

ELECTRO-HYDRAULIC STEERING SYSTEMS “ STEER-BY-WIRE ”

2019



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ELECTRO-HYDRAULIC STEERING SYSTEMS

INTRODUCTION

Lecomble & Schmitt has developed a range of **electro-hydraulic** steering systems to meet the **evolving challenges of steering gear** for boats.

Drawing on more than **50 years of experience at the service of the leading shipyards**, L.S. offers in this catalogue a comprehensive selection of the **best-performing and reliable** electric and hydraulic components to compose the **best suited** electro-hydraulic steering **for power and sail boats** with a total rudder torque **up to 4,000 kgm**.



DESCRIPTION OF LS ELECTRO-HYDRAULIC STEERING SYSTEMS

In general, the basic setup of an electro-hydraulic steering system includes:

- Receivers – cylinders with linear position sensors.
- Transmitters – electric wheels, FFU or NFU joysticks, selectors.
- Programmable logic controller with or without customizable multifunction screen display.
- Clearly labelled electrical harness with connecting pins.
- Hydraulic power pack and oil tank equipped with filters, oil level and temperature alarms.
- Proportional hydraulic distributor with independent circuits or hydraulic distribution block.
- Set of hydraulic flexible tubes with swaged fittings.

Some classification societies require additional safety components. In this case, please contact us.

In operating condition, the programmable logic controller continuously analyses the information sent by the cylinder position sensors and relays the orders from the transmitters.

It manages the position and the displacement of each cylinder by means of the hydraulic power pack and the hydraulic distribution system.

Depending on the selected model, a screen display can allow for navigation scrolling through pages and menus, activation or deactivation of an individual receiver or transmitter, thus providing a broad range of applications (safety, maintenance, intervention...). It also allows the fine-tuning of rudder angle settings (Ackerman effect...), reaction speed and rudder alignment. Finally, it triggers alarms (temperature, oil level, filter clogging...) and permits to isolate the components concerned.

The elimination of hydraulic circuits in the boat inhabitable parts and of the mechanical tie bars between the rudders, the lack of interventions on often complex hydraulic circuits such as filling and bleeding are all reasons that make the electro-hydraulic steering system a technically and economically sound solution that meets all of the market requirements.

ELECTRO-HYDRAULIC STEERING SYSTEMS

TORQUE CALCULATION

- **For boats fitted with a rudder with speed not exceeding 25 knots**, the torque of the rudder(s) is calculated according to the following formula and correction coefficients.

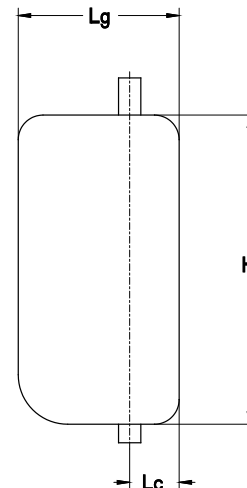
It should be pointed out that the necessary torque to maneuver a boat depends on:

- the speed of the water flowing on the surface of the rudder at a certain angle,
- the rudder dimensions,
- the total sweep of the rudder (and part of the boat), if the rudder stock is not perpendicular,
- the compensating surface of the rudder (balanced rudder).

Torque Calculation Formula for Speed below 25 Knots

$$C = S \times [(0,4 Lg) - Lc] \times V^2 \times K$$

- C** = Torque in kgm
S = Total rudder surface (H x Lg) in sq.m
H = Rudder height in m
Lg = Rudder width in m
Lc = Compensation width in m
V = Maximum speed of the boat in knots
K = Coefficient according to the total rudder angle
- Port to Starboard 70° **K = 15.89**
 - Port to Starboard 80° **K = 17.80**
 - Port to Starboard 90° **K = 19.52**



Corrections in function of the type of boat:

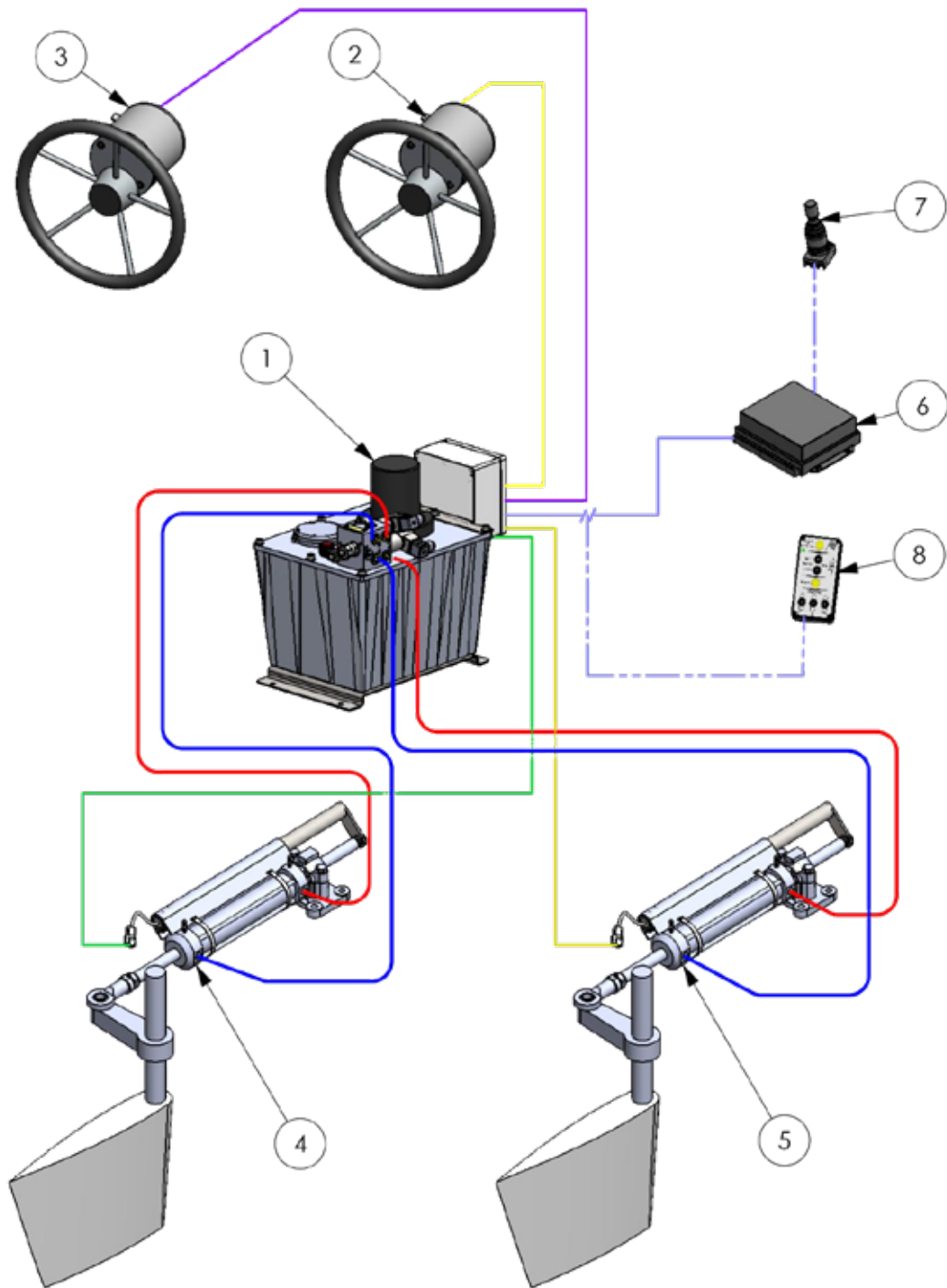
- For sailing boats **C x 0.5**
- For a boat with a steering nozzle **C x 2.0**
- For twin engine power boats with 1 rudder **C x 0.5**
- For boats fitted with several rudders (catamarans, trimarans, monohulls), multiply the calculated torque by the number of rudders fitted on the boat.

