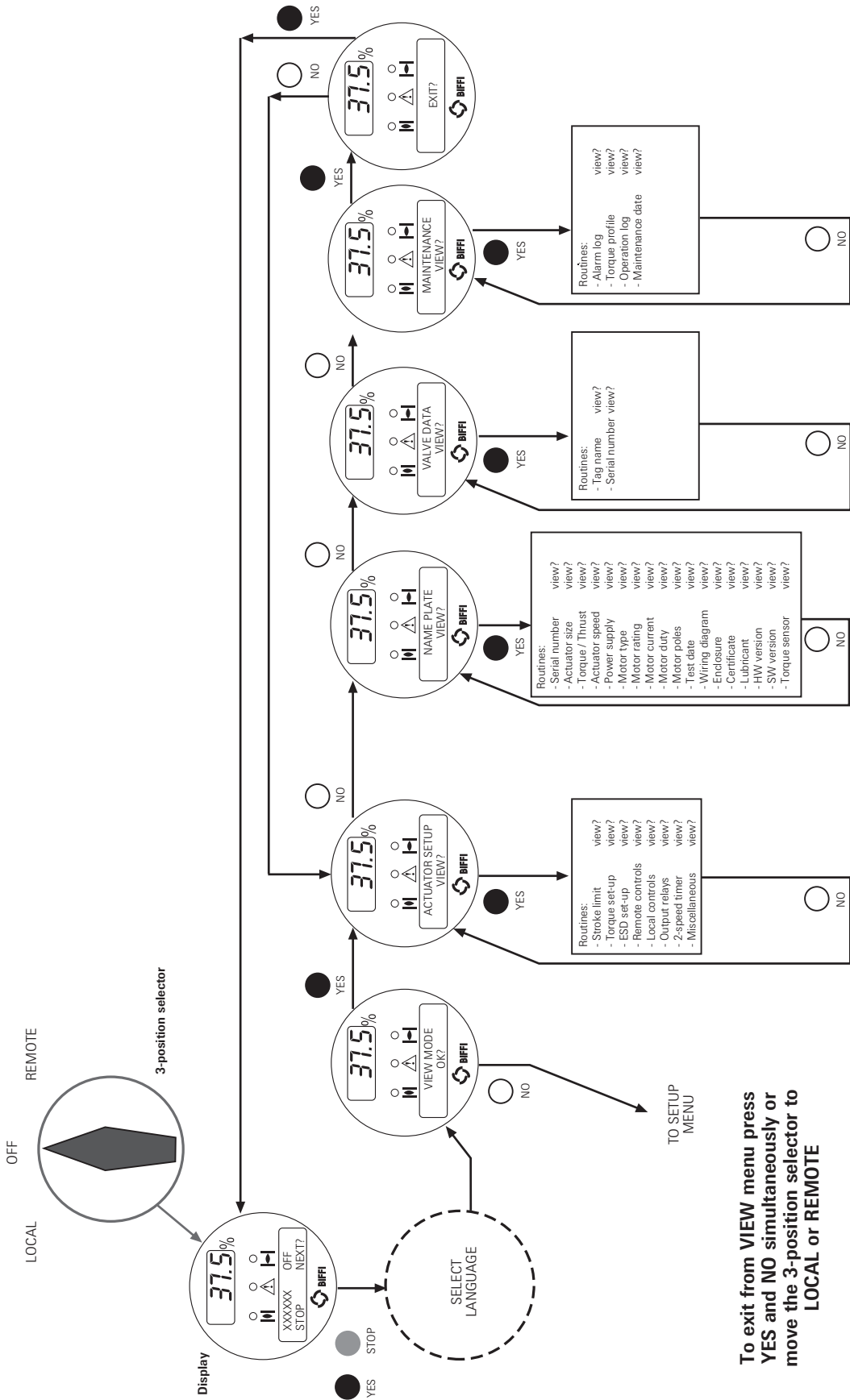


To exit from SETUP menu press YES and NO simultaneously or move the 3-position selector to LOCAL or REMOTE

The figure below shows the procedure to move in the set-up routines

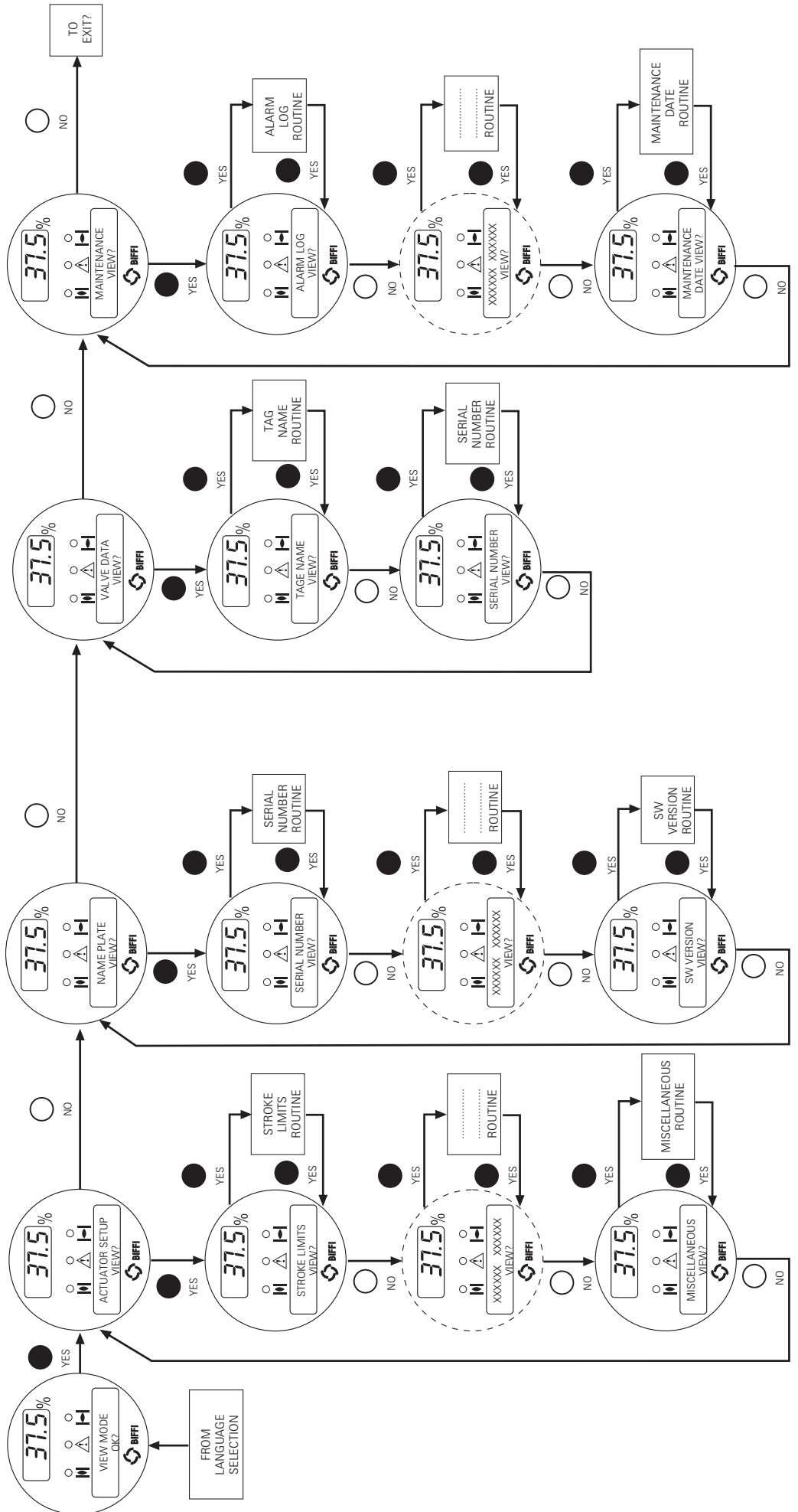


8. View menu



To exit from VIEW menu press YES and NO simultaneously or move the 3-position selector to LOCAL or REMOTE

The figure below shows the procedure to move in the view routines



9. Set-up routines

9.1 Actuator set-up

9.1.1 Set stroke limits

This routine allows the actuator to be configured according to the type of valve it is mounted on.

The following parameters will be set:

- opening and closing torque limits: from 40 % to 100 % of the nominal torque. The nominal torque corresponding to 100% is set in-house and is stated in the name plate menu.
- close direction: clockwise (CW) or counter-clockwise (CCW). Most valves require clockwise rotation of the stem when viewed from the handwheel. Engage the manual override and check if the valve closes with clockwise or counter-clockwise rotation of the handwheel
- close and open limits type: by position or by torque. Use the following table to choose:

Valve type	Close limit	Open limit
• Gate (solid, flexible and split wedge), globe, front seal butterfly valves	• Torque	• Position
• Ball, gate (parallel slide), plug valves	• Position	• Position
• Linear valves with back-seating on stem	• Torque or position	• Torque

- Move the valve to the mid-travel position by the handwheel.
- Move the local selector to OFF and then simultaneously press OPEN and STOP. Select the language and then enter the password according to the instructions (see "Entering the set-up mode"). When the message displayed is "SET-UP MODE OK?" press YES. Press YES to select the actuator set-up menu, and then press YES again to start with the stroke limits routine.
- Press YES if the closing torque limit is correct or NO to scroll the list of available values. When the value is correct, press YES.
- Press YES if the opening torque limit is correct or NO to scroll the list of available values. When the value is correct press YES.
- Press YES if the rotation to close is correct (CW or CCW), or NO to change. When the value is correct press YES.
- Press YES to set the close limit, or NO and then YES to set the open limit.

Press YES if the close limit type is correct (torque or position), press NO to change it.

Press YES when the type is correct.

