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# BCS

HYDRAULIC STEERING SYSTEMS



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Our products cannot be installed on racing boats without our previous authorization.

A photograph of a modern, curved white ceiling. The ceiling features a circular recessed light fixture in the upper center and a circular vent with a black fan-like pattern in the lower center. The ceiling is composed of several curved, overlapping panels that create a dynamic, flowing appearance. The lighting is soft and even, highlighting the smooth texture of the ceiling.

**Twin Disc - BCS: solutions, innovation, quality.**

**1956**, BCS s.r.l. was founded  
**2006**, Twin Disc Inc. acquired BCS s.r.l.  
**2007**, Incorporation of BCS s.r.l. in **Twin Disc S.r.l.**

BCS has been the leading company for the last 50 years in the manufacturing and distribution of marine equipments worldwide. The acquisition by Twin Disc Inc. – leader in several different areas such as marine and industrial, heavy duty transmissions and the oil extraction industry – has consolidated Twin Disc position on the market as a part of a multinational group. **BCS, BCS Service, Twin Disc Technodrive, Twin Disc Propulsion** have then merged together creating one company, **Twin Disc S.r.l.**, supported by the additional value of the sister-company **Rolla SP Propellers**.



Production plants of Limite sull'Arno

#### **Global "package"**

Twin Disc S.r.l. offers to boat builders and design engineers a complete "package" of products, such as propulsion systems, gearboxes, transmissions, control and steering systems, together with customized solutions and efficient technical support. **Twin Disc offers a global customer service for the development and realization of the whole kinematics system.** A dynamic team of engineers, technicians and professional people is devoted to help customers in any step: development, planning, prototyping, design definition, bench and fieldtesting, production, assembly, installation and service on board. Day by day, Twin Disc S.r.l. works alongside customers.

The ability to understand and anticipate market needs, the certified products, specialized service, together with the continuous research and innovation technology, forms a unique worldwide system dedicated to the marine industry.

Twin Disc provides the following product range: **hydraulic and electronic steering systems, complete shaft lines** for boats up to 40 meters, **trim tab systems** either in stainless steel or aluminum, **bow and stern thrusters**, both electric and hydraulic, **electro-hydraulic gangways** and **side ladders** for big applications, as well as a large variety of stainless steel **hydraulic actuators** and **multi-function electro-hydraulic power units**.



From the concept to the production:

prototype development, care for design, field testing, product definition.

**Twin Disc Srl** is certified by **Registro Italiano Navale (RINA)** according to the requirements of the standards **UNI EN ISO 9001:2000**.

All the management and production processes of the company, from the material research and the design of products, up to the planning of the production cycles, checking tests and shipping management, undergo the constant verification of the strictest quality criteria in order to guarantee the highest reliability level.

As a result of more than 50 years of experience, the **steering systems** are a synthesis between selected materials, innovative design and state-of-art technical solutions.

All the components are built with high precision systems and tooling and meet the requirements of the best survey authorities such as: **Rina Lloyd's Register, ABS, Bureau Veritas** etc. As a further guarantee of efficiency and durability, certificates for special applications are also available upon request.

Conforming with the **Standard 94/25/CE**, as amended by the **Standard 2003/44/CE**, and also included in the **Type Accepted of Program NMMA, hydraulic pumps and cylinders** covers any type of application: outboard, stern-drives and inboard systems for pleasure and commercial vessels.

# HYDRAULIC STEERING SYSTEMS

## COMPOSITION AND WORKING PRINCIPLE

In order to get the best control with the minimum effort, the steering system must match the specific vessel's requirements. A standard steering system in its basic composition is composed by three major elements such as:

- **hydraulic helm pump (1)** of the axial piston type, which pumps oil into the system each time the steering wheel is turned. The pump is provided with a non return (lock) valve, to prevent any uncontrolled movement of the rudder, and with a relief valve to protect the steering system from any sudden and excessive increase in pressure;
- **hydraulic cylinder (2)** is the real rudder actuator and determines the power of the system. It is therefore important to select the right cylinder model for the required torque (see page 27-44-66 for cylinder selection).

The pump and the cylinder are connected together by means of:

- **rigid or flexible hoses (3)** suitable for hydraulic applications and sized according to the pump displacement. The rigid piping system guarantees the best steering performance. A flexible hose system can be used for rudder torque not higher than 290 Kg/m (24.675 lb.in.).

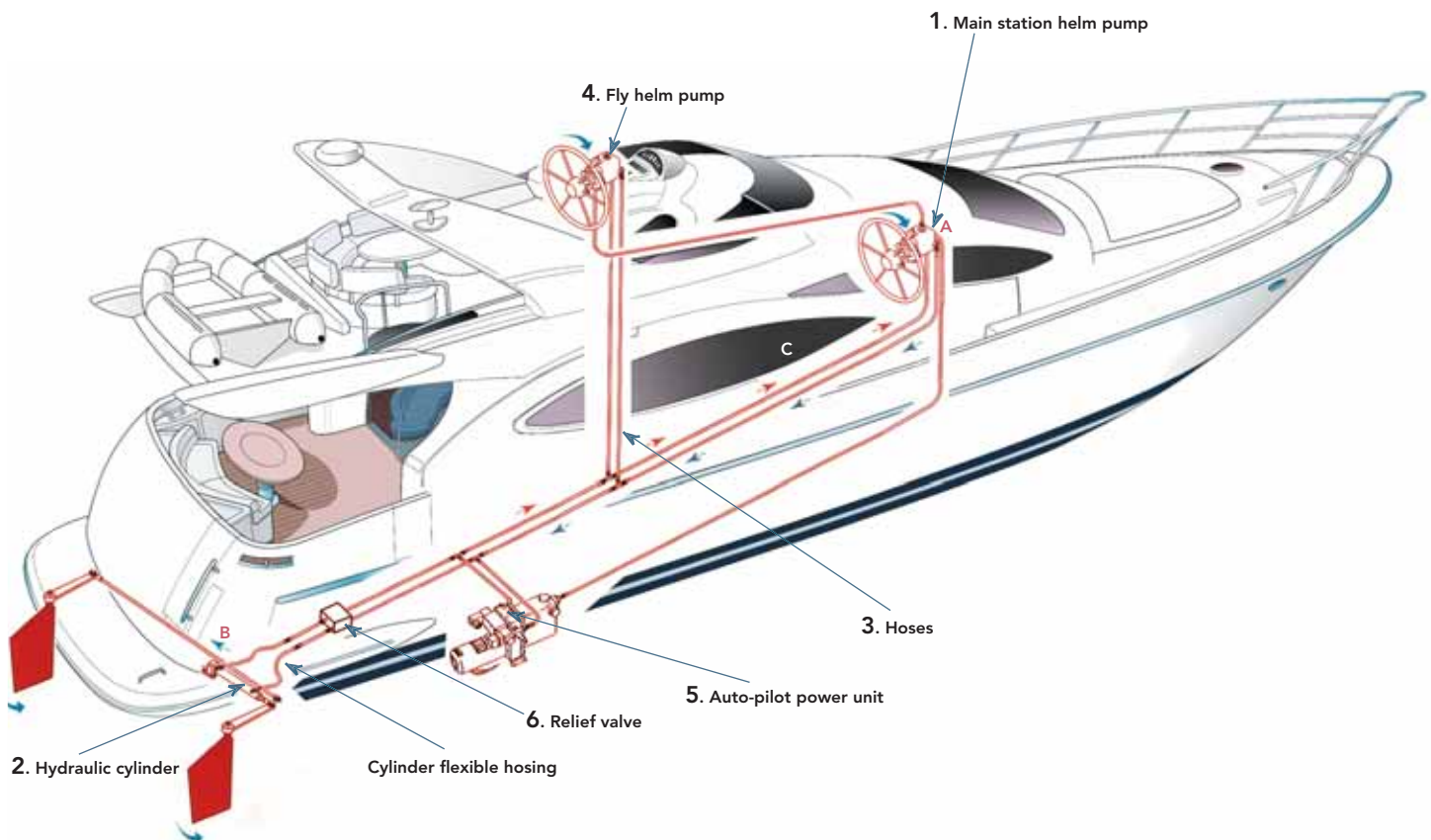
**Note:** in case of dual station, the oil cap of the pilot house shall be closed. If a power unit with automatic filling is installed both caps shall be closed.

To satisfy different needs, or adapt to specific solutions, this basic configuration can be integrated with many other steering components such as:

- **hydraulic helm pumps for additional control stations (4);**
- **auto-pilot power units (5)** are available in a wide range of displacements and they can be combined with different steering cylinders with a capacity of up to 3900 cc;
- **valves and accessories (6)** (see section "steering accessories" from page 75).

The working principle of the basic steering system is very simple:

- A.** By turning the steering wheel in one direction oil flow goes from the helm pump to the steering cylinder.
- B.** This flow, which enters the cylinder, moves the piston, as well as the rod connected to the tiller arm, in order to allow the rudder to rotate.
- C.** Oil displaced from the opposite side of the cylinder flows back to the helm pump.
- D.** By rotating the rudder in the opposite direction, simply turn the helm pump the other way.





# HOW TO SELECT THE SUITABLE SYSTEM

The steering system determines boat maneuverability, ease of control and reliability. Model choice and configuration will be based on boat's requirements and user's needs.

Below is a list of the necessary steps to select the most suitable system, either for boats equipped with outboard engines **(A)**, or for boats equipped with inboard engines **(B)**. The following pages provide customers with a range of steering components and an **Order Guide** helps in the selection and suggests how to size them.

## A. BOATS EQUIPPED WITH OUTBOARD ENGINES

1. Determine the number of outboard engines the boat has;
2. Determine the total engines power (i.e.: horsepower) reminding that:
  - if there are two engines with the **same rotation direction** you need to **add** their powers;
  - if there are two **counter-rotating engines**, you need to consider the **one engine power**.

Example:

|  |                    |
|--|--------------------|
| no. 1 engine of 300 Hp                               | total power 300 Hp |
| no. 2 engine of 150 Hp - same rotation direction     | total power 300 Hp |
| no. 1 engine of 300 Hp - opposite rotation direction | total power 150 Hp |

## B. BOATS EQUIPPED WITH RUDDERS WHOSE MAX speed is below 28 knots

1. Calculate the required **rudder torque** (i.e.: Kgm or lb.in.) according to the formula below. Bear in mind that the **max rudder torque** of a boat depends on:
  - boat max speed;
  - rudder's dimensions and shape;
  - rudder compensation surface.

2. Determine the **number of rudders** in order to obtain the total rudder torque.

**Note:** an important factor for the choice of the steering cylinder is the type of hull (i.e.: **planing** or **displacement**) as it can influence the vessel speed:

- **planing** hull: max speed > 18 knots
- **displacement** hull: max speed < 18 knots.

Once the rudder torque has been calculated and the most suitable steering cylinder has been selected, you need to determine the size of the hydraulic helm pump, whose choice depends on the following options:

- A. total number of wheel turns lock-to-lock (\*);
- B. number of the control stations;
- C. helm pump mounting configuration (**frontal, intermediate, rear** or **tilt** mounting).

(\* **Note:** the total number of wheel turns lock-to-lock depends on cylinder volume and helm displacement (divide the cylinder volume by the helm pump displacement).

The necessary effort on the steering wheel is inversely proportional to the total number of wheel turns lock-to-lock. Therefore:

- **less wheel turns** lock-to-lock result in **more wheel effort** on the steering wheel;
- **more wheel turns** lock-to-lock result in **less wheel effort** on the steering wheel.

**ATTENTION!** In case a helm pump with a higher displacement is chosen, to decrease the total wheel turns lock-to-lock (within the limitations indicated on the tables), you need to install a wheel with a bigger diameter.

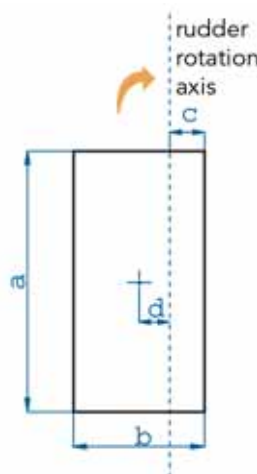
### Formula for rudder torque calculation for each rudder with an angle of 35°

a = rudder height in **meters**  
 b = rudder beam in **meters**  
 c = compensation distance in **meters**  
 d = arm = distance between the rudder axis and pressure point  
 S = force  
 V = max speed in knots  
 A = total area in square meters=(a**x**b)

$$d = (0,372 \times b) - c$$

$$S = 8,16 \times V^2 \times A$$

$$Mt = \text{rudder torque in Kgm} = S \times d$$



Example:

$$a = 1,10 \text{ mt}$$

$$b = 0,65 \text{ mt}$$

$$c = 0,21 \text{ mt}$$

$$V = 18 \text{ knots}$$

$$d = (0,372 \times 0,65) - 0,21 = 0,03$$

$$A = 1,10 \times 0,65 = 0,71 \text{ mt}^2$$

$$S = 8,16 \times 324 \times 0,71 = 1.877,12 \text{ Kg}$$

$$Mt = 1.877,12 \times 0,03 = 56,31 \text{ Kgm}$$

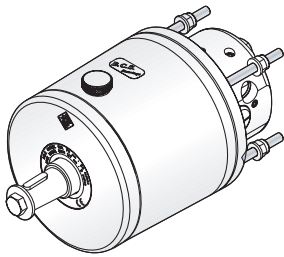
**Note:** in case the vessel is equipped with two rudders the total torque will be:

$$Mt = 2 \times 56,31 = 112,62 \text{ Kgm}$$

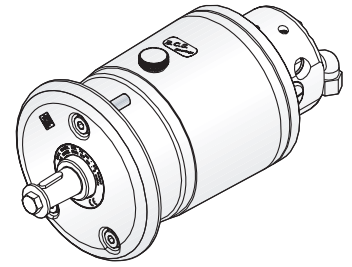
# HELM PUMPS

A range of models in different displacements, configurations and mounting options: a compact design with minimal helm protrusion is one of the main features of this axial-piston pump. Pumps are made of a high strength cast aluminum housing, that is corrosion and abrasion resistant, and supplied with a lock valve, which prevents any possible rudder feedback, while a relief valve protects the steering components from over-pressure.

BCS helms are available in different mounting configurations: the BASIC version, which is normally mounted outside on the dash surface and with the steering shaft perpendicular to it, can be combined with different mounting kits allowing the helm protrusion to be reduced or even disappear behind the dash. A SPORT TILT mechanism is available for a more comfortable driving position (mounting angles other than 90 degrees).



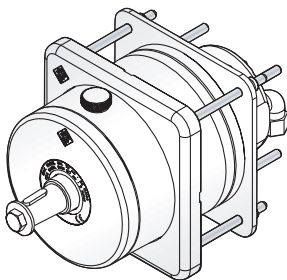
**FRONTAL mount helm**  
(basic helm)



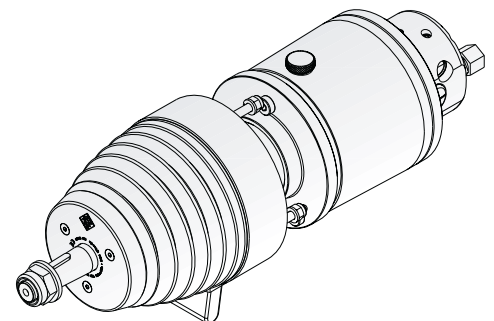
**Basic helm**  
**+ REAR mounting kit**

## Main features

- Compact design and easy installation
- Range of displacements: 20 cc - 25 cc - 30 cc - 35 cc - 42 cc
- Mounting configurations:  
FRONT, INTERMEDIATE, REAR and with SPORT TILT
- Built-in lock valve to prevent any rudder feedback
- Built-in relief valve to protect the system from over-pressure
- Cast aluminium housing for a high resistance to corrosion
- Pump shaft with **ABYC** 3/4 taper
- Built according to quality criteria and **CE** approved
- Provided with elbow fittings
- Provided with no-bleeder cap for possible additional control station



**Basic helm**  
**+ INTERMEDIATE mounting kit**

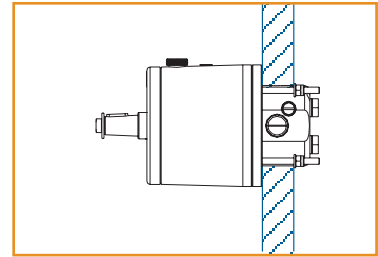


**Helm with Tilt SPORT**

# Helm pumps 20 cc - 30 cc - 42 cc FRONTAL mounting (basic helm)



## Mounting configuration FRONTAL mounting



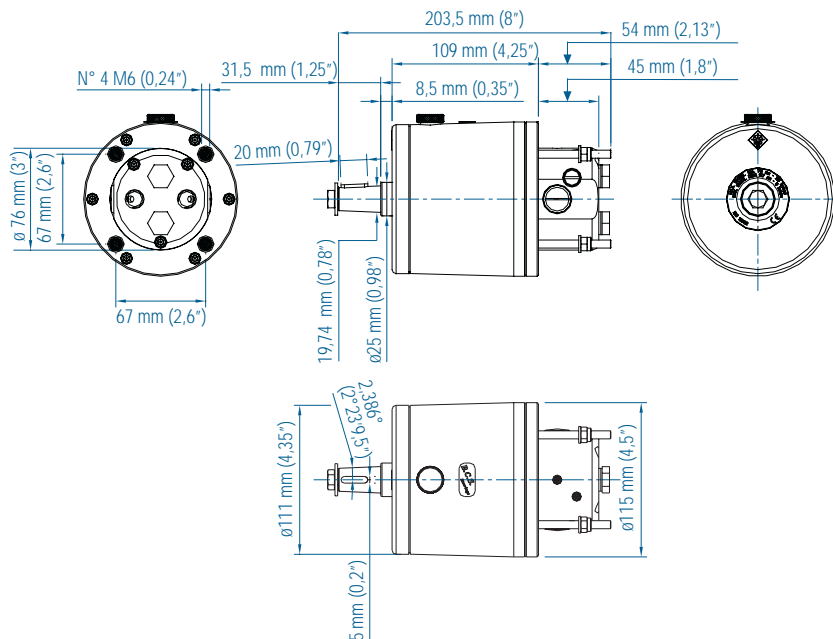
- Metrical fittings
- Imperial fittings

## Order Guide

| HELM PUMP |                |       |
|-----------|----------------|-------|
| Model     | Displacement   | Code  |
| P20BAP    | 20 cc/rev      | 21173 |
| P20BA     | 1.22 cu.in/rev | 16192 |
| P30BAP    | 30 cc/rev      | 21174 |
| P30BA     | 1.83 cu.in/rev | 16193 |
| P42BAP    | 42cc/rev       | 21175 |
| P42BA     | 2.56 cu.in/rev | 16194 |

## FRONTAL mounting helm - Technical specifications

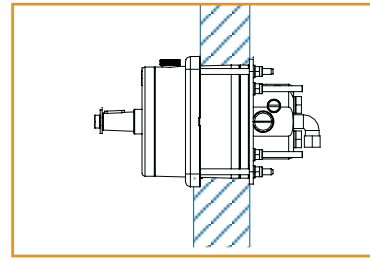
| Model  | Mounting configuration | Non return valve | Reilef valve | Displacement   | Nr pistons | Relief valve setting pressure | Fittings included   | Min. wheel | Max. wheel | Weight |
|--------|------------------------|------------------|--------------|----------------|------------|-------------------------------|---|------------|------------|--------|
| P20BAP | Frontal                | Yes              | Yes          | 20 cc/rev      | 5          | 70 bar                        | 1/4" NPTF - 3/8" D.E.   | 350 mm     | 711 mm     | 2.6 Kg |
| P20BA  |                        |                  |              | 1.22 cu.in/rev |            | 1000 psi                      | G1/4" - hose d. 10  | 13,78 in.  | 28 in.     | 5.8 lb |
| P30BAP | Frontal                | Yes              | Yes          | 30 cc/rev      | 5          | 70 bar                        | 1/4" NPTF - 3/8" D.E.   | 350 mm     | 711 mm     | 3.0 Kg |
| P30BA  |                        |                  |              | 1.83 cu.in/rev |            | 1000 psi                      | G1/4" - hose d. 10  | 13,78 in.  | 28 in.     | 6.7 lb |
| P42BAP | Frontal                | Yes              | Yes          | 42 cc/rev      | 7          | 70 bar                        | 1/4" NPTF - 3/8" D.E.   | 450 mm     | 711 mm     | 3.0 Kg |
| P42BA  |                        |                  |              | 2.56 cu.in/rev |            | 1000 psi                      | 1/4" NPTF - 1/2" D.E.<br>G1/4" - hose d. 10<br>G1/4" - hose d. 12 | 17,72 in.  | 28 in.     | 6.7 lb |



# Helm pump 20 cc - 30 cc - 42 cc INTERMEDIATE mounting



## Mounting configuration INTERMEDIATE mounting



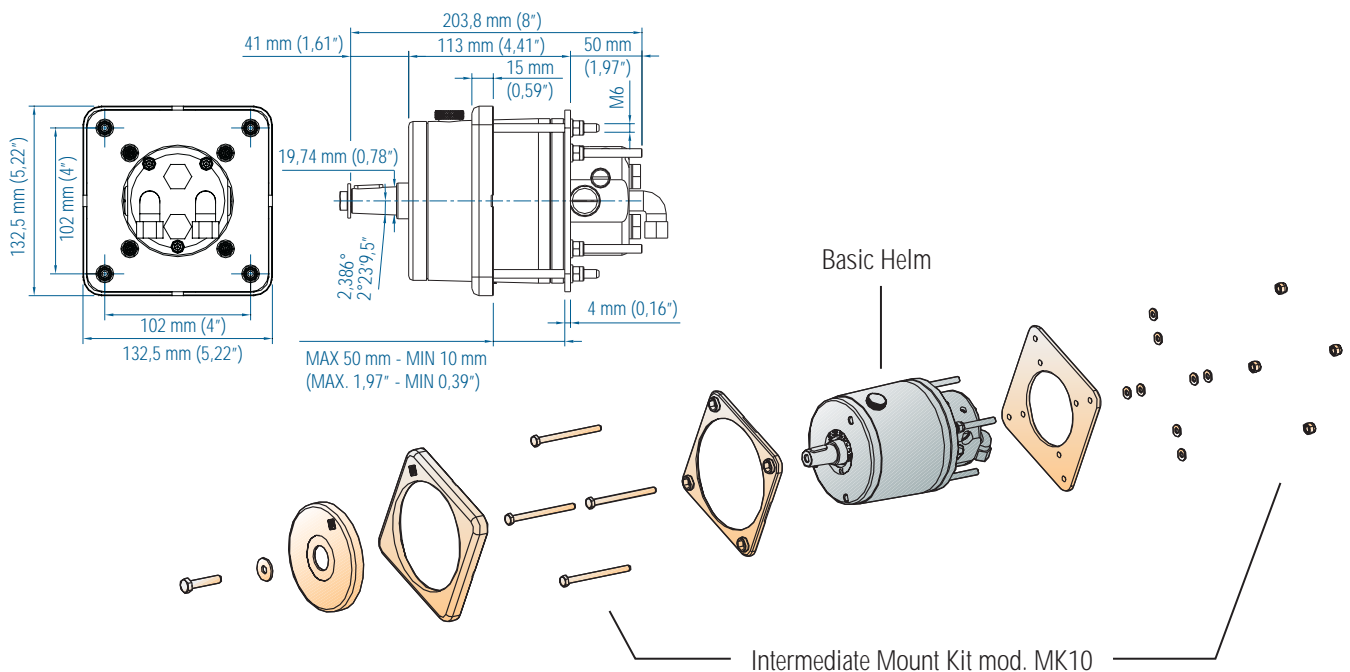
## Order Guide

| HELM PUMP         |                |             |
|-------------------|----------------|-------------|
| Model             | Displacement   | Code        |
| P20BAP + Kit MK10 | 20 cc/rev      | 21173+16199 |
| P20BA + Kit MK10  | 1.22 cu.in/rev | 16192+16199 |
| P30BAP + Kit MK10 | 30 cc/rev      | 21174+16199 |
| P30BA + Kit MK10  | 1.83 cu.in/rev | 16193+16199 |
| P42BAP + Kit MK10 | 42 cc/rev      | 21175+16199 |
| P42BA + Kit MK10  | 2.56 cu.in/rev | 16194+16199 |

- Metrical fittings
- Imperial fittings

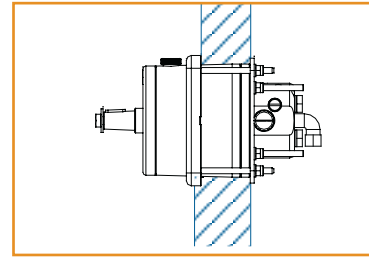
## INTERMEDIATE mounting helm - Technical specifications

| Model         | Mounting configuration | Non return valve | Reilef valve | Displacement   | Nr pistons | Relief valve setting pressure | Fittings included     | Min. wheel         | Max. wheel | Weight |
|---------------|------------------------|------------------|--------------|----------------|------------|-------------------------------|-----------------------|--------------------|------------|--------|
| P20BAP + MK10 | Intermediate           | Yes              | Yes          | 20 cc/rev      | 5          | 70 bar                        | 1/4" NPTF - 3/8" D.E. | 350 mm             | 711 mm     | 2.6 Kg |
| P20BA + MK10  |                        |                  |              | 1.22 cu.in/rev |            | 1000 psi                      | G1/4" - hose d. 10    | 13,78 in.          | 28 in.     | 5.8 lb |
| P30BAP + MK10 | Intermediate           | Yes              | Yes          | 30 cc/rev      | 5          | 70 bar                        | 1/4" NPTF - 3/8" D.E. | 350 mm             | 711 mm     | 3.0 Kg |
| P30BA + MK10  |                        |                  |              | 1.83 cu.in/rev |            | 1000 psi                      | G1/4" - hose d. 10    | 13,78 in.          | 28 in.     | 6.7 lb |
| P42BAP + MK10 | Intermediate           | Yes              | Yes          | 42 cc/rev      | 7          | 70 bar                        | 1/4" NPTF - 3/8" D.E. | 450 mm             | 711 mm     | 3.0 Kg |
| P42BA + MK10  |                        |                  |              | 2.56 cu.in/rev |            | 1000 psi                      | 1/4" NPTF - 1/2" D.E. | G1/4" - hose d. 10 | 17,72 in.  | 28 in. |



Helm pump 20 cc - 30 cc - 42 cc  
**INTERMEDIATE mounting**  
**WITH ROUND FLANGE**

**Mounting configuration**  
 INTERMEDIATE mounting



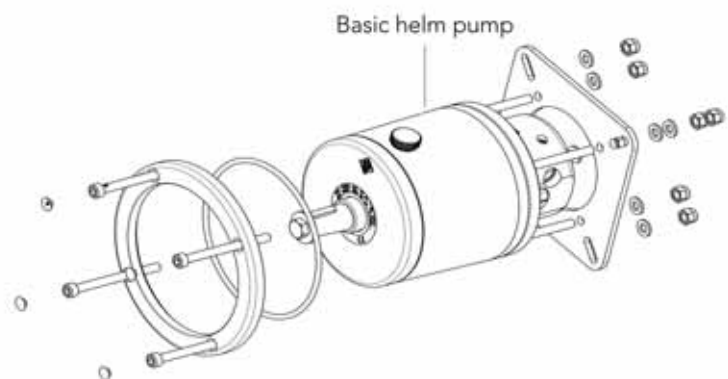
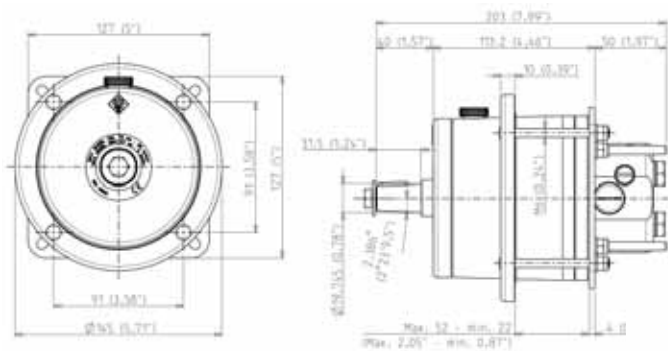
**Order Guide**

| HELM PUMP         |                |             |
|-------------------|----------------|-------------|
| Model             | Displacement   | Code        |
| P20BAP + Kit MK20 | 20 cc/rev      | 21173+28098 |
| P20BA + Kit MK20  | 1.22 cu.in/rev | 16192+28098 |
| P30BAP + Kit MK20 | 30 cc/rev      | 21174+28098 |
| P30BA + Kit MK20  | 1.83 cu.in/rev | 16193+28098 |
| P42BAP + Kit MK20 | 42 cc/rev      | 21175+28098 |
| P42BA + Kit MK20  | 2.56 cu.in/rev | 16194+28098 |

- Metrical fittings
- Imperial fittings

**INTERMEDIATE mounting helm - Technical specifications**

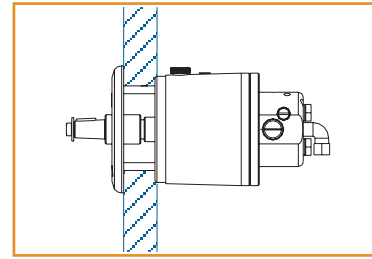
| Model         | Mounting configuration | Non return valve | Reilef valve | Displacement   | Nr pistons | Relief valve setting pressure | Fittings included                        | Min. wheel | Max. wheel | Weight |
|---------------|------------------------|------------------|--------------|----------------|------------|-------------------------------|--|------------|------------|--------|
| P20BAP + MK20 | Intermediate           | Yes              | Yes          | 20 cc/rev      | 5          | 70 bar                        | 1/4" NPTF - 3/8" D.E.                    | 350 mm     | 711 mm     | 2.6 Kg |
| P20BA + MK20  |                        |                  |              | 1.22 cu.in/rev |            | 1000 psi                      | G1/4" - hose d. 10                       | 13,78 in.  | 28 in.     | 5.8 lb |
| P30BAP + MK20 | Intermediate           | Yes              | Yes          | 30 cc/rev      | 5          | 70 bar                        | 1/4" NPTF - 3/8" D.E.                    | 350 mm     | 711 mm     | 3.0 Kg |
| P30BA + MK20  |                        |                  |              | 1.83 cu.in/rev |            | 1000 psi                      | G1/4" - hose d. 10                       | 13,78 in.  | 28 in.     | 6.7 lb |
| P42BAP + MK20 | Intermediate           | Yes              | Yes          | 42 cc/rev      | 7          | 70 bar                        | 1/4" NPTF - 3/8" D.E.                    | 450 mm     | 711 mm     | 3.0 Kg |
| P42BA + MK20  |                        |                  |              | 2.56 cu.in/rev |            | 1000 psi                      | G1/4" - hose d. 10<br>G1/4" - hose d. 12 | 17,72 in.  | 28 in.     | 6.7 lb |



# Helm pump 20 cc - 30 cc - 42 cc REAR mounting



### Mounting configuration REAR mounting



### Order Guide

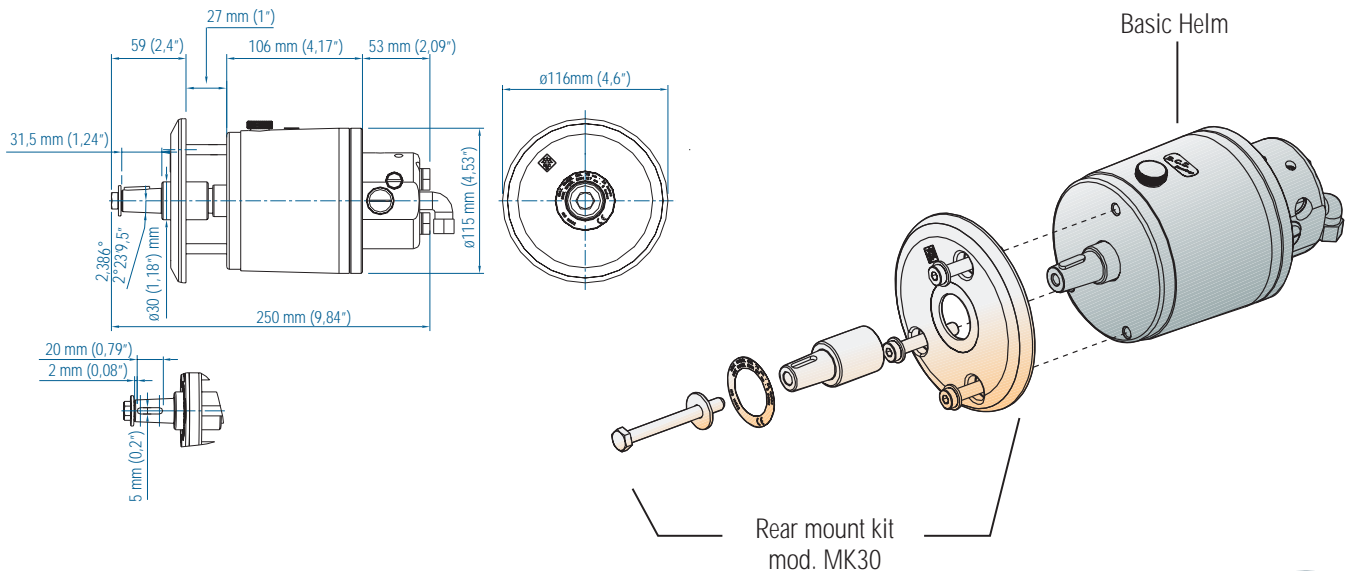
| HELM PUMP         |                |             |
|-------------------|----------------|-------------|
| Model             | Displacement   | Code        |
| P20BAP + Kit MK30 | 20 cc/rev      | 21173+16198 |
| P20BA + Kit MK30  | 1.22 cu.in/rev | 16192+16198 |
| P30BAP + Kit MK30 | 30 cc/rev      | 21174+16198 |
| P30BA + Kit MK30  | 1.83 cu.in/rev | 16193+16198 |
| P42BAP + Kit MK30 | 42 cc/rev      | 21175+16198 |
| P42BA + Kit MK30  | 2.56 cu.in/rev | 16194+16198 |

- Metrical fittings
- Imperial fittings

### REAR mounting helm - Technical specifications

| Model         | Mounting configuration | Non return valve | Reilef valve | Displacement   | Nr pistons | Relief valve setting pressure | Fittings included  | Min. wheel | Max. wheel | Weight |
|---------------|------------------------|------------------|--------------|----------------|------------|-------------------------------|--|------------|------------|--------|
| P20BAP + MK30 | Rear                   | Yes              | Yes          | 20 cc/rev      | 5          | 70 bar                        | 1/4"NPTF - 3/8" D.E.   | 350 mm     | 711 mm     | 2.6 Kg |
| P20BA + MK30  |                        |                  |              | 1.22 cu.in/rev |            | 1000 psi                      | G1/4" - hose d. 10   | 13,78 in.  | 28 in.     | 5.8 lb |
| P30BAP + MK30 | Rear                   | Yes              | Yes          | 30 cc/rev      | 5          | 70 bar                        | 1/4"NPTF - 3/8" D.E.   | 350 mm     | 711 mm     | 3.0 Kg |
| P30BA + MK30  |                        |                  |              | 1.83 cu.in/rev |            | 1000 psi                      | G1/4" - hose d. 10   | 13,78 in.  | 28 in.     | 6.7 lb |
| P42BAP + MK30 | Rear                   | Yes              | Yes          | 42 cc/rev      | 7          | 70 bar                        | 1/4"NPTF - 3/8" D.E.   | 450 mm     | 711 mm     | 3.0 Kg |
| P42BA + MK30  |                        |                  |              | 2.56 cu.in/rev |            | 1000 psi                      | 1/4"NPTF - 1/2" D.E.<br>G1/4" - hose d. 10<br>G1/4" - hose d. 12 | 17,72 in.  | 28 in.     | 6.7 lb |

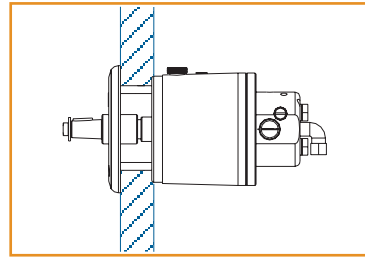
Note: this pump is also available with plastic cromate cover (Kit MK31 - cod. 23277). All rear mounting helm pumps are also available without flange (Kit MK50 - cod. 23180). For this model we suggest purchasing the filling kit mod. K100 (oil filling kit code 18599). See the "Steering accessories" section on page 73.



Helm pump 20 cc - 30 cc - 42 cc  
**REAR mounting**  
**WITH OPEN STAINLESS STEEL COVER**



**Mounting configuration**  
 REAR mounting



**Order Guide**

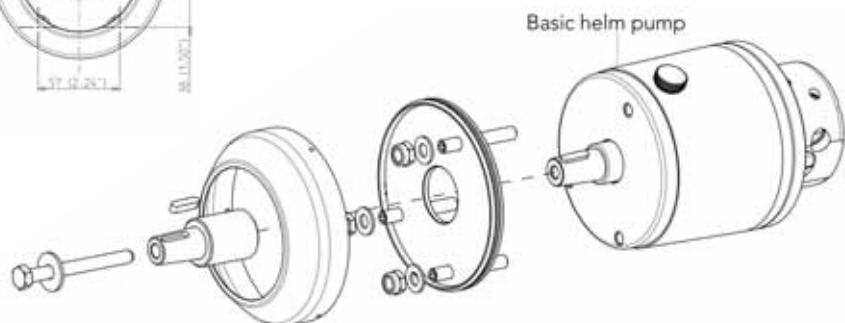
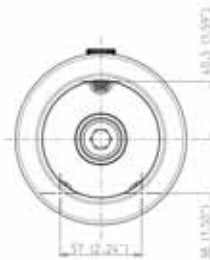
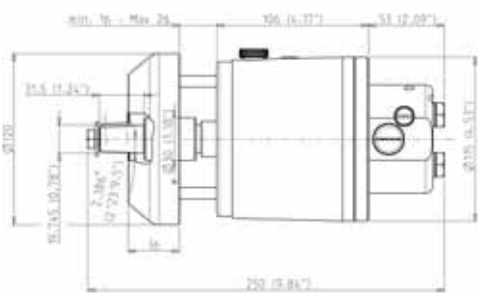
| HELM PUMP         |                |             |
|-------------------|----------------|-------------|
| Model             | Displacement   | Code        |
| P20BAP + Kit MK60 | 20 cc/rev      | 21173+28064 |
| P20BA + Kit MK60  | 1.22 cu.in/rev | 16192+28064 |
| P30BAP + Kit MK60 | 30 cc/rev      | 21174+28064 |
| P30BA + Kit MK60  | 1.83 cu.in/rev | 16193+28064 |
| P42BAP + Kit MK60 | 42 cc/rev      | 21175+28064 |
| P42BA + Kit MK60  | 2.56 cu.in/rev | 16194+28064 |

- Metrical fittings
- Imperial fittings

**REAR mounting helm - Technical specifications**

| Model         | Mounting configuration | Non return valve | Reilef valve | Displacement   | Nr pistons | Relief valve setting pressure | Fittings included  | Min. wheel | Max. wheel | Weight |
|---------------|------------------------|------------------|--------------|----------------|------------|-------------------------------|--|------------|------------|--------|
| P20BAP + MK60 | Rear                   | Yes              | Yes          | 20 cc/rev      | 5          | 70 bar                        | 1/4"NPTF - 3/8" D.E.   | 350 mm     | 711 mm     | 2.6 Kg |
| P20BA + MK60  |                        |                  |              | 1.22 cu.in/rev |            | 1000 psi                      | G1/4" - hose d. 10   | 13,78 in.  | 28 in.     | 5.8 lb |
| P30BAP + MK60 | Rear                   | Yes              | Yes          | 30 cc/rev      | 5          | 70 bar                        | 1/4"NPTF - 3/8" D.E.   | 350 mm     | 711 mm     | 3.0 Kg |
| P30BA + MK60  |                        |                  |              | 1.83 cu.in/rev |            | 1000 psi                      | G1/4" - hose d. 10   | 13,78 in.  | 28 in.     | 6.7 lb |
| P42BAP + MK60 | Rear                   | Yes              | Yes          | 42 cc/rev      | 7          | 70 bar                        | 1/4"NPTF - 3/8" D.E.   | 450 mm     | 711 mm     | 3.0 Kg |
| P42BA + MK60  |                        |                  |              | 2.56 cu.in/rev |            | 1000 psi                      | 1/4"NPTF - 1/2" D.E.<br>G1/4" - hose d. 10<br>G1/4" - hose d. 12 | 17,72 in.  | 28 in.     | 6.7 lb |

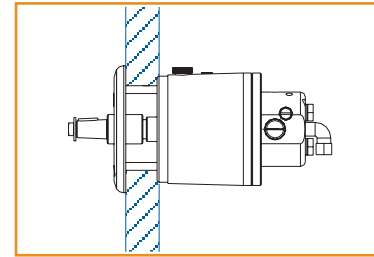
Note: all rear mounting helm pumps are also available without flange (Kit MK50 - cod. 23180). For this model we suggest purchasing the filling kit mod. K100 (oil filling kit code 18599). See the "Steering accessories" section on page 73.