Once the torque has been calculated, the appropriate cylinder(s) will be selected and the remaining components of the steering system can be defined.

- **Please contact us for boats fitted with a rudder, when the speed exceeds 25 knots.**

ELECTRO-HYDRAULIC STEERING SYSTEMS UP TO 500 kgm

WORKING PRINCIPLE

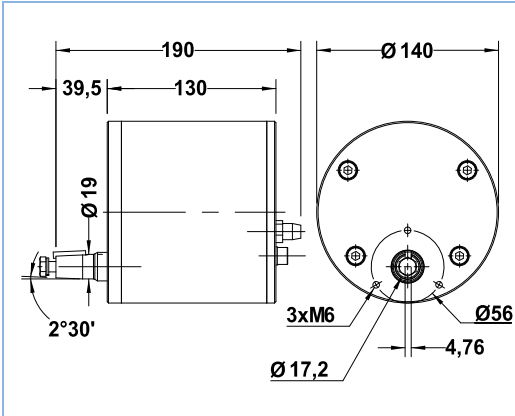


ITEM	DESIGNATION
①	Hydraulic Power Pack
② ③	540° Electric Wheel
④ ⑤	Cylinder / Linear Sensor
⑥	Autopilot Course Computer (not supplied)
⑦	Joystick (optional)
⑧	Programming Box

ELECTRO-HYDRAULIC STEERING SYSTEMS UP TO 500 kgm

TRANSMITTERS

2203287 540° Electric Wheel (1.5 turn with automatic recentering)

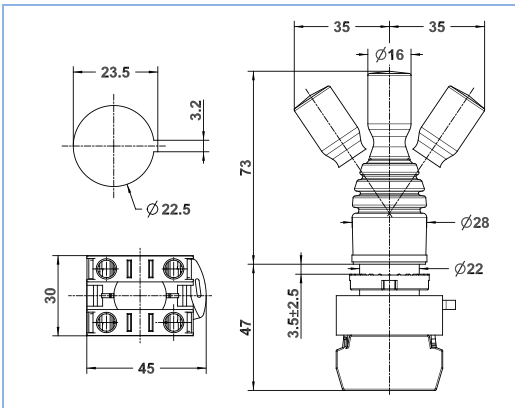


With this sturdy designed electric wheel, it takes 540° (1.5 turn) for the cylinder(s) to travel their full strokes. The electric wheel is affixed with three screws behind a bulkhead and is connected to the electric harness with an identified, pre-swaged connecting pin.

It is equipped with a standard conic shaft end. Thanks to the automatic recentering function, it can be used for twin steering station installations with two steering wheels.



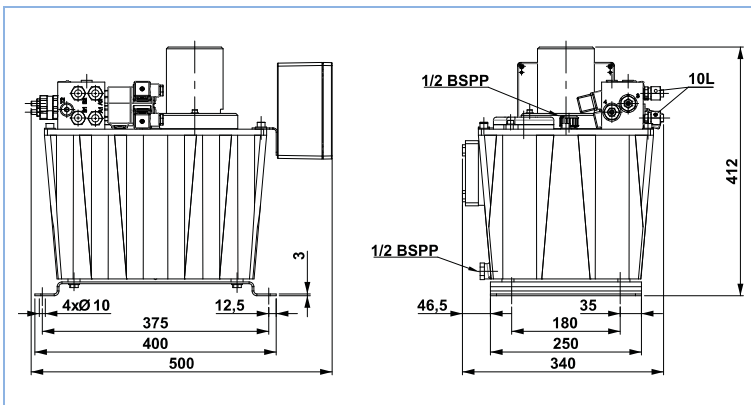
2201143 Joystick



The joystick control operates on an “on-off” basis. It is connected to the programmable logic controller by a wire provided with the electrical harness. The direction of the control lever corresponds to the desired direction the boat is to be steered to. When released, the control lever goes back to its neutral position automatically but the cylinders remain in their last positions. To bring them back to their central positions, the joystick control lever will have to be operated.



