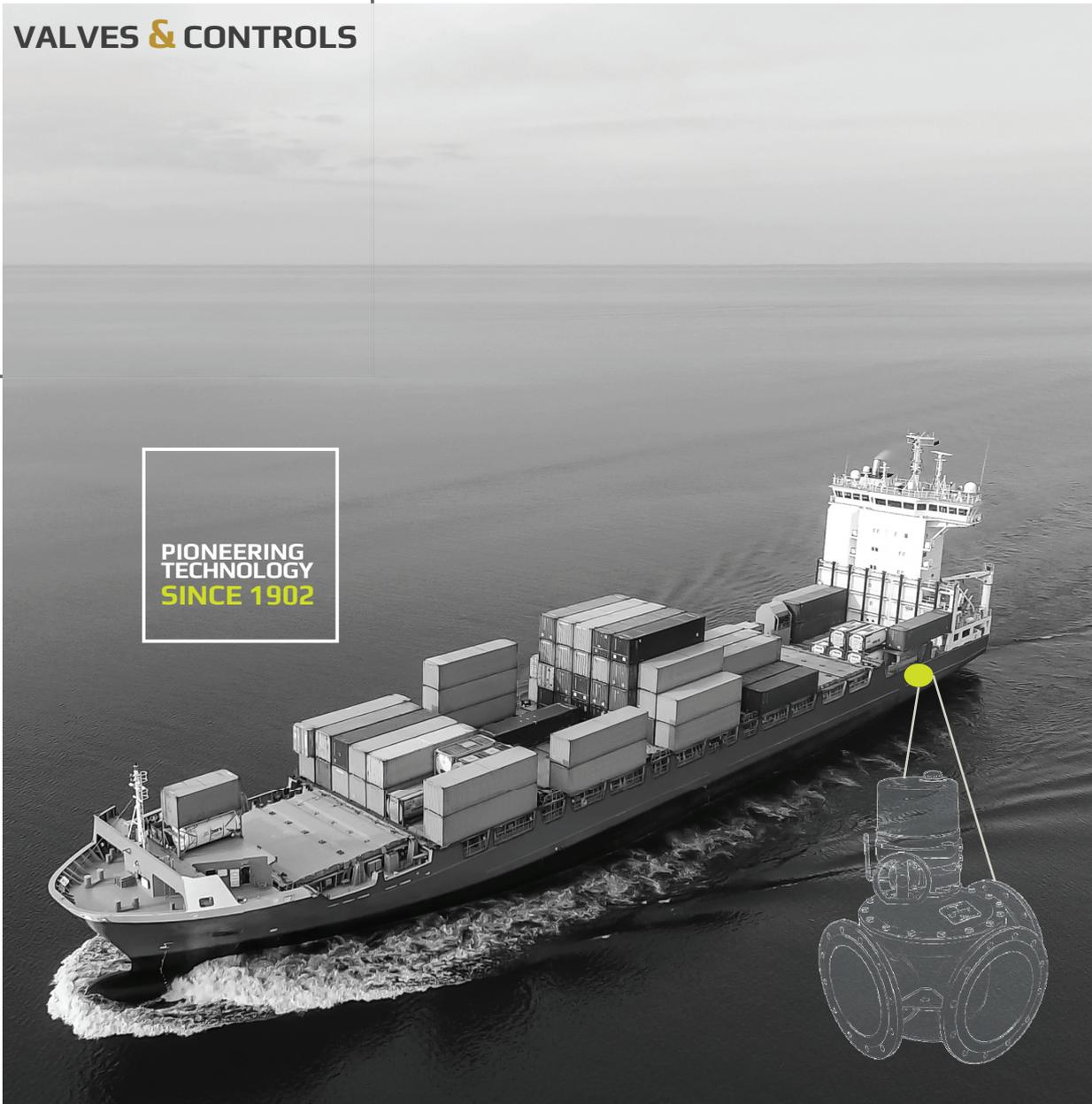


# Marine Solutions

VALVES & CONTROLS

PIONEERING  
TECHNOLOGY  
SINCE 1902



# PREMIUM FLOW MANAGEMENT SOLUTIONS

Clorius Controls is a leading manufacturer of valves, actuators, and comprehensive control solutions supporting various marine and industrial applications. Aside from our extensive assortment of control valves and actuators, we provide tailored solutions, including electric, pneumatic, self-acting and direct-acting control systems to meet the specific requirements set by the customers.

Clorius' products are designed to meet the tasking requirements of our clients. Our products, constructed with premium materials ensure longer life cycle, minimal maintenance and lower cost of ownership.



