

# rotork® Fluid Systems



## VRCS Range

Valve Remote Control Systems for Marine Applications



Keeping the World Flowing

## Introduction

More than 80 years of experience in specialist design, fabrication and installation of actuators and Valve Remote Control Systems

The Valve Remote Control System (VRCS) is considered by the "International Convention for the Safety of the Life at Sea" (SOLAS) to be critical for the safety of passengers, crew and transported cargo on any type of ship, whether on commercial ships, cruise vessels, chemical carriers, LNG, LPG, and even FPSOs.

Since the company was founded, Rotork has become the standard for excellence in the field of valve and damper automation for all industries around the world.

Rotork's leading solution for the marine and offshore industries is the Masso range of Valve Remote Control Systems. With more than 80 years of experience in specialist design, fabrication and installation of actuators and VRCS, the Masso range provides safety critical solutions.

Our involvement goes further than just providing the actuators; we provide solutions. Well equipped Rotork trained engineers, technicians and representatives provide worldwide on-site and factory based service. In addition, specialist Rotork Site Services teams offer preventive maintenance, retrofit and client support services.

### Industry Compliance

- IACS UR E10
- IEC 60092-504
- IEC 60945 Ed.4

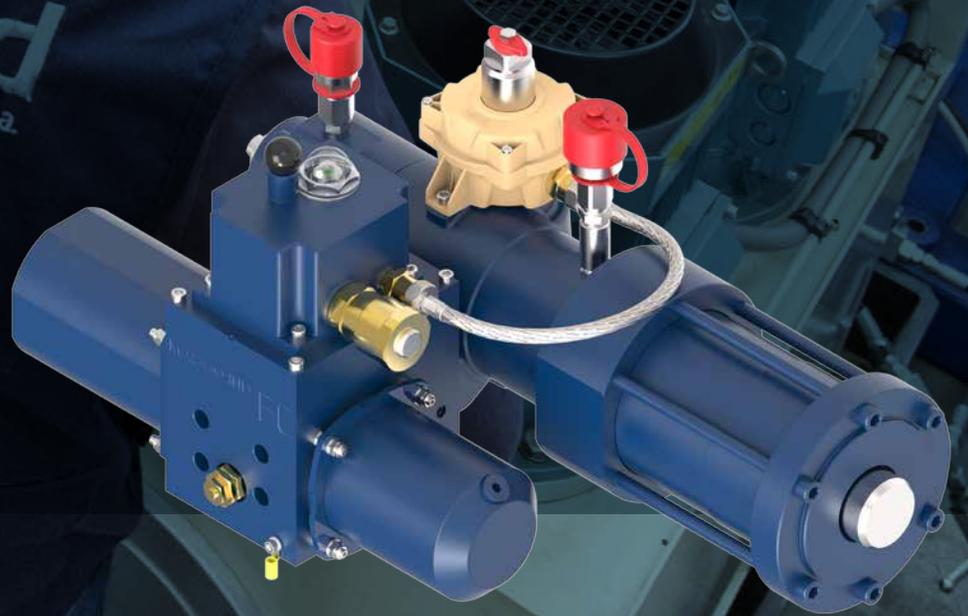
Frigates  
Corvettes  
Aircraft Carriers  
Submarines  
FPSOs  
FLNG  
Semi-Submersible Platforms  
Offshore Support Vessels  
Cargo Ships  
Oil and Chemical Tankers  
LNG Carriers  
Cruise Vessels  
Ferries  
Mega Yachts





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## Hydraulic Valve Remote Control System

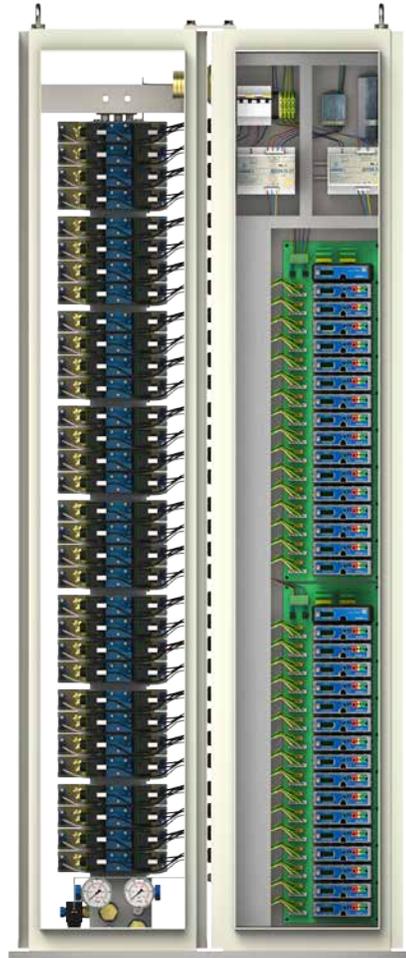


Designed for marine applications, our VRCS takes into consideration all the challenges faced by ship operators worldwide. The main design concepts are:

