Installation, Operation and Maintenance Manual
VCIOM-08500-EN Rev. 2
May 2022

Biffi ICON3000

Electric Actuator



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Revision Details

Rev.	Date	Description	Prepared	Checked	Approved
2	May 2022	Document Update	L. Piacenti	-	C. Doglio
1	December 2021	Document Update	-	-	-
0	December 2019	Migration to new template	-	-	-

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Section 1: General Safety Instructions

1.1 Range of Applications

The Biffi ICON3000 and the ICON3000v2 electric actuators covered in this manual are designed for the operation of any type of industrial valve used in heavy industrial, chemical, and petrochemical facilities. Biffi will not be liable for potential damage resulting from use in anything other than these designated applications. Such risk lies entirely with the user. Where not explicitly highlighted with the generic indication ICON3000 it is intended to refer to both ICON3000 and ICON3000v2 versions.

⚠ WARNING

Installation, configuration, commissioning, maintenance, and repairs must be performed by approved and qualified personnel only.

⚠ WARNING

The warning symbol labelled on the actuator means that it is mandatory to read the manual before installing, operating and servicing the equipment.

Biffi electric actuators are designed in accordance with the applicable international rules and specifications; nonetheless, 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

1.2 Safety Instructions for Installation in Hazardous Areas

⚠ WARNING

When installing in a hazardous area as defined by the applicable rules, verify that the actuator nameplate conforms to site safety requirements.

⚠ WARNING

Installation, configuration, commissioning, maintenance, and repairs must be performed by approved and qualified personnel only.

The ICON3000 is designed according to IEC/EN 60079-0, IEC/EN 60079-1, and IEC/EN 50079-31 standards. Different types of protection are available, depending on the marking printed on the actuator label:

- Ex d IIB Txx, Ex d IIC Txx with “Explosion proof” terminal board enclosure, or
- Ex d e IIB Txx, Ex d e IIB+H2 Txx, Ex d e IIC Txx with “Increased safety” terminal board enclosure

These are suitable for use in hazardous areas classified as at risk of explosion caused by the presence of gas and dust.

The ICON3000 has IP66/68 degree of protection according to EN 60529.

1.2.1 Marking

Table 1.

IECEx INE XX.ZZZZ	IECEx reference certificate (CoC)
XX ATEX ZZZZ	ATEX reference certificate
0080	Notified body for ATEX quality assurance (INERIS)
II	Group II (surface industries)
2	Category 2 apparatus
G	Explosive atmospheres caused by gas, mists, or vapors
D	Explosive atmospheres caused by gas and dusts
P66/68	Degree of protection
FM18US0279X	FM reference certificate for USA
FM18CA0134X	FM-c reference certificate for Canada

Table 2.

Hazardous zone	Zone	Categories according to 2014/34/EU Directive
Gas, mists, or vapors	0	1G
Gas, mists, or vapors	1	2G or 1G
Gas, mists, or vapors	2	3G or 2G or 1G
Dust	20	1D
Dust	21	2D or 1D
Dust	22	3D or 2D or 1D

Table 3. Equipment Protection Level (EPL) EN 60079-14

Explosive atmosphere	Zone	EPL
Gas, mists, or vapors	0	1G
Gas, mists, or vapors	1	2G or 1G
Gas, mists, or vapors	2	3G or 2G or 1G
Dust	20	1D
Dust	21	2D or 1D
Dust	22	3D or 2D or 1D

1.3 Applicable Standards and Regulations

Table 4.

EN ISO 12100	Safety of machinery - General principle for design - Risk assessment and risk reduction
EN 60204-1	Safety of machinery - Electrical equipment of industrial machines
2006/42/EC	Machinery directive
2014/35/EU	Low voltage directive
2014/30/EU	EMC directive
2014/34/EU	ATEX directive
2014/53/EU	RED directive
FM (for USA)	FM3600, FM3810, ANSI/ISA 60079-0, ANSI/ISA 60079-1, ANSI/NEMA 250
FM-C (for Canada)	CAN/CSA C22.2 No. 60079-0, CAN/CSA C22.2 No. 60079-1, CAN/CSA 61010-1, CSA-C22.2 No. 94

Low Voltage Requisition in accordance with IEC-61010-1

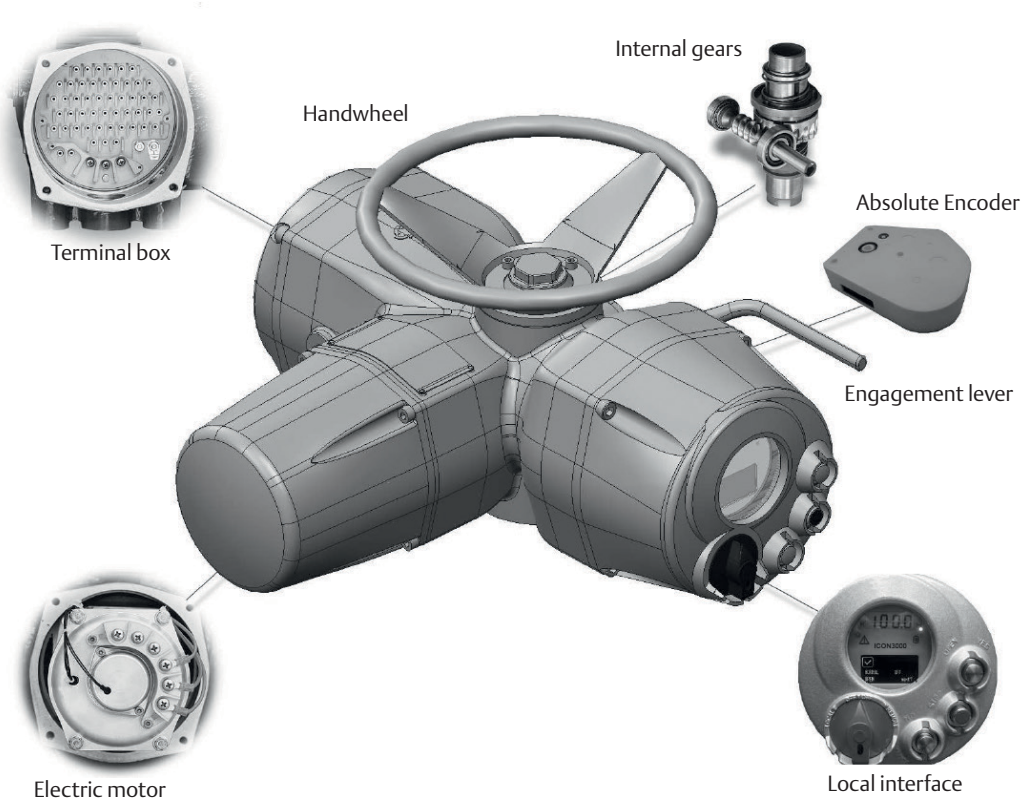
All MAINS circuits are to be considered in overvoltage CATEGORY II.

Applications at altitudes below 2,000 meters must comply with:

- All circuits connected to the actuator relays contacts (OUTPUT SIGNALS) must refer to the same power supply system (both SELV or NON-SELV).
- All remote commands (INPUT SIGNALS) must refer to the same power supply system.

Applications in altitude between 2,000 and 4,000 meters must have INPUT and OUTPUT SIGNALS referred to the same power supply system (both SELV or NON-SELV).

Figure 1



1.4 Terms and Conditions

Biffi Italia s.r.l. guarantees every product to be free from defects and to conform to industry standards. 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 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 unauthorized personnel. Repair work due to improper use will be charged at standard rates.

Section 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 the below 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%, which indicates 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%, which indicates that the valve is completely closed. If the test result is satisfactory, the actuator has already been adjusted and one 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. Pay particular attention to the push-buttons, the display area glass, and the selector.
- Check the information on the nameplate. In particular, check the serial number and performance data (nominal torque, operation speed, protection class, motor supply voltage, etc.) and verify that this data matches the data on the display (see Section 10, View Routines).

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

2.2 Storage Procedure

NOTICE

Not following the procedures according to this document will invalidate the product warranty.

2.2.1 General

The actuator leaves the factory in perfect condition, guaranteed by an individual test certificate. In order to maintain these characteristics until the actuator is installed on-site, proper procedures must be followed for preservation during the storage period. ICON3000 actuators are weatherproof to IP66/68; this condition can only be maintained if the unit is correctly installed on-site and if the actuator was correctly stored. The standard plastic plugs used to close the cable entries are not weatherproof; their only function is to prevent the entry of foreign objects during transport.

2.2.2 Short-term Storage (One Year or Fewer)

2.2.2.1 Indoor Storage

Make sure that the actuator is kept in a dry place, laid on a wooden pallet, and protected from dust.

2.2.2.2 Outdoor Storage

- Make sure that the actuator is protected from the elements (e.g. protected from rain by covering with a canvas tarp).
- Place the actuator on a wooden pallet or some other raised platform, such that it is not in direct contact with the ground.
- If the actuator is supplied with standard plastic plugs, remove them from the conduit entries and replace them with weatherproof plugs.

2.2.3 Long-term Storage (More Than One Year)

2.2.3.1 Indoor Storage

In addition to the instructions in Section 2.2.2.1:

- If the actuator is supplied with standard plastic plugs, replace them with weatherproof plugs.
- If the actuator is provided with a lithium battery, remove it and store it in a clean and dry location (see Section 11.3, Lithium Battery Change).

2.2.3.2 Outdoor Storage

In addition to the instructions in Section 2.2.2.2:

- Check the general condition of the actuator, paying particular attention to the terminal board and local display glass.
- If the actuator is provided with a lithium battery, remove it and store it in a clean and dry location (see Section 11.3, Lithium Battery Change).

Figure 2



Figure 3



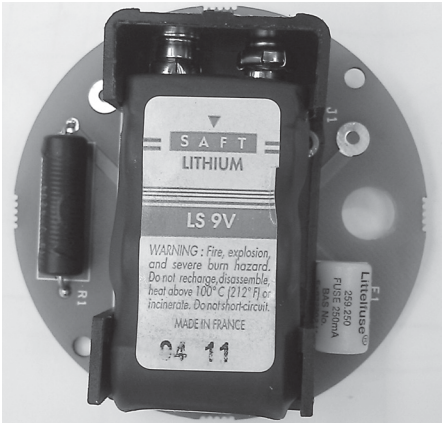
Figure 4



Figure 5



Figure 6



2.3 Checks to be Performed Before Installation

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

If the actuator has been stored for a long period of time prior to its installation, make sure to:

- Check the condition of the O-ring seals.
- Check the installation of the plugs or conduit glands on the conduit entries.
- Check if 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 Section 11.3, Lithium Battery Change).

Section 3: Installation

3.1 Working Condition

Standard actuators are suitable for the following environment temperatures:

-20 °C +85 °C (-4 °F to +185 °F)

Special versions are available for extreme environment temperatures:

-40 °C +85 °C (-40 °F to +185 °F)

-55 °C +65 °C (-67 °F to +149 °F)

Altitude up to 4,000 meters max.

NOTICE

The above conditions apply only to Ex d or Ex de versions. For other applications, refer to the applicable addendum.

3.1.1 Heater Options

Actuators are suitable for ambient temperature range as per Product Data Sheet.
Heater options are available for specific application.

Table 5.

	Model			Ambient Temperature Range		Control Type
	Heater Type	Heater Power Supply	Heater Power	Low Temperature up to -40 °C (-40 °F)	Extreme Low Temperature -41 °C (-41.8 °F) to -60 °C (-76 °F)	Power ON and OFF managed by thermostat assembled on the kit; Power ON: < 0 °C ; Power OFF: > 10 °C Heater Externally powered
1	PTC - A	24 V DC	max 15 W	Optional	N/A	✓
2	PTC -B	110-240 1 ph	max 15 W	Optional	N/A	✓
3	PTC - C*	24 V DC	max 65 W	N/A	Mandatory	✓
4	PTC - D*	110-240 1 ph	max 45 W	N/A	Mandatory	✓

(*) Default in case of Extreme Low Temperature Range.

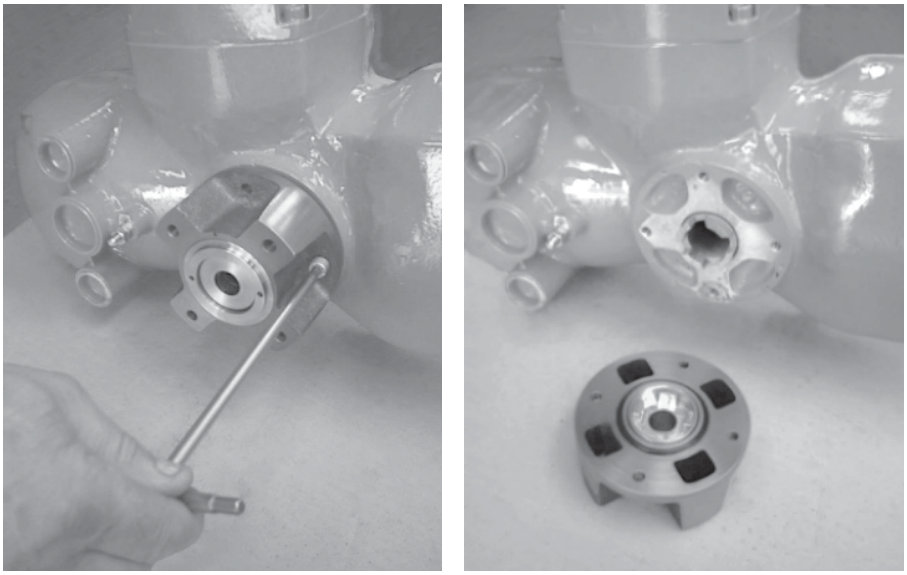
NOTICE

PTC (C) Actuator Power Supply ON (Start up or after Power shortage)
In the event of an ambient temperature below -40 °C (°F), the Actuator Main Power supply must be kept ON or preceded by a preheating time. Actuator Main Power supply can be switch ON after a warming up period. The minimum heating time must not be less than 60 minutes in case of ambient temperatures down to -60 °C.

NOTICE

Installation in an environment where the ambient temperature range falls outside the rated temperature will invalidate the warranty. Refer to the nameplate to verify the rated ambient temperature.

Figure 7



3.2 Coupling Block: Disassembly from the Actuator

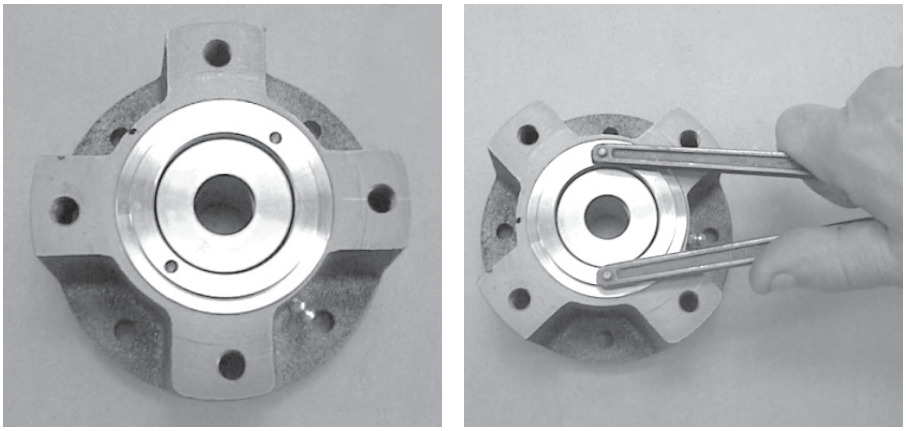
The bushing is delivered already assembled to the drive sleeve, even when it is unmachined. In order to perform the necessary machining, remove the bushing from its housing. Remove the fixing screws from the coupling block. View the actuator from the coupling side, with the block separated from the gearbox. Do not misplace the seal ring between the coupling block and the gear reduction unit.

3.2.1 Type “A” Coupling Block

3.2.1.1 Preparing the Bushing

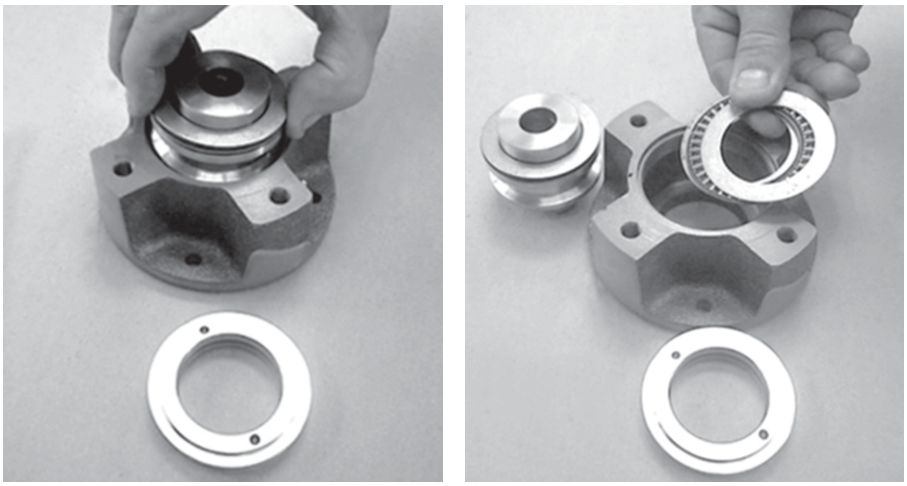
Using a spanner wrench, unscrew the lower ring nut.

Figure 8



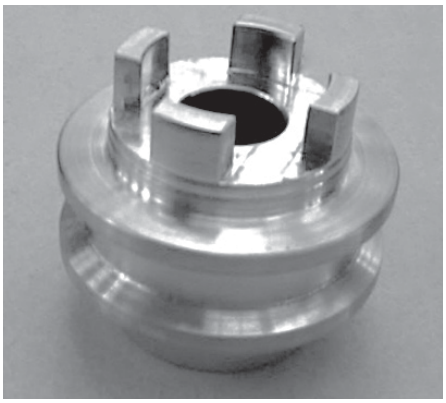
Extract the stem nut from the block housing.

Figure 9



The internal thrust bearing will remain at the bottom of the block housing.

Figure 10



NOTICE

Before remounting the stem nut, make sure that coupling tolerances to the valve stem are correct. The threaded stem nut must be checked either with a thread gauge or with the stem of the motorized valve by screwing the nut entirely along the valve stem without excessive friction.

The bore can now be machined in the stem nut to suit coupling requirements.
The same procedure is also used if maintenance is required.

3.2.1.2 Reassembling the Internal Parts

It is advisable to wash the dismantled parts with a suitable solvent and dry them with compressed air. Make sure that no metal filings or foreign bodies remain; spread a film of grease on all parts (for grease type, see Section 4, Lubrication).

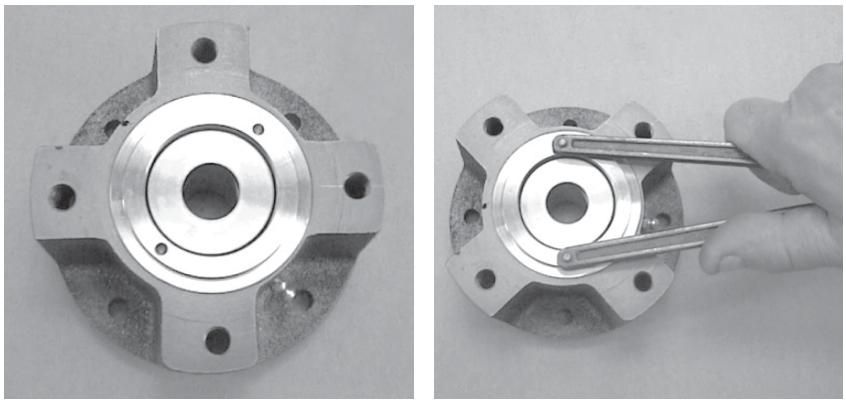
Proceed with the assembly of the internal parts by following the disassembly procedure in reverse; tighten the lower ring nut with thread sealant LOCTITE 270 or equivalent, and ensure that the stem nut still rotates freely. Attach the unit to the gear reducer as described further on.

3.2.2 Types “B1” and “B2” Coupling Blocks

3.2.2.1 Preparing the Bushing

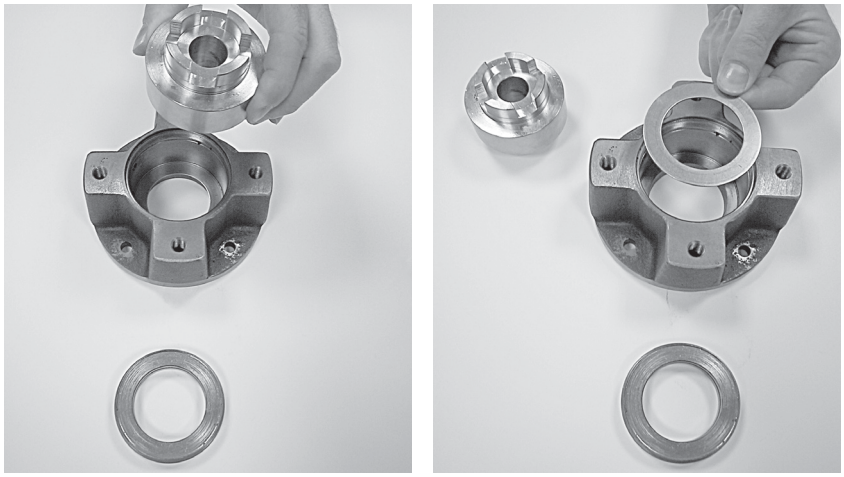
Using a spanner wrench, unscrew the lower ring nut.

Figure 11



Extract the bushing from the block housing.

Figure 12



The internal thrust washer will remain at the bottom of the block housing.

The bore can now be machined in the bushing to suit coupling requirements. The same procedure is also used if maintenance becomes necessary.

3.2.2.2 Reassembling the Internal Parts

It is advisable to wash the dismantled parts with a suitable solvent and dry them with compressed air. Make sure that no metal filings or foreign bodies remain; spread a film of grease on all parts (for grease type, see Section 4, Lubrication). Proceed with assembly of the internal parts by following the disassembly procedure in reverse order; tighten the lower ring nut with thread sealant LOCTITE 270 or equivalent, and ensure that the bushing still rotates freely. Attach the unit to the gear reducer as described further on.

3.2.3 Types “B3” and “B4” Coupling Blocks

3.2.3.1 Preparing the Bushing

Remove the mounting bolts of the coupling flange.

Figure 13

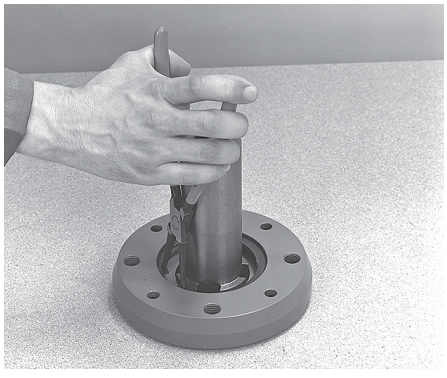
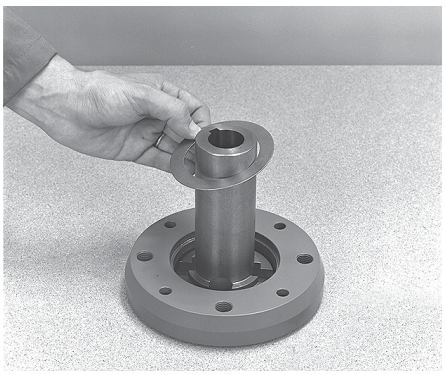
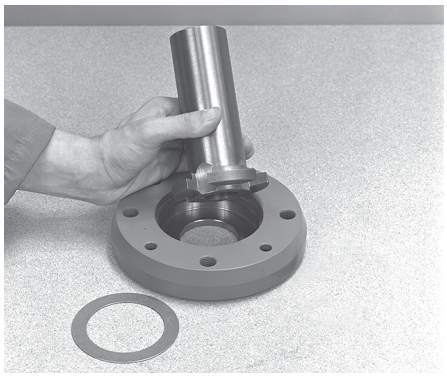


Figure 14



Extract the bushing and machine it according to the mating needs.

Figure 15



3.2.3.2 Reassembling the Internal Parts

It is advisable to wash the dismantled parts with a suitable solvent and dry them with compressed air. Make sure that no metal filings or foreign bodies remain; spread a film of grease on all parts (for grease type see Section 4, Lubrication).

Proceed with the assembly of the internal parts by following the disassembly procedure in reverse order. Attach the unit to the gear reducer as described further on.

3.2.4 Attaching the Coupling Block to the Gear Reduction Unit

Check the integrity of the O-ring seal and place it in its slot on the coupling block. Ensure that the lugs of the drive sleeve fit in the correct slots on the bushing.

Attach the screws previously removed.

3.3 Manual Operation

To engage manual operation, depress (by 20° - 30°) the lever in the direction shown in Figure 18 and then let the lever automatically return to its rest position. If no engagement is obtained, slowly rotate the handwheel and repeat the operation.

Rotate the handwheel to achieve the desired operation (normally clockwise rotation closes the valve).

A label is located on the handwheel with an arrow showing the closing direction (clockwise by default). If the closing direction is counterclockwise, the label must be removed and remounted upside-down.

⚠ WARNING

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

Figure 16



Engagement lever locked in motor operation position: manual operation cannot be engaged, thus preventing unwarranted local operation.

Figure 17



Engagement lever locked in handwheel operation position: operation with the electric motor is mechanically disengaged.



Figure 18



Figure 19

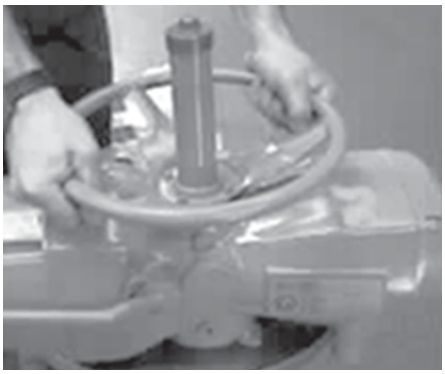
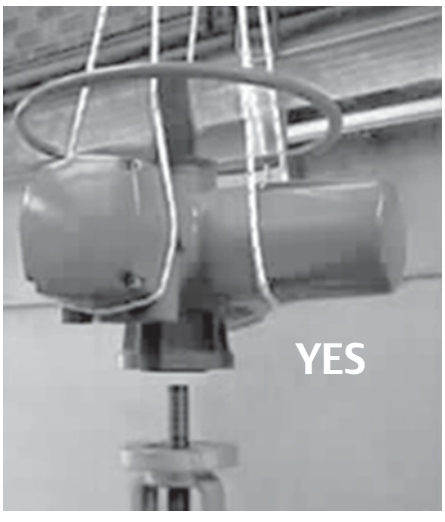
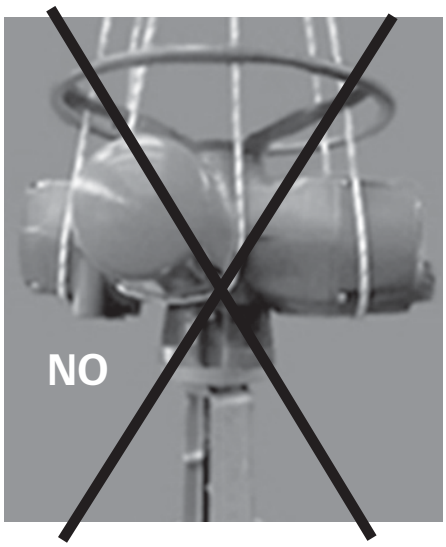


Figure 20





⚠ WARNING

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

Table 6.

Model	Max. weight, kg (lb)
010	32 (70.6)
020	38 (83.8)
030	46 (101.4)
040	56 (123.5)
050	73 (160.9)

3.4 Mounting the Actuator onto the Valve

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

Lift the actuator with slings suitable for its weight.

The actuator will operate properly in any position. When mounted upside-down, a 5 mm diameter hole should be drilled in the end of the stem cover to avoid build-up of service fluid or rainwater.

3.4.1 Coupling Type “A”

Place the actuator vertically on the stem, screw the threaded bushing of the coupling block on the valve stem, and then rotate (normally counterclockwise) until the coupling block and flange surfaces of the valve are securely in contact.

For safety purposes, rotate the handwheel in the opening direction for about two turns in order to lift the valve gate from its seat to avoid imparting (during bolt fixing) excessive axial thrust on the internal parts of the valve and the actuator.

Depending on the conditions of assembly, it could be easier to separate the thrust block from the actuator and mount it onto the valve yoke.

3.4.2 Coupling Types “B1”, “B2”, ”B3” and “B4”

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

Manually engage the actuator using the handwheel and place the actuator vertically on the valve stem. Perform the coupling operations (with the aid of manual operation if necessary); make sure no mating parts are forced.

3.4.3 Actuator Mounting

NOTICE

If the actuator is supplied without stud bolts and nuts, these must be provided by the customer and conform to the material requirements in Table 7.

⚠ CAUTION

Failure to use proper torque values can result in damage to the actuator and/or valve.

Figure 21



Table 7.

Model	Tightening Torque, Nm (lb.ft)	Material
010	40 (29.5)	Studs/Bolts: ISO Class 8.8 or ASTM A 320 Grade L7 or L7M
020	150 (110.6)	
030	150 (110.6)	
040	300 (221.3)	Nuts: ISO Class 8.8 or ASTM A 194 Grade 4
050	150 (110.6)	

3.5 Electrical Connections

Before powering the actuator check that the supply voltage details on the nameplate are correct for the receiving plant. Access to terminals for electrical connections and commissioning is via the terminal cover, since all settings are non-intrusive. The removal of any other covers without Biffi approval will invalidate the warranty; Biffi will not accept responsibility for any damage or deterioration that may be caused.

NOTICE

All accessories (including cable glands) must comply with approved specifications for the site requirements and be certified according to the standard directive.

3.5.1 Plant Requirements

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

For the proper sizing of protection devices, refers to certificate attached to the actuator (Is current).

Protection devices must be easily reached and identifiable by the operator.

3.6 Removing the Terminal Board Enclosure

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

⚠ WARNING

Be careful to not damage the joint surfaces of the terminal cover or seal during removal.

⚠ CAUTION

Using a fastener other than the approved type may result in damage to the actuator or valve. Refer to Table 8.

NOTICE

If the screws of the cover must be replaced, a SS AISI 316 must be used with minimum yield strength of 450 N/mm^2 (65,266 psi).

⚠ CAUTION

Failure to use proper torque values can result in damage to the actuator and/or valve.

Figure 22



3.7 Removing the Terminal Board Enclosure

The sealing of cables and conduit entries should be carried out in accordance with the relevant national standards or the regulatory authorities that certified the actuators. This is especially 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.

Standard cable entries (housing)

1" NPT, Qty 2
1-1/2" NPT, Qty 1
Optional: 3/4" NPT, up to Qty 2

On request, certified conduit entry adapters may be added (Metric, Pg, Rc, ASA, etc.)

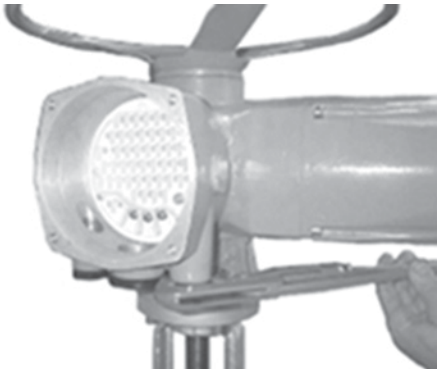
Remove the conduit entry plugs.

NOTICE

All accessories (including cable glands) must comply with approved specifications for the site requirements and be certified according to the standard directive.

To guarantee a weatherproof and explosion proof fit, screw the cable glands tightly (at least 5 turns) and coat them with a thread sealant. The use of a thread sealant is necessary in explosion proof and weatherproof applications.

Figure 23



If some parts of the cable glands have been removed while working on the conduit entries, put them back into place immediately to avoid misplacing the dismantled parts.

Unused entries:

- For explosion proof construction: unused entries must be plugged with metal explosion proof plugs and coated with a thread sealant.
- For weatherproof construction: replace the plastic standard protection plugs (supplied with the actuator) with metal plugs.

3.8 Terminal Board

⚠ WARNING

Installation, configuration, commissioning, maintenance, and repairs must be performed by approved and qualified personnel only.

⚠ WARNING

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

NOTICE

Be careful to not damage the joint surfaces of the terminal cover or seal during removal.

NOTICE

When removing the cover assembly or terminal block cover on existing installations, follow all safety and applicable site-specific rules.

Terminate the ground connections to the stud marked “ground”.

One internal ground stud and one external ground stud are provided.

Before performing service or maintenance operations (unless otherwise indicated), ensure that power is turned off to the unit to avoid injury or damage to equipment.

Check the wiring diagram (always included with the actuator) and the layout displayed on the back of the terminal enclosure cover to ensure a correct electrical connection.

All terminations should be made with an insulated ring, or spade connectors using the appropriate crimping tool. This operation will ensure an easily-made and correct electrical connection.

Connect the motor supply cable previously sized in accordance with:

- The absorbed current corresponding to the actuator nominal torque with the torque-limiting device set at 100% (see the test certificate attached to the actuator, Is current).
- The applicable plant and safety norms.
- Power cable maximum operating temperature greater than 85 °C.

Assemble the power terminal 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 with customer requests. Voltage and frequency values are stated on the motor nameplate.