Helm pump 20 cc - 30 cc - 42 cc  
**REAR mounting**  
**WITH CLOSED STAINLESS STEEL COVER**



**Mounting configuration**  
 REAR mounting



**Order Guide**

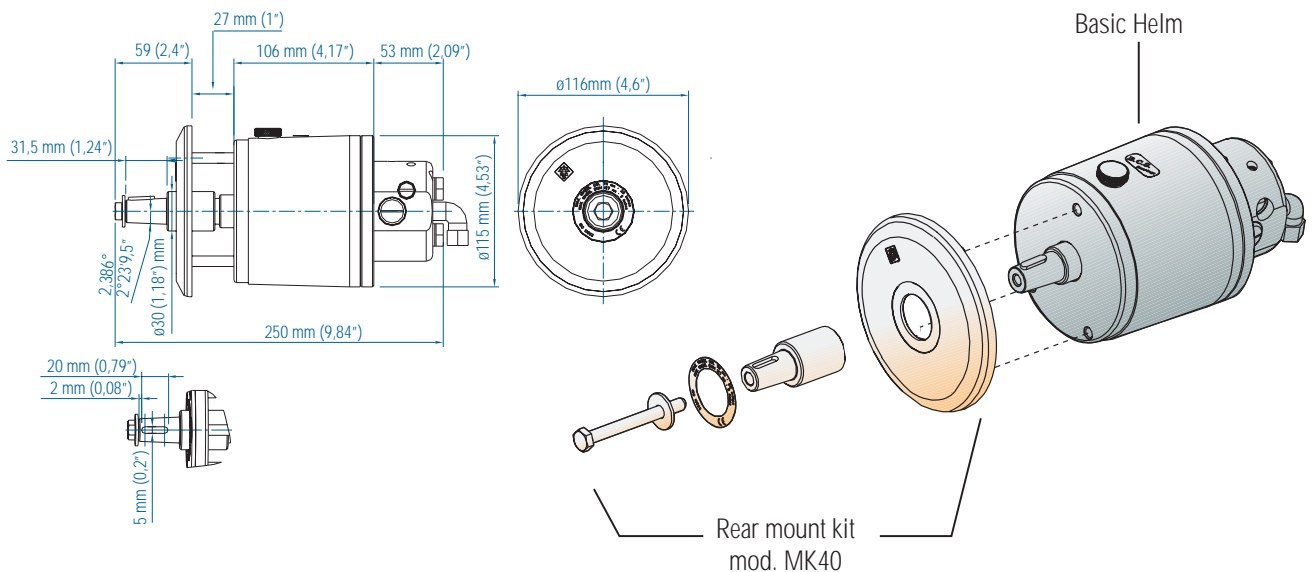
| HELM PUMP         |                |             |
|-------------------|----------------|-------------|
| Model             | Displacement   | Code        |
| P20BAP + Kit MK40 | 20 cc/rev      | 21173+24855 |
| P20BA + Kit MK40  | 1.22 cu.in/rev | 16192+24855 |
| P30BAP + Kit MK40 | 30 cc/rev      | 21174+24855 |
| P30BA + Kit MK40  | 1.83 cu.in/rev | 16193+24855 |
| P42BAP + Kit MK40 | 42 cc/rev      | 21175+24855 |
| P42BA + Kit MK40  | 2.56 cu.in/rev | 16194+24855 |

- Metrical fittings
- Imperial fittings

**REAR mounting helm - Technical specifications**

| Model         | Mounting configuration | Non return valve | Relief valve | Displacement   | Nr pistons | Relief valve setting pressure | Fittings included   | Min. wheel | Max. wheel | Weight |
|---------------|------------------------|------------------|--------------|----------------|------------|-------------------------------|---|------------|------------|--------|
| P20BAP + MK40 | Rear                   | Yes              | Yes          | 20 cc/rev      | 5          | 70 bar                        | 1/4" NPTF - 3/8" D.E.   | 350 mm     | 711 mm     | 2.6 Kg |
| P20BA + MK40  |                        |                  |              | 1.22 cu.in/rev |            | 1000 psi                      | G1/4" - hose d. 10  | 13,78 in.  | 28 in.     | 5.8 lb |
| P30BAP + MK40 | Rear                   | Yes              | Yes          | 30 cc/rev      | 5          | 70 bar                        | 1/4" NPTF - 3/8" D.E.   | 350 mm     | 711 mm     | 3.0 Kg |
| P30BA + MK40  |                        |                  |              | 1.83 cu.in/rev |            | 1000 psi                      | G1/4" - hose d. 10  | 13,78 in.  | 28 in.     | 6.7 lb |
| P42BAP + MK40 | Rear                   | Yes              | Yes          | 42 cc/rev      | 7          | 70 bar                        | 1/4" NPTF - 3/8" D.E.   | 450 mm     | 711 mm     | 3.0 Kg |
| P42BA + MK40  |                        |                  |              | 2.56 cu.in/rev |            | 1000 psi                      | 1/4" NPTF - 1/2" D.E.<br>G1/4" - hose d. 10<br>G1/4" - hose d. 12 | 17,72 in.  | 28 in.     | 6.7 lb |

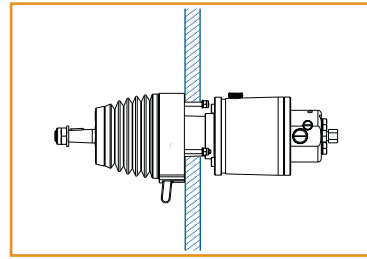
Note: all rear mounting helm pumps are also available without flange (Kit MK50 - cod. 23180). For this model we suggest purchasing the filling kit mod. K100 (oil filling kit code 18599). See the "Steering accessories" section on page 73.





# Helm pump 20 cc - 30 cc - 42 cc Mounting with TILT SPORT

## Mounting configuration Mounting with Tilt SPORT



## Order Guide

| HELM PUMP |                |       |
|-----------|----------------|-------|
| Model     | Displacement   | Code  |
| P20TSP    | 20 cc/rev      | 25726 |
| P20TS     | 1.22 cu.in/rev | 25582 |
| P30TSP    | 30 cc/rev      | 25727 |
| P30TS     | 1.83 cu.in/rev | 25584 |
| P42TSP    | 42 cc/rev      | 25728 |
| P42TS     | 2.56 cu.in/rev | 25585 |

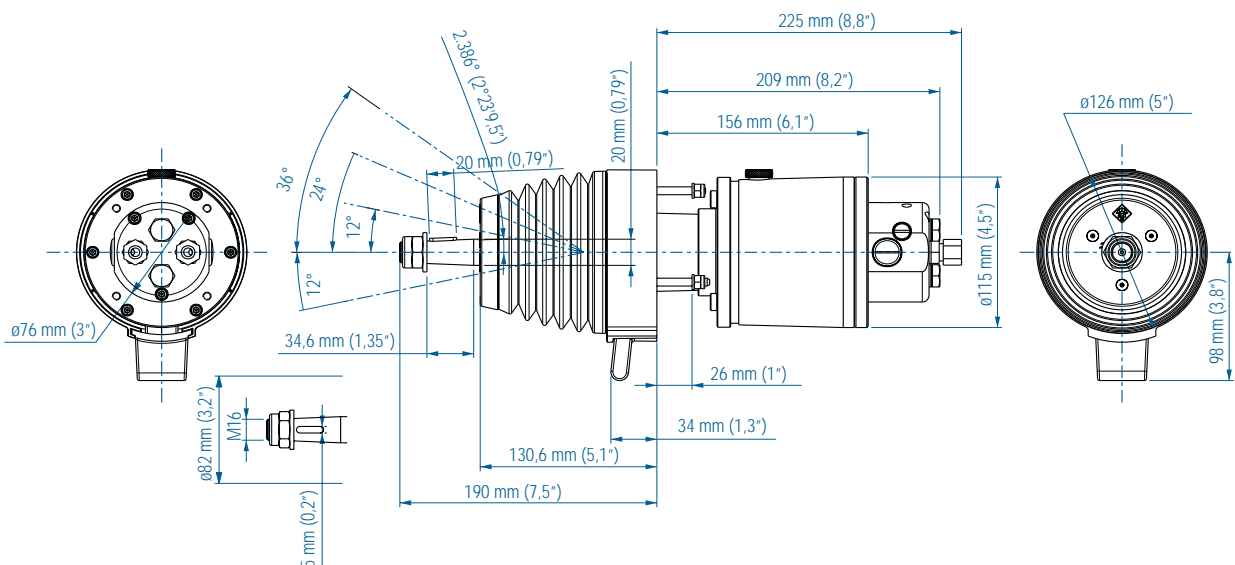


- Metrical fittings
- Imperial fittings

## TILT SPORT helm - Technical specifications

| Model  | Mounting configuration | Non return valve | Reilef valve | Displacement   | Nr pistons | Relief valve setting pressure | Fittings included                              | Min. wheel | Max. wheel | Weight |
|--------|------------------------|------------------|--------------|----------------|------------|-------------------------------|--|------------|------------|--------|
| P20TSP | Tilt                   | Yes              | Yes          | 20 cc/rev      | 5          | 70 bar                        | 1/4" NPTF - 3/8" D.E.                          | 350 mm     | 508 mm     | 3.9 Kg |
| P20TS  |                        |                  |              | 1.22 cu.in/rev |            | 1000 psi                      | G1/4" - hose d. 10                             | 13,78 in.  | 20 in.     | 8.6 lb |
| P30TSP | Tilt                   | Yes              | Yes          | 30 cc/rev      | 5          | 70 bar                        | 1/4" NPTF - 3/8" D.E.                          | 350 mm     | 508 mm     | 3.9 Kg |
| P20TS  |                        |                  |              | 1.83 cu.in/rev |            | 1000 psi                      | G1/4" - hose d. 10                             | 13,78 in.  | 20 in.     | 8.6 lb |
| P42TSP | Tilt                   | Yes              | Yes          | 42 cc/rev      | 7          | 70 bar                        | 1/4" NPTF - 3/8" D.E.<br>1/4" NPTF - 1/2" D.E. | 450 mm     | 508 mm     | 3.9 Kg |
| P20TS  |                        |                  |              | 2.56 cu.in/rev |            | 1000 psi                      | G1/4" - hose d. 10<br>G1/4" - hose d. 12       | 17,72 in.  | 20 in.     | 8.6 lb |

Note: for this model we suggest purchasing the filling kit mod. K100 (oil filling kit code 18599). See the "Steering accessories" section on page 73.



## OUTBOARD CYLINDERS FRONT MOUNTING

Reliability, quality and comfort.

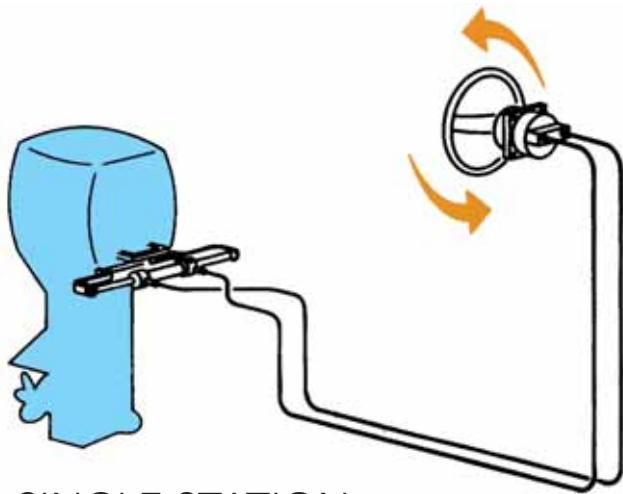
Outboard steering can be adapted to the different mounting configurations to cover any outboard application: this is the best alternative for mechanical steering.

Suitable for single and multiple outboards up to 300 hp (600 hp with combined counter-rotating engines), the outboard steering is the ideal solution for runabouts, cruisers, and inflatables, with either single or dual engine; they can also be used on work, commercial or rescue boats, which normally require high performances in severe service conditions.

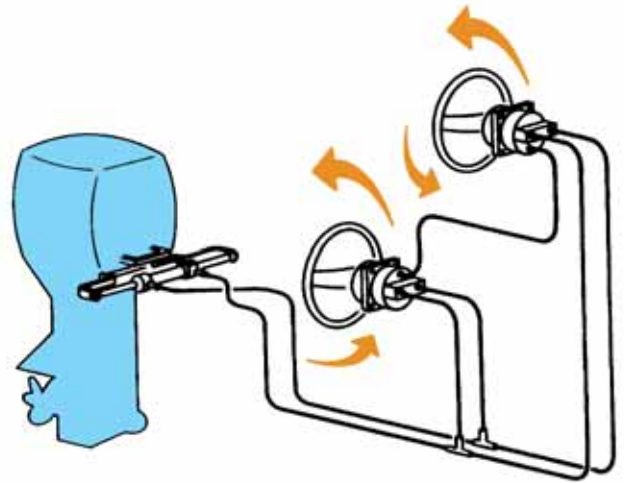
Built with high-quality materials, suitable to work in a marine environment, compact design; the outboard steering cylinders are suitable for most splash-well configurations.

The balanced front mounting cylinders allow the engine full and free movement with minimum dimensions.

They can be combined with a wide range of accessories, such as helm pumps, hoses in the necessary length, inch fittings and hydraulic oil for a complete steering package.



SINGLE STATION



DUAL STATION

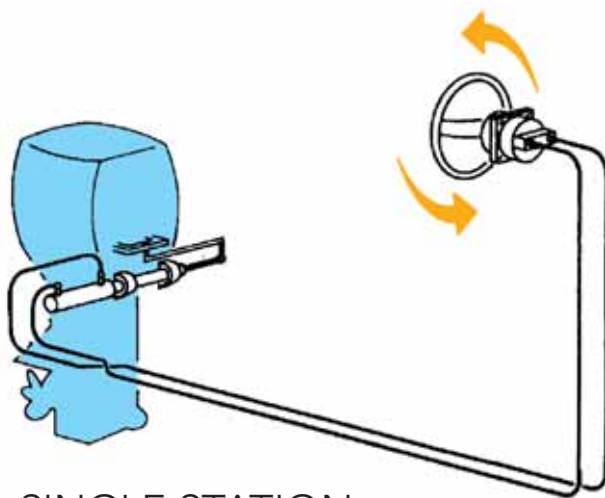
### Main features

- Elegant and compact design that fits most splashwells
- Hard chromed stainless steel piston rod
- Balanced frontal mounting cylinder
- Suitable for single and twin engine applications
- Suitable for outboards up to 150 hp for the model OB-108 and 300 hp for the model OB-133 (600 hp if combined with counter-rotating outboard engines) with a max speed of 60 kts
- Combined with BCS helms, tubing, fittings and oil provides a complete package of easy installation
- Meets **ABYC** standards
- **CE** approved

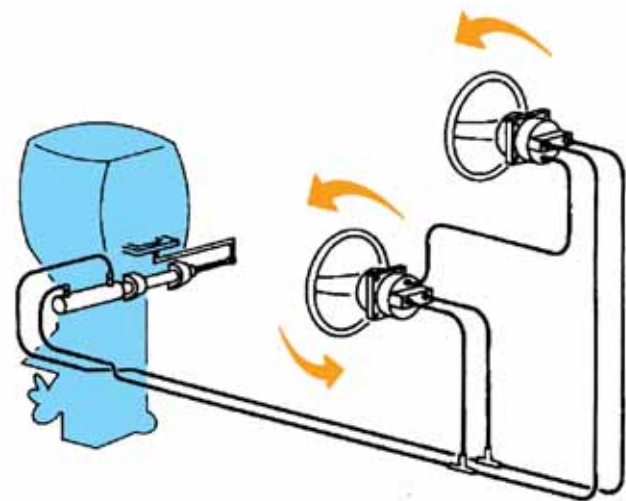
## OUTBOARD CYLINDERS SIDE MOUNTING

The side mounting outboard cylinder represents the best alternative to either mechanical steering or frontal mounting cylinder, especially where the splashwell is not very deep. It is suitable for outboard engines up to 300 hp (600 hp with

combined counter-rotating outboards) for a max. speed of 60 kts. It can be combined with the steering helms (inch tubing and fittings, hydraulic oil) for a complete package of easy installation.



SINGLE STATION



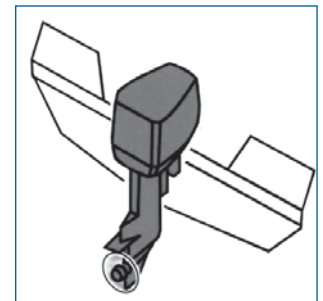
DUAL STATION

### Main features

- Compact design and reduced dimensions for low splashwells
- Suitable for mounting with threaded engine tilt tubes
- Hard chromed stainless steel piston rod
- Balanced cylinder
- Suitable for single or multiple engine configurations
- Suitable for outboard engines up to 300 hp (600 hp with combined counter-rotating outboards) with a max speed of 60 kts
- Combined with helms, tubing, inch fittings and oil provides a complete package of easy installation
- Meets **ABYC** standards
- **CE** approved

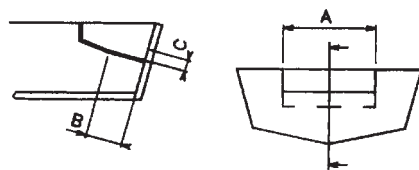
# Front mounting outboard cylinders

## Cylinder mod. OB-108



### Dimensions A+B+C

#### Minimum splashwell dimensions

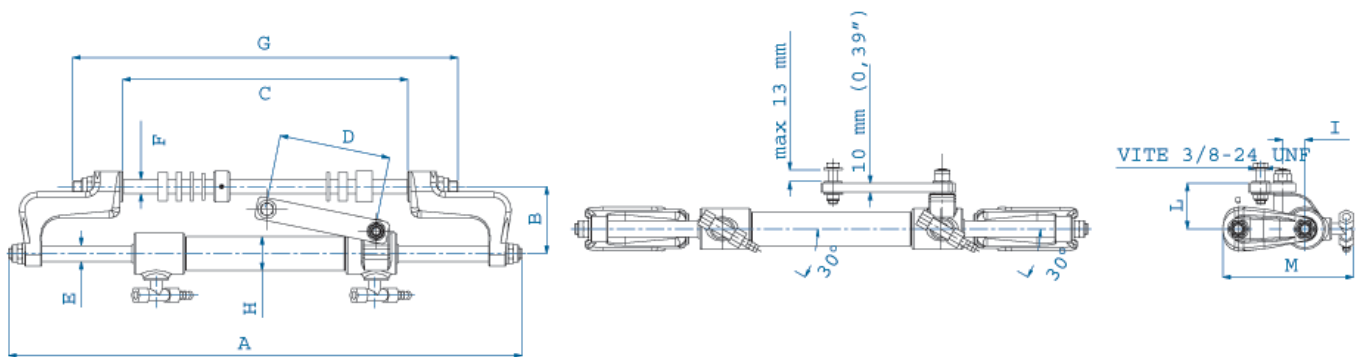


| Cylinder model | Number of engines | A         | B        | C        |
|----------------|-------------------|-----------|----------|----------|
| OB-108         | 1                 | 609,6 mm  | 203 mm   | 153 mm   |
|                |                   | 24 in.    | 7.99 in. | 6.02 in. |
|                | 2                 | 1219,2 mm | 203 mm   | 178 mm   |
|                |                   | 48 in.    | 7.99 in. | 7 in.    |
| OB-133         | 1                 | 698,5 mm  | 203 mm   | 153 mm   |
|                |                   | 27.5 in.  | 7.99 in. | 6.02 in. |
|                | 2                 | 1397 mm   | 203 mm   | 178 mm   |
|                |                   | 55 in.    | 7.99 in. | 7 in.    |

#### Technical specifications

| Mod.   | Code  | Stroke   | Force at 70 bar/ 1000 psi | Vol.      | Fittings  | Engine power | Max. speed |
|--------|-------|----------|---------------------------|-----------|-----------|--------------|------------|
| OB-108 | 19304 | 197.0 mm | 385 Kgf                   | 108 cc    | 1/4" NPTF | 150 Hp       | 85 Km/h    |
|        |       | 7.75 in  | 848 lbf                   | 6.6 cu.in | 3/8" D.E. | 110 Kw       | 45 kts     |
| OB-133 | 20932 | 241.3 mm | 385 Kgf                   | 133 cc    | 1/4" NPTF | 300 Hp       | 110 Km/h   |
|        |       | 9.5 in   | 848 lbf                   | 8.1 cu.in | 3/8" D.E. | 221 Kw       | 60 kts     |

Note: the front mounting cylinders mod. OB-108 and OB-133 are not suitable for installations where the boat max speed exceeds 85 km/h (45 kts) for mod. OB-108 and 110 Km/h (60 kts) for mod. OB-133 and for any application on racing boats.

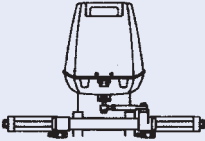
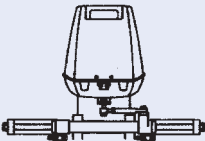
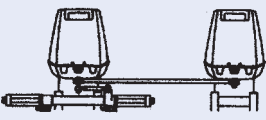
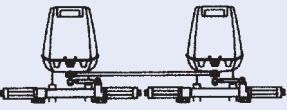


#### Dimensions

| Model  | A         | B        | C         | D        | E        | F        | G         | H        | I        | L       | M        |
|--------|-----------|----------|-----------|----------|----------|----------|-----------|----------|----------|---------|----------|
| OB-108 | 576 mm    | 75 mm    | 320 mm    | 125 mm   | 18 mm    | 15,8 mm  | 432 mm    | 38 mm    | 25mm     | 51 mm   | 146,5 mm |
|        | 22.67 in. | 2.95 in. | 12.59 in. | 4.92 in. | 0.70 in. | 0.62 in. | 17 in.    | 1.49 in. | 0.98 in. | 2 in.   | 7.76 in. |
| OB-133 | 667.3 mm  | 75 mm    | 317.3 mm  | 147 mm   | 18 mm    | 15.8 mm  | 430 mm    | 38 mm    | 25 mm    | 51 mm   | 147 mm   |
|        | 26,27 in. | 2,95 in. | 12.49 in. | 5.7 in.  | 0.70 in. | 0.62 in. | 16.92 in. | 1.49 in. | 0.98 in. | 2.0 in. | 5.78 in. |

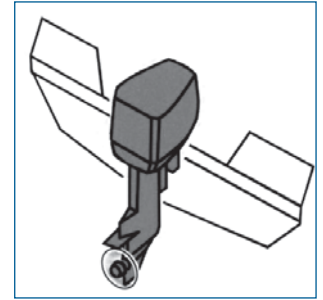
# Order Guide

All the outboard cylinders are available with imperial fittings only.

| System description   | Components                          | Model                               | Code                 | Q.ty |
|--|-------------------------------------|-------------------------------------|----------------------|------|
| Single engine/Cylinder   | <b>System OB1 / Wheel turns 5,4</b> |                                     |                      |      |
| <br>Application up to:<br><b>150 Hp max</b>                                     | Front mounting cylinder             | OB-108                              | 19304                | 1    |
|  | Basic steering helm                 | P20BAP                              | 21173                | 1    |
|  | Hose kit                            | SH-O... (**)                        | Page 74-75 for codes | 1    |
|  | Hydraulic oil                       | VG22                                | 21334                | 2    |
|  | In case of additional station add:  |                                     |                      |      |
|  | Basic steering helm                 | P20BAP                              | 21173                | 1    |
|  | Fittings kit                        |                                     | 23376                | 1    |
|  | Hose kit                            | SH-O... (**)                        | Page 74-75 for codes | 1    |
|  | Hydraulic oil                       | VG22                                | 21334                | 1    |
|  |                                     | <b>System OB3 / Wheel turns 4,4</b> |                      |      |
| <br>Application up to:<br><b>300 Hp max</b>                                     | Front mounting cylinder             | OB-133                              | 20932                | 1    |
|  | Basic steering helm                 | P30BAP                              | 21174                | 1    |
|  | Hose kit                            | SH-O... (**)                        | Page 74-75 for codes | 1    |
|  | Hydraulic oil                       | VG22                                | 21334                | 2    |
|  | In case of additional station add:  |                                     |                      |      |
|  | Basic steering helm                 | P30BAP                              | 21174                | 1    |
|  | Fittings kit                        |                                     | 23376                | 1    |
|  | Hose kit                            | SH-O... (**)                        | Page 74-75 for codes | 1    |
|  | Hydraulic oil                       | VG22                                | 21334                | 1    |
|  |                                     | <b>System OB3 / Wheel turns 4,4</b> |                      |      |
| <br>Application up to:<br><b>450 Hp max</b><br>(non-counter rotating engines) | Front mounting cylinder             | OB-133                              | 20932                | 1    |
|  | Basic steering helm                 | P30BAP                              | 21174                | 1    |
|  | Hose kit                            | SH-O... (**)                        | Page 74-75 for codes | 1    |
|  | Hydraulic oil                       | VG22                                | 21334                | 2    |
|  | Tie bar                             | Supplied by engine manufacturer     | Not available        |      |
|  | In case of additional station add:  |                                     |                      |      |
|  | Basic steering helm                 | P30BAP                              | 21174                | 1    |
|  | Fittings kit                        |                                     | 23376                | 1    |
|  | Hose kit                            | SH-O... (**)                        | Page 74-75 for codes | 1    |
|  | Olio idraulico                      | VG22                                | 21334                | 1    |
|  | <b>System OB6 / Wheel turns 3,2</b> |                                     |                      |      |
| <br>Application up to:<br><b>600 Hp max</b><br>(counter rotating engines)     | Front mounting cylinder             | OB-133                              | 20932                | 2    |
|  | Basic steering helm                 | P42BAP                              | 21175                | 1    |
|  | Hose kit                            | SH-O... (**)                        | Page 74-75 for codes | 2    |
|  | Hydraulic oil                       | VG22                                | 21334                | 3    |
|  | Tie bar                             | Supplied by engine manufacturer     | Not available        | 1    |
|  | In case of additional station add:  |                                     |                      |      |
|  | Basic steering helm                 | P42BAP                              | 21175                | 1    |
|  | Fittings kit                        |                                     | 23376                | 1    |
|  | Hose kit                            | SH-O... (**)                        | Page 74-75 for codes | 1    |
|  | Hydraulic oil                       | VG22                                | 21334                | 1    |

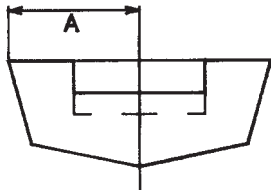
Note: for kit of fittings please see on page 74 and following. (\*\*) For kit of hoses please see on page. 74-75.

# Side mounting outboard cylinder Cylinder mod. OB-163SY

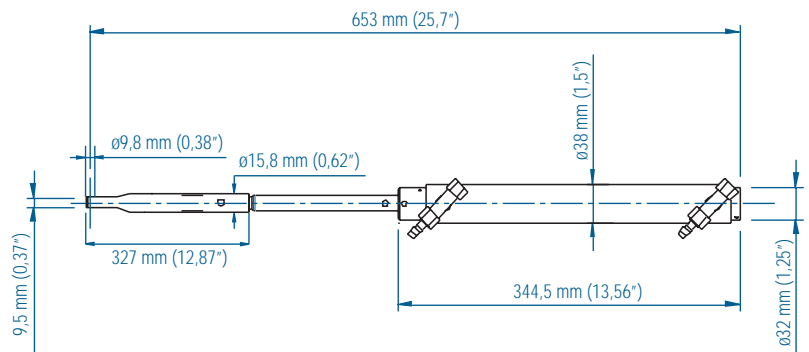


## Dimensions

### Minimum splashwell dimensions



| Cylinder model | Number of engines | A                  |
|----------------|-------------------|--------------------|
| OB-163SY       | 1                 | 530 mm<br>20,8 in. |



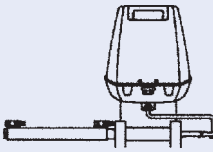
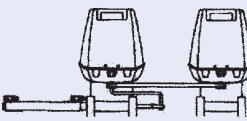
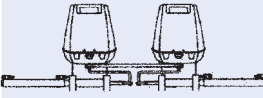
### Technical specifications

| Model    | Code  | Stroke   | Force at 70 bar/1000 psi | Volume              | Engine power | Max. speed |
|----------|-------|----------|--------------------------|---------------------|--------------|------------|
| OB-163SY | 20928 | 203.0 mm | 455 - 562 Kgf            | 132.11 - 163.34 cc. | 300 Hp       | 85 Km/h    |
|          |       | 8.0 in   | 1003 -1238 lbf           | 8.05 - 9.97 cu.in   | 221 Kw       | 45 kts     |

Note: the side mounting cylinder mod. OB-163SY is not suitable for installations where the boat max speed exceeds 110 Km/h (60 kts) and for any application on racing boats.

# Order Guide

All the outboard cylinders are available with imperial fittings only.

| System description  | Components                          | Model                               | Code                 | Q.ty |
|---|-------------------------------------|-------------------------------------|----------------------|------|
| Single engine/Cylinder  | System OB8 / Wheel turns 6,6 / 8,1  |                                     |                      |      |
| <br>Application up to:<br><b>300 Hp max</b>                                    | Side mounting cylinder              | OB-163SY                            | 20928                | 1    |
|   | Basic steering helm                 | P20BAP                              | 21173                | 1    |
|   | Hose kit                            | SH-O... (**)                        | Page 74-75 for codes | 1    |
|   | Hydraulic oil                       | VG22                                | 21334                | 3    |
|   | In case of additional station add:  |                                     |                      |      |
|   | Basic steering helm                 | P20BAP                              | 21173                | 1    |
|   | Fittings kit                        |                                     | 23376                | 1    |
|   | Hose kit                            | SH-O... (**)                        | Page 74-75 for codes | 1    |
|   | Hydraulic oil                       | VG22                                | 21334                | 1    |
|   | Double engine/<br>Single cylinder   | System OB10 / Wheel turns 4,4 / 5,4 |                      |      |
| <br>Application up to:<br><b>300 Hp max</b><br>(non-counter rotating engines) | Side mounting cylinder              | OB-163SY                            | 20928                | 1    |
|   | Basic steering helm                 | P30BAP                              | 21174                | 1    |
|   | Hose kit                            | SH-O... (**)                        | Page 74-75 for codes | 1    |
|   | Hydraulic oil                       | VG22                                | 21334                | 3    |
|   | Tie bar                             | supplied by engine manufacturer     | Not available        | 1    |
|   | In case of additional station add:  |                                     |                      |      |
|   | Basic steering helm                 | P30BAP                              | 21174                | 1    |
|   | Fittings kit                        |                                     | 23376                | 1    |
|   | Hose kit                            | SH-O... (**)                        | Page 74-75 for codes | 1    |
|   | Hydraulic oil                       | VG22                                | 21334                | 1    |
| Double engine/Cylinder  | System OB12 / Wheel turns 3,1 / 3,8 |                                     |                      |      |
| <br>Application up to:<br><b>600 Hp max</b><br>(counter rotating engines)     | Side mounting cylinder              | OB-163SY                            | 20928                | 2    |
|   | Basic steering helm                 | P42BAP                              | 21175                | 1    |
|   | Hose kit                            | SH-O... (**)                        | Page 74-75 for codes | 2    |
|   | Hydraulic oil                       | VG22                                | 21334                | 3    |
|   | Tie bar                             | supplied by engine manufacturer     | Not available        | 1    |
|   | In case of additional station add:  |                                     |                      |      |
|   | Basic steering helm                 | P42BAP                              | 21175                | 1    |
|   | Fittings kit                        |                                     | 23376                | 1    |
|   | Hose kit                            | SH-O... (**)                        | Page 74-75 for codes | 1    |
|   | Hydraulic oil                       | VG22                                | 21334                | 1    |

Note: for kit of fittings please see on page 74 and following. (\*\*) For kit of hoses please see on page. 74-75.

## INBOARD STEERING SYSTEMS

The steering system is of crucial importance to ensure the best boat maneuverability. Therefore, it is very important to choose the model and configuration that best satisfy the boat requirements and the user's needs.

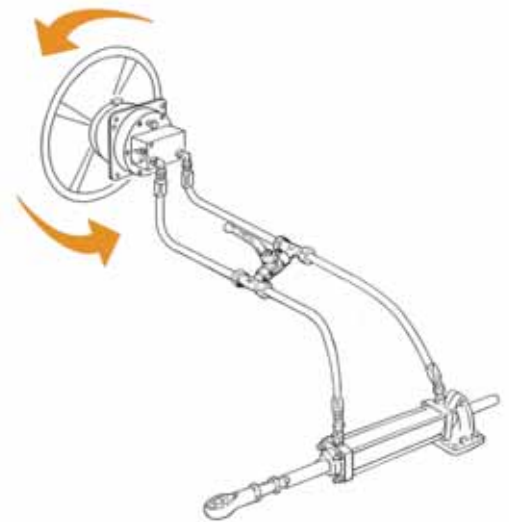
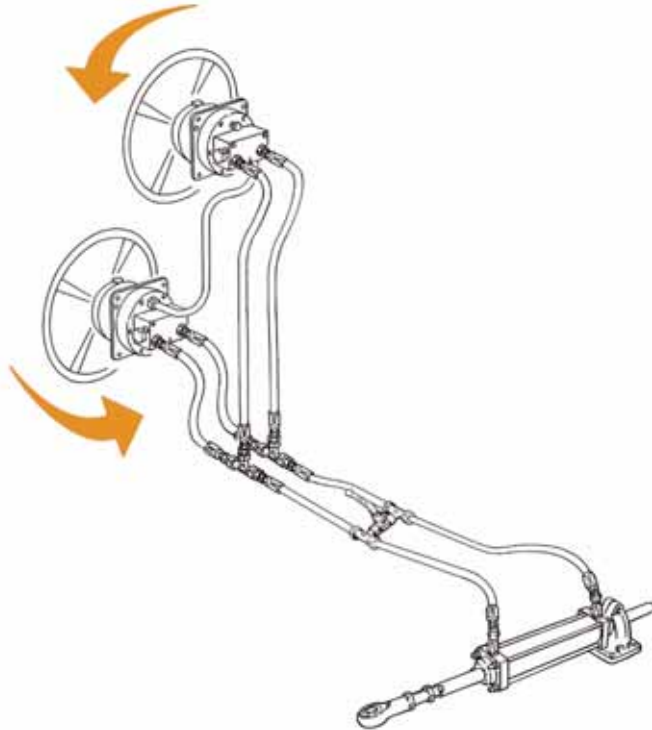
Please, see at pages 8-9 the guide for system selection and the calculation of the max rudder torque, while the following pages help in the selection of steering components.

For any questions, please contact the Twin Disc Technical Dept. Precision and high quality materials are the main features of every component of the BCS inboard steerings. Specific certificates are available on request from the major classification bodies, such as **RINA, American Bureau of Shipping, Lloyd's Register of Shipping, Bureau Veritas, etc.**

**Inboard cylinders** are available either in anodized aluminum or brass versions. The **piston rod** is made of stainless steel to ensure a longer, trouble-free life and to prevent rust or corrosion. The **ball joint** is easily available in the most popular sizes. The **cylinder base** moves both horizontally, to follow the complete cylinder arch, and vertically, to follow and adapt to any excursion of the tiller arm.

Every cylinder is supplied with Tee fittings provided with bleeders and with all the connection fittings needed.

All the materials used for production of inboard steering cylinders are suitable for applications in marine environment, even when high level of salt is found.



### Main features

- Compact design
- Available in a wide variety of volumes and strokes for an extraordinary flexibility of applications
- Provided with bleeders
- Piston rod in stainless steel
- Base moving either horizontally or vertically
- High resistance to corrosion
- Built according to **ABYC** standards
- **CE** approved



# Application guide according to boat length and type

- Metrical fittings
- Imperial fittings

| Boat length<br>LOA          | System to order   |         |           |         |                   |         |           |         |
|-----------------------------|---|---------|-----------|---------|-------------------|---------|-----------|---------|
|                             | Planing hull  |         |           |         | Displacement hull |         |           |         |
|                             | 1 engine  |         | 2 engines |         | 1 engine          |         | 2 engines |         |
|                             | Pleasure  | Working | Pleasure  | Working | Pleasure          | Working | Pleasure  | Working |
| Fino a 8 mt / 26 ft         | 1   | 2       | 1         | 2       | 1                 | 2       | 1         | 2       |
| 8 - 9,8 mt / 26 - 32 ft     | 1   | 2       | 1         | 2       | 2                 | 3       | 2         | 3       |
| 9,8 - 11,6 mt / 32 - 38 ft  | 2   | 3       | 2         | 3       | 3                 | 4       | 2         | 3       |
| 11,6 - 13,4 mt / 38 - 44 ft | 3   | 4       | 2         | 4       | 4                 | 6       | 3         | 5       |
| 13,4 - 15,3 mt / 44 - 50 ft | 7   | 7       | 4         | 5       | 6                 | 7       | 5         | 6       |
| 15,5 - 16,8 mt / 50 - 55 ft | 8   | 9       | 5         | 6       | 7                 | 8       | 7         | 8       |
| 16,8 - 18 mt / 55 - 60 ft   | 8   | 9       | 6         | 7       | 8                 | 8       | 8         | 8       |
| 18 - 19,8 mt / 60 - 65 ft   | -   | -       | 8         | -       | 8                 | 9       | 8         | 9       |
| 19,8 - 21 mt / 65 - 70 ft   | -   | -       | 8         | -       | 9                 | 9       | 9         | 10      |
| 21 - 22,8 mt / 70 - 75 ft   | -   | -       | 9         | -       | 10                | 11      | 10        | 11      |
| 22,8 - 24,3 mt / 75- 80 ft  | -   | -       | 9         | -       | 10                | 11      | 10        | 11      |
| oltre 24,3 mt / 80 ft       | For boat lengths over 24,3 mt / 80 ft please contact our Technical Department to check applications suggested on systems 12-13-14 |         |           |         |                   |         |           |         |

**WARNING! The above suggestions shall be intended as indicative.** To check the proper application the required max torque must be calculated. If the required information is not available please contact our authorized dealer or service center and submit boat length, maximum speed and rudder dimensions.

**WARNING!** For displacement boats, hull speed normally does not exceed 18 knots. For planing boats, the above steering systems are suggested for boat speeds under 30 knots.

| Cylinder         |               | System to order     |
|------------------|---------------|---------------------|
| Mod.             | Code          |                     |
| CTA40U - CTA40   | 15649 - 12675 | System 1 (page 26)  |
| CTA65U - CTA65   | 12677 - 12676 | System 2 (page 27)  |
| CTA75U - CTA75   | 15763 - 12678 |                     |
| CTA80U - CTA80   | 12682 - 12679 | System 3 (page 28)  |
| CTB110U - CTB110 | 12687 - 12683 | System 4 (page 29)  |
| CTB130U - CTB130 | 12691 - 15606 |                     |
| CTB145U - CTB145 | 12694 - 12692 | System 5 (page 30)  |
| CTC200           | 12695         | System 6 (page 41)  |
| CTC230           | 12698         | System 7 (page 42)  |
| CTC300           | 12701         | System 8 (page 43)  |
| CTC400           | 15697         | System 9 (page 44)  |
| CTD310           | 15698         |                     |
| CTD450           | 15699         | System 10 (page 45) |
| CTE600           | 15700         | System 11 (page 46) |
| CTE900           | 15701         | System 12 (page 47) |
| CTE1200          | 15702         | System 13 (page 48) |
| CTF1600          | 15703         | System 14 (page 49) |

# System 1

■ Metrical fittings

■ Imperial fittings

| ALUMINUM cylinder                              |   |                              |      |
|--|---|------------------------------|------|
| Components                                     | Model   | Code                         | Q.ty |
| Cylinder                                       | CTA40U - CTA40  | 15649 - 12675                | 1    |
| Helm pump                                      | Choose the pump model according to the desired wheel turns number in the table here below   |                              | 1    |
| Hose kit                                       | SH-O... (**)  | See on pages 74-75 for codes | 1    |
| Hydraulic oil                                  | VG22  | 21334                        | 3    |
| By-pass  | Choose the by-pass model according to the pump-cylinder combination in the table here below |                              | 1    |
| In case of additional station add:             |   |                              |      |
| Second station helm pump                       | Same pump model as above  | (see table on page bottom)   | 1    |
| Second station fittings kit                    |   | 23376 - 23487                | 1    |
| Hose kit                                       | SH-O... (**)  | See on pages 74-75 for codes | 1    |
| Hydraulic oil                                  | VG22  | 21334                        | 1    |
| In case of auto-pilot installation please add: |   |                              |      |
| Auto-pilot power unit                          | Choose auto-pilot power unit model on the Selection Guide on pages 55-58-59                 |                              | 1    |
| Auto-pilot fittings kit                        |   | 23377 - 23489                | 1    |







## Pump-cylinder combination

### Steering effort

LIGHT 

NORMAL 

HEAVY 

|  |   | HELM PUMP  |  |   |
|--|---|--|--|---|
| <p>Choose combination between pump and cylinder according to the wished number of wheel turns lock-to-lock.</p> <p><b>Note:</b> the requested effort on the steering wheel is inversely proportional to the wheel turns number lock-to-lock:</p> <ul style="list-style-type: none"> <li>• less wheel turns, more effort</li> <li>• more wheel turns, less effort</li> </ul> <p><b>Note:</b> by increasing the wheel diameter, the requested effort is reduced.</p> |   |   |   |  |
|  |   | (*)<br><b>P20BAP Cod. 21173</b><br>P20BA Cod. 16192  | (*)<br><b>P30BAP Cod. 21174</b><br>P30BA Cod. 16193  | (*)<br><b>P42BAP Cod. 21175</b><br>P42BA Cod. 16194                                   |
| CYLINDER   |  | No. of wheel turns: <b>5,8</b> <br>Min. hose size: 5/16" I.D. (**)<br>Tiller: 153 mm - 6,02 in<br>Angle: 35° + 35°<br>Torque:<br>57,83 Kgm - 5028 lb.in.<br>Min. wheel diam.:<br>350 mm-13,77 in.<br>By-pass: cod. <b>23186 - 12216</b> | No. of wheel turns: <b>3,9</b> <br>Min. hose size: 5/16" I.D. (**)<br>Tiller: 153 mm - 6,02 in<br>Angle: 35° + 35°<br>Torque:<br>57,83 Kgm - 5028 lb.in.<br>Min. wheel diam.:<br>350 mm-13,77 in.<br>By-pass: cod. <b>23186 - 12216</b> |   |
|  | <b>CTA40U - Cod. / Part # 15649</b><br><b>CTA40 - Cod. / Part # 12675</b>           |  |  |   |

Rudder torque calculated at the working pressure of 70 bar (1000 psi).

(\*) For more details, see the basic helm section on page 11 and following and to choose the desired mounting configuration.

(\*\*) See on page 74-75 to choose the model and code of the preferred kit. Flexible hose can be used up to a max length of 15 mt - 45' between pump and cylinder.

# System 2

■ Metrical fittings

■ Imperial fittings

| ALUMINUM cylinder                              |   |                                |      |
|--|---|--------------------------------|------|
| Components                                     | Model   | Code                           | Q.ty |
| Cylinder                                       | CTA65U - CTA65<br>CTA75U - CTA75  | 12677 - 12676<br>15763 - 12678 | 1    |
| Helm pump                                      | Choose the pump model according to the desired wheel turns number in the table here below   |                                | 1    |
| Hose kit                                       | SH-O... (**)  | See on pages 74-75 for codes   | 1    |
| Hydraulic oil                                  | VG22  | 21334                          | 3    |
| By-pass  | Choose the by-pass model according to the pump-cylinder combination in the table here below |                                | 1    |
| In case of additional station add:             |   |                                |      |
| Second station helm pump                       | Same pump model as above  | (see table on page bottom)     | 1    |
| Second station fittings kit                    |   | 23376 - 23487                  | 1    |
| Hose kit                                       | SH-O... (**)  | See on pages 74-75 for codes   | 1    |
| Hydraulic oil                                  | VG22  | 21334                          | 1    |
| In case of auto-pilot installation please add: |   |                                |      |
| Auto-pilot power unit****                      | Choose auto-pilot power unit model on the Selection Guide on pages 55-58-59                 |                                | 1    |
| Auto-pilot fittings kit                        |   | 23377 - 23487 (****)           | 1    |








## Pump-cylinder combination

### Steering effort

LIGHT 

NORMAL 

HEAVY 

| <p>Choose combination between pump and cylinder according to the wished number of wheel turns lock-to-lock.<br/><b>Note:</b> the requested effort on the steering wheel is inversely proportional to the wheel turns number lock-to-lock:</p> <ul style="list-style-type: none"> <li>• less wheel turns, more effort</li> <li>• more wheel turns, less effort</li> </ul> <p><b>Note:</b> by increasing the wheel diameter, the requested effort is reduced.</p> |   | HELM PUMP   |   |   |
|---|---|---|---|---|
|   |   |  |   |  |
|   |   | (*)<br>P20BAP Cod. 21173<br>P20BA Cod. 16192  | (*)<br>P30BAP Cod. 21174<br>P30BA Cod. 16193  | (*)<br>P42BAP Cod. 21175<br>P42BA Cod. 16194  |
| CYLINDER  |  |   | No. of wheel turns: <b>5,6</b><br>Min. hose size: 5/16" I.D. (**)<br>Tiller: 153 mm - 6,02 in.<br>Angle: 35° + 35°<br>Torque: 83,81 Kgm - 7287 lb.in.<br>Min. wheel diam.: 350 mm-13,77 in.<br>By-pass: cod. <b>23186</b> - 12216 |  |
|   |  |   | No. of wheel turns: <b>6,3</b><br>Min. hose size: 5/16" I.D. (**)<br>Tiller: 175 mm - 6,89 in.<br>Angle: 35° + 35°<br>Torque: 94,17 Kgm - 8188 lb.in.<br>Min. wheel diam.: 350 mm-13,77 in.<br>By-pass: cod. <b>23186</b> - 12216 |  |
|   | CTA65U - Cod. / Part # 12677<br>CTA65 - Cod. / Part # 12676                         |   |   |   |
|   | CTA75U - Cod. / Part # 15763<br>CTA75 - Cod. / Part # 12678                         |   |   |   |

Rudder torque calculated at the working pressure of 70 bar (1000 psi).