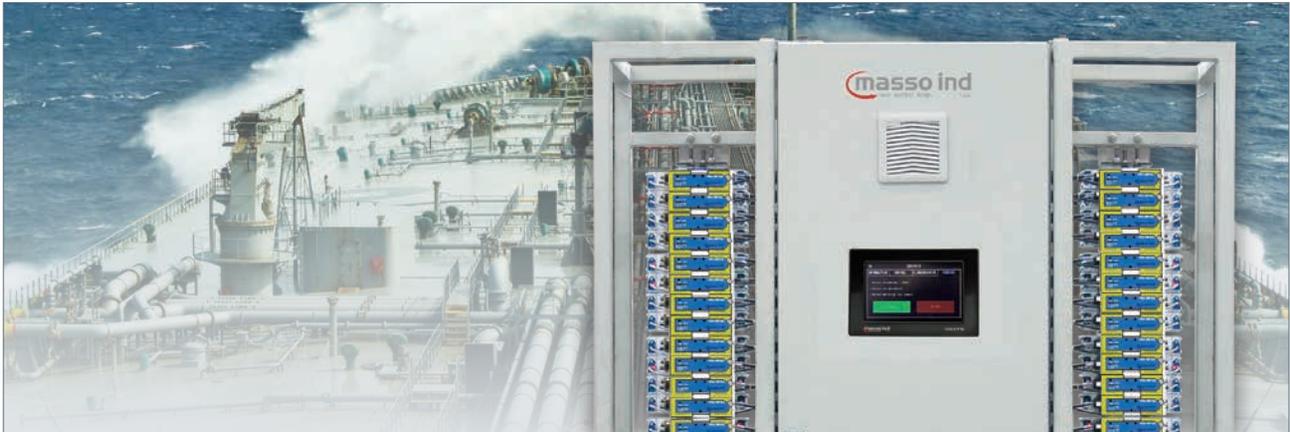
- Engineered for reliability. The cabinets allow for redundant power supply and redundant communication lines to the automation system. Two VoOil sensors are installed per each valve, increasing the precision of the position feedback reading.
- Internal leakage of hydraulic components has been reduced to a minimum, minimizing the loss of hydraulic pressure. A solution called RPC (Reduce Pressure Consumption) has been developed to further reduce leakage on the solenoid valves when there are no commands to the actuators. This results in reducing the HPU's number of motor starts, thus increasing the lifetime of the system, and as a result achieving lower maintenance costs.
- Purposely designed for valve applications – providing critical information such as pipe leakage detection alarms, valve obstruction, change in operating conditions.

The high reliability of our VoOil sensor, in combination with our dedicated valve controllers, makes our system extremely useful not only for submerged valves but even in case of valves installed in Hazardous area Zone 1 or 0, where the use of traditional indirect position feedback methods are not reliable, and the cost of explosion-proof devices is excessively high.

The system is interfaced with the automation by redundant bus communication, while an additional hard-wired interface is also available for each valve to be controlled by a mimic or a security system.



## Hydraulic Solenoid Valve Cabinet



Because our cabinets have been specifically designed with marine applications in mind, we keep the right balance between performance and the need to save space.

With purposely designed electronic components, and small envelope connectors to the field, our cabinets are very compact and at the same time communicate directly to the IAS (Integrated Automation System) directly, without the need of an intermediate I/O cabinet.

In fact, our cabinets can be integrated with any type of Automation System by means of redundant digital communication RS485 serial lines through Modbus® standard protocol interface. Ethernet communication is also available upon request.

Redundancy is a core aspect of our system, considering also redundant power supplies, and an additional input from the UPS Bus bar. Additionally, our control cabinets can be interfaced to other systems, like a Mimic, or the ESD system via direct hard-wired connections for each valve.

The cabinets are provided with an operator service terminal, which can be used to monitor the status of the valves and the cabinets, and also for setup of maintenance.

The Hydraulic Solenoid Valve Cabinet fulfills the requirements of all major classification societies and is complete with all installation accessories and emergency operation fittings.



## Valve Controllers

The foundation of our VRC System lies on the Valve Controller cards. Based on the proven TAC-S technology, already implemented in hundreds of ships, the Masso Ind valve controllers are used to control and monitor the valve actuators in the field.

Each digital card controls a single valve, and receives its position feedback. A number of LEDs on the front panel report the operating status of each card. The valves can be controlled directly from the card via a Local/Remote Selector and open/close button.

The cards also monitor the status of the valves, with alarms generated due to a leakage in the hydraulic piping, valve obstruction, and if the valves are moved manually.

For additional safety, the cards can be connected hardwired directly to Mimic or ESD systems.

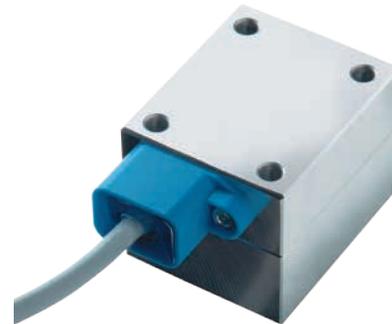


## Voil Oil

The VoilOil is a volumetric sensor designed to measure the amount of oil passing through a hydraulic circuit. In particular the sensor has been designed to indirectly detect, with extreme precision, the position of hydraulic actuators used in remote control valve systems.

The high reliability and accuracy of our Voloil sensor –less than 2% error on 100m pipe length-, in combination with our valve controllers, makes it an extremely useful and economic feedback sensor in all cases, On/Off or throttling and including submerged valves or valves installed in Hazardous area Zone 1 or 0.

Its extreme precision, even with very low flow rates, allows our system to easily detect leakages in the hydraulic pipes, which would otherwise be extremely difficult to detect.



## RPC Function

The RPC end Manifold, reduces the oil pressure (from 150 bar to 30 bar) to the hydraulic solenoid valve rack when no command is applied to the valve. This prevents a natural oil leakage of the solenoid valves, avoiding an otherwise typical loss of pressure of the system.

This process increases accumulator load times and the stand-by-time of the hydraulic pumps, thus extending the life time of the pumps.

The RPC function is particularly useful for systems that remain inoperative for a long period of time.