Figure 24



Figure 25

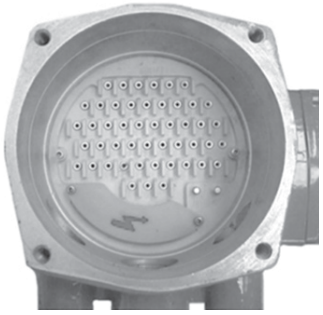
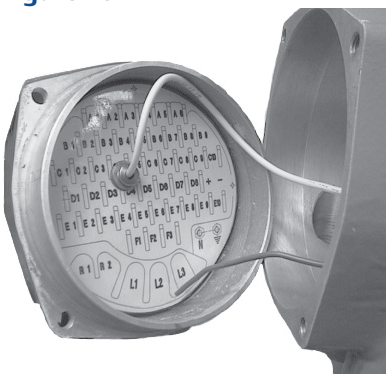


Figure 26



3.9 Instructions For Explosion proof Enclosures

NOTICE

The Biffi ICON3000 electric actuator shall be installed and maintained according to the applicable rules regarding electrical installations in hazardous area (other than mines) classified as zone 1 (gas); for example: EN 60079-10 (hazardous area classification), EN 60079-14 (electrical installation), EN 60079-17 (maintenance), and/or other national standards.

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

Table 8.

Model	Motor cover	Terminal enclosure cover	Local interface cover	Material
010	M8x30	M10x30	M10x35	AISI 316/ASME B16.11 A182-F316 (yield strength ≥ 450 N/mm² (65,266 psi)
020	M8x30	M10x30	M10x35	AISI 316/ASME B16.11 A182-F316 (yield strength ≥ 450 N/mm² (65,266 psi)
030	M10x35	M10x30	M10x35	AISI 316/ASME B16.11 A182-F316 (yield strength ≥ 450 N/mm² (65,266 psi)
040	M10x35	M10x30	M10x35	AISI 316/ASME B16.11 A182-F316 (yield strength ≥ 450 N/mm² (65,266 psi)
050	M12x45	M10x30	M10x35	AISI 316/ASME B16.11 A182-F316 (yield strength ≥ 450 N/mm² (65,266 psi)

Important points to note:

- Do not damage the explosion proof mating surfaces on the housing and on the electrical covers.
- Reinstall all the screws associated with the dismantled parts, and coat them with a thread sealant after coating them with a film of copper or molybdenum-based grease. This will prevent the screws from sticking and facilitate their removal when maintenance is required.
- Check that the bolts and screws are of the same dimensions and at least equal quality to those originally installed (as stated on the nameplate).

⚠ DANGER

Do not electrically operate the actuator when the electrical covers are removed. Do not open the actuator covers when an explosive atmosphere may be present. Ignoring the above precautions may result in personal injury or death.

- Replace any weatherproof seals that may have been removed (O-ring for the covers, O-ring for the explosion proof joint of the motor).

3.10 Installation in Environments with Explosive Dusts

NOTICE

The Biffi ICON3000 electric actuator shall be installed and maintained according to the applicable rules regarding electrical installation in hazardous areas (other than mines), classified as zone 21 (dust); for example: EN 50281-1-2 (dust) and/or other national standards.

Ensure that:

- The joint surfaces are greased with silicone oil or equivalent before assembly.
- The cable glands have minimum protection degree IP6X (EN 60529).

Section 4: Lubrication

4.1 Lubrication Inspection

The actuator is lubricated for the duration of its service life; 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 (see Figures 27 and 28) depending on what orientation the actuator was mounted.

The actuator is fitted with oil plugs (parts 1 and 2), such 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.

A spherical head lubricator (part 3) is fitted on the coupling block for the proper greasing of the inside thrust or sliding bearings.

The actuator is supplied with oil and greased where necessary.

Should maintenance become necessary, the following OILS are recommended:

Ambient temperature from -20 °C to +85 °C

- SHELL - OMALA S4 WE 320 or equivalent

Ambient temperature from -40 °C to +85 °C

- SHELL - TELLUS S4 ME 46 or equivalent

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

- SHELL - TELLUS S4 VX 32 or equivalent

Table 9.

Model	Oil quantity, liter (quart)
010	0.5 (0.53)
020	0.8 (0.85)
030	1.3 (1.37)
040	1.8 (1.90)
050	2.5 (2.64)

Should maintenance become necessary, the following GREASES are recommended:

Ambient temperature from -20 °C to +85 °C

- AGIP GREASE MU EP 2 or equivalent

Ambient temperature from -40 °C to +85 °C

- AEROSHELL GREASE 7 or equivalent

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

- AEROSHELL GREASE 7 or equivalent

Figure 27

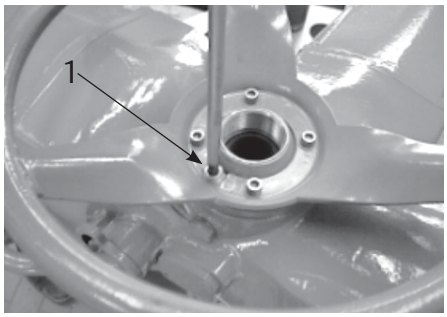
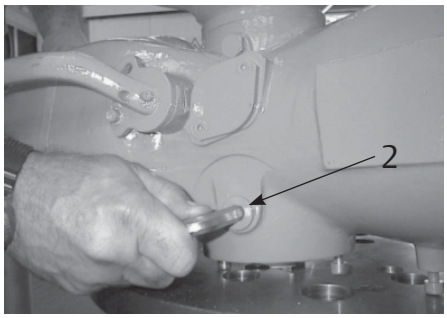


Figure 28



Section 5: Operating the ICON3000

5.1 Operation By Handwheel

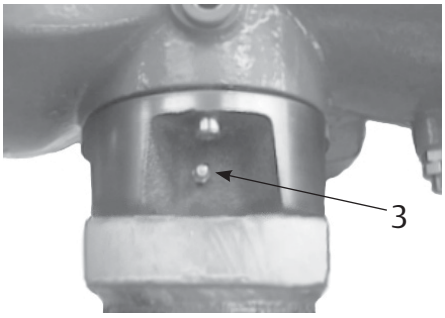
To operate the actuator via the handwheel, press down the lever and at the same time rotate the handwheel until the clutch is engaged. Release the lever and move the valve via the handwheel. The actuator will return to electrical operation only by energizing the motor.

5.1.1 Operation By Handwheel in Absence of a Power Supply and With the Lithium Battery

- The position is updated for strokes higher than a half turn of the wheel.
- The actuator position and battery status can be updated at any time by pressing the STOP button for at least 3 seconds.
- The position is automatically checked and updated at least once a day.

At the end of each operation by handwheel, it is recommended to update the position by pushing the STOP button.

Figure 29



⚠ WARNING

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

5.2 Electrical Operation

Before connecting power to the actuator check that the voltage is correct and corresponds to the indications on the nameplate. An incorrect power supply could cause permanent damage to the electrical components. Checking phase rotation is not necessary since the actuator is provided with automatic phase rotation correction. Rotate the 3-position selector switch to OFF and then switch on the power. Do not operate the actuator without first checking that the configuration is suitable for the required application (see Section 6.4).

Power supply limits

Voltage: +/- 10% (continuous) +10% -15% (intermittent)
Nominal duty: -5%/5% according to IEC 60034-1
Total Harmonic Distortion (THD): max 5% according to IEC 60034-1
Form and symmetry on voltages and currents: according to IEC 60034-1 (Section 7.2.1.1)

⚠ CAUTION

Working outside the above limitations could damage the actuator.
Be careful if an inverter or generator is used as a power supply.

5.3 Local Control

If no alarm is present after configuring the actuator, place the 3-position selector in LOCAL and control the actuator with the 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-energized.

If “latched” was selected: as the OPEN or CLOSE push-button is pressed the motor is energized, and it will continue to run 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 one need only press the push-button relevant to the opposite direction.

Depending on the position of the local selector, the OPEN/YES and CLOSE/NO push-buttons work as follows:

- OPEN/CLOSE commands if the selector is in the LOCAL position.
- YES/NO to answer prompts in the menu, if the selector is in the OFF or REMOTE positions.

5.4 Local Indication

By default, the upper display indicates the valve position as a percentage of opening (open = 100%). The lower display in the upper part shows icons that indicate the actuator status or the Menu, where the user is operating.

The lower display in the lower part is organized in two lines. The upper line indicates the actuator status and the 3-position selector status. The lower line indicates the actuator operation, or the position request % value, according to the configuration.

Two LEDs indicate the actuator position and operating direction (OPEN or CLOSE), while a third and fourth LED indicate alarms and Bluetooth connectivity respectively.

Figure 30



Figure 31

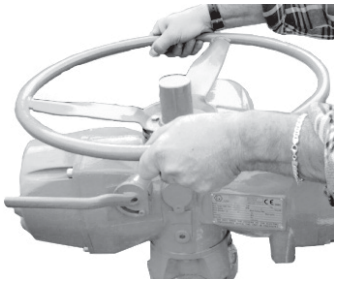


Figure 32



Figure 33



Figure 34

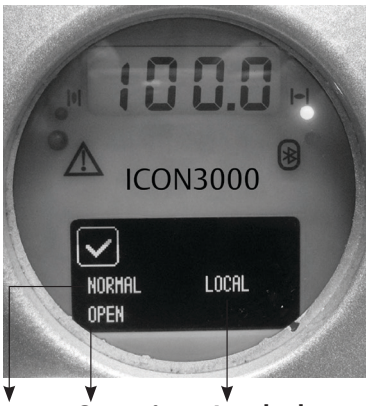


Figure 35



5.5 Locking the 3-Position Selector

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

5.6 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 the local STOP control remains active. Using the “VIEW and SET-UP” features, one can configure different control modes.

The remote controls are optically-isolated (opto-coupled). A non-regulated 24 V DC voltage (variable from 23 to 27 V DC, max. 4 W) is available on the actuator terminal board to supply the remote controls or external devices.

5.6.1 Remote Commands

Using the “VIEW and SET-UP” features, one may configure different control modes.

4 WIRES (see the remote connections diagram in Figure 36)

In “4 wires latched” (OPEN, CLOSE, STOP, COMMON) mode with the OPEN or CLOSE signal switched to ON, the motor is energized and it will continue to run after the signal returns to OFF. To stop the motor, press STOP. To reverse the direction, press STOP and then press the button relevant to the opposite direction. The action of the STOP signal (stop with signal ON or stop with signal OFF) may be reversed using the VIEW and SET-UP features; see Section 9.1.4, Remote Controls.

3 WIRES (see the remote connections diagram in Figure 37)

With the “3 wires” option (OPEN, CLOSE, COMMON), the actuator can be driven in either “push-to-run” or “latched with instant reverse” mode.

In “push-to-run” mode, the actuator can be driven to the desired position by switching the OPEN or CLOSE signal to ON. As the signal returns to OFF, the motor is de-energized. In “latched with instant reverse” mode when the OPEN or CLOSE signal switches to ON, the motor is energized and it continues to run after the signal returns to OFF. If the signal relevant to the opposite direction goes ON, the actuator reverses its direction and maintains the new direction if the signal returns to OFF.

2 WIRES (see the remote connections diagram in Figure 38)

With the “2 wires” option, two different activities may be selected:

In “2 wires, signal ON to open”, the actuator opens if the signal switches to ON and closes if the signal goes to OFF. In “2 wires, signal ON to close”, the actuator closes if the signal switches to ON and opens if the signal switches to OFF. This option requires two wires (signal and common).

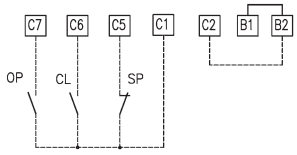
The circuits associated to the inputs can be supplied by the internally-generated 24 V DC or by an external 20-125 V DC or 20-120 V AC (50/60 Hz).

The signal levels are the following:

- Minimum ON signal > 20 V DC or 20 V AC (50/60 Hz).
- Maximum ON signal < 125 V DC or 120 V AC (50/60 Hz).
- Maximum OFF signal < 3 V.
- Minimum signal duration > 500 ms.
- Total current drawn from remote controls < 25 mA.

Figure 36

Option A1)



Option B1)

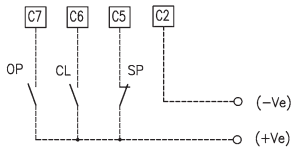
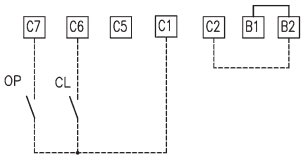


Figure 37

Option A2)



Option B2)

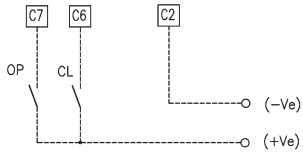
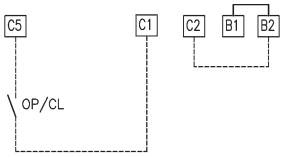
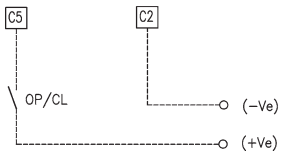


Figure 38

Option A3)



Option B3)



5.6.2 Output Contacts

Standard version

- Monitor relay: the voltage-free, change-over contacts of the monitor relay are available on the terminal board. The monitor relay indicates if the actuator can be remotely controlled or if there is a problem or condition that prevents remote control of the valve. The conditions that cause the relay to switch over are listed in Section 9.1.6, Output Relays.
- AS1, 2, 3, 4, 5, 6, 7 relays: the voltage-free contacts of 7 latching relays are available on the terminal board. The status (make or break) and the conditions that cause switching of a given relay can be viewed and configured by using the “VIEW and SET-UP” features. The status of the latching relays is immediately updated if the associated conditions for change occur, or are cyclically updated (every second).
- AS8 relay: a further voltage-free, change-over contact is available on the terminal board. The conditions that cause the switching of the relay can be viewed and configured by using the “VIEW and SET-UP” features.
- Contact rating:
  Max. voltage 250 V AC/30 V DC: max. current 5 A.
  Min. voltage 5 V DC: min. current 5 mA.

5.6.3 ESD Operation

An ESD (Emergency Shut Down) signal can be sent to the actuator to override any existing command and to drive the valve to a predetermined position.

The control is not self-maintained; that is, the ESD action continues until the relevant signal is present. The “VIEW and SET-UP” features can configure the polarity of the ESD signal, the valve position after the ESD action, and the priority of the ESD function, as described in Section 9.1.3, ESD Control.

The ESD command is optically-isolated (opto-coupled). The circuits associated with the input can be supplied by the internally generated 24 V DC or by an external 20 - 125 V DC or 20 - 120 V AC (50/60 Hz).

The signal levels are the following:

- Minimum ON signal > 20 V DC or 20 V AC (50/60 Hz).
- Maximum ON signal < 125 V DC or 120 V AC (50/60 Hz).
- Maximum OFF signal < 3 V.
- Current drawn from ESD controls < 15 mA.

⚠ WARNING

Any certification relating to actuator operation in hazardous areas will be invalidated if the client desires that the motor thermostat be bypassed during ESD operation.

5.6.4 Interlock Inputs

Two additional inputs are available to inhibit actuator movement in the open or closed direction. The controls are momentary, and the inhibiting action continues until the relevant signal is present. The interlock controls work when the local selector is in either LOCAL or REMOTE positions. The ESD control overrides the interlock controls. The “VIEW and SET-UP” features can configure the polarity of INTERLOCK signal as described in Section 9.1.10, Interlock.

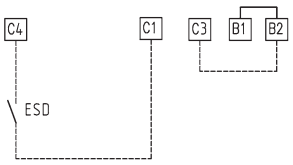
The interlock inputs are optically-isolated (opto-coupled) and can be supplied by the internally generated 24 V DC or by an external 20-125 V DC or 20-120 V AC (50/60 Hz).

The signal levels are the following:

- Minimum ON signal > 20 V DC or 20 V AC (50/60 Hz).
- Maximum ON signal < 125 V DC or 120 V AC (50/60 Hz).
- Maximum OFF signal < 3 V.
- Total current drawn from remote controls < 20 mA.

Figure 39

Option D1)



Option D2)

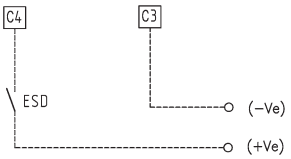
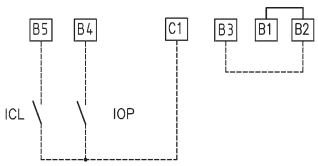
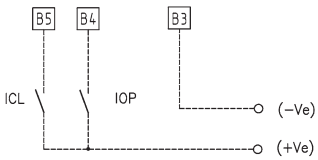


Figure 40

Option E1)



Option E2)



5.7 Operating the ICON3000 for the First Time

Before attempting to operate the ICON3000 for the first time, check that the actuator is correctly mounted on to the valve. Place the 3-position selector to OFF and switch the power on. The alphanumeric display will show “ICON3000” for a few seconds.

If an alarm is active (i.e. the Alarm icon is shown on the display), take the necessary action to resolve the alarm before proceeding (see Section 12.11).

If a warning is active (i.e. the Warning icon is shown on the display) a warning condition is present. One can proceed since the ICON3000 will continue to function, but some data are not according to the configured parameters (see Section 12.11).

If the lower lines of the display show “INT OFF”, then an interlock input is active. If the lower lines of the display show “ESD ON OFF”, the ESD input is active.

Do not operate the actuator without first checking that the configuration is according to the required application by using the “VIEW and SET-UP” features (see Section 6/10).

Set torque limits, position limits and closing direction by means of the “stroke limits routine” of the “actuator set-up” menu (see Section 9).

When the stroke limits and the configurations are correct, bring the 3-position selector to LOCAL and drive the actuator to the open or closed position (see Section 5.3).

5.8 Optional Modules

⚠ CAUTION

The actuator contains parts and assemblies susceptible to damage via Electrostatic Discharge (ESD). Prior to performing work, use ESD protection or discharge static electricity by touching grounded metal.

Additional modules can be plugged in the base card of the ICON3000 to provide the following functions:

5.8.1 Fieldbus Interface for Remote Control via FIELDBUS

This card allows the ICON3000 to connect to a FIELDBUS. The following bus interface cards are available:

- Profibus DPV0
- Profibus DPV1 with or without redundancy
- Profibus DPV2 with or without redundancy
- Foundation Fieldbus
- LonWorks
- Modbus RTU

A hardware alarm is generated if the ICON3000 is set to be equipped with a bus card but the card is damaged or missing. A BUS REPORT is also present in the list of reports if the card is present (Refer to Section 6). Refer to the specific manuals for instructions and setting of the above modules.

5.8.2 Ain/Aout Card

With the above card, the ICON3000 is provided with a 4 - 20 analog input and a 4 - 20 mA analog output. This card should be plugged on the base card, replacing the “TERMINAL BOARD ADAPTOR” card supplied as standard. A hardware alarm is generated if the ICON3000 was set to be equipped with an Ain/Aout card and the card is damaged or missing.

An Ain/Aout REPORT is also present in the list of reports if the card is present (see Section 6).

Figure 41



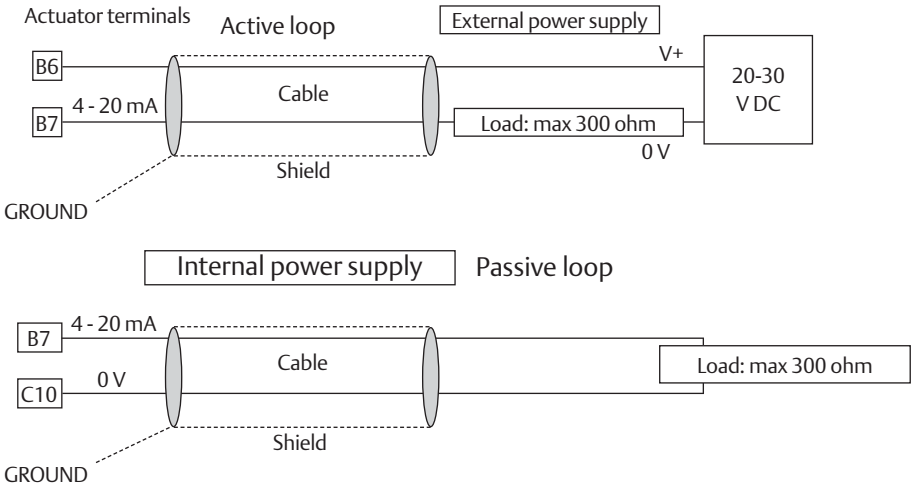
- **4 - 20 mA analog output**

  The 4 - 20 mA output can be configured to provide a signal proportional to either “position” or “torque”. The polarity option allows the relationship between position (or torque) and the 4 - 20 mA output signal to be reversed and the 4 - 20 mA output signal. See “VIEW and SET-UP” features (Section 9.1.9, OUT 4 - 20 mA).

  The 4 - 20 mA output is optically-isolated (opto-coupled). It should be powered by a 20-30 V DC voltage (externally or internally generated) and the maximum load (including cable resistance) should be less than 300 ohm.

  Figure 42 shows the wiring diagram.

Figure 42



If mains voltage is lost, behavior will be different if the power supply of the 4 - 20 mA output stage is internally- or externally-generated:

— Internal power supply (or passive loop):
If mains voltage is lost the output 4 - 20 mA drops to 0. The correct output will be restored when mains voltage returns.

— External power supply (or active loop):
If the actuator is provided with a lithium battery (or supplied by the auxiliary 24 V DC) and if mains voltage fails, the output 4 - 20 mA maintains the last value. If the actuator is moved via the handwheel, the output 4 - 20 mA will be updated. If the actuator is not provided with a lithium battery (or not supplied by the auxiliary 24 V DC) and mains voltage fails, the output 4 - 20 mA maintains the last value. If the actuator is moved by handwheel, the output 4 - 20 mA will not be updated.

- **4 - 20 mA analog input**

  The 4 - 20 mA analog input is the position request R% signal and is used by the ICON3000 to position the valve in positioning (inching) and modulating actuators. The “POSITIONER” routine processes the input signal, compares the present actuator position % with the position request R%, and if the difference is greater than the dead band - the actuator is driven to reach the requested position. 4 mA corresponds to request R% = 0% = valve closed and 20 mA corresponds to request R% = 100% = valve open. The relationship between position and request signals can be reversed by the “Polarity” function. The 4 - 20 mA input is optically-isolated (opto-coupled). The input impedance is less than 500 ohm. The loss of the 4 - 20 mA input signal is indicated as follows:

  — Change-over of the monitor relay

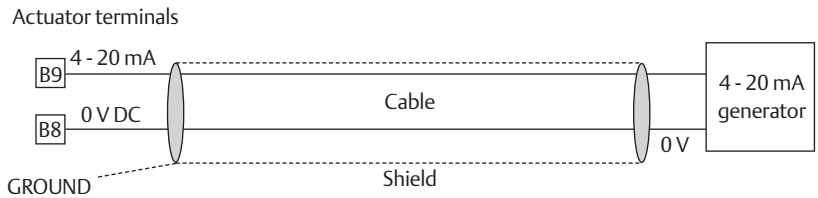
  — Alarm LED on

  — List of ALARMS (see Section 12.11, Diagnostic Messages)

  — Alarm log

Figure 43 shows the wiring diagram.

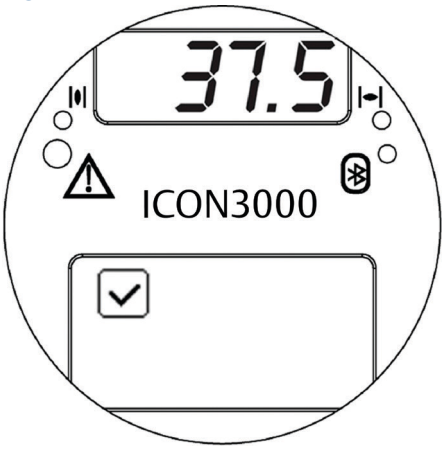
Figure 43



The “VIEW and SET-UP” features can configure different options, which are described in Section 9.1.7, Positioner.

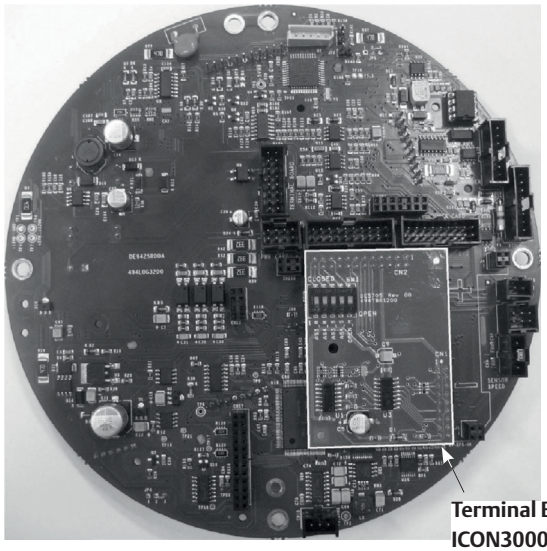
If the POSITIONER function is active, the alpha-numeric display indicates the value of the position request in % (R%: xxx.x).

Figure 44



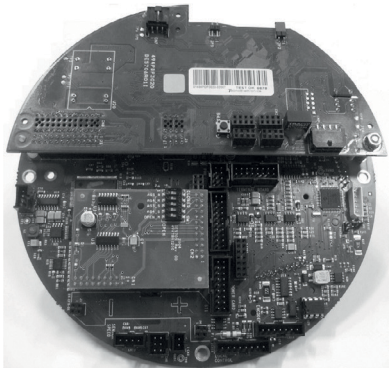
5.9 Base Card of the ICON3000

Figure 45 Bottom View of Base Card



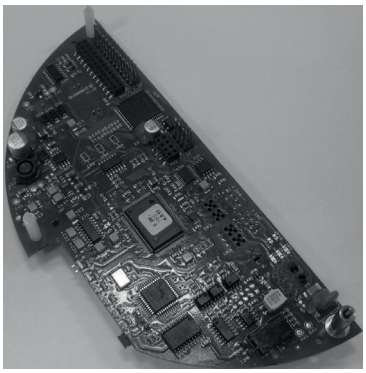
Terminal Board Adaptor card (TBA) only for ICON3000. It is not necessary for ICON3000v2

Figure 46 Top View of Base Card



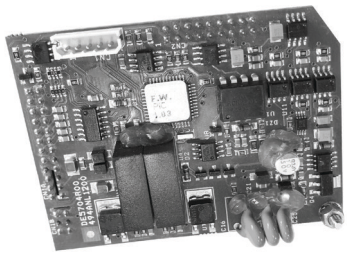
Top View of Base Card
Base card equipped with fieldbus interface card and Terminal Board Adapter (TBA) card.

Figure 47 Fieldbus interface card



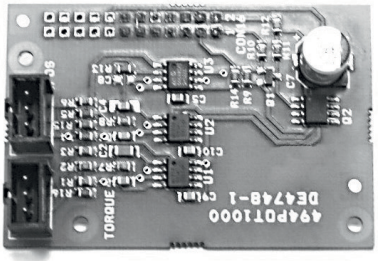
Fieldbus Interface Card
The type of card depends on the fieldbus present in the plant.

Figure 48 Ain/Aout card



Ain/Aout card
This optional card is used in place of the Terminal Board Adapter (TBA) card when an analog 4 - 20 mA input and output signal is requested.

Figure 49 Potentiometer card



Potentiometer card
This card can be used for some special FW versions of the ICON3000.

Figure 50



5.10 Absolute Encoder of the ICON3000

The ICON3000 absolute encoder can measure up to 8,000 output turns. The absolute encoder maintains the actuator/valve position without electrical power and battery back-up.

Figure 51 Potentiometer card



Section 6: Local Controls

6.1 Description of the Local Operator Interface

The following functions are available via the ICON3000 local operator interface:

- Actuator Control
- Actuator Configuration
- Actuator Status Visualization

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

Figure 52 Local Operator Interface Components



1. **OLED Graphic display:** during normal operation the alphanumeric display shows the present status (NORMAL, ESD ON, ALARMS, WARNINGS, INTERLOCK, INT.EFS, SLEEP, EFS OFF, PST ON), the 3-position selector status (LOCAL, OFF, REMOTE), and the actuator action (OPEN, OPENING, CLOSED, CLOSING, STOP, or R% : xxx.x). If the local selector is in OFF or REMOTE, pressing the YES push-button allows the user to scroll through the list of variables, alarms, and reports:

Table 10. List

output torque	mot temp
motor speed	term temp
main voltage	log status
current	wireless report
temperature	node report *
time	FDI report *
date	base report
alarm	term report
warning	Ain/Aout report *
Ktemp	-

The data with * are only present if the relevant modules are present.

2. **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

3. The ICON3000 can be provided with a radio-frequency wireless connection based on a qualified Bluetooth class 1 module. This allows exchange of data with a PDA or PC with built-in **Bluetooth™** technology. The following tasks can be wirelessly performed:

- View and change configuration
- Set maintenance function
- Read maintenance data
- Download new firmware to the ICON3000
- The blue LED indicates that communication with a host device is established

4. **Numeric display** to indicate the present valve position as a % of open position. Display resolution is a function of the number of complete turns of the actuator output shaft:

- From 2 to 4 turns = 0.2%
- From 4 to 8,000 turns = 0.1%

5. **Three LEDs** to indicate the actuator status according to the following logic:

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

The above color combination is supplied as standard, but it may be changed (red to green, green to red, and yellow to red), during actuator setup operations.

6. **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 prompts (next? OK? view?, change? exit?) shown on the alphanumeric display.

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

In REMOTE, the OPEN/YES and CLOSE/NO push-buttons allow the list of variables, status, alarms and reports to be scrolled through but the actuator configuration cannot be viewed or changed.

Table 11. Description of Variables and Reports

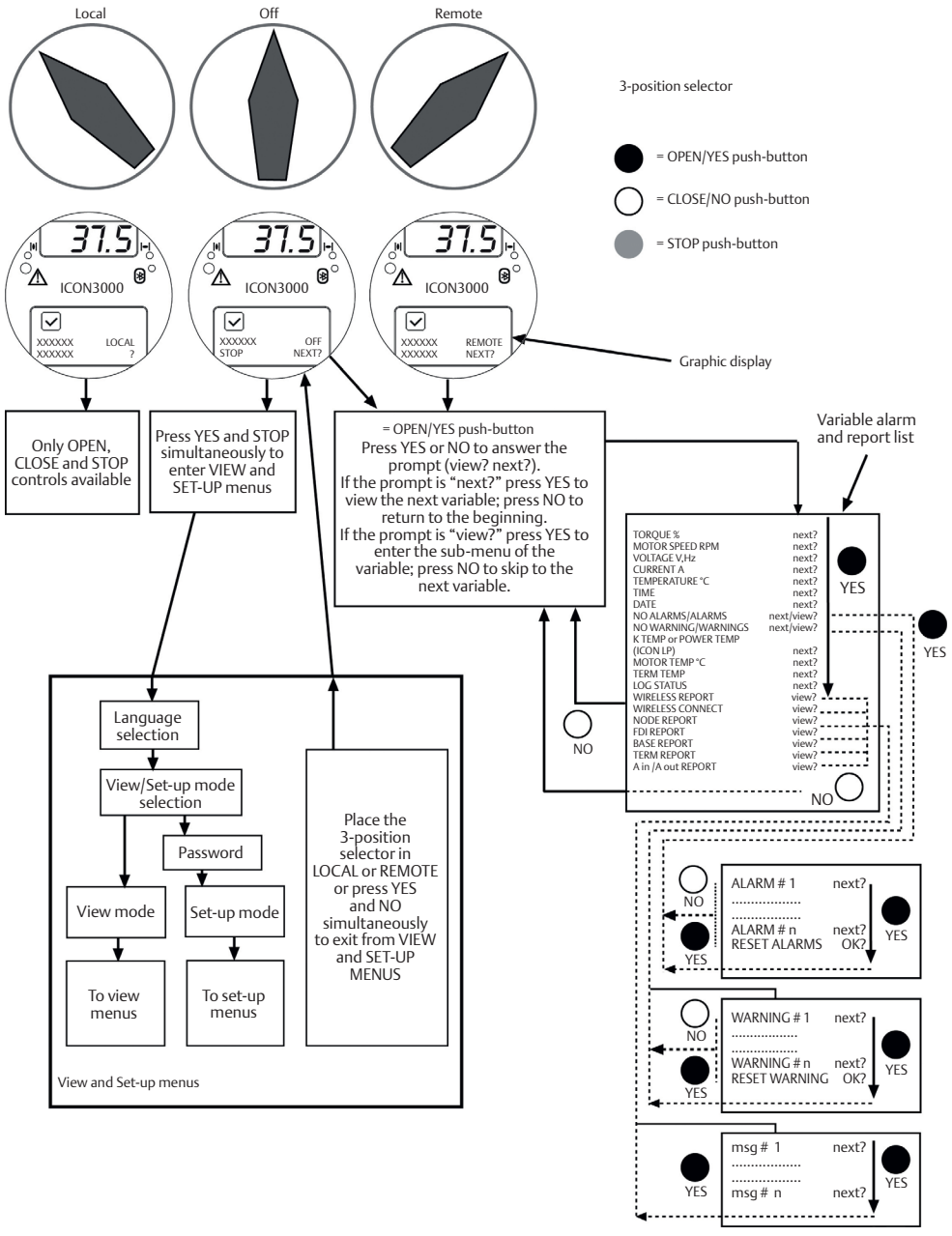
Variable	Report
Torque	Output torque in % of the nominal torque stated in the NAMEPLATE menu
Motor speed	RPM of electrical motor
Main voltage	Voltage (V) and frequency (Hz) of mains
Current	Current (A) absorbed by the motor
Temperature	Temperature (°C), inside the electronic compartment
Time	Present time
Date	Present date
Alarm	List of present alarms (see Section12.11, Diagnostic Messages)
Warning	List of present warnings (see Section 12.11, Diagnostic Messages)
Ktemp	Temperature factor
Mot temp	Temperature (°C) of the electrical motor
Term temp	Temperature (°C) inside the terminal board compartment
Log status	Data logger status (off, ready, in progress: E: event number - number of memory cycle or R: sample number - number of memory cycle)
Wireless report	Bluetooth interface status (ready, not ready)
Node report	Report of bus interface card (only present if the bus card is present; refer to the relevant instruction manual)
FDI report	Report of FDI function (only present if the LonWorks bus card is present; refer to the relevant instruction manual)
Base report	Base card report - card code - manufacturing week and year - electrical diagram, etc.
Term report	Terminal board card report - card code - manufacturing week and year - electrical diagram, etc.
Ain/Aout report	Ain/Aout card report (only present if the card is present) - card code - manufacturing week and year - electrical diagram, etc.