HYDRAULIC POWER PACKS



Hydraulic power packs consist of a brushless electric motor coupled to a 6 or 9 litre/minute submersible pump in function of the cylinder volume to be fed. They also feature a hydraulic distribution block fitted with its coils and delivery solenoid valves and its circuit protection components. The oil tank is equipped with an oil level sight glass, a filler cap and an additional opening to allow draining. These power packs support the logic controller to which the electrical harness is connected.

- 2203790** Hydraulic Power Pack DEH ECO 6 l/mn 12 V
- 2203872** Hydraulic Power Pack DEH ECO 6 l/mn 24 V
- 2203873** Hydraulic Power Pack DEH ECO 9 l/mn 12 V
- 2203804** Hydraulic Power Pack DEH ECO 9 l/mn 24 V

ELECTRO-HYDRAULIC STEERING SYSTEMS UP TO 500 kgm

RECEIVERS

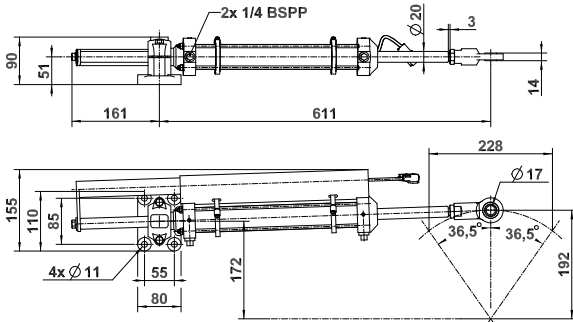
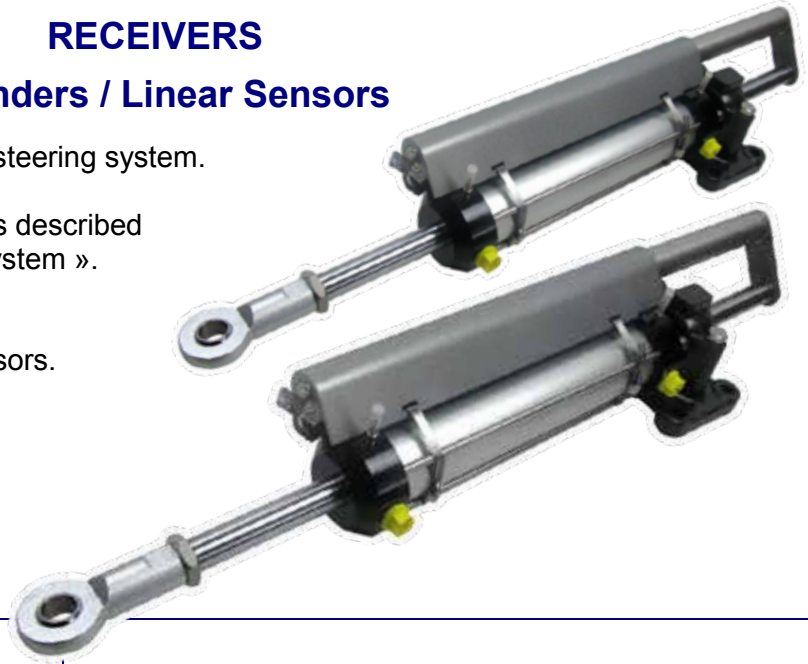
Cylinders / Linear Sensors

The cylinders provide the power of the steering system.

They are selected by using the methods described on page 8 « Selection of the steering system ».