We are surpassing expectations by providing the best flow management solutions, the most experienced people, and unparalleled application knowledge.



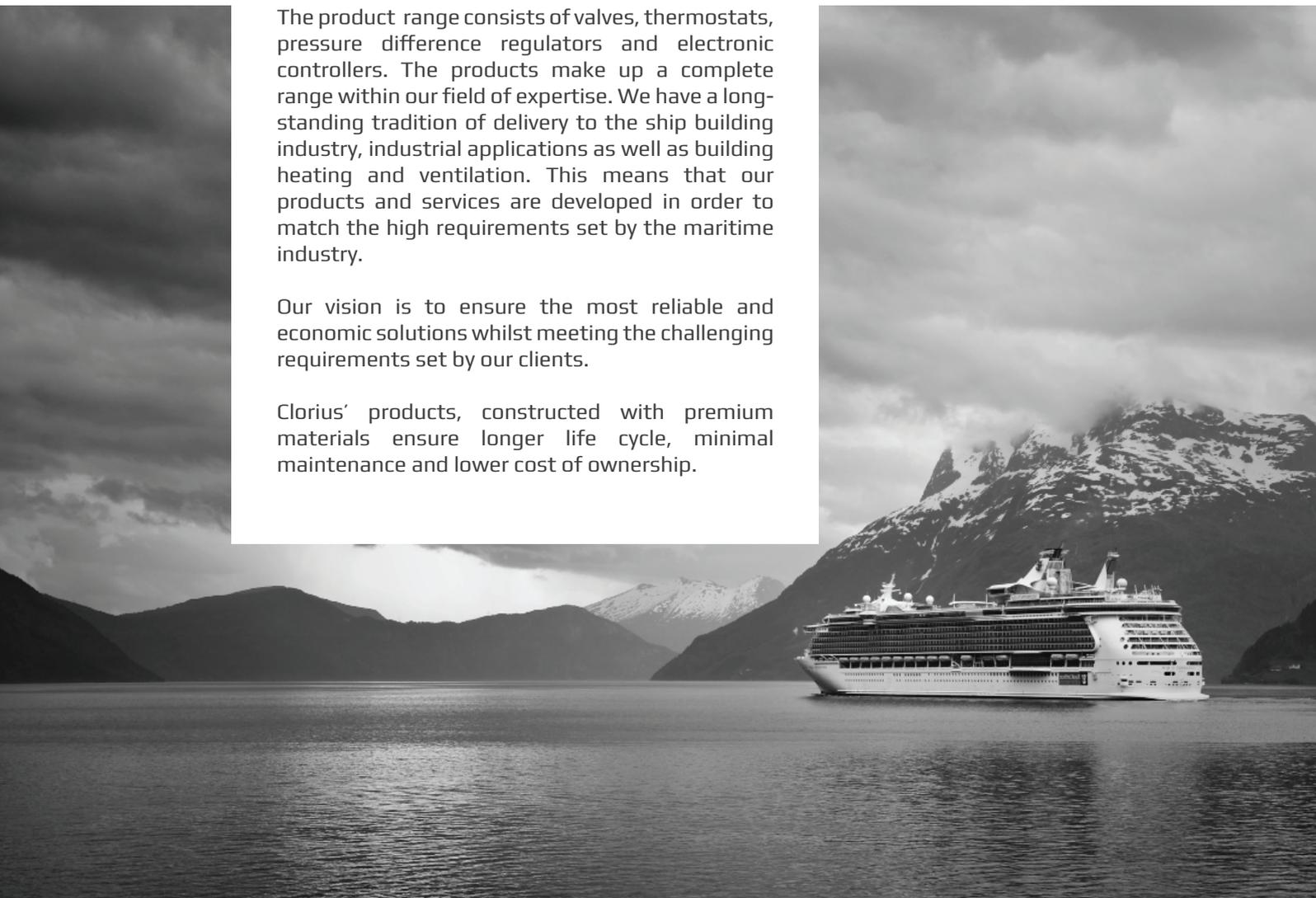
# A CENTURY OF DELIVERING QUALITY

Clorius specializes in the development and production of equipment for monitoring, controlling and regulating heating, cooling and ventilation.

The product range consists of valves, thermostats, pressure difference regulators and electronic controllers. The products make up a complete range within our field of expertise. We have a long-standing tradition of delivery to the ship building industry, industrial applications as well as building heating and ventilation. This means that our products and services are developed in order to match the high requirements set by the maritime industry.

Our vision is to ensure the most reliable and economic solutions whilst meeting the challenging requirements set by our clients.

Clorius' products, constructed with premium materials ensure longer life cycle, minimal maintenance and lower cost of ownership.