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 moves out of its acceptable range and thus causes the actuator control functions to become unavailable.

The alarm and warning lists only 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 type of alarm/warning that is memorized (over-torque, jammed valve, etc.).

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

Figure 53



6.2 Configuration Options

The ICON3000 actuator can be completely configured via the local interface by means of a series of menus that can be selected from the alphanumeric display. The operator can navigate 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; if not, press NO to scroll through the list of available languages and then press YES to when the menu reaches the desired language.

After choosing the language, the next step is the selection between view and set-up mode. Use “View” mode to see the actuator configuration, and use “Set-up” mode to change the present configuration. Unauthorized 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 current password can also be modified by the “set password” routine in the Maintenance menu. After entering the new password the old one becomes invalid, so it is important to record the new 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, and 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.

- Stroke limits
- Torque set-up
- ESD set-up
- PST set-up
- Remote controls
- Local controls
- Output relays
- Positioner *
- Fail-safe *
- Out 4 - 20 mA *
- Interlock
- 2-speed timer
- Bus *
- Miscellaneous

The routines with * are only available if the relevant modules are present. If the bus interface is LonWorks, the “BUS” routine changes to “FDI control”.

Nameplate

This menu includes a series of data identifying the actuator characteristics, service, and utilization mode. The data are entered by the manufacturer and can only be viewed (not edited; as such, this menu is only available in View mode).

List of routines:

- serial number
- actuator type
- torque/thrust
- actuator speed
- power supply
- motor data
- test date
- wiring diagram
- enclosure
- certificate
- lubricant
- revision
- torque sensor

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 (max 28 characters)
- serial number (max 28 characters)
- manufacturer (max 28 characters)
- break OP torque (max 28 characters)
- max stem thrust (max 28 characters)
- flange type (max 28 characters)

Maintenance

This menu includes all diagnostic and historic data which can assist the operator if failures occur or during maintenance operations. The Maintenance menu also includes the "Set password" routine.

List of routines:

- Set-up Mode
  - new password
  - clear alarm log
  - torque profile reference
  - torque curve reference
  - clear recent data log
  - configuration (backup/restore) (only for ICON3000v2)
  - maintenance date
  - data logger
  - PST reference (only if INTERLOCK = ADVANCED)
  - PST cmd (only if INTERLOCK = ADVANCED)
- View Mode
  - alarm log
  - torque profile
  - torque curve
  - operation log
  - maintenance date
  - data logger

The parameters appear on the alphanumeric display in the same order in both 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 reenter (by pressing YES) or 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 at the factory according to standard settings, or to customer requirements. No password is required to access view mode, but no change of parameters can be made.

- Ensure that mains power is supplied.
- 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 through the list of available languages. Press YES to select a new language Press YES to confirm.
- Press NO to scroll through 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 through the list of available routines and press YES to select the routine where the parameter to be changed is located.
- Press NO to scroll through 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 stroke limits it is necessary to enter the correct password.

Ensure that mains power (or the external auxiliary supply) is supplied.

- 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 through 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 the prompt “ENTER PASSWORD OK?”.
- Enter the password. Enter one digit at a time. Press YES if a digit is correct; otherwise, press NO to scroll through 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 through the list of available menus (actuator set-up, valve data, maintenance) and press YES to select the desired menu.
- Press NO to scroll through 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 are retained if electrical power is removed from the actuator.

All ICON3000 actuators are configured before shipping with a standard default setting unless alternatives were requested on order. If complications arise during commissioning, the default setting can be reinstated via the appropriate function in the ”miscellaneous” routine in the actuator set-up menu. The actuator will return to its original configuration and commissioning can resume.

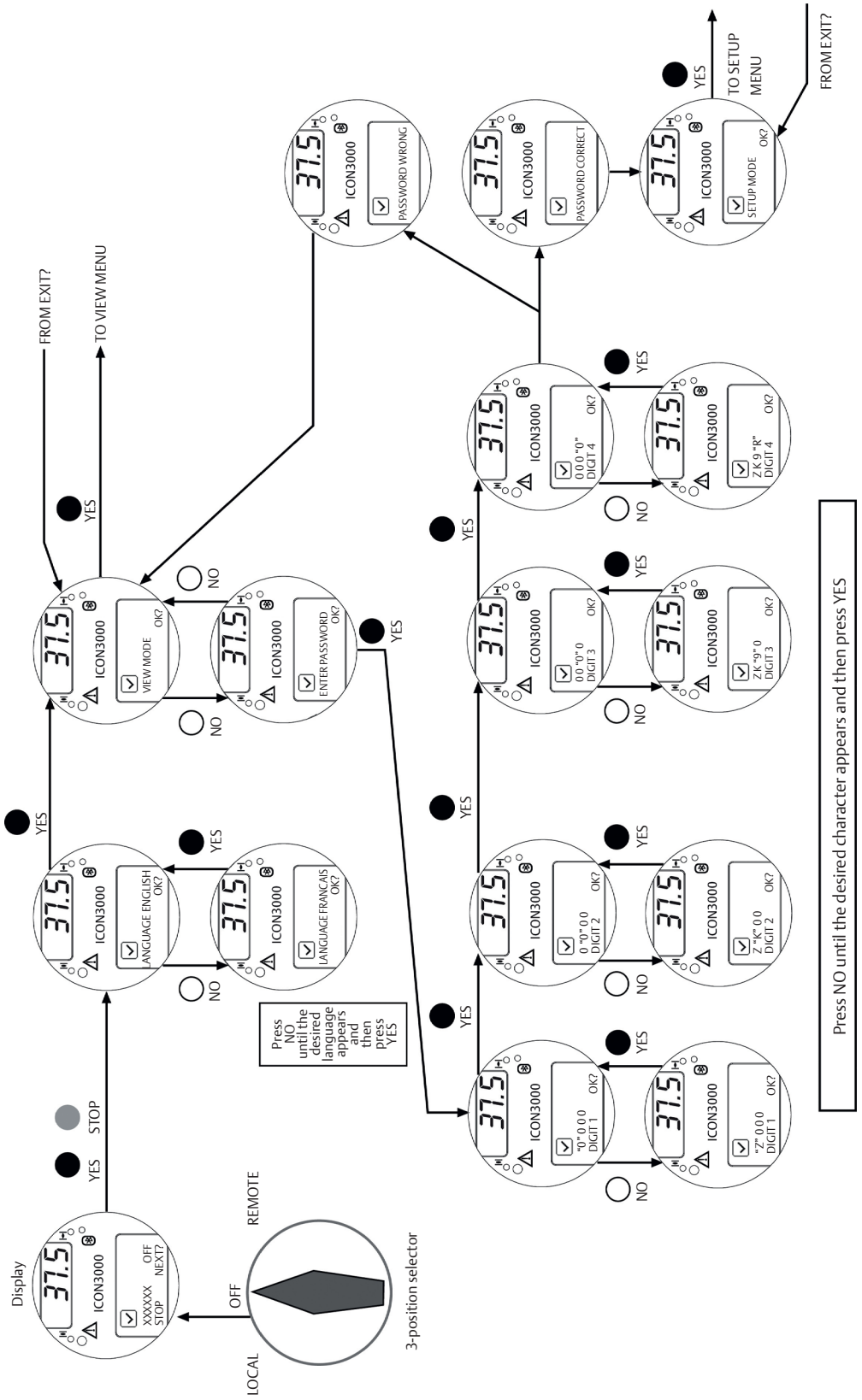
6.5 Exit from View and Set-Up Mode

The following actions causes the actuator to exit from view and set-up mode:

- Moving the 3-position selector to LOCAL or REMOTE.
- Answering YES when the display asks “EXIT OK?”.
- Pressing YES and NO simultaneously.
- Automatic exit after 90 minutes without any parameter change or view.
- Removal of electrical power from the unit.

Figure 54 shows the procedure to enter view and set-up mode.

Figure 54 Enter View and Set-Up Mode



Section 7: Set-Up Menu

Figure 55

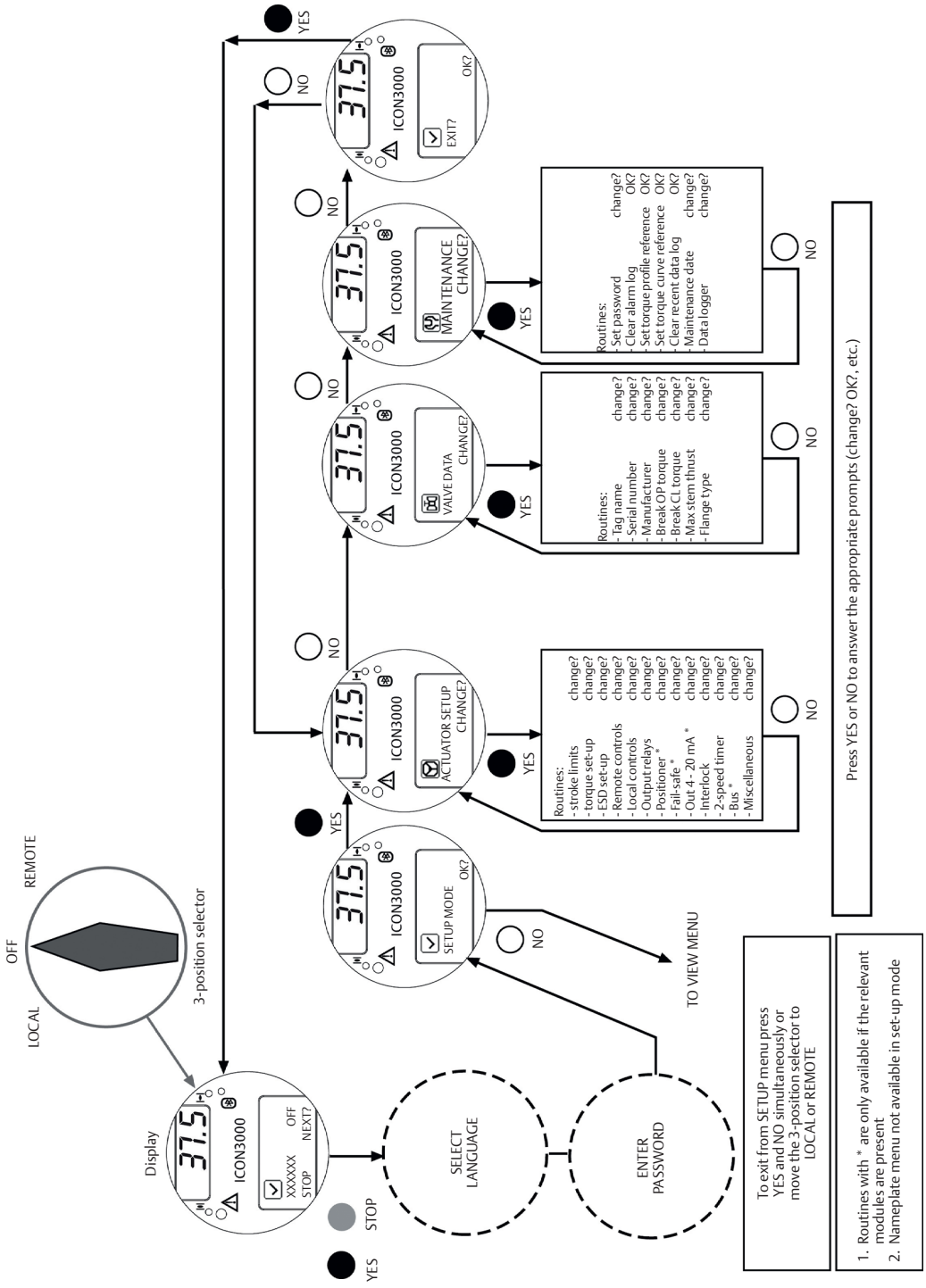
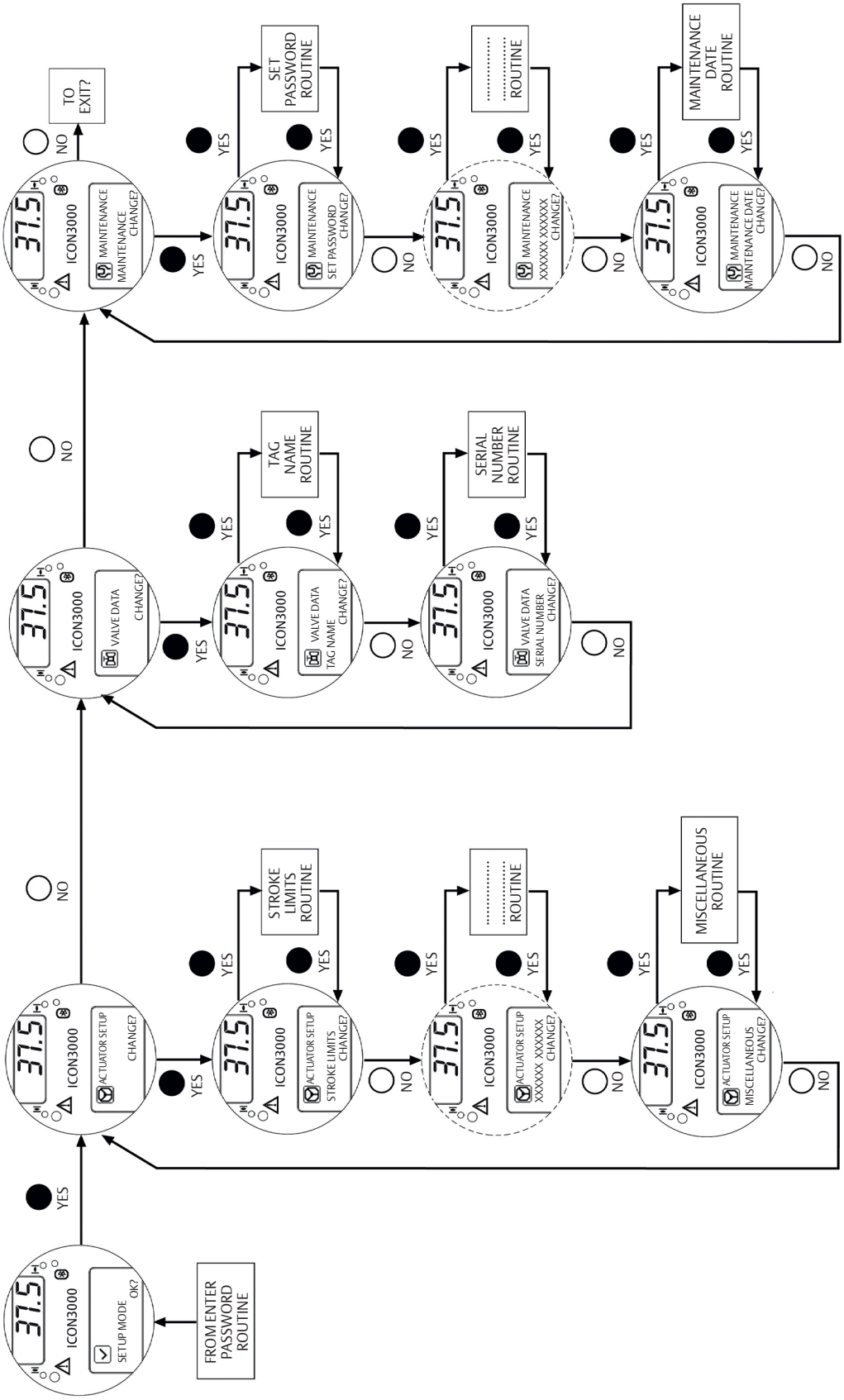


Figure 56 shows the procedure to navigate through the set-up routines.

Figure 56



Section 8: View Menu

Figure 57 View Menu

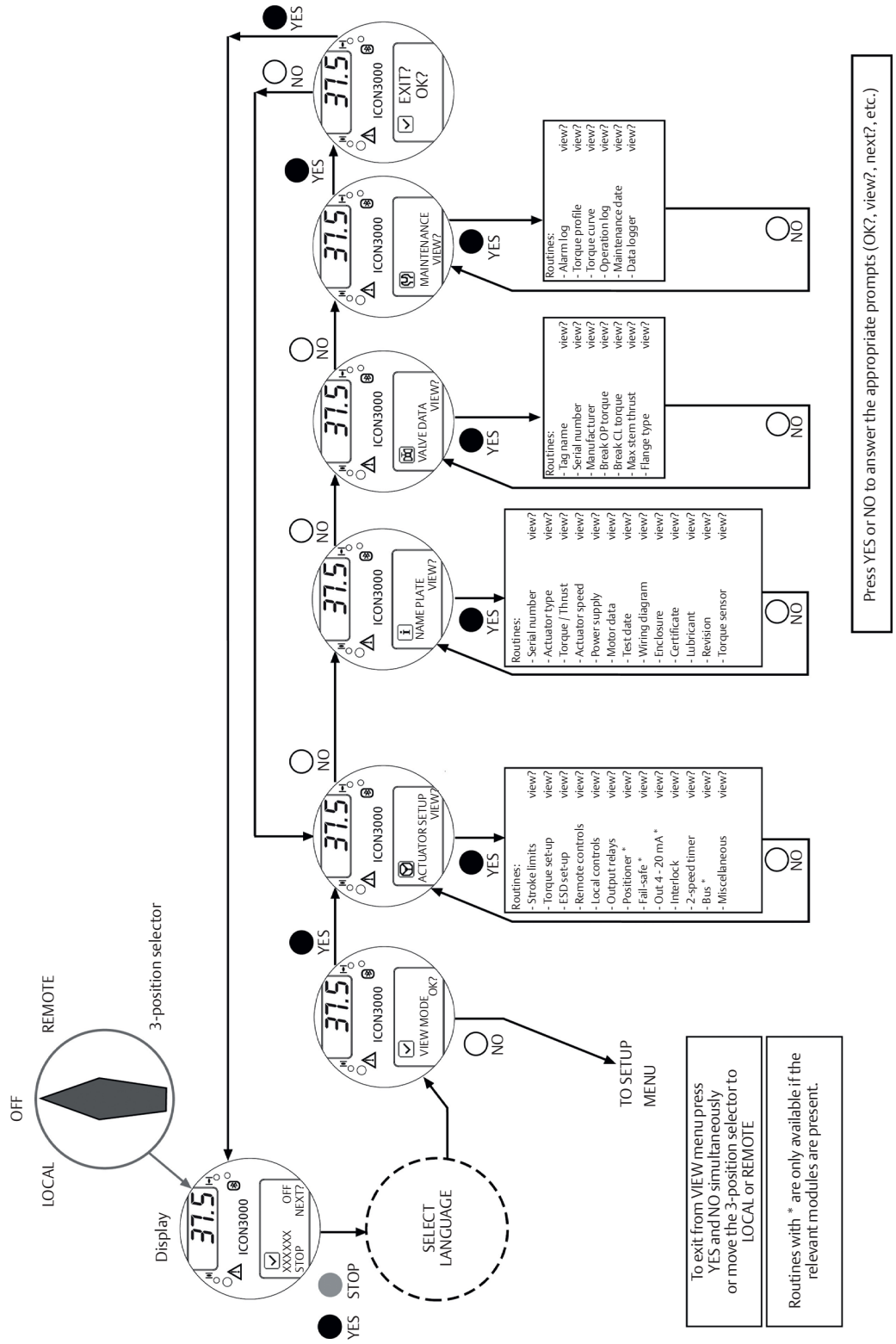
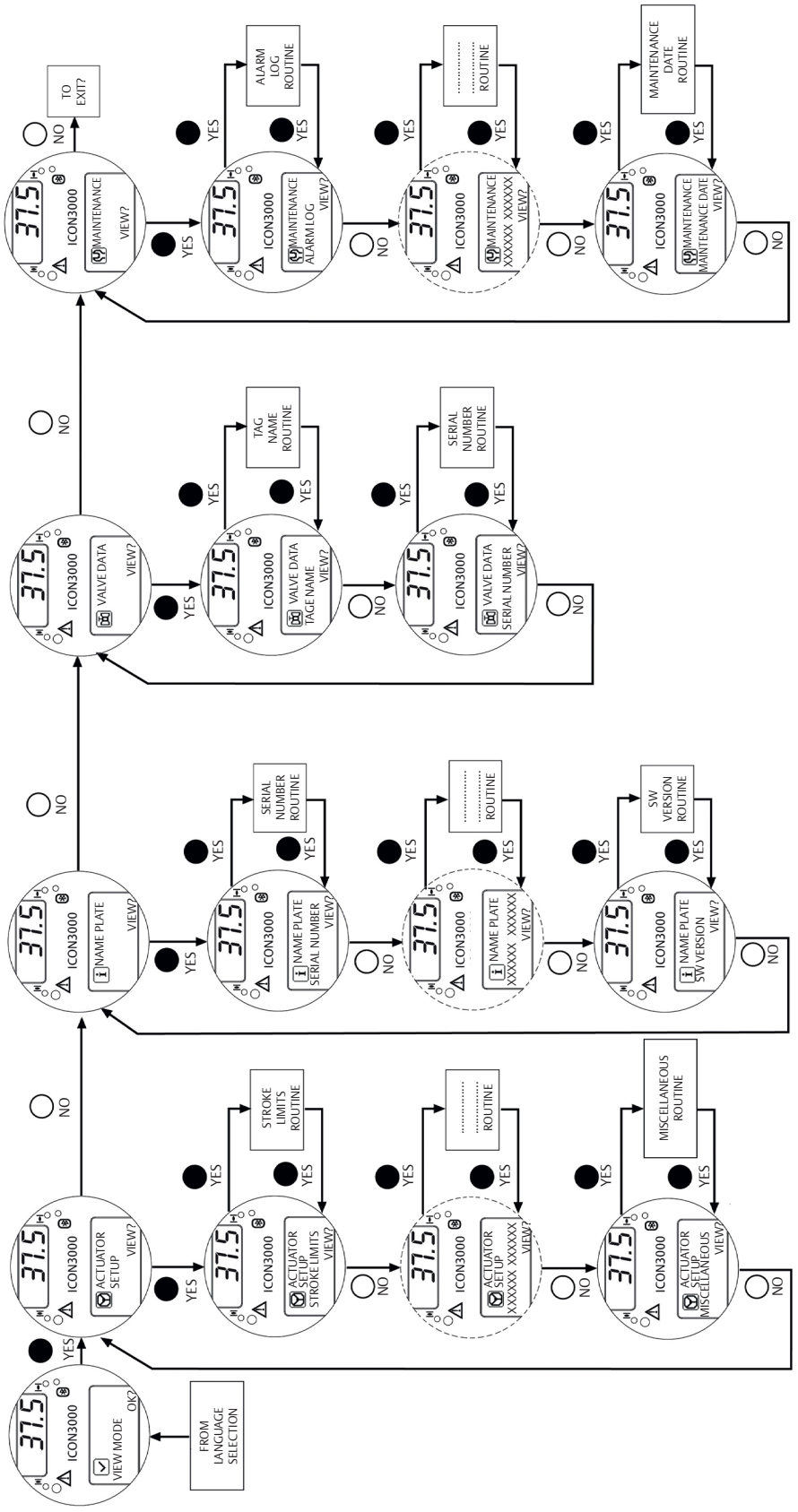


Figure 58 shows the procedure to navigate through the view routines.

Figure 58 Procedure to Move in the View Routines



Section 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 nameplate menu for reference.
- Close direction: clockwise (CW) or counterclockwise (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 Table 12 to choose.

Set-up Procedure

- Engage the manual override and move the valve to the mid-travel position.
- 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 (refer to “Entering the set-up mode”). When the message displayed is “SET-UP MODE OK?” press YES. Press YES to select the “Actuator Setup” menu, and then press YES again to start with the stroke limits routine.
- Press YES if the closing torque limit is correct or press NO to scroll through the list of available values. When the value is correct, press YES.
- Press YES if the opening torque limit is correct or press NO to scroll through 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 press NO to change. When the value is correct press YES.
- Press YES to set the close limit, or press NO and then YES to set the open limit.

Close limit type

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

Close limit by position

- Move the local selector to LOCAL. The local controls can be used.
- Move the valve to the closed position (via the CLOSE command or via the handwheel).
- Move the local selector to OFF.
- Press YES to confirm.
- Press YES to continue with the open limit setting, 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 will move in the closing direction and when the configured torque value is reached, the motor will stop and the new position limit is memorized.
- Move the local selector to OFF.
- Press YES to confirm.
- Press YES to continue with the close limit setting, 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); otherwise, 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 the open position (via the OPEN command or via the handwheel).
- Move the local selector to OFF.
- Press YES to confirm.
- Press YES to exit, or press NO and then YES to repeat the close limit setting procedure.

Open limit by torque

- Move the local selector to LOCAL. The local controls become active.
- Press the OPEN control. The actuator will move in the opening direction and when the configured torque value is reached, the motor will stop and the new position limit is memorized.
- Move the local selector to OFF.
- Press YES to confirm.
- Press YES to exit or press NO and then YES to repeat the close limit setting procedure.

If the parameter “direction to close” is changed, both limits (open and close) must be set.

Table 12.

Valve type	Close Limit	Open Limit
Gate (solid, flexible and split wedge), globe, metal-seated butterfly valves	Torque	Position
Ball, gate (parallel slide), plug valves, rubber-seated butterfly valves	Position	Position
Linear valves with back-seating on stem	Torque or Position	Torque

Before leaving the stroke limits routine the microprocessor calculates the new value of the position resolution. If the stroke turns are fewer than 2.7, the message “error retry” 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 (refer to “Entering the set-up mode”). When the message displayed is “SET-UP MODE OK?” press YES. Press YES to select the “Actuator Setup” menu, press NO, and then press YES to select the “Torque Setup” routine.
- Press YES if the opening torque limit is correct; otherwise, press NO to scroll through the list of available values. Press YES when the value is correct.
- Press YES if the closing torque limit is correct; otherwise, press NO to scroll through the list of available values. Press YES when the value is correct.

9.1.3 ESD (Emergency Shut Down) 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.

⚠ 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.

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 (refer to “Entering the setup mode”). When the message displayed is “SET-UP MODE OK?” press YES. Press YES to select the “Actuator Setup” menu, press NO to scroll through 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 through 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. By choosing ESD > THERMOSTAT, the ESD action will be carried out even in the event of motor over-heating. Conversely, if ESD < THERMOSTAT was chosen, the ESD action will not be performed in the event of motor over-heating.
  - (*) Torque limit tripped. By choosing ESD > TORQUE LIMIT, the ESD action will be carried out even if a torque alarm is present. Conversely, if ESD < TORQUE LIMIT was chosen, the ESD action will not be performed while a torque alarm is present.
  - (*) Local stop pressed. By choosing ESD > LOCAL STOP, the ESD action will override the local STOP signal. Conversely, 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. By choosing ESD > LOCAL CONTROLS, the ESD action will be carried out also when the local selector is in LOCAL. Conversely, if ESD < LOCAL CONTROLS was chosen, the ESD action will not be performed if the 3-position selector is in LOCAL.
  - 2-speed timer. By choosing ESD > 2-speed timer, the 2-speed timer function will be inhibited during the ESD action. Conversely, if ESD < 2-speed timer was chosen, the 2-speed timer function will remain enabled 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. Conversely, 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.

9.1.4 Remote Controls

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. The action of the stop signal can be reversed (stop when signal is On [MAKE] or stop when signal is Off [BREAK]).
- 3 wires latched instant reverse: requires 2 momentary signals (since the control is self-maintained) to open or close. A 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

By selecting the option “Off”, the remote controls are disabled.

Configuration should be performed 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 the “Actuator Setup” menu, press NO to scroll through 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 through the list of available options: 4 wires, 3 wires, 2 wires, off. Press YES to select the desired option. If 4 wires was chosen, use YES and NO to select the STOP signal; set MAKE to stop when the signal is on and set BREAK to stop when the signal is off. 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 for:

- Configuration of the control mode by means of the local controls when the 3-position selector is in LOCAL. The available options are “push-to-run AS5-AS6”, “latched”, “latched with instant reverse”.
- Changing the colors of the LEDs. 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 Setup” menu, press NO to scroll through 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 through the list of available options: 4 wires, 3 wires, 2 wires, off. Press YES to select the desired option. If 4 wires was chosen, use YES and NO to select the STOP signal; set MAKE to stop when the signal is on and set BREAK to stop when the signal is off. 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.

Control mode

- Press YES if the display shows the correct control mode or press NO to scroll through the list of available options (push-to-run, latched). Press YES to confirm. Option “push-to-run rel. AS5-6” is used when remote enabling of local commands is required. With the local selector in LOCAL, pressing the OPEN or CLOSE local push-buttons causes relays AS5 or AS6 to switch, but no command is sent to the motor. The control PLC should read the status of the above-mentioned relays and send an open or close command to the remote inputs (refer to Section 5.6, push-to-run mode; see relevant electrical diagram when the option is used).

LED colors

- Press YES if the color of the open LED is correct. Press NO to change it, and then press YES to confirm.
- Press YES if the color of the close LED is correct. Press NO to change it, and then press YES to confirm.
- Press YES if the color of the alarm LED is correct. Press NO to change it, and then press 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 energized and will be de-energized on:

- mains voltage failure
- lost phase
- internal temperature alarm
- K1 contactor failure
- K2 contactor failure
- position sensor failure
- speed sensor failure
- configuration error
- hardware error
- mid-travel alarm
- request signal (available if positioner enabled and request from 4 - 20 mA)

The following situations can be configured individually to not de-energize the monitor relay when they occur:

- motor over-temperature
- over-torque
- jammed valve
- LOCAL/OFF selected
- manual operation
- ESD signal on (ESD-EFS)
- low lithium battery (if present)
- LOCAL/STOP pressed

Auxiliary output relays

For status indication or diagnostic purposes, 8 voltage-free contacts of 8 relays are available to be configured individually to switch upon occurrence of 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/PST-efs
- manual operation
- interlock PST-icon
- heater (only AS8)
- EFS in Manual (*)
- EFS coil OFF (*)

Alarm

- motor over-temperature
- over-torque
- over-torque in OP
- over-torque in CL
- valve jammed
- valve jammed in OP
- valve jammed in CL
- low lithium battery (if present)
- mid travel alarm in CL/OP
- mains (only AS8)
- EFS mid travel alarm (*)

Warning

- warnings
- PST failed (i.e. Partial Stroke Test failure)

The contacts may be configured to make or break on condition. The options with (*) also appear in the menu, but they are not available on the ICON3000 and ICON3000v2.

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 the “Actuator Setup” menu, press NO to scroll though the list of available routines, and then press YES to select “Output Relays”.

Configure output relays

- Press YES to change the monitor relay or NO to change auxiliary relays AS1, 2, 3, 4, 5, 6, 7, 8.

Monitor relay

- Press YES or NO to enable or disable the following situations from the conditions that normally de-energize the monitor relay: motor over-temperature, over-torque, jammed valve, manual override, ESD signal on, low lithium battery (if present), local STOP pressed, LOCAL/OFF selected.

Auxiliary relays AS1, 2, 3, 4, 5, 6, 7, and 8

- Press NO to answer prompt “MONITOR RELAY change?”.
- Press YES to change AS1; otherwise, press NO to select the other relays.
- Press YES if the condition associated to AS1 relay is correct; otherwise, press NO to scrolls through 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). Since relay AS8 is a change-over relay (i.e. not a latching relay like AS1-AS7), this option is not available.
- Press NO to proceed to AS2 and then repeat the procedure for the other relays.
- Press NO to exit.

9.1.7 Positioner

The positioning function is only available in positioning (inching) or modulating ICON3000 actuators and allows for positioning of the valve according to a “position request R%” command signal.

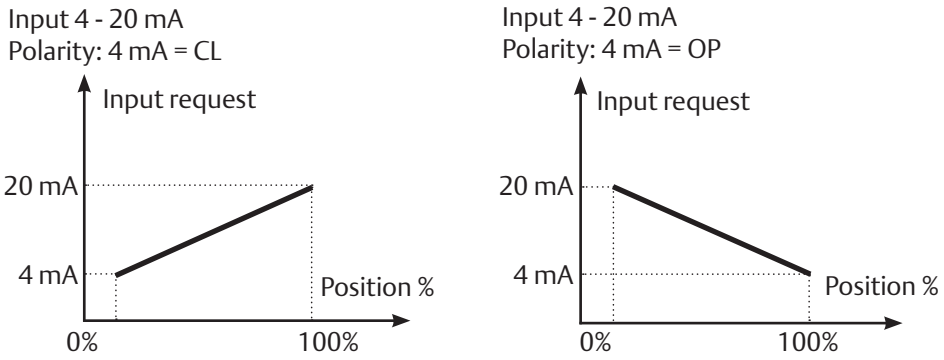
The positioning function compares the present actuator position % with the position request R%, and if the difference is greater than the dead band the actuator is driven to reach the new requested position.

The “position request R%” signal may either be received from the bus or the 4 - 20 mA analog input. If the ICON3000 is set to receive the position request R% from the bus, the relevant fieldbus interface card must be present; otherwise, a hardware alarm will be generated. If the ICON3000 is set to receive the position request R% from the 4 - 20 mA generator, the Ain/Aout card must be present; otherwise, a hardware alarm will be generated.

The following options can be configured via the local operator interface:

- Dead band: configurable from “position resolution%” to 25.5% of the maximum position error. The configured value should be great enough to avoid a “hunting” effect.
- Polarity of the 4 - 20 mA position request signal (see Figure 59): this allows reversal of the relationship between the 4 - 20 mA input signal and the “position request R%”, according to the following diagrams. This option is not available when the ICON3000 is set to receive the “position request R%” from the bus.
- Motion inhibit time: this allows adjustment of the length of the delay time between two cycles of the motor. It can be configured from 1 to 255 seconds and allows the user to set the maximum number of starts/hour of the motor.
- % MIN and % MAX, 4 - 20 mA input signal range: this allows a change in the relationship between the input signal and the position request R%. This function is useful when a single 4 - 20 mA signal is used to control the position of 2 valves (e.g. split range applications). This option is not available when the ICON3000 is set to receive the “position request R%” from the bus.