(\*) For more details, see the basic helm section on page 11 and following and to choose the desired mounting configuration.

(\*\*) See on page 74-75 to choose the model and code of the preferred kit. Flexible hose can be used up to a max length of 15 mt - 45' between pump and cylinder.

(\*\*\*\*) In case of choosing an auto-pilot power unit with automatic filling is installed, the fittings kit to order is code 23376 - 23487\*\*.

# System 3

■ Metrical fittings

■ Imperial fittings

| ALUMINUM cylinder                              |  |  |      |
|--|--|--|------|
| Components                                     | Model  | Code                                       | Q.ty |
| Cylinder                                       | CTA80U - CTA80   | 12682 - 12679                              | 1    |
| Helm pump                                      | Choose the pump model according to the desired wheel turns number in the table below   |  | 1    |
| Hose kit                                       | SH-O... (**)   | See on pages 74-75 for codes               | 1    |
| Hydraulic oil                                  | VG22   | 21334                                      | 3    |
| By-pass  | Choose the by-pass model according to the pump-cylinder combination in the table below |  | 1    |
| In case of additional station add:             |  |  |      |
| Second station helm pump                       | Same pump model as above   | (see table on page bottom)                 | 1    |
| Second station fittings kit                    |  | 23376 o 23418 (***)<br>23487 o 23488 (***) | 1    |
| Hose kit                                       | SH-O... (**)   | See on pages 74-75 for codes               | 1    |
| Hydraulic oil                                  | VG22   | 21334                                      | 1    |
| In case of auto-pilot installation please add: |  |  |      |
| Auto-pilot power unit****                      | Choose auto-pilot power unit model on the Selection Guide on pages 55-58-59            |  | 1    |
| Auto-pilot fittings kit****                    |  | 23377 o 23373 (***)<br>23489 o 23490 (***) | 1    |







## Pump-cylinder combination

### Steering effort

LIGHT 

NORMAL 

HEAVY 

|  |   | HELM PUMP   |  |  |
|--|---|---|--|--|
| <p>Choose combination between pump and cylinder according to the wished number of wheel turns lock-to-lock.</p> <p><b>Note:</b> the requested effort on the steering wheel is inversely proportional to the wheel turns number lock-to-lock:</p> <ul style="list-style-type: none"> <li>• less wheel turns, more effort</li> <li>• more wheel turns, less effort</li> </ul> <p><b>Note:</b> by increasing the wheel diameter, the requested effort is reduced.</p> |   |    |  |   |
|  |   | (*)<br>P20BAP Cod. 21173<br>P20BA Cod. 16192  | (*)<br>P30BAP Cod. 21174<br>P30BA Cod. 16193   | (*)<br>P42BAP Cod. 21175<br>P42BA Cod. 16194   |
| CYLINDER   |  | <p>No. of wheel turns: 7,2 </p> <p>Min. hose size: 5/16" I.D. (**)</p> <p>Tiller: 200 mm - 7,87 in.</p> <p>Angle: 35° + 35°</p> <p>Torque:<br/>107,36 Kgm - 9335 lb.in.</p> <p>Min. wheel diam.:<br/>350 mm-13,77 in.</p> <p>By-pass: cod. 23186 - 12216</p> |  | <p>No. of wheel turns: 5,1 </p> <p>Min. hose size:<br/>5/16" - 3/8" I.D. (**)</p> <p>Tiller: 200 mm - 7,87 in.</p> <p>Angle: 35° + 35°</p> <p>Torque:<br/>107,36 Kgm - 9335 lb.in.</p> <p>Min. wheel diam.:<br/>450 mm-17,71 in.</p> <p>By-pass: cod. 23186 - 23480 (***)<br/>12216 - 16968 (***)</p> |
|  | CTA80U - Cod. / Part # 12682<br>CTA80 - Cod. / Part # 12679                         |   |  |  |

Rudder torque calculated at the working pressure of 70 bar (1000 psi).

(\*) For more details, see the basic helm section on page 11 and following and to choose the desired mounting configuration.

(\*\*) See on page 74-75 to choose the model and code of the preferred kit. With 42 cc pumps and hose length over 8 mt - 24' it is suggested to use 3/8" I.D. flexible hose with 1/2" fittings. Flexible hose can be used up to a max length of 15 mt - 45'.

(\*\*\*) It is suggested for combination with 42 cc helm pump if the total length between pump and cylinder exceeds 8 mt - 24'.

(\*\*\*\*) In case an auto-pilot power unit with automatic filling is installed, you need to use fitting kits codes 23376 - 23418/23487 - 23488 (\*\*).

# System 4

■ Metrical fittings

■ Imperial fittings

| BRASS cylinder                                 |  |  |      |
|--|--|--|------|
| Components                                     | Model  | Code                                       | Q.ty |
| Cylinder                                       | CTB110U - CTB130U<br>CTB110 - CTB130   | 12687 - 12691<br>12683 - 15606             | 1    |
| Helm pump                                      | Choose the pump model according to the desired wheel turns number in the table below   |  | 1    |
| Hose kit                                       | SH-O... (**)   | See on pages 74-75 for codes               | 1    |
| Hydraulic oil                                  | VG22   | 21334                                      | 3    |
| By-pass  | Choose the by-pass model according to the pump-cylinder combination in the table below |  | 1    |
| In case of additional station add:             |  |  |      |
| Second station helm pump                       | Same pump model as above   | (see table on page bottom)                 | 1    |
| Second station fittings kit                    |  | 23376 o 23418 (***)<br>23487 o 23488 (***) | 1    |
| Hose kit                                       | SH-O... (**)   | See on pages 74-75 for codes               | 1    |
| Hydraulic oil                                  | VG22   | 23377 o 23373 (***)<br>23489 o 23490 (***) | 1    |
| In case of auto-pilot installation please add: |  |  |      |
| Auto-pilot power unit****                      | Choose auto-pilot power unit model on the Selection Guide on pages 55-58-59            |  | 1    |
| Auto-pilot fittings kit                        |  | 23373 (****) - 23490 (***)                 | 1    |








## Pump-cylinder combination

### Steering effort

LIGHT 

NORMAL 

HEAVY 

| Choose combination between pump and cylinder according to the wished number of wheel turns lock-to-lock.<br><b>Note:</b> the requested effort on the steering wheel is inversely proportional to the wheel turns number lock-to-lock: less wheel turns, more effort - more wheel turns, less effort.<br><b>Note:</b> by increasing the wheel diameter, the requested effort is reduced. |  | HELM PUMP   |  |   |   |
|---|--|---|--|---|---|
|   |  | <br>(*)<br>P20BAP Cod. 21173<br>P20BA Cod. 16192 | <br>(*)<br>P30BAP Cod. 21174<br>P30BA Cod. 16193 | <br>(*)<br>P42BAP Cod. 21175<br>P42BA Cod. 16194 |   |
| CYLINDER  | <br>CTB110U - Cod. / Part # 12687<br>CTB110 - Cod. / Part # 12683 |   |  |   | No. of wheel turns: 6,7<br>Min. hose size: 3/8" I.D. (**)<br>Tiller: 153 mm - 6,02 in. <br>Angle: 35° + 35°<br>Torque: 140,85 Kgm - 12247 lb.in.<br>Min. wheel diam.: 450 mm-17,71 in.<br>By-pass: cod. 23186 - 23480 (***)<br>12216 - 16968 (***) |
|   | <br>CTB130U - Cod. / Part # 12691<br>CTB130 - Cod. / Part # 15606 |   |  |   | No. of wheel turns: 7,7<br>Min. hose size: 3/8" I.D. (**)<br>Tiller: 180 mm - 7 in. <br>Angle: 35° + 35°<br>Torque: 140,85 Kgm - 12247 lb.in.<br>Min. wheel diam.: 450 mm-17,71 in.<br>By-pass: cod. 23186 - 23480 (***)<br>12216 - 16968 (***)    |

Rudder torque calculated at the working pressure of 70 bar (1000 psi).

(\*) For more details, see the basic helm section on page 11 and following and to choose the desired mounting configuration.

(\*\*) See on page 74-75 to choose the model and code of the preferred kit. With 42 cc pumps and hose length over 8 mt - 24' it is suggested to use 3/8" I.D. flexible hose with 1/2" fittings. Flexible hose can be used up to a max length of 15 mt - 45'.

(\*\*\*) It is suggested for combination with 42 cc helm pump if the total length between pump and cylinder exceeds 8 mt - 24'.

(\*\*\*\*) In case an auto-pilot power unit with automatic filling is installed, you need to use fitting kits codes 23376 - 23418/23487 - 23488 (\*\*).

# System 5

■ Metrical fittings

■ Imperial fittings

| BRASS cylinder                                 |   |                              |      |
|--|---|------------------------------|------|
| Components                                     | Model   | Code                         | Q.ty |
| Cylinder                                       | CTB145U - CTB145  | 12694 - 12692                | 1    |
| Helm pump                                      | Choose the pump model according to the desired wheel turns number in the table here below   |                              | 1    |
| Hose kit                                       | SH-O... (**)  | See on pages 74-75 for codes | 1    |
| Hydraulic oil                                  | VG22  | 21334                        | 3    |
| By-pass  | Choose the by-pass model according to the pump-cylinder combination in the table here below |                              | 1    |
| In case of additional station add:             |   |                              |      |
| Second station helm pump                       | Same pump model as above  | (see table on page bottom)   | 1    |
| Second station fittings kit                    |   | 23418 - 21488                | 1    |
| Hose kit                                       | SH-O... (**)  | See on pages 74-75 for codes | 1    |
| Hydraulic oil                                  | VG22  | 21334                        | 1    |
| In case of auto-pilot installation please add: |   |                              |      |
| Auto-pilot power unit****                      | Choose auto-pilot power unit model on the Selection Guide on pages 55-58-59                 |                              | 1    |
| Auto-pilot fittings kit                        |   | 23373 - 23490 (****)         | 1    |






## Pump-cylinder combination

### Steering effort

LIGHT 

NORMAL 

HEAVY 

|  |   | HELM PUMP  |  |   |
|--|---|--|--|---|
| <p>Choose combination between pump and cylinder according to the wished number of wheel turns lock-to-lock.</p> <p><b>Note:</b> the requested effort on the steering wheel is inversely proportional to the wheel turns number lock-to-lock:</p> <ul style="list-style-type: none"> <li>• less wheel turns, more effort</li> <li>• more wheel turns, less effort</li> </ul> <p><b>Note:</b> by increasing the wheel diameter, the requested effort is reduced.</p> |   |   |  |  |
|  |   | (*)<br>P20BAP Cod. 21173<br>P20BA Cod. 16192   | (*)<br>P30BAP Cod. 21174<br>P30BA Cod. 16193   | (*)<br>P42BAP Cod. 21175<br>P42BA Cod. 16194  |
| CYLINDER   |  | <p>No. of wheel turns: <b>8,6</b> </p> <p>Min. hose size: 3/8" I.D. (**)</p> <p>Tiller: 200 mm - 7,8 in.</p> <p>Angle: 35° + 35°</p> <p>Torque: 140,85 Kgm - 12247 lb.in.</p> <p>Min. wheel diam.: 450 mm-17,71 in.</p> <p>By-pass: cod. <b>23480 - 16968</b></p> |  |   |
| <p>CTB145U - Cod. / Part # 12694</p> <p>CTB145 - Cod. / Part # 12692</p>   |   |  |  |   |

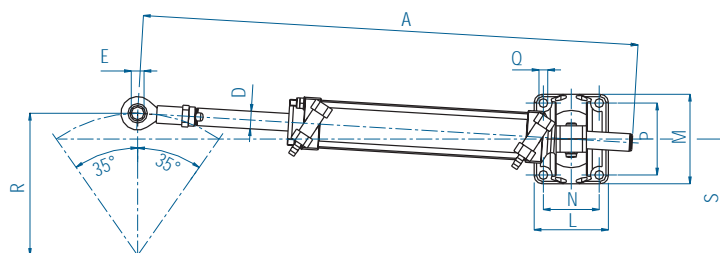
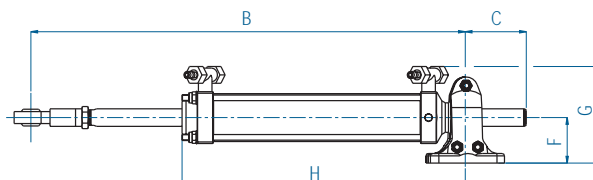
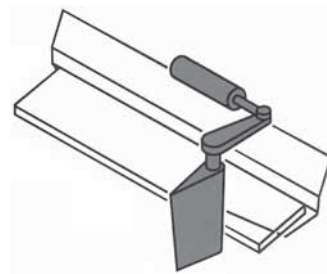
Rudder torque calculated at the working pressure of 70 bar (1000 psi).

(\*) For more details, see the basic helm section on page 11 and following and to choose the desired mounting configuration.

(\*\*) See on page 74-75 to choose the model and code of the preferred kit. With 42 cc pumps and hose length over 8 mt - 24' it is suggested to use 3/8" I.D. flexible hose with 1/2" fittings. Flexible hose can be used up to a max length of 15 mt - 45'.

(\*\*\*\*) In case an auto-pilot power unit with automatic filling is installed, the fitting kits are codes 23418 - 23488 (\*\*).

# Inboard steering cylinders Series CTA



### Main features

- Cylinder body in **anodized aluminum**
- Piston rod in stainless steel for a high corrosion resistance
- Adjustable base either horizontally or vertically
- Available in a range of volumes between 115 to 215 cc
- Supplied with bleeders
- Meet **ABYC** standards

### Technical specifications

■ Metrical fittings

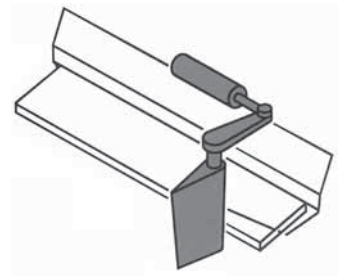
■ Imperial fittings

| Dimensions      |          |           |           |          |          |          |          |          |           |          |          |          |          |          |          |         |
|-----------------|----------|-----------|-----------|----------|----------|----------|----------|----------|-----------|----------|----------|----------|----------|----------|----------|---------|
| Model           | Stroke   | A         | B         | C        | D        | E        | F        | G        | H         | L        | M        | N        | P        | Q        | R        | S       |
| CTA40U<br>CTA40 | 178 mm   | 555 mm    | 459 mm    | 96 mm    | 14 mm    | 19,05 mm | 35 mm    | 86 mm    | 298 mm    | 62 mm    | 90 mm    | 40 mm    | 73 mm    | 8,5 mm   | 153 mm   | 127 mm  |
|                 | 7.0 in.  | 21.85 in. | 18 in.    | 3.78 in. | 0.55 in. | 3/4 in.  | 1.38 in. | 3.39 in. | 11.73 in. | 2.44 in. | 3.54 in. | 1.57 in. | 2.87 in. | 0.33 in. | 6.0 in.  | 5.0 in. |
| CTA65U<br>CTA65 | 178 mm   | 586 mm    | 495 mm    | 91 mm    | 20 mm    | 19,05 mm | 40 mm    | 91 mm    | 305 mm    | 60 mm    | 125 mm   | 40 mm    | 105 mm   | 8,5 mm   | 153 mm   | 127 mm  |
|                 | 7.0 in.  | 23 in.    | 19.49 in. | 3.58 in. | 0.79 in. | 3/4 in.  | 1.57 in. | 3.58 in. | 12.0 in.  | 2.36 in. | 4.92 in. | 1.57 in. | 4.13 in. | 0.33 in. | 6.0 in.  | 5.0 in. |
| CTA75U<br>CTA75 | 200 mm   | 630 mm    | 528 mm    | 102 mm   | 20 mm    | 19,05 mm | 40 mm    | 91 mm    | 327 mm    | 60 mm    | 125 mm   | 40 mm    | 105 mm   | 8,5 mm   | 175 mm   | 143 mm  |
|                 | 7.87 in. | 24.8 in.  | 20.79 in. | 4.0 in.  | 0.79 in. | 3/4 in.  | 1.57 in. | 3.58 in. | 12.87 in. | 2.36 in. | 4.92 in. | 1.57 in. | 4.13 in. | 0.33 in. | 6.89 in. | 5.6 in. |
| CTA80U<br>CTA80 | 228 mm   | 690 mm    | 573 mm    | 117 mm   | 20 mm    | 19,05 mm | 40 mm    | 91 mm    | 355 mm    | 60 mm    | 125 mm   | 40 mm    | 105 mm   | 8,5 mm   | 200 mm   | 164 mm  |
|                 | 9.0 in.  | 27.16 in. | 22.56 in. | 4.61 in. | 0.79 in. | 3/4 in.  | 1.57 in. | 3.58 in. | 13.98 in. | 2.36 in. | 4.92 in. | 1.57 in. | 4.13 in. | 0.33 in. | 7.87 in. | 6.5 in. |

| Technical specifications |       |          |             |                              |              |         |         |                       |         |
|--------------------------|-------|----------|-------------|------------------------------|--------------|---------|---------|-----------------------|---------|
| Model                    | Code  | Stroke   | Torque      | Thrust at 70 bar<br>1000 psi | Volume       | Tiller  | Angle   | Fittings              | Weight  |
| CTA40U<br>CTA40          | 15649 | 178 mm   | 57.83 Kgm   | 455 Kgf                      | 115.7 cc     | 153 mm  | 35°+35° | 1/4" NPTF - 3/8" D.E. | 2,2 Kg  |
|                          | 12675 | 7.0 in.  | 5008 lb.in. | 1002 lbf                     | 7.1 cu.in.   | 6 in.   |         | G1/4" - hose d. 10    | 4,85 lb |
| CTA65U<br>CTA65          | 12677 | 178 mm   | 83.81 Kgm   | 659.4 Kgf                    | 167.68 cc    | 153 mm  | 35°+35° | 1/4" NPTF - 3/8" D.E. | 2,6 Kg  |
|                          | 12676 | 7.0 in.  | 7257 lb.in. | 1453 lbf                     | 10.23 cu.in. | 6 in.   |         | G1/4" - hose d. 10    | 5,73 lb |
| CTA75U<br>CTA75          | 15763 | 200 mm   | 94.17 Kgm   | 659.4 Kgf                    | 188.4 cc     | 175 mm  | 35°+35° | 1/4" NPTF - 3/8" D.E. | 3,0 Kg  |
|                          | 12678 | 7.78 in. | 8155 lb.in. | 1453 lbf                     | 11.5 cu.in.  | 6.9 in. |         | G1/4" - hose d. 10    | 6,61 lb |
| CTA80U<br>CTA80          | 12682 | 228 mm   | 107.36 Kgm  | 659.4 Kgf                    | 214.78 cc    | 200 mm  | 35°+35° | 1/4" NPTF - 3/8" D.E. | 3,2 Kg  |
|                          | 12679 | 9.0 in.  | 9297 lb.in. | 1453 lbf                     | 13.11 cu.in. | 7.8 in. |         | G1/4" - hose d. 10    | 7,05 lb |

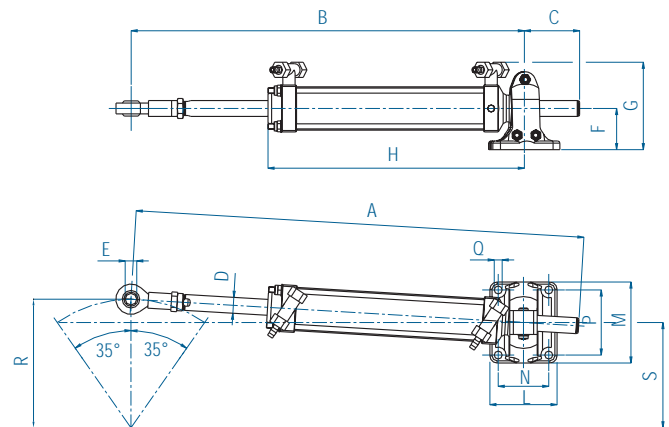
Note: the inboard cylinders mod. CTA are not suitable for installations on racing boats.

# Inboard steering cylinders Series CTB



### Main features

- Cylinder body in **brass** and **stainless steel** base
- Piston rod in stainless steel for a high corrosion resistance
- Adjustable base either horizontally or vertically
- Available in a range of volumes between 281 a 360 cc
- Supplied with bleeders
- Meet **ABYC** standards



### Technical specifications

■ Metrical fittings

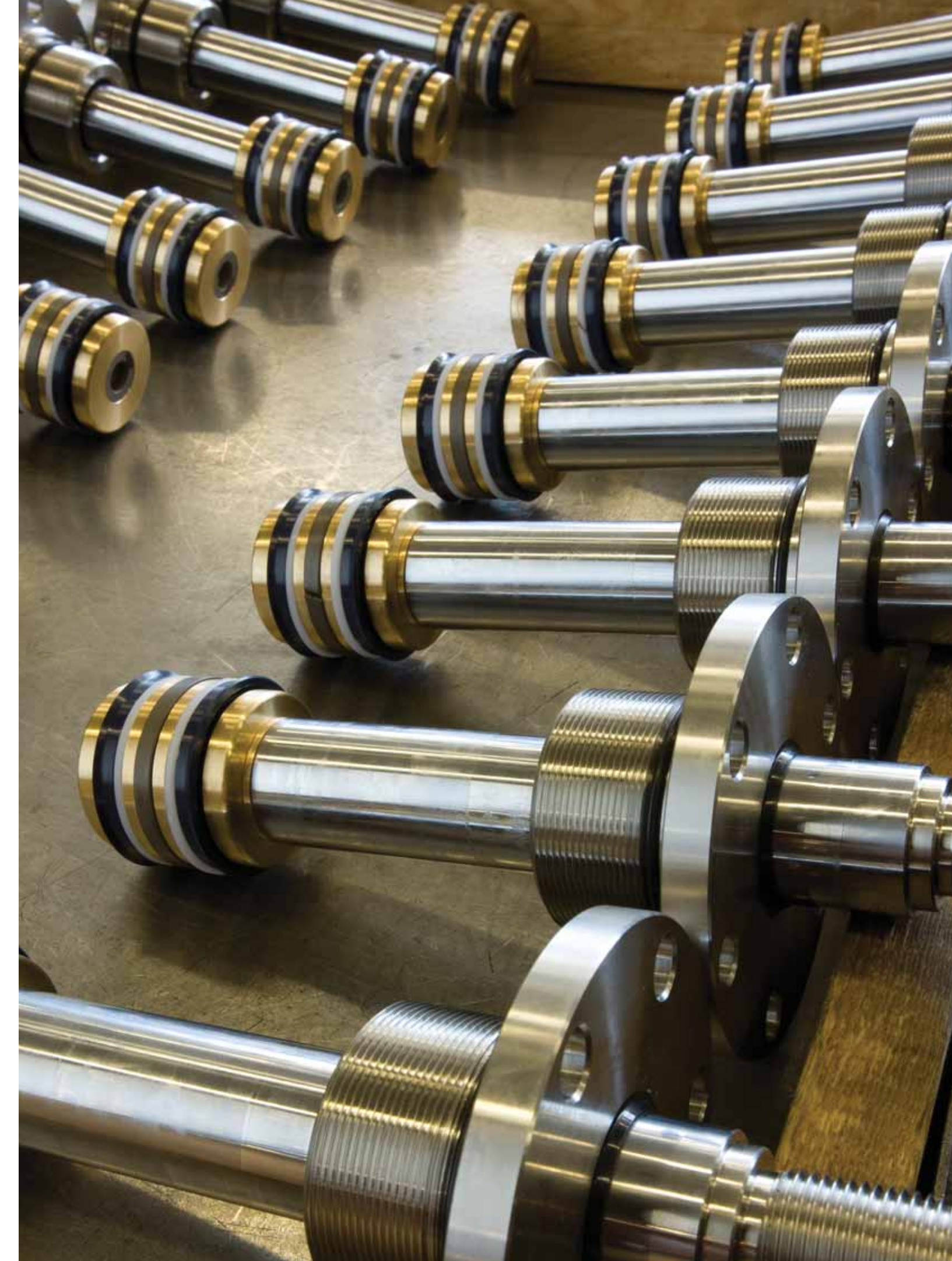
■ Imperial fittings

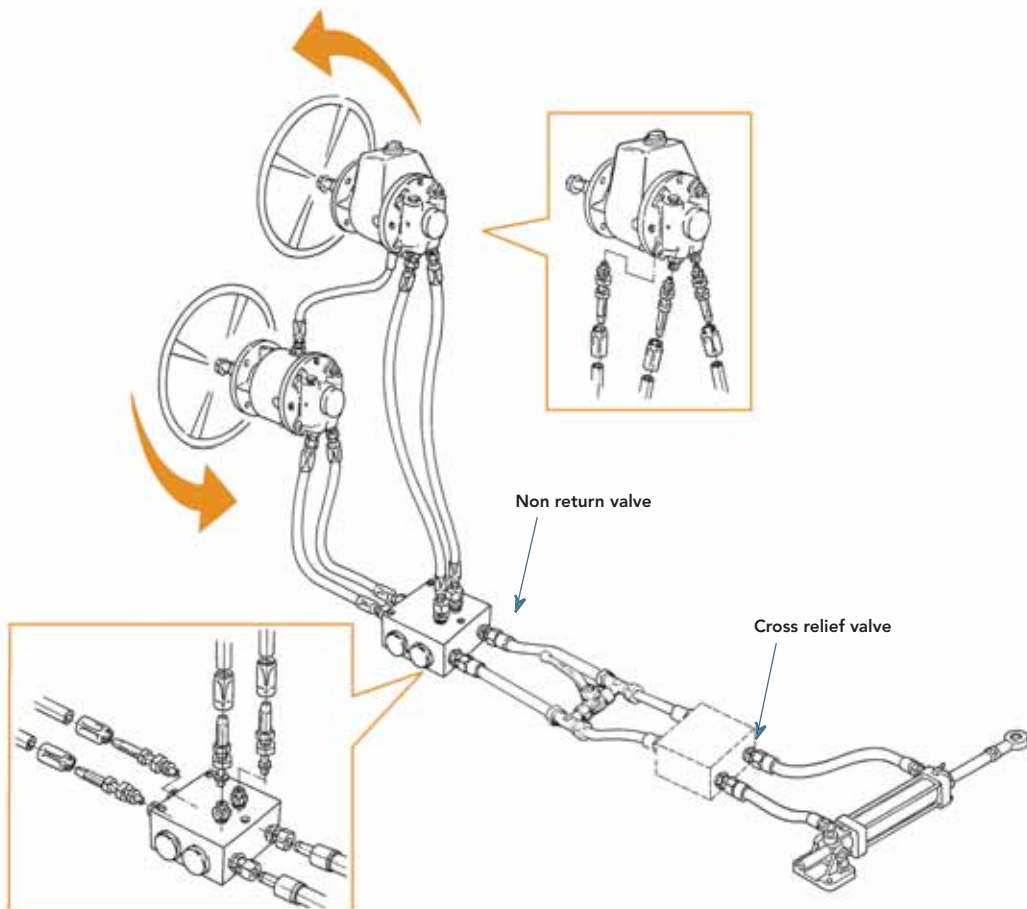
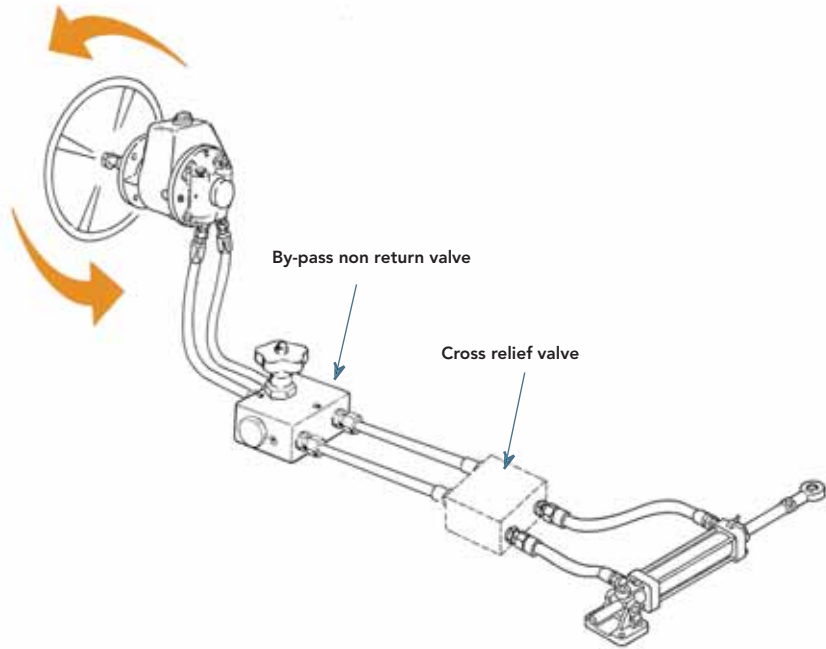
| Dimensions        |         |           |           |          |          |          |          |          |           |          |          |          |          |          |          |          |
|-------------------|---------|-----------|-----------|----------|----------|----------|----------|----------|-----------|----------|----------|----------|----------|----------|----------|----------|
| Model             | Stroke  | A         | B         | C        | D        | E        | F        | G        | H         | L        | M        | N        | P        | Q        | R        | S        |
| CTB110U<br>CTB110 | 178 mm  | 585 mm    | 521 mm    | 64 mm    | 22 mm    | 19,05 mm | 57 mm    | 121 mm   | 329 mm    | 93 mm    | 112 mm   | 70 mm    | 90 mm    | 11 mm    | 153 mm   | 127 mm   |
|                   | 7.0 in. | 22.99 in. | 20.51 in. | 2.52 in. | 0.87 in. | 3/4 in.  | 2.24 in. | 4.76 in. | 12.95 in. | 3.66 in. | 4.40 in. | 2.75 in. | 3.54 in. | 0.43 in. | 6.0 in.  | 5.0 in.  |
| CTB130U<br>CTB130 | 204 mm  | 622 mm    | 545 mm    | 77 mm    | 22 mm    | 16 mm    | 57 mm    | 121 mm   | 355 mm    | 93 mm    | 112 mm   | 70 mm    | 90 mm    | 11 mm    | 180 mm   | 147 mm   |
|                   | 8.0 in. | 24.45 in. | 21.46 in. | 3.03 in. | 0.87 in. | 0.63 in. | 2.24 in. | 4.76 in. | 13.98 in. | 3.66 in. | 4.40 in. | 2.75 in. | 3.54 in. | 0.43 in. | 7.08 in. | 5.78 in. |
| CTB145U<br>CTB145 | 228 mm  | 685 mm    | 596 mm    | 89 mm    | 22 mm    | 19,05 mm | 57 mm    | 121 mm   | 379 mm    | 93 mm    | 112 mm   | 70 mm    | 90 mm    | 11 mm    | 200 mm   | 164 mm   |
|                   | 9.0 in. | 26.93 in. | 23.46 in. | 3.5 in.  | 0.87 in. | 3/4 in.  | 2.24 in. | 4.76 in. | 14.92 in. | 3.66 in. | 4.40 in. | 2.75 in. | 3.54 in. | 0.43 in. | 7.87 in. | 6.5 in.  |

| Technical specifications |       |        |              |                             |             |         |         |                        |          |  |
|--------------------------|-------|--------|--------------|-----------------------------|-------------|---------|---------|------------------------|----------|--|
| Model                    | Code  | Stroke | Torque       | Thrust at 70 bar - 1000 psi | Volume      | Tiller  | Angle   | Fittings               | Weight   |  |
| CTB110U                  | 12687 | 178 mm | 140.85 Kgm   | 1108 Kgf                    | 281.77 cc   | 153 mm  | 35°+35° | 3/8 " NPTF - 1/2" D.E. | 8,6 Kg   |  |
| CTB110                   | 12683 | 7 in.  | 12197 lb.in. | 2442 lbf                    | 17.19 cu.in | 6 in.   |         | T - G3/8" - hose d. 12 | 18,95 lb |  |
| CTB130U                  | 12691 | 204 mm | 161.42 Kgm   | 1108 Kgf                    | 322.93 cc   | 180 mm  | 35°+35° | 3/8 " NPTF - 1/2" D.E. | 8,8 Kg   |  |
| CTB130                   | 15606 | 8 in.  | 13978 lb.in. | 2442 lbf                    | 19.71 cu.in | 7 in.   |         | T - G3/8" - hose d. 12 | 19,40 lb |  |
| CTB145U                  | 12694 | 228 mm | 180.41 Kgm   | 1108 Kgf                    | 360.92 cc   | 200 mm  | 35°+35° | 3/8 " NPTF - 1/2" D.E. | 9,4 Kg   |  |
| CTB145                   | 12692 | 9 in.  | 15623 lb.in. | 2442 lbf                    | 22 cu.in    | 7.8 in. |         | T - G3/8" - hose d. 12 | 20,72 lb |  |

Note: the inboard cylinders mod. CTB are not suitable for installations on racing boats.







# HEAVY DUTY INBOARD STEERING SYSTEMS

Twin Disc has developed a complete BCS line of **heavy duty steering components** specifically for fishing or commercial boats where work loads are heavier and therefore we need a better performance.

The complete range includes several models of **helm pumps**, built with materials and techniques to be extremely robust, and **hydraulic cylinders**, designed to satisfy the highest requirements of reliability and long, trouble-free service.

There is also a selection of steering accessories easy to install which complete the system. These make it safe (even in severe service conditions) for the user to maintain control with the maximum steering comfort.

Every component of this range is built and tested to meet the toughest tests and satisfy the strictest standards of international Survey Authorities such as **RINA, Lloyd's Register of Shipping, American Bureau of Shipping, Bureau Veritas**, etc.; these organizations can also release specific certificates on request.

## Heavy duty helm pumps

The heavy duty helm pumps are available in displacements from 63 cc, 89 cc, 105 cc, 151cc to 191cc. The 63 cc and 89 cc helm pumps are also available with or without an extra oil tank.

In the single station steering system we suggest to install the helm pump with extra oil tank, while with a dual station system we suggest to install a classic helm pump on the lower station

and a helm pump with extra tank on the upper station.

The 105 cc, 151 cc and 191 cc helm pumps are all provided with extra oil tank. The helm body is made of aluminum and the shaft is made of stainless steel. High resistance seals are tested for long life and heavy working cycles. Every pump is painted to withstand even highly saline marine environments.

This series of helm pumps are not provided with built-in non return and relief valves; so, these accessories shall be selected and ordered separately to complete the steering system. In addition the fittings kit is available in several sizes to satisfy the different mounting configurations. They shall be selected and ordered separately (see page 80).

## Heavy duty cylinders

All heavy duty inboard cylinders are built with stainless steel piston rod for high corrosion resistance.

The **cylinder body** is painted with paints suitable to work in a marine environment. **Ball joints** are available in the most popular sizes for the market and a stainless steel version can be supplied on request. The **cylinder base** can adjust either horizontally, to follow the complete arc of the cylinder, or vertically, in order to adapt to any tiller excursion. Each cylinder is provided with Tee fittings with bleeders as well as the necessary fittings for hose connection.

### Main features of heavy duty helm pumps

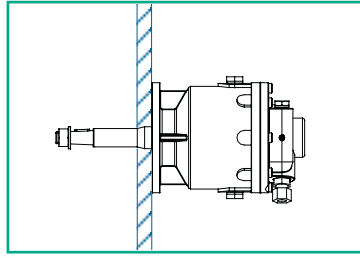
- Axial piston helm pumps
- Helm shaft in stainless steel for the maximum resistance and the best performances
- Available in displacements: 63 cc, 89 cc, 105 cc, 151 cc, 191 cc
- Available with extra oil tank
- Built with high quality materials to ensure long and trouble-free work even in the toughest service conditions
- Multiple control station can be easily installed
- **CE** approved
- Complying with **ABYC** standard requirements
- Designed to satisfy the requirements of the international Survey Authorities such as **RINA, Lloyd's Register of Shipping, American Bureau of Shipping, Bureau Veritas, etc.**

### Main features of heavy duty inboard cylinders

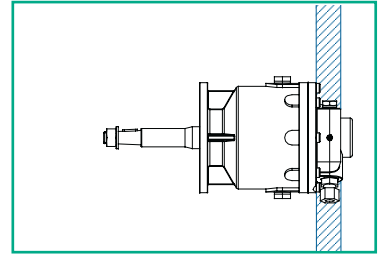
- Suitable for application on commercial boats even with high rudder torques
- Available in a wide range of volumes and strokes
- Cylinder body in stainless steel painted
- Piston rod in stainless steel
- Steel base adjustable either horizontally or vertically
- Fittings and ball joints available in stainless steel
- Supplied with bleeders
- Built according to **ABYC** standards and marked
- **CE** approved

# Heavy duty helm pumps Mod. P63T - P89T

Mounting configuration  
REAR mounting



Mounting configuration  
FRONTAL mounting



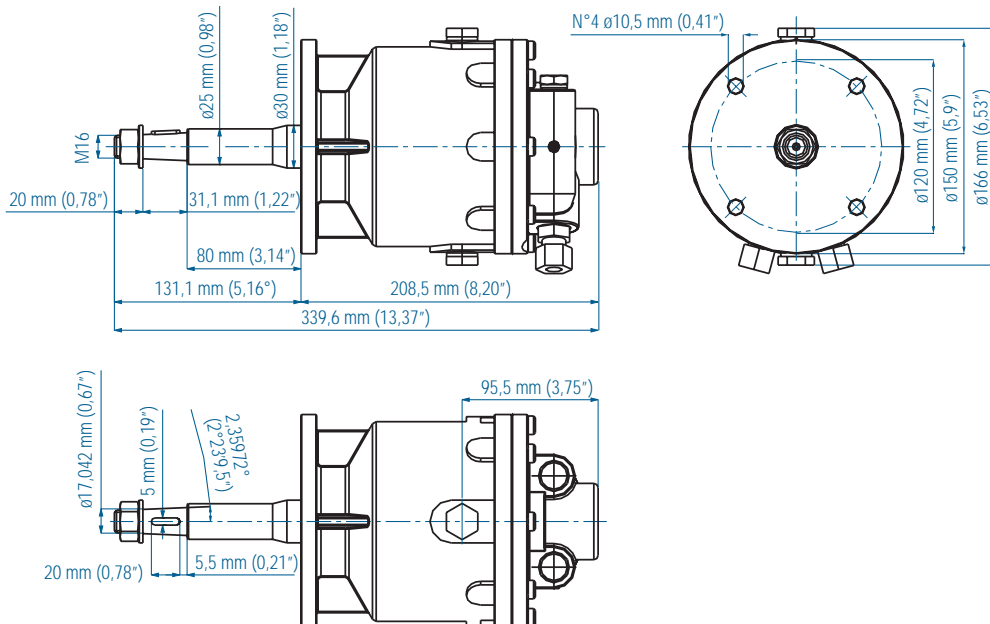
## Order Guide

| HEAVY DUTY HELM PUMP |                |       |
|----------------------|----------------|-------|
| Model                | Displacement   | Code  |
| P63T                 | 63 cc/rev      | 13996 |
|                      | 3.84 cu.in/rev |       |
| P89T                 | 89 cc/rev      | 14003 |
|                      | 5.5 cu.in/rev  |       |

## Heavy duty helm pumps - Technical specifications

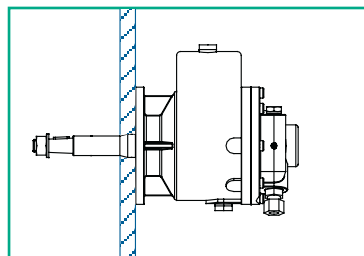
| Model | Mounting | Non return valve | Relief valve | Displacement   | No. of pistons | Fittings provided | Min. wheel diameter | Max wheel diameter | Weight  |
|-------|----------|------------------|--------------|----------------|----------------|-------------------|---------------------|--------------------|---------|
| P63T  | REAR     | No               | No           | 63 cc/rev      | 5              | -                 | 700 mm              | 1016 mm            | 8,7 Kg  |
|       | FRONTAL  |                  |              | 3.84 cu.in/rev |                |                   | 27,56 in.           | 40 in.             | 19.2 lb |
| P89T  | REAR     | No               | No           | 89 cc/rev      | 7              | -                 | 700 mm              | 1016 mm            | 8,9 Kg  |
|       | FRONTAL  |                  |              | 5.5 cu.in/rev  |                |                   | 27,56 in.           | 40 in.             | 20.0 lb |

Note: available with metrical fittings only. Fittings not provided.