Close limit by position

- Move the local selector to LOCAL. The local controls can be used.
- Move the valve to closed position (by CLOSE control or by handwheel)
- Move the local selector to OFF
- Press YES to confirm
- Press YES to set the open limit or press NO and again NO to repeat the close limit setting procedure. Press NO and then YES to exit from the stroke limits routine.

Close limit by torque

- Move the local selector to LOCAL. The local controls can be used.
- Press the CLOSE control. The actuator moves in closing direction and when the configured torque value is reached the motor is stopped and the new position limit is memorised.
- Move the local selector to OFF
- Press YES to confirm
- Press YES to set the open limit or press NO and again NO to repeat the close limit setting procedure. Press NO and then YES to exit from the stroke limits routine.

Open limit type

- Press YES if the open limit type is correct (torque or position), press NO to change it. Press YES to confirm.

Open limit by position

- Move the local selector to LOCAL. The local controls become active.
- Move the valve to open position (by OPEN control or by handwheel)
- Move the local selector to OFF
- Press YES to confirm
- Press YES to set the open limit or press NO and again NO to repeat open limit setting procedure. Press NO and then YES to exit from the stroke limits routine.

Open limit by torque

Move the local selector to LOCAL. The local controls become active.

- Press the OPEN control. The actuator moves in opening direction and when the configured torque value is reached the motor is stopped and the new position limit is memorised.
- Move the local selector to OFF
- Press YES to confirm
- Press YES to set the open limit or press NO and again NO to repeat the open limit setting procedure. Press NO and then YES to exit from the stroke limits routine.

If parameter "direction to close" is changed, both limits (open and close) must be set. Before leaving the stroke limits routine the microprocessor calculates the new value of the position resolution. If the stroke turns are less than 2.7, the message "error re-try" appears and the stroke limits procedure must be repeated.

9.1.2 Torque set-up

The output torque limits to close or to open may be configured between 40% and 100% of the nominal torque stated on the actuator nameplate.

Set-up procedure:

- Move the local selector to OFF and then simultaneously press OPEN and STOP. Select the language and then enter the password according to the instructions (see "Entering the set-up mode"). When the message displayed is "SET-UP MODE OK?" press YES. Press YES to select the actuator set-up menu, press NO and then press YES to select the torque set-up routine.
- Press YES if the opening torque limit is correct, press NO to scroll the list of available values. Press YES when the value is correct.
- Press YES if the closing torque limit is correct, press NO to scroll the list of available values. Press YES when the value is correct.

9.1.3 ESD control

An ESD signal can be connected to the actuator to override any existing command and drive the valve to a predetermined position. The ESD control is not self-maintained: the ESD action is only performed if the relevant input is active. The ESD control is active when the 3-position selector is in REMOTE and no alarm is present.

Function "ESD priority" allows the ESD command to override the following additional situations: (*) motor thermostat alarm, (*) torque limit tripped, (*) local stop pressed, 3-position selector in local, 2-speed timer, (*) 3-position selector in OFF.

Configuration procedure:

- Move the local selector to OFF and then simultaneously press OPEN and STOP. Select the language and then enter the password according to the instructions (see "Entering the set-up mode"). When the message displayed 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 ESD set-up.
- Press YES if the ESD action is correct, or press NO to scroll the list of available options (off, open, close, stay-put, go to position xx %). Press YES to select the desired option.
- Press either YES or NO to select the signal type (present, absent)
- Press YES to change ESD priority with reference to the following signals or status:
- (*) motor thermostat alarm. Choosing ESD > THERMOSTAT, the ESD action will be carried out also in case of motor over-heating. Vice-versa, if ESD < THERMOSTAT was chosen, the ESD action will not be done in case of motor over-heating.
- (*) torque limit tripped. Choosing ESD > TORQUE LIMIT, the ESD action will be carried out also in case of torque alarm. Vice-versa, if ESD < TORQUE LIMIT was chosen, the ESD action will not be done in case of torque alarm.
- (*) local stop pressed. Choosing ESD > LOCAL STOP, the ESD action will override the local STOP signal. Vice-versa, if ESD < LOCAL STOP was chosen, the ESD action will not be performed if the local STOP push-button is pressed.
- local selector in LOCAL. Choosing ESD > LOCAL CONTROLS, the ESD action will be carried out also when the local selector is in LOCAL. Vice-versa, if ESD < LOCAL CONTROLS was chosen, the ESD action will not be performed if the 3-position selector is in LOCAL.
- 2-speed timer. Choosing ESD > 2-speed timer, the 2-speed timer function will be inhibited during ESD action. Vice-versa, if ESD < 2-speed timer was chosen, the 2-speed timer function will be active during ESD action.
- (*) local selector in OFF. By choosing ESD > OFF, the ESD action will be carried out also when the local selector is in OFF. Vice-versa, if ESD < OFF was chosen, the ESD action will not be performed if the 3-position selector is in OFF.

The factory configuration is the following: action: CLOSE, signal type: PRESENT, priorities: ESD > LOCAL CONTROLS, ESD > 2-speed timer, ESD < all other cases.



Warning

The user may select ESD to override the situations indicated by (*). If these situations occur and if "ESD > ..." is configured, the actuator may be damaged. Therefore, selecting "ESD > ..." will invalidate the warranty.

The actuator may be remotely controlled by 4, or 3, or 2 wires depending on the connection made on the terminal board of the actuator. The following options are available:

- 4 wires latched: requires 2 momentary signals (since the control is self-maintained) to open or close and one signal to stop in mid-travel
- 3 wires latched instant reverse: requires 2 momentary signals (since the control is self-maintained) to open or close. Reverse momentary signal reverses the direction.
- 3 wires momentary: requires 2 push-to-run type signals (since the control is not self-maintained) to open or close
- 2 wires open if signal On: requires signal On to open and no signal to close
- 2 wires open if signal Off: requires signal Off to open and signal On to close

Configuration should be done during actuator set-up.

Configuration procedure:

- Move the local selector to OFF and then simultaneously press OPEN and STOP. Select the language and then enter the password according to the instructions (see "Entering the set-up mode"). When the message displayed 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 Remote controls.
- Press YES if the control mode is correct or NO to scroll the list of available options: 4 wires, 3 wires, 2 wires. Press YES to select the desired option. If "3 wires" was chosen, use YES or NO to answer the prompt on the display and choose among "push-to-run" or "latched instant reverse" control modes. If "2 wires" was chosen, use YES and NO to choose among "open if signal ON" or "open if signal OFF" control modes.

9.1.5 Local controls

This routine allows:

- to configure the control mode by means of the local controls when the 3-position selector is in LOCAL. The available options are "push-to-run", "latched", "latched with instant reverse".
- to set the LED's colour. The following options are available: open LED: green or red; close LED: green or red; alarm LED: yellow or red.

Configuration procedure:

- Move the local selector to OFF and then simultaneously press OPEN and STOP. Select the language and then enter the password according to the instructions (see "Entering the set-up mode"). When the message displayed is "SET-UP MODE OK?" press YES. Press YES to select the actuator set-up menu, press NO to scroll the list of available routines and then press YES to select Local controls.
- Press YES to change control mode, or press NO to proceed to LED's colour setting

Control mode

- Press YES if the display shows the correct control mode or press NO to scroll the list of available options (push-to-run, latched). Press YES to confirm.

LED's colour

- Press YES if the colour of the open LED is correct. Press NO to change it, then YES to confirm
- Press YES if the colour of the close LED is correct. Press NO to change it, then YES to confirm
- Press YES if the colour of the alarm LED is correct. Press NO to change it, then YES to confirm

9.1.6 Output relays

Monitor relay

The voltage-free, change-over, contacts of the monitor relay indicate that the actuator is either available for remote control or that a problem or a condition preventing remote control of the valve exists.

The monitor relay is normally energised and will be de-energised on:

- | | |
|------------------------------|---------------------------|
| - main voltage failure | - position sensor failure |
| - lost phase | - speed sensor failure |
| - internal temperature alarm | - configuration error |
| - K1 contactor failure | - HW error |
| - K2 contactor failure | - mid-travel alarm |

The following situation can be configured individually to switch-over the monitor relay:

- | | |
|------------------------|-----------------------------------|
| Motor over-temperature | Manual operation |
| Over-torque | ESD signal on |
| Jammed valve | Low alkaline battery (if present) |
| LOCAL/OFF selected | LOCAL/STOP pressed |

Auxiliary output relays

For status indication or diagnostic purposes, 4 voltage-free contacts of 4 relays are available to be configured individually to switch for the following conditions:

Status

- open limit
- closed limit
- position >= xx %
- position <= xx %
- closing
- opening
- motor running
- blinker
- mid-travel position
- local selected
- remote selected
- local stop active
- ESD signal on
- manual operation

Alarm

- motor over-temperature
- over-torque
- over-torque in OP
- over-torque in CL
- valve jammed
- warnings
- valve jammed in OP
- valve jammed in CL
- low alkaline battery (if present)
- mid travel alarm in CL/OP

The contacts may be configured to make or break on condition.

If the alkaline battery is present, the following conditions and the associated relay will be updated also if the main power supply is absent: open limit, closed limit, position>= xx%, position<= xx%, mid-travel position, low alkaline battery.