## Hydraulic Actuators



Our Rack & Pinion Double Acting and Single Acting rotary actuators, are specifically engineered to operate small to medium size butterfly, ball, plug or other quarter-turn valves for either on/off or throttling service.

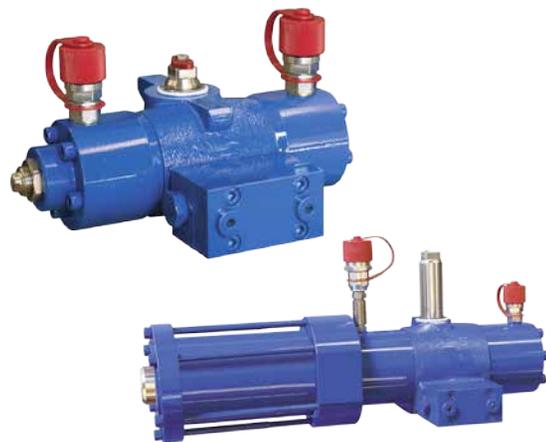
The body is in nodular cast iron, rack in steel, pinion in AISI 316, wide selection of gaskets and slide bearings in Viton, Teflon, BUNA N, NBR. These materials-in conjunction with special cycles of epoxy coating- have been carefully selected to operate in aggressive marine and off-shore environments. They are also suitable for submerged applications in crude oil (sour category / heavy API degree), oil products, salt water, installed inside floating and dry docks galleries, drilling platforms legs and placed in every dry location.

Due to their compact and modular construction based on a central body and two cylinders housing the rack and the pinion, it is possible to carry out maintenance activities (replacement of gaskets and o-rings) directly on the spot, without removing the actuator from the valve.



## Quarter-Turn Rack and Pinion Hydraulic Actuators

- Rack & Pinion Hydraulic Actuators Spring-Return (5 sizes) and Double acting (10 sizes)
- Double acting torques up to 4,360 Nm (single rack) and 22,950 Nm (double rack) at 150 bar
- Single acting torques up to 655 Nm (Higher torques available upon request)
- Body in nodular cast iron
- Rack in steel, pinion and shaft in AISI 316
- Possible close regulation from  $-3^\circ$  up to  $+0^\circ$
- 2 quick connectors for portable or local hand pump
- Modular interconnecting brackets according to ISO 5211
- Local position indicator
- Available special execution in AISI 316

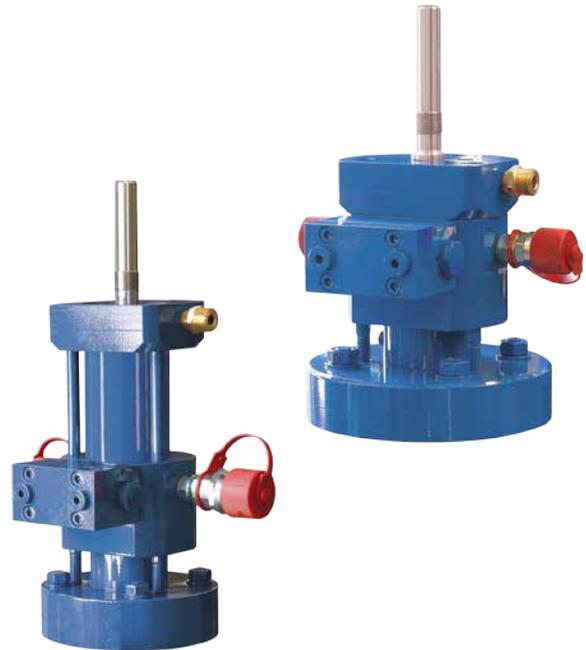


## Linear Hydraulic Actuators

Our linear actuators have been specifically designed to be mounted directly on globe valves. This provides a compact and lightweight assembly on board. Typical applications include bilge, ballast and fuel services.

Main features include:

- Heavy duty linear hydraulic actuator
- Design pressure 150 bar
- Single acting thrusts up to 22,650 N
- Double acting thrusts up to 126,300 N
- Body and flanges in nodular cast iron
- Shaft fully in AISI 316
- Extended stem available for feedback unit coupling
- 2 quick connectors for portable or local hand pump
- Easily connected to our self-contained mini power pack



## Quarter-Turn Helical Actuators

Featuring a hyper-compact screw type design, our helical actuators have been designed to reduce the actuator weight and space as much as possible. With its center of gravity as close to the mid-point of the valve, these actuators are ideal for naval applications requiring a high tolerance to shocks.

Main features include:

- Hyper compact screw type design
- Design pressure 150 bar
- Double acting execution
- 3 sizes – 240, 460, 850 Nm @150 bar
- Shaft and Pinion in one piece fully in AISI 316
- Possible close regulation from  $-3^{\circ}$  up to  $+0^{\circ}$
- 2 quick connectors for portable or local hand pump
- Direct assembling by means of ISO 5211 standard



## Hydraulic Power Unit



Our Hydraulic Power Unit features a stand-alone design: it can be hard-wired to the automation system or have an optional serial connection but in both cases the automation cannot stop or re-start it from remote: it may only read the information.

A touch screen housed in the Starter cabinet displays the HPU status, keeps a record of the events, provides indications and programmed maintenance.