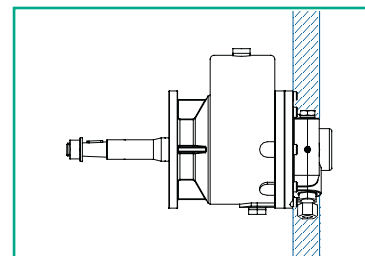


# Heavy duty helm pumps Mod. P63S - P89S with oil tank

Mounting configuration  
REAR mounting



Mounting configuration  
FRONTAL mounting



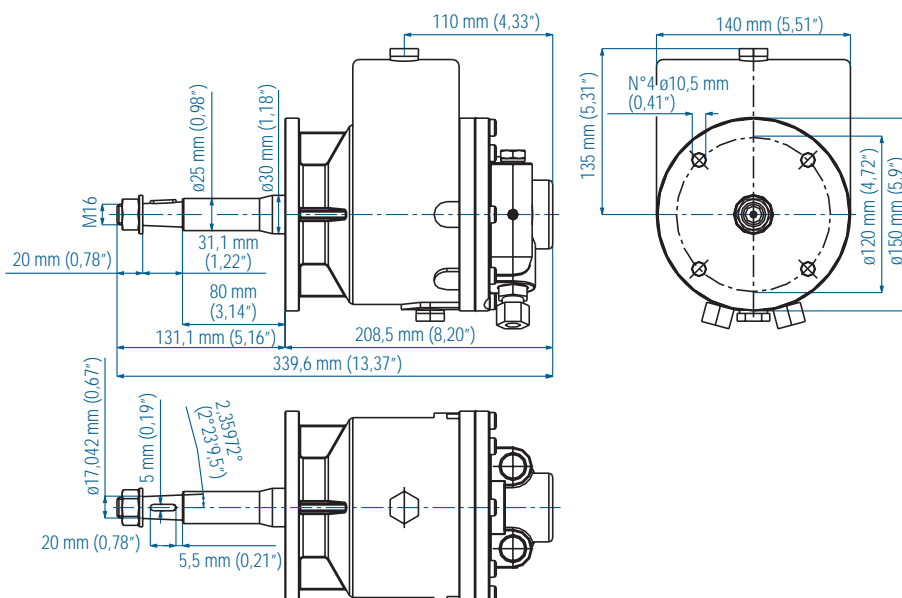
## Order Guide

| HEAVY DUTY HELM PUMP |                |       |
|----------------------|----------------|-------|
| Model                | Displacement   | Code  |
| P63S                 | 63 cc/rev      | 13995 |
|                      | 3.84 cu.in/rev |       |
| P89S                 | 89 cc/rev      | 14002 |
|                      | 5.5 cu.in/rev  |       |

## Heavy duty helm pumps with oil tank - Technical specifications

| Model | Mounting | Non return valve | Relief valve | Displacement   | No. of pistons | Fittings provided | Min. wheel diameter | Max wheel diameter | Weight  |
|-------|----------|------------------|--------------|----------------|----------------|-------------------|---------------------|--------------------|---------|
| P63S  | REAR     | No               | No           | 63 cc/rev      | 5              | -                 | 700 mm              | 1016 mm            | 9,3 Kg  |
|       | FRONTAL  |                  |              | 3.84 cu.in/rev |                |                   | 27,56 in.           | 40 in.             | 20.5 lb |
| P89S  | REAR     | No               | No           | 89 cc/rev      | 7              | -                 | 700 mm              | 1016 mm            | 9,5 Kg  |
|       | FRONTAL  |                  |              | 5.5 cu.in/rev  |                |                   | 27,56 in.           | 40 in.             | 21.0 lb |

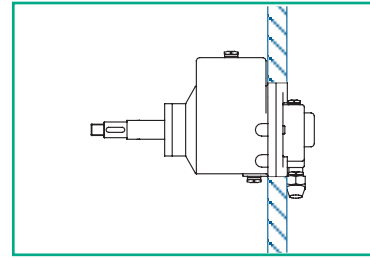
Note: available with metrical fittings only. Fittings not provided



# Heavy duty helm pumps Mod. P105 - P151 - P191 with oil tank



## Mounting configuration FRONTAL mounting



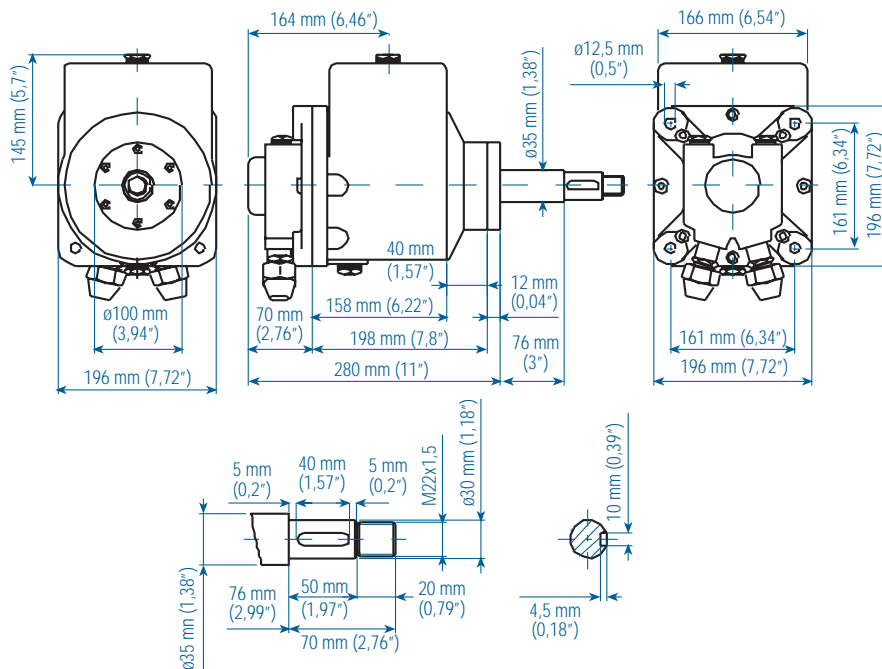
## Order Guide

| HEAVY DUTY HELM PUMP |                |       |
|----------------------|----------------|-------|
| Model                | Displacement   | Code  |
| P105                 | 105 cc/rev     | 14052 |
|                      | 6,4 cu.in/rev  |       |
| P151                 | 151 cc/rev     | 14082 |
|                      | 9,2 cu.in/rev  |       |
| P191                 | 191cc/rev      | 14084 |
|                      | 11,7 cu.in/rev |       |

## Heavy duty helm pumps with oil tank - Technical specifications

| Model | Mounting | Non return valve | Relief valve | Displacement   | No. of pistons | Fittings provided   | Min. wheel diameter  | Max wheel diameter | Weight              |
|-------|----------|------------------|--------------|----------------|----------------|---------------------|----------------------|--------------------|---------------------|
| P105  | REAR     | No               | No           | 105 cc/rev     | 5              | G1/2"<br>18 mm D.E. | 1000 mm<br>39,37 in. | 1220 mm<br>48 in.  | 21,5 Kg<br>47,39 lb |
|       |          |                  |              | 6,4 cu.in/rev  |                |                     |                      |                    |                     |
| P151  | REAR     | No               | No           | 151 cc/rev     | 7              | G1/2"<br>18 mm D.E. | 1000 mm<br>39,37 in. | 1220 mm<br>48 in.  | 23,2 Kg<br>51,14 lb |
|       |          |                  |              | 9,2 cu.in/rev  |                |                     |                      |                    |                     |
| P191  | REAR     | No               | No           | 191 cc/rev     | 7              | G1/2"<br>18 mm D.E. | 1000 mm<br>39,37 in. | 1220 mm<br>48 in.  | 24,5 Kg<br>54,00 lb |
|       |          |                  |              | 11,7 cu.in/rev |                |                     |                      |                    |                     |

Note: available with metrical fittings only. Fittings provided.





## Order Guide

| Boat length<br>LOA          | System to order  |         |           |         |                   |         |           |         |
|-----------------------------|--|---------|-----------|---------|-------------------|---------|-----------|---------|
|                             | Planing hull   |         |           |         | Displacement hull |         |           |         |
|                             | 1 engine   |         | 2 engines |         | 1 engine          |         | 2 engines |         |
|                             | Pleasure   | Working | Pleasure  | Working | Pleasure          | Working | Pleasure  | Working |
| 11,6 - 13,4 mt / 38 - 44 ft | 3  | 4       | 3         | 4       | 4                 | 6       | 3         | 5       |
| 13,4 - 15,3 mt / 44 - 50 ft | 7  | 7       | 4         | 5       | 6                 | 7       | 5         | 6       |
| 15,5 - 16,8 mt / 50 - 55 ft | 8  | 9       | 5         | 6       | 7                 | 8       | 7         | 8       |
| 16,8 - 18 mt / 55 - 60 ft   | 8  | 9       | 6         | 7       | 8                 | 8       | 8         | 8       |
| 18 - 19,8 mt / 60 - 65 ft   | -  | -       | 8         | -       | 8                 | 9       | 8         | 9       |
| 19,8 - 21 mt / 65 - 70 ft   | -  | -       | 8         | -       | 9                 | 9       | 9         | 10      |
| 21 - 22,8 mt / 70 - 75 ft   | -  | -       | 9         | -       | 10                | 11      | 10        | 11      |
| 22,8 - 24,3 mt / 75- 80 ft  | -  | -       | 9         | -       | 10                | 11      | 10        | 11      |
| oltre 24,3 mt / 80 ft       | For boat lengths over 24,3 mt/ 80 ft please contact our technical department to check applications suggested on systems 12-13-14 |         |           |         |                   |         |           |         |

**WARNING! The above suggestions shall be intended as indicative.** To check the proper application the required max torque must be calculated. If the required information is not available please contact our authorized dealer or service center and submit boat length, maximum speed and rudder dimensions.

**WARNING!** For displacement boats, hull speed normally does not exceed 18 knots. For planing boats, the above steering systems are suggested for boat speeds under 30 knots.

| Cylinder |       | System to order     |
|----------|-------|---------------------|
| Model    | Code  |                     |
| CTC200   | 12695 | System 6 (page 41)  |
| CTC230   | 12698 | System 7 (page 42)  |
| CTC300   | 12701 | System 8 (page 43)  |
| CTC400   | 15697 | System 9 (page 44)  |
| CTD310   | 15698 |                     |
| CTD450   | 15699 | System 10 (page 45) |
| CTE600   | 15700 | System 11 (page 46) |
| CTE900   | 15701 | System 12 (page 47) |
| CTE1200  | 15702 | System 13 (page 48) |
| CTF1600  | 15703 | System 14 (page 49) |



## System 6

| SINGLE-station steering system  |  |                       |      | DOUBLE-station steering system |  |                       |      |
|---|--|-----------------------|------|--------------------------------|--|-----------------------|------|
| Components  | Model  | Code                  | Q.ty | Components                     | Model  | Code                  | Q.ty |
| Cylinder  | CTC200   | 12695                 | 1    | Cylinder                       | CTC200   | 12695                 | 1    |
| Flexible hoses for cylinder   | Included   | -                     | 2    | Flexible hoses for cylinder    | Included   | -                     | 2    |
| Main station pump   | P63S   | 13995                 | 1    | Main station pump              | P63T   | 13996                 | 1    |
| Second station pump   | -  | -                     | -    | Second station pump            | P63S   | 13995                 | 1    |
| Pump fittings kit   |  | 14359<br>o<br>14360** | 2    | Pump fittings kit              |  | 23492<br>o<br>23493** | 1    |
| Suggested min. hose size  | Copper tube d.e.12 x 1 mm<br>Copper tube d.e. 14 x 1 mm**                    | -                     | -    | Suggested min. hose size       | Copper tube d.e.12 x 1 mm<br>Copper tube d.e. 14 x 1 mm**                    | -                     | -    |
| Hydraulic oil   | VG22   | 21334                 | 4    | Hydraulic oil                  | VG22   | 21334                 | 4    |
| See on page bottom for by-pass and valve selection according to pump type and tube length |  |                       |      |                                |  |                       |      |
| In case of auto-pilot installation please add:  |  |                       |      |                                |  |                       |      |
| Auto-pilot power unit   | Choose auto-pilot power unit model on the selection guides on pages 55-58-59 |                       | 1    | Auto-pilot power unit          | Choose auto-pilot power unit model on the selection guides on pages 55-58-59 |                       | 1    |





## Pump-cylinder combination

### Steering effort

LIGHT 

NORMAL 

HEAVY 

|  |   | HELM PUMP   |  |
|--|---|---|--|
| <p>Choose combination between pump and cylinder according to the wished number of wheel turns lock-to-lock.</p> <p><b>Note:</b> the requested effort on the steering wheel is inversely proportional to the wheel turns number lock-to-lock:</p> <ul style="list-style-type: none"> <li>• less wheel turns, more effort</li> <li>• more wheel turns, less effort</li> </ul> <p><b>Note:</b> by increasing the wheel diameter, the requested effort is reduced.</p> |   |  <p>P63T<br/>Cod. 13996 (*)</p>  |  <p>P63S<br/>Cod. 13995 (*)</p> |
| CYLINDER   |  <p>CTC200<br/>Cod. / Part # 12695</p> | <p>No. of wheel turns: <b>7,9</b> </p> <p>Min. hose size: copper tube d.e.12 x 1 mm<br/>or copper tube d.e. 14 x 1 mm (**)</p> <p>Tiller: 175 mm / 6.9 in.<br/>Angle: 35° + 35°<br/>Torque: 249,93 Kgm / 21643 lb.in.<br/>Min. wheel diam.: 700 mm - 27,56 in.</p> |  |

Max rudder torque calculated at a working pressure of 70 bar/1000 psi. (\*) See the specific section "heavy duty pumps" on page 36 for more information. (\*\*) To be used when the hose length between pump and cylinder exceeds 15 mt. - 45'.

| Pump | No. of stations | Kit fittings code |                | Valve and by-pass code |              |                          |                | Type and length of copper tube between pump and cylinder |              |
|------|-----------------|-------------------|----------------|------------------------|--------------|--------------------------|----------------|--|--------------|
|      |                 | <15 mt - 45'      | >15 mt - 45'   | Non return valve       | Relief valve | Non return valve by-pass | Manual by-pass |  |              |
| P63  | 1               | 14359 x 2 q.ty    |                |                        | 23500        | 15707                    |                | Copper tube d.e. 12 x 1 mm                               | <15 mt - 45' |
|      | 1               |                   | 14360 x 2 q.ty |                        | 23501        | 17672                    |                | Copper tube d.e. 14 x 1 mm                               | >15 mt - 45' |
|      | 2               | 23492             |                | 15708                  | 23500        |                          | 16968          | Copper tube d.e. 12 x 1 mm                               | <15 mt - 45' |
|      | 2               |                   | 23493          | 23513                  | 23501        |                          | 12134          | Copper tube d.e. 14 x 1 mm                               | >15 mt - 45' |

For additional information on the fittings kit see the section on page 74-75

## System 7

| SINGLE-station steering system  |  |                       |      | DOUBLE-station steering system |  |                       |      |
|---|--|-----------------------|------|--------------------------------|--|-----------------------|------|
| Components  | Model  | Code                  | Q.ty | Components                     | Model  | Code                  | Q.ty |
| Cylinder  | CTC230   | 12698                 | 1    | Cylinder                       | CTC230   | 12698                 | 1    |
| Flexible hoses for cylinder   | Included   | -                     | 2    | Flexible hoses for cylinder    | Included   | -                     | 2    |
| Main station pump   | P63S   | 13995                 | 1    | Main station pump              | P63T   | 13996                 | 1    |
| Second station pump   | -  | -                     | -    | Second station pump            | P63S   | 13995                 | 1    |
| Pump fittings kit   |  | 14359<br>o<br>14360** | 2    | Pump fittings kit              |  | 23492<br>o<br>23493** | 1    |
| Suggested min. hose size  | Copper tube d.e. 12 x 1 mm or<br>Copper tube d.e. 14 x 1 mm**                | -                     | -    | Suggested min. hose size       | Copper tube d.e. 12 x 1 mm or<br>Copper tube d.e. 14 x 1 mm**                | -                     | -    |
| Hydraulic oil   | VG22   | 21334                 | 4    | Hydraulic oil                  | VG22   | 21334                 | 4    |
| See on page bottom for by-pass and valve selection according to pump type and tube length |  |                       |      |                                |  |                       |      |
| In case of auto-pilot installation please add:  |  |                       |      |                                |  |                       |      |
| Auto-pilot power unit   | Choose auto-pilot power unit model on the selection guides on pages 55-58-59 |                       | 1    | Auto-pilot power unit          | Choose auto-pilot power unit model on the selection guides on pages 55-58-59 |                       | 1    |





## Pump-cylinder combination

### Steering effort

LIGHT 

NORMAL 

HEAVY 

|   |   |   |  |
|---|---|---|--|
| <p>Choose combination between pump and cylinder according to the wished number of wheel turns lock-to-lock.</p> <p><b>Note:</b> the requested effort on the steering wheel is inversely proportional to the wheel turns number lock-to-lock:</p> <ul style="list-style-type: none"> <li>• less wheel turns, more effort</li> <li>• more wheel turns, less effort</li> </ul> <p><b>Note:</b> by increasing the wheel diameter within the specified limitations, the requested effort is reduced.</p> |   | <b>HELM PUMP</b>  |  |
|   |   | <br><b>P63T</b><br>Cod. 13996 (*)   | <br><b>P63S</b><br>Cod. 13995 (*) |
| <b>CYLINDER</b>   | <br><b>CTC230</b><br>Cod. / Part # 12698 | <p>No. of wheel turns: <b>7,9</b> </p> <p>Min. hose size: copper tube d.e. 12 mm x 1 mm or copper tube d.e. 14 x 1 (**)</p> <p>Tiller: 175 mm / 6.9 in.</p> <p>Angle: 35° + 35°</p> <p>Torque: 249,93 Kgm / 21643 lb.in.</p> <p>Min. wheel diam.: 700 mm - 27,56 in.</p> |  |

Max rudder torque calculated at a working pressure of 70 bar/1000 psi. (\*) See the specific section "heavy duty pumps" on page 36 for more information. (\*\*) To be used when the hose length between pump and cylinder exceeds 15 mt. - 45'.

| Pump | No. of stations | Kit fittings code |                | Valve and by-pass code |              |                          |                | Type and length of copper tube between pump and cylinder |              |
|------|-----------------|-------------------|----------------|------------------------|--------------|--------------------------|----------------|--|--------------|
|      |                 | <15 mt - 45'      | >15 mt - 45'   | Non return valve       | Relief valve | Non return valve by-pass | Manual by-pass |  |              |
| P63  | 1               | 14359 x 2 q.ty    |                |                        | 23500        | 15707                    |                | Copper tube d.e. 12 x 1 mm                               | <15 mt - 45' |
|      | 1               |                   | 14360 x 2 q.ty |                        | 23501        | 17672                    |                | Copper tube d.e. 14 x 1 mm                               | >15 mt - 45' |
|      | 2               | 23492             |                | 15708                  | 23500        |                          | 16968          | Copper tube d.e. 12 x 1 mm                               | <15 mt - 45' |
|      | 2               |                   | 23493          | 23513                  | 23501        |                          | 12134          | Copper tube d.e. 14 x 1 mm                               | >15 mt - 45' |

For additional information on the fittings kit see the section on page 74-75

# System 8

| SINGLE-station steering system  |  |                       |      | DOUBLE-station steering system |  |                       |      |
|---|--|-----------------------|------|--------------------------------|--|-----------------------|------|
| Components  | Model  | Code                  | Q.ty | Components                     | Model  | Code                  | Q.ty |
| Cylinder  | CTC300   | 12701                 | 1    | Cylinder                       | CTC300   | 12701                 | 1    |
| Flexible hoses for cylinder   | Included   | -                     | 2    | Flexible hoses for cylinder    | Included   | -                     | 2    |
| Main station pump   | P63S o P89S  | 13995<br>o<br>14002   | 1    | Main station pump              | P63T o P89T  | 13996<br>o<br>14003   | 1    |
| Second station pump   | -  | -                     | -    | Second station pump            | P63S o P89S  | 13995<br>o<br>14002   | 1    |
| Pump fittings kit   |  | 14360<br>o<br>14361** | 2    | Pump fittings kit              |  | 23493<br>o<br>23452** | 1    |
| Suggested min. hose size  | Copper tube d.e.14 x 1 mm or<br>Copper tube d.e.18 x 1,5 mm**                |                       | -    | Suggested min. hose size       | Copper tube d.e.14 x 1 mm or<br>Copper tube d.e.18 x 1,5 mm**                |                       | -    |
| Hydraulic oil   | VG22   | 21334                 | 4    | Hydraulic oil                  | VG22   | 21334                 | 4    |
| See on page bottom for by-pass and valve selection according to pump type and tube length |  |                       |      |                                |  |                       |      |
| In case of auto-pilot installation please add:  |  |                       |      |                                |  |                       |      |
| Auto-pilot power unit   | Choose auto-pilot power unit model on the selection guides on pages 55-58-59 |                       | 1    | Fittings kit for auto-pilot    | Choose auto-pilot power unit model on the selection guides on pages 55-58-59 |                       | 1    |






## Pump-cylinder combination

### Steering effort

LIGHT 

NORMAL 

HEAVY 

|  |   | HELM PUMP  |  |  |   |
|--|---|--|--|--|---|
| <p>Choose combination between pump and cylinder according to the wished number of wheel turns lock-to-lock.</p> <p><b>Note:</b> therequested effort on the steering wheel is inversely proportional to the wheel turns number lock-to-lock:</p> <ul style="list-style-type: none"> <li>• less wheel turns, more effort</li> <li>• more wheel turns, less effort</li> </ul> <p><b>Note:</b> by increasing the wheel diameter within the specified limitations, the requested effort is reduced.</p> |   |   |  |   |  |
|  |   | P63T<br>Cod. 13996 (*)   | P63S<br>Cod. 13995(*)  | P89T<br>Cod. 14003 (*)   | P89S<br>Cod. 14002 (*)  |
| CYLINDER   |  | <p>No. of wheel turns: <b>11,9</b></p> <p>Copper tube d.e.14 x 1 mm or<br/>Copper tube d.e.18 x 1,5 mm (**)</p> <p>Tiller: 260 mm / 10,24 in.</p> <p>Angle: 35° + 35°</p> <p>Torque: 374,89 Kgm / 32465 lb.in.</p> <p>Min. wheel diam.: 700 mm - 27,56 in.</p> |  | <p>No. of wheel turns: <b>8,4</b></p> <p>Copper tube d.e.14 x 1 mm or<br/>Copper tube d.e.18 x 1,5 mm (**)</p> <p>Barra: 260 mm / 10,24 in.</p> <p>Angle: 35° + 35°</p> <p>Torque: 374,89 Kgm / 32465 lb.in.</p> <p>Min. wheel diam.: 700 mm - 27,56 in.</p> |   |
|  | CTC300<br>Cod. / Part # 12701   |  |  |  |   |

Max rudder torque calculated at a working pressure of 70 bar/1000 psi. (\*) See the specific section "heavy duty pumps" on page 36 for more information. (\*\*) To be used when the hose length between pump and cylinder exceeds 15 mt. - 45'.

| Pump | No. of stations | Kit fittings code |                | Valve and by-pass code |              |                          |                | Type and length of copper tube between pump and cylinder |               |
|------|-----------------|-------------------|----------------|------------------------|--------------|--------------------------|----------------|--|---------------|
|      |                 | <15 mt - 45'      | >15 mt - 45'   | Non return valve       | Relief valve | Non return valve by-pass | Manual by-pass |  |               |
| P63  | 1               | 14360 x 2 q.ty    |                |                        | 23501        | 17672                    |                | Copper tube d.e. 14 x 1 mm                               | < 15 mt - 45' |
|      | 1               |                   | 14361 x 2 q.ty |                        | 23503        | 15709                    |                | Copper tube d.e. 18 x 1,5 mm                             | > 15 mt - 45' |
|      | 2               | 23493             |                | 23513                  | 23501        |                          | 12134          | Copper tube d.e. 14 x 1 mm                               | < 15 mt - 45' |
|      | 2               |                   | 23452          |                        | 23503        | 15709 x 2 q.ty           |                | Copper tube d.e. 18 x 1,5 mm                             | > 15 mt - 45' |
| P89  | 1               | 14360 x 2 q.ty    |                |                        | 23501        | 17672                    |                | Copper tube d.e. 14 x 1 mm                               | < 15 mt - 45' |
|      | 1               |                   | 14361 x 2 q.ty |                        | 23503        | 15709                    |                | Copper tube d.e. 18 x 1,5 mm                             | > 15 mt - 45' |
|      | 2               | 23493             |                | 23513                  | 23501        |                          | 12134          | Copper tube d.e. 14 x 1 mm                               | < 15 mt - 45' |
|      | 2               |                   | 23452          |                        | 23503        | 15709 x 2 q.ty           |                | Copper tube d.e. 18 x 1,5 mm                             | > 15 mt - 45' |

For additional information on the fittings kit see the section on page 74-75

## System 9

| SINGLE-station steering system  |  |                       |      | DOUBLE-station steering system |  |                       |      |
|---|--|-----------------------|------|--------------------------------|--|-----------------------|------|
| Components  | Model  | Code                  | Q.ty | Components                     | Model  | Code                  | Q.ty |
| Cylinder  | CTC400 o CTD310  | 15697<br>o<br>15698   | 1    | Cylinder                       | CTC400 o CTD310  | 15697<br>o<br>15698   | 1    |
| Flexible hoses for cylinder   | Included   | -                     | 2    | Flexible hoses for cylinder    | Included   | -                     | 2    |
| Main station pump   | P63S o P89S  | 13995<br>o<br>14002   | 1    | Main station pump              | P63T o P89T  | 13996<br>o<br>14003   | 1    |
| Second station pump   | -  | -                     | -    | Second station pump            | P63S o P89S  | 13995<br>o<br>14002   | 1    |
| Pump fittings kit   |  | 14360<br>o<br>14361** | 2    | Pump fittings kit              |  | 23493<br>o<br>23452** | 1    |
| Suggested min. hose size  | Copper tube d.e.14 x 1 mm or<br>Copper tube d.e.18 x 1,5 mm**                |                       | -    | Suggested min. hose size       | Copper tube d.e.14 x 1 mm or<br>Copper tube d.e.18 x 1,5 mm**                |                       | -    |
| Hydraulic oil   | VG22   | 21334                 | 4    | Hydraulic oil                  | VG22   | 21334                 | 4    |
| See on page bottom for by-pass and valve selection according to pump type and tube length |  |                       |      |                                |  |                       |      |
| In case of auto-pilot installation please add:  |  |                       |      |                                |  |                       |      |
| Auto-pilot power unit   | Choose auto-pilot power unit model on the selection guides on pages 55-58-59 |                       | 1    | Fittings kit for auto-pilot    | Choose auto-pilot power unit model on the selection guides on pages 55-58-59 |                       | 1    |











### Pump-cylinder combination

#### Steering effort

LIGHT 

NORMAL 

HEAVY 

| Choose combination between pump and cylinder according to the wished number of wheel turns lock-to-lock.<br><b>Note:</b> therequestedeffortonthesteeringwheelisinversely proportional to the wheel turns number lock-to-lock:<br>• less wheel turns, more effort<br>• more wheel turns, less effort<br><b>Note:</b> byincreasingthewheel diameterwithintheprescribed limitations, the requested effort is reduced. |  | HELM PUMP   |  |   |   |
|--|--|---|--|---|---|
|  |  | <br>P63T<br>Cod. 13996 (*)   | <br>P63S<br>Cod. 13995(*)  | <br>P89T<br>Cod. 14003 (*) | <br>P89S<br>Cod. 14002 (*) |
| CYLINDER   | <br>CTC400<br>Cod. / Part # 15697 | No. of wheel turns: <b>15,9</b> <br>Copper tube d.e.14x1 mm<br>or copper tube d.e.18x1,5 mm (**)<br>Tiller: 350 mm / 13,78 in.<br>Angle: 35° + 35°<br>Torque: 400 Kgm / 34780 lb.in.<br>Min. wheel diam.: 700 mm - 27,56 in. | No. of wheel turns: <b>11,2</b> <br>Copper tube d.e.14x1 mm<br>or copper tube d.e.18x1,5 mm (**)<br>Tiller: 350 mm / 13,78 in.<br>Angle: 35° + 35°<br>Torque: 400 Kgm / 34780 lb.in.<br>Min. wheel diam.: 700 mm - 27,56 in.  |   |   |
|  | <br>CTD310<br>Cod. / Part # 15698 | No. of wheel turns: <b>13,4</b> <br>Copper tube d.e.14x1 mm<br>or copper tube d.e.18x1,5 mm (**)<br>Tiller: 175 mm / 6,88 in.<br>Angle: 35° + 35°<br>Torque: 422 Kgm / 36693 lb.in.<br>Min. wheel diam.: 700 mm - 27,56 in.  | No. of wheel turns: <b>9,5</b> <br>Copper tube d.e.14x1 mm<br>or copper tube d.e.18x1,5 mm (**)<br>Tiller : 260 mm / 10,24 in.<br>Angle : 35° + 35°<br>Torque: 422 Kgm / 36693 lb.in.<br>Min. wheel diam.: 700 mm - 27,56 in. |   |   |

Max rudder torque calculated at a working pressure of 70 bar/1000 psi. (\*) See the specific section "heavy duty pumps" on page 36 for more information. (\*\*) To be used when the hose length between pump and cylinder exceeds 15 mt. - 45'.

| Pump | No. of stations | Kit fittings code |                | Valve and by-pass code |              |                          |                | Type and length of copper tube between pump and cylinder |               |
|------|-----------------|-------------------|----------------|------------------------|--------------|--------------------------|----------------|--|---------------|
|      |                 | <15 mt - 45'      | >15 mt - 45'   | Non return valve       | Relief valve | Non return valve by-pass | Manual by-pass |  |               |
| P63  | 1               | 14360 x 2 q.ty    |                |                        | 23501        | 17672                    |                | Copper tube d.e. 14 x 1 mm                               | < 15 mt - 45' |
|      | 1               |                   | 14361 x 2 q.ty |                        | 23503        | 15709                    |                | Copper tube d.e. 18 x 1,5 mm                             | > 15 mt - 45' |
|      | 2               | 23493             |                | 23513                  | 23501        |                          | 12134          | Copper tube d.e. 14 x 1 mm                               | < 15 mt - 45' |
|      | 2               |                   | 23452          |                        |              | 23503                    | 15709 x 2 q.ty | Copper tube d.e. 18 x 1,5 mm                             | > 15 mt - 45' |
| P89  | 1               | 14360 x 2 q.ty    |                |                        | 23501        | 17672                    |                | Copper tube d.e. 14 x 1 mm                               | < 15 mt - 45' |
|      | 1               |                   | 14361 x 2 q.ty |                        | 23503        | 15709                    |                | Copper tube d.e. 18 x 1,5 mm                             | > 15 mt - 45' |
|      | 2               | 23493             |                | 23513                  | 23501        |                          | 12134          | Copper tube d.e. 14 x 1 mm                               | < 15 mt - 45' |
|      | 2               |                   | 23452          |                        |              | 23503                    | 15709 x 2 q.ty | Copper tube d.e. 18 x 1,5 mm                             | > 15 mt - 45' |








For additional information on the fittings kit see the section on page 74-75

# System 10

| SINGLE-station steering system  |  |                       |      | DOUBLE-station steering system |  |                     |      |
|---|--|-----------------------|------|--------------------------------|--|---------------------|------|
| Components  | Model  | Code                  | Q.ty | Components                     | Model  | Code                | Q.ty |
| Cylinder  | CTD450   | 15699                 | 1    | Cylinder                       | CTD450   | 15699               | 1    |
| Flexible hoses for cylinder   | Included   | -                     | 2    | Flexible hoses for cylinder    | Included   | -                   | 2    |
| Main station pump   | P89S o P105  | 14002<br>o<br>14052   | 1    | Main station pump              | P89T o P105  | 14003<br>o<br>14052 | 1    |
| Second station pump   | -  | -                     | -    | Second station pump            | P89S o P105  | 14002<br>o<br>14052 | 1    |
| Pump fittings kit   |  | 14360<br>o<br>14361** | 2    | Pump fittings kit              | See table on page bottom   |                     | 1    |
| Suggested min. hose size  | Copper tube d.e.14 x 1 mm or<br>Copper tube d.e.18 x 1,5 mm**                |                       | -    | Suggested min. hose size       | Copper tube d.e.14 x 1 mm or<br>Copper tube d.e.18 x 1,5 mm**                |                     | -    |
| Hydraulic oil   | VG22   | 21334                 | 4    | Hydraulic oil                  | VG22   | 21334               | 4    |
| See on page bottom for by-pass and valve selection according to pump type and tube length |  |                       |      |                                |  |                     |      |
| In case of auto-pilot installation please add:  |  |                       |      |                                |  |                     |      |
| Auto-pilot power unit   | Choose auto-pilot power unit model on the selection guides on pages 55-58-59 |                       | 1    | Fittings kit for auto-pilot    | Choose auto-pilot power unit model on the selection guides on pages 55-58-59 |                     | 1    |

## Pump-cylinder combination

Steering effort    LIGHT                       NORMAL                       HEAVY 

|  |   | HELM PUMP  |   |  |
|--|---|--|---|--|
| Choose combination between pump and cylinder according to the wished number of wheel turns lock-to-lock.<br><b>Note:</b> the requested effort on the steering wheel is inversely proportional to the wheel turns number lock-to-lock:<br>• less wheel turns, more effort<br>• more wheel turns, less effort<br><b>Note:</b> by increasing the wheel diameter, the requested effort is reduced. |   |   |   |   |
|  |   | P89T<br>Cod. 14003 (*)   | P89S<br>Cod. 14002 (*)  | P105<br>Cod. 14052 (*)   |
| CYLINDER   |  | No. of wheel turns: <b>14,2</b> <br>Copper tube d.e.14 x 1 mm or<br>copper tube d.e.18 x 1,5 mm**<br>Tiller: 260 mm / 10,24 in.<br>Angle: 35° + 35°<br>Torque:<br>633 Kgm / 55040 lb.in.<br>Min. wheel diam.:<br>700 mm-27,56 in. | No. of wheel turns: <b>14,2</b> <br>Copper tube d.e.14 x 1 mm -<br>copper tube d.e.18 x 1,5 mm**<br>Tiller: 260 mm / 10,24 in.<br>Angle: 35° + 35°<br>Torque:<br>633 Kgm / 55040 lb.in.<br>Min. wheel diam.:<br>700 mm-27,56 in. | No. of wheel turns: <b>12,1</b> <br>Copper tube d.e.14 x 1 mm -<br>copper tube d.e.18 x 1,5 mm**<br>Tiller: 260 mm / 10,24 in.<br>Angle: 35° + 35°<br>Torque:<br>633 Kgm / 55040 lb.in.<br>Min. wheel diam.:<br>1000 mm-39,37 in. |
|  | CTD450<br>Cod. / Part # 15699   |  |   |  |

Max rudder torque calculated at a working pressure of 70 bar/1000 psi. (\*) See the specific section "heavy duty pumps" on page 36 for more information. (\*\*) To be used when the hose length between pump and cylinder exceeds 15 mt. - 45'.

| Pump | No. of stations | Kit fittings code |                | Valve and by-pass code |              |                          |                | Type and length of copper tube between pump and cylinder |               |
|------|-----------------|-------------------|----------------|------------------------|--------------|--------------------------|----------------|--|---------------|
|      |                 | <15 mt - 45'      | >15 mt - 45'   | Non return valve       | Relief valve | Non return valve by-pass | Manual by-pass |  |               |
| P89  | 1               | 14360 x 2 q.ty    |                |                        | 23501        | 17672                    |                | Copper tube d.e. 14 x 1 mm                               | < 15 mt - 45' |
|      | 1               |                   | 14361 x 2 q.tà |                        | 23503        | 15709                    |                | Copper tube d.e. 18 x 1,5 mm                             | > 15 mt - 45' |
|      | 2               | 23493             |                | 23513                  | 23501        |                          | 12134          | Copper tube d.e. 14 x 1 mm                               | < 15 mt - 45' |
|      | 2               |                   | 23452          |                        |              | 23503                    | 15709 x 2 q.ty | Copper tube d.e. 18 x 1,5 mm                             | > 15 mt - 45' |
| P105 | 1               | Included          |                |                        | 23503        | 15709                    |                | Copper tube d.e. 18 x 1,5 mm                             | Any length    |
|      | 2               | 23518             |                |                        | 23503        | 15709 x 2 q.ty           |                | Copper tube d.e. 18 x 1,5 mm                             | Any length    |

For additional information on the fittings kit see the section on page 74-75

# System 11

| SINGLE-station steering system  |  |                                  |      | DOUBLE-station steering system |  |                                  |      |
|---|--|----------------------------------|------|--------------------------------|--|----------------------------------|------|
| Components  | Model  | Code                             | Q.ty | Components                     | Model  | Code                             | Q.ty |
| Cylinder  | CTE600   | 15700                            | 1    | Cylinder                       | CTE600   | 15700                            | 1    |
| Flexible hoses for cylinder   | Included   | -                                | 2    | Flexible hoses for cylinder    | Included   | -                                | 2    |
| Main station pump   | P89S<br>P105<br>P151<br>P191   | 14002<br>14052<br>14082<br>14084 | 1    | Main station pump              | P89T<br>P105<br>P151<br>P191   | 14003<br>14052<br>14082<br>14084 | 1    |
| Second station pump   | -  | -                                | -    | Second station pump            | P89S<br>P105<br>P151<br>P191   | 14002<br>14052<br>14082<br>14084 | 1    |
| Pump fittings kit   |  | 14360<br>o<br>14361**            | 2    | Pump fittings kit              | Vedi tabella fondo pagina  |                                  | 1    |
| Suggested min. hose size  | Copper tube d.e.14 x 1 mm or<br>Copper tube d.e.18 x 1,5 mm**                |                                  | -    | Suggested min. hose size       | Copper tube d.e.14 x 1 mm or<br>Copper tube d.e.18 x 1,5 mm**                |                                  | -    |
| Hydraulic oil   | VG22   | 21334                            | 4    | Hydraulic oil                  | VG22   | 21334                            | 4    |
| See on page bottom for by-pass and valve selection according to pump type and tube length |  |                                  |      |                                |  |                                  |      |
| In case of auto-pilot installation please add:  |  |                                  |      |                                |  |                                  |      |
| Auto-pilot power unit   | Choose auto-pilot power unit model on the selection guides on pages 55-58-59 |                                  | 1    | Fittings kit for auto-pilot    | Choose auto-pilot power unit model on the selection guides on pages 55-58-59 |                                  | 1    |











## Pump-cylinder combination

### Steering effort

LIGHT 

NORMAL 

HEAVY 

|  |   | HELM PUMP  |   |   |   |   |  |   |  |
|--|---|--|---|---|---|---|--|---|--|
| <p>It is possible to choose the combination between pump and cylinder according to the wished number of wheel turns lock-to-lock.</p> <p><b>Note:</b> the requested effort on the steering wheel is inversely proportional to the wheel turns number lock-to-lock:</p> <ul style="list-style-type: none"> <li>• less wheel turns, more effort</li> <li>• more wheel turns, less effort</li> </ul> <p><b>Note:</b> by increasing the wheel diameter, the requested effort is reduced.</p> |   |   |  |    |  |    |  |   |  |
|  |   | (*) P89T<br>Cod. 14003   | (*) P89S<br>Cod. 14002  | (*) P105<br>Cod. 14052  | (*) P151<br>Cod. 14082  | (*) P191<br>Cod. 14084  |  |   |  |
| CYLINDER   |  | No. of wheel turns: <b>14,8</b>   |   | No. of wheel turns: <b>12,6</b>    |   | No. of wheel turns: <b>8,7</b>   |  | No. of wheel turns: <b>6,9</b>   |  |
|  | CTE600<br>Cod. / Part # 15700   | Copper tube: d.e.14 x 1 mm or d.e.18 x 1,5 mm (**)<br>Tiller: 175 mm / 6,89 in.<br>Angle: 35° + 35°<br>Torque: 660 Kgm / 57387 lb.in.<br>Min. wheel diam: 700 mm - 27,56 in. |   | Copper tube: d.e.14 x 1 mm or d.e.18x1,5 mm (**)<br>Tiller: 175 mm / 6,89 in.<br>Angle: 35° + 35°<br>Torque: 660 Kgm / 57387 lb.in.<br>Min. wheel diam: 1000 mm - 39,37 in. |   | Copper tube: d.e.14 x 1 mm or d.e.18x1,5 mm (**)<br>Tiller: 175 mm / 6,89 in.<br>Angle: 35° + 35°<br>Torque: 660 Kgm / 57387 lb.in.<br>Min. wheel diam: 1000 mm - 39,37 in. |  | Copper tube: d.e.14 x 1 mm or d.e.18x1,5 mm (**)<br>Tiller: 175 mm / 6,89 in.<br>Angle: 35° + 35°<br>Torque: 660 Kgm / 57387 lb.in.<br>Min. wheel diam: 1000 mm - 39,37 in. |  |

Max rudder torque calculated at a working pressure of 70 bar/1000 psi. (\*) See the specific section "heavy duty pumps" on page 36 for more information.  
(\*\*) To be used when the hose length between pump and cylinder exceeds 15 mt. - 45'.

| Pump | No. of stations | Kit fittings code |                | Valve and by-pass code |              |                          |                | Type and length of copper tube between pump and cylinder |                              |
|------|-----------------|-------------------|----------------|------------------------|--------------|--------------------------|----------------|--|------------------------------|
|      |                 | <15 mt - 45'      | >15 mt - 45'   | Non return valve       | Relief valve | Non return valve by-pass | Manual by-pass |  |                              |
| P89  | 1               | 14360 x 2 q.ty    |                |                        | 23501        | 17672                    |                | Copper tube d.e. 14 x 1 mm                               | < 15 mt - 45'                |
|      | 1               |                   | 14361 x 2 q.ty |                        | 23503        | 15709                    |                | Copper tube d.e. 18 x 1,5 mm                             | > 15 mt - 45'                |
|      | 2               | 23493             |                | 23513                  | 23501        |                          | 12134          | Copper tube d.e. 14 x 1 mm                               | < 15 mt - 45'                |
|      | 2               |                   | 23452          |                        |              | 23503                    | 15709 x 2 q.ty |  | Copper tube d.e. 18 x 1,5 mm |
| P105 | 1               | Included          |                |                        | 23503        | 15709                    |                | Copper tube d.e. 18 x 1,5 mm                             | Any length                   |
| P151 | 2               | 23518             |                |                        | 23503        | 15709 x 2 q.ty           |                | Copper tube d.e. 18 x 1,5 mm                             | Any length                   |
| P191 |                 |                   |                |                        |              |                          |                |  |                              |

For additional information on the fittings kit see the section on page 74-75








## System 12

| SINGLE-station steering system  |  |                         |      | DOUBLE-station steering system |  |                         |      |
|---|--|-------------------------|------|--------------------------------|--|-------------------------|------|
| Components  | Model  | Code                    | Q.ty | Components                     | Model  | Code                    | Q.ty |
| Cylinder  | CTE900   | 15701                   | 1    | Cylinder                       | CTE900   | 15701                   | 1    |
| Flexible hoses for cylinder   | Included   | -                       | 2    | Flexible hoses for cylinder    | Included   | -                       | 2    |
| Main station pump   | P105<br>P151<br>P191   | 14052<br>14082<br>14084 | 1    | Main station pump              | P105<br>P151<br>P191   | 14052<br>14082<br>14084 | 1    |
| Second station pump   | -  | -                       | -    | Second station pump            | P105<br>P151<br>P191   | 14052<br>14082<br>14084 | 1    |
| Pump fittings kit   | Included   | -                       | -    | Pump fittings kit              |  | 23518                   | 1    |
| Suggested min. hose size  | Copper tube d.e.18 x 1,5 mm  |                         | -    | Suggested min. hose size       | Copper tube d.e.18 x 1,5 mm  |                         | -    |
| Hydraulic oil   | VG22   | 21334                   | 4    | Hydraulic oil                  | VG22   | 21334                   | 4    |
| See on page bottom for by-pass and valve selection according to pump type and tube length |  |                         |      |                                |  |                         |      |
| In case of auto-pilot installation please add:  |  |                         |      |                                |  |                         |      |
| Auto-pilot power unit   | Choose auto-pilot power unit model on the selection guides on pages 55-58-59 |                         | 1    | Fittings kit for auto-pilot    | Choose auto-pilot power unit model on the selection guides on pages 55-58-59 |                         | 1    |