Figure 59



The curves in Figure 61 may better clarify the above option:

Example A

With input signal = 4 mA, the position request is 0% and the actuator is driven to close.
With input signal = 20 mA, the position request is 100% and the actuator is driven to open.
With input signal = 12 mA, the position request is 50% and the actuator is driven to reach position 50%.

Example B

With input signal < 8 mA, the position request is 0% and the actuator is driven to close.
With input signal = 16 mA, the position request is 100% and the actuator is driven to open.
With input signal = 12 mA, the position request is 50% and the actuator is driven to reach position 50%.

Example C

With input signal = 4 mA , the position request is 100% and the actuator is driven to open.
With input signal = 20 mA, the position request is 0% and the actuator is driven to close.
With input signal = 12 mA, the position request is 50% and the actuator is driven to reach position 50%.

Example D

With input signal < 8 mA, the position request is 100% and the actuator is driven to open.
With input signal = 16 mA , the position request is 0% and the actuator is driven to close.
With input signal = 12 mA, the position request is 50% and the actuator is driven to reach position 50%.

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 (refer to Entering the set-up mode). When the message displayed is “SET-UP MODE OK?” press YES. Press YES to select the “Actuator Setup” menu, press NO to scroll through the list of available routines, and then press YES to select “POSITIONER”.
- Press YES if the configured value of the Dead Band is correct (from “position resolution %” to 25.5%). If not, press NO to change it and then press YES.
- Press YES if the configured value of the Polarity is correct (4 mA=CL or 4 mA=OP). If not, press NO to change it and then press YES.
- Press YES if the configured value of the Motion Inhibit Time is correct (from 1 to 255 seconds). If not, press NO to change it and then press YES.
- Press YES if the configured value of the % MIN is correct (from 0 to 75%). If not, press NO to change it and then press YES. The standard value is 0.
- Press YES if the configured value of the % MAX is correct (from 25 to 100%). If not, press NO to change it and then press YES. The difference between % MAX and % MIN should be greater than 25%. The standard value is 100.

9.1.8 Fail-Safe

This function configures the actuator action if loss of the 4 - 20 mA input or bus signals occurs. This action only takes place if the local selector is in REMOTE and if the positioning function or the bus interface are active. When the 4 - 20 mA or bus signal is restored, the ICON3000 resumes normal functionality. The Interlock and ESD controls override the Fail-Safe action according to Figure 60:

Figure 60 Diagram

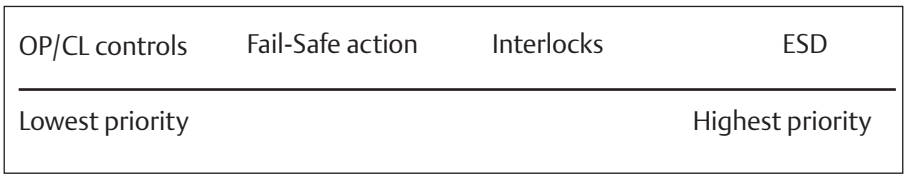
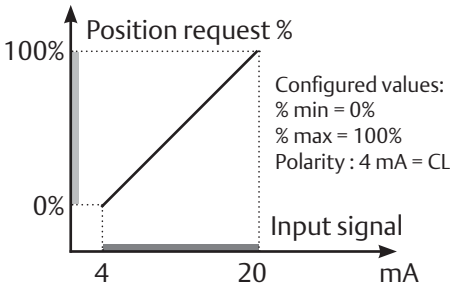
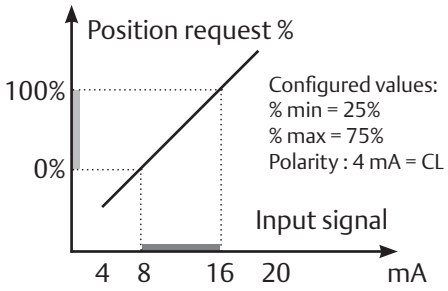


Figure 61

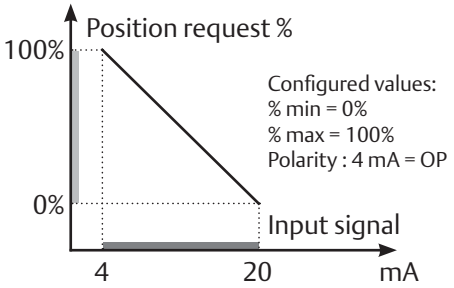
Example A



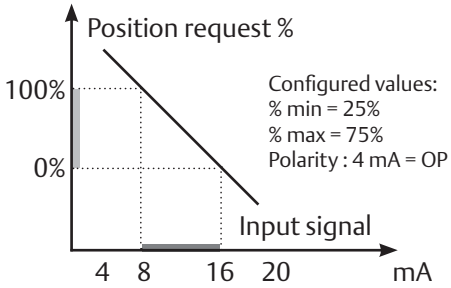
Example B



Example C



Example D



Configuration procedure

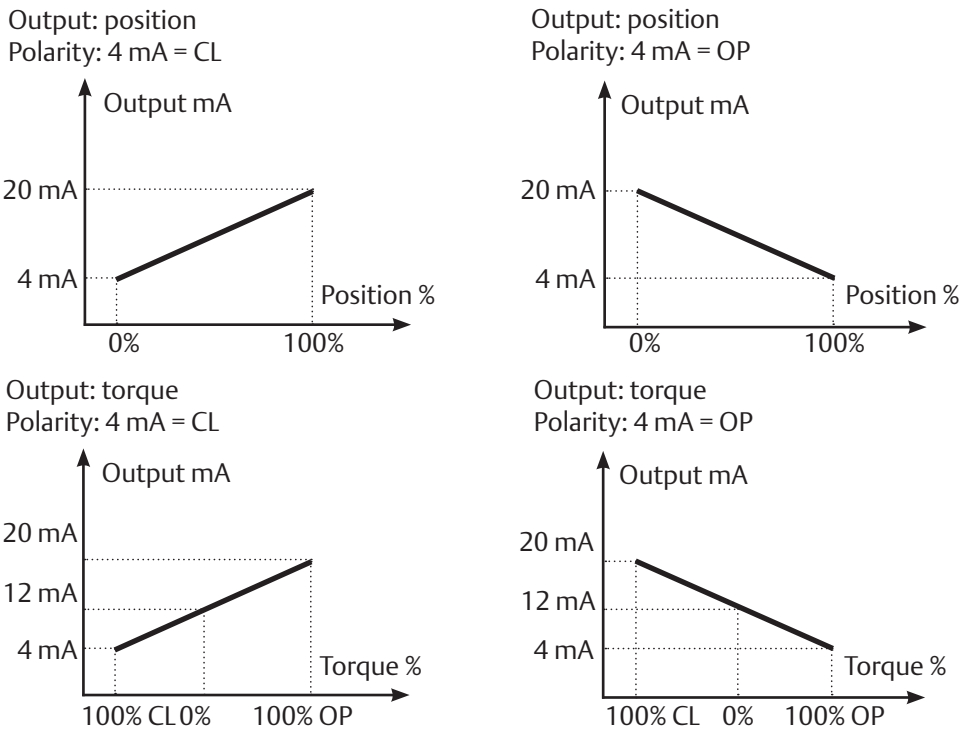
- Move the local selector to OFF and then simultaneously press OPEN and STOP. Select the language and then enter the password according to the instructions (see entering the set-up mode). When the message displayed is “SET-UP MODE OK?” press YES. Press YES to select the “Actuator Setup” menu, press NO to scroll through the list of available routines, and then press YES to select “FAIL-SAFE”.
- Press YES if the configured ACTION is correct (open, close, stay-put, go to position xxx%, off). If not, press NO to change it and then press YES.
- Press YES if the configured value of the DELAY is correct (from 0 to 255 seconds). If not, press NO to change it and then press YES.

9.1.9 OUT 4 - 20 mA

This routine is only available if the Ain/Aout card is present. With this card, the ICON3000 is provided with a 4 - 20 mA analog input and a 4 - 20 mA analog output.

The 4 - 20 mA output can be configured to provide a current proportional to either “position” or “torque”. The polarity option allows reversal of the relationship between the present position or torque and the 4 - 20 mA output signal, according to the following diagrams:

Figure 62 Diagram



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 of the display is “SET-UP MODE OK?” press YES. Press YES to select the “Actuator Setup” menu, press NO to scroll through the list of available routines, and then press YES to select “Out 4 - 20 mA”.
- Press YES if the output is correct (POSITION or TORQUE). If not, press NO to change it and then press YES.
- Press YES if the polarity is correct. If not, press NO to change it and then press YES.

9.1.10 Interlock

The interlock inputs can be used to inhibit the actuator movement in the open or closed direction. The controls are momentary; the inhibiting action continues while the relevant signal is present. The interlock controls work when the local selector is in LOCAL or in REMOTE. The ESD control overrides the interlock controls.

The following options can be configured:

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

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 Setup” menu, press NO to scroll through the list of available routines, and then press YES to select “INTERLOCK”.
- Press YES if the configured value of the Open Interlock is correct (PRESENT, ABSENT, OFF). If not, press NO to change it and then press YES.
- Press YES if the configured value of the Close Interlock is correct (PRESENT, ABSENT, OFF). If not, press NO to change it and then press YES.

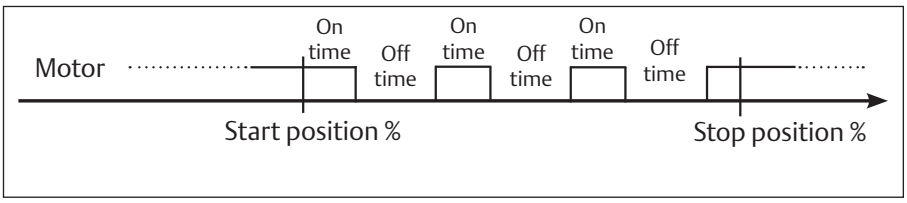
9.1.11 2-Speed Timer

The “2-speed timer” routine is used to extend the actuator travelling time in the opening and/or closing direction, by driving the motor via pulses that results in duration (ON and OFF time) becoming 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 may be adjusted from 2 - 200 seconds and OFF time may be adjusted from 1 - 200 seconds separately in both the opening and closing direction.

Figure 63



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 Setup” menu, press NO to scroll through the list of available routines, and then press YES to select “2-Speed Timer”.
- Press YES to change the close direction parameters, press NO, and then press YES to change only the 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; if not, press NO to scroll through the list of available values. Press YES when the value is correct.
- Press YES if the position value where pulsing control stops is correct; if not, press NO to scroll through 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; if not, press NO to scroll through 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; if not, press NO to scroll through 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; if not, press NO to scroll through the list of available values. Press YES when the value is correct.
- Press YES if the position value where pulsing control stops is correct; if not, press NO to scroll through 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; if not, press NO to scroll through 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; if not, press NO to scroll through the list of available values. Press YES when the value is correct.

9.1.12 BUS (or FDI Control)

This routine is only available if a fieldbus interface card is present. The routine allows setting of the most important parameters (node address, termination, etc.) necessary to connect the actuator to a fieldbus. If the ICON3000 was set to work with a fieldbus but the relevant fieldbus card is not present, a hardware alarm will be generated. Different interfaces are available to connect the ICON3000 to different types of fieldbus. If the bus interface is LonWorks, the routine “BUS” changes to “FDI control”. Refer to the specific manuals for instructions and setting of the above modules.

9.1.13 Miscellaneous

This includes different types of routines such as “time and date”, “lithium battery”, and “torque profile”, used only for special applications or in particular conditions.

9.1.13.1 Time and Date

Time and date are used in maintenance functions to associate time information to the memorized 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 the “Actuator Setup” menu, press NO to scroll through 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; otherwise, press NO to change it.
- Enter hours, minutes and seconds. Press NO to scroll the list of available values, and press YES to select.
- Press YES when the time is correct.
- Press YES if the date is correct; otherwise, press NO to change.
- Enter day, month, and year. Press NO to scroll the list of available values, and YES to select.
- Press YES if the date is correct.

9.1.13.2 Torque Limits

Torque limits are used as a reference for the 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 can determine the torque alarm or end of travel situations. In the same application it is useful to configure 3 different torque thresholds for each traveling 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 64).

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 the “Actuator Setup” menu, press NO to scroll through the list of available routines, and then press YES to select “Miscellaneous”.
- Press NO and then NO to select “torque mode”. Press YES if setting is correct; otherwise, press NO to change. Press YES when the value is correct.
- Repeat the stroke limits setting routine.

Figure 64 Actuator Direction: Closing

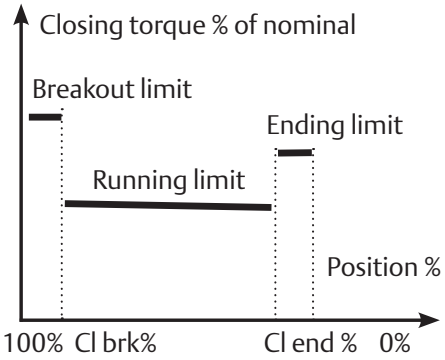
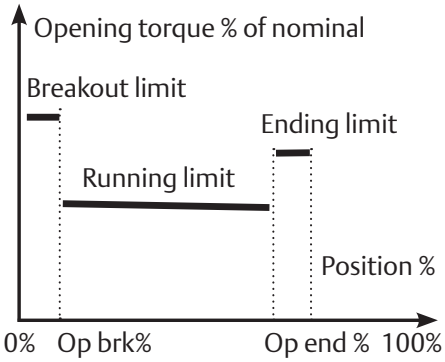


Figure 65 Actuator Direction: Opening



9.1.13.3 Lithium Battery

In the standard version, the actuator is provided with a lithium battery to keep visible the local position display, to back-up the RTC (real-time-clock) for diagnostic functions, to test the battery charge, and to update the remote outputs (output relays status when set as “open limit” or “close limit” and 4 - 20 mA when externally supplied) in case of electrical power failure and manual override operations.

The program runs the functions relevant to the battery only if the appropriate flag “lithium battery” is configured with “present”. If the battery is absent or if the above functions are not requested, the flag “lithium battery” 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 the “Actuator Setup” menu, press NO to scroll through 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 “Lithium Battery”. Press YES if the setting is correct; otherwise, press NO to change. Press YES when the value is correct.

9.1.13.4 Torque Bypass (%)

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

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

To disable torque bypass, 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 the “Actuator Setup” menu, press NO to scroll through 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 Bypass”. Press YES if the setting is correct; otherwise, press NO to change. Press YES when the value is correct.

9.1.13.5 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 variation in valve position is smaller than 0.5%. The motor is stopped, the command is cleared and a “valve jammed” alarm indication is generated.
2. The valve is moving, but during valve travel the variation in valve position is smaller than 0.5% of the time equal to “valve jammed time”. The motor is stopped, the command is cleared and a “mid-travel alarm” indication is generated.

The valve jammed time is expressed in seconds and can be configured from 0 to 100 seconds. Configure “0” to disable 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 the “Actuator Setup” menu, press NO to scroll through 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; otherwise, press NO to change. Press YES when the value is correct.

9.2 Valve Data

The valve data allow identification of 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 characters)
- Serial number (max. 28 characters)
- Manufacturer (max. 28 characters)
- Break OP torque (max. 28 characters)
- Max stem thrust (max. 28 characters)
- Flange type (max. 28 characters)

9.2.1 Sample Configuration Procedure

Tag name

- 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 through the list of available menus and then press YES to select the “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 through the list of available characters. Press YES to select the desired character.
- Enter up to 28 characters. Enter a blank character, followed by “←” (character left arrow) to mark the end of the string.

The configuration of all other valve data items is performed in the same way, by selecting the relevant item from the list of available routines.

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 a maintenance program. The maintenance menu also includes the set password routine and the potential to modify or start the maintenance functions. The following data are available:

- new password
- clear alarm log
- torque profile reference
- torque curve reference
- clear recent data log
- configuration (backup/restore) (only for ICON3000v2)
- maintenance date
- data logger
- PST reference (only if INTERLOCK = ADVANCED)
- PST cmd (only if INTERLOCK = ADVANCED)

9.3.1 Set Password

The actuator is supplied by Biffi with the default password (“0 0 0 0”). The Set Password routine allows the user to enter a different password consisting of 4 alphanumeric characters. After entering the new password, the old one becomes invalid. Therefore, it is mandatory to NOT FORGET THE PASSWORD (or store the password in a secure location) after the default one has been modified. Losing 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 through 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 “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; otherwise, press NO to scroll through 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 through the list of available routines and then press YES to select “Clear Alarm Log”.
- Press YES to clear the alarm log.

9.3.3 Set Torque Reference

The set torque profile reference routine allows transfer of the last torque profile to the reference profile registers. The old reference data are lost and the new data 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 through the list of available menus and then press YES to select the “Maintenance” menu.
- Press NO to scroll through 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 Set Curve Reference

The “set curve reference” routine allows selection of 1 of 100 opening and closing torque curves in the memory of the ICON3000 and to transfer them to the torque curve reference registers. The old reference data are lost and the new data will become the new torque curves’ reference (see VIEW mode, Maintenance, Torque Curve, Section 10.4.3).

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 NO to scroll through 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 “Set Curve Reference”.
- Press NO to scroll the list and then press YES to select the desired curves (in opening and closing).
- Press YES to update the torque curve reference.

9.3.5 Clear Recent Data Log

The clear recent data log routine allows the user to clear the counters of the recent operation log. This command does not affect the content of the “general operation log”. The date of the “clear recent data log” is memorized 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 through the list of available menus and press YES to select the “Maintenance” menu.
- Press NO to scroll through 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.

9.3.6 Configuration (Backup/Restore)

Only available on ICON3000v2

This routine allows the user to save or restore a copy of the current actuator configuration. After completing the configuration operations and verifying that they are working properly, the Backup sub-routine creates a copy of the configuration in the actuator's permanent memory. The copy thus created can be used by means of the Restore sub-routine in the future to return to a known condition to cancel any subsequent changes.

Backup 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 through the list of available menus and press YES to select the "Configuration (Backup/Restore)" menu.
- Press NO to scroll through the list of available routines and then press YES to select "Backup".
- Press YES to confirm the operation or press NO to exit.
- At the end of the operation the display shows the message "BACKUP DONE" for a few seconds.

Restore 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 through the list of available menus and press YES to select the "Configuration (Backup/Restore)" menu.
- Press NO to scroll through the list of available routines and then press YES to select "Restore".
- Press YES to confirm the operation or press NO to exit.
- At the end of the operation, the display shows the message "RESTORE DONE" for a few seconds.

9.3.7 Set PST Reference

This routine allows the user to select as reference a PST curve among the curves already stored.

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 through the list of available menus and press YES to select the “PST reference” menu.
- Press NO to scroll through the list of available routines and then press YES to select “Sel. curve”.
- Press NO to scroll through the list of the available curves from 1 to 16 considering that 16 is the index of the last curve, press YES to select the selected curve.
- At the end of the operation the display shows the message “REFERENCE OK” for a few seconds.

9.3.8 PST Command

This routine allows the user to execute on the actuator a PST command.

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 through the list of available menus and press YES to select the “PST cmd” menu.
- In the menu “New base line” select if the PST that is going to be executed is a reference curve: press NO to scroll through the list of available options “Enabled” or “Disabled” and press YES to confirm the selection.
- Press YES to confirm the PST execution and follow the instructions on the local display.

9.3.9 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 through the list of available menus and then YES to select the “Maintenance” menu.
- Press NO to scroll through 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; otherwise, press NO to change it.
- Enter day, month, and year. Press NO to scroll through 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; otherwise, press NO to change it.
- Enter day, month, and year. Press NO to scroll through 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; otherwise, press NO to change it.
- Enter day, month, and year. Press NO to scroll through the list of available values; press YES to select.
- Press YES if the date is correct.

9.3.10 Set Data Logger

The “data logger” routine allows setting of the data logger parameters (see Section 10.4.6, Data Logger).

To start the data logger the following data should be set:

Table 13.

Logger mode	recorder, event, off
Sampling time	from 1 to 3600 seconds (the sampling time is only used in recorder mode)
Memory mode	stop when memory is full, continuous (stop after overwriting the memory 5000 times (event) and 10000 times (recorder/T-recorder)
Start date	date when the logger starts
Start time	time when the logger starts

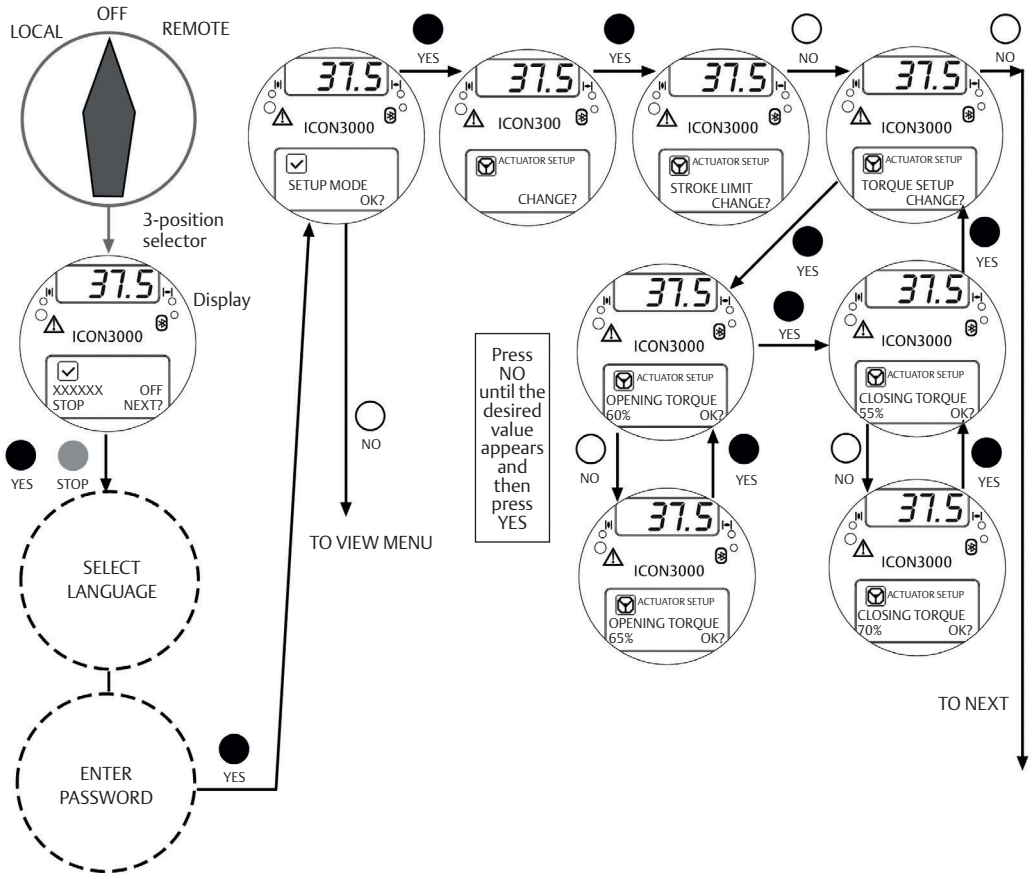
Configuration procedure

- 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 NO to scroll through the list of available menus and then press YES to select the “Maintenance” menu.
- Press NO to scroll through the list of available routines and then press YES to select “data logger”.
- Press YES if the mode is correct; otherwise, press NO to scroll through the list of modes and press YES to select the desired value .
- Press YES if the sampling time is correct; otherwise, press NO to scroll through the list of times and press YES to select the desired value.
- Press YES if the memory mode is correct (stop when full or continuous); otherwise, press NO to change and press YES to select.
- Press YES if the start time is correct; otherwise, press NO to scroll through the list and press YES to select the desired sampling times (hour, min, seconds).
- Press YES if the start date is correct; otherwise, press NO to scroll through the list and press YES to select the desired sampling times (day, month, year).

9.4 Example of Set-Up Routine

9.4.1 Torque Set-Up

Figure 66



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

Section 10: View Routines

10.1 Actuator Set-Up

The above menu allows the operator to view the present actuator configuration. No changes may be made to the present data. The following data can be viewed (see Table 14):

Table 14.

Routine	Parameters
Stroke limits	Close direction (CW, CCW), close limit type (torque or position), open limit type (torque or position)
Torque set-up	Closing torque limit %, opening torque limit %
ESD control	ESD action, signal type, ESD priority
PST set-up	PST configuration. Available if INTERLOCK= ADVANCED
Remote controls	Control type
Local controls	Control type, color of LEDs
Output relays	Monitor relay conditions, ASi conditions, contact action
Positioner *	Dead band, motion inhibit time, polarity, %min, %max (%min and %max are present only if “position request R%” is from 4 - 20 mA input)
Fail-safe *	Action, delay
Out 4 - 20 mA *	Output signal (position or torque), polarity
Interlock	Signal type in OP, signal type in CL
2-speed timer	Close direction: status, start, stop, on time, off time Open direction: status, start, stop, on time, off time
Bus *	Node address, terminations, etc. depending on fieldbus type
Miscellaneous	Time and date, torque mode, lithium battery, torque bypass %, valve jammed time

The routines with * can only be viewed if the relevant electronic cards are present. If the bus interface is LonWorks, the “BUS” routine changes to “FDI control”. Detailed descriptions of the above routines and their parameters can be found in Section 9.

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 Setup” menu.
- Press NO to scroll through the list of available routines and press YES to select.
- Press YES to answer the prompt “view” or “next” and to see the data.

10.2 Nameplate

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:

- Serial number: max. 28 characters, unique identifier of the actuator with reference to the Biffi order acknowledgment.
- Actuator type: max. 28 characters, describes the type of actuator with reference to the Biffi catalog.
- Torque/Thrust: nominal torque or thrust of actuator.
- Actuator speed: nominal speed of actuator.
- Speed Loop: parameters to set the speed loop (for ICON3000LP (Low Power) only)
- Power supply: nominal voltage and frequency of actuator.
- Motor data: includes the following data relevant to the electrical motor:
  - Power type (3ph, 1ph, dc) - Power rating, max. 99.9 kW
  - In, max. 99.9 A
  - Is, max. 99.9 A/KT (for ICON LP)
  - Icc, max 99.9 A/TMax (for ICON LP)
  - Duty (S2/15 min, etc.)
  - Poles (2, 4, etc.)
  - Biffi name, max. 28 characters
  - Gear ratio, max. 1000/M.R. Ratio (for ICON LP)
- Test date: date of the in-house functional test of actuator.
- Wiring diagram (WD): wiring diagram number, max 28 characters.
- Enclosure: type of enclosure (Ex d, etc.), max. 28 characters.
- Certificate: number of certificate, max. 28 characters.
- Lubricant: type of lubricant, max. 28 characters.
- Revision: hardware revision of base card, software revision of CPU microprocessor, software revision of PIC microprocessor, hardware revision of the encoder, software revision of the encoder.
- Torque sensor: data relevant to the relationship between motor torque and speed. This set of data also includes the factory torque limit setting, “Torque set CL” and “Torque set OP”.

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 through 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 characters)
- Serial number (max. 28 characters)
- Manufacturer (max. 28 characters)
- Break OP torque (max. 28 characters)
- Max stem thrust (max. 28 characters)
- Flange type (max. 28 characters)

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 through 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

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 through 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 through the list of alarms (“Alarms view?”).
- Press NO to move on to “Warnings view?” and then YES to scroll through 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 memorized reference profile. The torque profile can indicate a change in process conditions.

Reference details are retained and the latest torque is expressed as a % of the nominal torque.

At the end of a full stroke in opening or closing, the ICON3000 stores the 3 maximum torque values in position intervals 0% - 10%, 10% - 90%, 90% - 100% in opening, and the 3 maximum torque values in position intervals 100% - 90%, 90% - 10%, 10% - 0% in closing. Time and date of valve strokes are also saved. The above data are updated at the end of every full valve stroke and the previous data are overwritten. The “set torque reference” function in the SET-UP MENU, Maintenance, (Section 7), allows saving of the “torque profile” data in the “torque profile reference” with a date and time. The “torque profile reference” will not be updated until a new “set torque reference” command is entered. The user can compare the last torque profile relevant to the last valve stroke with the torque profile reference saved before.

The following definitions will be used:

- Breakout: maximum torque % in position interval 0 - 10% in opening or 100% - 90% in closing = max. % of torque to unseat the valve.
- Peak running: maximum torque % in position interval 10 - 90% in opening or 90% - 10% in closing = max. % of torque when the valve runs from Breakout to Ending (maximum mid-travel).
- Ending: maximum torque % in position interval 90 - 100% in opening or 10% - 0% in closing = max. % of torque to seat the valve.

The following data may be viewed:

Closing torque

- Breakout %
- Breakout reference %
- Peak run %
- Peak run reference %
- Ending %
- Ending reference %
- Date of the last stroke
- Date of reference (same of opening)

Opening torque

- Breakout %
- Breakout reference %
- Peak run %
- Peak run reference %
- Ending %
- Ending reference %
- Date of the last stroke
- Date of reference (same of 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 through the list of available menus and press YES to select the “Maintenance” menu.
- Press NO to scroll through the list of routines and press YES to select “Torque Profile”.
- Press YES to scroll through the list of values.

10.4.3 Torque Curve

The torque curve routine gives important information on the actuator working conditions in comparison with a previously memorized reference torque curve. It can be used to perform a detailed analysis of a change in the process conditions.

During a full valve stroke in opening or closing, the ICON3000 measures the torque values relevant to every 1% of position variation. At the end of the stroke the collected 101 values (one torque value every 1% of position change) are saved in the ICON3000 memory together with the time and date of strokes, main voltage, motor temperature, temperature inside the electronics compartment, and temperature inside the terminal board compartment. Up to 100 curves in opening and 100 curves in closing can be saved. When a new curve becomes available, the oldest one is canceled and the new one is memorized. The above data are updated at the end of every full valve stroke. Data relevant to a partial stroke are disregarded. The function “set curve reference”, in the SET-UP MENU, Maintenance, Section 7, allows the user to save the full set of data relevant to 1 of 100 “torque curves” in the “torque curve reference”. The “torque curve reference” will not be updated until a new “set curve reference” command is entered.

The user can compare the last 100 torque curves in opening and closing in relation to the last 200 valve strokes with the torque curve reference saved before.

Table 15 shows the list of saved data for each opening or closing curve:

Table 15.

Date	Date of the valve stroke
Time	Time of the valve stroke
Temperature	Temperature (°C) inside the electronics compartment during the valve stroke
Term temp	Temperature (°C) inside the terminal board compartment during the valve stroke
Motor temp	Temperature of the electrical motor (°C) during the valve stroke
Main voltage	Main voltage supply (V) during the valve stroke
Closing/Opening time	
Torque 0	Torque value in % of the nominal torque/thrust stated in the Name Plate menu. In opening “Torque 0” corresponds to position 0% and in closing “Torque 0” corresponds to position 100%
Torque 100	Torque value in % of the nominal torque/thrust stated in the Name Plate menu. In opening “Torque 100” corresponds to position 100% and in closing “Torque 100” corresponds to position 0%

The amount of data to be viewed is large and the local display can only display one datum at a time. To use this function, it is recommended to utilize the features of A-Manager via a PDA or PC. Figure 67 below shows an example of a graph available on the PDA or PC screen, showing the reference opening torque curve and the latest opening torque curve.

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 through the list of available menus and press YES to select the “Maintenance” menu.
- Press NO to scroll through the list of routines and press YES to select torque curve.
- Press NO to scroll through the list of available curves (from 100 to 1 and reference). Curve 100 is the latest and curve 1 is the oldest. Press YES to select.
- Press YES to select the opening or closing curve. Press NO to exit.
- Press YES to scroll through the list of values. Press NO to exit.

10.4.4 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 test date is set in-house and can be viewed in the “Nameplate” menu, but cannot be changed. The recent data log collects data from the last “clear recent data log” date to “present date”.

Command “clear recent data log” is available in Section 7, Set-Up Menu. This command clears the content of the recent data log and resets the counters to 0. The old data are lost.

The main differences between “general” and “recent” data log are the following:

- The general data log gives information relevant to the full life of the actuator, starting from the manufacturing date.
- In the recent data log the same data are collected starting from a date set by the user. The date may be viewed in the Maintenance Date section.

Figure 67

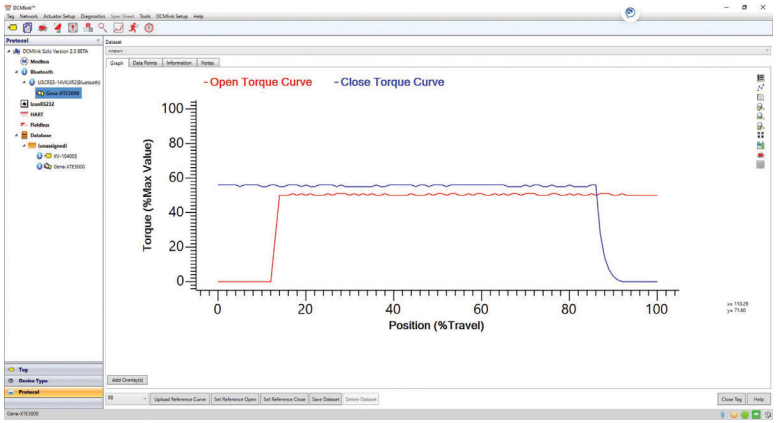


Table 16 shows the list of data collected by the general and recent data log:

Table 16.

General Data	Recent Data Log
Opening time	-
Closing time	-
Contactor cycles	Contactor cycles
Motor run time	Motor run time
No power time	No power time
Utilization rate	Utilization rate
Temperature min	Temperature min
Temperature max	Temperature max
Term temp min	Term temp min
Term temp max	Term temp max
Motor temp max	Motor temp max
Thermostat alarms	Thermostat alarms
Torque alarms	Torque alarms

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 through the list of available menus and press YES to select the “Maintenance” menu.
- Press NO to scroll through 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 through the list of values.
- Press YES to view the recent data log or press NO to exit.
- Press YES to scroll through the list of values.