Configuration procedure:

- Move the local selector to OFF and then simultaneously press OPEN and STOP. Select the language and enter the password according to the instructions (see "Entering the set-up mode"). When the message displayed 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 Output relays.
- Press YES to select DEFAULT #1, or press NO to change
- Press YES to select DEFAULT #2, or press NO to configure the output relays

Default # 1

Monitor relay

- main voltage failure
- lost phase
- local/off selected
- local stop pressed
- manual operation
- internal temperature alarm
- K1 contactor failure
- K2 contactor failure
- position sensor failure
- speed sensor failure
- configuration error
- HW error
- motor over-temperature
- over-torque
- jammed valve
- low alkaline battery (if present)
- mid-travel alarm

Auxiliary relays

AS1 : open limit; make
 AS2 : close limit; make
 AS3 : open limit; break
 AS4 : close limit; break

Default # 2

Monitor relay

- main voltage failure
- lost phase
- local/off selected
- local stop pressed
- manual operation
- internal temperature alarm
- K1 contactor failure
- K2 contactor failure
- position sensor failure
- speed sensor failure
- configuration error
- HW error
- motor over-temperature
- over-torque
- jammed valve
- low alkaline battery (if present)
- mid-travel alarm

Auxiliary relays

AS1 : open limit; break
 AS2 : close limit; break
 AS3 : local selected; break
 AS4 : motor running; break

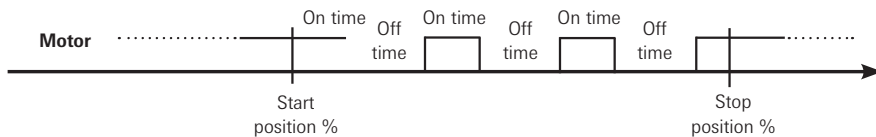
- Press YES to change the monitor relay or NO to change auxiliary relays AS1, 2, 3, 4.
- Press YES or NO to enable or disable the following situations from the conditions which de-energise the monitor relay: motor over-temperature, over-torque, jammed valve, manual override, ESD signal on, low alkaline battery (if present), local STOP pressed, LOCAL/OFF selected..

Auxiliary relays AS1, 2, 3, 4

- Press NO to answer prompt "MONITOR RELAY change?"
- Press YES to change AS1, press NO to select the other relays
- Press YES if the condition associated to AS1 relay is correct, press NO to scrolls the list of conditions and press YES to set.
- Press YES or NO to either confirm or change the type of contact when the condition occurs (break, make).
- Press NO to pass to AS2 and then repeat the procedure for the other relays
- Press NO to exit

9.1.7 2-Speed timer

The "2-speed timer" routine is used to extend the actuator travelling time in opening and / or closing direction, by driving the motor by pulses which duration (ON and OFF time) is configurable. Pulsing control can be applied to full travel or only a part of it.



Start position and stop position may be adjusted from 0% - 100 % separately in opening and closing direction.

ON time and OFF time may be adjusted from 1 sec - 200 sec separately in opening and closing direction.

Configuration procedure:

- Move the local selector to OFF and then simultaneously press OPEN and STOP. Select the language and then enter the password according to the instructions (see "Entering the set-up mode"). When the message displayed 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 2-speed timer.
- Press YES to change close direction parameters, press NO and then YES to change only open direction parameters

Closing direction

- Press YES if the status is OK, or NO to change. Press YES to confirm (status = On, enables 2-speed timer operation in closing direction; status = Off, disables timer operation in closing direction).
- Press YES if the position value where pulsing control starts is correct, press NO to scroll the list of available values. Press YES when the value is correct
- Press YES if the position value where pulsing control stops is correct, press NO to scroll the list of available values. Press YES when the value is correct
- Press YES if the value of the ON time of pulsing control is correct, press NO to scroll the list of available values. Press YES when the value is correct
- Press YES if the value of the OFF time of pulsing control is correct, press NO to scroll the list of available values. Press YES when the value is correct

Opening direction

- Press YES if the status is OK, or NO to change. Press YES to confirm (status = On enables 2-speed timer operation in opening direction; status = Off, disables timer operation in opening direction).
- Press YES if the position value where pulsing control starts is correct, press NO to scroll the list of available values. Press YES when the value is correct
- Press YES if the position value where pulsing control stops is correct, press NO to scroll the list of available values. Press YES when the value is correct
- Press YES if the value of the ON time of pulsing control is correct, press NO to scroll the list of available values. Press YES when the value is correct
- Press YES if the value of the OFF time of pulsing control is correct, press NO to scroll the list of available values. Press YES when the value is correct

9.1.8 Miscellaneous

It includes different types of routines as “time and date”, “factory settings”, “alkaline battery”, “torque profile”, etc. used only for special application or in particular conditions.

9.1.8.1 Time and date

Time and date are used in maintenance functions to associate the time information to the memorised event (torque profile, alarm log, maintenance request, etc.). Time and date are entered at the time of manufacture, but they can be adjusted during commissioning or maintenance operations.

Configuration procedure:

- Move the local selector to OFF and then simultaneously press OPEN and STOP. Select the language and enter the password according to the instructions (see “Entering the set-up mode”). When the message displayed 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 Miscellaneous.
- Press YES to enter the time and date routine.
- Press YES if the time is correct, press NO to change it
- Enter hours, minutes and seconds. Press NO to scroll the list of available values, press YES to select.
- Press YES when the time is correct
- Press YES if the date is correct, press NO to change
- Enter day, month, and year. Press NO to scroll the list of available values, press YES to select.
- Press YES if the date is correct

9.1.8.2 Factory settings

The above routine resets the present configuration and restores the default configuration as below:

- Stroke limits close direction: CW
 close limit: by position
 open limit: by position
- Torque set-up Closing torque: 40%
 Opening torque: 40%
- ESD set-up ESD action: close
 ESD signal: present
 ESD priority: ESD < motor thermostat
 ESD < torque limit
 ESD < local stop
 ESD > local controls
 ESD > 2-speed timer
 ESD < OFF
- Remote controls Control type: 4 wires latched
- Locals controls Control type: latched with instant reverse
 LED’s colour: green = open / opening
 red = close / closing
 yellow = alarm / warning
- Output relay Default #1
- 2-speed timer Opening direction: off
 Closing direction: off
- Miscellaneous Alkaline battery : absent
 Torque profile: standard
 torque by-pass: 4%
 valve jammed: 4 sec.

Configuration procedure:

- Move the local selector to OFF and then simultaneously press OPEN and STOP. Select the language and then enter the password according to the instructions (see “Entering the set-up mode”). When the message displayed is “SET-UP MODE OK?” press YES. Press YES to select the actuator set-up menu, press NO to scroll the list of available routines and then press YES to select Miscellaneous.
- Press No to scroll the list of routines and press YES to select factory configuration. Press YES to download the standard configuration, press NO to exit.

9.1.8.3 Alkaline battery

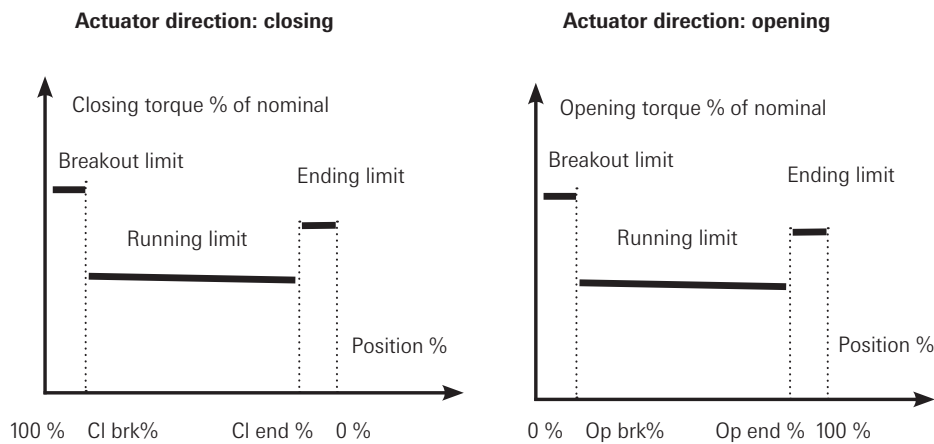
On request, the actuator can be provided with an alkaline battery to update the remote outputs (output relays status and bus messages) in case of electrical power failure and manual override operations. The program runs the functions relevant to the battery only if the appropriate flag "alkaline battery" is configured with "present". If the battery is absent or if no updating of remote outputs is requested, the above flag should be configured with "absent".

Configuration procedure:

- Move the local selector to OFF and then simultaneously press OPEN and STOP. Select the language and enter the password according to the instructions (see "Entering the set-up mode"). When the message displayed 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 Miscellaneous.
- Press No to scroll the list of routines and press YES to select alkaline battery. Press YES if the setting is correct, press NO to change. Press YES when the value is correct.

9.1.8.4 Torque limits TYPE

Torque limits are used as a reference for torque alarm and end of travel. With the option "standard", the torque limits are constant along the full stroke. The limits can be configured in the "stroke limits" or "torque set-up" routines and determine the torque alarm or end of travel situations. In the same particular application it is useful to configure 3 different torque thresholds for each travelling direction, to limit separately the unseating, running and ending torque. To select this option pick "3-point limits" and then follow the torque set-up and stroke limits routines (see figure).



Configuration procedure:

- Move the local selector to OFF and then simultaneously press OPEN and STOP. Select the language and enter the password according to the instructions (see "Entering the set-up mode"). When the message displayed 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 Miscellaneous.
- Press NO to scroll the list of routines and press YES to select 3-point torque limits. Press YES if the setting is correct, press NO to change. Press YES when the value is correct.
- Repeat stroke limits setting routine.

9.1.8.5 Torque by-pass (%)

Since a high torque may be required to unseat certain valves, the torque by-pass routine masks the torque alarm when an open or close command is received and the actuator is fully open or closed. The torque by-pass is expressed in % of position and is configurable from 0% to 20%. For example, if a 10% by-pass value is set, we may have:

- by-pass active in Opening: from 0% to 10%
- by-pass active in Closing: from 100% to 90%

To exclude torque by-pass configure 0%.

Configuration procedure:

- Move the local selector to OFF and then simultaneously press OPEN and STOP. Select the language and enter the password according to the instructions (see "Entering the set-up mode"). When the message displayed 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 Miscellaneous.
- Press No to scroll the list of routines and press YES to select torque by pass. Press YES if the setting is correct, press NO to change. Press YES when the value is correct.