## **PREFERRED SUPPLIER TO THE MARITIME INDUSTRY**

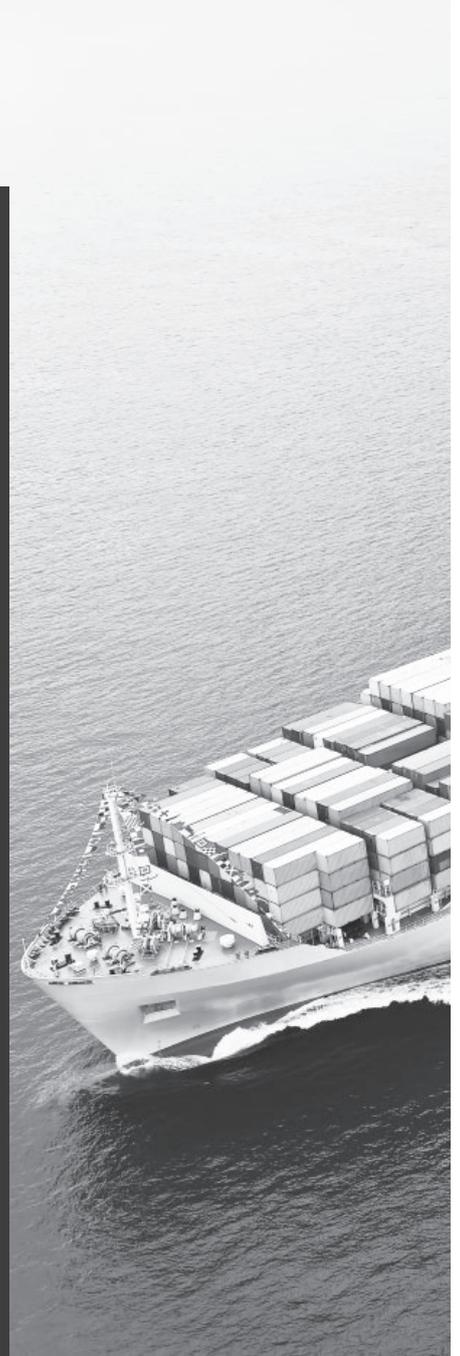
With roots in the maritime industry that go back to 1902, Clorius has become a preferred supplier of solutions for relatively simple as well as far more complex challenges. By working closely with our clients and their suppliers, Clorius adds value throughout the entire lifecycle of the ship. With our focus on quality we provide solutions that guarantee optimal use of the equipment and the vessel.

We take pride in being the preferred supplier to the maritime industry by offering customer-specific, value-driven and long-lasting solutions.

All Clorius Controls solutions are designed with extensive research and development and is supported by over 115 years of experience in the maritime industry.

This is acknowledged by the type approvals for our solutions from multiple classification authorities, including Germanischer Lloyds, DNV GL, ABS, RINA, RS, CCS, KR to name a few.

Clorius' marine products are designed to meet the challenging requirements of shipbuilders around the globe, by delivering premium quality valves and actuators for various marine applications. Their robust construction coupled with premium materials ensures longer life cycle for the vessels, minimal maintenance and lower cost of ownership.



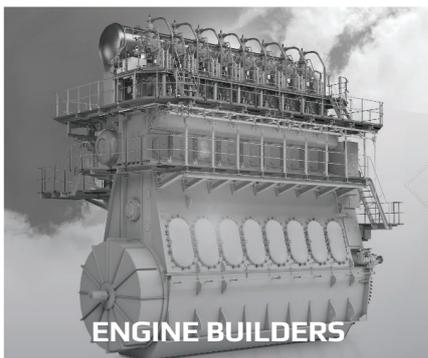
# INDUSTRIES WE SERVE

*Clorius Controls caters to the specific needs of the maritime and offshore industry by supplying premium and highly efficient flow management solutions, comprising of top-quality control valves, actuators and positioners.*

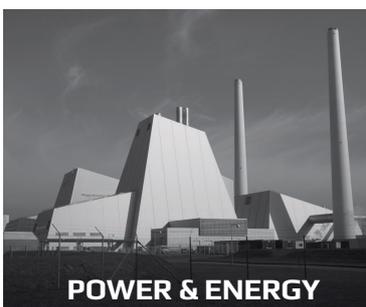
*Our products and services are continually ensuring safe, reliable and efficient usage while preventing any potential downtime.*



- Main and auxiliary engine cooling systems
- Fuel and lubricating oil temperature control
- Tank heating and cleaning



- Customer specific engineered valves for main and auxiliary engine cooling systems



