

The background of the entire page is a photograph of an industrial facility, likely a refinery or chemical plant, silhouetted against a dramatic sunset sky. The sun is low on the horizon, creating a bright orange and yellow glow that filters through dark, heavy clouds. The industrial structures, including tall distillation columns and complex piping, are dark against the bright sky. In the foreground, the dark, rippling surface of a body of water reflects the light from the sky.

# EFS 2000 ELECTRIC FAILSAFE ACTUATORS

# A WORLD OF EXPERIENCE

Biffi has been a leading manufacturer of valve actuators for more than 50 years. As one of the few manufacturers who have a global presence we can offer our customers a comprehensive selection of standard as well as specially designed actuation products. The range includes electric, pneumatic, hydraulic, direct gas, gas-hydraulic, compact and subsea actuators. All our actuators are available with a full complement of accessories suitable for a wide range of applications.

Our state-of-the-art manufacturing facilities combine lean manufacturing principles with continuous quality auditing and a zero harm work ethic, allowing us to maintain the highest standards of product reliability and quality. Local sales offices and after sales support teams situated in 32 countries worldwide ensure we are on hand to meet the day-to-day flow control requirements of your plant or process. Our network of smart and configuration centres, sales representatives, distributors and agents offices provides local spares inventory, product support and training for each market, with access to our global support services, design, engineering and manufacturing expertise where required.

Biffi's commitment to the highest ethical standards in our daily business practices, towards our workers, the environment and the wider community, is recognized by the achievement of the following certifications

**ISO 9001** – Quality management system

**SA 8000** – Social accountability standard

**ISO 14001** – Environmental management system

**BS OHSAS 18001** – Occupational health and safety assessment



# EFS 2000 THE FAILSAFE SOLUTION

## PRECISE AND RELIABLE

EFS 2000 is an intelligent electric quarter-turn spring-return actuator designed to close or open a valve in emergency conditions. In critical applications where electricity is the only available power source, the EFS 2000 mechanical spring guarantees fail safe operation. This combines the safety of conventional spring return actuators with the economy and ease of use of electric actuators.

It integrates advanced ICON technology to provide precise and reliable actuation and comprehensive information to ensure your valves operate effectively and efficiently.

Reliability is engineered through carefully-selected materials and internal components. Models are available either waterproof or explosionproof.

## EFFICIENT AND COST-EFFECTIVE

Operating and maintenance costs are kept low through minimal mechanical parts and an efficient design with the motor engaged directly to the gears. All internal sensors are contactless, ensuring long life and high precision. Internal wiring is minimized through an enhanced terminal board and modular, reprogrammable electronic card with all major optional functions integrated, enabling easy plug-in of future upgrades.

## SIMPLE AND SAFE

Configuring and commissioning are fast and easy, either through its user friendly integral push-button panel or a PDA communicating wirelessly via Bluetooth™.

Non-intrusive set-up and operation provide personnel safety and a configurable Emergency Shutdown (ESD) feature protects the valve and process. It is certified for use in SIL 3 applications.

## INTELLIGENT AND INFORMATIVE

Internal circuits monitor system status continuously and elaborate all the information from the sensors. Clear messages are displayed for process diagnostic and advanced maintenance programs.

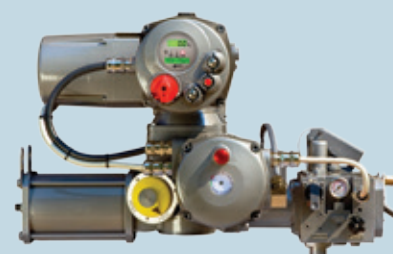
These include:

- Advanced maintenance data including the last opening and closing position/torque curves with relative parameters and direct comparisons with torque signature
- Actuator internal parameters with precise and clear alarm reports, with both general and recent (partial) log

An exhaustive data log system collects valuable data for maintenance or diagnostic programs. It provides a torque analysis to assist in valve fault detection and condition monitoring, which can result in significant time and cost savings. Essential actuator and valve information can be stored electronically in a non-volatile memory and downloaded.

## ADVANCED COMMUNICATION

EFS 2000 is easily upgradable to provide network system connectivity and supports all major fieldbus systems.