9.1.8.6 Valve jammed (time)

The valve jammed time is used to monitor the following situations:

1. The time passed after receiving an open or close control is greater than the "valve jammed time", but the valve position variation is smaller than 0,5%.
The motor is blocked, the command is cleared and the "valve jammed" alarm indication is generated.
2. Condition 1 is Ok, but during the travel the position valve variation is smaller than 0,5% in a time equal to "valve jammed time" and motor speed is 0 RPM. The motor is blocked, the command is cleared and the "mid-travel alarm" indication is generated.

The valve jammed time is expressed in seconds and can be configured from 0 to 100 sec. Configure "0" to exclude the routine.

Configuration procedure:

- Move the local selector to OFF and then simultaneously press OPEN and STOP. Select the language and enter the password according to the instructions (see "Entering the set-up mode".) When the message displayed 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 Miscellaneous.
- Press No to scroll the list of routines and press YES to select valve jammed. Press YES if the setting is correct, press NO to change. Press YES when the value is correct.

9.2. Valve data

The valve data allow identifying the valve and its function in the process. The valve manufacturer and the end user can enter the data. The following data can be entered:

- tag name (max. 28 char.)
- serial number (max. 28 char.)

9.2.1 Tag number

Configuration procedure:

- Move the local selector to OFF and then simultaneously press OPEN and STOP. Select the language and enter the password according to the instructions (see "Entering the set-up mode"). When the message displayed is "SET-UP MODE OK?" press YES. Press NO to scroll the list of available menus and then press YES to select valve data menu.
- Press NO to scroll the list of available routines and then press YES to select Tag name.
- Press YES if the 1st character of the string is correct. Press NO to scroll the list of available characters. Press YES to select the desired character.
- Enter up to 28 characters. Enter a blank character, and "←" as end of string.

9.2.2 Serial number

Configuration procedure:

- Move the local selector to OFF and then simultaneously press OPEN and STOP. Select the language and enter the password according to the instructions (see “Entering the set-up mode”). When the message displayed is “SET-UP MODE OK?” press YES. Press NO to scroll the list of available menus and then press YES to select valve data menu.
- Press NO to scroll the list of available routines and then press YES to select Serial number.
- Press YES if the 1st character of the string is correct. Press NO to scroll the list of characters. Press YES to select.
- In the above way enter up to 28 characters. Enter a blank character, and “ ← ” as end of string.

9.3 Maintenance

A large amount of data is stored in the actuator memory and is available for future analysis or to assist the operator in the maintenance program. The maintenance menu also includes the set password routine.

The following data are available:

- set password
- clear alarm log
- set reference torque data
- clear recent data log
- set maintenance date

9.3.1 Set password

The actuator is supplied by BIFFI with a default password (“0 0 0 0”). By the above routine the end user can enter a different password consisting of 4 alphanumeric characters. After entering the new password, the old one ceases to be valid. Therefore it is mandatory “NOT TO FORGET THE PASSWORD” after the default one has been modified. Forgetting the new password makes it impossible to enter the set-up menu and to configure the actuator.

Configuration procedure:

- Move the local selector to OFF and then simultaneously press OPEN and STOP. Select the language and enter the password according to the instructions (see “Entering the set-up mode”). When the message displayed is “SET-UP MODE OK?” press YES. Press NO to scroll the list of available menus and then press YES to select Maintenance menu.
- Press NO to scroll the list of available routines and then press YES to select Set password. Press YES again to select Enter new password.
- Enter the new password one digit at a time. Press YES if the digit is correct, press NO to scroll the list of available characters and then press YES to select. Enter 4 digits. When the display shows the message Password changed the old password is no longer valid.

9.3.2 Clear alarm log

Clear procedure:

- Move the local selector to OFF and then simultaneously press OPEN and STOP. Select the language and enter the password according to the instructions (see “Entering the set-up mode”). When the message displayed is “SET-UP MODE OK?” press YES. Press NO to scroll the list of available menus and then press YES to select the Maintenance menu.
- Press NO to scroll the list of available routines and then press YES to select clear alarm log.
- Press YES to clear alarm list.

9.3.3 Set torque reference

The set torque profile reference routine allows to transfer the last torque profile to the reference profile registers. The old reference data are lost and the new ones are used as a new reference torque profile.

- Move the local selector to OFF and then simultaneously press OPEN and STOP. Select the language and enter the password according to the instructions (see “Entering the set-up mode”). When the message displayed is “SET-UP MODE OK?” press YES. Press NO to scroll the list of available menus and then press YES to select maintenance menu.
- Press NO to scroll the list of available routines and then press YES to select Set torque reference.
- Press YES to update the torque reference data.

9.3.4 Clear recent data log

The clear recent data log routine allows clearing the counters of the recent operation log.

The following counters will be cleared:

- recent contactor operations
- recent motor run time
- recent time without electrical power
- recent utilisation rate

The date of the "clear recent data log" is memorised and can be viewed in the maintenance date routine of the view menu.

Clearing procedure:

- Move the local selector to OFF and then simultaneously press OPEN and STOP. Select the language and enter the password according to the instructions (see "Entering the set-up mode".) When the message displayed is "SET-UP MODE OK?" press YES. Press NO to scroll the list of available menus and press YES to select the maintenance menu.
- Press NO to scroll the list of available routines and then press YES to select clear recent data log.
- Press YES
- Press YES to clear or press NO to exit.

9.3.5 Set maintenance date

The maintenance date routine allows the following operations:

- to set the last maintenance date
- to set the next maintenance date
- to set the start-up date

Configuration procedure:

- Move the local selector to OFF and then simultaneously press OPEN and STOP. Select the language and enter the password according to the instructions (see "Entering the set-up mode"). When the message displayed is "SET-UP MODE OK?" press YES. Press NO to scroll the list of available menus and then YES to select the maintenance menu.
- Press NO to scroll the list of available routines and press YES to select maintenance date.
- Press YES to set the last maintenance date. Press NO to skip to "next maintenance date".

Last maintenance date:

- Press YES if the date is correct, press NO to change it
- Enter day, month, and year. Press NO to scroll the list of available values, press YES to select
- Press YES if the date is correct

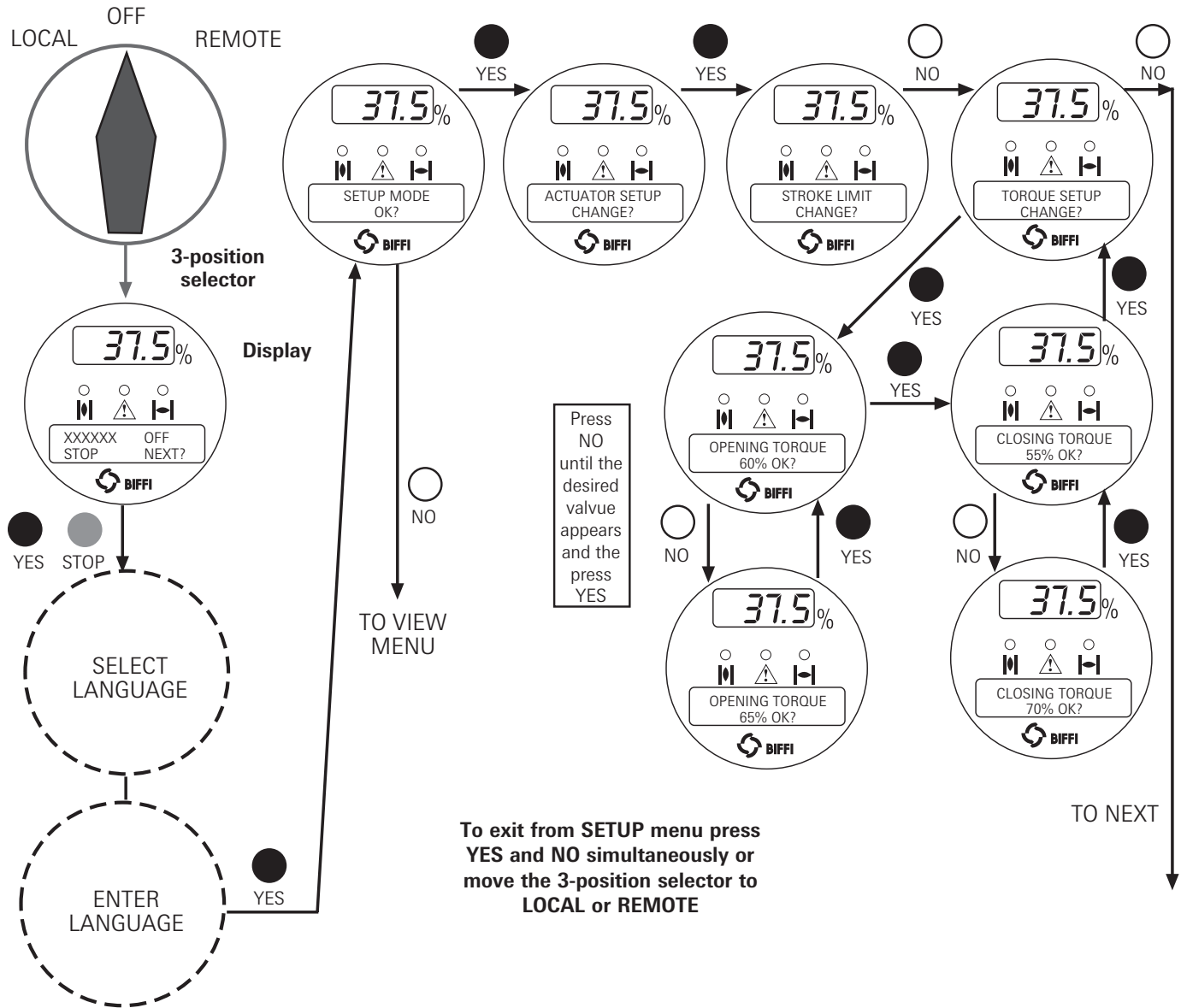
Next maintenance date:

- Press YES if the date is correct, press NO to change it
- Enter day, month, and year. Press NO to scroll the list of available values, press YES to select
- Press YES if the date is correct

Start-up date:

- Press YES if the date is correct, press NO to change it
- Enter day, month, and year. Press NO to scroll the list of available values, press YES to select
- Press YES if the date is correct

9.4. Example of set-up routine
9.4.1 Torque set-up



10. View routines

10.1 Actuator set-up

The above menu allows to view the present actuator configuration. No change can be made to the present data. The following data can be viewed:

Routine	Parameters
<ul style="list-style-type: none">• stroke limits• torque set-up• ESD control• remote controls• local controls• output relays	<ul style="list-style-type: none">• close direction, close limit type, open limit type• closing torque limit, opening torque limit• ESD action, signal type, ESD priority• control type• control type, LED's colour• default #1, default #2, monitor relay conditions, ASi conditions, contact action
<ul style="list-style-type: none">• 2-speed timer	<ul style="list-style-type: none">• close direction: status, start, stop, on time, off time• open direction: status, start, stop, on time, off time
<ul style="list-style-type: none">• miscellaneous	<ul style="list-style-type: none">• time and date, torque by-pass%, valve jammed time, various status

View procedure:

- Move the local selector to OFF and then simultaneously press OPEN and STOP. Select the language according to the instructions (see "Entering the view mode"). When the message displayed is "VIEW MODE OK?" press YES. Press YES to select the actuator set-up menu.
- Press NO to scroll the list of available routines and press YES to select.
- Press YES to answer at the prompt "view" or "next" and to see the data.

10.2 Name plate

Use this menu to view the data identifying the actuator. The data are entered in-house and can only be changed by the manufacturer. The following data may be viewed:

<ul style="list-style-type: none">• serial number (max. 28 char.)• actuator size (max. 28 char.)• nominal torque/thrust• actuator speed• motor type• power supply• motor rating (Kw)• motor duty• motor current In, Is, Icc (A)	<ul style="list-style-type: none">• motor poles• test date• wiring diagram (max. 28 char.)• enclosure (max. 28 char.)• certificate (max. 28 char.)• lubricant (max. 28 char.)• HW version• SW version• Torque sensor data
---	---

View procedure:

- Move the local selector to OFF and then simultaneously press OPEN and STOP. Select the language according to the instructions (see "Entering the view mode"). When the message displayed is "VIEW MODE OK?" press YES. Press NO to scroll the list of available menus and press YES to select the nameplate menu.
- Press YES to answer the prompt "view" or "next" and see the data in the above list.

10.3 Valve data

To identify the valve and its function in the process the following data can be viewed.

- tag name (max. 28 char.)
- serial number (max. 28 char.)

The data should be entered by the valve manufacturer or by the end user during set-up operations.

View procedure:

- Move the local selector to OFF and then simultaneously press OPEN and STOP. Select the language according to the instructions (see "Entering the view mode"). When the message displayed is "VIEW MODE OK?" press YES. Press NO to scroll the list of available menus and press YES to select the valve data menu.
- Press YES to answer prompts "view" or "next" and see the data in the above list.

10.4. Maintenance

10.4.1 Alarm log

The alarm log routine is used to view the list of the latest 5 alarms and 5 warnings and the data when they occurred. The “clear alarm log” routine of the set-up menu should be used to clear the list.

View procedure:

- Move the local selector to OFF and then simultaneously press OPEN and STOP. Select the language according to the instructions (see “Entering the view mode”). When the message displayed is “VIEW MODE OK?” press YES. Press NO to scroll the list of available menus and press YES to select the Maintenance menu.
- Press YES to answer the prompt “Alarm log view?”.
- Press YES to scroll the list of alarms (“Alarms view?”).
- Press NO to move on to “Warnings view?” and then YES to scroll the list of warnings.

10.4.2 Torque profile

The torque profile routine gives important information on the actuator working conditions in comparison with a previously memorised reference profile. It can give an indication of a change in the process conditions.

Details are given of the reference and latest torque expressed in % of the nominal torque.

The following data may be viewed:

- breakout reference torque in opening
- peak running reference torque in opening
- ending reference torque in opening
- breakout torque in opening
- peak running torque in opening
- ending torque in opening
- breakout reference torque in closing
- peak running reference torque in closing
- ending reference torque in closing
- breakout torque in closing
- peak reference torque in closing
- ending torque in closing
- date of the last “set torque reference”
- date of the last torque profile in opening
- date of the last torque profile in closing

View procedure:

- Move the local selector to OFF and then simultaneously press OPEN and STOP. Select the language according to the instructions (see “Entering the view mode”). When the message displayed is “VIEW MODE OK?” press YES. Press NO to scroll the list of available menus and press YES to select the Maintenance menu.
- Press NO to scroll the list of routines and press YES to select torque profile.
- Press YES to scroll the list of values.

10.4.3 Operation log

The operation log consists of different counters and routines that provide information to assist in the maintenance program. The data are grouped into 2 families: general and recent data. The general data log collects data from “test date” to “present date”. The recent data log collects data from the last “clear recent data log” date to “present date”.

General data log

- opening time of the last stroke (h:m:s)
- closing time of the last stroke (h:m:s)
- total contactor operations
- motor run time (hours)
- time without electrical power (hours)
- utilisation rate (%)

Recent data log

- recent contactor operations
- recent motor run time (hours)
- recent time without electrical power (hours)
- recent utilisation rate (%)

View procedure:

- Move the local selector to OFF and then simultaneously press OPEN and STOP. Select the language according to the instructions (see “Entering the view mode”). When the message displayed is “VIEW MODE OK?” press YES. Press NO to scroll the list of available menus and press YES to select the Maintenance menu.
- Press NO to scroll the list of available routines and press YES to select operation log.
- Press YES to select general data or press NO to skip to recent data
- Press YES to scroll the list of values.
- Press YES to view the recent data log or press NO to exit
- Press YES to scroll the list of values.

10.4.4 Maintenance date

The routine allows viewing the following dates:

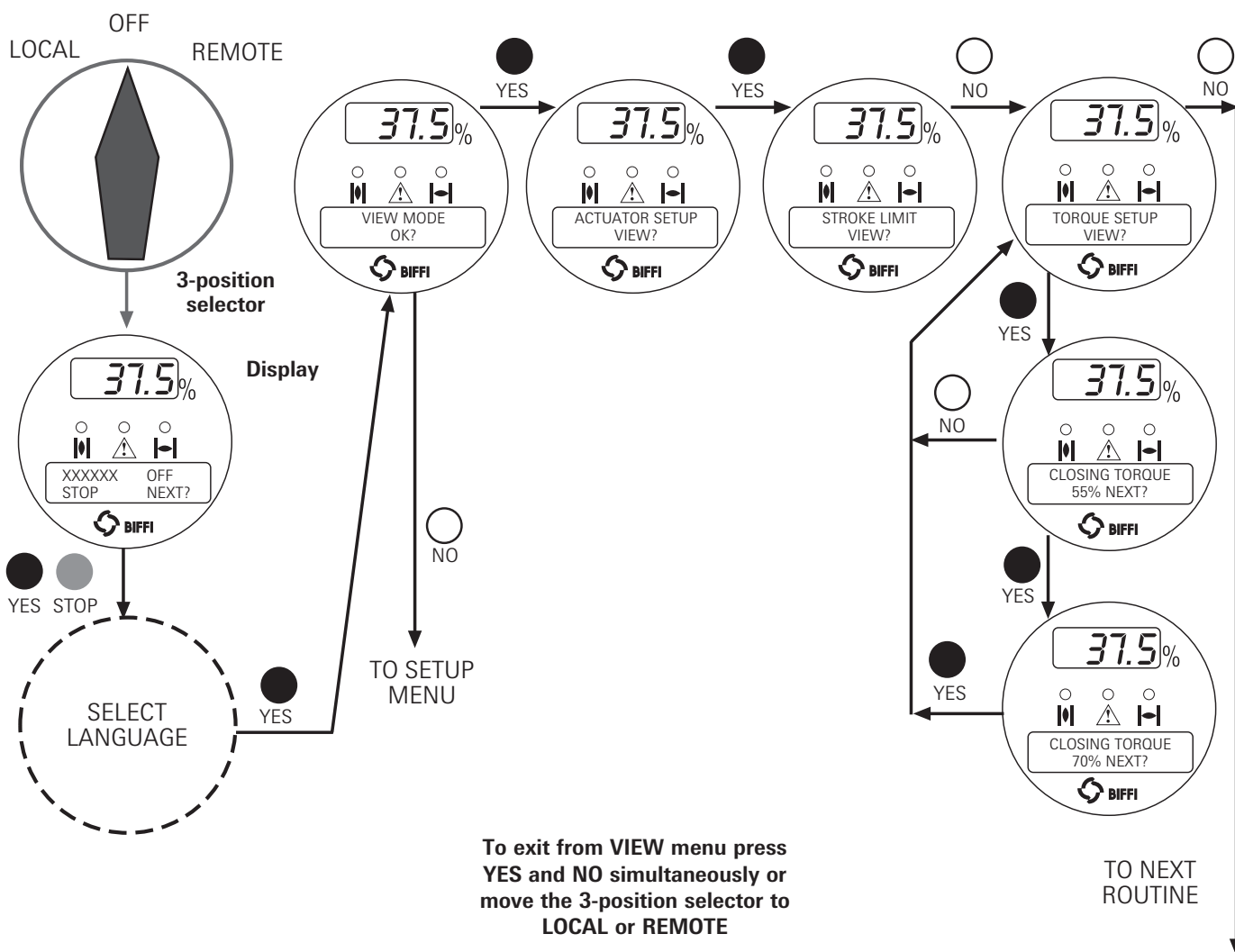
- last maintenance date
- next maintenance date
- date of the last "clear recent data log "
- start-up date

View procedure:

- Move the local selector to OFF and then simultaneously press OPEN and STOP. Select the language according to the instructions (see "Entering the view mode"). When the message displayed is "VIEW MODE OK?" press YES. Press NO to scroll the list of available menus and press YES to select the Maintenance menu.
- Press NO to scroll the list of available routines and press YES to select the maintenance date routine
- Press YES to scroll the list of date

10.5. Example of view routine

10.5.1 View torque set-up



11. Maintenance

11.1 Standard maintenance

Approx. every 2 years:

Under normal operating conditions, the F01-2000 is maintenance-free: no actuator maintenance is formally required, even though visual inspection for oil leakage or external visible damages is recommended every two years. When conditions are severe (frequent operation or high temperatures), inspect the oil level and oil quality more often. Replace all seals that permit oil leakage or water ingress.