Internal leakage of hydraulic components has been reduced to a minimum, minimizing the loss of hydraulic pressure

### Main Features:

- Redundancy of all critical components
- Redundant power supply
- 2 accumulators as standard
- Compact design for confined spaces
- Very low leakage of hydraulic components
- Low maintenance costs
- Full diagnostic capabilities



## Accessories



### PHP (Portable Hand Pump)

This easy transportable lightweight PHP unit is used for the actuators' emergency operations. It consists of:

- Lever operated hydraulic pump with a 3 litre oil reservoir complete with optical level indicator and filling cap
- Manually operated three position directional valve for the control of open/close operations
- Pressure gauges on both the pressure and return connections
- 2 metre length hoses provided with standard female quick connecting coupling (other lengths available upon request)
- Installed on an open frame structure used both for its transport and for the pumping operations, providing the PHP with necessary support base

### SHP (Stationary Hand Pump)

The SHP (Stationary Hand Pump) is normally used for the manual operation of valves requested by Classification Societies to be connected with a fixed emergency pump (Side valves, overboard discharge for example) and consists of:

- 5 litre oil reservoir (Double acting), or 3 litre oil reservoir (Single acting)
- Removable hand lever
- Directional three position flow control valve for valve open-close-stop (Double acting only)
- Pressure gauges on both the pressure and return connections
- Installed on an open frame structure
- The SHP may be optionally supplied housed in carbon steel (sand blasted and primer coated) or in a stainless steel deck boxes for installation on the Main Deck or unsheltered areas

### ALEB (Actuator Local Emergency Block)

The ALEB block is used to maintain the valve in position (Fail Set) in case of an oil leakage of the hydraulic pipes, and consists of a double piloted check valve (hydrolock) in spheroidal cast iron with carbon steel inner parts.

### AREB (Actuator Remote Emergency Block)

The AREB block is used for the remote emergency operation – using our Portable Hand Pump (PHP) – of double acting valve actuators that are not easily accessible, or are even submerged, and consists of:

- A modular block, manufactured in cast iron, sand blasted and primer coated, suitable for installation on open deck
- One double piloted check valve
- Two standard quick connecting coupling in galvanized carbon steel complete with protective plastic cap (stainless steel quick coupling available on request)
- Standard in/out carbon steel pipe fittings (stainless steel pipe fittings available on request)
- A carbon steel support can be supplied optionally for the AREB installation on Deck or Bulkhead.

### CROSS-OVER

The Cross Over block is used only for air venting the pipes.

### LVPI (Local Visual Position Indicator)

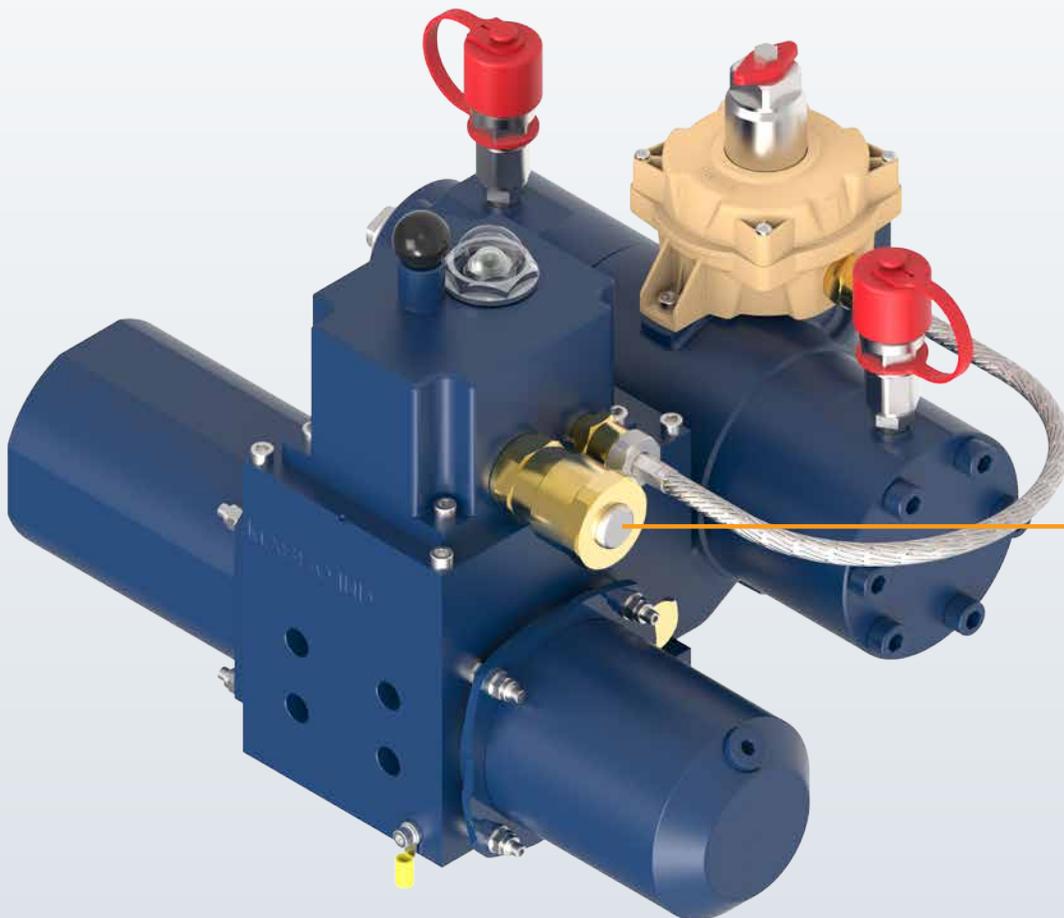
This device provides an indication of the last branch pressurized, and is mostly used for submerged valves.