## TECHNICAL SPECIFICATIONS

### POWER SUPPLY

Three phase from:  
208 to 690 V at 50/60 Hz

Single phase from:  
110 to 240 V at 50/60 Hz:

Direct current:  
24 to 110 V

### TORQUE OUTPUT

Spring starting torque:  
up to 18000 Nm

Spring ending torque:  
up to 9000 Nm

Electric mode starting torque:  
up to 25500 Nm

Electric mode ending torque:  
up to 12500 Nm

### AMBIENT TEMPERATURE

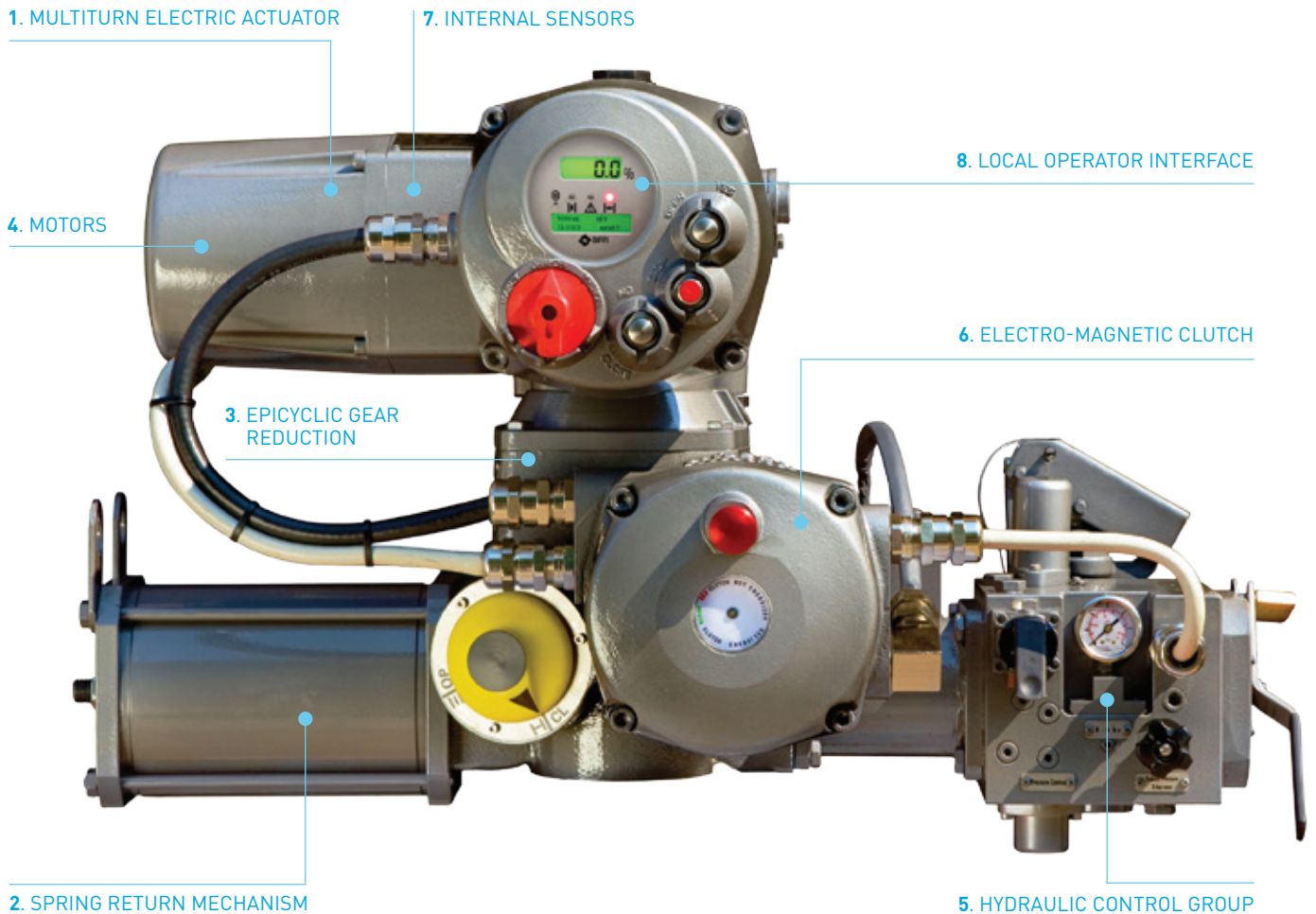
Standard range -20°C to +85°C  
Extended temperature ranges  
available

### DUTIES

On / Off or inching

S2 - 15'

S2 - 30'



# ENGINEERED FOR PERFORMANCE AND RELIABILITY

## HIGH PROFILE STANDARDS

The base version is an intelligent actuator with hardwired connections which incorporates all the major features.