## Pump-cylinder combination

### Steering effort

LIGHT 
                 
 NORMAL 
                 
 HEAVY 

|  |   | HELM PUMP   |  |   |
|--|---|---|--|---|
| Choose combination between pump and cylinder according to the wished number of wheel turns lock-to-lock.<br><b>Note:</b> the requested effort on the steering wheel is inversely proportional to the wheel turns number lock-to-lock:<br>• less wheel turns, more effort<br>• more wheel turns, less effort<br><b>Note:</b> by increasing the wheel diameter, the requested effort is reduced. |   |                       |  |   |
|  |   | <b>P105</b><br>Cod. 14052 (*)   | <b>P151</b><br>Cod. 14082 (*)  | <b>P191</b><br>Cod. 14084 (*)   |
| CYLINDER   | <br><b>CTE900</b><br>Cod. / Part # 15701 | No. of wheel turns: <b>18,8</b> <br>Copper tube d.e.18 x 1,5 mm<br>Tiller: 260 mm / 10,24 in.<br>Angle: 35° + 35°<br>Torque: 989 Kgm / 85993 lb.in.<br>Min. wheel diam:<br>1000 mm - 39,73 in. | No. of wheel turns: <b>13,1</b> <br>Copper tube d.e.18 x 1,5 mm<br>Tiller: 260 mm / 10,24 in.<br>Angle : 35° + 35°<br>Torque: 989 Kgm / 85993 lb.in.<br>Min. wheel diam:<br>1000 mm - 39,73 in. | No. of wheel turns: <b>10,4</b> <br>Copper tube d.e.18 x 1,5 mm<br>Tiller: 260 mm / 10,24 in.<br>Angle: 35° + 35°<br>Torque: 989 Kgm / 85993 lb.in.<br>Min. wheel diam:<br>1000 mm - 39,73 in. |

Max rudder torque calculated at a working pressure of 70 bar/1000 psi. (\*) See the specific section "heavy duty pumps" on page 36 for more information.

| Pump         | No. of stations | Kit fittings code |              | Valve and by-pass code |              |                          |                | Type and length of copper tube between pump and cylinder |            |
|--------------|-----------------|-------------------|--------------|------------------------|--------------|--------------------------|----------------|--|------------|
|              |                 | <15 mt - 45'      | >15 mt - 45' | Non return valve       | Relief valve | Non return valve by-pass | Manual by-pass |  |            |
| P105         | 1               | Included          |              |                        | 23503        | <b>15709</b>             |                | Copper tube d.e. 18 x 1,5 mm                             | Any length |
| P151<br>P191 | 2               | 23518             |              |                        | 23503        | <b>15709</b><br>x 2 q.ty |                | Copper tube d.e. 18 x 1,5 mm                             | Any length |

For additional information on the fittings kit see the section on page 74-75

## System 13

| SINGLE-station steering system  |  |                |      | DOUBLE-station steering system |  |                |      |
|---|--|----------------|------|--------------------------------|--|----------------|------|
| Components  | Model  | Code           | Q.ty | Components                     | Model  | Code           | Q.ty |
| Cylinder  | CTE1200  | 15702          | 1    | Cylinder                       | CTE1200  | 15702          | 1    |
| Flexible hoses for cylinder   | Included   | -              | 2    | Flexible hoses for cylinder    | Included   | -              | 2    |
| Main station pump   | P151<br>P191   | 14082<br>14084 | 1    | Main station pump              | P151<br>P191   | 14082<br>14084 | 1    |
| Second station pump   | -  | -              | -    | Second station pump            | P151<br>P191   | 14082<br>14084 | 1    |
| Pump fittings kit   | Included   | -              | -    | Pump fittings kit              |  | 23518          | 1    |
| Suggested min. hose size  | Copper tube d.e.18 x 1,5 mm  |                | -    | Suggested min. hose size       | Copper tube d.e.18 x 1,5 mm  |                | -    |
| Hydraulic oil   | VG22   | 21334          | 4    | Hydraulic oil                  | VG22   | 21334          | 4    |
| See on page bottom for by-pass and valve selection according to pump type and tube length |  |                |      |                                |  |                |      |
| In case of auto-pilot installation please add:  |  |                |      |                                |  |                |      |
| Auto-pilot power unit   | Choose auto-pilot power unit model on the selection guides on pages 55-58-59 |                | 1    | Fittings kit for auto-pilot    | Choose auto-pilot power unit model on the selection guides on pages 55-58-59 |                | 1    |






## Pump-cylinder combination

### Steering effort

LIGHT 

NORMAL 

HEAVY 

|   |  | HELM PUMP   |   |
|---|--|---|---|
| <p>Choose combination between pump and cylinder according to the wished number of wheel turns lock-to-lock.</p> <p><b>Note:</b> the requested effort on the steering wheel is inversely proportional to the wheel turns number lock-to-lock:</p> <ul style="list-style-type: none"> <li>• less wheel turns, more effort</li> <li>• more wheel turns, less effort</li> </ul> <p><b>Note:</b> by increasing the wheel diameter within the specified limitations, the requested effort is reduced.</p> |  | <br><b>P151</b><br>Cod. 14082 (*)   | <br><b>P191</b><br>Cod. 14084 (*)  |
| CYLINDER  | <br><b>CTE1200</b><br>Cod. / Part # 15702 | No. of wheel turns: <b>17,5</b> <br>Copper tube d.e.18 x 1,5 mm<br>Tiller: 350 mm / 13,78 in.<br>Angle: 35° + 35°<br>Torque: 1318 Kgm / 114601 lb.in.<br>Min. wheel diam.: 1000 mm - 39,37 in. | No. of wheel turns: <b>13,8</b> <br>Copper tube d.e.18 x 1,5 mm<br>Tiller: 350 mm / 13,78 in.<br>Angle: 35° + 35°<br>Torque: 1318 Kgm / 114601 lb.in.<br>Min. wheel diam.: 1000 mm - 39,37 in. |

Max rudder torque calculated at a working pressure of 70 bar/1000 psi. (\*) See the specific section "heavy duty pumps" on page 36 for more information.

| Pump         | No. of stations | Kit fittings code |              | Valve and by-pass code |              |                          |                | Type and length of copper tube between pump and cylinder |            |
|--------------|-----------------|-------------------|--------------|------------------------|--------------|--------------------------|----------------|--|------------|
|              |                 | <15 mt - 45'      | >15 mt - 45' | Non return valve       | Relief valve | Non return valve by-pass | Manual by-pass |  |            |
| P151<br>P191 | 1               | Included          |              |                        | 23503        | 15709                    |                | Copper tube d.e. 18 x 1,5 mm                             | Any length |
|              | 2               | 23518             |              |                        | 23503        | 15709<br>x 2 q.ty        |                | Copper tube d.e. 18 x 1,5 mm                             | Any length |

For additional information on the fittings kit see the section on page 74-75



# System 14

| SINGLE-station steering system  |  |       |      | DOUBLE-station steering system |  |       |      |
|---|--|-------|------|--------------------------------|--|-------|------|
| Components  | Model  | Code  | Q.ty | Components                     | Model  | Code  | Q.ty |
| Cylinder  | CTF1600  | 15703 | 1    | Cylinder                       | CTF1600  | 15703 | 1    |
| Flexible hoses for cylinder   | Included   | -     | 2    | Flexible hoses for cylinder    | Included   | -     | 2    |
| Main station pump   | P191   | 14084 | 1    | Main station pump              | P191   | 14084 | 1    |
| Second station pump   | -  | -     | -    | Second station pump            | P191   | 14084 | 1    |
| Pump fittings kit   | Included   | -     | -    | Pump fittings kit              |  | 23518 | 1    |
| Suggested min. hose size  | Copper tube d.e.18 x 1,5 mm  |       | -    | Suggested min. hose size       | Copper tube d.e.18 x 1,5 mm  |       | -    |
| Hydraulic oil   | VG22   | 21334 | 4    | Hydraulic oil                  | VG22   | 21334 | 4    |
| See on page bottom for by-pass and valve selection according to pump type and tube length |  |       |      |                                |  |       |      |
| In case of auto-pilot installation please add:  |  |       |      |                                |  |       |      |
| Auto-pilot power unit   | Choose auto-pilot power unit model on the selection guides on pages 55-58-59 |       | 1    | Fittings kit for auto-pilot    | Choose auto-pilot power unit model on the selection guides on pages 55-58-59 |       | 1    |


## Pump-cylinder combination

### Steering effort

LIGHT 

NORMAL 

HEAVY 

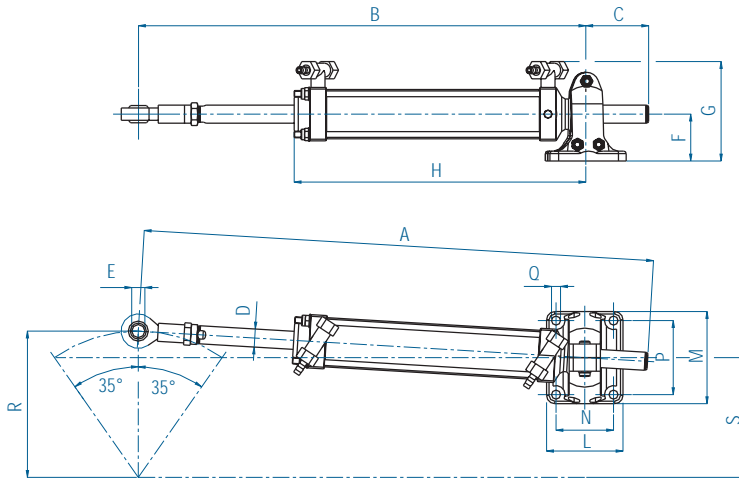
|   |   |  |
|---|---|--|
| <p>Choose combination between pump and cylinder according to the wished number of wheel turns lock-to-lock.</p> <p><b>Note:</b> the requested effort on the steering wheel is inversely proportional to the wheel turns number lock-to-lock:</p> <ul style="list-style-type: none"> <li>• less wheel turns, more effort</li> <li>• more wheel turns, less effort</li> </ul> <p><b>Note:</b> by increasing the wheel diameter within the specified limitations, the requested effort is reduced.</p> | <b>HELM PUMP</b>  |  |
|   | <br>P191 Cod. 14084 (*)           |  |
| <b>CYLINDER</b>   | <br>CTF1600<br>Cod. / Part # 15703 | <p>No. of wheel turns: <b>20,2</b> </p> <p>Copper tube d.e.18 x 1,5 mm<br/>                 Tiller: 350 mm / 13,78 in.<br/>                 Angle: 35° + 35°<br/>                 Torque: 1928 Kgm / 167640 lb.in.<br/>                 Min. wheel diam.: 1000 mm - 39,37 in.</p> |

Max rudder torque calculated at a working pressure of 70 bar/1000 psi. (\*) See the specific section "heavy duty pumps" on page 36 for more information.

| Pump | No. of stations | Kit fittings code |              | Valve and by-pass code |              |                          |                | Type and length of copper tube between pump and cylinder |            |
|------|-----------------|-------------------|--------------|------------------------|--------------|--------------------------|----------------|--|------------|
|      |                 | <15 mt - 45'      | >15 mt - 45' | Non return valve       | Relief valve | Non return valve by-pass | Manual by-pass |  |            |
| P191 | 1               | Included          |              |                        | 23503        | 15709                    |                | Copper tube d.e. 18 x 1,5 mm                             | Any length |
|      | 2               | 23518             |              |                        | 23503        | 15709 x 2 q.ty           |                | Copper tube d.e. 18 x 1,5 mm                             | Any length |

For additional information on the fittings kit see the section on page 74-75

# Heavy duty inboard steering cylinders Series CTC



### Main features

- Cylinder in **stainless steel** and **brass** painted
- Piston rod in stainless steel for a high corrosion resistance
- Stainless steel cylinder base
- Adjustable base either horizontally or vertically
- Available in a range of volumes between 500 and 1000 cc
- Supplied with bleeders
- Meet **ABYC** standards

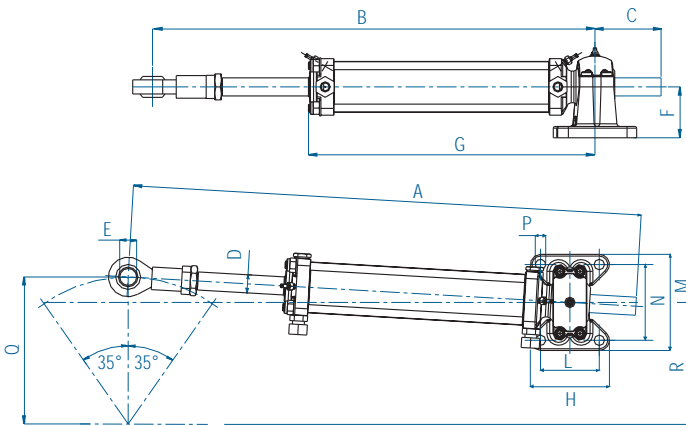
### Technical specifications

| Dimensions |           |           |           |          |          |          |          |          |           |          |          |          |          |          |           |          |
|------------|-----------|-----------|-----------|----------|----------|----------|----------|----------|-----------|----------|----------|----------|----------|----------|-----------|----------|
| Model      | Stroke    | A         | B         | C        | D        | E        | F        | G        | H         | L        | M        | N        | P        | Q        | R         | S        |
| CTC200     | 200 mm    | 733 mm    | 607 mm    | 127 mm   | 28 mm    | 25 mm    | 55 mm    | 133 mm   | 385 mm    | 100 mm   | 140 mm   | 72 mm    | 112 mm   | 11 mm    | 175 mm    | 143 mm   |
|            | 7.87 in.  | 28.86 in. | 23.9 in.  | 5.0 in.  | 1.10 in. | 0.98 in. | 2.17 in. | 5,25 in. | 16.16 in. | 3.94 in. | 5.51 in. | 2.83 in. | 4.41 in. | 0.43 in. | 6.89 in.  | 5.6 in.  |
| CTC230     | 228 mm    | 789 mm    | 649 mm    | 141 mm   | 28 mm    | 25 mm    | 55 mm    | 133 mm   | 413 mm    | 100 mm   | 140 mm   | 72 mm    | 112 mm   | 11 mm    | 200 mm    | 164 mm   |
|            | 9.0 in.   | 31.0 in.  | 25.55 in. | 5.55 in. | 1.10 in. | 0.98 in. | 2.17 in. | 5,25 in. | 16.26 in. | 3.94 in. | 5.51 in. | 2.83 in. | 4.41 in. | 0.43 in. | 7.87 in.  | 6.5 in.  |
| CTC300     | 300 mm    | 933 mm    | 757 mm    | 177 mm   | 28 mm    | 25 mm    | 55 mm    | 133 mm   | 485 mm    | 100 mm   | 140 mm   | 72 mm    | 112 mm   | 11 mm    | 260 mm    | 215 mm   |
|            | 11.81 in. | 36.73 in. | 29.8 in.  | 6.97 in. | 1.10 in. | 0.98 in. | 2.17 in. | 5,25 in. | 19.09 in. | 3.94 in. | 5.51 in. | 2.83 in. | 4.41 in. | 0.43 in. | 10.24 in. | 8.5 in.  |
| CTC400     | 400 mm    | 1133 mm   | 907 mm    | 227 mm   | 28 mm    | 25 mm    | 55 mm    | 133 mm   | 585 mm    | 100 mm   | 140 mm   | 72 mm    | 112 mm   | 11 mm    | 350 mm    | 286 mm   |
|            | 15.75 in. | 44.61 in. | 35.71 in. | 8.94 in. | 1.10 in. | 0.98 in. | 2.17 in. | 5,25 in. | 23.0 in.  | 3.94 in. | 5.51 in. | 2.83 in. | 4.41 in. | 0.43 in. | 13.78 in. | 11.3 in. |

| Technical specifications |       |           |              |                             |             |          |         |                |          |
|--------------------------|-------|-----------|--------------|-----------------------------|-------------|----------|---------|----------------|----------|
| Model                    | Code  | Stroke    | Torque       | Thrust at 70 bar - 1000 psi | Volume      | Tiller   | Angle   | Fittings       | Weight   |
| CTC200                   | 12695 | 200 mm    | 249.93 Kgm   | 1750 Kgf                    | 500 cc      | 175 mm   | 35°+35° | G1/2" - d.12mm | 13,2 Kg  |
|                          |       | 7.87 in.  | 21643 lb.in. | 3857 lbf                    | 30.5 cu.in  | 6.9 in.  |         |                | 29,10 lb |
| CTC230                   | 12698 | 228 mm    | 284.92 Kgm   | 1750 Kgf                    | 570 cc      | 200 mm   | 35°+35° | G1/2" - d.12mm | 15,3 Kg  |
|                          |       | 9 in.     | 24674 lb.in. | 3857 lbf                    | 34.78 cu.in | 7.8 in.  |         |                | 33,73 lb |
| CTC300                   | 12701 | 300 mm    | 374.89 Kgm   | 1750 Kgf                    | 750 cc      | 260 mm   | 35°+35° | G1/2" - d.12mm | 17,7 Kg  |
|                          |       | 11.81 in. | 32465 lb.in. | 3857 lbf                    | 45.77 cu.in | 10.2 in. |         |                | 39,02 lb |
| CTC400                   | 15697 | 400 mm    | 499.85 Kgm   | 1750 Kgf                    | 1000 cc     | 350 mm   | 35°+35° | G1/2" - d.12mm | 20,0 Kg  |
|                          |       | 15.75 in. | 43287 lb.in. | 3857 lbf                    | 61.02 cu.in | 13.7 in. |         |                | 44,1 lb  |

Note: the inboard cylinders mod CTC are not suitable for installations on racing boats. They are provided with flexible hoses type SAE100 R1.

# Heavy duty inboard steering cylinders Series CTD



### Main features

- Cylinder in **stainless steel** and **brass** painted
- Piston rod in stainless steel for a high corrosion resistance
- Adjustable base either horizontally or vertically
- Available in a range of volumes between 844 and 1266 cc
- Supplied with bleeders
- Meet **ABYC** standards

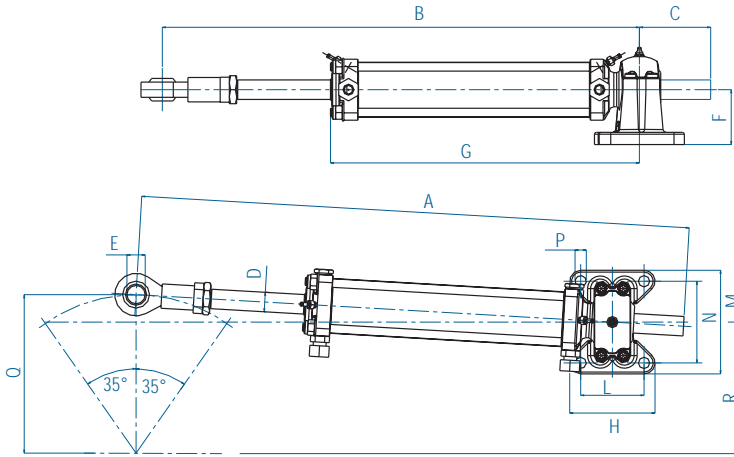
### Technical specifications

| Dimensions |           |           |           |          |          |          |          |           |          |          |          |          |          |           |          |
|------------|-----------|-----------|-----------|----------|----------|----------|----------|-----------|----------|----------|----------|----------|----------|-----------|----------|
| Model      | Stroke    | A         | B         | C        | D        | E        | F        | G         | H        | L        | M        | N        | P        | Q         | R        |
| CTD310     | 200 mm    | 700 mm    | 633 mm    | 67 mm    | 32 mm    | 30 mm    | 90 mm    | 410 mm    | 140 mm   | 104 mm   | 170 mm   | 134 mm   | 18,5 mm  | 175 mm    | 143 mm   |
|            | 7.87 in.  | 27.55 in. | 24.92 in. | 2.63 in. | 1.25 in. | 1.18 in. | 3.54 in. | 16.14 in. | 5.51 in. | 4.09 in. | 25.4 in. | 5.27 in. | 0.72 in. | 6.88 in.  | 5.62 in. |
| CTD450     | 300 mm    | 900 mm    | 783 mm    | 117 mm   | 32 mm    | 30 mm    | 90 mm    | 510 mm    | 140 mm   | 104 mm   | 170 mm   | 134 mm   | 18,5 mm  | 260 mm    | 215 mm   |
|            | 11.81 in. | 35.43 in. | 30.82 in. | 4.60 in. | 1.25 in. | 1.18 in. | 3.54 in. | 20.07 in. | 5.51 in. | 4.09 in. | 25.4 in. | 5.27 in. | 0.72 in. | 10.20 in. | 8.44 in. |

| Technical specifications |       |           |              |                             |             |          |         |        |          |
|--------------------------|-------|-----------|--------------|-----------------------------|-------------|----------|---------|--------|----------|
| Model                    | Code  | Stroke    | Torque       | Thrust at 70 bar - 1000 psi | Volume      | Tiller   | Angle   | Thread | Weight   |
| CTD310                   | 15698 | 200 mm    | 421 Kgm      | 2954 Kgf                    | 844 cc      | 175 mm   | 35°+35° | 1/2"   | 23 Kg    |
|                          |       | 7.87 in.  | 36459 lb.in. | 6510 lbf                    | 51,50 cu.in | 6.9 in.  |         |        | 50,70 lb |
| CTD450                   | 15699 | 300 mm    | 633 Kgm      | 2954 Kgf                    | 1266 cc     | 260 mm   | 35°+35° | 1/2"   | 25,6 Kg  |
|                          |       | 11.81 in. | 54818 lb.in. | 6510 lbf                    | 77,25 cu.in | 10.2 in. |         |        | 56,43 lb |

Note: the inboard cylinders mod CTD are not suitable for installations on racing boats. They are provided with flexible hoses type SAE100 R1.

# Heavy duty inboard steering cylinders Series CTE



### Main features

- Cylinder in **stainless steel** and **brass** painted
- Piston rod in stainless steel for a high corrosion resistance
- Adjustable base either horizontally or vertically
- Available in a range of volumes between 1318 a 2637 cc
- Supplied with bleeders
- Meet **ABYC** standards

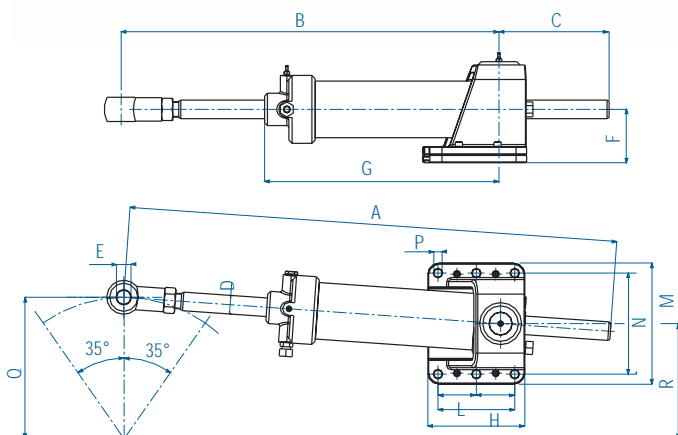
### Technical specifications

| Dimensions |           |           |           |          |          |          |          |           |          |          |          |          |          |           |           |
|------------|-----------|-----------|-----------|----------|----------|----------|----------|-----------|----------|----------|----------|----------|----------|-----------|-----------|
| Model      | Stroke    | A         | B         | C        | D        | E        | F        | G         | H        | L        | M        | N        | P        | Q         | R         |
| CTE600     | 200 mm    | 735 mm    | 695 mm    | 40 mm    | 40 mm    | 35 mm    | 102 mm   | 450 mm    | 182 mm   | 143 mm   | 198 mm   | 160 mm   | 18,5 mm  | 175 mm    | 143 mm    |
|            | 7.87 in.  | 28.93 in. | 27.36 in. | 1.57 in. | 1.57 in. | 1.37 in. | 4.01 in. | 17.71 in. | 7.16 in. | 5.62 in. | 7.79 in. | 6.29 in. | 0.72 in. | 6.88 in.  | 5.62 in.  |
| CTE900     | 300 mm    | 935 mm    | 845 mm    | 90 mm    | 40 mm    | 35 mm    | 102 mm   | 555 mm    | 182 mm   | 143 mm   | 198 mm   | 160 mm   | 18,5 mm  | 260 mm    | 215 mm    |
|            | 11.81 in. | 36.81 in. | 33.26 in. | 3.54 in. | 1.57 in. | 1.37 in. | 4.01 in. | 21.85 in. | 7.16 in. | 5.62 in. | 7.79 in. | 6.29 in. | 0.72 in. | 10.20 in. | 8.44 in.  |
| CTE1200    | 400 mm    | 1135 mm   | 995 mm    | 140 mm   | 40 mm    | 35 mm    | 102 mm   | 650 mm    | 182 mm   | 143 mm   | 198 mm   | 160 mm   | 18,5 mm  | 350 mm    | 286 mm    |
|            | 15.75 in. | 44.68 in. | 37.59 in. | 5.51 in. | 1.57 in. | 1.37 in. | 4.01 in. | 25.59 in. | 7.16 in. | 5.62 in. | 7.79 in. | 6.29 in. | 0.72 in. | 13.77 in. | 11.25 in. |

| Technical specifications |       |           |               |                             |              |          |         |        |         |  |
|--------------------------|-------|-----------|---------------|-----------------------------|--------------|----------|---------|--------|---------|--|
| Model                    | Code  | Stroke    | Torque        | Thrust at 70 bar - 1000 psi | Volume       | Tiller   | Angle   | Thread | Weight  |  |
| CTE600                   | 15700 | 200 mm    | 659 Kgm       | 4616 Kgf                    | 1318 cc      | 175 mm   | 35°+35° | 1/2"   | 38,5 Kg |  |
|                          |       | 7.87 in.  | 57069 lb.in.  | 10173 lbf                   | 80,40 cu.in  | 6.9 in.  |         |        | 85 lb   |  |
| CTE900                   | 15701 | 300 mm    | 988 Kgm       | 4616 Kgf                    | 1978 cc      | 260 mm   | 35°+35° | 1/2"   | 38,8 Kg |  |
|                          |       | 11.81 in. | 85560 lb.in.  | 10173 lbf                   | 120,65 cu.in | 10.2 in. |         |        | 85,5 lb |  |
| CTE1200                  | 15702 | 400 mm    | 1318 Kgm      | 4616 Kgf                    | 2637 cc      | 350 mm   | 35°+35° | 1/2"   | 42,0 Kg |  |
|                          |       | 15.75 in. | 114138 lb.in. | 10173 lbf                   | 160,91 cu.in | 13.7 in. |         |        | 92,6 lb |  |

Note: the inboard cylinders mod CTE are not suitable for installations on racing boats. They are provided with flexible hoses type SAE100 R1.

# Heavy duty inboard steering cylinders Series CTF



### Main features

- Cilinder in **stainless steel** and **brass** painted
- Piston rod in stainless steel for a high corrosion resistance
- Adjustable base either horizontally or vertically
- Available in a range of volumes from 3857 cc
- Supplied with bleeders
- Meet **ABYC** standards

### Technical specifications

| Dimensions |           |           |           |           |          |          |          |           |          |          |           |          |          |           |           |
|------------|-----------|-----------|-----------|-----------|----------|----------|----------|-----------|----------|----------|-----------|----------|----------|-----------|-----------|
| Model      | Stroke    | A         | B         | C         | D        | E        | F        | G         | H        | L        | M         | N        | P        | Q         | R         |
| CTF1600    | 400 mm    | 1205 mm   | 935 mm    | 270 mm    | 46 mm    | 36 mm    | 130 mm   | 580 mm    | 240 mm   | 190 mm   | 300 mm    | 250 mm   | 20,5 mm  | 350 mm    | 286 mm    |
|            | 15.75 in. | 47.44 in. | 36.81 in. | 10.62 in. | 1.81 in. | 1.41 in. | 5.11 in. | 22.83 in. | 9.44 in. | 7.48 in. | 11.81 in. | 9.84 in. | 0.80 in. | 13.77 in. | 11.25 in. |

| Technical specifications |       |           |               |                             |              |           |         |        |           |  |
|--------------------------|-------|-----------|---------------|-----------------------------|--------------|-----------|---------|--------|-----------|--|
| Model                    | Code  | Stroke    | Torque        | Thrust at 70 bar - 1000 psi | Volume       | Tiller    | Angle   | Thread | Weight    |  |
| CTF1600                  | 15703 | 400 mm    | 1928 Kgm      | 6750 Kgf                    | 3857 cc      | 350 mm    | 35°+35° | 1/2"   | 78,8 Kg   |  |
|                          |       | 15.75 in. | 166964 lb.in. | 14850 lbf                   | 235,27 cu.in | 13,77 in. |         |        | 173,72 lb |  |

Note: the inboard cylinders mod CTF are not suitable for installations on racing boats. They are provided with flexible hoses type SAE100 R1.

# AUTO-PILOT POWER UNITS

The automatic pilot and other electronic navigation systems are more popular, even on small vessels: it is necessary for the equipment to be able to exchange information and work together to guarantee safe navigation.

Twin Disc has developed a complete range of auto-pilot power units that represent the best interface for your auto-pilot.

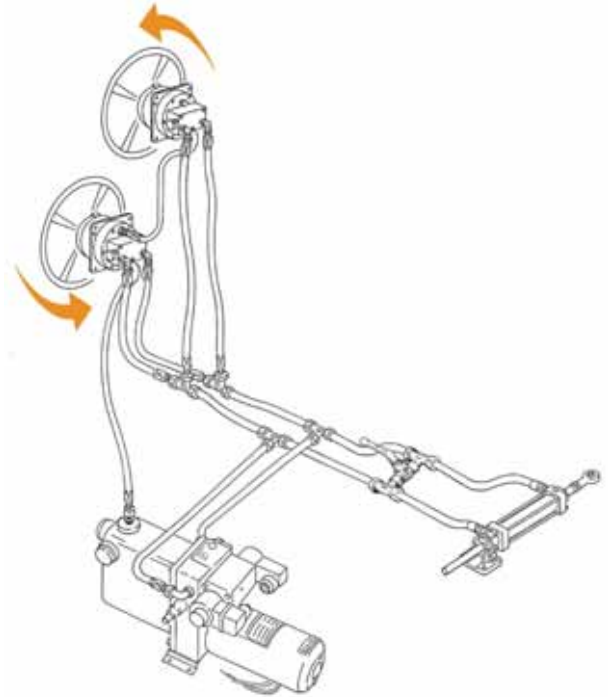
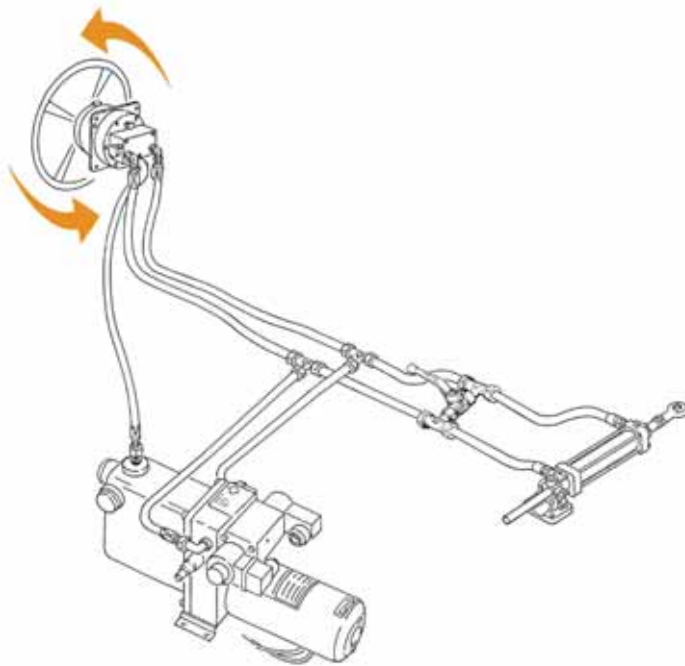
The auto-pilot power unit range can give very simple solutions in terms of working principle and installation, but extremely reliable, accurate performance.

It is possible to choose among several types of units:

- Solenoid-valve power units
- Solenoid-valve power units with automatic filling
- Reversible power units

Please check the different tables for the products characteristics and technical details.

In order to choose the most suitable unit it is necessary to have the steering cylinder volume, from which the actuation time is calculated and the suitable model selected.



### Main features

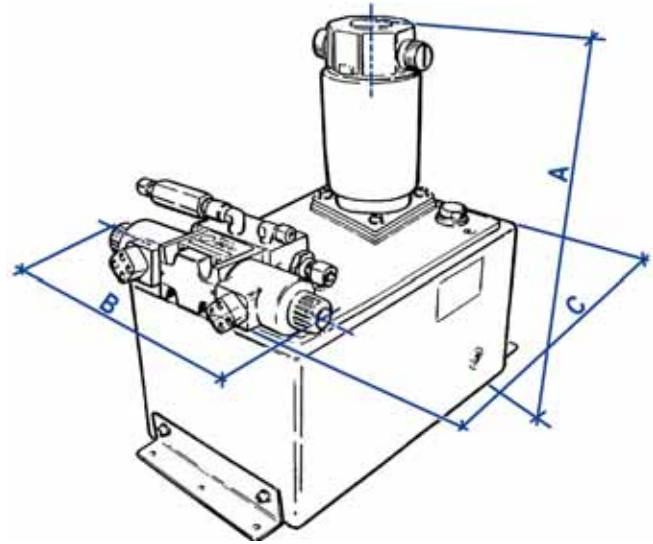
- Interface with any auto-pilot
- Reduced dimensions
- Models for any kind of application
- High quality materials and components for the best reliability and performance
- Steering automatic filling device available on certain models for an easier and faster bleeding
- Reversible and solenoid-valve power units

# Auto-pilot solenoid-valve power units with automatic filling device Mod. C03RA - C04RA

The latest version of the auto-pilot power unit with solenoid valves has a safe and accurate interface for the automatic pilot. It is equipped with a special device that allows the **automatic filling of the steering system**. This additional device allows oil to go automatically through steering hoses and any remaining air goes out the designed bleeders.

By turning occasionally the steering wheel from port to starboard and vice-versa; the bleeding procedure becomes quick and easy.

For any other technical specifications please refer to previous section under "Solenoid-valve power units".



### Main features

- Available in two models for application with steering cylinders having a volume up to 500 cc
- Safe and precise interface with any automatic pilot
- Compact design and reduced dimensions
- Solenoid-valves electro-magnetically actuated
- Special device for the steering automatic filling
- Easy and fast steering bleeding

### Technical specifications and applications

■ Metrical fittings

■ Imperial fittings

| Dimensions      |           |        |           |
|-----------------|-----------|--------|-----------|
| Modello         | A         | B      | C         |
| C03RAU<br>C03RA | 370 mm    | 230 mm | 240 mm    |
|                 | 14,56 in. | 9 in.  | 9,44 in.  |
| C04RAU<br>C04RA | 370 mm    | 230 mm | 380 mm    |
|                 | 14,56 in. | 9 in.  | 14,96 in. |

### Order guide and technical specifications

| Model                   | Code           | Typical cylinder application | Cylinder application | Application time in sec. | Displacement | Setting pressure | Max power cons. | Therm protection | Motor nominal power | Tank capacity | Weight*            |
|-------------------------|----------------|------------------------------|----------------------|--------------------------|--------------|------------------|-----------------|------------------|---------------------|---------------|--------------------|
| C03RAU 12V<br>C03RA 12V | 23338<br>18044 | 130 - 360 cc                 | CTA65U<br>CTA65      | 12,2                     | 816 cc/min.  | 50 bar           | 11 A            | 16 A             | 125 W               | 7 lt          | 10 Kg - 20,04 lb   |
|                         |                |                              | CTA75U<br>CTA75      | 13,8                     |              |                  |                 |                  |                     |               |                    |
| C03RAU 24V<br>C03RA 24V | 12552<br>12551 | 7,93 - 21,96 cu.in.          | CTA80U<br>CTA80      | 15,8                     | 49,77 cu.in. | 725 psi          | 6 A             | 10 A             | 125 W               | 427 in.cu     | 10,5 Kg - 23,14 lb |
|                         |                |                              | CTB110U<br>CTB110    | 20,7                     |              |                  |                 |                  |                     |               |                    |
| C04RAU 12V<br>C04RA 12V | 23339          | 360 - 500 cc                 | CTB130U<br>CTB130    | 10                       | 1940 cc/min. | 50 bar           | 26 A            | 32 A             | 150 W               | 12 lt         | 15 Kg - 33,06 lb   |
|                         |                |                              | CTB145U<br>CTB145    | 11,2                     |              |                  |                 |                  |                     |               |                    |
| C04RAU 24V<br>C04RA 24V | 12569<br>12568 | 21,96 - 30,5 cu.in.          | CTC200<br>CTC300     | 15,4<br>23,2             | 118,34 cu.in | 725 psi          | 13 A            | 16 A             | 150 W               | 732 in.cu     | 15,5 Kg - 34,16 lb |

(\* ) Weight is intended without oil.

## Auto-pilot power units with solenoid-valves Mod. C01N - C03N

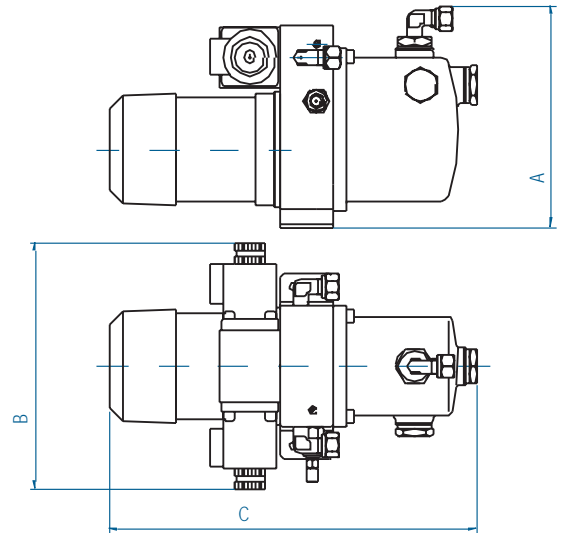
Auto-pilot power units with solenoid valves includes several models with different characteristics and displacements to satisfy a wide application field on any type of boat.

The system's major components are an electric motor, a hydraulic pump, an oil tank and an electro-magnetically actuated valve group.

The small unit dimensions allow an easy and fast installation in narrow areas.

To select the most suitable model, first verify the steering cylinder volume and then select the suggested model on our **Order Guide on page 58**.

For any special application, please contact a specialized installer or dealer who will help in the product selection.