- Cooling systems on Biomass, Oil & Gas and nuclear power plants
- Cooling water and lubricating oil temperature control on power units

# SOLUTION OVERVIEW

*Clorius Controls specializes in a control valve and actuator portfolio with the lowest cost of ownership for use in challenging conditions. As one of the leading control valve manufacturers, we are committed to providing premium industrial solutions to our clients.*

*Below are just a few of the configurations we currently produce and supply.*

## ELECTRIC

### ELECTRIC ACTUATOR 3 POINT, ANALOG



For 2-way and 3-way valve up to DN 800. Actuators for linear and rotating valve types. Handle for manual control available

## PNEUMATIC

### PNEUMATIC ACTUATOR SPRING CLOSE/OPEN POSITIONER



For 2-way and 3-way valve up to DN 800. Actuators for linear and rotating valve types. PI or alternatively PID pneumatic controllers.

## SELF-ACTING

### THERMOSTAT DN15 - 150



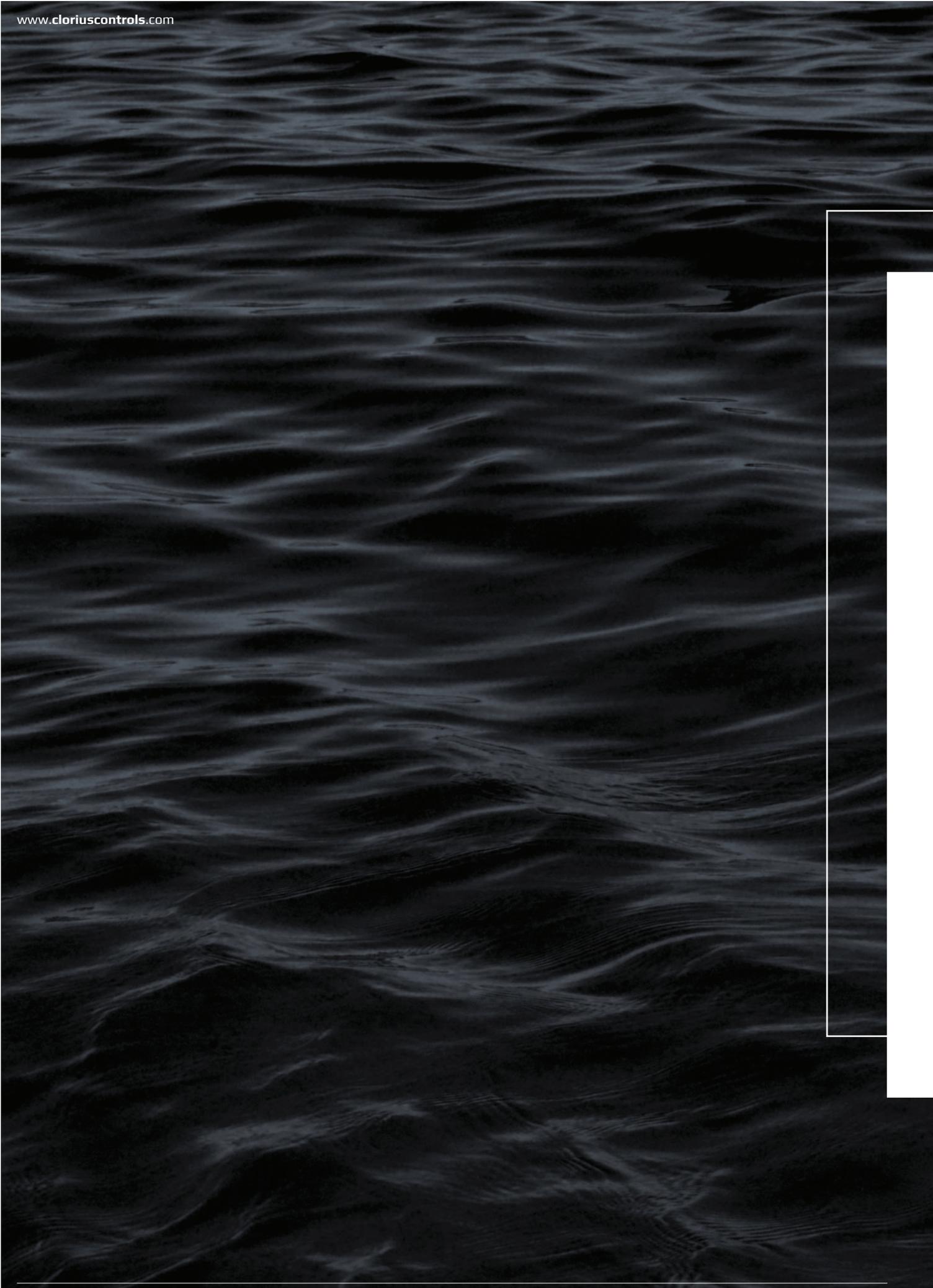
For 2-way and 3-way valve up to DN 150. No external power needed. Narrow neutral zone (1.5 °C - 2.5 °C) compared to all other brands.