Table 17.

General Data	
Opening time	This datum is only available in the general data log. It is updated at the end of every full valve stroke of the valve in opening direction. The data of the previous stroke are lost. It gives the time necessary to the valve to move from the closed position to the open position, expressed in hours, minutes and seconds.
Closing time	This datum is only available in the general data log. It is updated at the end of every full valve stroke of the valve in closing direction. The data of the previous stroke are lost. It gives the time necessary to the valve to move from the open position to the closed position, expressed in hours, minutes and seconds.
Contactor cycles	This number counts the cycles of contactors K1 and K2. The value indicated in the general data log is also used to generate the “max. contactor cycles” warning when the maximum allowable number of cycles of the contactor is reached (see Section 12.11, Diagnostic Messages). If the main power is DC or single phase and the actuator supports modulating duty, the counters (general and recent) are held to 0.
Motor run time	This number counts the hours with the motor energized.
No power time	This number counts the hours without electrical power.
Utilization rate	This number % is incremented every 200 full strokes of the actuator. It reaches 100% after 20,000 full strokes.
Temperature min	This is the lowest temperature value (in °C) measured inside the electronics compartment.
Temperature max	This is the highest temperature value (in °C) measured inside the electronics compartment.
Term temp min	This is the lowest temperature value (in °C) measured inside the terminal board enclosure.
Term temp max	This is the highest temperature value (in °C) measured inside the terminal board enclosure.
Motor temp max	This is the highest temperature value (in °C) measured in the electrical motor.
Thermostat alarms	This counts the number of alarms due to high temperature of the electrical motor and resultant tripping of the motor thermostat.
Torque alarms	This counts the number of alarms due to high torque in opening and closing.

10.4.5 Maintenance Date

The routine allows the following dates to be viewed:

- Last date
- Next date
- Start-up date
- Recent log date

(see Table 18 below)

Table 18.

Last date	This is the date of the previous maintenance operation. This date should be updated by the user after all maintenance operations (see Section 9.3).
Next date	This is the date of the next scheduled actuator maintenance. When the date is reached, the ICON3000 generates a maintenance request warning. The date should be updated by the user after all maintenance operations (see Section 9.3).
Start-up date	This is the date of actuator start-up. During commissioning, the user should enter the start-up date (see Section 9.3).
Recent log date	This is updated after entering command “Clear recent data log” (see Section 9.3). This command clears the “recent data log” counters. The content of “recent log” is updated starting from “recent log 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 through the list of available menus and press YES to select the “Maintenance” menu.
- Press NO to scroll through the list of available routines and press YES to select the “Maintenance Date” date routine.
- Press YES to scroll the list of dates.

10.4.6 Data Logger

The “data logger” routine allows collection of different types of data useful for maintenance or for diagnostic programs. Since the amount of collected data is very large, the data logger can only be viewed via a PDA or PC. The data can be uploaded from the ICON3000 to a PDA or PC via a Bluetooth wireless connection.

The local display only allows viewing of configured parameter values (see Section 9.3.7, Set Data Logger).

The following data can be viewed on the local display:

- Logger mode
- Sampling time
- Memory mode
- Date
- Time

Data logger modes:

- OFF: the data logger is not active.
- RECORDER mode: the ICON3000 measures and memorizes the following 3 data:
  - Main voltage supply (V)
  - Motor temperature (°C)
  - Temperature inside the electronics compartment (°C)
- T-RECORDER mode: the ICON3000 measures and memorizes the following 3 data:
  - Torque in OP/CL
  - Motor temperature (°C)
  - Voltage

In RECORDER and T-RECORDER mode, the SAMPLING TIME fixes the time interval among two sets of measures. Up to 256 sets of measures (equivalent to 256x4 samples) can be memorized. The sampling time can be configured from 1 to 3600 seconds. As the memory becomes full, the recorder stops recording or overwrites the previous data according to the selected MEMORY MODE (“stop when full” or “continuous”). If “continuous” was selected, as a new set of measures is achieved the oldest one is canceled and the new one becomes the latest. Up to 10,000 cycles of full memory overwriting are performed, and then the recorder stops. In T-RECORDER mode, the recording operation is also stopped if a torque alarm is raised in opening or in closing. This additional feature allows the user to maintain memory of the last 256 samples and see the trend of torque, motor temperature, and main voltage prior to the alarm. A new start of T-RECORDER clears the data stored in the memory. By using a PDA or PC, the recorded data can be viewed by a graph where time is on the X axis and the measured data on the Y axis.

Figure 68 below shows a graph with a sampling time of 2 seconds in RECORDER mode (electronics temperature and motor temperature).

Figure 68 Recorder Mode

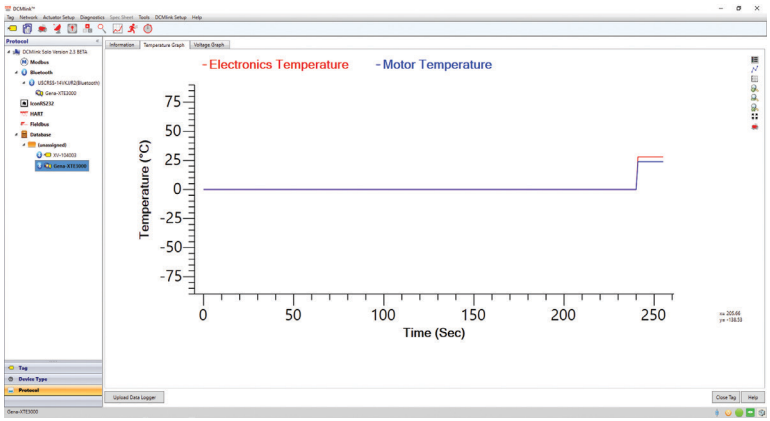
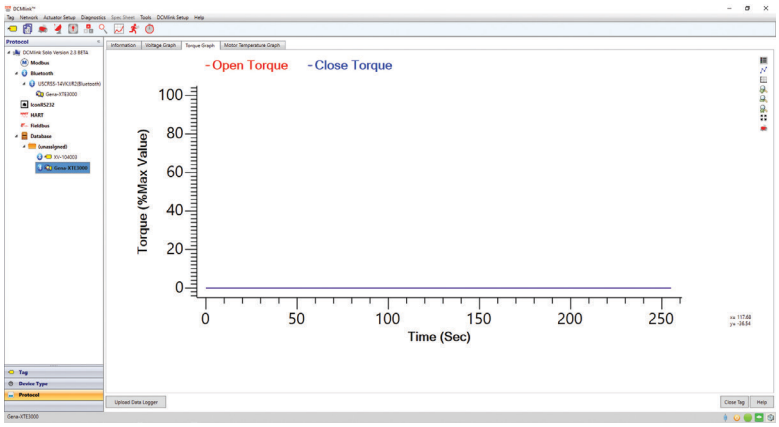


Figure 69 shows the data logger in “T-Recorder” mode.

Figure 69 T-Recorder Mode



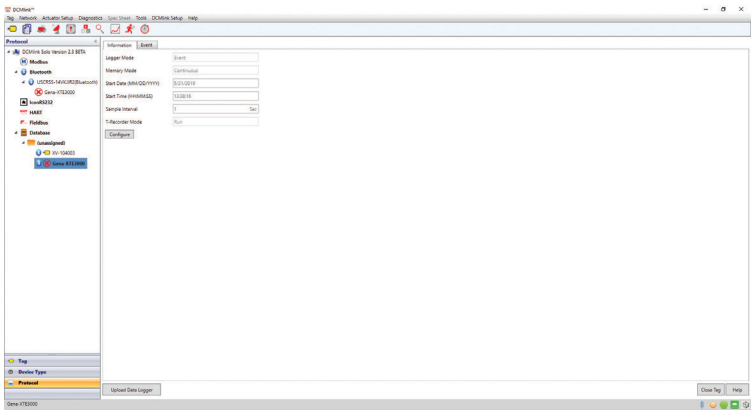
T-logger stops recording if a torque alarm is triggered. The last 256 samples remain in the actuator memory until a new start of the logger is initiated.

- EVENT mode: the ICON3000 detects the type of received command (OPEN or CLOSE), the source of the command (local controls, remote controls, bus, etc.), and the date and time of the command. Up to 128 EVENTS can be memorized. As the memory becomes full, the logger stops memorizing events or overwrites the previous data according to the selected MEMORY MODE (“stop when full” or “continuous”). If “continuous” was selected, old events are canceled in place of new events and the newest event becomes the latest. Up to 50 cycles of full memory overwriting are possible before the logger stops.
  The START DATE and START TIME fix date and time to start a recording operation.
  By using a PDA or PC, the collected data can be viewed via a graph or event table.
  The parameter “sampling time” is not used. Figure 70 shows an example of a report in EVENT mode.

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 through the list of available menus and press YES to select the “Maintenance” menu.
- Press NO to scroll through the list of routines and press YES to select “Data logger”.
- Press YES to view the MODE, the SAMPLING time, the MEMORY mode, the start DATE, and the start TIME.
- Press YES to return to the data logger. Press NO to exit.

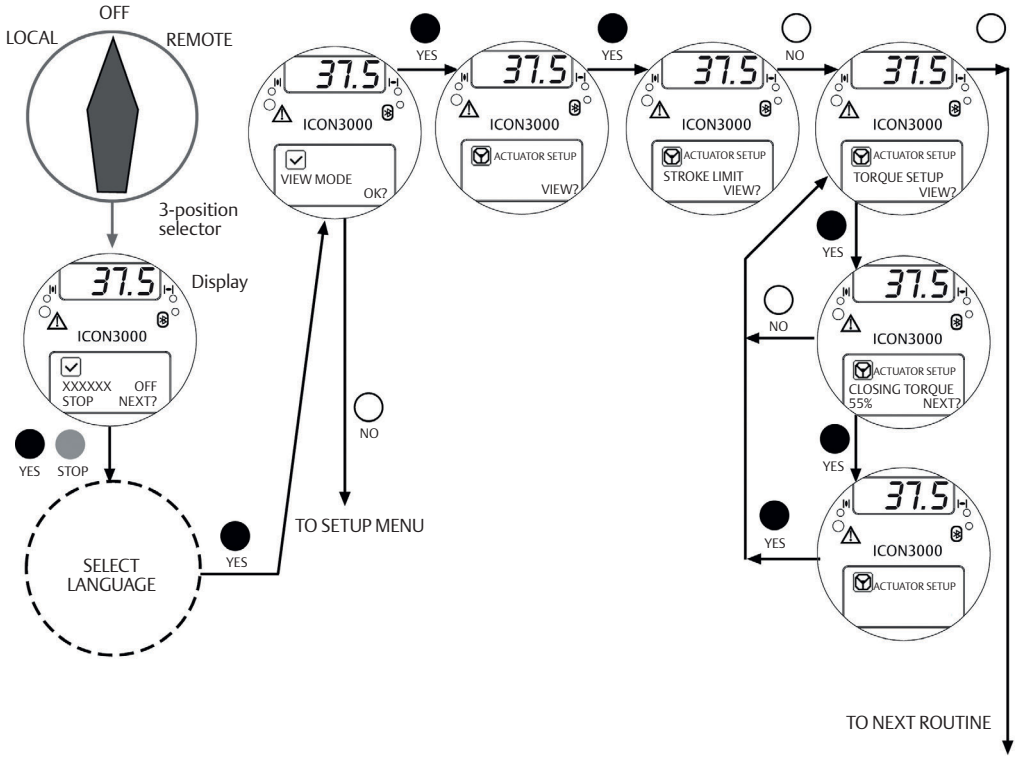
Figure 70 Event Mode



10.5 Example of View Routine

10.5.1 View Torque Set-up

Figure 71



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

Section 11: Maintenance

11.1 Standard Maintenance

Approx. every 2 years:

Under normal operating conditions, the ICON3000 requires no formal maintenance; however, visual inspection for oil leakage or external visible damage is recommended every two years. When conditions are severe (frequent operation or high temperatures), inspect the oil level and oil quality more frequently. Replace all seals that permit oil leakage or water ingress.

⚠ WARNING

Installation, configuration, commissioning, maintenance, and repairs must be performed by approved and qualified personnel only.

⚠ WARNING

Before performing service or maintenance operations (unless otherwise indicated), ensure that power is turned off to the unit to avoid injury and/or damage to equipment.

⚠ WARNING

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

⚠ CAUTION

Using a fastener other than the approved type may result in damage to the actuator or valve.

The following checks will assure optimum performance and can be considered as good practice in preventive and/or predictive maintenance:

- External visual inspection and general health check.
- Electrical enclosures: Check the external parts for possible damage and replace them immediately if necessary. If the window glass is broken, the complete cover must be replaced (see Section 13, Parts List and Drawings for individual item numbers).
- Electrical enclosures: perform an internal check of the cable glands and tightness of cable terminals, and replace the cover O-ring.
- Make sure that there are no oil leaks from the actuator housing. Check the oil level; it should be approximately 20 mm from the fill plug. Top-up the oil volume if needed (see Section 4, Lubrication).
- Lubricate the internal components of the coupling block (if present) via the spherical head lubricator using suggested greases (see Section 4, Lubrication).

- If the stem is external, check that the valve stem is clean and lubricated. If not, clean and lubricate it in order to prevent damage to the threaded bush.
- Check that all nuts and bolts securing the actuator to the valve are tight. If necessary, retighten them with a torque wrench (for tightening torque values see, Section 3.4.3, Actuator Mounting).
- For actuators provided with lithium batteries, make sure that the display is still visible when the power is off and that there is no “Battery low” warning message. If the“Battery low” warning appears, replace the battery (see Section 11.3, Lithium Battery Change). Always replace batteries if the actuator has been subjected to long periods without power (see Section 12, Troubleshooting).
- Manual override operation check (if valve operation allows).
- Check local and remote electrical commands (if valve operation allows).
- Full Stroke test (FST) or Partial Stroke Test (PST) (if valve operation allows), torque vs. position diagram report (via AManager, if Bluetooth or a serial cable connection is available).
- Download .icon file (via AManager, if Bluetooth or a serial cable connection is available).
- Identification of recommended spare parts based on inspection results.
- Identification of next routine inspection date.
- Identification of maintenance needs during next planned plant outage/shut down.
- Final report, including .icon file.
- Repaint all areas where paint is missing. In chemically aggressive or saline environments, remove rust from surfaces and protect the unit with a rust preventative.
- For severe applications or if actuator operation is infrequent, more frequent maintenance checks are recommended.

11.2 Special Maintenance

In case actuator failure, please refer to Section 12, Troubleshooting for possible causes.

Spare parts can be ordered from Biffi; refer to the individual item number shown in Section 13, Parts List and Drawings.

NOTICE

In cases of actuator failure, refer to Section 12, Troubleshooting for possible causes. Spare parts can be ordered from Biffi; refer to the individual item number shown in Section 13, Parts List and Drawings.

11.3 Lithium Battery Change

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

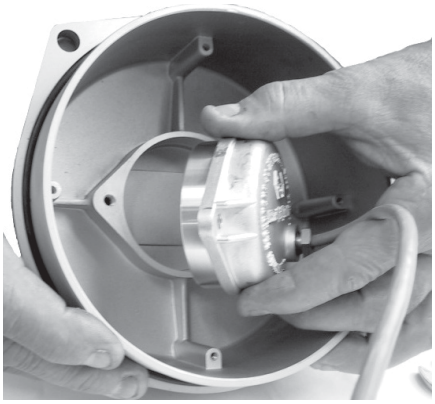
Figure 72



Figure 73



Figure 74



— Remove the battery cover.

Figure 75



Figure 76

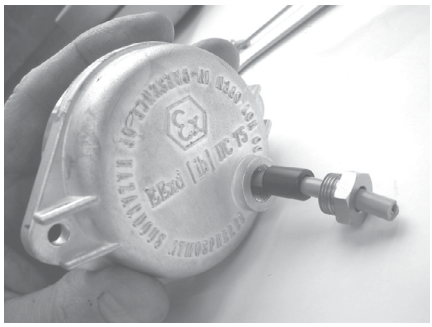
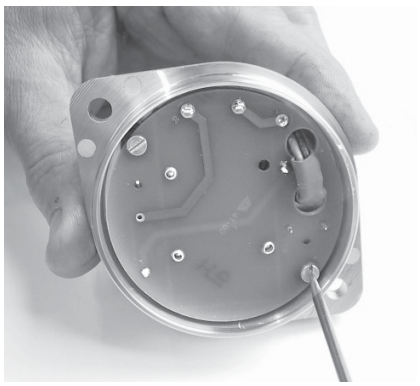


Figure 77



— Replace the battery.

Figure 78



Figure 79



Figure 80



NOTICE

The new battery must be the same type as the one provided: Lithium – SAFT LS 9 V.

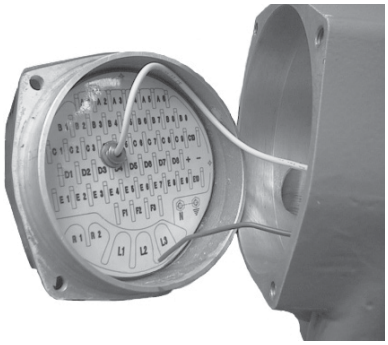
NOTICE

To check the battery status, press the STOP button for at least 3 seconds. In any event, the battery status is automatically checked at least once a day. The expected battery life is up to 4 years but this can vary depending on frequency of usage and environmental conditions. Battery life may be reduced at high and low temperatures.

⚠ WARNING

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.

Figure 81



Section 12: Troubleshooting

This section assumes that the ICON3000 has passed a functional test performed by Biffi quality assurance personnel.

⚠ WARNING

Installation, configuration, commissioning, maintenance, and repairs must be performed by approved and qualified personnel only.

⚠ WARNING

The ICON3000 actuator is non-intrusive. The control compartment is sealed in dry and clean conditions and contains no site-serviceable components. Do not open the control compartment unless absolutely necessary. Unauthorized access will invalidate the warranty.

⚠ WARNING

Before performing service or maintenance operations (unless otherwise indicated), ensure that power is turned off to the unit to avoid injury and/or damage to equipment.

If the actuator is not functioning correctly, before troubleshooting ensure that:

- the numeric display indicates xx %;
- the local selector is not in OFF;
- the mains supply voltage is the same as stated in the nameplate menu;
- the local selector is moved to OFF and the alphanumeric display shows one of the following messages:
  - “normal off”
  - “alarm off”
  - “warning off”
  - “ESD ON off”
  - “INT off”

If the above checks are passed, attempt to locate the fault using the diagnostic facilities.

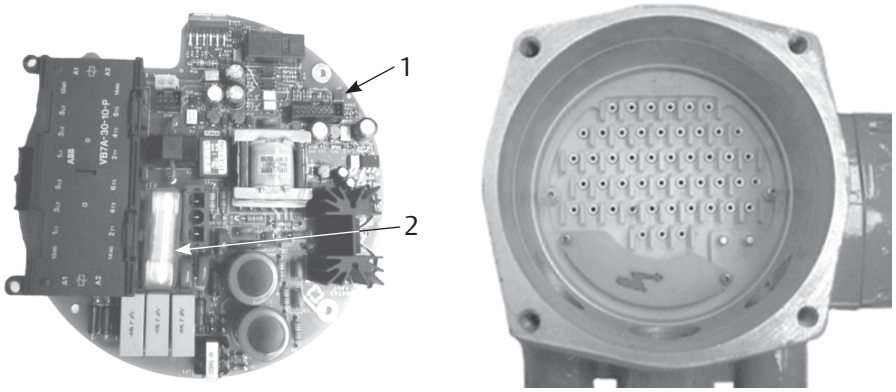
12.1 The Electronics Do Not Switch On When Powered

- Check that the value of the mains 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 the wiring 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 V DC.
- If the voltage is correct, check the external wiring and the electrical load. It should not exceed 4 W.
- If the voltage is not correct, replace the power card.

Figure 82



1. Power card
2. Fuse

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. If the alphanumeric display indicates “INT”, an interlock control is present. Check the signal on terminals B3, B4 and B5, and adjust the Interlock 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 4 W;
  - the value is in the range 20-120 V AC 50/60 Hz or 20-125 V DC, if an external voltage supply is used.

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 (NC) 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 (refer to the nameplate menu).
- Check that the valve operating torque is within the range of the unit's designed operating torque.
- Always check for causes of abnormal operation.

12.5 The Motor Runs but the Actuator Does Not Move the Valve

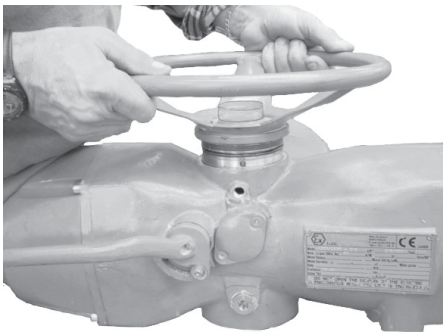
If the valve position indicators do not change on the local display:

- Check that the manual de-clutch lever is not stuck in the manual operation position.
- Rotate the handwheel a few degrees to remove any possible sticking between the handwheel and the drive sleeve.

Figure 83



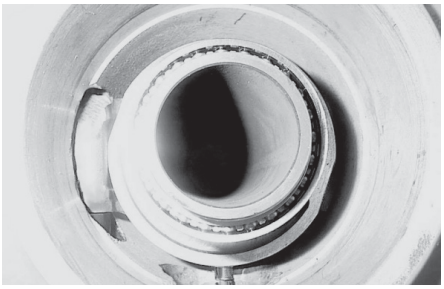
Figure 84



If the local display changes the valve position indicators:

- Verify that the stem nut fits correctly in the actuator base.
- Verify that the stem nut has sufficient engagement with the valve stem.
- Verify that the key correctly fits in bore/keyways applications.
- Check that the valve works in manual operation. If not, check the manual control area as follows:
  - Loosen the handwheel security dowel.
  - Remove the handwheel.
  - Remove the cover supporting the handwheel.
  - Check the integrity of the internal parts.
  - Proceeding with the assembly, follow the reverse order of the disassembly.
  - Ensure that no foreign bodies are present.Be careful not to damage the O-ring seals.

Figure 85



12.6 The Manual Override Cannot Be Engaged

If engagement of the manual override lever proves difficult, check whether the drive sleeve is stuck and proceed as follows:

- Open the cover.
- Try to move the drive sleeve with a screwdriver.
- Reassemble the cover.

12.7 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, and then readjust the setting of the position limit.
- The internal trim of the valve may be damaged.

12.8 Valve Operation Requires Excessive Torque

- Clean, lubricate and check the valve stem.
- If the valve packing is too tight, loosen the gland bolt nuts.
- Coupling type “A”: if a tight fit between bush and stem is evident, increase the thread clearance on the drive coupling.
- Coupling types “B1”, “B2”, “B3” and “B4”: ensure that there are no axial forces on the valve stem by leaving adequate axial clearance between the stem and the drive bush. Also check that all transmission shafts, universal joints, or bulkhead passages are sufficiently lubricated 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 section, Section 12.11, Diagnostic Messages.

Figure 86

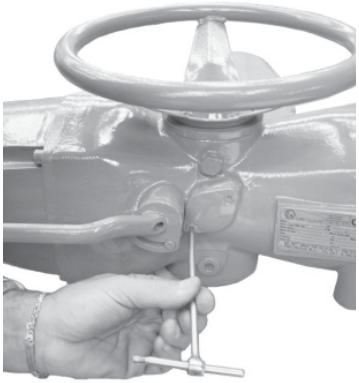


Figure 87



12.9 The Actuator Does Not Stop in the 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.
- Ensure that the torque and travel limits are correctly set (see Section 9.1, Actuator Set-up).

12.10 The Numeric Position Display Indicates "---"

Stroke limits must be recalibrated (see Section 9.1, Actuator Set-up).

12.11 Diagnostic Messages

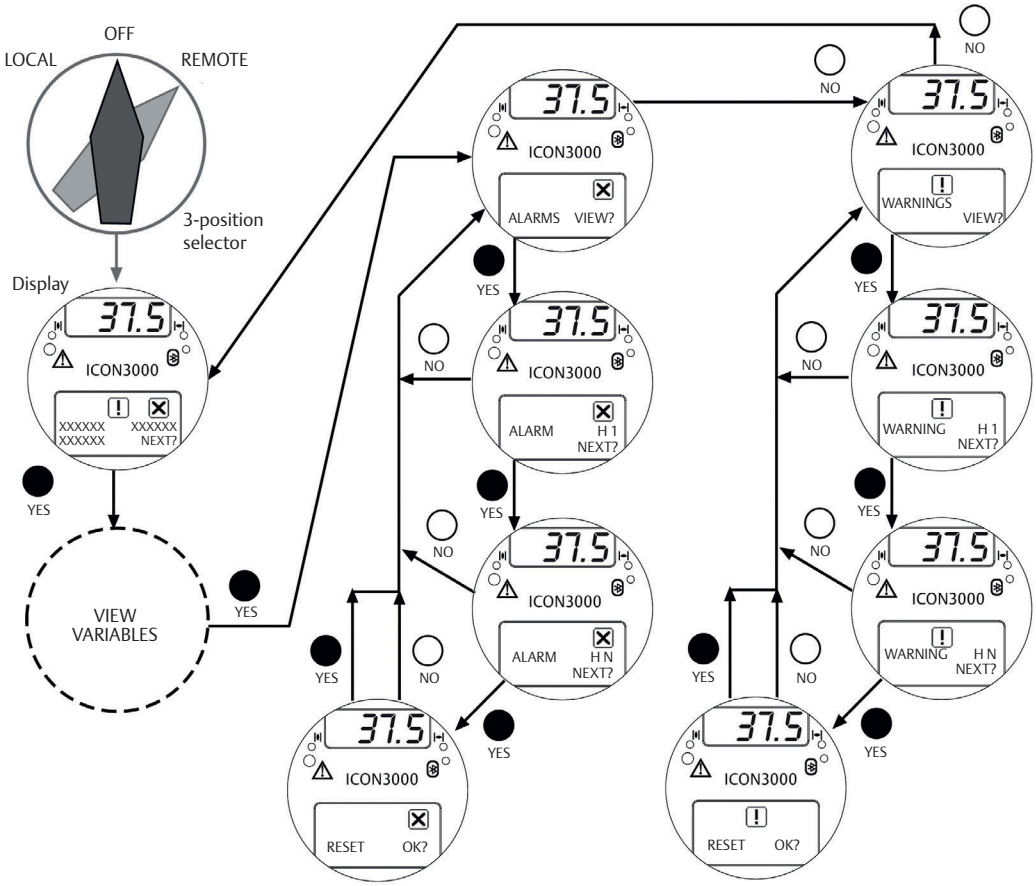
The alarm and warning lists contain the alarms and warnings momentarily present.

A Warning is a condition that occurs when a variable reaches a critical value and/or when a maintenance action is required but all actuator functions remain available. The Warning icon on the lower display and the flashing of the alarm/warning LED indicate a warning condition.

An Alarm is a condition that occurs when a variable is outside its acceptable range and/or some actuator functionality is not available. The Alarm icon on the lower display and the Alarm/Warning LED ON indicate an alarm condition. When the fault condition disappears, the corresponding alarm or warning also disappears from the list.

A reset routine is available to clear certain types of alarms that are memorized by the actuator (over-torque, jammed valve, etc.).

Figure 88



View procedure

- Move the 3-position selector to either OFF or REMOTE, and then press NO to scroll through the list of available variables.
- Press YES when the display shows the message “ALARMS view?” Press YES to scroll through the list of alarms.
- Press NO when the display shows the message “ALARMS view?”.
- Press YES when the display shows the message “WARNINGS view?” Press YES to scroll through the list of warnings.
- Press YES to reset alarms or warnings held within the actuator’s memory.

Table 19. 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 opening direction. Check the torque needed to operate the valve	Only open	Only open	Configuration dependent	Open 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 closing direction. Check the torque needed to operate the valve	Only close	Only close	Configuration dependent	Close control
Jammed valve in closing	No position change after receiving a CLOSE control command	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 command	Check status of actuator and valve mechanical parts	Only close	Only close	Only close	Close control
Motor thermostat	Motor thermostat open due to high temperature in the motor windings	Wait until the motor cools down	Not available	Not available	Configuration dependent	When thermostat closes
Internal-temperature	Temperature inside the actuator enclosure higher than 90 °C (194 °F) or lower than -40 °C (-40 °F)	Ambient temperature too high or too low. Verify insulation among actuator and heat source	Not available	Not available	Not available	Control temperature <90 °C (194 °F) or >-40 °C (-40 °F)
Position sensor	Value of the actuator position is not valid	Replace position sensor or recalibrate both stroke limits	Not available	Not available	Not available	Position signal correct
Speed sensor	Measure of motor speed is 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	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	Check status of actuator and valve mechanical parts. Recalibrate both stroke limits	Only open	Only open	Only open	Open control

Display message	Condition for alarm	Action	Available Controls			Alarm reset
			Local	Remote	ESD	
Main voltage	Main voltage lower than -20% or higher than+20% of the value stated in the nameplate menu	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 (not available for ICON LP)	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 (not available for ICON LP)	The test routine reports a failure of K2 (coil or auxiliary contact)	Check the contactor	Opposite direction	Opposite direction	Not available if ESD use K1 contactor	Control in opposite direction
Configuration obj n°	The checksum of the EEPROM memory that contains the configuration data is wrong	Reconfigure all parameters (see details on next page)	Not available	Not available	Not available	Memory OK
Hardware n°	The diagnostic program detects some malfunction in the electronics controlling the actuator	Some circuit is damaged and does not work (see details on next page)	Not available	Not available	Not available	Hardware OK
Low lithium battery	The voltage of the lithium battery is too low (only detected if the lithium battery is present and the relevant parameter of the miscellaneous routine is set to “present”)	Change lithium battery	Available with main voltage	Available with main voltage	Available with main voltage	Lithium battery OK
Lost phase LP Configuration (not available for ICON LP)	The alarm appears only with 3-phase mains supply. The alarm is generated when a fault exists in one of the phases that supplies the actuator transformer	Check main power supply on terminals L1, L2, L3	Not available	Not available	Not available	Phase OK
Request signal	The analog 4 - 20 mA signal is not correct	Check the external 4 - 20 mA generator and wiring	Available	Positioner function not available	Available	4 - 20 mA input OK
LP Configuration (for ICON LP only)	ICON LP Configuration is not correct	Check the parameters setting	Available	Available	Available	Correct the wrong parameters
Driver Fault (for ICON LP only)	Power Card Failure	Check the Power Card	Available	Available	Available	Power Card works properly
Direction (for ICON LP only)	Motor rotates in the wrong direction	Check the motor wiring	Available	Available	Available	Correct the motor wiring and reset

Table 20. Warning Table

Display message	Condition for alarm	Action	Available Controls			Alarm reset
			Local	Remote	ESD	
High torque in OP (near max.)	Measured torque greater than the relevant value configured in torque set-up or stroke limits routine	Check the torque necessary to move the valve	Available	Available	Available	Close control
High torque in CL (near max.)	Measured torque is 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 (176 °F) or lower than -35 °C (-31 °F)	Find the heat source and insulate the actuator	Available	Available	Available	Control temperature >-35 °C (-31 °F) and <80 °C (176 °F)
Main voltage (near limits)	Value of the main voltage out of the correct range (-15% or +10% of the value stated in the nameplate menu) or wrong frequency	Check section of wires and values of voltage and frequencies	Available	Available	Available	Main voltage correct
(Max.) contactor cycles (not available for ICON LP)	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	Recalibrate both stroke limits	Available	Available	Available	Recalibrate both stroke limits
Bus	Fieldbus not working	Check bus communication	Available	Available	Available	Bus OK
Low speed (for ICON LP only)	Set speed not reached	Check the mechanics or parameters setting	Available	Available	Available	Reset or redo Open/Close Control

Configuration obj n°

N° indicates the number of the parameter to be configured. To clear the alarm, a table of all ICON3000 parameters is necessary. Call Biffi Italia s.r.l. After-Sales service to solve the problem. If the alarm message is “CONFIGURATION OBJ 9999”, only one of the ICON3000 parameters needs to be changed. For example: enter the SET-UP menu, go to “Actuator Setup”, then “Torque Setup”, and then either increase or decrease the closing torque by 1%. As the alarm message disappears reenter the SET-UP menu, go to “Actuator Setup”, then “Torque Setup”, and then set the previous value (see Section 9.1, Actuator Set-up).

Hardware n°

N° indicates the module that is not working. The problem may be due to a malfunction of the module, to an incorrect wiring between modules, or to an incorrect setting of the ICON3000. Call Biffi Italia s.r.l. After-Sales service to solve the problem. The following hardware alarms can be detected:

- Hardware 1 = incorrect coding of local push-buttons and selector
- Hardware 2 = incorrect configuration of Ain/Aout optional module
- Hardware 3 = no communication between Ain/Aout optional module and base card
- Hardware 4 = incorrect configuration of type of terminal board
- Hardware 5 = no communication between terminal board and base card
- Hardware 6 = incorrect configuration ICON3000/F01
- Hardware 7 = incorrect configuration of type of bus card
- Hardware 8 = no communication between bus card and base card
- Hardware 9 = Logic Card cannot update the settings of the Power Card (for ICON LP only)
- Hardware 10 = Logic Card cannot communicate with the Power Card (for ICON LP only)
- Hardware 11 = no communication between bus card (redundant Profibus card) and base card
- Hardware 12 = no communication between encoder and base card
- Hardware 13 = encoder damaged or wrongly configured

Section 13: Parts List and Drawings

This section includes the drawings and parts list of each component and sub-assembly of the ICON3000.

⚠ CAUTION

Using a fastener other than the approved type may result in damage to the actuator or valve.

NOTICE

- When ordering spare parts, be sure to indicate the serial number embossed on the actuator nameplate.
- When ordering spare parts, refer to the item number on the attached drawings.