Important

Before starting any maintenance operation, make sure that the mains and all other service voltage connected to terminal board are switched-off.



Warning

The actuator is non-intrusive. The control compartment was sealed in dry and clean conditions and contains no site serviceable components. Do not open it unless absolutely necessary. Unauthorised access will invalidate the warranty.



Warning

Since the control compartment contains a 3.6V lithium battery, only open it in safe area. If the actuator is located in a hazardous area a "hot work" permit must be obtained unless the actuator can be moved to a non-hazardous area.

The following checks will assure optimum performance:

- If the stem is external, check that the valve stem is clean and lubricated. If not, clean it and lubricate it in order to prevent damages to the threaded bush.
- Make sure there are no oil leaks from the actuator housing. The oil level should be approx. 20 mm. from the fill plug (see chapter 4, Lubrication).
- Check the external parts for possible damage and replace them immediately, if necessary. In case the window glass is broken, the complete cover must be replaced (see chapter 13, Partslists and drawings).
- Repaint all areas where paint is missing. In chemically aggressive or saline environments, remove rust from surfaces and protect with a rust preventative.
- Check that all nuts and bolts securing the actuator to the valve are tight. If necessary, re-tighten with a dynamometric key (for tightening torque values see chapter 3.4.1 Installation - Mounting the actuator onto the valve - Actuator fixing).
- For severe applications or if actuator operation is infrequent, perform maintenance checks more often.
- For actuators provided with alkaline batteries, make sure that the display is still visible when power is off and that there is no "Battery low" warning message. If "Battery low" warning appears, replace the battery (see chapter 11.3, Maintenance - Alkaline battery change). Always replace batteries if the actuator has been subjected to long periods without power (see chapter 11.3, Maintenance - Alkaline battery change).

11.2 Special maintenance

In case actuator failure, please refer to chapter 12, Troubleshooting for possible causes. Spare parts can be required to BIFFI: please refer to the individual item number shown in chapter 13, Partslists and drawings.

Note

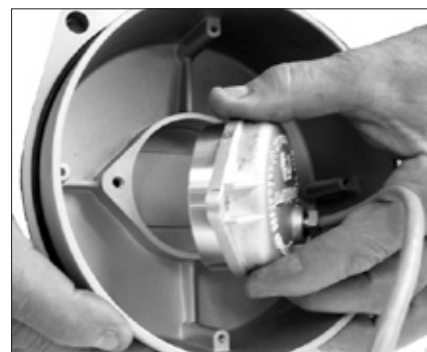
Special maintenance is also recommended when, during operations, the actuator generates an excessive noise.



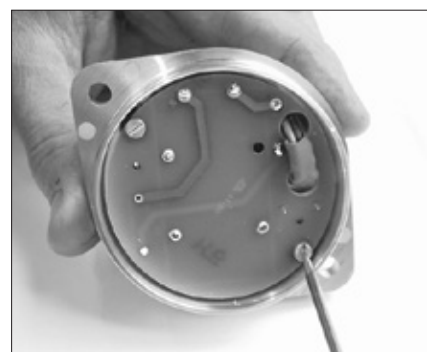
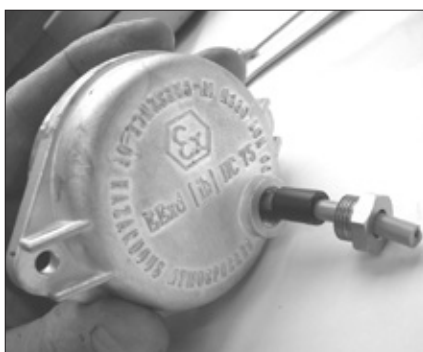
11.3 Alkaline battery change

- Isolate the main supply to the actuator and all other control voltages.
- Open the terminal boards cover.
- Disconnect two wires (+) (-) from the main board.
- Bring the cover to a safe area. When in a safe area:

- Remove the label.



- Remove the battery cover.



- Replace the battery.



! Important

Note: the new battery must be chosen between the following types:

- Alkaline Manganese- Duracell Ultra-
Can style: PP3 Voltage: 9.0
- Alkaline Manganese- Energizer-
Can style: PP3 Voltage: 9.0

12. Trouble-shooting

The F01-2000 actuator has passed the functional test performed by Biffi Quality Assurance personnel.

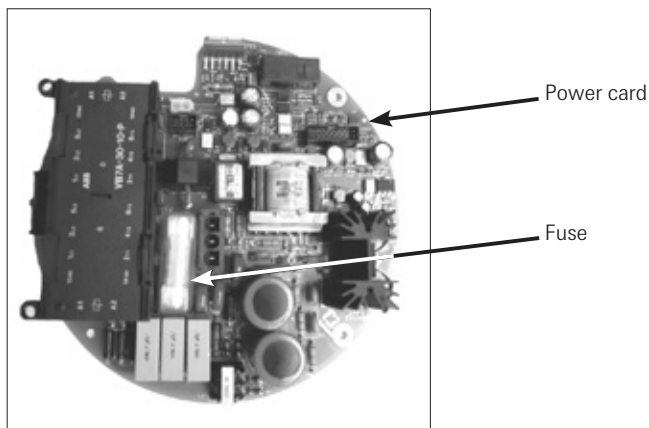
If the actuator does not work, before trouble-shooting make sure that:

- the numeric display indicates xx %
- the local selector is not in OFF
- the main supply voltage is the same as stated in the name plate menu
- you move the local selector to OFF and check that the alphanumeric display shows one of the following messages:
 - "normal, off, stop"
 - "alarm, off, stop"
 - "warning, off, stop"

If the above checks are satisfactory try to locate the fault using the diagnostic facilities.

12.1 The electronics do not switch on when powered

- Check that the value of the main voltage on terminals L1, L2, L3 is correct
- Remove the cover of the compartment where the electronic cards are located
- Check the fuse mounted on the power card. Replace it if burnt.
- If the fuse is OK, check the wires between terminals L1, L2, L3 and connector M1 of the power card. If it is correct, replace the power card.



12.2 DC output voltage not available at the terminals

- Switch the main power supply off and disconnect all wires from terminals B1-B2 and C1
- Switch the main power supply on and check if the voltage on the terminals B1-B2 and C1 is between 23 and 27 Vdc
- If the voltage is correct check the external wiring and the electrical load. It should not exceed 4W.
- If the voltage is not correct replace the power card

12.3 The actuator does not work from remote controls

- Move the 3-position selector to LOCAL and check that the actuator works from local controls.
- Move the local selector to REMOTE. If the ESD signal is active, the alphanumeric display indicates "ESD On". Check the signal on terminals C3 and C4 and adjust the ESD configuration.
- Check that:
 - the wiring to terminals B1-B2 and C1 is correct
 - there is no short-circuit between wires
 - the electrical load does not exceed 4W
 - the value is in the range 20-120 Vac 50/60Hz or 20-125 Vdc, if external voltage supply is used



Warning

The actuator is non-intrusive. The control compartment was sealed in dry and clean conditions and contains no site serviceable components. Do not open it unless absolutely necessary. Unauthorised access will invalidate the warranty.



Warning

Since the control compartment contains a 3.6V lithium battery, only open it in safe area. If the actuator is located in a hazardous area, a "hot work" permit must be obtained unless the actuator can be moved to a non-hazardous area.



12.4 The motor is very hot and does not start

- Check that no alarm other than motor overheating is present.
- Wait until the motor cools down and the normally closed contact of the thermal switch automatically resets before trying to operate the actuator again.
- Check that the number of operations per hour and their duration is suitable for the actuator service (see the name-plate menu).
- Check that the valve operating torque is within the range of the unit's designed operating torque.
- Always check the causes of abnormal operation.

12.5 The motor runs but the actuator does not move the valve

In case the local display does not change the valve position indicators:

- Rotate the handwheel a few degrees to remove all possible sticking between the handwheel and the drive sleeve.

In case the local display changes the valve position indicators:

- Verify the stem nut correctly fits in the actuator base.
- Verify the stem nut has sufficient engagement with the valve stem.
- Verify the key correctly fits in bore/keyways applications.
- Check that the valve works in manual operation.

12.6 The valve does not seat correctly

- If the valve is stopped by the torque limit in closing, increase the actuator output torque limit.
- If the valve is stopped by the position limit in closing, check that the valve reaches its seat position, then readjust the setting of the position limit.
- The internal trim of the valve may be damaged.