### Main features

- Wide range of models with different displacements to satisfy any application
- Safe and precise interface with any auto-pilot
- Supplied with electro-magnetically actuated solenoid valves
- Compact design

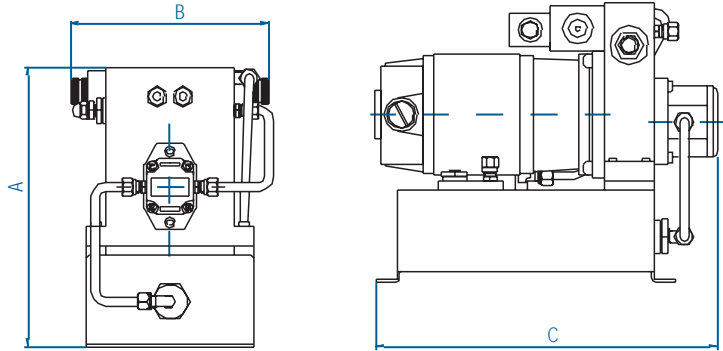
### Technical details

- Imperial fittings
- Metrical fittings

| Dimensions        |                    |                    |                     |
|-------------------|--------------------|--------------------|---------------------|
| Model             | A                  | B                  | C                   |
| CO1NU<br>CO1N     | 160 mm<br>6,30 in. | 185 mm<br>7,28 in. | 285 mm<br>11,22 in. |
| CO2NU<br>CO2N     | 160 mm<br>6,30 in. | 185 mm<br>7,28 in. | 285 mm<br>11,22 in. |
| CO2/3NU<br>CO2/3N | 185 mm<br>7,28 in. | 185 mm<br>7,28 in. | 360 mm<br>14,17 in. |
| CO3NU<br>CO3N     | 185 mm<br>7,28 in. | 185 mm<br>7,28 in. | 360 mm<br>14,17 in. |



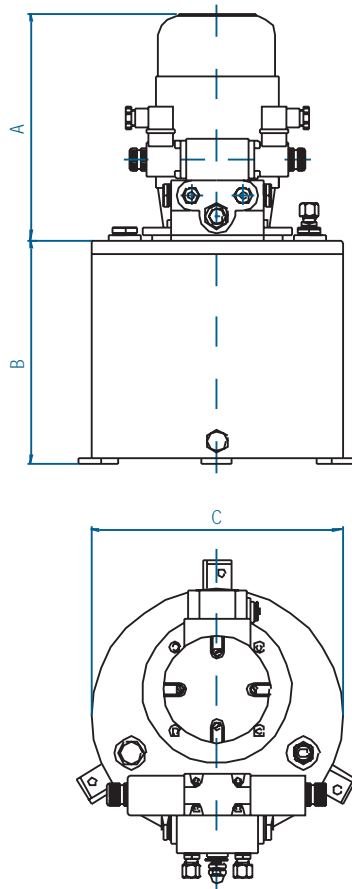
## Auto-pilot power units with solenoid-valves Mod. C04 - C04/5



### Technical specifications

| Dimensions |           |         |           |
|------------|-----------|---------|-----------|
| Model      | A         | B       | C         |
| C04        | 270 mm    | 200 mm  | 310 mm    |
|            | 10,63 in. | 7.8 in. | 12,20 in. |
| C04/5      | 270 mm    | 200 mm  | 310 mm    |
|            | 10,63 in. | 7.8 in. | 12,20 in. |

## Auto-pilot power units with solenoid-valves Mod. C07 - C016



### Technical specifications

| Dimensions |           |           |           |
|------------|-----------|-----------|-----------|
| Model      | A         | B         | C         |
| C07        | 230 mm    | 230 mm    | 270 mm    |
|            | 9,06 in.  | 9,06 in.  | 10,63 in. |
| C08        | 230 mm    | 230 mm    | 270 mm    |
|            | 9,06 in.  | 9,06 in.  | 10,63 in. |
| C09        | 240 mm    | 310 mm    | 350 mm    |
|            | 9,45 in.  | 12,20 in. | 13,78 in. |
| C010       | 230 mm    | 230 mm    | 270 mm    |
|            | 9,06 in.  | 9,06 in.  | 10,63 in. |
| C011       | 240 mm    | 310 mm    | 350 mm    |
|            | 9,45 in.  | 12,20 in. | 13,78 in. |
| C012       | 240 mm    | 310 mm    | 350 mm    |
|            | 9,45 in.  | 12,20 in. | 13,78 in. |
| C013       | 240 mm    | 360 mm    | 350 mm    |
|            | 9,45 in.  | 14,17 in. | 13,78 in. |
| C014       | 300 mm    | 360 mm    | 350 mm    |
|            | 11,81 in. | 14,17 in. | 13,78 in. |
| C015       | 300 mm    | 360 mm    | 350 mm    |
|            | 11,81 in. | 14,17 in. | 13,78 in. |
| C016       | 300 mm    | 360 mm    | 350 mm    |
|            | 11,81 in. | 14,17 in. | 13,78 in. |

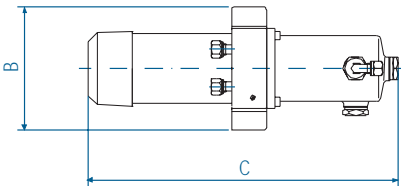
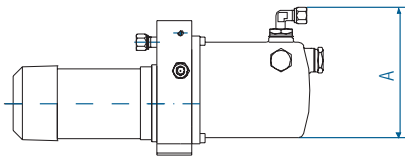
## Technical specifications and applications of solenoid-valve auto-pilot power units

■ Metrical fittings      ■ Imperial fittings

| Order Guide and technical specifications |                |                              |                      |                                  |                  |                  |                 |                  |                     |               |          |
|--|----------------|------------------------------|----------------------|----------------------------------|------------------|------------------|-----------------|------------------|---------------------|---------------|----------|
| Model                                    | Code           | Typical cylinder application | Cylinder application | Application time in sec.         | Displacement     | Setting pressure | Max power cons. | Therm protection | Motor nominal power | Tank capacity | Weight*  |
| CO1NU 12V<br>CO1N 12V                    | 21313<br>12517 | 70 - 100 cc                  | -                    | depending on the cylinder volume | 360 cc/min       | 50 bar           | 7 A             | 10 A             | 60 W                | 0,55 lt       | 6.5 Kg   |
| CO1NU 24V<br>CO1N 24V                    | 21314<br>12518 | 4.27 - 6.1 cu.in             |                      |                                  | 21.97 cu.in/min  | 725 psi          | 4.5 A           | 10 A             |                     | 33,56 in.cu   | 14.33 lb |
| CO2NU 12V<br>CO2N 12V                    | 21315<br>12532 | 115 - 130 cc                 | CTA40U<br>CTA40      | 14,5                             | 480 cc/min       | 50 bar           | 9.4 A           | 10 A             | 60 W                | 0,55 lt       | 6.5 Kg   |
| CO2NU 24V<br>CO2N 24V                    | 21316<br>12533 | 6.1 - 7.93 cu.in             |                      |                                  | 29.30 cu.in/min  | 725 psi          | 6 A             | 10 A             |                     | 33,56 in.cu   | 14.33 lb |
| CO2/3NU 12V<br>CO2/3N 12V                | 21317<br>12521 | 130 - 220 cc                 | CTA65U<br>CTA65      | 14                               | 720 cc/min       | 50 bar           | 16 A            | 20 A             | 100 W               | 0,95 lt       | 8.5 Kg   |
| CO2/3NU 24V<br>CO2/3N 24V                | 21318<br>12522 | 7.93 - 13.42 cu.in           | CTA75U<br>CTA75      | 15,6                             | 43.95 cu.in/min  | 725 psi          | 10 A            | 16 A             |                     | 57,97 in.cu   | 18.73 lb |
|  |                |                              | CTA80U<br>CTA80      | 17,9                             |                  |                  |                 |                  |                     |               |          |
| CO3NU 12V<br>CO3N 12V                    | 21319<br>15314 | 220 - 360 cc                 | CTB110U<br>CTB110    | 13,8                             | 1220 cc/min      | 50 bar           | 18 A            | 20 A             | 100 W               | 0,95 lt       | 8.5 Kg   |
| CO3NU 24V<br>CO3N 24V                    | 21320<br>12549 | 13.42 - 21.96 cu.in          | CTB130U<br>CTB130    | 15,8                             | 74.48 cu.in/min  | 725 psi          | 12 A            | 16 A             |                     | 57,97 in.cu   | 18.73 lb |
|  |                |                              | CTB145U<br>CTB145    | 17,7                             |                  |                  |                 |                  |                     |               |          |
| CO4 12V<br>CO4 24V                       | 12559<br>11342 | 360 - 500 cc                 | CTC200<br>CTC230     | 16                               | 1860 cc/min      | 45 bar           | 18 A            | 20 A             | 150 W               | 3,0 lt        | 14 Kg    |
|  |                | 21.96 - 30.5 cu.in           |                      | 18                               | 113.55 cu.in/min | 652 psi          | 10 A            | 16 A             |                     | 183 in.cu     | 30.86 lb |
| CO4/5 12V<br>CO4/5 24V                   | 12555<br>12556 | 500 - 570 cc                 | CTC200<br>CTC230     | 12,3                             | 2440 cc/min      | 45 bar           | 20 A            | 25 A             | 150 W               | 3,0 lt        | 14 Kg    |
|  |                | 30.50 - 34.77 cu.in          |                      | 14                               | 148.96 cu.in/min | 652 psi          | 12 A            | 16 A             |                     | 183 in.cu     | 30.86 lb |
| CO7 24V                                  | 12581          | 500 - 570 cc                 | CTC300               | 21                               | 2100 cc/min      | 55 bar           | -               | -                | 300 W               | 12,0 lt       | 25 Kg    |
|  |                | 30.50 - 34.77 cu.in          |                      |                                  | 128.20 cu.in/min | 797 psi          | 18 A            | 20 A             |                     | 732 in.cu     | 55.11 lb |
| CO8 24V                                  | 12582          | 570 - 750 cc                 | CTC300               | 15,7                             | 2850 cc/min      | 55 bar           | -               | -                | 300 W               | 12,0 lt       | 25 Kg    |
|  |                | 34.77 - 45.75 cu.in          |                      |                                  | 173.99 cu.in/min | 797 psi          | 21 A            | 25 A             |                     | 732 in.cu     | 55.11 lb |
| CO9 24V                                  | 12584          | 750 - 1000 cc                | CTC400<br>CTD310     | 16,6                             | 3600 cc/min      | 55 bar           | -               | -                | 550 W               | 25,0 lt       | 40 Kg    |
|  |                | 45.75 - 61.00 cu.in          |                      | 14                               | 219.78 cu.in/min | 797 psi          | 21 A            | 25 A             |                     | 1525 in.cu    | 88.18 lb |
| CO10 24V                                 | 12497          | 1000 - 1200 cc               | CTC400<br>CTD310     | 13                               | 4650 cc/min      | 55 bar           | -               | -                | 300 W               | 12,0 lt       | 40 Kg    |
|  |                | 61.00 - 73.3 cu.in           |                      | 10,9                             | 283.88 cu.in/min | 797 psi          | 30 A            | 32 A             |                     | 732 in.cu     | 88.18 lb |
| CO11 24V                                 | 12499          | 1200 - 1250 cc               | CTD450               | 16,3                             | 4650 cc/min      | 55 bar           | -               | -                | 550 W               | 25,0 lt       | 40 Kg    |
|  |                | 73,28 - 76,27 cu.in          |                      |                                  | 283.88 cu.in/min | 797 psi          | 35 A            | 40 A             |                     | 1525 in.cu    | 88.18 lb |
| CO12 24V                                 | 12500          | 1250 - 1350 cc               | CTE600               | 14,6                             | 5400 cc/min      | 55 bar           | -               | -                | 550 W               | 25,0 lt       | 40 Kg    |
|  |                | 76,27 - 82,38 cu.in.         |                      |                                  | 329.4 cu.in/min  | 797 psi          | 35 A            | 40 A             |                     | 1525 in.cu    | 88,18 lb |
| CO13 24V                                 | 12502          | 1350 - 1750 cc               | CTE600               | 11                               | 7200 cc/min      | 55 bar           | -               | -                | 550 W               | 32,0 lt       | 43 Kg    |
|  |                | 82,38 - 106,79 cu.in.        |                      |                                  | 439.2 cu.in/min  | 797 psi          | 40 A            | 50 A             |                     | 1952 in.cu    | 94,80 lb |
| CO14 24V                                 | 12503          | 1250 - 1350 cc               | CTE600               | 12,5                             | 6300 cc/min      | 55 bar           | -               | -                | 1100 W              | 32,0 lt       | 43 Kg    |
|  |                | 76,27 - 84,38 cu.in.         |                      |                                  | 384.3 cu.in/min  | 797 psi          | 55 A            | 63 A             |                     | 1952 in.cu    | 94,80 lb |
| CO15 24V                                 | 12504          | 1750 - 2000 cc               | CTE900               | 13                               | 9150 cc/min      | 55 bar           | -               | -                | 1100 W              | 32,0 lt       | 43 Kg    |
|  |                | 106,79 - 122 cu.in.          |                      |                                  | 558.15 cu.in/min | 797 psi          | 55 A            | 63 A             |                     | 1952 in.cu    | 94,80 lb |
| CO16 24V                                 | 12507          | 2000 - 3900 cc               | CTE1200<br>CTF1600   | 13,3                             | 11850 cc/min     | 55 bar           | -               | -                | 1100 W              | 32,0 lt       | 43 Kg    |
|  |                | 122 - 238 cu.in              |                      | 19,5                             | 722.85 cu.in/min | 797 psi          | 65 A            | 80 A             |                     | 1952 in.cu    | 94,80 lb |

(\*) Weight is intended without oil.

# Reversible auto-pilot power units Mod. C01R - C04R



Four different models of reversible power units are available for auto-pilot application with steering cylinders with a volume up to 500 cc. They should be used for all applications where the power consumption is critical and needs to be as low as possible. They have the same performances as the solenoid-valve units, ensuring an accurate and reliable interface with the auto-pilot software.

The small dimensions allow installation in very narrow places. The unit comprised of a reversible electric motor, a reversible hydraulic pump, an oil tank and a filter group.

For the selection of the most suitable system, please determine the steering cylinder volume and then choose the appropriate model listed in the **Order Guide** here below.

### Main features

- Available in four models for steering cylinder volumes up to 500 cc
- Precise and reliable interface with the auto-pilot
- Very low electric consumption
- Compact design and reduced dimensions

### Technical specifications and applications

■ Metrical fittings

■ Imperial fittings

| Dimensions     |                   |                   |                    |
|----------------|-------------------|-------------------|--------------------|
| Model          | A                 | B                 | C                  |
| CO1RU - CO1R   | 160 mm - 6,30 in. | 155 mm - 6,10 in. | 285 mm - 11,22 in. |
| CO2RU - CO2R   | 160 mm - 6,30 in. | 155 mm - 6,10 in. | 285 mm - 11,22 in. |
| CO3RU - CO3R   | 185 mm - 7,28 in. | 155 mm - 6,10 in. | 360 mm - 14,17 in. |
| CO4NRU - CO4NR | 185 mm - 7,28 in. | 155 mm - 6,10 in. | 360 mm - 14,17 in. |

| Order Guide and technical specifications |                |                              |  |                                  |              |                  |                 |                  |                     |               |          |             |         |     |      |
|--|----------------|------------------------------|--|----------------------------------|--------------|------------------|-----------------|------------------|---------------------|---------------|----------|-------------|---------|-----|------|
| Model                                    | Code           | Typical cylinder application | Cylinder application   | Application time in sec.         | Displacement | Setting pressure | Max power cons. | Therm protection | Motor nominal power | Tank capacity | Weight*  |             |         |     |      |
| CO1RU 12V<br>CO1R 12V                    | 21305<br>12519 | 70 - 100 cc                  | -  | depending on the cylinder volume | 360 cc/min   | 50 bar           | 7 A             | 10 A             | 80 W                | 0.55 lt       | 6.5 Kg   |             |         |     |      |
| CO1RU 24V<br>CO1R 24V                    | 21306<br>11341 | 4.27 - 6.1 cu.in             |  |                                  | 21.97 cu.in  | 725 psi          | 4.5 A           | 10 A             |                     | 33,56 in.cu   | 14,33 lb |             |         |     |      |
| CO2RU 12V<br>CO2R 12V                    | 21307<br>12535 | 115 - 130 cc                 | CTA40U - CTA40   | 14,5                             | 480 cc/min   | 50 bar           | 8,5 A           | 10 A             | 80 W                | 0.55 lt       | 6.5 Kg   |             |         |     |      |
| CO2RU 24V<br>CO2R 24V                    | 21308<br>12536 | 6.1 - 7.93 cu.in             |  |                                  | 29.30 cu.in  | 725 psi          | 4,5 A           | 10 A             |                     | 33,56 in.cu   | 14,33 lb |             |         |     |      |
| CO3RU 12V<br>CO3R 12V                    | 21309<br>15710 | 130 - 360 cc                 | CTA40U - CTA40<br>CTA75U - CTA75<br>CTA80U - CTA80<br>CTB110U - CTB110<br>CTB130U - CTB130<br>CTB145U - CTB145 | 10,5                             | 960 cc/min   | 50 bar           | 10 A            | 16 A             | 125 W               | 0.95 lt       | 8.5 Kg   |             |         |     |      |
| CO3RU 24V<br>CO3R 24V                    | 21310<br>12550 | 7.93 - 13.42 cu.in           |  | 11,7                             |              |                  |                 |                  |                     |               |          | 58.56 cu.in | 725 psi | 7 A | 10 A |
|  |                |                              |  | 13,4                             |              |                  |                 |                  |                     |               |          |             |         |     |      |
| CO4NRU 12V<br>CO4NR 12V                  | 21311<br>15711 | 360 - 500 cc                 | CTC200<br>CT230  | 15,6                             | 1920 cc/min  | 50 bar           | 22 A            | 25 A             | 150 W               | 0.95 lt       | 8.5 Kg   |             |         |     |      |
| CO4NRU 24V<br>CO4NR 24V                  | 21312<br>15712 | 21.96 - 30,5 cu.in           |  | 17,8                             | 117.12 cu.in | 725 psi          | 11 A            | 16 A             |                     | 33,56 in.cu   | 18,73 lb |             |         |     |      |

(\*) Weight is intended without oil.

## POWER-ASSISTED INBOARD STEERING SYSTEM

Cruising towards the horizon of innovation, reliability and comfort with the BCS power-assisted steering.

A prompt responsiveness and total control with **just 3,5 wheel turns** lock-to-lock even at high speeds (over 28 Knots).

The compact design and the **reduced number of components** (3 vs. 6-7 in other brands) allows the system to be **easy to install and service**.

BCS power-assisted steering assures maximum comfort, minimum effort, total efficiency in any sea condition.

### The system.

The hydraulic helm pump is available in all displacements and mounting configurations (see helm pump section from page 11 for the model selection).

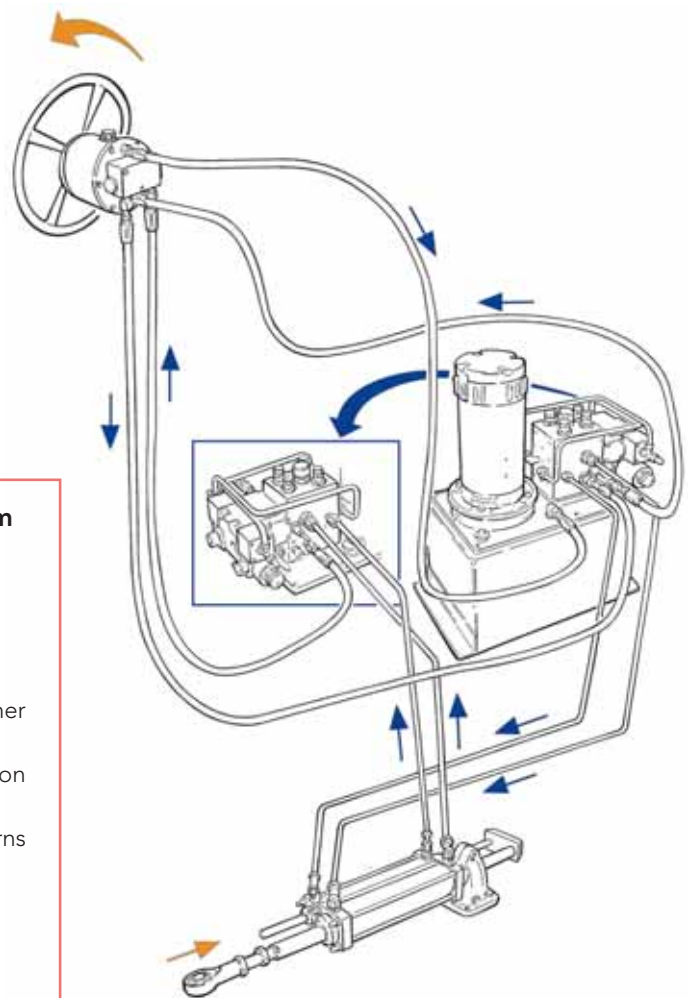
Simple design with reduced dimensions for the steering cylinder, which are available either in **anodized aluminum body** (for

applications up to 45'), or in a **brass body** for heavier applications, has the servo cylinder mounted directly to the main cylinder.

The BCS power-assisted steering is completely independent from the vessel's main engines and all necessary power is provided by a single electro-hydraulic power unit.

The system has all the necessary valves for the servo system in order to ensure safe steering (non return valves, relief valves etc.). It also includes an **interface for the auto-pilot and a special device for the system automatic filling** (see description of the working principle for this device at the section "Auto-pilot power units with automatic filling" page 54).

In order to ensure the best safety and total boat control in emergency conditions, the BCS steering system **automatically** turns into a **manual system** if there is any problem with the power unit.



### Main features of the power-assisted steering system

- Totally independent from the vessel propulsion system
- Effortless navigation comfort in any condition
- High quality, safety and reliability
- Innovative concept and working principle
- 3 elements of the basic system vs. 6-7 elements in other brands
- Strong reduction of installation time (over 30% in comparison with competitors steering)
- Prompt responsiveness and total control in just 3.5 turns lock-to-lock (this number can be varied)
- Cooling system is not necessary
- Supplied with interface for the auto-pilot
- Special device for automatic filling of the system
- Bleeding procedure easy and fast
- Steering helm pump available in 5 displacements and 4 mounting configurations
- Provided with automatic manual back-up steering
- Simplified service and repair procedures (the system is not pressurized)
- Limited number of spare parts
- Helm pumps and cylinders meet **ABYC** standards and are **CE** approved
- Helm pumps are **NMMA Type Approved**

## WORKING PRINCIPLE

The power-assisted steering is totally independent: the electro-hydraulic power unit provides all the necessary power. The steering system consists of an axial piston helm pump and a power assisted cylinder, which has the servo cylinder mounted on its body.

1. By turning the steering wheel, an oil flow is sent from the helm pump to the small servo cylinder mounted on the main one.
2. This flow enters the cylinder and makes the piston move. The pressure resulting from this movement is used to open a distributor placed on the electro-hydraulic power unit.
3. As the distributor opens, an oil flow reaches the main cylinder moving the piston as well as the rod connected to the tiller arm. This causes the rudder to rotate.

4. Oil displaced from the opposite side of the main cylinder flows back to the helm pump.

5. To rotate the rudder in the opposite direction, simply turn the helm pump the other way.

### In case of emergency.

In case of electrical failure (i.e.: power unit cannot be turned on or is out of order), by turning the helm pump oil flows automatically into the main cylinder which then allows rudder to rotate. The power-assisted steering automatically becomes a manual hydraulic back-up system with no need for switching anything or open/close any by-pass.

## CYLINDERS

The power-assisted steering cylinders are available with anodized **aluminum body** (for applications up to 45'), or with a **brass body** (for applications over 45').

The small servo cylinder is mounted directly to the main cylinder. This results in an extremely simple design with reduced dimensions for an easy installation in very narrow spaces.

The piston rod is made of stainless steel for both the servo and main cylinders allowing longer life and higher resistance to rust and corrosion.

The standard dimensions of ball joints can be easily ordered and

can be supplied in stainless steel upon request.

The cylinder base can be adjusted either horizontally, to follow the complete arc of the cylinder, or vertically, in order to be adapted to any tiller extension.

Every cylinder is supplied with Tee fittings with bleeders as well as the necessary fittings for hose connection.

All cylinders are built with materials suitable for application in marine environment, where there is high level of salinity.

In case of particularly difficult environment conditions, we recommend the use of stainless steel ball joints and fittings.

### Main features of the power-assisted cylinders

- Compact design with reduced dimensions
- Servo cylinder integrally fixed to the main one
- Available in a wide variety of volumes and strokes for application flexibility
- Provided with bleeders
- Available with anodized aluminum or bronze body
- Piston rod in stainless steel
- Cylinder base twisting either horizontally or vertically
- High resistance to corrosion
- Meet **ABYC** standards
- **CE** marked

## Power-assisted steering system applications according to the boat length

| Boat length<br>LOA          | System to order |                        |         |
|-----------------------------|-----------------|------------------------|---------|
|                             | Planing hull    | Semi displacement hull |         |
|                             |                 | Pleasure               | Working |
| 12 - 13,7 mt / 40 - 45 ft   | 15              | 17                     | 18      |
| 13,7 - 15,3 mt / 45 - 50 ft | 16              | 18                     | 19      |
| 15,3 - 16,8 mt / 50 - 55 ft | 17              | 19                     | 20      |
| 16,8 - 18 mt / 55 - 60 ft   | 18              | 20                     | 21      |
| 18 - 19,8 mt / 60 - 65 ft   | 19              | 21                     | 22      |
| 19,8 - 21 mt / 65 - 70 ft   | 20              | 22                     | -       |
| 21 - 22,9 mt / 70 - 75 ft   | 21              | 22                     | -       |
| 22,9 - 24,4 mt / 75 - 80 ft | 22              | -                      | -       |
| 24,3 - 26 mt / 80 - 85 ft   | 22              | -                      | -       |

**WARNING! The above suggestions shall be intended as indicative.** To check the proper application the required max torque must be calculated. If the required information is not available please contact our authorized dealer or service center and submit boat length, maximum speed and rudder dimensions. For planing boats, the above steering systems are suggested for boat speeds between 30 and 45 knots and for semi displacement boat with hull speed between 15 and 20 knots.

■ Metrical fittings

■ Imperial fittings

| Power-assisted steering system |                     |                |           |                                   |   |                        |       |                       |                |
|--------------------------------|---------------------|----------------|-----------|-----------------------------------|---|------------------------|-------|-----------------------|----------------|
| System to order                | Cylinder            | Code           | Pump      | Wheel turns lock-to-lock (manual) | Wheel turns lock-to-lock (servo-assisted) | Power-unit             | Code  | Hydraulic scheme      |                |
|                                |                     |                |           |                                   |   |                        |       | Main station          | Second station |
| System 15                      | CTA80AU<br>CTA80A   | 12681<br>12680 | 20 cc/rev | 10.7                              | 4   | CO500/3/0,5U<br>12Vdc  | 16132 | SI-600/B              | SI-610/B       |
|                                |                     |                |           |                                   |   |                        |       | CO500/3/0,5<br>12Vdc  | 12571          |
| System 16                      | CTB110AU<br>CTB110A | 12686<br>12684 | 30 cc/rev | 9.4                               | 3.8                                       | CO500/3/0,5U<br>24Vdc  | 12572 | SI-602/B              | SI-612/B       |
|                                |                     |                |           |                                   |   |                        |       | CO500/3/0,5<br>24Vdc  | 15654          |
| System 17                      | CTB130AU<br>CTB130A | 12690<br>12688 | 30 cc/rev | 10.7                              | 4.4                                       | CO500/4/0,75U<br>24Vdc | 16133 | SI-603/B              | SI-613/B       |
|                                |                     |                | 42 cc/rev | 7.7                               | 3.1                                       |                        |       | CO500/4/0,75<br>24Vdc | 12573          |
| System 18                      | CTB145AU<br>CTB145A | 15883<br>12693 | 30 cc/rev | 12                                | 4.9                                       | CO500/6/0,75U<br>24Vdc | 16134 | SI-604/B              | SI-614/B       |
|                                |                     |                | 42 cc/rev | 8.6                               | 3.5                                       |                        |       | CO500/6/0,75<br>24Vdc | 12574          |
| System 19                      | CTC200AU<br>CTC200A | 15885<br>12696 | 30 cc/rev | 16.6                              | 4.3                                       | CO500/6/0,75U<br>24Vdc | 16134 | SI-605/B              | SI-615/B       |
|                                |                     |                | 42 cc/rev | 11.9                              | 3   |                        |       | CO500/6/0,75<br>24Vdc | 12574          |
| System 20                      | CTC230AU<br>CTC230A | 15887<br>12699 | 30 cc/rev | 19                                | 4.9                                       | CO500/6/0,75<br>24Vdc  | 12574 | SI-606/A              | SI-616/A       |
|                                |                     |                | 42 cc/rev | 13.6                              | 3.5                                       |                        |       | CO500/6/0,75<br>24Vdc | 12574          |
| System 21                      | CTC300AU<br>CTC300A | 15889<br>15715 | 42 cc/rev | 17.8                              | 4.6                                       | CO500/6/0,75<br>24Vdc  | 12574 | SI-606/A              | SI-616/A       |
| System 22                      | CTC400AU<br>CTC400A | 16136<br>12702 | 42 cc/rev | 24                                | 6.1                                       |                        |       | SI-606/C              | SI-616/C       |

## System 15

| Components                              | Model  | Code                             | Q.ty   |
|---|--|----------------------------------|--------|
| Cylinder                                | CTA80AU<br>CTA80A  | 12681<br>12680                   | 1      |
| Helm pump                               | P20BAP<br>P20BA  | 21173<br>16192                   | 1      |
| Fittings for single station             |  | 12784<br>13685                   | 2<br>1 |
| Electro-hydraulic power unit            | CO500/3/0,5U 12 Vdc<br>CO500/3/0,5 12 Vdc<br>CO500/3/0,5U 24 Vdc<br>CO500/3/0,5 24 Vdc | 16132<br>12571<br>12572<br>15654 | 1      |
| Hydraulic oil                           | VG22   | 21334                            | 3      |
| In case of a second station please add: |  |                                  |        |
| 2° station helm pump                    | P20BAP<br>P20BA  | 21173<br>16192                   | 1      |
| Fittings kit for additional station     |  | 23376<br>23942                   | 1      |
| Hydraulic oil                           | VG22   | 21334                            | 1      |

## System 16

| Components                              | Model  | Code                             | Q.ty   |
|---|--|----------------------------------|--------|
| Cylinder                                | CTB110AU<br>CTB110A  | 12686<br>12684                   | 1      |
| Helm pump                               | P30BAP<br>P30BA  | 21174<br>16193                   | 1      |
| Fittings for single station             |  | 12784<br>13685                   | 2<br>1 |
| Electro-hydraulic power unit            | CO500/3/0,5U 12 Vdc<br>CO500/3/0,5 12 Vdc<br>CO500/3/0,5U 24 Vdc<br>CO500/3/0,5 24 Vdc | 16132<br>12571<br>12572<br>15654 | 1      |
| Hydraulic oil                           | VG22   | 21334                            | 3      |
| In case of a second station please add: |  |                                  |        |
| 2° station helm pump                    | P30BAP<br>P30BA  | 21174<br>16193                   | 1      |
| Fittings kit for additional station     |  | 23376<br>23942                   | 1      |
| Hydraulic oil                           | VG22   | 21334                            | 1      |

## Pump-cylinder combination

### Responsiveness

SLOW 

MEDIUM 

FAST 

■ Metrical fittings

■ Imperial fittings

|   |  | HELM PUMP   |   |  |
|---|--|---|---|--|
| <p>Choose combination between pump and cylinder according to the wished number of wheel turns lock-to-lock.</p> <p><b>Note:</b> the requested effort on the steering wheel is inversely proportional to the wheel turns number lock-to-lock:</p> <ul style="list-style-type: none"> <li>• less wheel turns, more effort</li> <li>• more wheel turns, less effort</li> </ul> |  | <br>(*)<br><b>P20BAP Cod. 21173</b><br>P20BA Cod. 16192  | <br>(*)<br><b>P30BAP Cod. 21174</b><br>P30BA Cod. 16193 | <br>(*)<br><b>P42BAP Cod. 21175</b><br>P42BA Cod. 16194 |
| CYLINDER  | <br><b>CTA80AU - Cod. / Part # 12681</b><br><b>CTA80A - Cod. / Part # 12680</b>   | No. of wheel turns<br>Manual: <b>10,7</b> <br>Servo-control system: <b>4,0</b><br>Suggested min hose (**)<br>Tiller: 200 mm / 7.8 in.<br>Angle: 35° + 35°<br>Torque: 107,36 Kgm / 92,97 lb.in.<br>Min. wheel diam: 350 mm - 13,77 in.    |   |  |
|   | <br><b>CTB110AU - Cod. / Part # 12686</b><br><b>CTB110A - Cod. / Part # 12684</b> | No. of wheel turns<br>Manual: <b>9,4</b> <br>Servo-control system: <b>3,8</b><br>Suggested min hose (**)<br>Tiller: 153 mm / 6.0 in.<br>Angle: 35° + 35°<br>Torque: 140. 85 Kgm / 121,97 lb.in.<br>Min. wheel diam: 350 mm - 13,77 in. |   |  |

(\*) For more details, see the basic helm section on page 11 and choose the desired mounting configuration.

(\*\*) For the choice of the hydraulic hose, please see the relative scheme.

## System 17

| Components                              | Model  | Code                             | Q.ty   |
|---|--|----------------------------------|--------|
| Cylinder                                | CTB130AU<br>CTB130A  | 12690<br>12688                   | 1      |
| Helm pump                               | P30BAP<br>P30BA<br>P42BAP<br>P42BA   | 21174<br>16193<br>21175<br>16194 | 1<br>1 |
| Fittings for single station             |  | 12784<br>13685                   | 2<br>1 |
| Electro-hydraulic power unit            | CO500/3/0,5U 12 Vdc<br>CO500/3/0,5 12 Vdc<br>CO500/3/0,5U 24 Vdc<br>CO500/3/0,5 24 Vdc | 16132<br>12571<br>12572<br>15654 | 1      |
| Hydraulic oil                           | VG22   | 21334                            | 3      |
| In case of a second station please add: |  |                                  |        |
| 2° station helm pump                    | P30BAP<br>P30BA<br>P42BAP<br>P42BA   | 21174<br>16193<br>21175<br>16194 | 1<br>1 |
|   |  | 23376<br>23942                   | 1      |
| Fittings kit for additional station     |  | 23376<br>23942                   | 1      |
| Hydraulic oil                           | VG22   | 21334                            | 1      |

## System 18

| Components                              | Model                                       | Code                             | Q.ty   |
|---|---|----------------------------------|--------|
| Cylinder                                | CTB145AU<br>CTB145A                         | 15883<br>12693                   | 1      |
| Helm pump                               | P30BAP<br>P30BA<br>P42BAP<br>P42BA          | 21174<br>16193<br>21175<br>16194 | 1<br>1 |
| Fittings for single station             |   | 12784<br>13685                   | 2<br>1 |
| Electro-hydraulic power unit            | CO500/4/0,75U 24 Vdc<br>CO500/4/0,75 24 Vdc | 16133<br>12573                   | 1      |
| Hydraulic oil                           | VG22  | 21334                            | 3      |
| In case of a second station please add: |   |                                  |        |
| 2° station helm pump                    | P30BAP<br>P30BA<br>P42BAP<br>P42BA          | 21174<br>16193<br>21175<br>16194 | 1<br>1 |
|   |   | 23376<br>23942                   | 1      |
| Fittings kit for additional station     |   | 23376<br>23942                   | 1      |
| Hydraulic oil                           | VG22  | 21334                            | 1      |

## Pump-cylinder combination

### Responsiveness

SLOW 

MEDIUM 

FAST 

■ Metrical fittings

■ Imperial fittings

|   |  | HELM PUMP  |   |   |
|---|--|--|---|---|
| <p>Choose combination between pump and cylinder according to the wished number of wheel turns lock-to-lock.</p> <p><b>Note:</b> the requested effort on the steering wheel is inversely proportional to the wheel turns number lock-to-lock:</p> <ul style="list-style-type: none"> <li>• less wheel turns, more effort</li> <li>• more wheel turns, less effort</li> </ul> |  |   |   |    |
|   |  | (*)<br>P20BAP Cod. 21173<br>P20BA Cod. 16192   | (*)<br>P30BAP Cod. 21174<br>P30BA Cod. 16193  | (*)<br>P42BAP Cod. 21175<br>P42BA Cod. 16194  |
| CYLINDER  | <br>CTB130AU - Cod. / Part # 12690<br>CTB130A - Cod. / Part # 12688 | No. of wheel turns<br>Manual: <b>10,7</b><br>Servo-control system: <b>4,4</b><br>Suggested min hose (**)<br>Tiller: 180 mm / 7.0 in.<br>Angle: 35° + 35°<br>Torque: 161,42 Kgm / 13978 lb.in.<br>Min. wheel diam: 350 mm - 13,77 in. |  | No. of wheel turns<br>Manual: <b>7,7</b><br>Servo-control system: <b>3,2</b><br>Suggested min hose (**)<br>Tiller: 180 mm / 7.0 in.<br>Angle: 35° + 35°<br>Torque: 161,42 Kgm / 13978 lb.in.<br>Min. wheel diam: 450 mm - 17,71 in. |
|   | <br>CTB145AU - Cod. / Part # 15883<br>CTB145A - Cod. / Part # 12693 | No. of wheel turns<br>Manual: <b>12</b><br>Servo-control system: <b>4,9</b><br>Suggested min hose (**)<br>Tiller: 200 mm / 7.8 in.<br>Angle: 35° + 35°<br>Torque: 180,41 Kgm / 15623 lb.in.<br>Min. wheel diam: 350 mm - 13,77 in.   |  | No. of wheel turns<br>Manual: <b>8,6</b><br>Servo-control system: <b>3,5</b><br>Suggested min hose (**)<br>Tiller: 200 mm / 7.8 in.<br>Angle: 35° + 35°<br>Torque: 180,41 Kgm / 15623 lb.in.<br>Min. wheel diam: 450 mm - 17,71 in. |

(\*) For more details, see the basic helm section on page 11 and choose the desired mounting configuration.

(\*\*) For the choice of the hydraulic hose, please see the relative scheme.



## System 19

| Components                              | Model                | Code           | Q.ty |
|---|----------------------|----------------|------|
| Cylinder                                | CTC200AU<br>CTC200A  | 15885<br>12696 | 1    |
| Helm pump                               | P30BAP               | 21174          | 1    |
|   | P30BA                | 16193          | 1    |
|   | P42BAP               | 21175          | 1    |
|   | P42BA                | 16194          | 1    |
| Fittings for single station             |                      | 12784          | 2    |
|   |                      | 13685          | 1    |
| Electro-hydraulic power unit            | CO500/6/0,75U 24 Vdc | 16134          | 1    |
|   | CO500/6/0,75 24 Vdc  | 12574          | 1    |
| Hydraulic oil                           | VG22                 | 21334          | 3    |
| In case of a second station please add: |                      |                |      |
| 2° station helm pump                    | P30BAP               | 21174          | 1    |
|   | P30BA                | 16193          | 1    |
|   | P42BAP               | 21175          | 1    |
|   | P42BA                | 16194          | 1    |
| Fittings kit for additional station     |                      | 23376          | 1    |
|   |                      | 23942          | 1    |
| Hydraulic oil                           | VG22                 | 21334          | 1    |

## System 20

| Components                              | Model                | Code           | Q.ty |
|---|----------------------|----------------|------|
| Cylinder                                | CTC230AU<br>CTC230A  | 15887<br>12699 | 1    |
| Helm pump                               | P30BAP               | 21174          | 1    |
|   | P30BA                | 16193          | 1    |
|   | P42BAP               | 21175          | 1    |
|   | P42BA                | 16194          | 1    |
| Fittings for single station             |                      | 12784          | 2    |
|   |                      | 13685          | 1    |
| Electro-hydraulic power unit            | CO500/6/0,75U 24 Vdc | 16134          | 1    |
|   | CO500/6/0,75 24 Vdc  | 12574          | 1    |
| Hydraulic oil                           | VG22                 | 21334          | 3    |
| In case of a second station please add: |                      |                |      |
| 2° station helm pump                    | P30BAP               | 21174          | 1    |
|   | P30BA                | 16193          | 1    |
|   | P42BAP               | 21175          | 1    |
|   | P42BA                | 16194          | 1    |
| Fittings kit for additional station     |                      | 23376          | 1    |
|   |                      | 23942          | 1    |
| Hydraulic oil                           | VG22                 | 21334          | 1    |

## Pump-cylinder combination

### Responsiveness










SLOW 

MEDIUM 

FAST 

■ Metrical fittings

■ Imperial fittings

|   |  | HELM PUMP  |  |  |
|---|--|--|--|--|
| <p>Choose combination between pump and cylinder according to the wished number of wheel turns lock-to-lock.</p> <p><b>Note:</b> the requested effort on the steering wheel is inversely proportional to the wheel turns number lock-to-lock:</p> <ul style="list-style-type: none"> <li>• less wheel turns, more effort</li> <li>• more wheel turns, less effort</li> </ul> |  | <br>(*)<br><b>P20BAP Cod. 21173</b><br>P20BA Cod. 16192   | <br>(*)<br><b>P30BAP Cod. 21174</b><br>P30BA Cod. 16193  | <br>(*)<br><b>P42BAP Cod. 21175</b><br>P42BA Cod. 16194 |
| CYLINDER  | <br><b>CTC200AU - Cod. / Part # 15885</b><br><b>CTC200A - Cod. / Part # 12696</b> | No. of wheel turns<br>Manual: <b>16,6</b> <br>Servo-control system: <b>4,3</b><br>Suggested min hose (**)<br>Tiller: 175 mm / 6.9 in.<br>Angle: 35° + 35°<br>Torque: 249,93 Kgm / 21643 lb.in.<br>Min. wheel diam: 350 mm - 13,77 in. | No. of wheel turns<br>Manual: <b>11,9</b> <br>Servo-control system: <b>3,1</b><br>Suggested min hose (**)<br>Tiller: 175 mm / 6.9 in.<br>Angle: 35° + 35°<br>Torque: 249,93 Kgm / 21643 lb.in.<br>Min. wheel diam: 450 mm - 17,71 in. |  |
|   | <br><b>CTC230AU - Cod. / Part # 15887</b><br><b>CTC230A - Cod. / Part # 12699</b> | No. of wheel turns<br>Manual: <b>7,6</b> <br>Servo-control system: <b>4,9</b><br>Suggested min hose (**)<br>Tiller: 200 mm / 7.8 in.<br>Angle: 35° + 35°<br>Torque: 284,92 Kgm / 24674 lb.in.<br>Min. wheel diam: 350 mm - 13,77 in.  | No. of wheel turns<br>Manual: <b>13,6</b> <br>Servo-control system: <b>3,5</b><br>Suggested min hose (**)<br>Tiller: 200 mm / 7.8 in.<br>Angle: 35° + 35°<br>Torque: 284,92 Kgm / 24674 lb.in.<br>Min. wheel diam: 450 mm - 17,71 in. |  |

(\*) For more details, see the basic helm section on page 11 and choose the desired mounting configuration.

(\*\*) For the choice of the hydraulic hose, please see the relative scheme.

## System 21

| Components                              | Model                | Code           | Q.ty |
|---|----------------------|----------------|------|
| Cylinder                                | CTC300AU             | 15889          | 1    |
|   | CTC300A              | 15715          |      |
| Helm pump                               | P42BAP               | 21175          | 1    |
|   | P42BA                | 16194          |      |
| Fittings for single station             |                      | 12784          | 2    |
|   |                      | 13685          | 1    |
| Electro-hydraulic power unit            | CO500/6/0,75U 24 Vdc | 16134          | 1    |
|   | CO500/6/0,75 24 Vdc  | 12574          |      |
| Hydraulic oil                           | VG22                 | 21334          | 3    |
| In case of a second station please add: |                      |                |      |
| 2° station helm pump                    | P42BAP<br>P42BA      | 21175<br>16194 | 1    |
| Fittings kit for additional station     |                      | 23944<br>23943 | 1    |
| Hydraulic oil                           | VG22                 | 21334          | 1    |

## System 22

| Components                              | Model                | Code           | Q.ty |
|---|----------------------|----------------|------|
| Cylinder                                | CTC400AU             | 16136          | 1    |
|   | CTC400A              | 12702          |      |
| Helm pump                               | P42BAP               | 21175          | 1    |
|   | P42BA                | 16194          |      |
| Fittings for single station             |                      | 12784          | 2    |
|   |                      | 13685          | 1    |
| Electro-hydraulic power unit            | CO500/6/0,75U 24 Vdc | 16134          | 1    |
|   | CO500/6/0,75 24 Vdc  | 12574          |      |
| Hydraulic oil                           | VG22                 | 21334          | 3    |
| In case of a second station please add: |                      |                |      |
| 2° station helm pump                    | P42BAP<br>P42BA      | 21175<br>16194 | 1    |
| Fittings kit for additional station     |                      | 23944<br>23943 | 1    |
| Hydraulic oil                           | VG22                 | 21334          | 1    |

## Pump-cylinder combination

### Responsiveness

SLOW 

MEDIUM 

FAST 

■ Metrical fittings

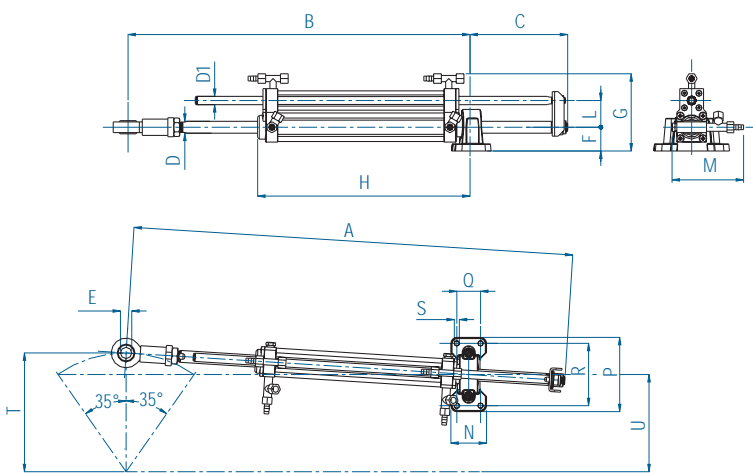
■ Imperial fittings

|   |   | HELM PUMP   |  |   |
|---|---|---|--|---|
| <p>Choose combination between pump and cylinder according to the wished number of wheel turns lock-to-lock.</p> <p><b>Note:</b> the requested effort on the steering wheel is inversely proportional to the wheel turns number lock-to-lock:</p> <ul style="list-style-type: none"> <li>• less wheel turns, more effort</li> <li>• more wheel turns, less effort</li> </ul> |   |    |  |  |
|   |   | (*)<br>P20BAP Cod. 21173<br>P20BA Cod. 16192  | (*)<br>P30BAP Cod. 21174<br>P30BA Cod. 16193   | (*)<br>P42BAP Cod. 21175<br>P42BA Cod. 16194  |
| CYLINDER  |  | <p>No. of wheel turns Manual: <b>17,8</b> </p> <p>Servo-control system: <b>4,6</b></p> <p>Suggested min hose (**)</p> <p>Tiller: 260 mm / 10,2 in.</p> <p>Angle: 35° + 35°</p> <p>Torque: 374,89 Kgm / 32465 lb.in.</p> <p>Min. wheel diam: 450 mm - 17,71 in.</p> |  |   |
|   | CTC300AU - Cod. / Part # 15889<br>CTC300A - Cod. / Part # 15715                     |   |  |   |
|   |  | <p>No. of wheel turns Manual: <b>24,0</b> </p> <p>Servo-control system: <b>6,1</b></p> <p>Suggested min hose (**)</p> <p>Tiller: 350mm / 13,7 in.</p> <p>Angle: 35° + 35°</p> <p>Torque: 499,85 Kgm / 43287 lb.in.</p> <p>Min. wheel diam: 450 mm - 17,71 in.</p>  |  |   |
|   | CTC400AU - Cod. / Part # 16136<br>CTC400A - Cod. / Part # 12702                     |   |  |   |

(\*) For more details, see the basic helm section on page 11 and choose the desired mounting configuration.