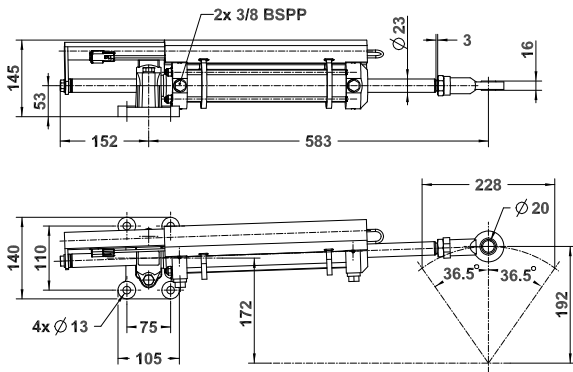
All the cylinders are supplied with their pre-assembled and adjusted linear sensors.

The linear sensor is supplied pre-wired with a pre-swaged connector half.



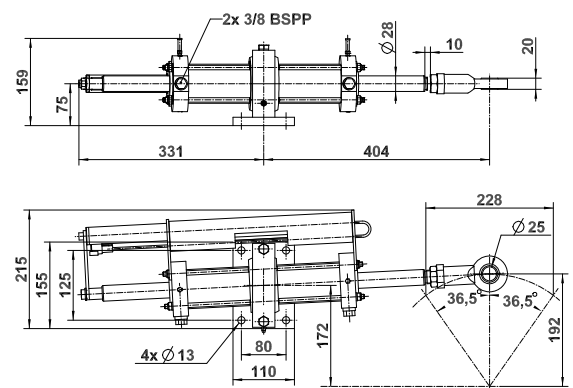
2203810 VHM 40 DTP C234 + Linear Sensor
2203811 VHM 40 DTP C234 + Reversed Linear Sensor

Maximum torque	90 kgm	663 ft.lbs
Stroke	228 mm	9"
Maximum pressure	50 bars	725 PSI
Volume	215 cc	13.1 cu.in
Radius of tiller arm	192 mm	7 9/16"
Total rudder angle	73° (2 x 36,5°)	
Weight	6.5 kg	14.3 lbs



2203874 VHM 50 DTP + Linear Sensor
2203875 VHM 50 DTP + Reversed Linear Sensor

Maximum torque	148 kgm	1091 ft.lbs
Stroke	228 mm	9"
Maximum pressure	50 bars	725 PSI
Volume	352 cc	21.5 cu.in
Radius of tiller arm	192 mm	7 9/16"
Total rudder angle	73° (2 x 36,5°)	
Weight	7.5 kg	16.5 lbs



2203437 VHM 60 DT + Linear Sensor
2203876 VHM 60 DT + Reversed Linear Sensor

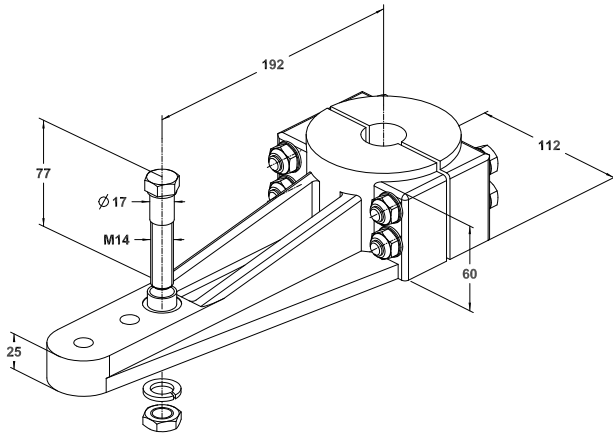
Maximum torque	254 kgm	1873 ft.lbs
Stroke	228 mm	9"
Maximum pressure	60 bars	870 PSI
Volume	505 cc	30.8 cu.in
Radius of tiller arm	192 mm	7 9/16"
Total rudder angle	73° (2 x 36,5°)	
Weight	18 kg	39.7 lbs