## ADVANCED DESIGN FEATURES

Heavy-duty simplified gearing provides exceptional efficiency and the highly precise internal sensors feature a low consumption position encoder specifically designed for electric actuators. The terminal box features a wide enclosure to facilitate wiring connection and the motor connections are simple, allowing fast removal. Opto-coupled remote controls enable the actuator to be controlled by 4,3 or 2 wires with configurable voltage-free latching relays providing status and alarm indication.

## LOCAL SHUTDOWN

The EFS 2000 spring's action moves the actuator to the required fail position by default when a shutdown signal is received.

Local shutdown can be configured through the local interface for loss of main power and local selector selected in OFF position.

Local shutdown can also be activated by remote hardwired command if the parameter 'PST/EFS' is configured as 'EFS' (PSD function) and locally via a mushroom pushbutton.

## EMERGENCY SHUTDOWN (ESD)

ESD is realized by safety function cutting the electric supply to the electromagnetic clutch.

## INDUSTRIES

- OFFSHORE PLATFORMS
- OIL & GAS PIPELINES AND STORAGE
- OIL REFINERIES
- LNG
- PETROCHEMICALS
- CHEMICALS
- PHARMACEUTICALS
- POWER GENERATION
- MINING
- WATER PIPELINES
- WATER TREATMENT

### 1. MULTITURN ELECTRIC ACTUATOR

Operates the valve, through an epicyclic gear reduction, during normal working conditions and compresses the spring when the operation is opposite to the fail safe direction.

### 2. SPRING RETURN MECHANISM

Based on a rack and pinion mechanism, it moves the valve to the fail-safe position in response to an ESD or local SD command. It is kept in the fail safe position by helical springs.

### 3. EPICYCLIC GEAR REDUCTION

Increments the actuator's torque and transforms the stroke into a quarter turn value.

### 4. MOTORS

The motor is engaged directly to the gears, increasing overall system efficiency and lowering operational costs. A three-phase asynchronous, squirrel cage, induction-type low inertia balanced motor is standard, with class F or H insulation and a dedicated speed and temperature sensor. A special interface enables the use of conventional asynchronous motors for single phase or direct current supply.

### 5. HYDRAULIC CONTROL GROUP

A hydraulic control group with two base functions:

1. Adjustment of fail-safe time
2. Manual override function for when electrical power is unavailable using a hand pump.

### 6. ELECTRO-MAGNETIC CLUTCH

Holds the female wheel of the epicyclic gear in position during normal operation and releases it in fail-safe mode.

### 7. INTERNAL SENSORS

All internal sensors are non-contact.