(\*\*) For the choice of the hydraulic hose, please see the relative scheme.

# Power-assisted inboard steering cylinders Series CTA\_A



### Main features

- Cylinder body in **anodized aluminum**
- Piston rod in stainless steel for a high corrosion resistance
- Adjustable base either horizontally or vertically
- Supplied with bleeders
- Meets **ABYC** standards

### Technical specifications

■ Metrical fittings

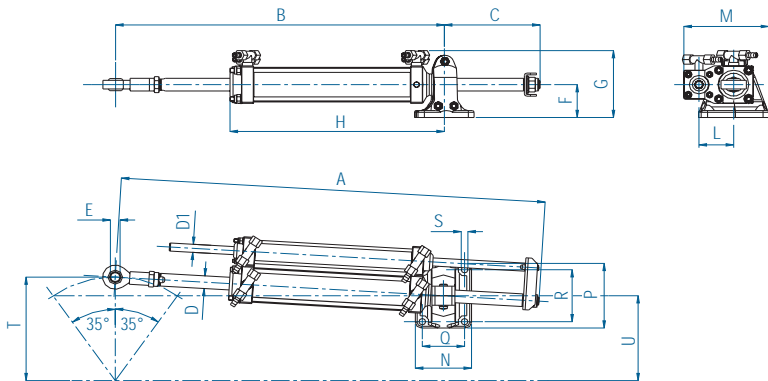
■ Imperial fittings

| Dimensions        |         |           |           |          |          |          |          |          |          |           |          |          |          |          |          |          |          |          |         |
|-------------------|---------|-----------|-----------|----------|----------|----------|----------|----------|----------|-----------|----------|----------|----------|----------|----------|----------|----------|----------|---------|
| Model             | Stroke  | A         | B         | C        | D        | D1       | E        | F        | G        | H         | L        | M        | N        | P        | Q        | R        | S        | T        | U       |
| CTA80AU<br>CTA80A | 228 mm  | 741 mm    | 578 mm    | 162 mm   | 20 mm    | 14 mm    | 19,05 mm | 40 mm    | 130 mm   | 360 mm    | 45 mm    | 120 mm   | 60 mm    | 125 mm   | 40 mm    | 105 mm   | 8,5 mm   | 200 mm   | 165 mm  |
|                   | 9,0 in. | 29,17 in. | 22,77 in. | 6,38 in. | 0,79 in. | 0,55 in. | 3/4 in.  | 1,57 in. | 5,11 in. | 13,17 in. | 1,77 in. | 4,72 in. | 2,36 in. | 4,92 in. | 1,57 in. | 4,13 in. | 0,33 in. | 7,87 in. | 6,5 in. |

| Technical specifications |       |        |             |                             |             |         |           |  |          |
|--------------------------|-------|--------|-------------|-----------------------------|-------------|---------|-----------|--|----------|
| Model                    | Code  | Stroke | Torque      | Thrust at 70 bar - 1000 psi | Volume      | Tiller  | Angle     | Thread                                     | Weight   |
| CTA80AU<br>CTA80A        | 12681 | 228 mm | 107.33 Kgm  | 659,4 Kgf                   | 214.78 cc   | 200 mm  | 35° + 35° | 1/4" NPTF - 3/8" O.D.<br>G1/4 - hose d. 10 | 5,5 Kg   |
|                          | 12680 | 9.0 in | 9297 lb.in. | 1453 lbf                    | 13.11 cu.in | 7,8 in. |           |  | 12,13 lb |

Note: the power-assisted inboard steering cylinders mod CTA\_A are not suitable for installations on racing boats.

# Power-assisted inboard steering cylinders Series CTB\_A



### Main features

- Cylinder body in **brass**
- Piston rod in stainless steel for a high corrosion resistance
- Adjustable base either horizontally or vertically
- Available in a range of volumes between 280 and 360 cc
- Supplied with bleeders
- Meets **ABYC** standards

### Technical specifications

■ Metrical fittings

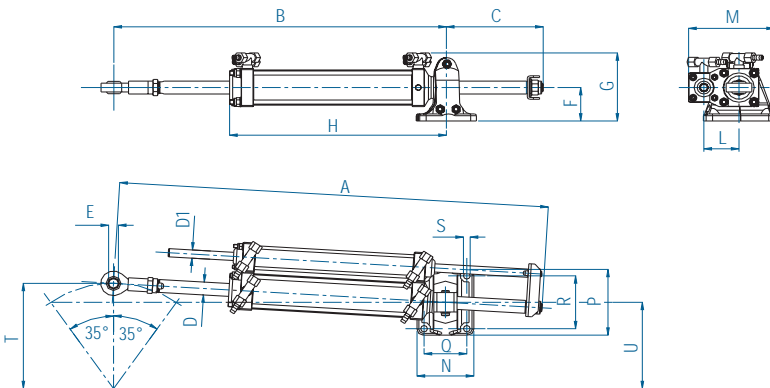
■ Imperial fittings

| Dimensions          |         |           |           |          |          |          |          |          |          |           |          |          |          |         |          |          |          |          |          |
|---------------------|---------|-----------|-----------|----------|----------|----------|----------|----------|----------|-----------|----------|----------|----------|---------|----------|----------|----------|----------|----------|
| Model               | Stroke  | A         | B         | C        | D        | D1       | E        | F        | G        | H         | L        | M        | N        | P       | Q        | R        | S        | T        | U        |
| CTB110AU<br>CTB110A | 178 mm  | 666 mm    | 521 mm    | 146 mm   | 22 mm    | 14 mm    | 19,05 mm | 57 mm    | 116 mm   | 329 mm    | 58 mm    | 140 mm   | 93 mm    | 112 mm  | 70 mm    | 90 mm    | 11 mm    | 153 mm   | 127 mm   |
|                     | 7.0 in. | 26,22 in. | 20,51 in. | 5.75 in. | 0.87 in. | 0.55 in. | 3/4 in.  | 2.24 in. | 4.56 in. | 12.95 in. | 2.28 in. | 5.51 in. | 3.66 in. | 4.4 in. | 2.75 in. | 3.54 in. | 0.43 in. | 6.0 in.  | 5.0 in.  |
| CTB130AU<br>CTB130A | 204 mm  | 703 mm    | 545 mm    | 159 mm   | 22 mm    | 14 mm    | 16 mm    | 57 mm    | 116 mm   | 355 mm    | 58 mm    | 140 mm   | 93 mm    | 112 mm  | 70 mm    | 90 mm    | 11 mm    | 180 mm   | 147 mm   |
|                     | 8.0 in. | 27,68 in. | 21.46 in. | 6,26 in. | 0.87 in. | 0.55 in. | 0,63 in. | 2.24 in. | 4.56 in. | 13.98 in. | 2.28 in. | 5.51 in. | 3.66 in. | 4.4 in. | 2.75 in. | 3.54 in. | 0.43 in. | 7.08 in. | 5,78 in. |
| CTB145AU<br>CTB145A | 228 mm  | 766 mm    | 596 mm    | 171 mm   | 22 mm    | 14 mm    | 19,05 mm | 57 mm    | 116 mm   | 379 mm    | 58 mm    | 140 mm   | 93 mm    | 112 mm  | 70 mm    | 90 mm    | 11 mm    | 200 mm   | 164 mm   |
|                     | 9.0 in. | 30,16 in. | 23.46 in. | 6.73 in. | 0.87 in. | 0.55 in. | 3/4 in.  | 2.24 in. | 4.56 in. | 14.92 in. | 2.28 in. | 5.51 in. | 3.66 in. | 4.4 in. | 2.75 in. | 3.54 in. | 0.43 in. | 7.87 in. | 6,5 in.  |

| Technical specifications |       |         |              |                             |             |          |         |   |          |
|--------------------------|-------|---------|--------------|-----------------------------|-------------|----------|---------|---|----------|
| Model                    | Code  | Stroke  | Torque       | Thrust at 70 bar - 1000 psi | Volume      | Tiller   | Angle   | Fittings                                  | Weight   |
| CTB110AU<br>CTB110A      | 12686 | 178 mm  | 140.85 Kgm   | 1108 Kgf                    | 281,77 cc   | 153 mm   | 35°+35° | 1/4"NPTF - 3/8" D.E.<br>G1/4 - hose d. 10 | 11,9 Kg  |
|                          | 12684 | 7.0 in. | 12197 lb.in. | 2442 lbf                    | 17.19 cu.in | 6.0 in.  |         |   | 26,2 lb  |
| CTB130AU<br>CTB130A      | 12690 | 204 mm  | 161,42 Kgm   | 1108 Kgf                    | 322,93 cc   | 180 mm   | 35°+35° | 1/4"NPTF - 3/8" D.E.<br>G1/4 - hose d. 10 | 12,3 Kg  |
|                          | 12688 | 8 in.   | 13978 lb.in. | 2442 lbf                    | 19,71 cu.in | 7.0 in.  |         |   | 27,2 lb  |
| CTB145AU<br>CTB145A      | 15883 | 228 mm  | 180.41 Kgm   | 1108 Kgf                    | 360,92 cc   | 200 mm   | 35°+35° | 1/4"NPTF - 3/8" D.E.<br>G1/4 - hose d. 10 | 13,1 Kg  |
|                          | 12693 | 9.0 in. | 15623 lb.in. | 2442 lbf                    | 22,0 cu.in  | 7.87 in. |         |   | 28,85 lb |

Note: the power-assisted inboard steering cylinders mod CTB\_A are not suitable for installations on racing boats.

# Power-assisted inboard steering cylinders Serie CTC\_A



### Main features

- Cylinder body in **stainless steel** and **brass** painted
- Piston rod in stainless steel for a high corrosion resistance
- Adjustable base either horizontally or vertically
- Available in a range of volumes between 500 and 1000 cc
- Supplied with bleeders
- Meets **ABYC** standards

### Technical specifications

■ Metrical fittings

■ Imperial fittings

| Dimensions          |        |      |     |     |    |    |    |    |       |     |    |     |     |     |    |     |    |     |     |
|---------------------|--------|------|-----|-----|----|----|----|----|-------|-----|----|-----|-----|-----|----|-----|----|-----|-----|
| Model               | Stroke | A    | B   | C   | D  | D1 | E  | F  | G     | H   | L  | M   | N   | P   | Q  | R   | S  | T   | U   |
| CTC200AU<br>CTC200A | 200    | 767  | 607 | 161 | 28 | 14 | 25 | 55 | 132,5 | 385 | 65 | 162 | 100 | 140 | 72 | 112 | 11 | 175 | 143 |
|                     | mm     | mm   | mm  | mm  | mm | mm | mm | mm | mm    | mm  | mm | mm  | mm  | mm  | mm | mm  | mm | mm  | mm  |
| CTC230AU<br>CTC230A | 228    | 823  | 649 | 175 | 28 | 14 | 25 | 55 | 132,5 | 413 | 65 | 162 | 100 | 140 | 72 | 112 | 11 | 200 | 164 |
|                     | mm     | mm   | mm  | mm  | mm | mm | mm | mm | mm    | mm  | mm | mm  | mm  | mm  | mm | mm  | mm | mm  | mm  |
| CTC300AU<br>CTC300A | 300    | 967  | 757 | 211 | 28 | 14 | 25 | 55 | 132,5 | 485 | 65 | 162 | 100 | 140 | 72 | 112 | 11 | 260 | 215 |
|                     | mm     | mm   | mm  | mm  | mm | mm | mm | mm | mm    | mm  | mm | mm  | mm  | mm  | mm | mm  | mm | mm  | mm  |
| CTC400AU<br>CTC400A | 400    | 1167 | 907 | 261 | 28 | 14 | 25 | 55 | 132,5 | 585 | 65 | 162 | 100 | 140 | 72 | 112 | 11 | 350 | 286 |
|                     | mm     | mm   | mm  | mm  | mm | mm | mm | mm | mm    | mm  | mm | mm  | mm  | mm  | mm | mm  | mm | mm  | mm  |

| Technical specifications |       |           |              |                             |              |          |         |  |  |          |
|--------------------------|-------|-----------|--------------|-----------------------------|--------------|----------|---------|--|--|----------|
| Model                    | Code  | Stroke    | Torque       | Thrust at 70 bar - 1000 psi | Volume       | Tiller   | Angle   | Fittings   |  | Weight   |
| CTC200AU<br>CTC200A      | 15885 | 200 mm    | 249,93 Kgm   | 1750 Kgf                    | 500,0 cc     | 175 mm   | 35°+35° | 1/4"NPTF - 3/8" D.E. for servo-control cylinder<br>1/4"NPTF - 1/2" D.E. for main cylinder<br>G1/4 - hose d. 10 e T - G1/2 - hose d. 10 |  | 16,8 Kg  |
|                          | 12696 | 7,87 in.  | 21643 lb.in. | 3857 lbf                    | 30.5 cu.in.  | 6.9 in.  |         |  |  | 37,1 lb  |
| CTC230AU<br>CTC230A      | 15887 | 228 mm    | 284,92 Kgm   | 1750 Kgf                    | 570,0 cc     | 200 mm   | 35°+35° | 1/4"NPTF - 3/8" D.E. for servo-control cylinder<br>1/4"NPTF - 1/2" D.E. for main cylinder<br>G1/4 - hose d. 10 e T - G1/2 - hose d. 10 |  | 19,2 Kg  |
|                          | 12699 | 9.0 in.   | 24674 lb.in. | 3857 lbf                    | 34,78 cu.in. | 7.87 in. |         |  |  | 42,3 lb  |
| CTC300AU<br>CTC300A      | 15889 | 300 mm    | 374.89 Kgm   | 1750 Kgf                    | 750,0 cc     | 260 mm   | 35°+35° | 1/4"NPTF - 3/8" D.E. for servo-control cylinder<br>1/4"NPTF - 1/2" D.E. for main cylinder<br>G1/4 - hose d. 10 e T - G1/2 - hose d. 10 |  | 21,8 Kg  |
|                          | 15715 | 11.81 in. | 32465 lb.in. | 3857 lbf                    | 45.77 cu.in. | 10.2 in. |         |  |  | 48,1 lb. |
| CTC400AU<br>CTC400A      | 16136 | 400 mm    | 499.85 Kgm   | 1750 Kgf                    | 1000,0 cc    | 350 mm   | 35°+35° | 1/4"NPTF - 3/8" D.E. for servo-control cylinder<br>1/4"NPTF - 1/2" D.E. for main cylinder<br>G1/4 - hose d. 10 e T - G1/2 - hose d. 10 |  | 26,8 Kg  |
|                          | 12702 | 15.75 in. | 43287 lb.in. | 3857 lbf                    | 61,02 cu.in. | 13.7 in. |         |  |  | 59 lb    |

Note: the power-assisted inboard steering cylinders mod CTC\_A are not suitable for installations on racing boats.

## POWER-ASSISTED ELECTRO-HYDRAULIC POWER UNITS

The BCS power-assisted electro-hydraulic power unit ensures the best performance of the steering system: it guarantees all the power necessary to the steering system and is **completely independent from the boat's main engines**.

### Composition.

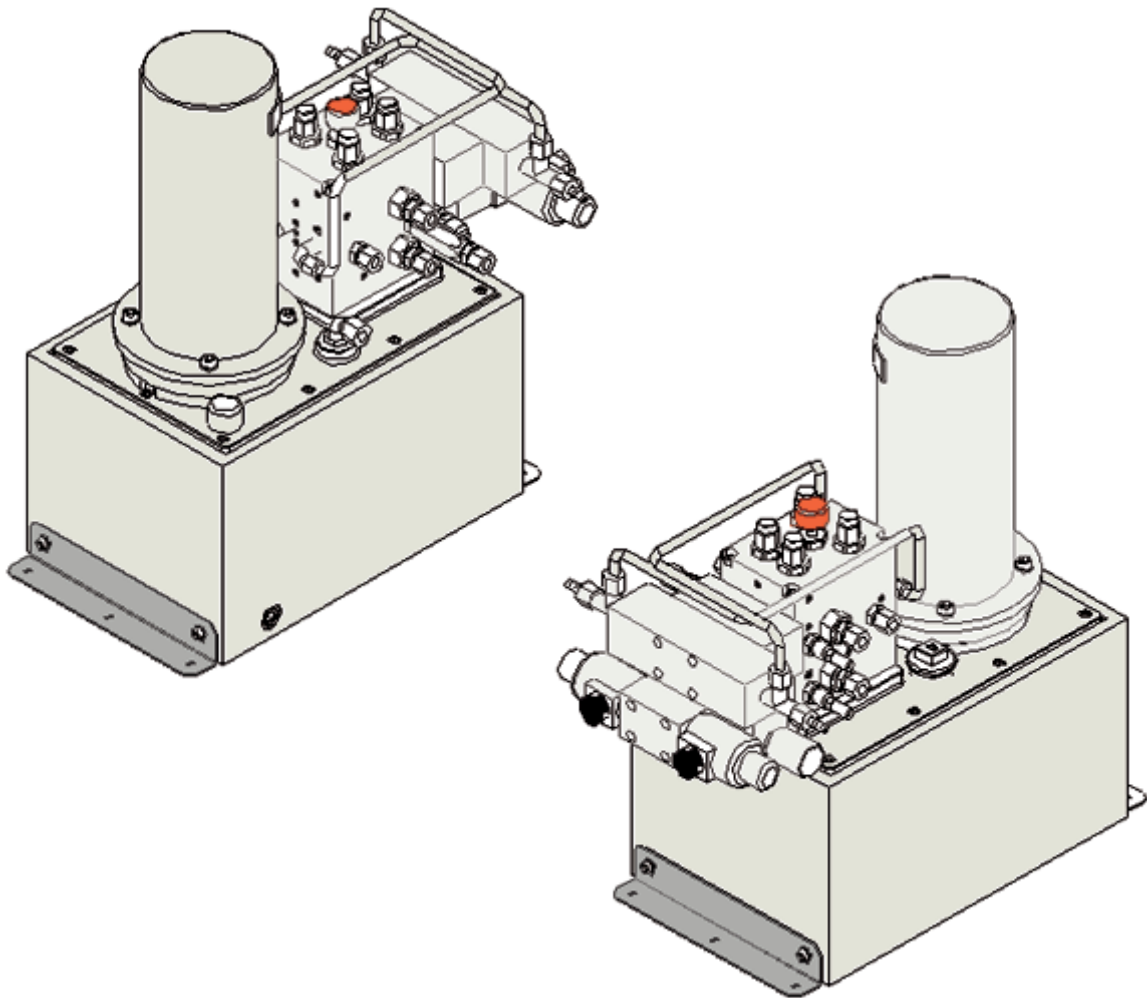
Extremely compact, it is composed of:

- a hard plastic tank, allowing the oil level to be easily checked;
- an electric motor;
- a hydraulic pump;
- a filter group;
- all necessary valves for both the steering operation and safety (non return valves, relief valves, servo-control groups, pressure adjusters, etc.).

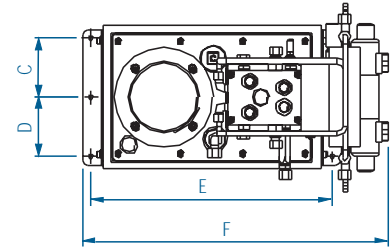
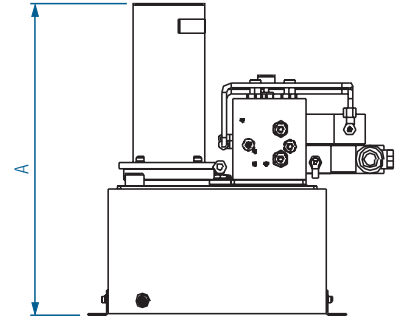
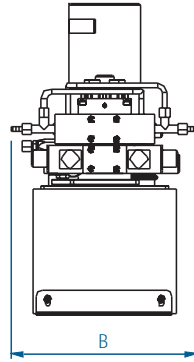
This power unit is provided with:

- an **interface for the auto-pilot**;
- a special device for automatic filling of the system makes the bleeding procedure easy and fast (more details at page 55 "Auto-pilot power units with automatic filling");
- a speed adjuster, which can be adapted to any auto-pilot manufacturer's requirements.

The servo-control power unit can be excluded from the steering system at any time by pressing the red button mounted on the unit top. This immediately converts the system into a manual steering system (please, also see the steering working principle on page 61).



# Power-assisted electro-hydraulic power unit Mod. C0500



## Technical specifications

■ Metrical fittings

■ Imperial fittings

| Dimensions                    |          |           |          |          |           |           |
|-------------------------------|----------|-----------|----------|----------|-----------|-----------|
| Model                         | A        | B         | C        | D        | E         | F         |
| CO500/3/0,5U<br>CO500/3/0,5   | 510 mm   | 300 mm    | 95 mm    | 95 mm    | 387 mm    | 505 mm    |
|                               | 20 in.   | 11,81 in. | 3,74 in. | 3,74 in. | 15,24 in. | 19,88 in. |
| CO500/4/0,75U<br>CO500/4/0,75 | 510 mm   | 300 mm    | 95 mm    | 95 mm    | 387 mm    | 505 mm    |
|                               | 20 in.   | 11,81 in. | 3,74 in. | 3,74 in. | 15,24 in. | 19,88 in. |
| CO500/6/0,75U<br>CO500/6/0,75 | 540 mm   | 300 mm    | 95 mm    | 95 mm    | 387 mm    | 505 mm    |
|                               | 21,2 in. | 11,81 in. | 3,74 in. | 3,74 in. | 15,24 in. | 19,88 in. |

| Applications and technical specifications |                |                      |                                  |                          |                  |                 |                    |                     |                  |                 |
|---|----------------|----------------------|----------------------------------|--------------------------|------------------|-----------------|--------------------|---------------------|------------------|-----------------|
| Model                                     | Code           | Cylinder application | Delivery in servo-control system | Delivery with auto-pilot | Setting pressure | Max power cons. | Thermal protection | Motor nominal power | Tank capacity    | Weight*         |
| CO500/3/0,5U 12V<br>CO500/3/0,5 12V       | 16132<br>12571 | CTA80AU              | 3300 cc/min                      | 675 cc/min               | 70 bar           | 43 A            | 50 A               | 600 W               | 12 lt            | 40 Kg           |
|   |                | CTA80A               |                                  |                          |                  |                 |                    |                     |                  |                 |
| CO500/3/0,5U 24V<br>CO500/3/0,5 24V       | 12572<br>15654 | CTB110AU             | 201,5 cu.in./min                 | 41,2 cu.in./min          | 1015 psi         | 23 A            | 25 A               | 500 W               | 732 cu.in        | 88 lb           |
|   |                | CTB110A              |                                  |                          |                  |                 |                    |                     |                  |                 |
| CO500/4/0,75U 24V<br>CO500/4/0,75 24V     | 16133<br>12573 | CTB145AU             | 3900 cc/min                      | 855 cc/min               | 70 bar           | 27 A            | 32 A               | 500 W               | 12 lt            | 40 Kg           |
|   |                | CTB145A              | 238,0 cu.in./min                 | 52,2 cu.in./min          | 1015 psi         |                 |                    |                     | 732 cu.in        | 88 lb           |
| CO500/6/0,75U 24V<br>CO500/6/0,75 24V     | 16134<br>12574 | CTC200AU             | 6450 cc/min                      | 1260 cc/min              | 70 bar           | 41 A            | 40 A               | 800 W               | 12 lt            | 40 Kg           |
|   |                | CTC200A              |                                  |                          |                  |                 |                    |                     | 394,0 cu.in./min | 77,0 cu.in./min |
|   |                | CTC230AU             |                                  |                          |                  |                 |                    |                     |                  |                 |
|   |                | CTC230A              |                                  |                          |                  |                 |                    |                     |                  |                 |
|   |                | CTC3000AU            |                                  |                          |                  |                 |                    |                     |                  |                 |
|   |                | CTC300A              |                                  |                          |                  |                 |                    |                     |                  |                 |
|   |                | CTC400AU             |                                  |                          |                  |                 |                    |                     |                  |                 |
|   |                | CTC400A              |                                  |                          |                  |                 |                    |                     |                  |                 |

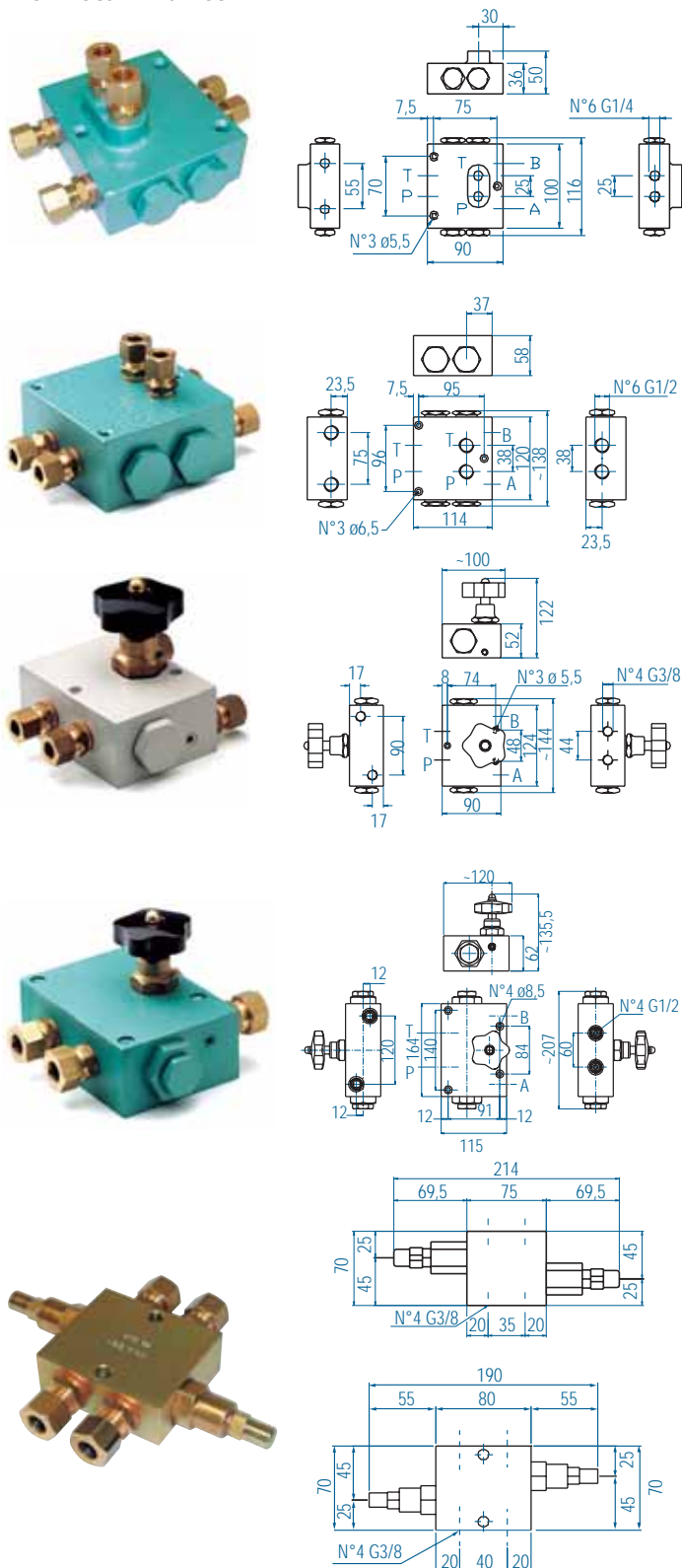
(\* Weight is intended without oil.

# STEERING ACCESSORIES

Helm pumps and steering cylinders can be combined with several accessories to complete the system and maintain safety and control. It is possible to choose among many types of relief valves, non return and by-pass valves, rudder angle indicator kits and fittings or hose kits for different configurations.

Each of the following section contains a selection of items which are most in demand. For any additional information or suggestion for a specific application, please contact the Twin Disc Technical Department.

### Non return valves



|  |       |
|--|-------|
| Double non return valve mod. MT50 with fittings d. 10                            | 15706 |
| Double non return valve mod. MT50 with fittings d. 12                            | 17119 |
| Double non return valve - threads G1/4" without fittings                         | 15378 |
| Double non return valve mod. MT100 - fittings d. 12                              | 15708 |
| Double non return valve mod. MT100 - fittings d. 1/2"                            | 23504 |
| Double non return valve mod. MT100 - "palpella" fittings d.14                    | 15771 |
| Double non return valve mod. MT100 - "palpella" fittings d.14 and fittings d. 12 | 23513 |
| Double non return valve mod. MT100 - fittings d.14                               | 17673 |
| Double non return valve mod. MT100 - threads G3/8" without fittings              | 15380 |
| Double non return valve mod. MT100 - threads G1/2" without fittings              | 31096 |
| By-pass non return valve mod. MT100 with fittings d. 10                          | 17120 |
| By-pass non return valve mod. MT100 with fittings d. 12                          | 15707 |
| By-pass non return valve mod. MT100 with fittings d. 14                          | 17672 |
| By-pass non return valve mod. MT100 - "palpella" fittings d.14                   | 15770 |
| By-pass non return valve mod. MT100 - threads G3/8" without fittings             | 15370 |
| By-pass non return valve mod. MT320 - "palpella" fittings d.14                   | 17280 |
| By-pass non return valve mod. MT320 with fittings d. 18                          | 15709 |
| By-pass non return valve mod. MT320 - threads G1/2" without fittings             | 15372 |
| Cross relief valve with G 3/8" threads - fittings d. 12                          | 17042 |
| Cross relief valve with G 1/2" threads - fittings d. 14                          | 23021 |
| Cross relief valve with G 1/2" threads - fittings d. 18                          | 15659 |
| Cross relief valve with d.12 threads - male fittings G1/2"                       | 23500 |
| Cross relief valve with d.14 threads - male fittings G1/2"                       | 23501 |
| Cross relief valve with d.18 threads - male fittings G1/2"                       | 23503 |
| Cross relief valve G1/2" threads without fittings                                | 31075 |
| Cross relief valve G3/8" threads without fittings                                | 31079 |



## Rudder angle indicator set

BCS steering range contains a kit of rudder angle indicators and transmitters: a simple and precise system that allows to control the exact position of the rudder and provides higher level of safety.

This set includes: rudder angle indicators which has a range from 0° to + 40°, as well as a kit of angle transmitters, which comprises lever mechanism, a ball joint together with a rod to connect to the tiller.



Single-station rudder angle indicator kit  
cod. 13608

Double-station rudder angle indicator kit  
cod. 13609

## Steering hydraulic oil

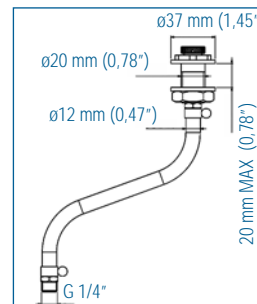


Steering hydraulic oil type ISO VG 22 – 1 litre bottle cod. 21334

## Filling kit helm pump

In all those cases where the helm pump mounting configuration does not allow easy access to the filling cap, which is placed on the helm top, (i.e. rear mounting or tilt mounting) a filling kit should be purchased. This kit is directly screwed on the helm cap in order to move the filling point to a new one which is accessed more easily by means of a hose prolongation.

MK100 cod. 18599






## Electric by-pass for auto-pilot power units



Note: the choice of the electric by-pass depends on cylinder volume and power unit displacement, as shown on table at page 58.

|  |       |
|--|-------|
| Electric by-pass 12Vdc for auto-pilot power units mod. CO2-CO2/3-CO3 - fittings for d. 10 hose   | 12140 |
| Electric by-pass 24Vdc for auto-pilot power units mod. CO2-CO2/3-CO3 - fittings for d. 10 hose   | 12141 |
| Electric by-pass 12Vdc for auto-pilot power units mod. CO4 - fittings for d. 10 hose             | 15713 |
| Electric by-pass 24Vdc for auto-pilot power units mod. CO4 - fittings for d. 10 hose             | 15714 |
| Electric by-pass 12Vdc for auto-pilot power units mod. CO2-CO2/3-CO3 - fittings for d. 3/8" hose | 21330 |
| Electric by-pass 24Vdc for auto-pilot power units mod. CO2-CO2/3-CO3 - fittings for d. 3/8" hose | 21331 |
| Electric by-pass 12Vdc for auto-pilot power units mod. CO4 - fittings for d. 1/2" hose           | 21332 |
| Electric by-pass 24Vdc for auto-pilot power units mod. CO4 - fittings for d. 1/2" hose           | 21333 |

## Steering flexible hose

|   |  |               |
|---|--|---------------|
|  | Flexible hose type SAE100 R7 3/8" I.D. for d. 1/2"<br>Reusable fittings - for meter  | cod.<br>14349 |
|  | Flexible hose type SAE100 R7 5/16" I.D. for d. 3/8"<br>Reusable fittings - for meter | cod.<br>14351 |
|  | D. 3/8" PARFLEX flexible hose (O.D. 0,075")<br>Type parker NBR-06-075 - for meter    | cod.<br>11543 |

Note: this type of flexible hose is suggested for combination with 20 cc and 30 cc helm pumps if the total length between pump and cylinder does not exceed 5 mt - 15'.

## Kit of d. 5/16" Hoses with inch crimped fittings

| Description   | Model      | Code  |
|---|------------|-------|
| Kit of d. 5/16" hoses with female compression fittings L = 0,5 mt PARKER crimped hose | SH - 0105  | 20260 |
| Kit of d. 5/16" hoses with female compression fittings L = 1 mt PARKER crimped hose   | SH - 0110  | 20261 |
| Kit of d. 5/16" hoses with female compression fittings L = 1,5 mt PARKER crimped hose | SH - 0115  | 20262 |
| Kit of d. 5/16" hoses with female compression fittings L = 2 mt PARKER crimped hose   | SH - 0120  | 20263 |
| Kit of d. 5/16" hoses with female compression fittings L = 2,5 mt PARKER crimped hose | SH - 0125  | 20264 |
| Kit of d. 5/16" hoses with female compression fittings L = 3 mt PARKER crimped hose   | SH - 0130  | 20265 |
| Kit of d. 5/16" hoses with female compression fittings L = 3,5 mt PARKER crimped hose | SH - 0135  | 20266 |
| Kit of d. 5/16" hoses with female compression fittings L = 4 mt PARKER crimped hose   | SH - 0140  | 20267 |
| Kit of d. 5/16" hoses with female compression fittings L = 4,5 mt PARKER crimped hose | SH - 0145  | 20268 |
| Kit of d. 5/16" hoses with female compression fittings L = 5 mt PARKER crimped hose   | SH - 0150  | 20269 |
| Kit of d. 5/16" hoses with female compression fittings L = 5,5 mt PARKER crimped hose | SH - 0155  | 20270 |
| Kit of d. 5/16" hoses with female compression fittings L = 6 mt PARKER crimped hose   | SH - 0160  | 20271 |
| Kit of d. 5/16" hoses with female compression fittings L = 6,5 mt PARKER crimped hose | SH - 0165  | 20272 |
| Kit of d. 5/16" hoses with female compression fittings L = 7 mt PARKER crimped hose   | SH - 0170  | 20273 |
| Kit of d. 5/16" hoses with female compression fittings L = 7,5 mt PARKER crimped hose | SH - 0175  | 20274 |
| Kit of d. 5/16" hoses with female compression fittings L = 8 mt PARKER crimped hose   | SH - 0180  | 20275 |
| Kit of d. 5/16" hoses with female compression fittings L = 8,5 mt PARKER crimped hose | SH - 0185  | 20276 |
| Kit of d. 5/16" hoses with female compression fittings L = 9 mt PARKER crimped hose   | SH - 0190  | 20277 |
| Kit of d. 5/16" hoses with female compression fittings L = 10 mt PARKER crimped hose  | SH - 01100 | 20278 |
| Kit of d. 5/16" hoses with female compression fittings L = 11 mt PARKER crimped hose  | SH - 01110 | 20279 |
| Kit of d. 5/16" hoses with female compression fittings L = 12 mt PARKER crimped hose  | SH - 01120 | 20280 |
| Kit of d. 5/16" hoses with female compression fittings L = 13 mt PARKER crimped hose  | SH - 01130 | 20281 |
| Kit of d. 5/16" hoses with female compression fittings L = 14 mt PARKER crimped hose  | SH - 01140 | 20282 |
| Kit of d. 5/16" hoses with female compression fittings L = 15 mt PARKER crimped hose  | SH - 01150 | 20283 |
| Kit of d. 5/16" hoses with female compression fittings L = 16 mt PARKER crimped hose  | SH - 01160 | 20284 |
| Kit of d. 5/16" hoses with female compression fittings L = 17 mt PARKER crimped hose  | SH - 01170 | 20285 |
| Kit of d. 5/16" hoses with female compression fittings L = 18 mt PARKER crimped hose  | SH - 01180 | 20286 |
| Kit of d. 5/16" hoses with female compression fittings L = 19 mt PARKER crimped hose  | SH - 01190 | 20287 |
| Kit of d. 5/16" hoses with female compression fittings L = 20 mt PARKER crimped hose  | SH - 01200 | 20288 |

## Kit of d. 5/16" hoses with inch reusable fittings

| Description           |            |                                      | Model    | Code  |
|-----------------------|------------|--------------------------------------|----------|-------|
| Kit of d. 5/16" hoses | L = 0,5 mt | with 3/8" straight reusable fittings | SH-0505  | 23098 |
| Kit of d. 5/16" hoses | L = 1 mt   | with 3/8" straight reusable fittings | SH-0510  | 23099 |
| Kit of d. 5/16" hoses | L = 1,5 mt | with 3/8" straight reusable fittings | SH-0515  | 23100 |
| Kit of d. 5/16" hoses | L = 2 mt   | with 3/8" straight reusable fittings | SH-0520  | 23101 |
| Kit of d. 5/16" hoses | L = 2,5 mt | with 3/8" straight reusable fittings | SH-0525  | 23102 |
| Kit of d. 5/16" hoses | L = 3 mt   | with 3/8" straight reusable fittings | SH-0530  | 23103 |
| Kit of d. 5/16" hoses | L = 3,5 mt | with 3/8" straight reusable fittings | SH-0535  | 23104 |
| Kit of d. 5/16" hoses | L = 4 mt   | with 3/8" straight reusable fittings | SH-0540  | 23105 |
| Kit of d. 5/16" hoses | L = 4,5 mt | with 3/8" straight reusable fittings | SH-0545  | 23106 |
| Kit of d. 5/16" hoses | L = 5 mt   | with 3/8" straight reusable fittings | SH-0550  | 23107 |
| Kit of d. 5/16" hoses | L = 5,5 mt | with 3/8" straight reusable fittings | SH-0555  | 23108 |
| Kit of d. 5/16" hoses | L = 6 mt   | with 3/8" straight reusable fittings | SH-0560  | 23109 |
| Kit of d. 5/16" hoses | L = 6,5 m  | with 3/8" straight reusable fittings | SH-0565  | 23110 |
| Kit of d. 5/16" hoses | L = 7 mt   | with 3/8" straight reusable fittings | SH-0570  | 23111 |
| Kit of d. 5/16" hoses | L = 7,5 mt | with 3/8" straight reusable fittings | SH-0575  | 23112 |
| Kit of d. 5/16" hoses | L = 8 mt   | with 3/8" straight reusable fittings | SH-0580  | 23113 |
| Kit of d. 5/16" hoses | L = 8,5 mt | with 3/8" straight reusable fittings | SH-0585  | 23114 |
| Kit of d. 5/16" hoses | L = 9 mt   | with 3/8" straight reusable fittings | SH-0590  | 23115 |
| Kit of d. 5/16" hoses | L = 10 mt  | with 3/8" straight reusable fittings | SH-05100 | 23381 |
| Kit of d. 5/16" hoses | L = 11 mt  | with 3/8" straight reusable fittings | SH-05110 | 23382 |
| Kit of d. 5/16" hoses | L = 12 mt  | with 3/8" straight reusable fittings | SH-05120 | 23383 |
| Kit of d. 5/16" hoses | L = 13 mt  | with 3/8" straight reusable fittings | SH-05130 | 23384 |
| Kit of d. 5/16" hoses | L = 14 mt  | with 3/8" straight reusable fittings | SH-05140 | 23385 |
| Kit of d. 5/16" hoses | L = 15 mt  | with 3/8" straight reusable fittings | SH-05150 | 23386 |
| Kit of d. 5/16" hoses | L = 16 mt  | with 3/8" straight reusable fittings | SH-05160 | 23387 |
| Kit of d. 5/16" hoses | L = 17 mt  | with 3/8" straight reusable fittings | SH-05170 | 23388 |
| Kit of d. 5/16" hoses | L = 18 mt  | with 3/8" straight reusable fittings | SH-05180 | 23389 |
| Kit of d. 5/16" hoses | L = 19 mt  | with 3/8" straight reusable fittings | SH-05190 | 23390 |
| Kit of d. 5/16" hoses | L = 20 mt  | with 3/8" straight reusable fittings | SH-05200 | 23391 |

## Flexible hoses for heavy duty steering cylinders

|  |            |             |       |
|--|------------|-------------|-------|
| Flexible hose SAE100 R1 1/2" with d.12 fitting - G 1/2" female compression fitting   | L = 0,6 mt | single hose | 11374 |
| Flexible hose SAE100 R1 1/2" with d.12 fitting - G 1/2" female compression fitting   | L = 1 mt   | single hose | 20954 |
| Flexible hose SAE100 R1 1/2" with d.12 fitting - G 1/2" female compression fitting   | L = 1,5 mt | single hose | 22157 |
| Flexible hose SAE100 R1 1/2" with d.14 fitting - G 1/2" female compression fitting   | L = 0,6 mt | single hose | 11371 |
| Flexible hose SAE100 R1 1/2" - 1/2" male fitting - G 1/2" female compression fitting | L = 1 mt   | single hose | 23404 |
| Flexible hose SAE100 R1 1/2" - 1/2" male fitting - G 1/2" female compression fitting | L = 1,5 mt | single hose | 23405 |
| Flexible hose SAE100 R1 3/8" - 3/8" male fitting - G 3/8" female compression fitting | L = 0,6 mt | single hose | 23406 |
| Flexible hose SAE100 R1 3/8" - 3/8" male fitting - G 3/8" female compression fitting | L = 1 mt   | single hose | 23407 |
| Flexible hose SAE100 R1 3/8" - 3/8" male fitting - G 3/8" female compression fitting | L = 1,5 mt | single hose | 23408 |

## Fitting kit for outboard and inboard steerings

|  |       |
|--|-------|
| Fitting kit for double station pump BAP installations - fittings d. 3/8"         | 23376 |
| Fitting kit for double station pump BAP installations - fittings 1/2"            | 23418 |
| Fitting kit for single station pump BAP installations - fittings d. 3/8"         | 23377 |
| Fitting kit for single station pump BAP installations - fittings d. 1/2"         | 23373 |
| Fitting kit for double station pump BA - fittings d. 10                          | 23487 |
| Fitting kit for double station pump BA - fittings d. 12                          | 23488 |
| Fitting kit for single station pump BA with power unit - fittings d. 10          | 23489 |
| Fitting kit for single station pump BA with power unit - fittings d. 12          | 23490 |
| Fitting kit and bolts for pump installation - elbow fitting 1/4 NPTF - hose 3/8" | 17981 |


## Ball-cock with lever

|   |       |
|---|-------|
| Ball-cock with lever - 1/2" female - 1/2" female fittings | 14524 |
| Ball-cock with lever - 1/4" female - 1/4" female fittings | 14526 |
| Ball-cock with lever - 3/8" female - 3/8" female fittings | 14529 |

## Fitting kit for heavy duty steerings

|   |       |
|---|-------|
| Fitting kit for double station P63 heavy duty pump installations - d.12 fittings                  | 23492 |
| Fitting kit for double station P63 and P89 heavy duty pump installations - d. 14 fittings         | 23493 |
| Fitting kit for double station P63 and P89 heavy duty pump installations - d. 18 fittings         | 23452 |
| Fitting kit for double station P105, P151 and P191 heavy duty pump installations - d. 18 fittings | 23518 |

## By-pass

|   |  |        |
|---|--|--------|
|  | Manual by-pass with 1/4" cocks and fittings for d. 3/8" hose | 23186  |
|   | Manual by-pass with 1/4" cocks and fittings for d. 10 hose   | 12216  |
|   | Manual by-pass with 3/8" cocks and fittings for d. 12 hose   | 16968  |
|   | Manual by-pass with 3/8" cocks and fittings for d. 1/2" hose | 23480  |
|   | Manual by-pass with 1/2" cocks and fittings for d. 14 hose   | 23036  |
|   | Manual by-pass with 1/2" cocks and fittings for d. 18 hose   | 23037  |
|   | High pressure by-pass with cocks of 1/2"                     | 12132* |
|   | Manual high pressure by-pass with cocks of 1/2" type B       | 12134  |

(\*) Available in different configurations. For more details please contact Twin Disc Technical Department.