## DIRECT-ACTING

### DIRECT ACTING WITH WAX ELEMENTS DN32-200



3 way thermostatic valve is a compact, premium quality control valve suitable for keeping medium temperatures (e.g. water, oil, and other industrial fluids) constant





# STANDARDS & CERTIFICATES

*Clorius Controls routinely manufactures and tests its products to the most demanding customer specifications and recognized national and international industry standards.*

*A long-standing tradition of delivering to the shipbuilding industry means that products delivered by Clorius Controls are developed in order to match the high requirements set by the maritime industry.*

Since 1993 we have been ISO 9001 certified for development, manufacturing, sales and servicing of controls for buildings, industrial and marine applications.

Clorius' internal standards for excellence are reflected in how we conduct our daily business. Our valves can be delivered with certificates issued by various recognized ship classification societies, stating that the classification society has participated in pressure test of the valve.

We can also deliver valves with certificates in accordance to:

- EN 10.204 / 2.1
- EN 10.204 / 2.2
- EN 10.204 / 3.1

Furthermore, we conduct:

- Inspection and test plan
- Pressure and leakage test

Valves from Clorius Controls can be delivered in accordance with the following standard and conformity assessment systems.

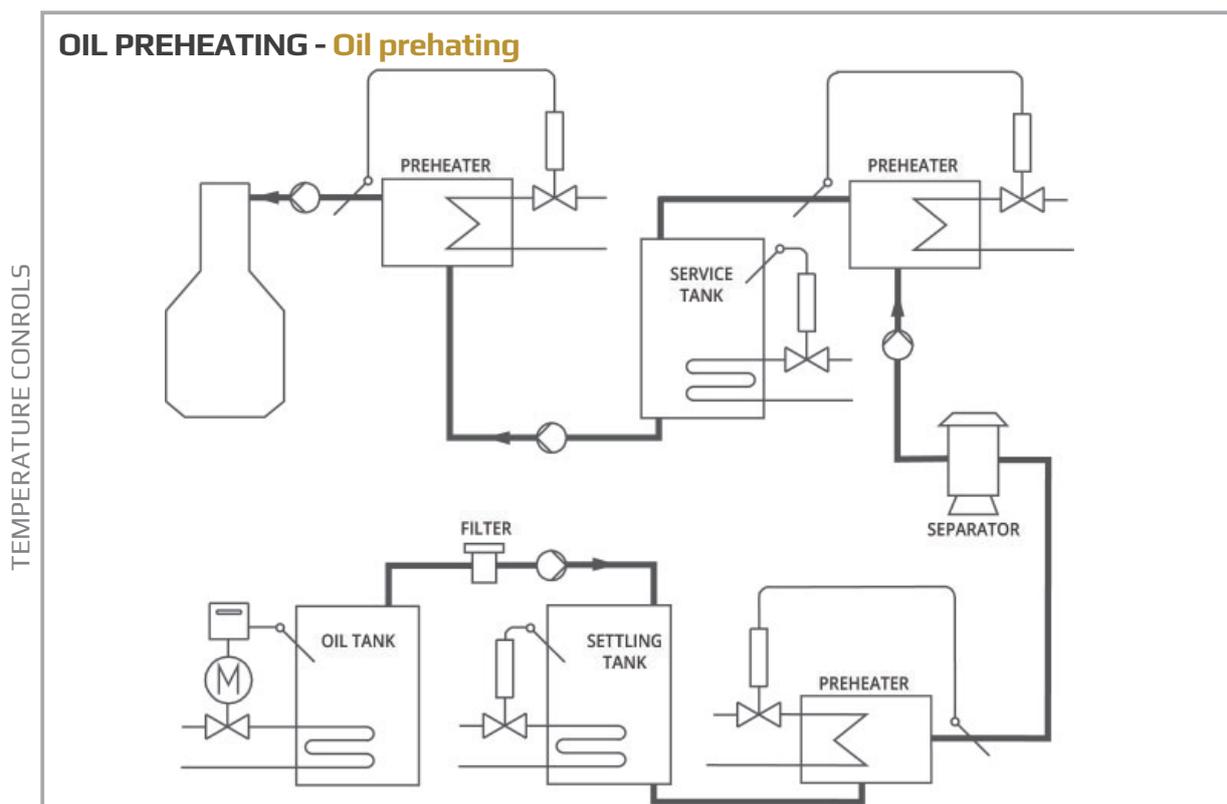
- ANSI, EN, JIS

# MARINE APPLICATIONS

*Clorius Controls has a long-standing history within the maritime sector. Our involvement within the engine room applications dates back at least 50 years. Fully aware of the special considerations that come with every job in the marine sector, we have compliant solutions for most types of vessels.*