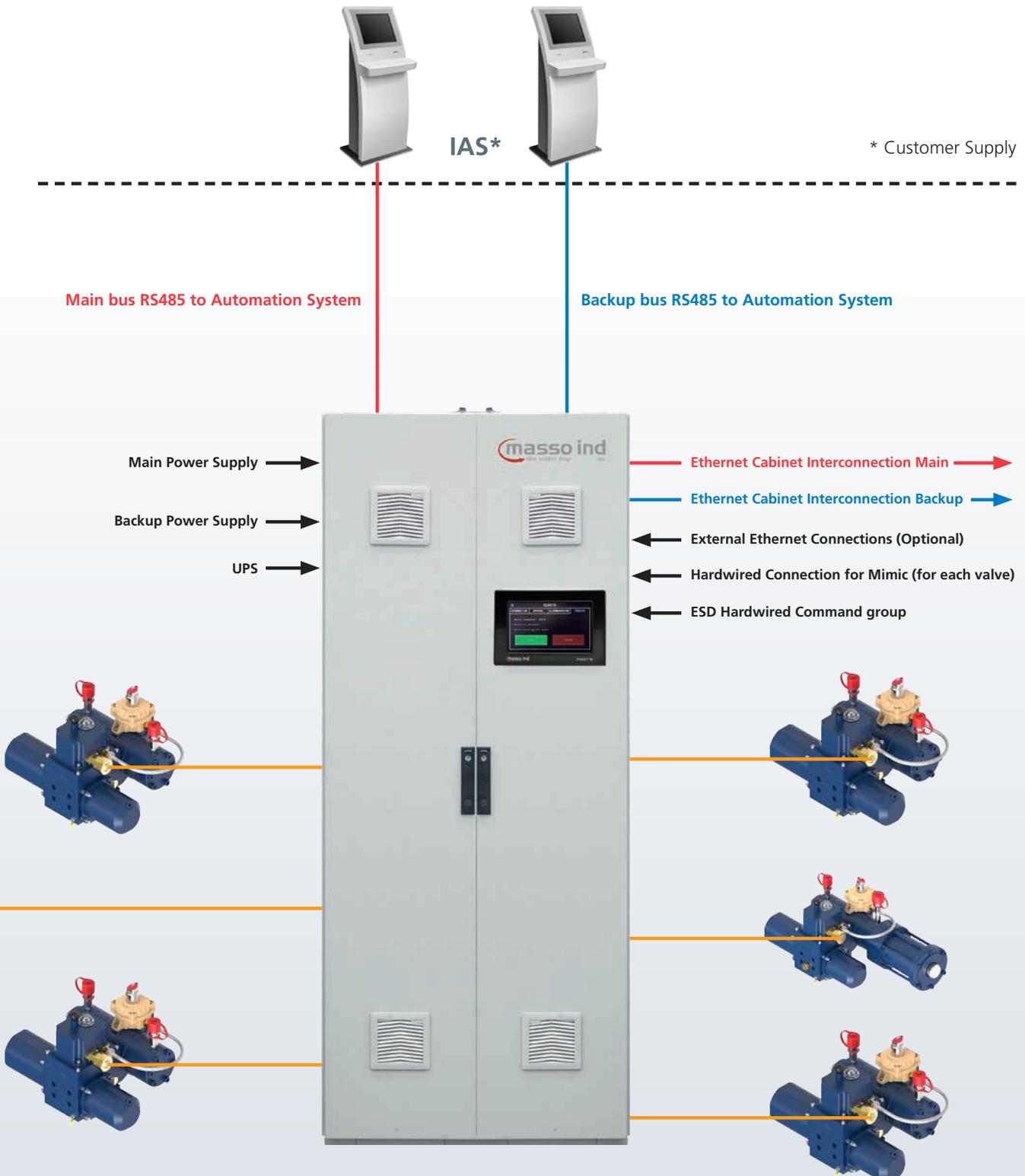
## Electro-Hydraulic Valve Remote Control System

Utilizing the valve controller technology used in our Hydraulic system, we can provide Electro-Hydraulic valve remote control systems.

MASSO IND E-ACTs (Electro hydraulic ACTuators) are used for the remote operation of the valves in a Valve Remote Control System. A mini power pack joined with a quarter turn or linear actuator and a hall-effect feed-back unit provides high reliability when operating butterfly, ball and stop-check valves with double or spring-return actions.

Amongst its main advantages, our electro-hydraulic system avoids the need of extensive hydraulic tubing throughout the ship, and replaces the HPU and Hydraulic Solenoid Valve Cabinets for smaller control cabinets. Additionally because we replace the hydraulic piping with electric cabling, installation and maintenance costs are vastly reduced, bringing cost savings to shipyards and ship-owners alike.