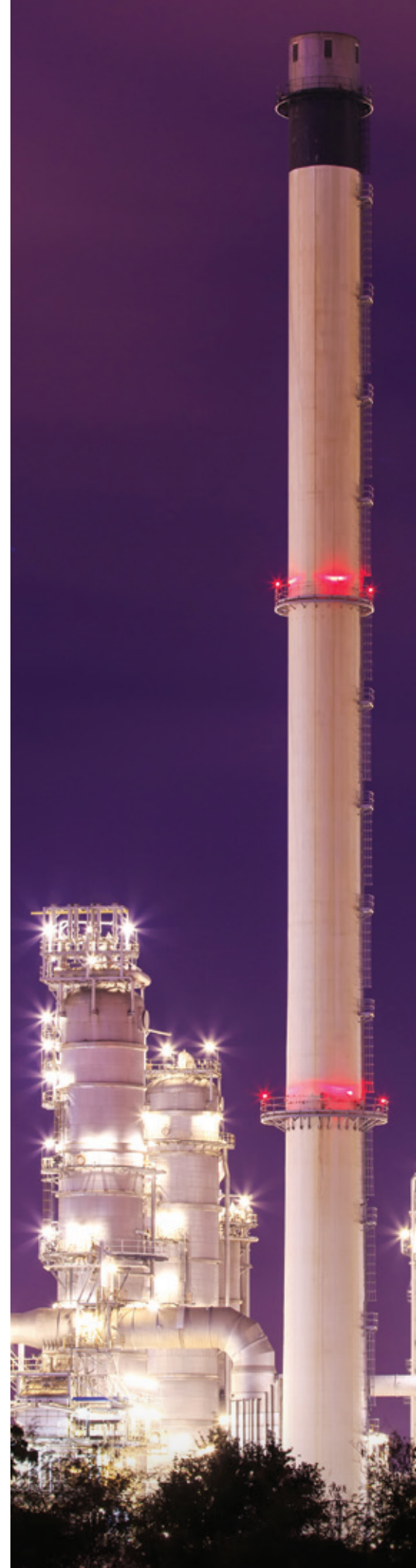
TORQUE SENSOR provides direct measurement of motor speed torque to 1% of nominal, based on motor torque vs. speed characteristics, compensated for voltage and temperature. The torque vs. speed curve is memorized for each motor type, enabling simple replacement if required.

POSITION SENSOR (US patented) based on a Hall-effect incremental encoder with 10° of output shaft rotation resolution. A dedicated low power microprocessor counts rotations in both directions.

Position is updated, stored and displayed locally following manual operation during power failure.

### 8. LOCAL OPERATOR INTERFACE

Designed to be operated easily and supply a complete and clear set of information, it features a padlockable operation selector and 3 recessed pushbuttons for controls and menu navigation. The heated backlit display is customizable in eight selectable languages, providing information numerically with 3½ digits for position and torque indication or graphically at 32 x 122 pixels for diagnostics.





# COMPLETE ACTUATION SOLUTIONS

## PC AND PDA MANAGER

PC and pda manager software allows the complete control, set-up and diagnostics of the actuator.

With a smart user-friendly graphic interface, the actuator set-up, configuration data, diagnostic messages and data logger information are available to view, analyse and reconfigure from your PDA or PC.

## DATA LOGGER

The inbuilt data logger collects valuable information for maintenance and diagnostic programs and can operate in recorder mode for measuring and storing main actuator internal parameters. Up to 256 sets of measurements can be stored with configurable sampling time and start date and time.

Event mode with storage of open or close commands including indication of source, date and time with configurable start date and time. Up to 128 events can be memorized including: alarms, torque profiles, torque curves and signatures, operations and maintenance data.

## OPTIONAL MODULES

A variety of optional modules can be added to the base version.

## 4-20 mA ANALOG CARD

Necessary for actuators in inching duty.

## POWER AND HEATING

Solid state power switch over temperature (only for heavy modulation duty version) detects the power card's maximum temperature condition and sets the relevant alarm.

Additional anti-condensate heater for use when the environment air humidity reaches critical levels.

Auxiliary battery in an intrinsically safe enclosure to enable position to be transmitted remotely in case of power failure.

## FIELDBUS INTERFACES

The EFS 2000 can be upgraded easily from hardwired to bus versions. A flexible interface allows connection to the major field bus available on the market:

- Foundation Fieldbus
- Profibus DPV0, DPV1 and redundant DPV1
- LonWorks
- Hart
- Modbus

## PARTIAL STROKE TEST (PST)

Initiated automatically or by a local or remote hardwired signal, PST checks the functionality of the essential parts to achieve the EFS safety function while the valve and actuator are in line and in service. The clutch is de-energized, enabling the spring

to move the valve to a preconfigured position and then re-energized to stop the valve. An electrical command drives the valve to its initial position.

## POSITION SERVOAMPLIFIER MODULE (PSM)

Necessary for actuators in inching duty, it drives the motor through pulses at constant frequency and duration proportional to the position error, following an externally set analog point signal.

The main features are:

### Input:

4-20 mA with galvanic insulation.