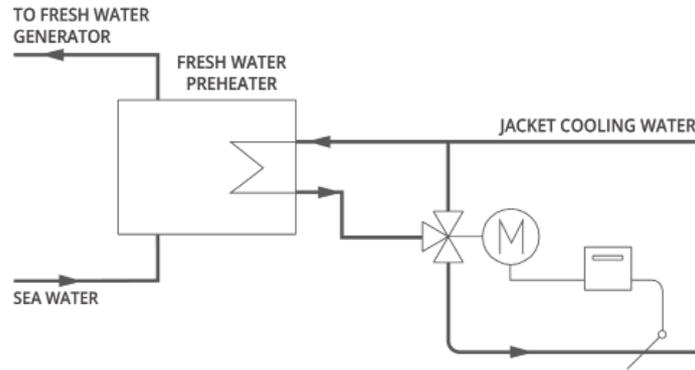
*Although Clorius Controls has products suited for many different applications, our undisputed core competence lies within the engine room. Our flow management systems cover both 2-stroke and 4-stroke engines. Possible applications include:*

- Oil preheating
- Lubricating oil heating
- Engine jacket cooling water - (self-acting)
- Engine jacket cooling water - (electric)
- Central cooling water systems
- Heating systems for fresh water generation
- Air conditioning plant - (self-acting)
- Air conditioning plant - (electric)