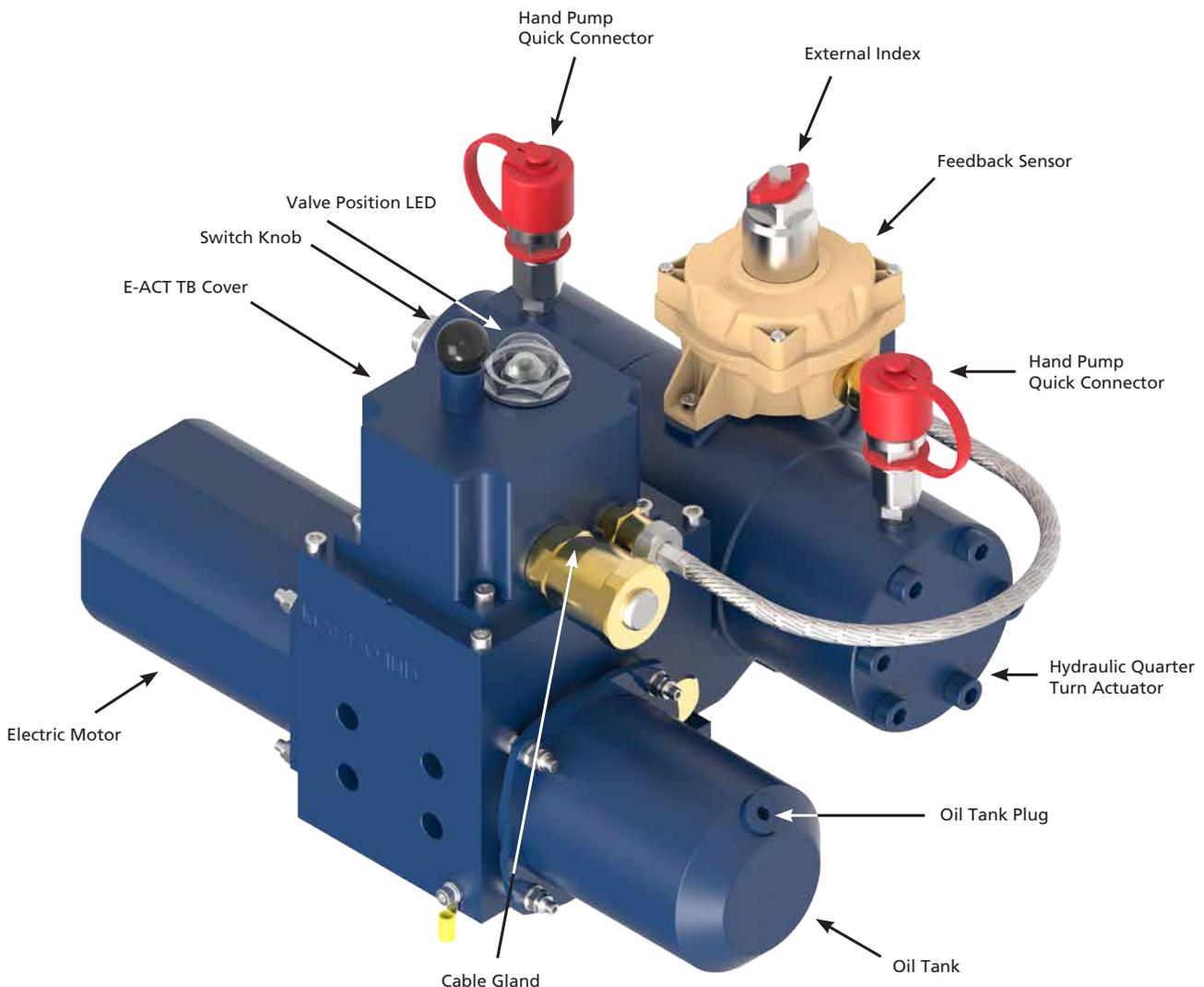


## Electro-Hydraulic Valve Remote Control System

MASSO IND E-ACTs (Electro hydraulic Actuators) feature a compact design, that allows installation even in narrow spaces. A mini power pack joined with a quarter turn or linear actuator and a hall-effect feed-back unit provides high reliability when operating butterfly, ball and stop-check valves with double or spring-return actions.

Its main features include:

- Actuators built to last - Nodular cast iron for linear and rotating actuators. Aluminium for mini-power pack. Techno polymer for feed-back unit box. Stainless steel 316 for shaft. The mini-power packs are also available in Nodular cast iron upon request.
- Its modular design allows for an easy exchange of spare parts, without the need of replacing the entire unit. Interchangeable mini-power pack unit.
- The Mini-power pack unit is interchangeable on every valve and actuator of the same type independently from their size. The different types are: one type for Fail Set; one type for Fail Close and one type for Fail Open. The differentiation is done by the hydraulic block. This allows drastic reduction of spare part set and allows the fastest and easiest maintenance procedures.
- The possibility to rotate the mini-tank makes it easier for the user to find the correct position for the oil filling plug. This solution allows the E-ACT to be installed in any position.
- The housing on the E-ACTs cover includes a switch knob to disconnect the automation priority in case of maintenance, with feedback both to the automation and on the spot by a blue LEDs. (If connected to third party control cabinets, this feature needs to be programmed by the PLC as an interlock)



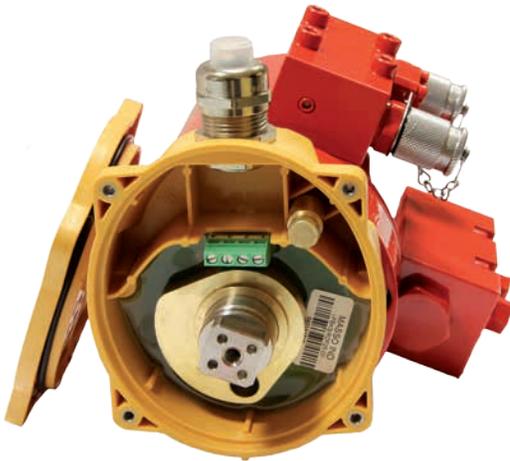
## Feedback Units

### FBKS

The FBKS is a feedback unit directly mounted on the actuator, and designed to meet the requirements established by the classification societies and deal with the critical situations of the marine field.

The FBKS (Both in its rotary and linear mode) was designed with the marine environment in mind: the unit consists of a printed circuit board containing hall-effect sensors, resin-bonded and located inside a polymer box. A magnetic dimmer is fixed to the valve stem, and has no contact with the feedback unit.