Figure 89 Component Parts

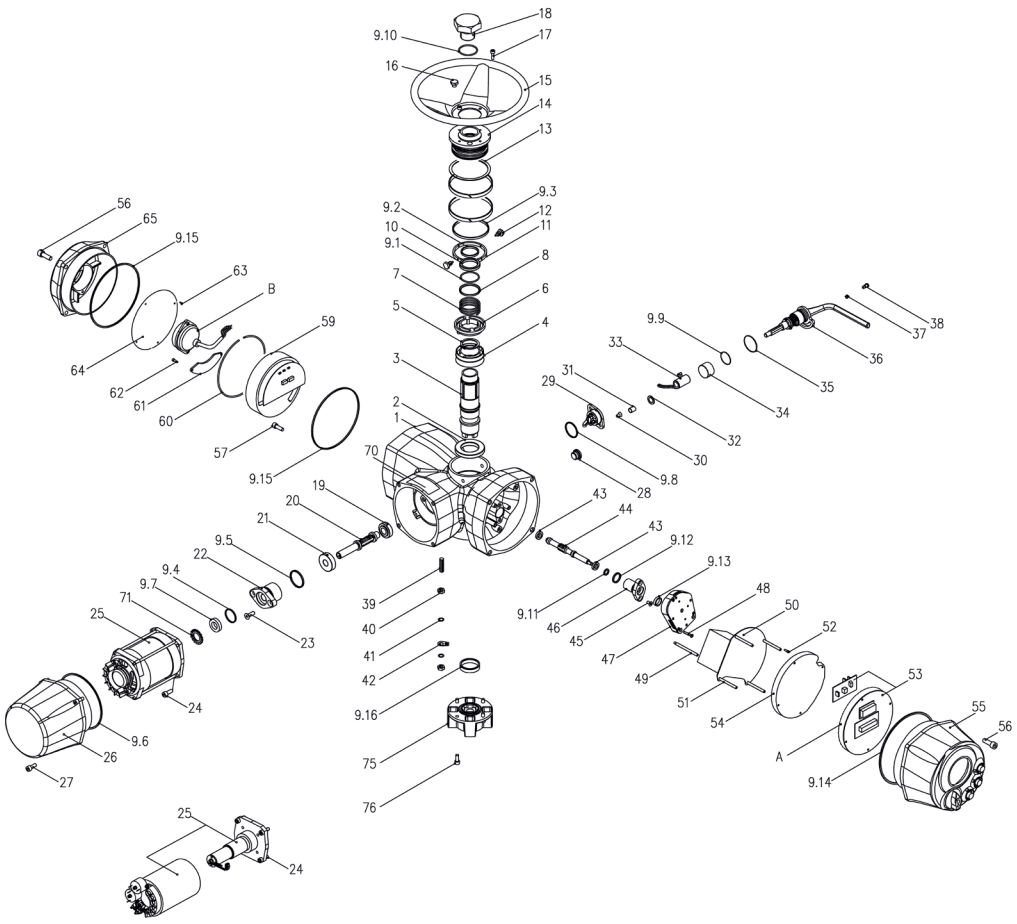


Table 21. Component Parts

Item	Qty	Description
1	1	Housing
2	1	Lower bearing
3	1	Hollow shaft
4	1	Worm wheel
5	1	Circlip
6	1	Driver sleeve
7	1	Driver sleeve spring
8	1	Spring retaining ring
9 *	1	Seal kit
9.1 *	1	O-ring
9.2 *	1	Seal ring
9.3 *	1	Q-ring
9.4 *	1	O-ring
9.5 *	1	O-ring
9.6 *	1	O-ring
9.7 *	1	Seal ring
9.8 *	1	O-ring
9.9 *	1	O-ring
9.10 *	1	O-ring
9.11 *	1	O-ring
9.12 *	1	O-ring
9.13 *	1	Seal ring
9.14 *	1	O-ring
9.15 *	2	O-ring
9.16 *	1	Seal ring
10	1	Upper bearing
11	2	Cover retaining ring
12	2	Plug
13	1	Cover shoulder washer
14	1	Cover
15	1	Handwheel
16	1	Oil plug
17	4	Screw
18	1	Stem protection tube
19	1	Taper bearing
20	1	Worm shaft
21	1	Taper bearing
22	1	Worm shaft flange
23	2	Screw
24	4	Screw
25 *	1	Electric motor assembly
26	1	Motor cover
27	4	Screw
28	1	Oil plug
29 *	1	Finger assembly
30	2	Screw

NOTE:
* Recommended spare parts

Item	Qty	Description
31	1	Bush
32	1	Shoulder washer
33	1	Fork
34	1	Bearing bush
35	1	Lever washer
36	1	Lever assembly
37	1	Lever screw block
38	1	Screw
39	1	Earth stud
40	2	Earth stud nut
41	2	Washer
42	1	Earth stud indication plate
43	2	Bearing
44	1	Position sensor shaft
45	2	Screw
46	1	Absolute Encoder flange
47 *	1	Absolute Encoder assembly
48	3	Screw
49	4	Column
50 *	1	Power card
51	4	Column
52	4	Screw
53 *	1	Processor card
54	1	Power card cover (only for models 010, 020, 030)
55	1	Local interface assembly
56	8	Screw
57	1	Screw
59 *	1	Terminal board
60	1	Circlip
61	1	Power terminals cover
62	2	Screw
63	4	Screw
64	1	Terminal board plate
65	1	Terminal board cover
70	1	Data plate
71	1	Circlip
75	1	Thrust block assembly
76	4	Screw
	Optional	
A *	1	Bus interface card
B	1	Battery assembly

NOTE:
* Recommended spare parts

Figure 90 Electric Motor

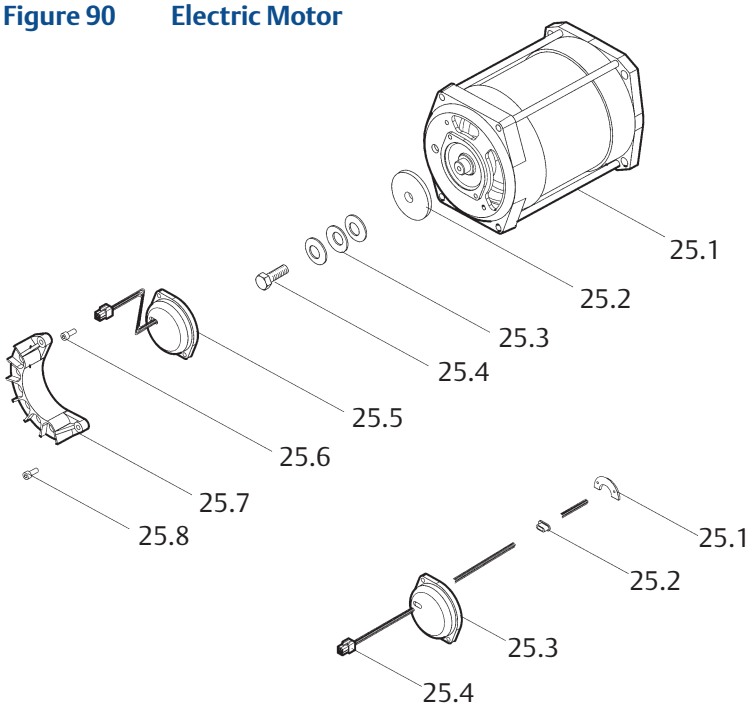


Table 22. Electric Motor

Item	Qty	Description
25.1 *	1	Electric motor
25.2	1	Speed magnetic sensor
25.3	3	Spring
25.4	1	Screw
25.5 *	1	Speed magnetic card assembly
25.6	2	Screw
25.7	1	Motor terminals board
25.8	1	Screw
	Speed magnetic card assembly	
25.5.1	1	Speed magnetic card
25.5.2	1	Rubber ring
25.5.3	1	Speed sensor cover
25.5.4	1	Speed sensor cable

NOTE:
* Recommended spare parts

Figure 91 Electric Motor (ICON LP)

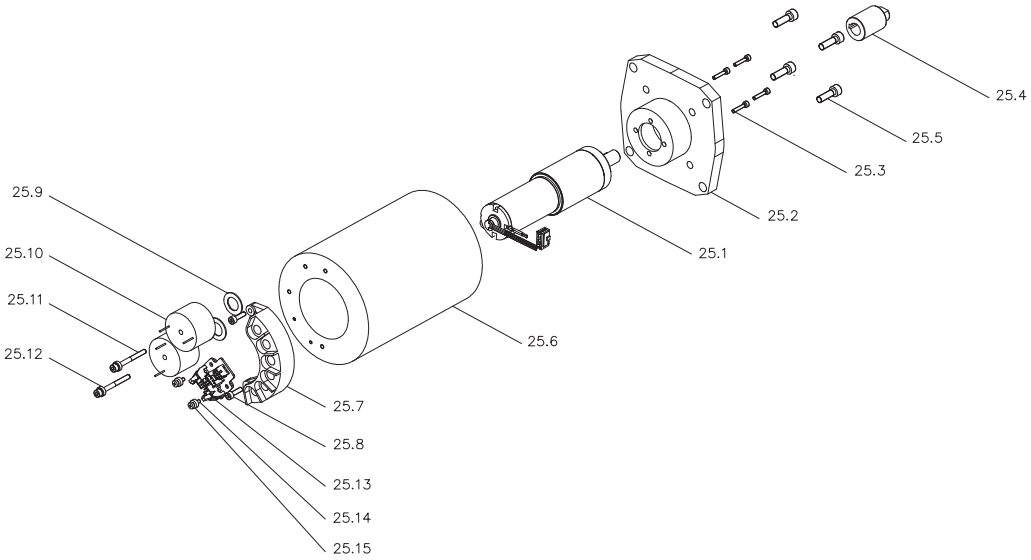


Table 23. Electric Motor (ICON LP)

Item	Qty	Description	Material
25.1 *	1	Electric motor	-
25.2	1	Flange	Carbon steel
25.3	4	Screw	Stainless steel
25.4	1	Motor coupling	Carbon steel
25.5	4	Screw	Stainless steel
25.6	1	Bracket	Aluminum
25.7	1	Motor terminals board	Plastic
25.8	2	Screw	Stainless steel
25.9	2	Washer	Plastic
25.10 *	2	Inductance coil	-
25.11	2	Screw	Stainless steel
25.12	2	Washer	Plastic
25.13 *	1	Electronic card	-
25.14	2	Screw	Stainless steel
25.15	2	Washer	Plastic

NOTE:
* Recommended spare parts

Figure 92 Finger Assembly

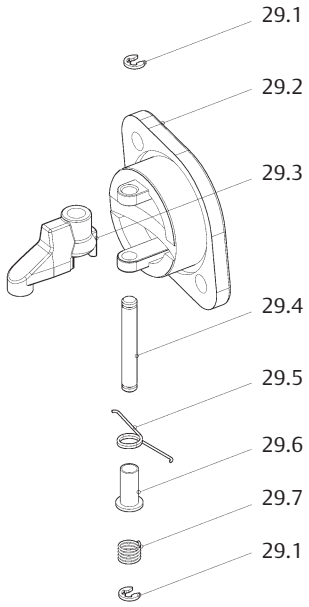


Table 24. Finger Assembly

Item	Qty	Description
29.1	2	Circlip
29.2	1	Cover finger
29.3	1	Finger
29.4	1	Pin
29.5	1	Bending spring
29.6	1	Bush
29.7	1	Spring

Figure 93 Lever Assembly

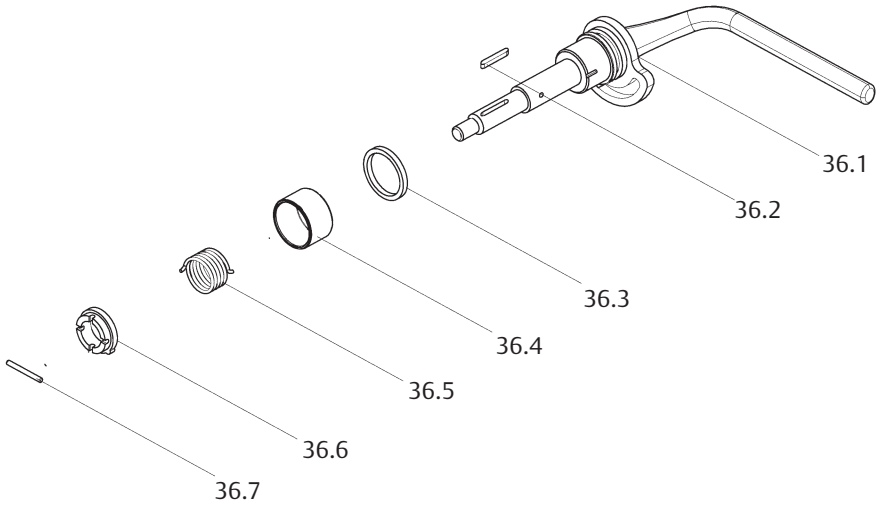


Table 25. Lever Assembly

Item	Qty	Description
36.1	1	Lever
36.2	1	Key
36.3	1	Shoulder washer
36.4	1	Bearing
36.5	1	Spring
36.6	1	Retainer ring
36.7	1	Pin

Figure 94 Local Interface Assembly

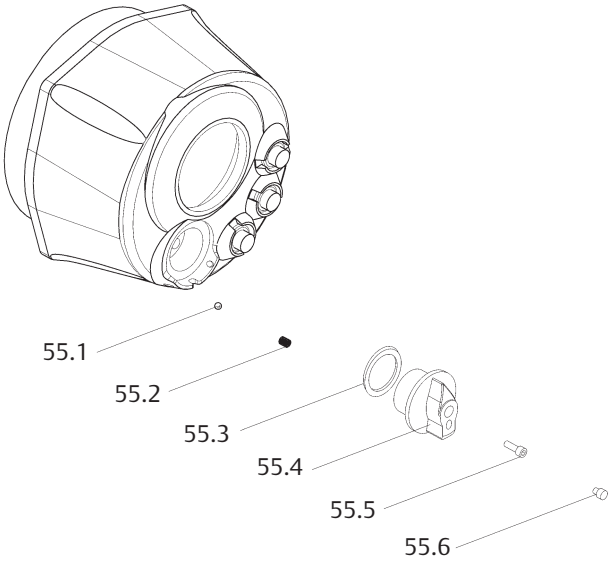


Table 26. Local Interface Assembly

Item	Qty	Description
55.1	1	Ball
55.2	1	Spring
55.3	1	O-ring
55.4	1	Selector
55.5	1	Screw
55.6	1	Plug

Figure 95 Thrust Block Assembly

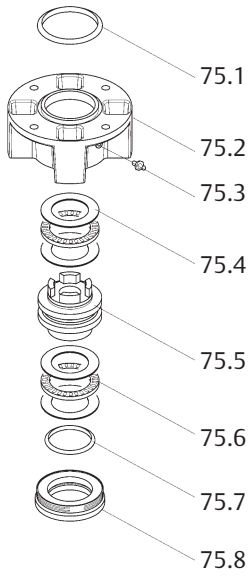


Table 27. Thrust Block Assembly

Item	Qty	Description
75.1	1	O-ring
75.2	1	Thrust block housing
75.3*	1	Greaser
75.4	4	Thrust washer
75.5	1	Stem nut
75.6*	2	Thrust bearing
75.7*	1	Quad ring
75.8	1	Lower ring nut

NOTE:
* Recommended spare parts

Figure 96 Wiring Loom and Cables Identification

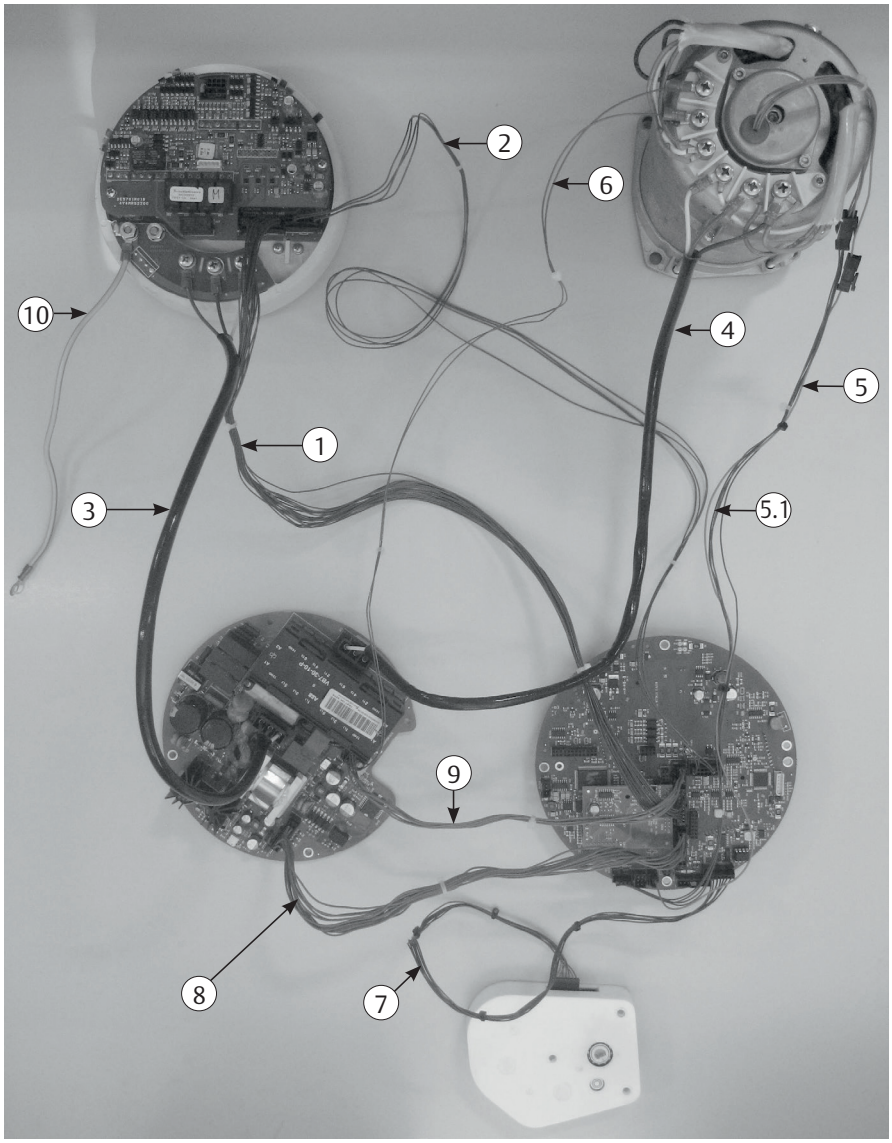


Table 28. Wiring Loom and Cables Identification

Item	Cable Type	Description
1	CAB0100	I/O remote cable
2	CAB0150	Remote control supply cable
3	CAB0160	Inlet power cable
4	CAB0270	Motor power cable
5	CAB0350	Speed sensor cable
5.1	CAB0354	Speed sensor cable
6	CAB0280	Thermostat cable
7	CAB0300	Absolute Encoder cable
8	CAB0200	Internal controls cable
9	CAB0250	Contact controls cable
10	CAB0170	Earth Wire

Appendix A: ICON3000/ICON3000AD

Ex db eb h IIB+H2 T4 Gb/Ex h tb IIICT135°C Db IP66/68

Ex db eb h ia IIB+H2 T4 Gb/Ex h tb IIIC T135°C Db IP66/68

A.1 Safety Instructions

A.1.1 General

This Appendix A is supplemental to Installation, Operation, and Maintenance Manual VCIOM-08500-EN and prescribes the safety instructions applicable to electric actuators ICON3000-040 and ICON3000-050. The subject actuator is certified according to EN and IEC Standards 60079-0, 60079-1, 60079-7, 60079-11, 60079-31, and EN ISO 80079-36, 80079-37 for protection type Ex db eb h or Ex db eb h ia for gas group IIB+H2 and Ex h tb for dust group IIIC. The actuator is suitable for installation in an ambient temperature range from -25 °C (-13 °F) to +60 °C (+140 °F).

⚠ WARNING

Installation, configuration, commissioning, maintenance, and repairs must be performed by approved and qualified personnel only.

The ICON3000 is designed in accordance with the applicable international rules and specifications, but the following regulations must be observed in every case:

- General installation and safety regulations.
- The proper use of personal protective devices (glasses, clothing, gloves).
- The proper use of tools, lifting equipment, and transport equipment.

A.2 Instructions for Proper Installation

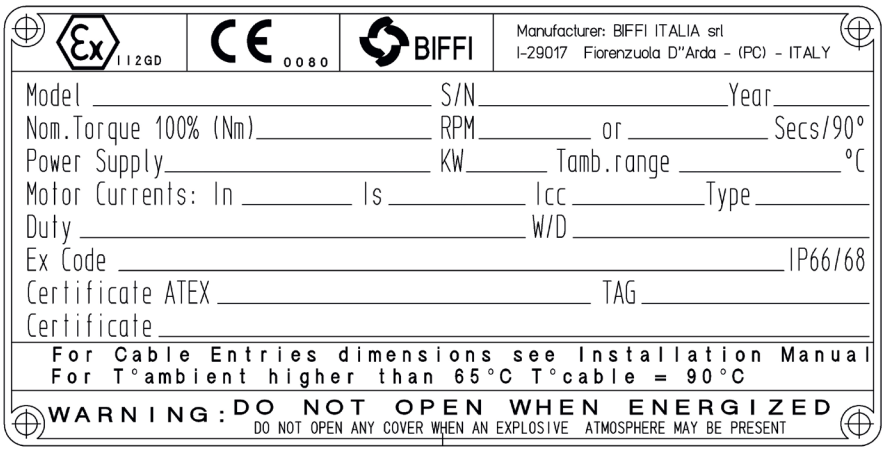
⚠ WARNING

Verify that the actuator nameplate conforms to the applicable certification, ambient temperature range, and site safety requirements.

Safety warnings and warranty will be invalidated if the ICON3000 is installed in explosive atmospheres not covered by the appropriate grade of protection, and/or in environments where temperatures exceed the maximum temperature specified on the product label.

A.2.1 Marking

Figure A-1 Template of the label for ICON3000/ICON3000AD



IECEx INE YY.NNNNX	= IECEx reference certificate (CoC)
INERIS YY ATEX NNNNX	= ATEX reference certificate
0080	= Notified body for ATEX quality assurance (INERIS)
II	= Group II (surface industries)
2	= Category 2 apparatus
G	= Explosive atmospheres caused by gas, mists, or vapors
D	= Explosive atmospheres caused by gas dusts
IP66/68	= Degree of protection

Table A-1.

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

Table A-2. Equipment Protection Level (EPL). EN 60079-14

Explosive atmosphere	Zone	EPL
Gas	0	Ga
	1	Ga or Gb
	2	Ga or Gb or Gc
Dust	20	Da
	21	Da or Db
	22	Da or Db or Dc

A.3 Applicable General Standards and Regulations

Table A-3.

2006/42/EC	Machinery directive
2014/30/EU	EMC directive
2014/35/EU	Low voltage directive
2014/34/EU	ATEX directive
EN ISO 12100-1	Safety of machinery - Basic concepts, general principles for design. Part 1 - Basic terminology, methodology.
EN ISO 12100-2	Safety of machinery - Basic concepts, general principles for design. Part 2 - Technical principles and specification.
EN 60079-0: 2012/A11:2013	IEC 60079-0: 2011
EN 60079-1: 2014	IEC 60079-1: 2014
EN 60079-7: 2015	IEC 60079-7: 2015
EN 60079-11: 2012	IEC 60079-11: 2011
EN 60079-31: 2014	IEC 60079-31: 2013
EN ISO 80079-36:2016	ISO 80079-36:2016
EN ISO 80079-37:2016	ISO 80079-37:2016

A.4 Terms and Conditions

Biffi guarantees every product to be free from defects and to conform to industry standards. Unless otherwise specified, 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 that are subject to improper storage, improper installation, misuse, or are modified or repaired by unauthorized personnel.

Repair work resulting from improper use will be charged at standard rates.

A.5 Manufacturer’s Liability

Biffi Italia s.r.l. will not accept any liability in the event of:

- Use of product in a fashion that contravenes local safety at work legislation.
- Incorrect installation relating to, disregard for, or incorrect application of the instructions as provided on the product nameplate and in the Installation, Operation, and Maintenance Manual VCIOM-08500-EN and Appendix A within.
- Modification of the product without Biffi authorization.
- Work done on the product by unqualified or unsuitable personnel.

A.6 Storage and Pre-Installation

A.6.1 Storage Procedure

NOTICE

Not following the procedures according to this document will invalidate the product warranty.

The standard plastic plugs used to protect the conduit entries during transport are neither explosion proof nor waterproof; these plugs are only designed to prevents the entry of foreign objects during transport. The general storage procedure stated in Section 2 must be followed.

A.6.2 Checks to be Performed Before Installation

Before installation, the following checks are recommended:

- Condition of joint surfaces between compartment covers and the main housing.
- Condition of the threads on the conduit entries.
- Whether the enclosure covers or the actuator body are cracked or broken.

A.7 Installation

NOTICE

Installation must be carried out in accordance to the applicable standards IEC/EN 60079-14 and IEC/EN 60079-17 regarding the electrical installations in Hazardous Areas (other than mines) classified as Zones 1, 2 (gas) and Zones 21, 22 (dust) following IEC/EN 60079-10-1 and IEC/EN 60079-10-2 and any other applicable national standards and rules.

A.7.1 Working Condition

⚠ WARNING

Verify that the actuator nameplate conforms to the applicable certification, ambient temperature range, and site safety requirements.

7.1.1 Models ICON-040 and ICON-050 from -25 °C to +60 °C (from -13 °F to +140 °F)

A.7.2 Identification of Entries

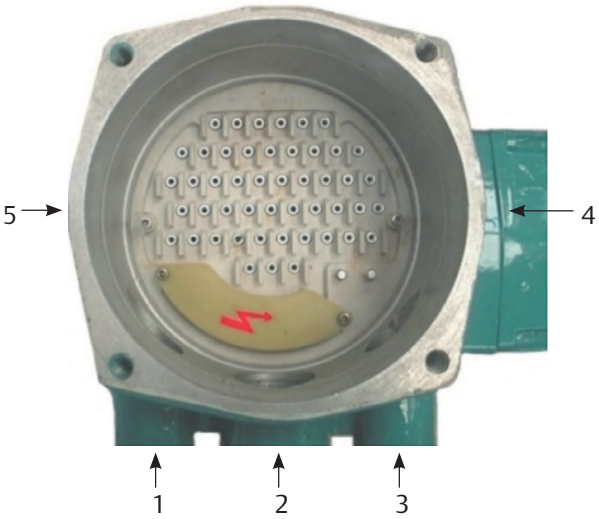
The ICON3000 electric actuator as it pertains to this appendix can be equipped with up to 5 conduit entries (3 are standard; the 4th and 5th are supplied upon request).

With reference to Figure A-2, the thread form/size for each entry is as follows:

Table A-4. Identification of Entries

Entry	NPT size	Metric size ISO 965 (alternative)
1	1"	M32x1.5
2	1-1/2"	M40x1.5
3	1"	M32x1.5
4 (optional)	3/4"	M25x1.5
5 (optional)	3/4"	M25x1.5

Figure A-2 Electric Actuator



NOTICE

When alternative entries according to ISO 965 are used, indication of the dimensions is imprinted on the adapter bush or directly on the housing when ISO 965 entries are obtained by machining the housing.

⚠ WARNING

Unused entries may remain unmachined or must be plugged with a certified plug suitable for the subject environment.

A.7.3 Electrical Connections

External wires or connections of external ATEX-certified apparatus via the conduit entry of an additional extension must be wired to the internal cards of the ICON3000, in accordance with the wiring diagram and general instructions on the actuator label.

A.7.3.1 Connection for Ex-e Terminals Enclosure

The wires must be terminated in accordance with the following method:

Type of terminal:	Insulated ring tongue
Eye dimensions:	5.5 mm (0.22 in.) for power cable 3.2 mm (0.13 in.) for control cables
Recommended tightening torques:	2.0 - 2.8 Nm (17.7 - 24.8 lb.in) for power cables 1.0 - 1.5 Nm (8.9 - 13.3 lb.in) for control cables
Wires section:	4 mm^2 (0.006 in^2) for power cables 2.5 mm^2 (0.004 in^2) for control cables

A.7.4 Cable Connection

Sealing of conduit entries must be carried out in accordance with national standards or as indicated by the relevant regulatory authorities.

Sealing methods and cable glands must be approved and separately certified for use in hazardous areas.

Two earth connection points - one internal and one external - are located on the ICON3000 base model (see Figure A-3) for connection to ground cables.

NOTICE

To prevent water infiltration through the line cable conduits, be sure the cable glands used possess the minimum degree of protection required by the plant and are specified on the actuator label. If a rigid conduit makes a connection to the plant, it is recommended to place a flexible pipe connection between the conduit and the conduit entry of the additional extension.

To guarantee that weatherproof and explosion proof characteristics are maintained, screw the cable gland or the external ATEX-certified apparatus tightly (at least 5 turns of engagement) and coat them with a thread sealant.

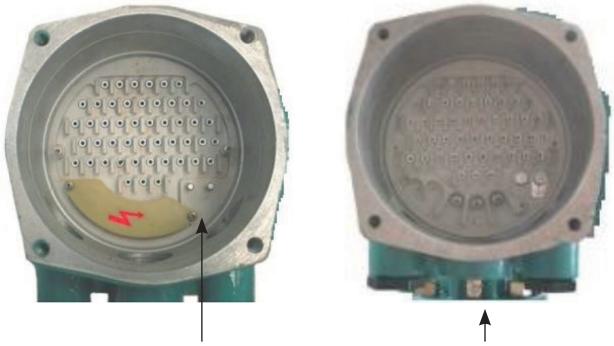
NOTICE

The cables and cable glands MUST be selected considering the maximum temperature of the cable indicated on the label fixed to the base ICON3000 unit.

Figure A-3

Connection for Ex-e terminals enclosure





A.7.5 Installation in Environments with Explosive Dusts

Special attention must be paid to the following points:

- Before assembly, joint surfaces must be greased with Aeroshell grease.
- The cable glands must at a minimum possess a protection degree of IP66 or IP68 (15 m depth/90 hours) according to IEC/EN 60529 standard.
- Periodically measure the quantity of dust deposited on the surface of the actuator body. Clean the dust if it accumulates to more than 5 mm high (relative to the actuator body).

A.8 Maintenance

⚠ WARNING

Before performing service or maintenance operations (unless otherwise indicated), ensure that power is turned off to the unit to avoid injury and/or damage to equipment.

⚠ WARNING

Installation, configuration, commissioning, maintenance, and repairs must be performed by approved and qualified personnel only.

A.8.1 Periodic Inspection

- Inspect the general condition of the ICON3000/3000AD at regular intervals. The recommended frequency of inspection is once every two years but this frequency could change depending on the installation and working conditions. Any crack on the surface, broken windows, or loose bolts must be reported for repair.
- Keep the external surfaces of the unit clean: if the unit is installed in a dusty environment, the specification stated in IEC/EN 60079-14 is to be followed (ensuring in particular that the dust layer does not exceed 5 mm.)
- If the actuator is covered by an intumescent coating (“Kmass”), an electrostatic charge risk is present; only anti-static cloth may be used when cleaning is required. When performing maintenance, avoid rubbing actions against the actuator (or any other friction-inducing action) that could electrostatically charge the unit.
- Check the condition of cable connections and mounting bolts; any loose connection must be tightened.

A.8.2 Disassembly and Reassembly

⚠ CAUTION

Using a fastener other than the approved type may result in damage to the actuator or valve. Refer to Table 8.

⚠ CAUTION

Failure to use proper torque values can result in damage to the actuator and/or valve.

If disassembly and subsequent reassembly of the explosion proof enclosure is required, take the necessary care to maintain all parts in their original condition.

To achieve this, the following steps must be taken:

- Do not damage the explosion proof mating surfaces on the housing or on the electrical enclosure cover.
- Reinstall all the screws that came with the dismantled parts and coat them with a film of molybdenum-based grease. This will prevent the screws from sticking and make future maintenance operations easier.
- If the screws need to be changed, the new screws must be of equal dimensions and at least equal material quality to the screws originally supplied with the unit.
- Replace the weatherproof seals that may have been removed, i.e. O-rings for the cover.
- In particular, be sure to spread a film of Aeroshell grease over the joint surfaces of all enclosures.

A.8.3 Repairs

When needed, repairs may only be carried out using spare parts supplied by the manufacturer. All accessories must comply with approved specifications and follow the application and site requirements.

⚠ WARNING

Installation, configuration, commissioning, maintenance, and repairs must be performed by approved and qualified personnel only.

⚠ WARNING

The values of gaps of explosion proof joints are lower than the maximum specified on tables of IEC/EN 60079-1 Standard and the values of widths of the explosion proof joints are greater than the values specified in the tables of the Standard IEC/EN 60079-1. Should maintenance require the replacement of any component that forms part of an explosion proof joint, only an original spare provided by Biffi can be used. Direct repair or reconstruction of the above components is not permitted without Biffi authorization. Not performing this procedure will invalidate the product safety and contractual guarantee.

Original spare parts must be ordered from the manufacturer; to ensure that correct spares are provided, the serial number printed on the ICON3000 product label must be specified when an order for spares is placed.

Appendix B: ICON3000/ICON3000AD/ ICON3000LP

Ex db h IIB T4 Gb/Ex h tb IIIC T135°C Db IP66/68

Ex db h ia IIB T4 Gb/Ex h tb IIIC T135°C Db IP66/68

B.1 Safety Instructions

B.1.1 General

This Appendix B supplemental to Installation, Operation, and Maintenance Manual VCIOM-08500-EN and prescribes the Safety Instructions applicable to electric actuators of Series ICON3000/ICON3000AD/ICON3000LP either as a base unit or when they are equipped with:

a. an additional entry mounted on the control compartment or when they are equipped with an optional extension

b. additional entries or with an optional extension

c. an optional electronic card mounted on the terminal board compartment, as shown in Figure B-3. The subject actuator is certified according to EN and IEC standards 60079-0, 60079-1, 60079-7, 60079-11 and 60079-31 and EN ISO 80079-36, 80079-37, for protection type Ex db h or Ex db h ia for gas group IIB and Ex h tb for dust group IIIC. The actuator is suitable for installation in an ambient temperature range from -25 °C (-13 °F) to +60 °C (+140 °F).