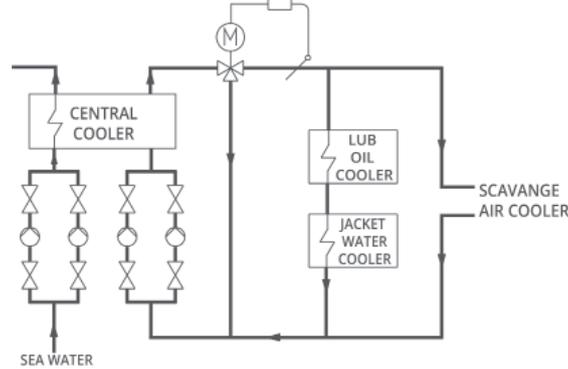
TEMPERATURE CONTROLS

### HEAT EXCHANGERS - Heating system for fresh water generation



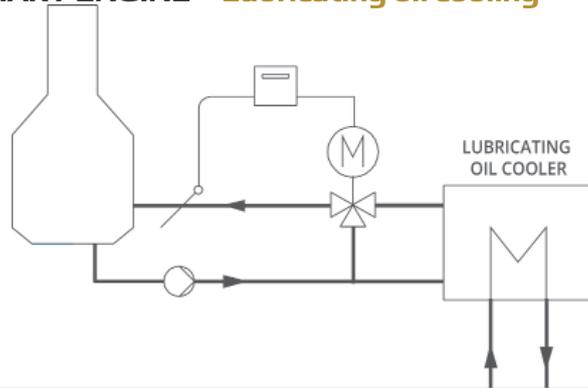
TEMPERATURE CONTROLS

### MAIN AND AUXILIARY ENGINE - Central cooling water system



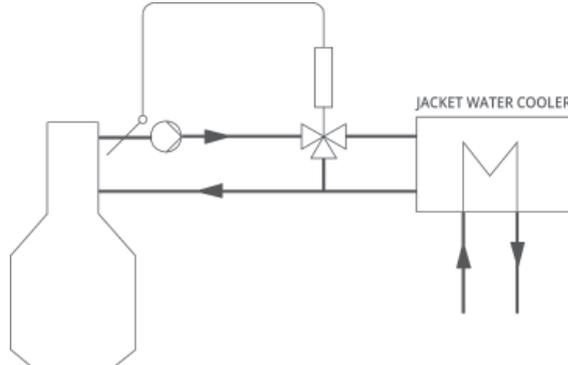
TEMPERATURE CONTROLS

### MAIN AND AUXILIARY ENGINE - Lubricating oil cooling



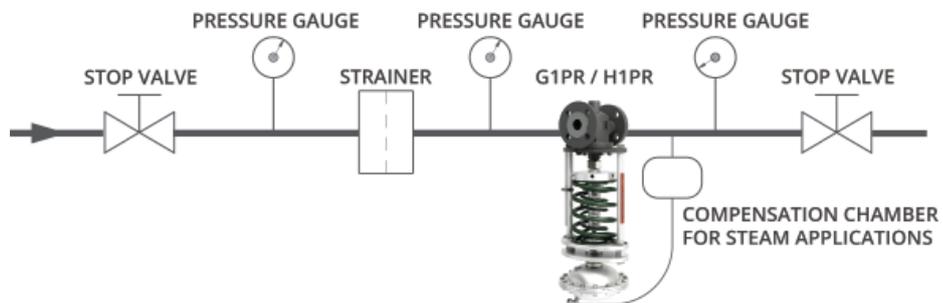
TEMPERATURE CONTROLS

### MAIN AND AUXILIARY ENGINE - Engine jacket cooling water system - electric



PRESSURE CONTROLS

### PRESSURE REDUCTION - Applicable for various media (eg. AIR, STEAM, LIQUID)



# ELECTRIC TEMPERATURE CONTROLS

**ELECTRONIC SYSTEM** - The electronic temperature and pressure control system combines an electrically actuated three-way control valve with an electronic controller and essential temperature sensor.

Microprocessor-based Controller type ER2000 for electronic temperature control is used for constant temperature control. It is suitable for all heating and cooling control systems. The ER2000 is a single loop controller which is intended for marine installations and other industrial applications - such as cooling water and lubricating oil installations, flow temperature control etc.

Microprocessor-based Controller type ER3000 Electronic Temperature Control

is used where conventional single loop controllers cannot maintain a constant and precise temperature.

The ER2000 and ER3000 controllers are designed for panel mounting and are fully programmable, which allows for uncomplicated system configuration.

The valve is designed for mixing and diverting media flows for large flow control systems.



## SELECTING YOUR SOLUTION >>>

### STEP 1

*Choose your valve and actuator*

**ELECTRIC ACTUATOR**



**3-WAY VALVE**

### STEP 2

*Choose your controller*

**PLC  
PROGRAMMABLE  
LOGIC CONTROLLER**



**CONTROLLER ER2000**



**CONTROLLER ER3000**

### STEP 3

*Choose your sensor*

**SENSOR**



**SENSOR**



# PNEUMATIC TEMPERATURE CONTROLS

**PNEUMATIC SYSTEM** - The pneumatic temperature control system integrates a pneumatically actuated three-way control valve with a pneumatic controller and temperature sensor and a pneumatic-pneumatic positioner. The pneumatic system is especially suitable when there is lack of electricity or when a fail-safe system is required.

## **ELECTRO-PNEUMATIC SYSTEM**

The electro-pneumatic temperature control system utilizes both electric and pneumatic technology, composed of a pneumatically actuated three-way control valve and electro-pneumatic positioner.

## **PERFECTED FOR HARSH ENVIRONMENTS**

Clorius Controls EPR/PPR Electro-pneumatic /pneumatic-pneumatic positioner is a rugged control device especially suited for harsh environments and engineered to meet the highest and most demanding control performance that the process industries of today require.

The AD/ADHW pneumatic actuators are made according to the Scotch Yoke principle, which is characteristic for its high torque when required - at the beginning and at end of each operation. This increases safety and reduces the energy consumption. The filter regulator, equipped with auto drain is protecting the positioner from dust, water and oil particles in the compressed air supply. With the backflow function it incorporates a mechanism to exhaust the air pressure in the outlet side reliably and quickly.



## SELECTING YOUR SOLUTION >>>

### STEP 1

*Choose your valve, actuator and positioner*



**3-WAY VALVE**



**PNEUMATIC ACTUATOR  
TYPE AD/ADHW**



**PPR/EPR  
POSITIONER**

### STEP 2

*Choose your air reduction valve/Filter*



**FILTER REGULATOR**

### STEP 3

*Choose your controller*

**PLC  
PROGRAMMABLE  
LOGIC CONTROLLER**



**PNEUMATIC  
CONTROLLER**



**CONTROLLER ER2000**

### STEP 4

*Choose your sensor*



**SENSOR**



## REDUCE UP TO 10% IN OIL CONSUMPTION

*Clorius Controls low leakage control valve assures energy savings by reduction in oil consumption, leading to reduced costs and downtime for shipowners.*

### BACKGROUND

In 2013 Clorius Controls successfully designed a robust low leakage valve in collaboration with MAN Diesel & Turbo, for a new internal cooling water system.

Today the low leakage control valve is used in the standard design of MAN Diesel & Turbo's two stroke engines, improving the performance of the engine cooling system.