This design allows for a very quick setup during commissioning of the system, and prevents dirt and humidity and corrosive elements to damage the unit during the installation process. Furthermore, an increased life of the feedback unit is guaranteed, resulting in a high reduction in maintenance costs.



Advantages of the FBKS include:

- Available for quarter-turn and linear valves
- No contact or mechanical drag between the valve stem and the feedback unit
- Maintenance free
- Immune to vibrations
- Immune to dirt ingress
- Immune to humidity and salt corrosion
- Easy to use, foolproof calibration
- Polarity reversal and overload-protected
- Output protected with current limiters



## Electric Valve Remote Control System

Using the same high-end technology used in our Hydraulic Valve Remote Control system, the Masso Ind VRCS is also able to operate electric actuators. We have a full range of actuators, designed to meet the stringent requirements of the marine industry. They are accurate, robust and efficient, and provide the high levels of durability and reliability that you require.

The ROM actuators provide quiet and reliable operation for all kinds of small butterfly and ball valves, making them an ideal solution on small to medium sized vessels. They provide self-locking as standard, local visual indicators and manual override options together with a wide range of voltages.

The ROM range is complimented with the Schischek range of electric actuators. Harsh environmental conditions and robust quality cause stringent design / construction requirements on components and materials. A fast closing electric actuator of less than 3 seconds is a common requirement in the oil and gas market, as well as cruise vessels. Thousands of Schischek actuators in special aluminum, C5-M and stainless steel housings have been delivered and installed, moreover, the product range has been continuously enlarged and refined.





## Pneumatic Valve Remote Control System

The RC200 pneumatic actuator features a modern scotch-yoke mechanism that provides high start- and end- torque output in a very compact package. It is available in both double-acting and spring-return configurations with an optional integral manual override.

RC200 actuators have the lowest weight and the smallest external dimensions of any actuators with an equivalent torque output. This yields a compact and light yet robust valve/actuator package, particularly when a manual override solution is required. Another benefit is that they have less stroke volume than comparable actuators, providing a significant saving in the use of compressed air.

The RC200 range is complimented with the GT range of rack and pinion actuators. Since 1963 G.T. Attuatori develops and manufactures pneumatic actuators and related accessories in Cusago (Milano, Italy). Our products are established and approved all over the world since some decades. Today G.T. Attuatori is one of the biggest actuator manufacturers of pneumatic actuators.

With decades of experience engineering fluid power valve automation for a multitude of applications and markets, you can depend on Rotork to provide a reliable and safe automation solution, including actuators, limit switch boxes, solenoid valves, positioners, or valve adaptation.



## Special Applications

### Anti-Shock Hydraulic System

Masso Ind has designed and developed a hydraulic valve remote control system to work at a shock Grade A Class 1 according to NAV-30-A001. The cabinets have additionally been tested for submersion IP68 3m, 48hours. This allows the cabinets to be installed in the lower decks with high shock requirements, reducing the need for hydraulic piping to the upper decks. Redundant power supply and communications to the automation system, make this system highly reliable in naval applications.

The Solenoid valve cabinets, in combination with our anti-shock HPU, and our PLPF actuators-also shock tested-completes a stand-alone system for controlling valves in marine and particularly naval applications.

### Hydraulic Multi-Turn Actuators

Hundreds of 4H multi-turn hydraulic actuators have been supplied to LNG vessels all around the world. On these vessels, the unique actuation properties of the 4H actuator successfully overcome many potential operational problems, particularly on the cryogenic globe valves used for cargo loading and unloading.

The actuator's torque limiting feature, through its Planetary Torque Control System (PTCS), incorporates a mechanism to permanently limit the torque output under any circumstances, even at high speeds. Although Masso Ind's HPU has a constant output pressure, this feature can be useful when integrated with other ship's systems or HPUs that operate various machinery, and if running at capacity can cause pressure surges to the actuators. The PTCS system prevents damages to the valve, caused by these pressure surges.

### Remote-Manual Operation

The Uniflex-Stow system is a unique answer to the problem of remote mechanical valve actuation. When a valve is in a hazardous or hard-to-reach position, and must be actuated, then Uniflex-Stow solves the problem. It is the safe and reliable way to actuate almost any valve.

#### Features

- Maximum operating torque at valve: 271 Nm
- Maximum system length: 46 M
- Minimum system length: 1 M
- Minimum bend radius: 304 mm
- Operating environment: -54 °C to +427 °C

### Manual Override Gearboxes

The Rotork Gears ILG-D gear operators are designed to provide a means of manually overriding pneumatic valve actuators in marine applications. These gear operators employ a de-clutchable design for use with double acting actuators. To ensure long life, the housing is sealed to IP65 and the input shaft is made from Protected Steel. All ILG-D units mount between the valve and actuator and may be supplied with an ISO drive shaft.

The range is complimented with the ILG-S series, designed to provide means of manually overriding pneumatic spring-return actuators. This design features a 90° slotted key drive and does not utilize a disengagement mechanism.



Anti-Shock Hydraulic System



Hydraulic Multi-Turn Actuators



Remote-Manual Operation



Manual Override Gearboxes

# rotork® Site Services

Rotork staff are dedicated to providing client support across all Rotork divisions with the aim of maximising the client production cycle. These teams are based out of service centres around the world and are complemented by factory-trained agents.

Our expert technicians support Rotork customers, allowing us to deliver on our promise of global solutions backed by local service.