⚠ WARNING

Installation, configuration, commissioning, maintenance, and repairs must be performed by approved and qualified personnel only.

Both the base unit ICON3000 and optional extension are designed in accordance with the applicable international rules and specifications, but the following regulations must be observed in every case:

- The general installation and safety regulations.
- The proper use of personal protective devices (glasses, clothing, gloves).
- The proper use of tools, lifting and transport equipment.

B.1.2 Identification of Main Parts

Figure B-1 Base Unit



Figure B-2 Base Unit with Extension [A]



Figure B-3 Base Unit with Extensions [B] or [C]



B.2 Instructions for Proper Installation

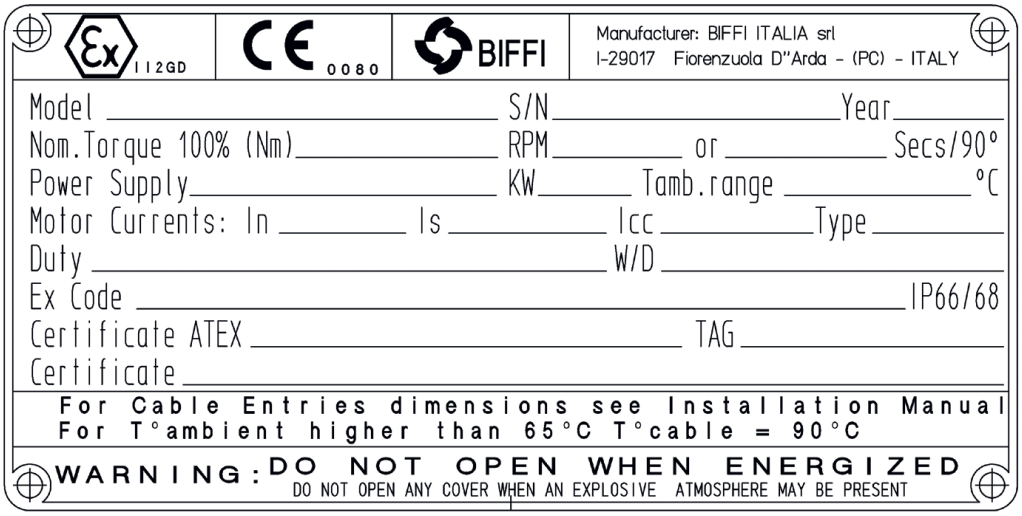
⚠ WARNING

Before installation, it is mandatory to check if the nameplate associated with the extension for additional entry specifies the appropriate degree of protection and ambient temperature limits as requested by the rules applicable to the plant/location where the ICON3000 is installed.

Safety warnings and warranty will be invalidated if the ICON3000 is installed in explosive atmospheres not covered by the appropriate grade of protection, and/or in environments where temperatures exceed the maximum temperature specified on the product label.

B.2.1 Marking

Figure B-4 Template of the label for ICON3000/ICON3000AD/ICON3000LP



IECEx INE YY.NNNNX	=	IECEx reference certificate (CoC)
INERIS YY ATEX NNNNX	=	ATEX reference certificate
0080	=	Notified body for ATEX quality assurance (INERIS)
II	=	Group II (surface industries)
2	=	Category 2 apparatus
G	=	Explosive atmospheres caused by gas, mists, or vapors
D	=	Explosive atmospheres caused by gas dusts
IP66/68	=	Degree of protection

Table B-1.

Hazardous zone	Categories according to 2014/34/EU Directive	
Gas, mists, or vapors	Zone 0	1G
Gas, mists, or vapors	Zone 1	2G or 1G
Gas, mists, or vapors	Zone 2	3G or 2G or 1G
Dust	Zone 20	1D
Dust	Zone 21	2D or 1D
Dust	Zone 22	3D or 2D or 1D

Table B-2. Equipment Protection Level (EPL). EN 60079-14

Explosive Atmosphere	Zone	EPL
Gas	0	Ga
	1	Ga or Gb
	2	Ga or Gb or Gc
Dust	20	Da
	21	Da or Db
	22	Da or Db or Dc

B.3 Applicable General Standards and Regulations

Table B-3.

2006/42/EC	Machinery directive
2014/30/EU	EMC directive
2014/35/EU	Low voltage directive
2014/34/EU	ATEX directive
EN ISO 12100-1	Safety of machinery - Basic concepts, general principles for design. Part 1 - Basic terminology, methodology.
EN ISO 12100-2	Safety of machinery - Basic concepts, general principles for design. Part 2 - Technical principles and specification.
EN 60079-0: 2012/A11:2013	IEC 60079-0: 2011
EN 60079-1: 2014	IEC 60079-1: 2014
EN 60079-11: 2012	IEC 60079-11: 2011
EN 60079-31: 2014	IEC 60079-31: 2013
EN ISO 80079-36:2016	ISO 80079-36:2016
EN ISO 80079-37:2016	ISO 80079-37:2016

B.4 Terms and Conditions

Biffi Italia s.r.l. guarantees every product to be free from defects and to conform to industry standards. Unless otherwise specified, 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 that are subject to improper storage, improper installation, misuse, or are modified or repaired by unauthorized personnel.

Repair work resulting from improper use will be charged at standard rates.

B.5 Manufacturer's Liability

Biffi Italia s.r.l. will not accept any liability in the event of:

- Use of product in a fashion that contravenes local safety at work legislation.
- Incorrect installation relating to, disregard for, or incorrect application of the instructions as provided on the product nameplate and in the Installation, Operation, and Maintenance Manual VCIOM-08500-EN and Appendix B within.
- Modification of the product without Biffi authorization.
- Work done on the product by unqualified or unsuitable personnel.

B.6 Storage and Pre-Installation

B.6.1 Storage Procedure

NOTICE

Not following the procedures according to this document will invalidate the product warranty.

Normally the optional extension for additional entry or additional electronic card is directly mounted on the base model of ICON3000 and leaves the factory in perfect condition. In this case, the general storage procedure as stated in Section 2 must be followed. When the above extension is shipped separately for a field upgrade on an existing ICON3000 unit, this extension must be stored in a protected area while ensuring that the explosion proof joints are well-protected and kept free of damage. The standard plastic plugs used to protect the cable entries during transport are not explosion proof nor water-proof; these plugs are only intended to prevent entry of foreign objects. The extension for additional entry/entries or additional electronic cards maintains the same weatherproof degree of protection as the base ICON3000 model. Good operating condition can only be maintained if the extension is correctly installed/connected on-site and if it has been correctly stored.

B.6.2 Checks to be Performed Before Installation

Before installing extensions for additional entries or additional electronic cards on a base ICON3000 unit, the following checks are recommended:

- Condition of joint surfaces between compartment covers and the main housing.
- Condition of the threads on the conduit entries.
- Whether the enclosure covers or the actuator body are cracked or broken.

B.7 Installation

NOTICE

Installation must be carried out in accordance to the applicable standards IEC/EN 60079-14 and IEC/EN 60079-17 regarding the electrical installations in Hazardous Areas (other than mines) classified as Zones 1, 2 (gas) and Zones 21, 22 (dust) following IEC/EN 60079-10-1 and IEC/EN 60079-10-2 and any other applicable national standards and rules.

B.7.1 Working Condition

⚠ WARNING

Verify that the actuator nameplate conforms to the applicable certification, ambient temperature range, and site safety requirements.

B.7.1.1 Models and Temperature

ICON-010 and ICON-020

from -60 °C to +65 °C (from -76 °F to +149 °F)
from -60 °C to +85 °C (from -76 °F to +185 °F)

ICON-030, ICON-040 and ICON-050

from -55 °C to +65 °C (from -67 °F to +149 °F)
from -55 °C to +85 °C (from -67 °F to +185 °F)

B.7.1.2 Base Unit With Extensions [A] or [B] or [C]

When an extension is installed on a base ICON3000 unit, the whole assembly is suitable for the following ambient temperatures:

ICON-010 and ICON-020

from -20 °C to +65 °C (from -4 °F to +149 °F)
from -20 °C to +85 °C (from -4 °F to +185 °F)

ICON-030, ICON-040 and ICON-050

from -20 °C to +65 °C (from -4 °F to +149 °F)
from -20 °C to +85 °C (from -4 °F to +185 °F)

For all models the maximum permissible temperature depends on the type of motor (SM, TM, DM, or LP) installed on the base ICON3000 unit.

B.7.2 Identification of Entries

B.7.2.1 Base Actuator

The ICON3000 electric actuator is equipped with 5 entries (3 are standard; the 4th and 5th are supplied upon request). With reference to Figure B-5, the thread form/size for each entry is as follows:

Table B-4.

Entry	NPT size	Alternative (Metric size ISO 965)
1	1"	M32x1.5
2	1-1/2"	M40x1.5
3	1"	M32x1.5
4 (optional)	3/4"	M25x1.5
5 (optional)	3/4"	M25x1.5

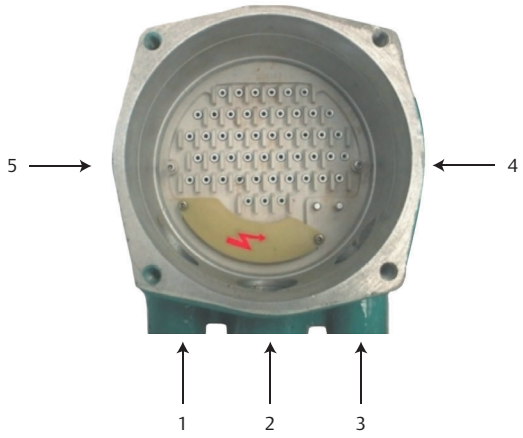
NOTICE

When alternative entries according to ISO 965 are used, indication of the dimensions is imprinted on the adapter bush or directly on the housing when ISO 965 entries are created by machining the housing.

⚠ WARNING

Unused entries may remain unmachined or must be plugged with a certified plug suitable for the subject environment.

Figure B-5 Base Actuator



B.7.2.2 Base Actuator With Extension [A] on the Control Compartment

Extension [A] provides an additional entry for a cable or conduit connection or for connection of an external ATEX-certified apparatus.

With reference to Figure B-6, the thread form/size for the entry is as follows:

Table B-5.

Entry	Standard Size	Optional
6	M25x1.5	3/4" NPT

Figure B-6 Base actuator with extension [A] on the control compartment



B.7.2.3 Base Actuator with Extensions [B] or [C] on the Terminal Board Compartment

Extension B provides up to 9 additional entries for cable or conduit connection. Extension [C] is equipped with an electronic card (Profibus or Lonworks Removable Connection Modules) and provides up to 6 additional entries.

With reference to Figure B-7, the thread form/size for the entries is as follows:

Table B-6.

Entries	Option 1 Standard Entries	Option 2 Alternative Entries (ISO 965)
A, B, C, D, E, F, G, H, K	1/2" NPT	M20x1.5

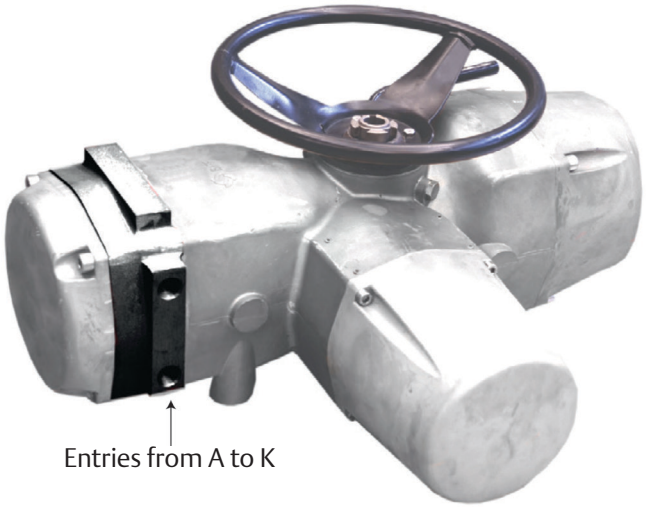
NOTICE

When alternative entries according to ISO 965 are used, indication of the dimensions is imprinted on the adapter bush or directly on the housing when ISO 965 entries are created by machining the housing.

⚠ WARNING

Unused entries may remain unmachined or must be plugged with a certified plug suitable for the subject environment.

Figure B-7 Base actuator with extensions [B] or [C] on the terminal board compartment



B.7.3 Electrical Connections

External wires or connections of external ATEX-certified apparatus via the conduit entry of an additional extension must be wired to the internal cards of the ICON3000, in accordance with the wiring diagram and general instructions on the actuator label.

B.7.3.1 Connection for Ex-e Terminals Enclosure

The wires must be terminated in accordance with the following method:

Type of terminal:	Insulated ring tongue
Eye dimensions:	5.5 mm (0.22 in.) for power cable 3.2 mm (0.13 in.) for control cables
Recommended tightening torques:	2.0 - 2.8 Nm (17.7 - 24.8 lb.in) for power cables 1.0 - 1.5 Nm (8.9 - 13.3 lb.in) for control cables
Wires section:	4 mm^2 (0.006 in^2) for power cables 2.5 mm^2 (0.004 in^2) for control cables

B.7.4 Cable Connection

When optional extensions for additional entries or additional electronic cards are connected to external cables or conduits, the sealing of these entries must be carried out in accordance with the national standards or regulatory authorities that certified the extension(s). The method of sealing and cable glands used must be approved and separately certified for use in hazardous areas.

Two earth connection points - one internal and one external - are located on the ICON3000 base model (see Figure B-8) for connection to ground cables.

NOTICE

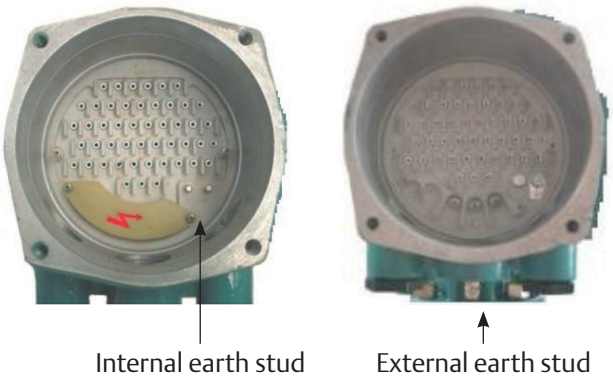
To prevent water infiltration through the line cable conduits, ensure that the cable glands used possess the minimum degree of protection required by the plant and are specified on the actuator label. If a rigid conduit makes a connection to the plant, it is recommended to place a flexible pipe connection between the conduit and the conduit entry of the additional extension.

To guarantee that the weatherproof and explosion proof characteristics are maintained, screw the cable gland or the external ATEX-certified apparatus tightly (at least 5 turns of engagement) and coat them with a thread sealant.

NOTICE

All accessories (including cable glands) must comply with approved specifications for the site requirements and be certified according to the standard directive.

Figure B-8



B.7.5 Installation in Environments with Explosive Dusts

Special attention must be paid to the following points:

- Before assembly, joint surfaces must be greased with Aeroshell grease.
- The cable glands must at a minimum possess a protection degree of IP66 or IP68 (15 m depth/90 hours) according to IEC/EN 60529 standard.
- Periodically measure the quantity of dust deposited on the surface of the actuator body. Clean the dust if it accumulates to more than 5 mm high (relative to the actuator body).

B.8 Maintenance

⚠ WARNING

Installation, configuration, commissioning, maintenance, and repairs must be performed by approved and qualified personnel only.

B.8.1 Periodic Inspection

- Inspect the general condition of the ICON3000 and the possible optional additional extension at regular intervals. The recommended frequency of inspection is once every two years but this frequency could change depending on the installation and working conditions. Any crack on the surface, broken windows, or loose bolts must be reported for repair.
- Keep the external surfaces of the unit clean: if the unit is installed in a dusty environment, the specification stated in IEC/EN 60079-14 is to be followed (ensuring in particular that the dust layer does not exceed 5 mm).
- If the actuator is covered by an intumescent coating (“Kmass”), an electrostatic charge risk is present; only anti-static cloth may be used when cleaning is required. When performing maintenance, avoid rubbing actions against the actuator (or any other friction-inducing action) that could electrostatically charge the unit.
- Check the condition of cable connections and mounting bolts; any loose connection must be tightened.

B.8.2 Disassembly and Reassembly

⚠ CAUTION

Using a fastener other than the approved type may result in damage to the actuator or valve. Refer to Table 8.

⚠ CAUTION

Failure to use proper torque values can result in damage to the actuator and/or valve.

If disassembly and subsequent reassembly of the explosion proof enclosure is required, take the necessary care to maintain all parts in their original condition.

To achieve this, the following steps must be taken:

- Do not damage the explosion proof mating surfaces on the housing or on the electrical enclosure cover.
- Reinstall all the screws that came with the dismantled parts and coat them with a film of molybdenum-based grease. This will prevent the screws from sticking and make future maintenance operations easier.
- If the screws need to be changed, the new screws must be of equal dimensions and at least equal material quality to the screws originally supplied with the unit.
- Replace the weatherproof seals that may have been removed, i.e. O-rings for the cover.
- In particular, be sure to spread a film of Aeroshell grease over the joint surfaces of all enclosures.

B.8.3 Repairs

When needed, repairs must only be carried out using spare parts supplied by the manufacturer. All accessories must comply with approved specifications and follow the application and site requirements.

⚠ WARNING

Installation, configuration, commissioning, maintenance, and repairs must be performed by approved and qualified personnel only.

⚠ WARNING

The values of gaps of explosion proof joints are lower than the maximum specified on tables of IEC/EN 60079-1 Standard and the values of widths of the explosion proof joints are greater than the values specified in the tables of the Standard IEC/EN 60079-1. Should maintenance require the replacement of any component that forms part of an explosion proof joint, only an original spare provided by Biffi can be used. Direct repair or reconstruction of the above components is not permitted without Biffi authorization. Not performing this procedure will invalidate the product safety and contractual guarantee.

Original spare parts must be ordered from the manufacturer; to ensure that correct spares are provided, the serial number printed on the ICON3000 product label must be specified when an order for spares is placed.

Appendix C: ICON3000/ICON3000AD

Ex db h IIC T4 Gb/Ex h tb IIIC T135°C Db IP66/68

Ex db h ia IIC T4 Gb/Ex h tb IIIC T135°C Db IP66/68

C.1 Safety Instructions

C.1.1 General

This Appendix C to Installation, Operation, and Maintenance Manual VCIOM-08500-EN prescribes the Safety Instructions applicable to electric actuators ICON3000-010 and ICON3000-020. The subject actuator is certified according to EN and IEC Standards 60079-0, 60079-1, 60079-11, 60079-31 and EN ISO 80079-36, 80079-37 for protection type Ex db h or Ex db h ia for gas group IIIC. The actuator is suitable for installation in an ambient temperature range from -60 °C (-76 °F) to +85 °C (+185 °F).

⚠ WARNING

Installation, configuration, commissioning, maintenance, and repairs must be performed by approved and qualified personnel only.

The ICON3000 is designed in accordance with the applicable international rules and specifications, but the following regulations must be observed in every case:

- General installation and safety regulations.
- The proper use of personal protective devices (glasses, clothing, gloves).
- The proper use of tools, lifting equipment, and transport equipment.

C.2 Instructions for Proper Installation

⚠ WARNING

Verify that the actuator nameplate conforms to the applicable certification, ambient temperature range, and site safety requirements.

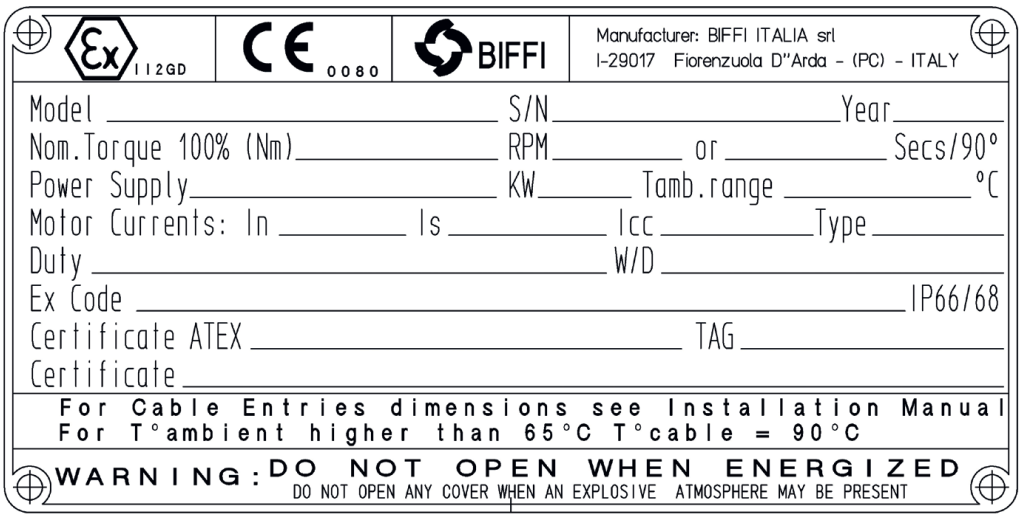
Safety warnings and warranty will be invalidated if the ICON3000 is installed in explosive atmospheres not covered by the appropriate grade of protection, and/or in environments where temperatures exceed the maximum temperature specified on the product label.

NOTICE

Check that the label (as shown by the example Figure C-1) is fixed to the unit and is complete with all the appropriate information.

C.2.1 Marking

Figure C-1 Template of the label for ICON3000



IECEx INE YY.NNNNX	=	IECEx reference certificate (CoC)
INERIS YY ATEX NNNNX	=	ATEX reference certificate
0080	=	Notified body for ATEX quality assurance (INERIS)
II	=	Group II (surface industries)
2	=	Category 2 apparatus
G	=	Explosive atmospheres caused by gas, mists, or vapors
D	=	Explosive atmospheres caused by gas dusts
IP66/68	=	Degree of protection

Table C-1.

Hazardous zone	Categories according to 2014/34/EU Directive	
Gas, mists, or vapors	Zone 0	1G
Gas, mists, or vapors	Zone 1	2G or 1G
Gas, mists, or vapors	Zone 2	3G or 2G or 1G
Dust	Zone 20	1D
Dust	Zone 21	2D or 1D
Dust	Zone 22	3D or 2D or 1D

Table C-2. Equipment Protection Level (EPL). EN 60079-14

Explosive Atmosphere	Zone	EPL
	0	Ga
Gas	1	Ga or Gb
	2	Ga or Gb or Gc
	20	Da
Dust	21	Da or Db
	22	Da or Db or Dc

C.3 Applicable General Standards and Regulations

Table C-3.

2006/42/EC	Machinery directive
2014/30/EU	EMC directive
2014/35/EU	Low voltage directive
2014/34/EU	ATEX directive
EN ISO 12100-1	Safety of machinery - Basic concepts, general principles for design. Part 1 - Basic terminology, methodology.
EN ISO 12100-2	Safety of machinery - Basic concepts, general principles for design. Part 2 - Technical principles and specification.
EN 60079-0: 2012/A11:2013	IEC 60079-0: 2011
EN 60079-1: 2014	IEC 60079-1: 2014
EN 60079-11: 2012	IEC 60079-11: 2011
EN 60079-31: 2014	IEC 60079-31: 2013
EN ISO 80079-36:2016	ISO 80079-36:2016
EN ISO 80079-37:2016	ISO 80079-37:2016

C.4 Terms and Conditions

Biffi Italia s.r.l. guarantees every product to be free from defects and to conform to industry standards. Unless otherwise specified, 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 that are subject to improper storage, improper installation, misuse, or are modified or repaired by unauthorized personnel.

Repair work resulting from improper use will be charged at standard rates.

C.5 Manufacturer’s Liability

Biffi Italia s.r.l. will not accept any liability in the event of:

- Use of product in a fashion that contravenes local safety at work legislation.
- Incorrect installation relating to, disregard for, or incorrect application of the instructions as provided on the product nameplate and in the Installation, Operation, and Maintenance Manual VCIOM-08500-EN and Appendix C within.
- Modification of the product without Biffi authorization.
- Work done on the product by unqualified or unsuitable personnel.

C.6 Storage and Pre-Installation

C.6.1 Storage Procedure

NOTICE

Not following the procedures according to this document will invalidate the product warranty.

The standard plastic plugs used to protect the cable entries during transport are neither explosion proof nor waterproof; these plugs are only designed to prevents the entry of foreign objects during transport. The general storage procedure stated in Section 2 must be followed.

C.6.2 Checks to be Performed Before Installation

Before installation, the following checks are recommended:

- Condition of joint surfaces between compartment covers and the main housing.
- Condition of the threads on the conduit entries.
- Whether the enclosure covers or the actuator body are cracked or broken.

C.7 Installation

NOTICE

Installation must be carried out in accordance to the applicable standards IEC/EN 60079-14 and IEC/EN 60079-17 regarding the electrical installations in Hazardous Areas (other than mines) classified as Zones 1, 2 (gas) and Zones 21, 22 (dust) following IEC/EN 60079-10-1 and IEC/EN 60079-10-2 and any other applicable national standards and rules.

C.7.1 Working Condition

⚠ WARNING

Verify that the actuator nameplate conforms to the applicable certification, ambient temperature range, and site safety requirements.

C.7.1.1 Models and Temperature

ICON-010 and ICON-020 from -60 °C to +85 °C (from -76 °F to +185 °F)

C.7.2 Identification of Entries

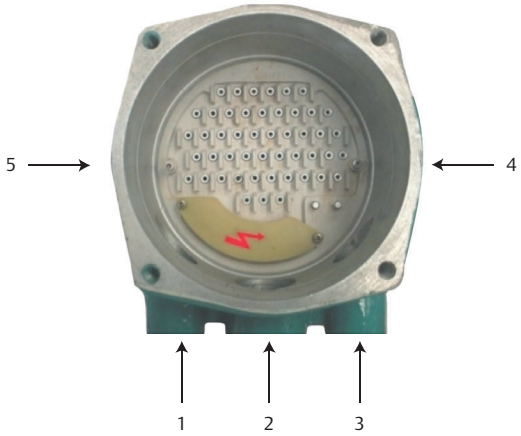
The ICON3000 electric actuator is equipped with 5 entries (3 are standard; the 4th and 5th are supplied upon request).

With reference to Figure C-2, the thread form/size for each entry is as follows:

Table C-4.

Entry	NPT size	Alternative (Metric size ISO 965)
1	1"	M32x1.5
2	1-1/2"	M40x1.5
3	1"	M32x1.5
4 (optional)	3/4"	M25x1.5
5 (optional)	3/4"	M25x1.5

Figure C-2 Base Actuator



NOTICE

When alternative entries according to ISO 965 are used, indication of the dimensions is imprinted on the adapter bush or directly on the housing when ISO 965 entries are obtained by machining the housing.

⚠ WARNING

Unused entries may remain unmachined or must be plugged with a certified plug suitable for the subject environment.

C.7.3 Electrical Connections

The electrical connections shall be made in accordance with the wiring diagram and to the general instructions associated with the documentation of the base unit.

C.7.3.1 Connection for Ex-e Terminals Enclosure

The wires must be terminated in accordance with the following method:

Type of terminal:	Insulated ring tongue
Eye dimensions:	5.5 mm (0.22 in.) for power cable 3.2 mm (0.13 in.) for control cables
Recommended tightening torques:	2.0 - 2.8 Nm (17.7 - 24.8 lb.in) for power cables 1.0 - 1.5 Nm (8.9 - 13.3 lb.in) for control cables
Wires section:	4 mm^2 (0.006 in^2) for power cables 2.5 mm^2 (0.004 in^2) for control cables

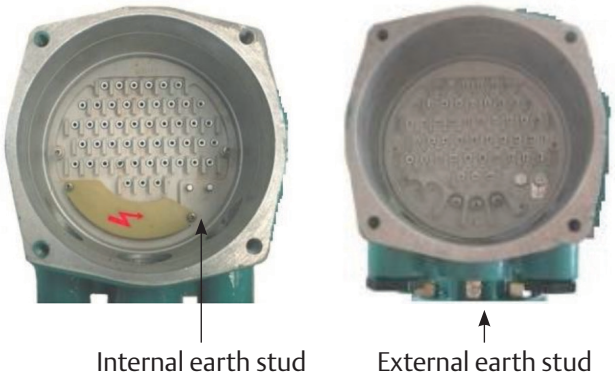
C.7.4 Cable Connection

Sealing of conduit entries must be carried out in accordance with national standards or as indicated by the relevant regulatory authorities.

Sealing methods and cable glands must be approved and separately certified for use in hazardous areas.

Two earth connection points - one internal and one external - are located on the ICON3000 base model (see Figure C-3) for connection to ground cables.

Figure C-3



NOTICE

To prevent water infiltration through the line cable conduits, be sure the cable glands used possess the minimum degree of protection required by the plant and are specified on the actuator label. If a rigid conduit makes a connection to the plant, it is recommended to place a flexible pipe connection between the conduit and the conduit entry of the additional extension.

To guarantee that weatherproof and explosion proof characteristics are maintained, screw the cable gland or the external ATEX-certified apparatus tightly (at least 5 turns of engagement) and coat them with a thread sealant.

NOTICE

The cables and cable glands MUST be selected considering the maximum temperature of the cable indicated on the label fixed to the base ICON3000 unit.

C.7.5 Installation in Environments with Explosive Dusts

Special attention must be paid to the following points:

- Before assembly, joint surfaces must be greased with Aeroshell grease.
- The cable glands must at a minimum possess a protection degree of IP66 or IP68 (15 m depth/90 hours) according to IEC/EN 60529 standard.
- Periodically measure the quantity of dust deposited on the surface of the actuator body. Clean the dust if it accumulates to more than 5 mm high (relative to the actuator body).

C.8 Maintenance

⚠ WARNING

Installation, configuration, commissioning, maintenance, and repairs must be performed by approved and qualified personnel only.

C.8.1 Periodic Inspection

- Inspect the general condition of the ICON3000 and the possible optional additional extension at regular intervals. The recommended frequency of inspection is once every two years but this frequency could change depending on the installation and working conditions. Any crack on the surface, broken windows, or loose bolts must be reported for repair.
- Keep the external surfaces of the unit clean: if the unit is installed in a dusty environment, the specification stated in IEC/EN 60079-14 is to be followed (ensuring in particular that the dust layer does not exceed 5 mm).
- If the actuator is covered by an intumescent coating (“Kmass”), an electrostatic charge risk is present; only anti-static cloth may be used when cleaning is required. When performing maintenance, avoid rubbing actions against the actuator (or any other friction-inducing action) that could electrostatically charge the unit.
- Check the condition of cable connections and mounting bolts; any loose connection must be tightened.

C.8.2 Disassembly and Reassembly

⚠ CAUTION

Using a fastener other than the approved type may result in damage to the actuator or valve. Refer to Table 8.

⚠ CAUTION

Failure to use proper torque values can result in damage to the actuator and/or valve.

If disassembly and subsequent reassembly of the explosion proof enclosure is required, take the necessary care to maintain all parts in their original condition.

To achieve this, the following steps must be taken:

- Do not damage the explosion proof mating surfaces on the housing and on the electrical enclosure cover.
- Reinstall all the screws that came with the dismantled parts and coat them with a film of molybdenum-based grease. This will keep screws from sticking and make maintenance future operations easier.
- In case the screws need to be changed it is mandatory to assure that the new screws are of the same dimension and same material as the original ones as stated in this manual, or of a better quality.
- Replace the weatherproof seals that may have been removed, i.e. O-rings for the cover.
- In particular, be sure the joint surfaces of all enclosures are spread with a film of Aeroshell grease.

C.8.3 Repairs

When needed, repairs may only be carried out using spare parts supplied by the manufacturer.

⚠ WARNING

The values of gaps of explosion proof joints are lower than the maximum specified on tables of IEC/EN 60079-1 Standard and the values of widths of the explosion proof joints are greater than the values specified in the tables of the Standard IEC/EN 60079-1. Should maintenance require the replacement of any component that forms part of an explosion proof joint, only an original spare provided by Biffi can be used. Direct repair or reconstruction of the above components is not permitted without Biffi authorization. Not performing this procedure will invalidate the product safety and contractual guarantee.

Original spare parts must be ordered from the manufacturer; to ensure that correct spares are provided, the serial number printed on the ICON3000 product label must be specified when an order for spares is placed.

Appendix D: ICON3000

Ex db eb h IIC T4 Gb/Ex h tb IIIC T135°C Db IP66/68

Ex db eb h ia IIC T4 Gb/Ex h tb IIIC T135°C Db IP66/68

D.1 Safety Instructions

D.1.1 General

This Appendix D is supplemental to Installation, Operation, and Maintenance Manual VCIOM-08500-EN and prescribes the safety instructions applicable to electric actuators ICON3000-010, ICON3000-020, and ICON3000-030, either as a base unit or when they are equipped with:

a. an additional entry mounted on the control compartment or when they are equipped with an optional extension

b. additional entries

c. an optional electronic card mounted on the terminal board compartment

The subject actuator is certified according to IEC/EN 60079-0, 60079-1, 60079-7, 60079-11 and 60079-31 standards, with protection type Ex db eb h IIC or Ex db eb h ia IIC for gas and Ex h tb IIIC for dust, suitable for installation in an ambient temperature range from -25 °C (-13 °F) to +60 °C (+140 °F).

⚠ WARNING

Installation, configuration, commissioning, maintenance, and repairs must be performed by approved and qualified personnel only.

The ICON3000 is designed in accordance with the applicable international rules and specifications, but the following regulations must be observed in every case:

- General installation and safety regulations.
- The proper use of personal protective devices (glasses, clothing, gloves).
- The proper use of tools, lifting equipment, and transport equipment.