12.7 Excessive torque for valve operation

- Clean, lubricate and check the valve stem.
- Valve packing too tight: loosen the gland bolt nuts.
- Coupling: ensure there are no axial forces on the valve stem by leaving an adequate axial clearance between the stem and the drive bush. Also check that all transmission shafts, universal joints or bulkhead passages have sufficient lubrication and check that the transmission shafts are not bent.
- Check that the internal valve trim or the reducer gears are well lubricated and not damaged.
- Check the alphanumeric display for diagnostic messages, and proceed with the suitable corrective actions as described in this Chapter, item 12.10 Diagnostic messages.

12.8 The actuator does not stop in fully open or fully closed position

- Check that the actual open and close positions of the valve respectively correspond to 100% and 0% on the actuator display
- Make sure that the torque and travel limits are correctly set (see chapter 9.1, Set-up routines - Actuator set-up).

12.9 The numeric position display indicates "E01"

- It is necessary to re-calibrate the stroke limits (see chapter 9.1, Set-up routines - Actuator set-up).

12.10 Diagnostic messages

The alarm and warning lists contain the alarms and warnings momentarily present.

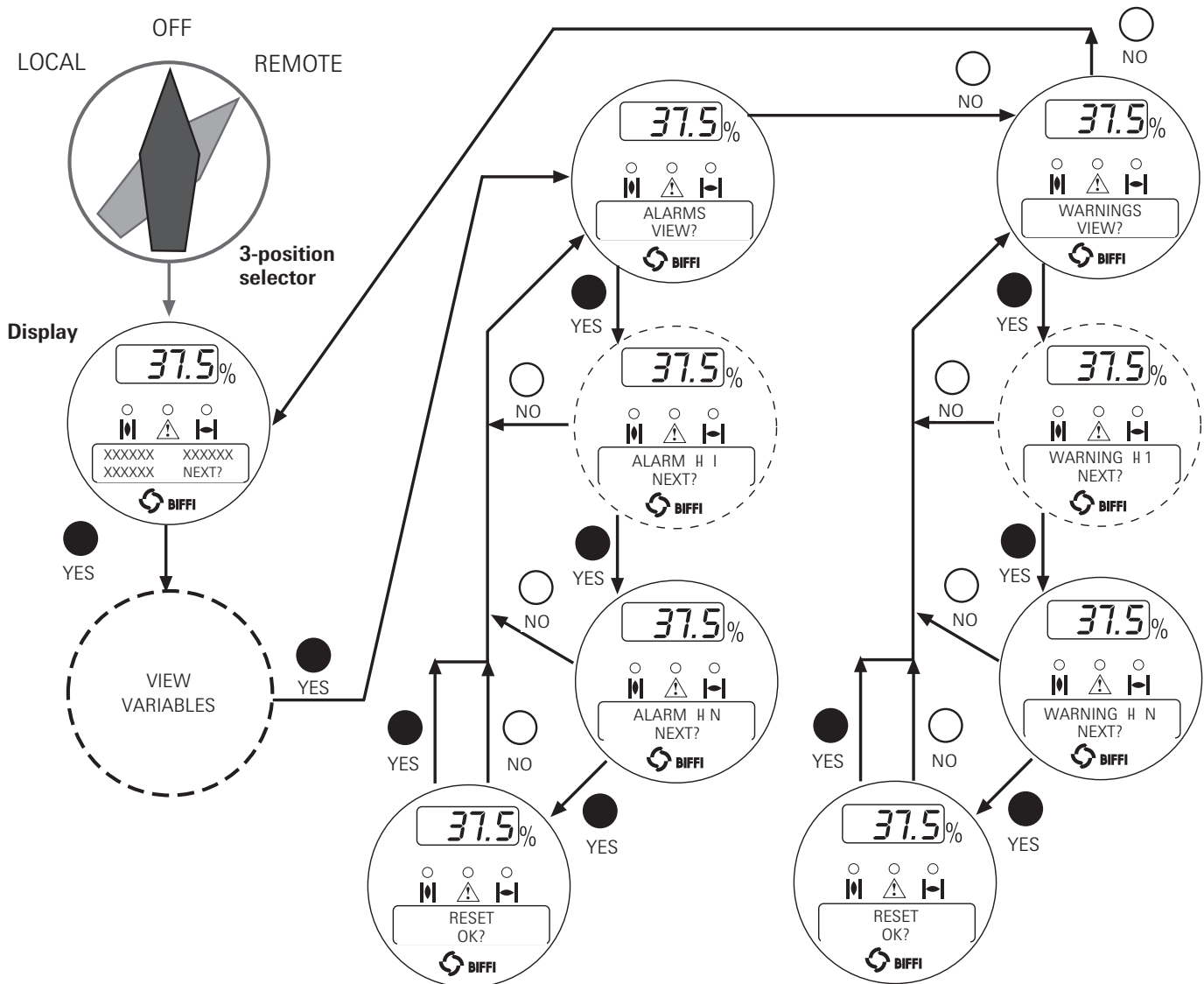
Warning is the condition that occurs when a variable reaches a critical value and/or when a maintenance action is required but all actuator functions are still available. The flashing of the alarm/warning LED indicates a warning condition.

Alarm is the condition that occurs when a variable is outside the acceptable range and some actuator function is not available. If the alarm/warning LED is on there is an alarm condition. When the fault condition disappears, the corresponding alarm or warning also disappears from the list.

A reset routine is provided to clear the types of alarms and warnings that are memorised (over-torque, jammed valve, etc.).

View procedure:

- Move the 3-position selector to either OFF or REMOTE, then press NO to scroll the list of available variables.
- Press YES when the display shows message "ALARMS view?" Press YES to scroll the list of alarms.
- Press NO when the display shows message "ALARMS view?"
- Press YES when the display shows message "WARNINGS view?" Press YES to scroll the list of warnings.
- Press YES to reset the alarms or warnings with memory.



Alarm table

Display message	Condition for alarm	Action	Available controls			Alarm reset
			Local	Remote	ESD	
High torque in closing	Measured torque greater than the relevant value configured in torque set-up or stroke limits routine	Operate the actuator in open direction. Check the torque needed to operate the valve	only open	only open	configuration dependent	Close control
High torque in opening	Measured torque greater than the relevant value configured in torque set-up or stroke limits routine	Operate the actuator in close direction. Check the torque needed to operate the valve	only close	only close	configuration dependent	Open control
Jammed valve in closing	No position change after receiving a CLOSE control and motor speed is 0 RPM	Check status of actuator and valve mechanical parts	only open	only open	only open	Open control
Jammed valve in opening	No position change after receiving an OPEN control and motor speed is 0 RPM	Check status of actuator and valve mechanical parts	only close	only close	only close	Close control
Motor thermostat	Motor thermostat open for high temperature in the motor windings	Wait until the motor cools down	not available	not available	configuration dependent	When thermostat close
Internal temperature	Temperature inside the actuator enclosure higher than 90°C or lower than -40°C	Ambient temperature too high or too low. Verify insulation among actuator and heat source	not available	not available	not available	Control temperature <90°C or >-40°C
Position sensor	Value of the actuator position not valid	Replace position sensor or re-calibrate both stroke limits	not available	not available	not available	Position signal correct
Speed sensor	Measure of motor speed not valid	Replace speed sensor	not available	not available	not available	Speed signal correct
Mid travel alarm in OP	The valve does not move in presence of an open control and motor speed is 0 RPM	Check status of actuator and valve mechanical parts. Recalibrate both stroke limits.	only close	only close	only close	Close control
Mid travel alarm in CL	The valve does not move in presence of a close control and motor speed is 0 RPM	Check status of actuator and valve mechanical parts. Recalibrate both stroke limits.	only open	only open	only open	Open control
Main voltage	Main voltage lower than -20% or higher than +20% of the value stated in the name plate menu or wrong frequency	Check main voltage supply and frequency on terminals L1, L2, L3. Check that wires section is correct	not available	not available	not available	Main voltage correct
K1 contactor	The test routine reports a failure of K1 (coil or auxiliary contact)	Check the contactor	opposite direction	opposite direction	not available if ESD use K1 contactor	Control in opposite direction
K2 contactor	The test routine reports a failure of K2 (coil or auxiliary contact)	Check the contactor	opposite direction	opposite direction	not available if ESD use K2 contactor	Control in opposite direction
Configuration error	The checksum of the EEPROM memory that contains the configuration data is wrong	Re-configure all parameters	not available	not available	not available	Memory OK
HW error	The diagnostic program detects some malfunction in the electronics controlling the actuator	The circuit is damaged. Change control card.	not available	not available	not available	HW OK
Low alkaline battery	The voltage of the alkaline battery is too low (only detected if the alkaline battery is present and the relevant parameter of the miscellaneous routine is set to "present")	Change alkaline battery	available with main voltage	available with main voltage	available with main voltage	Alkaline battery OK
Lost phase	The alarm appears only with 3-phase main supply. The alarm is generated in case of fault of one of the phases that supply the actuator transformer	Check main power supply on terminals L1, L2, L3	not available	not available	not available	Phase OK

Warning table

Display message	Condition for warning	Action	Available controls			Alarm reset
			Local	Remote	ESD	
High torque in OP (near max.)	Measured torque 10% lower than the relevant value configured in torque set-up or stroke limits routines	Check the torque necessary to move the valve	available	available	available	Close control
High torque in CL (near max.)	Measured torque 10% lower than the relevant value configured in torque set-up or stroke limits routines	Check the torque necessary to move the valve	available	available	available	Open control
Internal temp. (near limits)	Temperature inside the actuator enclosure higher than 80°C or lower than -35°C	Find the heat source and insulate the actuator	available	available	available	Control temperature >-35°C and <80°C
Main voltage (near limits)	Value of the main voltage out of the correct range (-15% or +10% of the value stated in the name plate menu) or wrong frequency	Check section of wires and values of voltage and frequency	available	available	available	Main voltage correct
Contactors cycles (max.)	Max. number of contactor cycles reached	Change contactor and reset operation log	available	available	available	Clear recent data log
Maintenance request	Date of the next maintenance reached	Perform maintenance and set next maintenance date	available	available	available	Change date
Motor current	Motor current greater or lower than limits	Check electrical motor	available	available	available	Current OK
Wrong stroke limits	The routine that monitors the stroke limits detects a wrong end of travel condition	Re-calibrate both stroke limits	available	available	available	Re-calibrate both stroke limits

13. Parts list and drawings

13.1 Introduction

This section includes the drawings and parts list of each component and subassembly of F01-2000 actuators.