We provide a full range of flow control services:

- Emergency and planned service
- Actuator overhauls
- Health checks
- Preventative maintenance
- Retrofitting actuators to existing valves
- Shutdown outages
- Certified inspection and safety checks
- Factory fitting of actuators to new valves
- Plant optimisation
- Repairs and upgrades
- Loan actuator service
- System Integration projects
- Automation projects

Visit [www.rotork.com](http://www.rotork.com) to identify your nearest Rotork Site Services centre.



### Client Support Programme

Rotork offers a premium level of product reliability and availability through the flexible Client Support Programme (CSP). Designed to facilitate the highest production demands while providing a tiered approach to maintenance, the CSP is committed to reducing maintenance downtime and costs.

Through consultation, the CSP is tuned to deliver the optimum level of maintenance through predictive maintenance algorithms.



### Features of the CSP are:

- Fixed term prices for Rotork products and services
- Customisable cover based on equipment criticality to production
- Equipment performance related targets for reliability and availability
- Priority support with customisable response times
- Fully parts and labour inclusive, no additional costs or discounted labour and parts
- Fix or replace options
- Periodic equipment performance and status reports
- Built-in regular health checks on all equipment

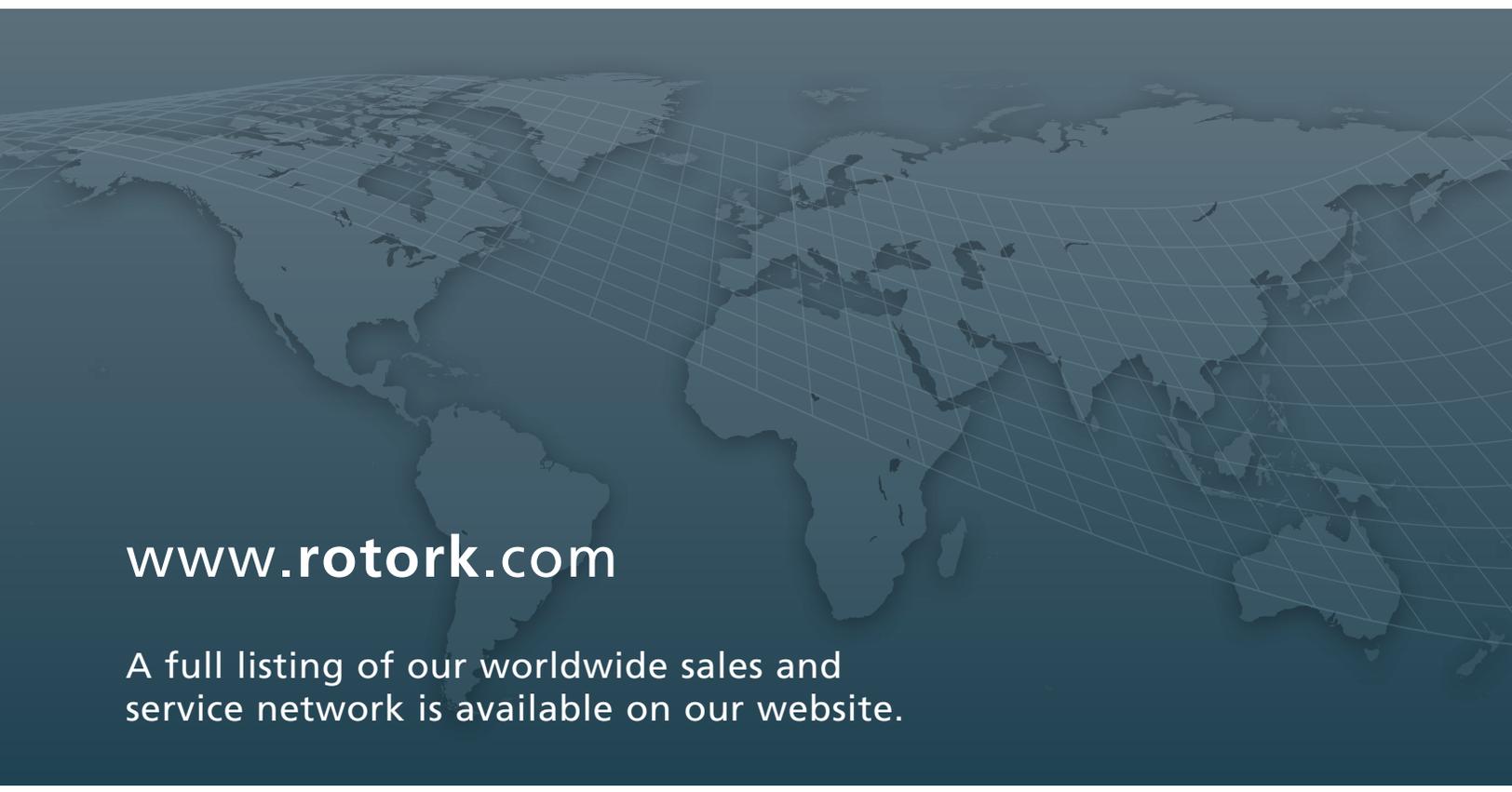
### Benefits of the CSP include but are not limited to:

- Year-on-year reduced maintenance costs
- Easy budget management
- Maximised production resulting in reduced downtime
- Year-on-year improved reliability and availability
- Optimised resource usage to accelerate in-house projects
- Reduced lifecycle costs





Keeping the World Flowing

A dark blue, semi-transparent world map with a white grid of latitude and longitude lines is centered in the background of the lower half of the page.

[www.rotork.com](http://www.rotork.com)

A full listing of our worldwide sales and service network is available on our website.

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