D.1.2 Identification of Main Parts

Figure D-1 Base Unit



Figure D-2 Base Unit with Extension [A]



Figure D-3 Base Unit with Extensions [B] or [C]



D.2 Instructions for Proper Installation

⚠ WARNING

Before installation, it is mandatory to check if the nameplate associated with the extension for additional entry specifies the appropriate degree of protection and ambient temperature limits as requested by the rules applicable to the plant/location where the ICON3000 is installed.

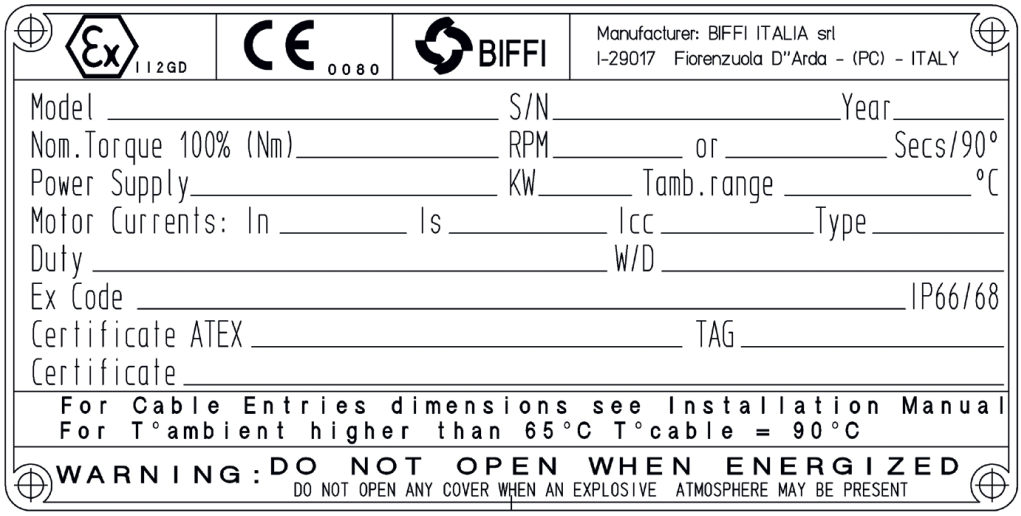
Installation in environments with the presence of an explosive atmosphere not covered by the specified grade of protection, or in environments that could reach a temperature higher than the maximum specified on the label, will invalidate the safety warnings and the warranty.

NOTICE

Check that the label (as shown by the example Figure D-4) is fixed to the unit and is complete with all the appropriate information.

D.2.1 Marking

Figure D-4 Template of the label for ICON3000/ICON3000AD/ICON3000LP



IECEx INE XX.ZZZZ	=	IECEx reference certificate (CoC)
XX ATEX ZZZZ	=	ATEX reference certificate
0080	=	Notified body for ATEX quality assurance (INERIS)
II	=	Group II (surface industries)
2	=	Category 2 apparatus
G	=	Explosive atmospheres caused by gas, mists, or vapors
D	=	Explosive atmospheres caused by gas dusts
IP66/68	=	Degree of protection

Table D-1.

Hazardous zone	Categories according to 2014/34/EU Directive	
Gas, mists, or vapors	Zone 0	1G
Gas, mists, or vapors	Zone 1	2G or 1G
Gas, mists, or vapors	Zone 2	3G or 2G or 1G
Dust	Zone 20	1D
Dust	Zone 21	2D or 1D
Dust	Zone 22	3D or 2D or 1D

Table D-2. Equipment Protection Level (EPL). EN 60079-14

Explosive Atmosphere	Zone	EPL
Gas	0	Ga
	1	Ga or Gb
	2	Ga or Gb or Gc
Dust	20	Da
	21	Da or Db
	22	Da or Db or Dc

D.3 Applicable Directives, General Standards, and Norms

Table D-3.

2006/42/EC	Machinery directive
2014/30/EU	EMC directive
2014/35/EU	Low voltage directive
2014/34/EU	ATEX directive
EN ISO 12100-1	Safety of machinery - Basic concepts, general principles for design. Part 1 - Basic terminology, methodology.
EN ISO 12100-2	Safety of machinery - Basic concepts, general principles for design. Part 2 - Technical principles and specification.
EN 60079-0: 2012/A11:2013	IEC 60079-0: 2011
EN 60079-1: 2014	IEC 60079-1: 2014
EN 60079-7: 2015	IEC 60079-7: 2015
EN 60079-11: 2012	IEC 60079-11: 2011
EN 60079-31: 2014	IEC 60079-31: 2013
EN ISO 80079-36:2016	ISO 80079-36:2016
EN ISO 80079-37:2016	ISO 80079-37:2016

D.4 Terms and Conditions

Biffi Italia s.r.l. guarantees every product to be free from defects and to conform to industry standards. Unless otherwise specified, 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 that are subject to improper storage, improper installation, misuse, or are modified or repaired by unauthorized personnel.

Repair work resulting from improper use will be charged at standard rates.

D.5 Manufacturer's Liability

Biffi Italia s.r.l. will not accept any liability in the event of:

- Use of product in a fashion that contravenes local safety at work legislation.
- Incorrect installation relating to, disregard for, or incorrect application of the instructions as provided on the product nameplate and in the Installation, Operation, and Maintenance Manual VCIOM-08500-EN and Appendix D within.
- Modification of the product without Biffi authorization.
- Work done on the product by unqualified or unsuitable personnel.

D.6 Storage and Pre-Installation

D.6.1 Storage Procedure

NOTICE

Not following the procedures according to this document will invalidate the product warranty.

Normally the optional extension for additional entry or additional electronic card is directly mounted on the base model of ICON3000 and leaves the factory in perfect condition.
In this case the general storage procedure as stated in section 2 must be followed. When the above extension is shipped separately for a field upgrade on an existing ICON3000 unit, this extension must be stored in a protected area while ensuring that the explosion proof joints are well-protected and kept free of damage. The standard plastic plugs used to protect the conduit entries during transport are not explosion proof nor waterproof; these plugs are only intended to prevent entry of foreign objects. The extension for additional entry/entries or additional electronic cards maintains the same weatherproof degree of protection as the base ICON3000 model. Good operating condition can only be maintained if the extension is correctly installed/connected on site and if it has been correctly stored.

D.6.2 Checks to be Performed Before Installation

Before installing extensions for additional entries or additional electronic cards on a base ICON3000 unit, the following checks are recommended:

- Condition of joint surfaces between compartment covers and the main housing.
- Condition of the threads on the conduit entries.
- Whether the enclosure covers or the actuator body are cracked or broken.

D.7 Installation

NOTICE

Installation must be carried out in accordance to the applicable standards IEC/EN 60079-14 and IEC/EN 60079-17 regarding the electrical installations in Hazardous Areas (other than mines) classified as Zones 1, 2 (gas) and Zones 21, 22 (dust) following IEC/EN 60079-10-1 and IEC/EN 60079-10-2 and any other applicable national standards and rules.

D.7.1 Working Condition

⚠ WARNING

Verify that the actuator nameplate conforms to the applicable certification, ambient temperature range, and site safety requirements.

D.7.1.1 Models and Temperature

ICON-010, ICON-020 and ICON-030 from -25 °C to +60 °C (from -13 °F to +140 °F)

D.7.2 Identification of Entries

D.7.2.1 Base Actuator

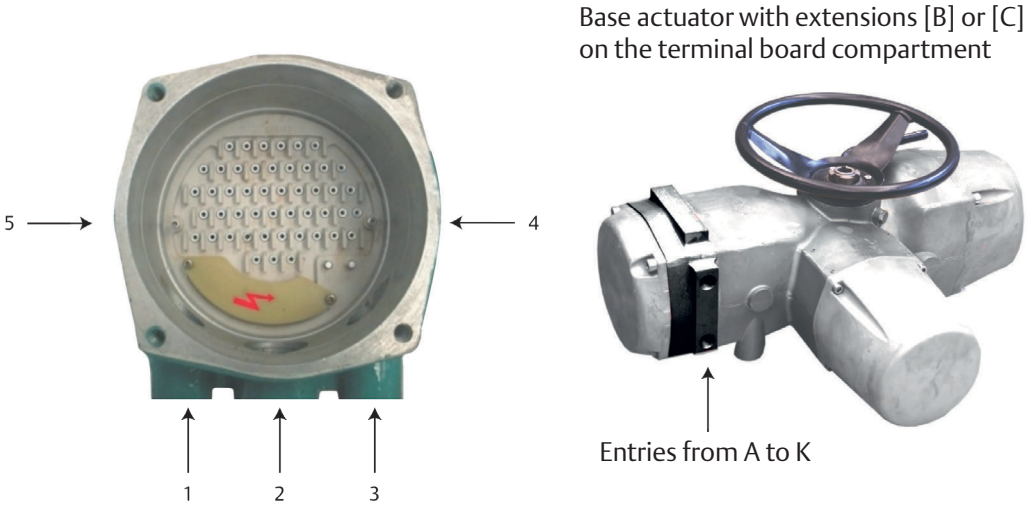
The ICON3000 electric actuator is equipped with 5 entries (3 are standard; the 4th and 5th are supplied upon request).

With reference to Figure D-5, the thread form/size for each entry is as follows:

Table D-4.

Entry	NPT size	Alternative (Metric size ISO 965)
1	1"	M32x1.5
2	1-1/2"	M40x1.5
3	1"	M32x1.5
4 (optional)	3/4"	M25x1.5
5 (optional)	3/4"	M25x1.5

Figure D-5 Base Actuator



NOTICE

When alternative entries according to ISO 965 are used, indication of the dimensions is imprinted on the adapter bush or directly on the housing when ISO 965 entries are created by machining the housing.

⚠ WARNING

Unused entries may remain unmachined or must be plugged with a certified plug suitable for the subject environment.

D.7.2.2 Base Actuator With Extension [A] on the Control Compartment

Extension [A] provides an additional entry for a cable or conduit connection or for connection of an external ATEX-certified apparatus. With reference to Figure D-2, the thread form/size for the entry is as follows:

Table D-5.

Entry	Standard size	Optional
6	M25x1.5	3/4" NPT

D.7.2.3 Base Actuator with Extensions [B] or [C] on the Terminal Board Compartment

Extension B provides up to 9 additional entries for cable or conduit connection. Extension [C] is equipped with an electronic card (Profibus or Lonworks Removable Connection Modules) and provides up to 6 additional entries.

With reference to Figure D-6, the thread form/size for the entries is as follows:

Table D-6.

Entry	Option 1 Standard Entries	Option 2 Alternative Entries (ISO 965)
A, B, C, D, E, F, G, H, K	1/2" NPT	M20x1.5

NOTICE

When alternative entries according to ISO 965 are used, indication of the dimensions is imprinted on the adapter bush or directly on the housing when ISO 965 entries are created by machining the housing.

⚠ WARNING

Unused entries may remain unmachined or must be plugged with a certified plug suitable for the subject environment.

D.7.3 Electrical Connections

External wires or connections of external ATEX-certified apparatus via the conduit entry of an additional extension must be wired to the internal cards of the ICON3000, in accordance with the wiring diagram and general instructions on the actuator label.

D.7.3.1 Connection for Ex-e Terminals Enclosure

The wires must be terminated in accordance with the following method:

Type of terminal:	Insulated ring tongue
Eye dimensions:	5.5 mm (0.22 in.) for power cable 3.2 mm (0.13 in.) for control cables
Recommended tightening torques:	2.0 - 2.8 Nm (17.7 - 24.8 lb.in) for power cables 1.0 - 1.5 Nm (8.9 - 13.3 lb.in) for control cables
Wires section:	4 mm^2 (0.006 in^2) for power cables 2.5 mm^2 (0.004 in^2) for control cables

D.7.4 Cable Connection

When optional extensions for additional entries or additional electronic cards are connected to external cables or conduits, the sealing of these entries must be carried out in accordance with the national standards or regulatory authorities that certified the extension(s). The method of sealing and cable glands used must be approved and separately certified for use in hazardous areas.

Two earth connection points - one internal and one external - are located on the ICON3000 base model (see Figure D-6) for connection to ground cables.

Figure D-6

Connection for Ex-e terminals enclosure



NOTICE

To prevent water infiltration through the line cable conduits, ensure that the cable glands used possess the minimum degree of protection required by the plant and are specified on the actuator label. If a rigid conduit makes a connection to the plant, it is recommended to place a flexible pipe connection between the conduit and the conduit entry of the additional extension.

To guarantee that the weatherproof and explosion proof characteristics are maintained, screw the cable gland or the external ATEX-certified apparatus tightly (at least 5 turns of engagement) and coat them with a thread sealant.

NOTICE

All accessories (including cable glands) must comply with approved specifications for the site requirements and be certified according to the standard directive.

D.7.5 Installation in Environments with Explosive Dusts

Special attention must be paid to the following points:

- Before assembly, joint surfaces must be greased with Aeroshell grease.
- The cable glands must at a minimum possess a protection degree of IP66 or IP68 (15 m depth/90 hours) according to IEC/EN 60529 standard.
- Periodically measure the quantity of dust deposited on the surface of the actuator body. Clean the dust if it accumulates to more than 5mm high (relative to the actuator body).

D.8 Maintenance

⚠ WARNING

Installation, configuration, commissioning, maintenance, and repairs must be performed by approved and qualified personnel only.

D.8.1 Periodic Inspection

- Inspect the general condition of the ICON3000 and the possible optional additional extension at regular intervals. The recommended frequency of inspection is once every two years but this frequency could change depending on the installation and working conditions. Any crack on the surface, broken windows, or loose bolts must be reported for repair.
- Keep the external surfaces of the unit clean: if the unit is installed in a dusty environment, the specification stated in IEC/EN 60079-14 is to be followed (ensuring in particular that the dust layer does not exceed 5 mm).
- If the actuator is covered by an intumescent coating (“Kmass”), an electrostatic charge risk is present; only anti-static cloth may be used when cleaning is required. When performing maintenance, avoid rubbing actions against the actuator (or any other friction-inducing action) that could electrostatically charge the unit.
- Check the condition of cable connections and mounting bolts; any loose connection must be tightened.

D.8.2 Disassembly and Reassembly

⚠ CAUTION

Using a fastener other than the approved type may result in damage to the actuator or valve. Refer to Table 8.

⚠ CAUTION

Failure to use proper torque values can result in damage to the actuator and/or valve.

If disassembly and subsequent reassembly of the explosion proof enclosure is required, take the necessary care to maintain all parts in their original condition.

To achieve this, the following steps must be taken:

- Do not damage the explosion proof mating surfaces on the housing or on the electrical enclosure cover.
- Reinstall all the screws that came with the dismantled parts and coat them with a film of molybdenum-based grease. This will prevent the screws from sticking and make future maintenance operations easier.
- If the screws need to be changed, the new screws must be of equal dimensions and at least equal material quality to the screws originally supplied with the unit.
- Replace the weatherproof seals that may have been removed, i.e. O-rings for the cover.
- In particular, be sure to spread a film of Aeroshell grease over the joint surfaces of all enclosures.

D.8.3 Repairs

When needed, repairs may only be carried out using spare parts supplied by the manufacturer. All accessories must comply with approved specifications and follow the application and site requirements.

⚠ WARNING

Installation, configuration, commissioning, maintenance, and repairs must be performed by approved and qualified personnel only.

⚠ WARNING

The values of gaps of explosion proof joints are lower than the maximum specified on tables of IEC/EN 60079-1 Standard and the values of widths of the explosion proof joints are greater than the values specified in the tables of the Standard IEC/EN 60079-1. Should maintenance require the replacement of any component that forms part of an explosion proof joint, only an original spare provided by Biffi can be used. Direct repair or reconstruction of the above components is not permitted without Biffi authorization. Not performing this procedure will invalidate the product safety and contractual guarantee.

Original spare parts must be ordered from the manufacturer; to ensure that correct spares are provided, the serial number printed on the ICON3000 product label must be specified when an order for spares is placed.

Appendix E: ICON3000

Ex db eb h IIB T4 Gb/Ex h tb IIIC T135°C Db IP66/68

Ex db eb h ia IIB T4 Gb/Ex h tb IIIC T135°C Db IP66/68

E.1 Safety Instructions

E.1.1 General

This Appendix E is supplemental to Installation, Operation, and Maintenance Manual VCIOM-08500-EN and prescribes the Safety Instructions applicable to ICON3000 electric actuators in sizes 010, 020, 030, 040, and 050 either as a base unit or when they are equipped with:

a. an additional entry mounted on the control compartment or when they are equipped with optional extension

b. additional entries or with an optional extension

c. an optional electronic card both mounted on the terminal board compartment, shown in Figure E-3.

The subject actuator is certified according to EN and IEC standards 60079-0, 60079-1, 60079-7, 60079-11 and 60079-31 and EN ISO 80079-36, 80079-37, for protection type Ex db eb h or Ex db eb h ia for gas group IIB and Ex h tb for dust group IIIC. The actuator is suitable for installation in an ambient temperature range from -25 °C (-13 °F) to +60 °C (+140 °F).

⚠ WARNING

Installation, configuration, commissioning, maintenance, and repairs must be performed by approved and qualified personnel only.

The ICON3000 is designed in accordance with the applicable international rules and specifications, but the following regulations must be observed in every case:

- General installation and safety regulations.
- The proper use of personal protective devices (glasses, clothing, gloves).
- The proper use of tools, lifting equipment, and transport equipment.

E.1.2 Identification of Main Parts

Figure E-1 Base Unit



Figure E-2 Base Unit with Extension [A]



Figure E-3 Base Unit with Extensions [B] or [C]



E.2 Instructions for Proper Installation

⚠ WARNING

Before installation, it is mandatory to check if the nameplate associated with the extension for additional entry specifies the appropriate degree of protection and ambient temperature limits as requested by the rules applicable to the plant/location where the ICON3000 is installed.

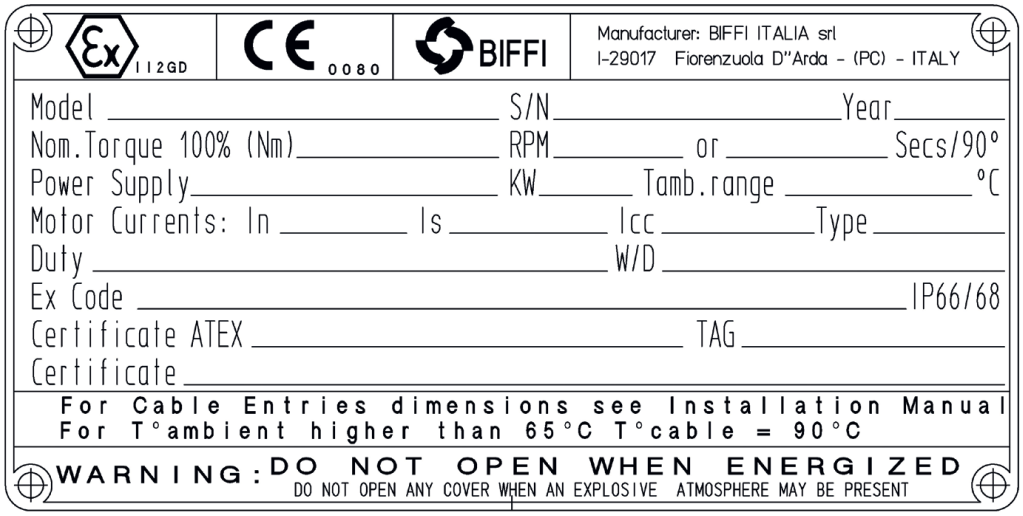
Installation in environments with the presence of an explosive atmosphere not covered by the specified grade of protection, or in environments that could reach a temperature higher than the maximum specified on the label, will invalidate the safety warnings and the warranty.

NOTICE

Check if the label, as the example here above, is fixed on the unit and completed with all the appropriate information.

E.2.1 Marking

Figure E-4 Template of the label for ICON3000



IECEx INE YY.NNNNX	=	IECEx reference certificate (CoC)
INERIS YY ATEX NNNNX	=	ATEX reference certificate
0080	=	Notified body for ATEX quality assurance (INERIS)
II	=	Group II (surface industries)
2	=	Category 2 apparatus
G	=	Explosive atmospheres caused by gas, mists, or vapors
D	=	Explosive atmospheres caused by gas dusts
IP66/68	=	Degree of protection

Table E-1.

Hazardous zone	Categories according to 2014/34/EU Directive	
Gas, mists, or vapors	Zone 0	1G
Gas, mists, or vapors	Zone 1	2G or 1G
Gas, mists, or vapors	Zone 2	3G or 2G or 1G
Dust	Zone 20	1D
Dust	Zone 21	2D or 1D
Dust	Zone 22	3D or 2D or 1D

Table E-2. Equipment Protection Level (EPL). EN 60079-14

Explosive Atmosphere	Zone	EPL
Gas	0	Ga
	1	Ga or Gb
	2	Ga or Gb or Gc
Dust	20	Da
	21	Da or Db
	22	Da or Db or Dc

E.3 Applicable General Standards and Regulations

Table E-3.

2006/42/EC	Machinery directive
2014/30/EU	EMC directive
2014/35/EU	Low voltage directive
2014/34/EU	ATEX directive
EN ISO 12100-1	Safety of machinery - Basic concepts, general principles for design. Part 1 - Basic terminology, methodology.
EN ISO 12100-2	Safety of machinery - Basic concepts, general principles for design. Part 2 - Technical principles and specification.
EN 60079-0: 2012/A11:2013	IEC 60079-0: 2011
EN 60079-1: 2014	IEC 60079-1: 2014
EN 60079-7: 2015	IEC 60079-7: 2015
EN 60079-11: 2012	IEC 60079-11: 2011
EN 60079-31: 2014	IEC 60079-31: 2013
EN ISO 80079-36:2016	ISO 80079-36:2016
EN ISO 80079-37:2016	ISO 80079-37:2016

E.4 Terms and Conditions

Biffi Italia s.r.l. guarantees every product to be free from defects and to conform to industry standards. Unless otherwise specified, 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 that are subject to improper storage, improper installation, misuse, or are modified or repaired by unauthorized personnel.

Repair work resulting from improper use will be charged at standard rates.

E.5 Manufacturer's Liability

Biffi Italia s.r.l. will not accept any liability in the event of:

- Use of product in a fashion that contravenes local safety at work legislation.
- Incorrect installation relating to, disregard for, or incorrect application of the instructions as provided on the product nameplate and in the Installation, Operation, and Maintenance Manual VCIOM-08500-EN, and Appendix E within.
- Modification of the product without Biffi authorization.
- Work done on the product by unqualified or unsuitable personnel.

E.6 Storage and Pre-Installation

E.6.1 Storage Procedure

NOTICE

Not following the procedures according to this document will invalidate the product warranty.

Normally the optional extension for additional entry or additional electronic card is directly mounted on the base model of ICON3000 and leaves the factory in perfect condition. In this case the general storage procedure as stated in section 2 must be followed. When the above extension is shipped separately for a field upgrade on an existing ICON3000 unit, this extension must be stored in a protected area while ensuring that the explosion proof joints are well-protected and kept free of damage. The standard plastic plugs used to protect the conduit entries during transport are not explosion proof nor waterproof; these plugs are only intended to prevent entry of foreign objects. The extension for additional entry/entries or additional electronic cards maintains the same weatherproof degree of protection as the base ICON3000 model. Good operating condition can only be maintained if the extension is correctly installed/connected on site and if it has been correctly stored.

E.6.2 Checks to be Performed Before Installation

Before installing extensions for additional entries or additional electronic cards on a base ICON3000 unit, the following checks are recommended:

- Condition of joint surfaces between compartment covers and the main housing.
- Condition of the threads on the conduit entries.
- Whether the enclosure covers or the actuator body are cracked or broken.

E.7 Installation

NOTICE

Installation must be carried out in accordance to the applicable standards EN/IEC 60079-14 and EN/IEC 60079-17 regarding the electrical installations in Hazardous Areas (other than mines) classified as Zones 1, 2 (gas) and Zones 21, 22 (dust) following EN/IEC 60079-10-1 and EN/IEC 60079-10-2 and any other applicable national standards and rules.

E.7.1 Working Condition

⚠ WARNING

Verify that the actuator nameplate conforms to the applicable certification, ambient temperature range, and site safety requirements.

E.7.1.1 Models and Temperature

ICON3000-010, ICON-020, ICON-030, ICON-040, ICON-050 from -25 °C to +60 °C (from -13 °F to +140 °F)

E.7.2 Identification of Entries

E.7.2.1 Base Actuator

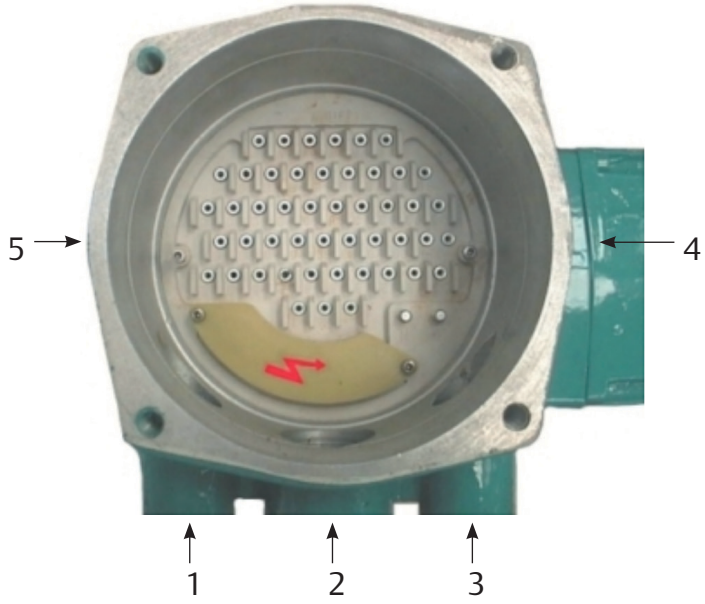
The ICON3000 electric actuator is equipped with 5 entries (3 are standard; the 4th and 5th are supplied upon request).

With reference to Figure E-5, the thread form/size for each entry is as follows:

Table E-4.

Entry	NPT size	Alternative (Metric size ISO 965)
1	1"	M32x1.5
2	1-1/2"	M40x1.5
3	1"	M32x1.5
4 (optional)	3/4"	M25x1.5
5 (optional)	3/4"	M25x1.5

Figure E-5 Base Actuator



NOTICE

When alternative entries according to ISO 965 are used, indication of the dimensions is imprinted on the adapter bush or directly on the housing when ISO 965 entries are obtained by machining the housing.

⚠ WARNING

Unused entries may remain unmachined or must be plugged with a certified plug suitable for the subject environment.

E.7.2.2 Base Actuator with Extension [A] on the Control Compartment

Extension [A] provides an additional entry for a cable or conduit connection or for connection of an external ATEX-certified apparatus.

With reference to Figure E-6, the thread form/size for the entry is as follows:

Table E-5.

Entry	Standard size	Optional
6	M25x1.5	3/4" NPT

E.7.2.3 Base Actuator with Extensions [B] or [C] on the Terminal Board Compartment

Extension B provides up to 9 additional entries for cable or conduit connection. Extension [C] is equipped with an electronic card (Profibus or Lonworks Removable Connection Modules) and provides up to 6 additional entries.

With reference to Figure E-6, the thread form/size for the entries is as follows:

Table E-6.

Entry	Option 1 Standard entries	Option 2 Alternative entries (ISO 965)
A, B, C, D, E, F, G, H, K	1/2" NPT	M20x1.5

NOTICE

When alternative entries according to ISO 965 are used, indication of the dimensions is imprinted on the adapter bush or directly on the housing when ISO 965 entries are created by machining the housing.

⚠ WARNING

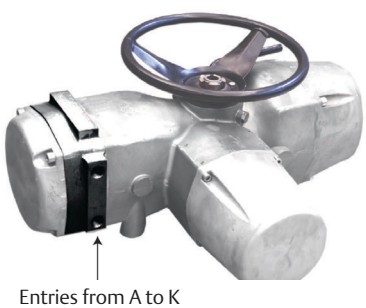
Unused entries may remain unmachined or must be plugged with a certified plug suitable for the subject environment.

Figure E-6

Base actuator with extension [A] on the control compartment



Base actuator with extensions [B] or [C] on the terminal board compartment



Connection for Ex-e terminals enclosure



E.7.3 Electrical Connections

External wires or connections of external ATEX-certified apparatus via the conduit entry of an additional extension must be wired to the internal cards of the ICON3000, in accordance with the wiring diagram and general instructions on the actuator label.

E.7.3.1 Connection for Ex-e Terminals Enclosure

The wires must be terminated in accordance with the following method:

Type of terminal:	Insulated ring tongue
Eye dimensions:	5.5 mm (0.22 in.) for power cable 3.2 mm (0.13 in.) for control cables
Recommended tightening torques:	2.0 - 2.8 Nm (17.7 - 24.8 lb.in) for power cables 1.0 - 1.5 Nm (8.9 - 13.3 lb.in) for control cables
Wires section:	4 mm^2 (0.006 in^2) for power cables 2.5 mm^2 (0.004 in^2) for control cables

E.7.4 Cable Connection

When optional extensions for additional entries or additional electronic cards are connected to external cables or conduits, the sealing of these entries must be carried out in accordance with the national standards or regulatory authorities that certified the extension(s). The method of sealing and cable glands used must be approved and separately certified for use in hazardous areas.

Two earth connection points - one internal and one external - are located on the ICON3000 base model (see Figure E-7) for connection to ground cables.

NOTICE

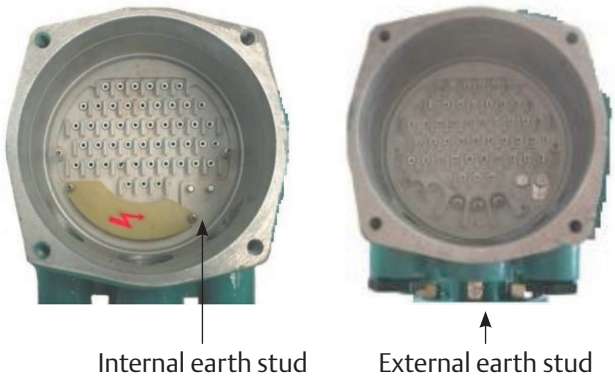
To prevent water infiltration through the line cable conduits, ensure that the cable glands used possess the minimum degree of protection required by the plant and are specified on the actuator label. If a rigid conduit makes a connection to the plant, it is recommended to place a flexible pipe connection between the conduit and the conduit entry of the additional extension.

To guarantee that the weatherproof and explosion proof characteristics are maintained, screw the cable gland or the external ATEX-certified apparatus tightly (at least 5 turns of engagement) and coat them with a thread sealant.

NOTICE

All accessories (including cable glands) must comply with approved specifications for the site requirements and be certified according to the standard directive.

Figure E-7



E.7.5 Installation in Environments with Explosive Dusts

Special attention must be paid to the following points:

- Before assembly, joint surfaces must be greased with Aeroshell grease.
- The cable glands must at a minimum possess a protection degree of IP66 or IP68 (15 m depth/90 hours) according to IEC/EN 60529 standard.
- Periodically measure the quantity of dust deposited on the surface of the actuator body. Clean the dust if it accumulates to more than 5 mm high (relative to the actuator body).

E.8 Maintenance

⚠ WARNING

Installation, configuration, commissioning, maintenance, and repairs must be performed by approved and qualified personnel only.

E.8.1 Periodic Inspection

- Inspect the general condition of the ICON3000 and the possible optional additional extension at regular intervals. The recommended frequency of inspection is once every two years but this frequency could change depending on the installation and working conditions. Any crack on the surface, broken windows, or loose bolts must be reported for repair.
- Keep the external surfaces of the unit clean: if the unit is installed in a dusty environment, the specification stated in IEC/EN 60079-14 is to be followed (ensuring in particular that the dust layer does not exceed 5 mm).
- If the actuator is covered by an intumescent coating (“Kmass”), an electrostatic charge risk is present; only anti-static cloth may be used when cleaning is required. When performing maintenance, avoid rubbing actions against the actuator (or any other friction-inducing action) that could electrostatically charge the unit.
- Check the condition of cable connections and mounting bolts; any loose connection must be tightened.

E.8.2 Disassembly and Reassembly

⚠ CAUTION

Using a fastener other than the approved type may result in damage to the actuator or valve. Refer to Table 8.

⚠ CAUTION

Failure to use proper torque values can result in damage to the actuator and/or valve.

If disassembly and subsequent reassembly of the explosion proof enclosure is required, take the necessary care to maintain all parts in their original condition.

To achieve this, the following steps must be taken:

- Do not damage the explosion proof mating surfaces on the housing or on the electrical enclosure cover.
- Reinstall all the screws that came with the dismantled parts and coat them with a film of molybdenum-based grease. This will prevent the screws from sticking and make future maintenance operations easier.
- If the screws need to be changed, the new screws must be of equal dimensions and at least equal material quality to the screws originally supplied with the unit.
- Replace the weatherproof seals that may have been removed, i.e. O-rings for the cover.
- In particular, be sure to spread a film of Aeroshell grease over the joint surfaces of all enclosures.

E.8.3 Repairs

When needed, repairs may only be carried out using spare parts supplied by the manufacturer. All accessories must comply with approved specifications and follow the application and site requirements.

⚠ WARNING

Installation, configuration, commissioning, maintenance, and repairs must be performed by approved and qualified personnel only.

⚠ WARNING

The values of gaps of explosion proof joints are lower than the maximum specified on tables of IEC/EN 60079-1 Standard and the values of widths of the explosion proof joints are greater than the values specified in the tables of the Standard IEC/EN 60079-1. Should maintenance require the replacement of any component that forms part of an explosion proof joint, only an original spare provided by Biffi can be used. Direct repair or reconstruction of the above components is not permitted without Biffi authorization. Not performing this procedure will invalidate the product safety and contractual guarantee.

Original spare parts must be ordered from the manufacturer; to ensure that correct spares are provided, the serial number printed on the ICON3000 product label must be specified when an order for spares is placed.

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