Important

When ordering spare parts, please indicate the serial number embossed on the actuator nameplate.



Important

When ordering spare parts, please refer to the marked part list items on the attached drawings.



Important

Recommended spares are marked with this sign • on parts list.

F01-2000 - Planicentric assembly

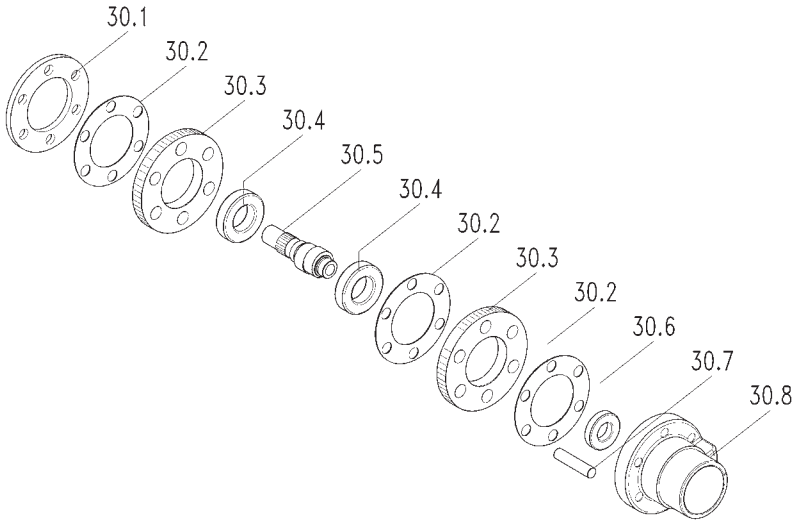


Table 2 - F01-2000 - Planicentric assembly

Item	Quantity	Description	• Recommended spare parts
30.1	1	Pin guide ring	
30.2	3	Spacer ring	
30.3	2	Eccentric wheel	
30.4	2	Bearing	
30.5	1	Double eccentric shaft	
30.6	1	Bearing	
30.7	6	Pin	
30.8	1	Splined bush	

F01-2000 - Worm gear assembly

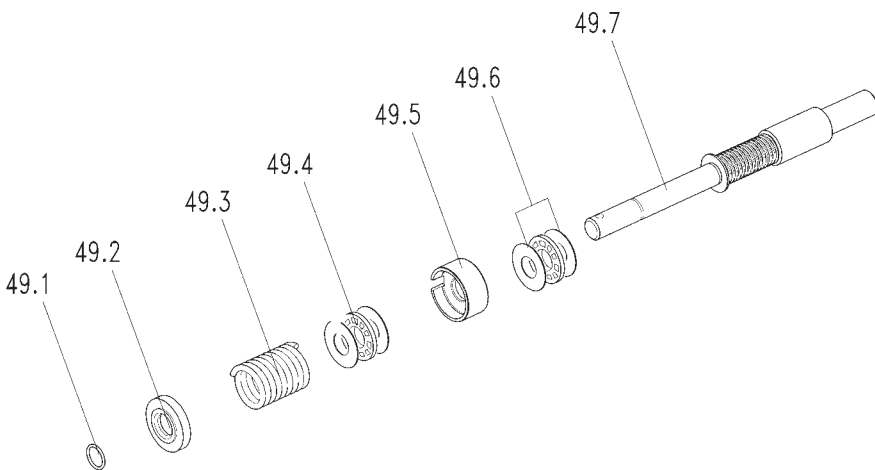


Table 3 - F01-2000 - Worm gear assembly

Item	Quantity	Description	• Recommended spare parts
49.1	1	Stop ring	
49.2	1	Spring support	
49.3	1	Spring	
49.4	2	Axial bearing	
49.5	1	Thrust bearing support	
49.6	4	Axial bearing shoulder	
49.7	1	Worm gear	

F01-2000 - Torque/Position assembly

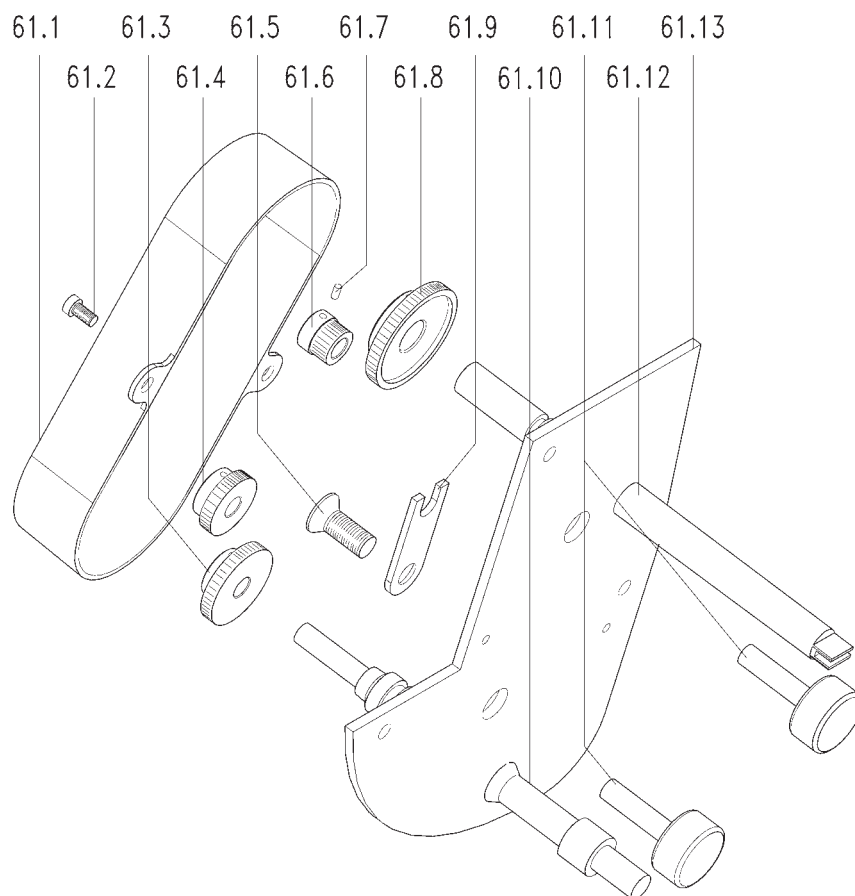


Table 4 - F01-2000 - Torque/Position assembly

Item	Quantity	Description	• Recommended spare parts
61.1	1	Gear cover	
61.2	5	Screw	
61.3	1	Gear	
61.4	1	Gear	
61.5	1	Screw	
61.6	1	Gear	
61.7	8	Screw	
61.8	1	Gear	
61.9	1	Torque fork	
61.10	1	Torque shaft	
61.11	2	Potentiometer	
61.12	1	Position shaft	
61.13	1	Torque/Position plate	

F01-2000 - Local interface assembly

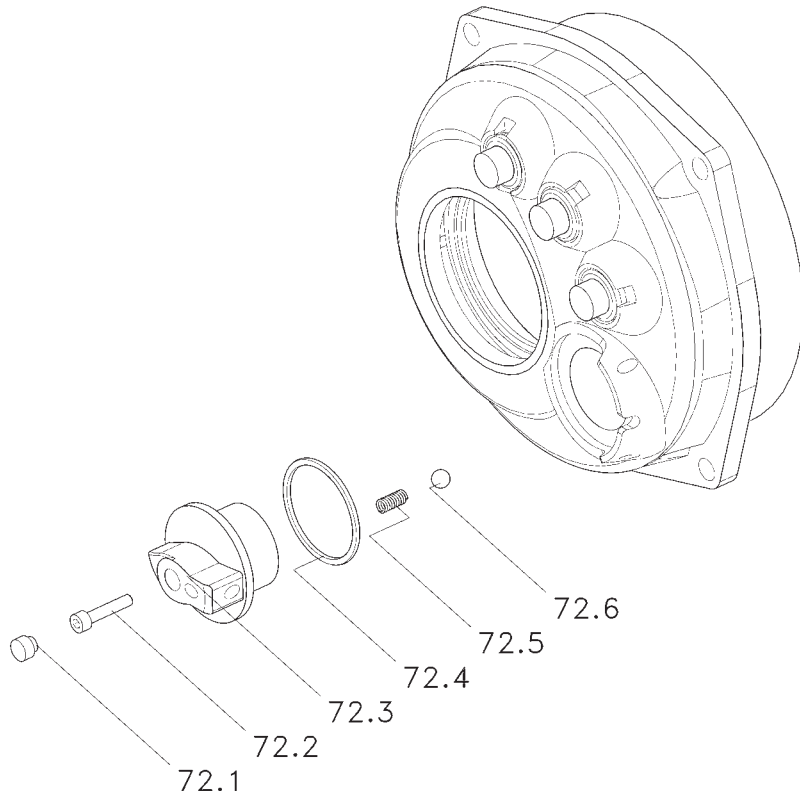


Table 5 - F01-2000 - Local interface assembly

Item	Quantity	Description	• Recommended spare parts
72.1	1	Plug	
72.2	1	Screw	•
72.3	1	Selector	
72.4	1	O-ring	
72.5	1	Spring	•
72.6	1	Ball	