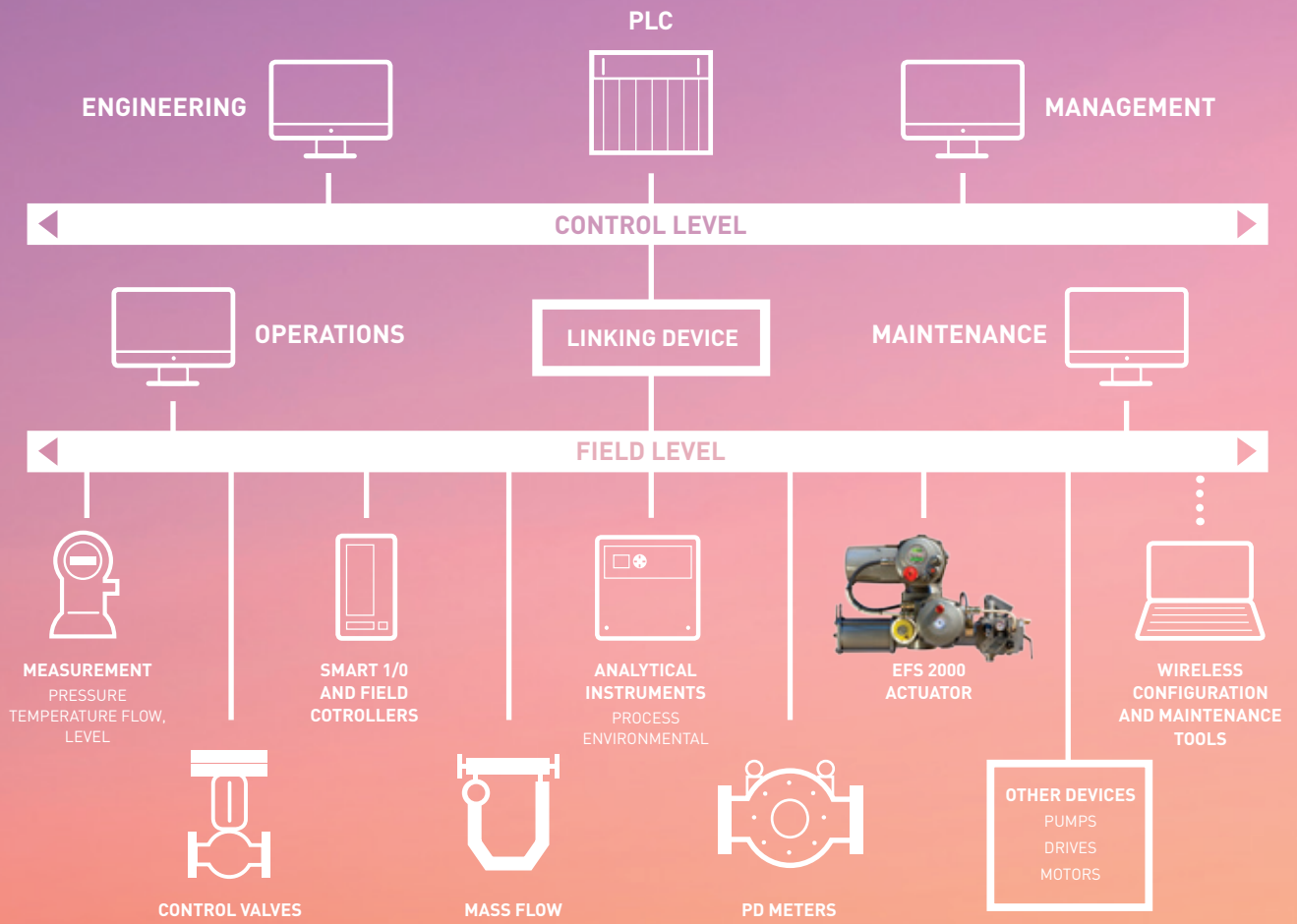
### Output:

4-20 mA with galvanic insulation for position or torque re-transmission.

## POSITION ANALOG RETRANSMISSION MODULE (APTM)

A 4-20 mA galvanically insulated module for position or torque retransmission which is easily plugged in on the base card with no need for dedicated tools.







Biffi reserve the the right to change product designs and specifications without notice.

**Biffi Italia S.r.L.**

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