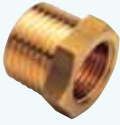




## Fitting kit for steering systems with auto-pilot power unit and automatic filling

|   |       |
|---|-------|
| Fitting kit for pump P63 and P89 single station and auto-pilot with automatic filling - hose d. 14          | 23511 |
| Fitting kit for pump P63 single station and auto-pilot with automatic filling - hose d. 1/2"                | 23512 |
| Fitting kit for pump P63 single station and auto-pilot with automatic filling - hose d. 12                  | 23510 |
| Fitting kit for pump P63 single station and auto-pilot - power unit CO4NR - hose d. 12                      | 23514 |
| Fitting kit for pump P63 single station and auto-pilot - power unit CO4NRU - hose d. 1/2"                   | 23516 |
| Fitting kit for pump P63 and P69 single station and auto-pilot - power unit CO4NR - hose d. 14              | 23515 |
| Fitting kit for pump P63 and P69 single station and auto-pilot - power units CO7, CO16 - hose d. 18         | 23517 |
| Fitting kit for pump P63 and P69 single station and auto-pilot - hose d. 14                                 | 23507 |
| Fitting kit for pump P63 and P69 single station and auto-pilot - hose d. 18                                 | 23509 |
| Fitting kit for pump P63 single station and auto-pilot - hose d. 1/2"                                       | 23508 |
| Fitting kit for pump P63 single station and auto-pilot - hose d. 12   | 23506 |
| Fitting kit for pump P105, P151, P191 single station and auto-pilot - hose d. 18                            | 23520 |
| Fitting kit for pump timoneria asservita doppio comando 1/4" NPTF hose d. 1/2" and filling hose d. 3/8"     | 23944 |
| Fitting kit for pump power assisted steering system double station G 1/4" - hose d. 10                      | 23942 |
| Fitting kit for pump power assisted steering system double station G 1/4" hose d. 12 and filling hose d. 10 | 23943 |
| Fitting kit for pump single station G 1/4" - hose d. 10   | 13685 |



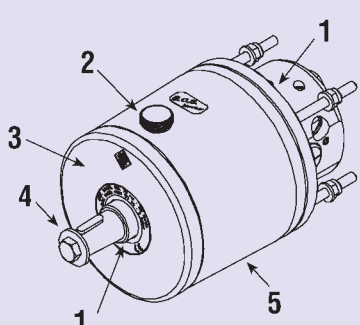
## Fittings

|   | Description  | Code for zinc plated | Code for brass | Code for chromium plated |
|---|--|----------------------|----------------|--------------------------|
|    | Seal kit and fittings for CTA cylinder bleeder                   |                      |                | 23048                    |
|   | Seal kit and fittings for CTB cylinder bleeder                   |                      |                | 23049                    |
|   | Seal kit and fittings for CTC cylinder bleeder                   |                      |                | 23050                    |
|   | Seal kit and fittings for power-assisted CTA_A cylinder bleeder  |                      |                | 23051                    |
|   | Seal kit and fittings for power-assisted CTB_A cylinder bleeder  |                      |                | 23052                    |
|   | Seal kit and fittings for power-assisted CTC_A cylinder bleeder  |                      |                | 23053                    |
|   | Seal kit and fittings for CTAU and OB108-133 cylinder bleeder    |                      |                | 23054                    |
|   | Seal kit and fittings for CTBU cylinder bleeder                  |                      |                | 23055                    |
|   | Seal kit and fittings for CTCU cylinder bleeder                  |                      |                | 23056                    |
|   | Seal kit and fittings for power-assisted CTA_AU cylinder bleeder |                      |                | 23057                    |
|   | Seal kit and fittings for power-assisted CTB_AU cylinder bleeder |                      |                | 23058                    |
|   | Seal kit and fittings for power-assisted CTC_AU cylinder bleeder |                      |                | 23059                    |
|  | Straight connection fitting G1/2" - G1/2"                        |                      | 21199          |                          |
|   | Straight connection fitting G3/8" - G3/8"                        |                      | 21198          |                          |
|   | Straight connection fitting d. 10 hose - d. 10 hose              |                      |                | 17038                    |
|   | Straight connection fitting d. 12 hose - d. 12 hose              |                      |                | 12877                    |
|   | Straight connection fitting d. 14 hose - d. 14 hose              | 12879                |                |                          |
|   | Straight connection fitting d. 16 hose - d. 16 hose              | 12880                |                |                          |
|   | Straight connection fitting d. 18 hose - d. 18 hose              | 12881                |                |                          |
|  | Straight fitting G 3/8" - d. 10 hose                             | 12800                | 14358          |                          |
|   | Straight fitting G 3/8" - d. 12 hose                             | 12801                | 14359          | 12791                    |
|   | Straight fitting G 3/8" - d. 14 hose                             | 12802                | 14360          |                          |
|   | Straight fitting G 3/8" - d. 18 hose                             |                      | 14361          |                          |
|   | Straight fitting G 3/8" - d. 1/2" hose                           |                      | 12809          |                          |
|   | Straight fitting G 1/2" - d. 14 hose                             | 12793                | 12808          |                          |
|   | Straight fitting G 1/2" - d. 16 hose                             | 12794                |                |                          |
|   | Straight fitting G 1/2" - d. 18 hose                             | 12795                | 14355          |                          |
|   | Straight fitting G 1/4" - d. 10 hose                             |                      | 14356          |                          |
|   | Straight fitting G 1/4" - d. 12 hose                             | 16043                |                |                          |
|   | Straight fitting 1/4" NPTF - 1/2" hose                           |                      | 21077          |                          |
| Straight fitting 1/4"NPTF - 3/8" hose   |  | 12784                |                |                          |

|   | Description   | Code for zinc plated | Code for brass | Code for chromium plated |
|---|---|----------------------|----------------|--------------------------|
|    | Reduction G 3/8" male - G1/2" female                  | 12836                |                |                          |
|   | Reduction G 3/8" male - G1/4" female                  |                      | 12851          |                          |
|   | Reduction G 1/2" male - G3/8" female                  | 12844                | 12839          |                          |
|   | Reduction G 1/4" male - G3/8" female                  | 12848                |                | 12826                    |
|   | Reduction G 1/2" male - 1/4"NPTF female               |                      | 11211          |                          |
|   | Reduction G 1/4" male - 1/4"NPTF female               |                      | 14352          |                          |
|   | Reduction 1/4" NPTF male - 3/8" NPTF female           |                      | 23546          |                          |
|    | Straight reusable fitting R7 5/16" - hose d. 10       |                      | 15610          |                          |
|   | Straight reusable fitting for R7 5/16" - hose d. 3/8" |                      | 15613          |                          |
|   | Straight reusable fitting for R7 3/8" - hose d. 12    |                      | 15720          |                          |
|   | Straight reusable fitting for R7 3/8" - hose d. 1/2"  |                      | 23477          |                          |
|   | Elbow reusable fitting for R7 5/16" - hose d. 3/8"    |                      | 23476          |                          |
|   | Elbow reusable fitting for R7 5/16" - hose d. 10      |                      | 15718          |                          |
|   | Elbow reusable fitting for R7 3/8" - hose d. 12       | 15721                |                |                          |
|  | Tee fitting d. 3/8" hose - 1/4" NPTF - hose d. 3/8"   |                      | 14734          |                          |
|   | Tee fitting d. 3/8" hose - 3/8" NPTF - hose d. 3/8"   |                      | 20837          |                          |
|   | Tee fitting d. 1/2" hose - 3/8" NPTF - hose d. 1/2"   |                      | 14733          |                          |
|   | Tee fitting d. 10 hose - G 1/4" - hose d. 10          |                      |                | 14735                    |
|   | Tee fitting d. 12 hose - G 3/8" - hose d. 12          |                      |                | 14750                    |
|   | Tee fitting d. 18 hose - G 1/2" - hose d. 18          | 22482                |                |                          |
|   | Tee fitting d. 10 hose - G 1/4" - hose d. 10          |                      |                | 14996+11795              |
|  | Elbow fitting 1/4" NPTF - hose d. 1/2"                |                      | 20574          |                          |
|   | Elbow fitting 1/4" NPTF - hose d. 3/8"                |                      | 11676          |                          |
|   | Elbow fitting G 1/4" - hose d. 10                     | 11687                |                | 11678                    |
|   | Elbow fitting G 1/4" - hose d. 12                     | 11688                |                |                          |
|  | Equal Tee fitting d. 3/8" - hose d. 3/8"              |                      | 21092          |                          |
|   | Equal Tee fitting d. 1/2" - hose d. 1/2"              |                      | 21093          |                          |
|   | Equal Tee fitting d. 10 - hose d. 10                  |                      | 14873          | 14874                    |
|   | Equal Tee fitting d. 12 - hose d. 12                  |                      |                | 14882                    |
|   | Equal Tee fitting d. 14 - hose d. 14                  | 14877                |                |                          |
|   | Equal Tee fitting d. 18 - hose d. 18                  | 14878                |                |                          |

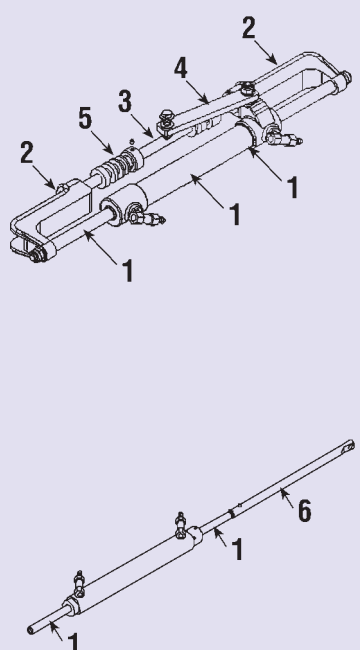
# SPARE PARTS

## Helm pump



| Position | Description  | Code  |
|----------|--|-------|
| 1        | Seal kit for helm pumps 20 cc - 30 cc 42 cc series BAP - BA - TSP - TS   | 23041 |
|          | Seal kit for helm pumps P63T - P63S - P89T - P89S  | 23042 |
|          | Seal kit for helm pumps P105 - P151 - P191   | 21987 |
| 2        | Kit for no-bleeder cap (cap + seal + washer) for helm pumps 20 cc - 25 cc - 30 cc - 35 cc - 42 cc series BAP - BA - TSP - TS | 23009 |
|          | Kit for no-bleeder cap (cap + seal + washer) for helm pumps 20 cc - 25 cc - 30 cc - 35 cc - 42 cc series BAP - BA - TSP - TS | 23006 |
| 3        | Cover flange for helm pumps 20 cc - 30 cc - 42 cc series BAP - BA  | 16390 |
| 4        | Prolongation for helm shaft - rear mounting kit MK31 - MK40 - MK50   | 16405 |
| 5        | Bolts kit and fittings d. 10 and d. 12 for helm pump 42 cc/rev with TS   | 25612 |
|          | Bolts kit and fittings d. 10 for helm pump 20 cc/rev - 30 cc/rev   | 18638 |
|          | Bolts kit and fittings d. 10 for helm pump 20 cc/rev - 30 cc/rev with TS   | 25586 |
|          | Bolts kit and fittings d. 3/8" and d. 1/2" for helm pump 42 cc/rev with TS   | 25725 |
|          | Bolts kit and fittings d. 3/8" for helm pump 20 cc/rev - 30 cc/rev with TS   | 25724 |

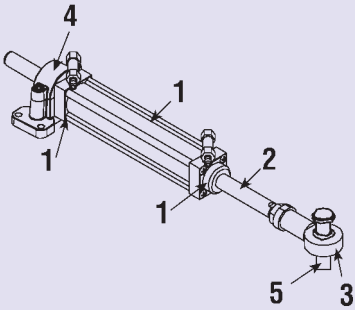
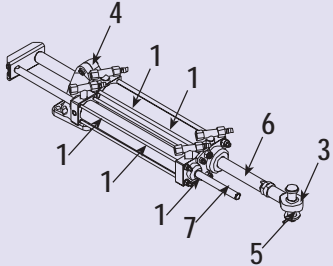
## Outboard steering cylinders

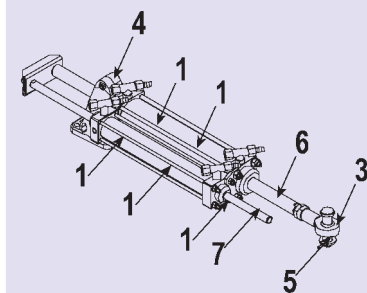
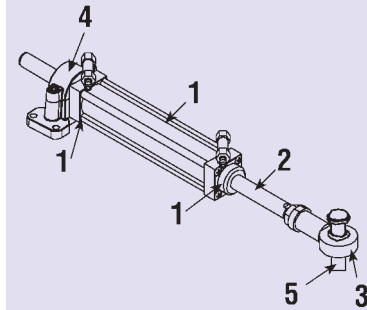


| Position | Description  | Code  |
|----------|--|-------|
| 1        | Seal kit for OB133 and OB108 cylinders                       | 20797 |
|          | Seal kit for OB163SY cylinder                                | 11514 |
| 2        | Black side bracket for OB133 cylinder                        | 12056 |
|          | Black side bracket for OB108 cylinder                        | 19297 |
| 3        | Through-tube stainless steel rod for OB133 cylinder          | 11855 |
|          | Through-tube stainless steel rod for OB108 cylinder          | 19301 |
| 4        | Link arm kit for OB133 cylinder                              | 23038 |
| 5        | Kit of spacers for OB133 and OB108 cylinder                  | 19495 |
| 6        | Extension rod kit for OB163SY cylinder (extension rod + pin) | 23018 |



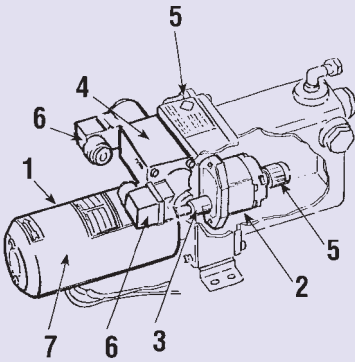
# Inboard steering cylinders

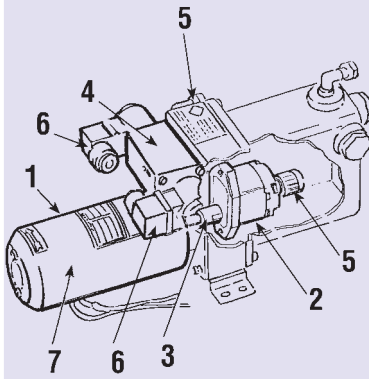
|   | Position   | Description   | Code  |   |       |
|---|--|---|-------|---|-------|
|  | 1  | Seal kit for CTA40 - CTA40U cylinders   | 21407 |   |       |
|   |  | Seal kit for CTA65 - CTA65U - CTA75 - CTA75U - CTA80 - CTA80U cylinders   | 11601 |   |       |
|   |  | Fitting and seal kit for bleeder for CTA cylinders  | 23048 |   |       |
|   |  | Fitting and seal kit for bleeder for CTAU cylinders   | 23054 |   |       |
|   |  | Seal kit for CTB110 - CTB110U - CTB130 - CTB130U - CTB145 - CTB145U cylinders   | 11603 |   |       |
|   |  | Fitting and seal kit for bleeder for CTB cylinders  | 23049 |   |       |
|   |  | Fitting and seal kit for bleeder for CTBU cylinders   | 23055 |   |       |
|   |  | Seal kit for CTC200 - CTC200U - CTC230 - CTC230U - CTC300 - CTC300U - CTC400 - CTC400U cylinders                        | 11602 |   |       |
|   |  | Fitting and seal kit for bleeder for CTC cylinders  | 23050 |   |       |
|   |  | Fitting and seal kit for bleeder for CTCU cylinders   | 23056 |   |       |
|   |  | Seal kit for CTD310 - CTD450 cylinders  | 11556 |   |       |
|   |  | Seal kit for CTE600 - CTE900 - CTE1200 cylinders  | 11586 |   |       |
|   |  | Seal kit for CTF1600 cylinders  | 20709 |   |       |
|   |  | Seal kit for power-assisted CTA80A - CTA80AU cylinders  | 22698 |   |       |
|   |  | Fitting and seal kit for bleeder for CTA power-assisted cylinders   | 23051 |   |       |
|   |  | Fitting and seal kit for bleeder for CTAU power-assisted cylinders  | 23057 |   |       |
|   |  | Seal kit for power-assisted CTB110A - CTB110AU - CTB130A - CTB130AU - CTB145A - CTB145AU cylinders                      | 22699 |   |       |
|   |  | Fitting and seal kit for bleeder for CTBA power-assisted cylinders  | 23052 |   |       |
|   |  | Fitting and seal kit for bleeder for CTBAU power-assisted cylinders   | 23058 |   |       |
|   |  | Seal kit for power-assisted CTC200A - CTC200AU - CTC230A - CTC230AU - CTC300A - CTC300AU - CTC400A - CTC400AU cylinders | 22700 |   |       |
|   |  | Fitting and seal kit for bleeder for CTCA power-assisted cylinders  | 23053 |   |       |
|   |  | Fitting and seal kit for bleeder for CTCAU power-assisted cylinders   | 23059 |   |       |
|   |  |                                      | 2     | Rod+piston kit for CTA40 - CTA40U cylinders | 10753 |
|   |  |   |       | Rod+piston kit for CTA65 - CTA65U cylinders | 10677 |
| Rod+piston kit for CTA75 - CTA75U cylinders                                       | 10682  |   |       |   |       |
| Rod+piston kit for CTA80 - CTA80U cylinders                                       | 10684  |   |       |   |       |
| Rod+piston kit for CTB110 - CTB110U cylinders                                     | 10740  |   |       |   |       |
| Rod+piston kit for CTB130 - CTB130U cylinders                                     | 10692  |   |       |   |       |
| Rod+piston kit for CTB145 - CTB145U cylinders                                     | 10746  |   |       |   |       |
| Rod+piston kit for CTC200 - CTC200U cylinders                                     | 25648  |   |       |   |       |
| Rod+piston kit for CTC230 - CTC230U cylinders                                     | 25647  |   |       |   |       |
| Rod+piston kit for CTC300 - CTC300U cylinders                                     | 25649  |   |       |   |       |
| Rod+piston kit for CTC400 - CTC400U cylinders                                     | 25650  |   |       |   |       |
| Rod+piston kit for CTD310 cylinder  | 25560  |   |       |   |       |
| Rod+piston kit for CTD450 cylinder  | 25559  |   |       |   |       |
| Rod+piston kit for CTE600 cylinder  | 25564  |   |       |   |       |
| Rod+piston kit for CTE900 cylinder  | 25565  |   |       |   |       |
| Rod+piston kit for CTE1200 cylinder   | 25566  |   |       |   |       |
| Rod+piston kit for CTF1600 cylinder   | 23027  |   |       |   |       |
| 6   | Rod+piston kit for main cylinder of CTA80A - CTA80AU   |   |       | 10757                                       |       |
|   | Rod+piston kit for main cylinder of CTB110A - CTB110AU | 15880   |       |   |       |
|   | Rod+piston kit for main cylinder of CTB130A - CTB130AU | 10697   |       |   |       |
|   | Rod+piston kit for main cylinder of CTB145A - CTB145AU | 10749   |       |   |       |



| Position | Description   | Code  |
|----------|---|-------|
| 6        | Rod+piston kit for main cylinder of CTC200A - CTC200AU  | 25698 |
|          | Rod+piston kit for main cylinder of CTC230A - CTC230AU  | 25696 |
|          | Rod+piston kit for main cylinder of CTC300A - CTC300AU  | 25697 |
|          | Rod+piston kit for main cylinder of CTC400A - CTC400AU  | 25699 |
| 7        | Rod+piston kit for servo-control cylinder of CTA80A - CTA80AU   | 10760 |
|          | Rod+piston kit for servo-control cylinder of CTB110A - CTB110AU   | 10743 |
|          | Rod+piston kit for servo-control cylinder of CTB130A - CTB130AU   | 10698 |
|          | Rod+piston kit for servo-control cylinder of CTB145A - CTB145AU   | 10750 |
|          | Rod+piston kit for servo-control cylinder of CTC200A - CTC200AU   | 10738 |
|          | Rod+piston kit for servo-control cylinder of CTC230A - CTC230AU   | 10719 |
|          | Rod+piston kit for servo-control cylinder of CTC300A - CTC300AU   | 10731 |
|          | Rod+piston kit for servo-control cylinder of CTC400A - CTC400AU   | 10784 |
| 3        | Ball joint for CTA40 - CTA40U cylinders   | 14712 |
|          | Ball joint for CTA65 - CTA65U - CTA75 - CTA75U - CTA80 - CTA80U - CTA80A - CTA80AU - CTB110 - CTB110U - CTB110A - CTB110AU - CTB145 - CTB145U - CTB145A - CTB145AU cylinders  | 14713 |
|          | Ball joint for CTB130 - CTB130U - CTB130A - CTB130AU cylinders  | 14706 |
|          | Ball joint for CTC200 - CTC200U - CTC200A - CTC200AU - CTC230 - CTC230U - CTC230A - CTC230AU - CTC300 - CTC300U - CTC300A - CTC300AU - CTC400 - CTC400U - CTC400A - CTC400AU cylinders                                    | 14711 |
|          | Ball joint for CTD310 - CTD450 cylinders  | 14703 |
|          | Ball joint for CTE600 - CTE900 - CTE1200 cylinders  | 14702 |
| 4        | Complete base for CTA40 - CTA40U cylinders (screws + base + ball bearings)  | 22994 |
|          | Complete base for CTA65 - CTA65U - CTA75 - CTA75U - CTA80 - CTA80U - CTA80A - CTA80AU cylinders (screws + base + 2 ball bearings)   | 22995 |
|          | Complete base for CTB110 - CTB110U - CTB110A - CTB110AU - CTB130 - CTB130U - CTB130A - CTB130AU - CTB145 - CTB145U - CTB145A - CTB145AU cylinders (screws + base + ball bearings)   | 22999 |
|          | Complete base for CTC200 - CTC200U - CTC200A - CTC200AU - CTC230 - CTC230U - CTC230A - CTC230AU - CTC300 - CTC300U - CTC300A - CTC300AU - CTC400 - CTC400U - CTC400A - CTC400AU cylinders (screws + base + ball bearings) | 23001 |
|          | Complete base for CTD310 - CTD450 cylinders (screws + base + ball bearings)   | 23002 |
|          | Complete base for CTE600 - CTE900 - CTE1200 cylinders (screws + base + ball bearings)   | 23003 |
|          | Pin of d. 12,7-60 for CTA40 - CTA40U cylinders  | 15643 |
| 5        | Pin of d. 19,05-84,5 for CTA65 - CTA65U - CTA75 - CTA75U - CTA80 - CTA80U - CTA80A - CTA80AU - CTB110 - CTB110U - CTB110A - CTB110AU - CTB145 - CTB145U - CTB145A - CTB145AU cylinders                                    | 11159 |
|          | Pin of d. 16-73,5 for cylinders CTB130 - CTB130U - CTB130A - CTB130AU   | 11121 |
|          | Pin of d. 25-103 for CTC200 - CTC200U - CTC200A - CTC200AU - CTC230 - CTC230U - CTC230A - CTC230AU - CTC300 - CTC300U - CTC300A - CTC300AU - CTC400 - CTC400U - CTC400A - CTC400AU cylinders                              | 11133 |
|          | Pin of d. 30-108 for CTD310 - CTD450 cylinders  | 14125 |
|          | Pin of d. 35-128 for CTE600 - CTE900 - CTE1200 cylinders  | 11128 |
|          | Pin of d. 36-143 for CTF1600 cylinders  | 15863 |

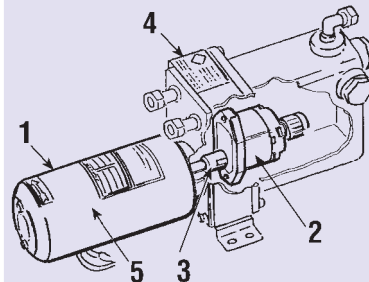
# Solenoid valves auto-pilot power units

|   | Position   | Description   | Code  |
|---|--|---|---|
|  | 1  | Electric motor 80W 12Vdc - S1 9A for power unit mod. CO1NU-CO1N and CO2NU-CO2N at 12V       | 11587   |
|   |  | Electric motor 80W 24Vdc - S1 5A for power unit mod. CO1NU-CO1N and CO2NU-CO2N at 24V       | 11589   |
|   |  | Electric motor 125W 12Vdc - S1 13A for power unit mod. CO2/3NU-CO2/3N and CO3NU-CO3N at 12V | 11292   |
|   |  | Electric motor 125W 24Vdc - S1 7A for power unit mod. CO2/3NU-CO2/3N and CO3NU-CO3N at 24V  | 11293   |
|   |  | Electric motor 200W 12Vdc - S1 22A for power unit mod. CO4 and CO4/5 at 12V                 | 11294   |
|   |  | Electric motor 200W 24Vdc - S2 10A for power unit mod. CO4 and CO4/5 at 24V                 | 11295   |
|   |  | Electric motor 300W 24Vdc - S2 19A for power unit mod. CO7 - CO8 - CO9 - CO10 at 24V        | 11297   |
|   |  | Electric motor 550W 24Vdc - S2 32A for power unit mod. CO11 - CO12 - CO13 at 24V            | 11299   |
|   |  | Electric motor 1000W 24Vdc - S2 52A for power unit mod. CO14 - CO15 - CO16 at 24V           | 11446   |
|   |  | 2   | Gear pump for power units mod. CO1NU-CO1N at 12-24V |
| Gear pump for power units mod. CO2NU-CO2N at 12-24V                               | 11309  |   |   |
| Gear pump for power units mod. CO2/3NU-CO2/3N at 12-24V                           | 11311  |   |   |
| Gear pump for power units mod. CO3NU-CO3N at 12-24 V                              | 11325  |   |   |
| Gear pump for power units mod. CO4-12V and CO4-24V                                | 11328  |   |   |
| Gear pump for power units mod. CO4/5-12V and CO4/5-24V                            | 11329  |   |   |
| Gear pump for power unit mod. CO7 at 24V  | 11365  |   |   |
| Gear pump for power unit mod. CO8 at 24V  | 11368  |   |   |
| Gear pump for power unit mod. CO9 at 24V  | 11375  |   |   |
| Gear pump for power units mod. CO10 - CO11 at 24V                                 | 11391  |   |   |
| Gear pump for power unit mod. CO12 at 24V   | 11392  |   |   |
| Gear pump for power unit mod. CO13 at 24V   | 11397  |   |   |
| Gear pump for power unit mod. CO14 at 24V   | 11396  |   |   |
| Gear pump for power unit mod. CO15 at 24V   | 11409  |   |   |
| Gear pump for power unit mod. CO16 at 24V   | 11428  |   |   |
| 3   | Pump coupling for power units mod. CO1NU-CO1N-CO2NU-CO2N at 12-24V           |   | 13204   |
|   | Pump coupling for power units mod. CO3NU-CO3N-CO2/3NU-CO2/3N at 12-24V       | 13205   |   |
|   | Pump coupling for power units mod. CO4-12V - CO4-24V - CO4/5-12V - CO4/5-24V | 10468   |   |
|   | Pump coupling for power units mod. CO7 - CO8 - CO9 - CO10 at 24V             | 10486   |   |
|   | Pump coupling for power units mod. CO11 - CO12 - CO13 at 24V                 | 10488   |   |
|   | Pump coupling for power units mod. CO14 - CO15 - CO16 at 24V                 | 10487   |   |



| Position | Description  | Code  |
|----------|--|-------|
| 4        | Two-solenoids electro valve at 12Vdc - "C" version with manual control for all power units from mod. CO1NU-CO1N to mod. CO4/5 at 12V | 20610 |
|          | Two-solenoids electro valve at 24Vdc - "C" version with manual control for all power units from mod. CO1NU-CO1N to mod. CO16 at 24V  | 20611 |
| 5        | Filter G1/4" for power units from mod. CO1NU-CO1N to mod. CO3NU-CO3N at 12-24V   | 13176 |
|          | Filter G3/8" for power units mod. CO4-12V - CO4-24V  | 13177 |
|          | Filter for power units mod. CO4/5-12V and CO4/5-24V - CO4-12 and CO4-24V   | 13179 |
|          | Filter for power units mod. CO7- CO8 - CO9 - CO10 - CO11 - CO13 - CO14 - CO15 at 24V   | 13182 |
|          | Filter for power units mod. CO12 - CO16 at 24V   | 13183 |
| 6        | Electrovalve connector for all solenoid valve power units  | 12632 |
| 7        | Brushes for electric motor of 80W - 125W at 12-24V   | 14718 |
|          | Brushes for electric motor of 200W at 12-24V   | 14719 |
|          | Brushes for electric motor of 300W - 550W at 24V   | 14720 |
|          | Brushes for electric motor of 1000W  | 14721 |

## Reversible auto-pilot power units



| Position | Description  | Code  |
|----------|--|-------|
| 1        | Electric motor 80W - 12V - S1 9A for power units mod. CO1RU-CO1R - CO2RU-CO2R at 12V | 11587 |
|          | Electric motor 80W - 24V - S1 5A for power units mod. CO1RU-24V - CO2RU-24V          | 11589 |
|          | Electric motor 125W - 12V - S1 13A for power units mod. CO3RU-CO3R at 12V            | 11292 |
|          | Electric motor 125W - 24V - S1 7A for power units mod. CO3RU-CO3R at 24V             | 11293 |
|          | Electric motor 150W - 12V - S1 16A for power units mod. CO4NRU-CO4NR at 12V          | 11291 |
|          | Electric motor 200W - 24V - S2 10A for power units mod. CO4NRU-CO4NR at 24V          | 16446 |
| 2        | Reversible gear pump for power units mod. CO1RU-CO1R at 12-24V                       | 11307 |
|          | Reversible gear pump for power units mod. CO2RU-CO2R at 12-24V                       | 11314 |
|          | Reversible gear pump for power units mod. CO3RU-CO3R - CO4NRU-CO4NR at 12-24V        | 16083 |
| 3        | Pump coupling for power units mod. CO1RU-CO1R - CO2RU-CO2R at 12-24V                 | 13204 |
|          | Pump coupling for power units mod. CO4NRU-CO4NR at 12-24V                            | 13205 |
| 4        | Filter G1/4" for power units from mod. CO1RU-CO1R to mod. CO3RU-CO3R at 12-24V       | 13176 |
| 5        | Brushes for electric motor of 80W - 125W - 150W - 200W at 12-24V                     | 14718 |

## Solenoid valves auto-pilot power units with automatic filling

|  | Position   | Description  | Code  |
|--|--|--|-------|
|  | 1  | Electric motor 125W 12Vdc - S1 13A for power unit mod. CO3RAU-CO3RA at 12V | 11292 |
|  |  | Electric motor 125W 24Vdc - S1 7A for power unit mod. CO3RAU-CO3RA at 24V  | 11293 |
|  |  | Electric motor 200W 12Vdc - S1 22A for power unit mod. CO4RAU-CO4RA at 12V | 11294 |
|  |  | Electric motor 200W 24Vdc - S1 10A for power unit mod. CO4RAU-CO4RA at 24V | 11295 |
|  | 2  | Gear pump for power unit mod. CO3RAU-CO3RA at 12-24V                       | 11321 |
|  |  | Gear pump for power unit mod. CO4RAU-CO4RA at 12-24V                       | 11328 |
|  | 3  | Pump coupling for power unit mod. CO3RAU-CO3RA at 12-24V                   | 13201 |
| Pump coupling for power unit mod. CO4RAU-CO4RA at 12-24V |  | 10468  |       |
| 4  | Two-solenoids electrovalve at 12Vdc - C" version with manual control for power units mod. CO3RAU-CO3RA - CO4RAU-CO4RA at 12V | 20610  |       |
|  | Two-solenoids electrovalve at 24Vdc - C" version with manual control for power units mod. CO3RAU-CO3RA - CO4RAU-CO4RA at 24V | 20611  |       |
| 5  | Filters for power units mod. CO3RAU-CO3RA-CO4RAU-CO4RA at 12-24V   | 13182  |       |
| 6  | Electrovalve connector for all solenoid valve power units  | 12632  |       |
|  | Brushes for electric motor of 125W at 12-24V   | 14718  |       |
| 7  | Brushes for electric motor of 200W at 12-24V   | 14719  |       |

## Power-assisted electro-hydraulic power units

|   | Position  | Description   | Code  |
|---|---|---|-------|
|   | 1   | Electric motor 600W - S2 65A for power unit mod. CO500/3/0,5U-CO500/3/0,5 at 12V                              | 11301 |
|   |   | Electric motor 500W - S2 30A for power unit mod. CO500/3/0,5U-CO500/3/0,5 - CO500/4/0,75U-CO500/4/0,75 at 24V | 11302 |
|   |   | Electric motor 800W - S2 42A for power unit mod. CO500/6/0,75U-CO500/6/0,75 at 24V                            | 11613 |
| 2 | Gear pump for power unit mod. CO500/3/0,5U-CO500/3/0,5 at 12V - CO500/3/0,5U-CO500/3/0,5 at 24V   | 11664   |       |
|   | Gear pump for power unit mod. CO500/4/0,75U-CO500/4/0,75 at 24V   | 11665   |       |
|   | Gear pump for power unit mod. CO500/6/0,75U-CO500/6/0,75 at 24V   | 11666   |       |
| 3 | Pump coupling for all CO500 power units   | 10486   |       |
| 4 | Two-solenoids electrovalve at 12Vdc - C" version with manual control for power units mod. CO500/3/0,5U-CO500/3/0,5 at 12V   | 20610   |       |
|   | Two-solenoids electrovalve at 24Vdc - C" version with manual control for power units mod. CO500/3/0,5U-CO500/3/0,5 - CO500/4/0,75U - CO500/4/0,75 - CO500/6/0,75U-CO500/6/0,75 at 24V | 20611   |       |
| 5 | Suction filter for all CO500 power units  | 13180   |       |
| 6 | Filter for all CO500 power units  | 13182   |       |
| 7 | Electrovalve connector for all solenoid valve power units   | 12632   |       |
| 8 | Spacer for electric motor for all CO500 power units   | 12912   |       |
| 9 | Brushes for electric motor of 500W - 600W at 12-24V   | 14720   |       |

# WARRANTY CONDITIONS

Twin Disc guarantees his equipment are sold and supplied against any faulty manufacturing or defects whether they are the result of the design, the raw material or construction under the terms and restrictions indicated below:

## 1) Warranty validity period

**1.a.** The period of warranty is twenty four (24) months starting from the date of the first use by the original consumer or thirty (30) months from the date of delivery of the products to the forwarder, distributor or wholesaler. In case our systems are mounted or used on work or commercial boats the guarantee period is of twelve (12) months from the date of production. The manufacturer has the right to require from the client proof of the commissioning date specified on the guarantee request.

**1.b.** This period is neither extended nor interrupted through legal or amicable claims on the part of the client. At the end of this period, the guarantee is terminated without further consideration.

**1.c.** The warranty will not be renewed following repairs or replacement or if the item is resold.

## 2) Conditions that make the warranty null and void

**2.a.** The obligation of guarantee does not apply in case of negligence, faulty maintenance or supervision, operators responsibility, imprudence, non observance of recommended or operating instructions, incidents resulting from a cause of force majeure or the use of oil of insufficient quality for the equipment. The manufacturer is not responsible for any damage caused by loss of oil or leaks.

**2.b.** The guarantee also does not apply for any incidents resulting from a cause of force major or Acts of God, as well as any damage, replacement or repairs exceeding the normal wear.

**2.c.** The guarantee is not valid in case some of our components are installed on a control system together with other manufacturers' products.

**2.d.** The guarantee does not apply if the equipment is not returned to the manufacturer in the state in which it broke down or if it has previously been disassembled, repaired, modified either by a third party, the user or the client.

**2.e.** The warranty does not cover failure due to construction or the choice of unsuitable materials whenever the customer has order the product with such characteristics in spite of prior advice given by Twin Disc.

## 3) Conditions of call-out

**3.a.** In case of equipment failure within its warranty period the manufacturer or service center, dealer and distributor, must be contacted to authorized any work. The client must do his best for the assistant to be able to ascertain these defects and to perform corrective actions. After receiving proper notification of the equipment defect, the assistance shall correct this fault as soon as possible, reserving the right, if applicable, to modify all or part of equipment in order to fulfil the obligations.

**3.b.** The repair or replacement of the defective components under warranty condition is left to the technical staff judgement and the warranty is limited both to repair in the manufacturer's shop or the nearest authorized service center, at its own cost within the shortest possible time of the equipment and parts supplied or to the article replacement, in case it is not repairable.

**3.c.** The defective products must be sent pre-paid together with a copy of invoice as well as the return form.

**3.d.** Twin Disc or its assistance, agrees to repair the vessel in a good workmanlike manner. In case the repairing is not under warranty as specified in the condition paragraph 2, the owner agrees to pay Twin Disc for said work, labour and materials at Twin Disc usual and customary time and material charge unless specific prices for specific items or job are agreed upon. Price quotes by personnel are rough estimates and are not binding upon, unless the quote is in writing and signed by the owner and/or representative.

**3.e.** During the guarantee period, the cost of labour, dismantling and reassembly of the faulty items, repairing, travelling and accommodation expenses for technicians are the responsibility of Twin Disc. The shipping costs for repaired or replaced products, as well as for hauling or furniture dismantling shall be paid by the client.

**3.f. Emergencies:** Twin Disc prefers to do work on vessels only with owner's specific instruction. However Twin Disc does reserve the right to repair owner's vessel if in the opinion of Twin Disc an emergency arises making such action necessary to protect the vessel. Owner agrees to pay for emergency hauling and/or necessary repairs at regular prevailing rates in case the job is not under warranty.

**3.g.** Twin Disc reserves all rights against the vessel and personally against the owner for payment of all charges in full.

**3.h.** Twin Disc shall not be responsible for any damage to said vessel while accessed by Twin Disc nor shall Twin Disc be responsible for damage to or loss of any items or personal property, gear or any other appurtenances left aboard the vessel, whether vessel's owner, representative and agents have at all time access to the vessel and, accordingly, Twin Disc does not have exclusive custody, care and control of the boat.

**3.i.** Twin Disc does not provide insurance for vessels; Twin Disc insurance liability coverage for Twin Disc only. Owner agree that he will provide his own insurance for his vessel, will keep coverage in effect for the time period the vessel being accessed by or in custody of Twin Disc and release Twin Disc from any damage.

## 4) General warranty terms

**4.a.** The obligation of the guarantee only applies if the defect appeared under normal operating conditions stipulated for this type of supply or indicated by the manufacturer in writing.

**4.b.** The components replaced under warranty must return immediately to Twin Disc as they are no longer customer's property.

**4.c.** Twin Disc reserves the right to change its models or parts of them without any obligation to make the same alterations to any products previously manufactured.

**4.d.** The client agrees that the manufacturer will not be responsible for damage resulting from the client non compliance with any of the obligations defined above.

**4.e.** No claim may be made for compensation such as personal injury, damage to goods other than those concerned in this document, privation of possession, operating losses, commercial damage or loss of earnings.



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