The low leakage control valve is also installed on the world's largest container ships, the Triple E series.

### THE CHALLENGE

Shipowners are currently faced with two main challenges:

- Fresh water generation when slow steaming

When a ship is slow steaming, a high leakage cooling valve causes the fresh water generator to stop producing water, leaving two options; either to buy fresh water from the nearest shore or start the preheater.

- Unwanted engine cooling when in harbour

When the ship is in harbour, energy is wasted for preheating purposes as a result of leaking cooling water. The cooling water passing through the engines causes unwanted cooling.



## FEATURED TESTIMONIAL

“ Clorius Controls has been a trusted partner for many years, and their equipment has been included in the auxiliary systems for our two-stroke diesel engines during the last 30 years. Furthermore, their service and equipment have been an appreciated part in our systems, at our R&D center”.

*Ole Skeltved,  
Head of Marine Installation Department  
MAN Diesel & Turbo*

## THE SOLUTION

By installing Clorius Controls' low leakage control valve, following savings can be achieved:

### ■ By not starting the preheater for fresh water generation:<sup>1</sup>

Water consumption	= 7t /day
1 kg oil to produce	= 13 kg water
Oil consumption	= 538 kg/day
Savings in USD <sup>2</sup>	~ <b>325\$/day</b>

### ■ By not wasting energy on leaking cooling water:

Oil consumption can be reduced up to **10%** by implementing a low leakage control valve, compared to valves with leakage rate of 5%.<sup>3</sup>

Oil consumption	= 7t/day
Oil consumption saving	= 0.7 t/day
Savings in USD <sup>2</sup>	~ <b>420\$/day</b>

## THE RECOMMENDATION

Shipowners should specify leakage class IV with max 0.01% leakage rate for both new builds and existing installations.

ROI for installing or replacing existing valves, with a Clorius Controls' low leakage control valve, is less than 1 month.

## THE FACTS

**LOCATION**  
ASSENS, DENMARK

### TECHNICAL DATA

Valve body:	Nodular cast iron
Trim:	Gun metal RG 5

Size & Pressure:	
DN 80-200	PN 16
DN 250-300	PN 10

Temperature range:	Max 150 °C
Flowrate :	80-1250m <sup>3</sup>
Leakage Port AB-B:	<0,01% of KVS
Lead time:	4-6 weeks

### European make

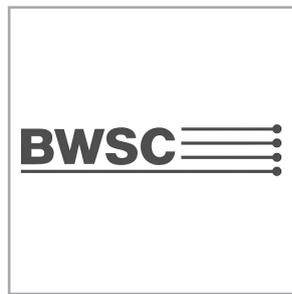
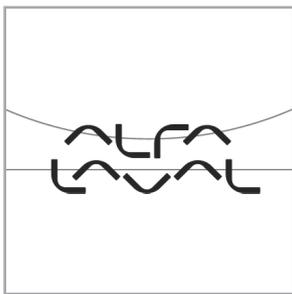
Valve supplied with electric or pneumatic actuation

<sup>1</sup> Example from a large container ship  
<sup>2</sup> Bunkerindex-MDO 05.02.2015: 601 USD/t  
<sup>3</sup> Based on feedback from various shipowners.

# OUR CLIENTS

*We have had the good fortune of being involved with a large number of strong global companies. Our clients are our starting point. They drive everything we do and we work collaboratively with them to achieve results they can measure. Our size enables our specialists to work closely together to develop tailor-made solutions, that meet our clients' evolving needs.*

Here are some clients we have recently added to our growing list of partnerships.







# PIONEERING TECHNOLOGY

## HEADQUARTERS

### Clorius Controls - DENMARK

Skovvej 30  
DK-5610 Assens  
+45 77 32 31 30  
mail@cloriuscontrols.com

## SALES REPRESENTATION

### Clorius Controls - CHINA

Room 1910-1911, Unicom International Tower,  
NO 547 West Tian Mu Road  
Shanghai 200070 P.R. China  
Tel: +86 21 33 030 279 // +86 21 33 035 279

### Clorius Controls - RUSSIA

BROEN Ltd.  
8-ya Tekstilschikov Street 11/2  
109129 Moscow, Russia  
Tel: +7 495 228 1150 ext. 11-24

### Clorius Controls - USA

27657 Commerce Oaks Drive  
Oak Ridge North, TX 77385  
United States of America  
Tel: +1 920 350 3622

### Clorius Controls - POLAND

BROEN SA  
ul. Strefowa 19  
58-200 Dzierżoniów  
Poland  
Tel: +48 74 832 54 00