ELECTRO-HYDRAULIC STEERING SYSTEMS UP TO 500 kgm

TILLER ARMS

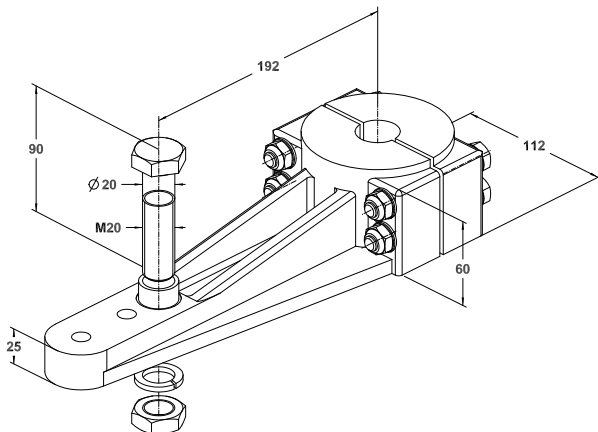
2203306

Pilot bored equipped tiller arm LS 90 kgm
Ø 28 pilot bored – maxi Ø 50



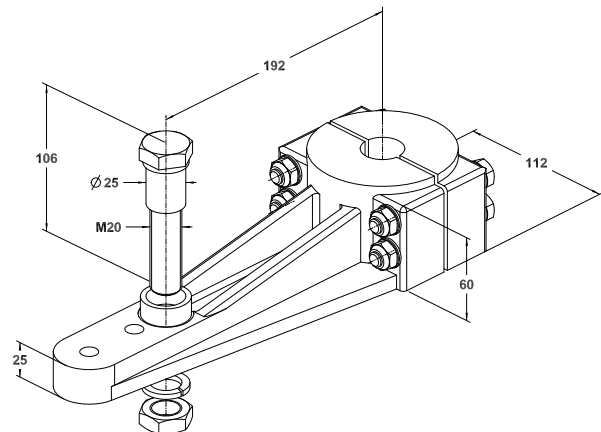
2203307

Pilot bored equipped tiller arm LS 148 kgm
Ø 28 pilot bored – maxi Ø 50



2203308

Pilot bored equipped tiller arm LS 254 kgm
Ø 28 pilot bored – maxi Ø 50



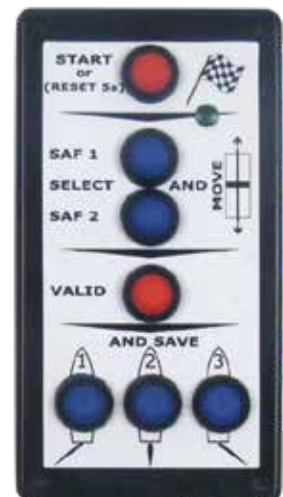
PROGRAMMING BOX

The programming box allows to adjust the cylinder setup (direction and positions). It connects instead of the autopilot computer during the implementation phase. It will potentially monitor the responsiveness of the autopilot and makes the cylinder bleeding procedure easier.

Functionalities:

- Facilitate the cylinder bleeding procedure.
- Set the cylinder travel stops (max-min).
- Determine the cylinder motion direction.
- Shift the midpoint of each cylinder stroke if required.
- Memorize the midpoints of the electric wheel(s) displacement.

2203848 Equipped programming box DEH ECO



ELECTRO-HYDRAULIC STEERING SYSTEMS UP TO 500 kgm

SELECTION OF THE STEERING SYSTEM

Electro-Hydraulic Steering System with Double Cylinder

Depending on the configuration of the steering system – single or double steering station –, the boat will be equipped with one or two electric wheels. It can also be equipped with an optional joystick.

		Single Steering Station	Double Steering Station
2203287	540° Electric Wheel	1	2
2201143	Joystick	1	1

Torque in kgm	180	296	505
Cylinder + Sensor	2203810 / 2203811	2203874 / 2203875	2203437 / 2203876
Hydraulic Power Pack 12 Vcc	2203790	2203873	2203873
Hydraulic Power Pack 24 Vcc	2203872	2203804	2203804
Tiller Arm	2203306	2203307	2203308
Electrical Harness / Hydraulic Piping: in function of the steering system setup (see page 9)			

Example of a Steering System Setup

Specifications of the steering system: 280 kgm rudder torque – Single steering station + 1 joystick – Voltage available: single-phase 24 Vcc

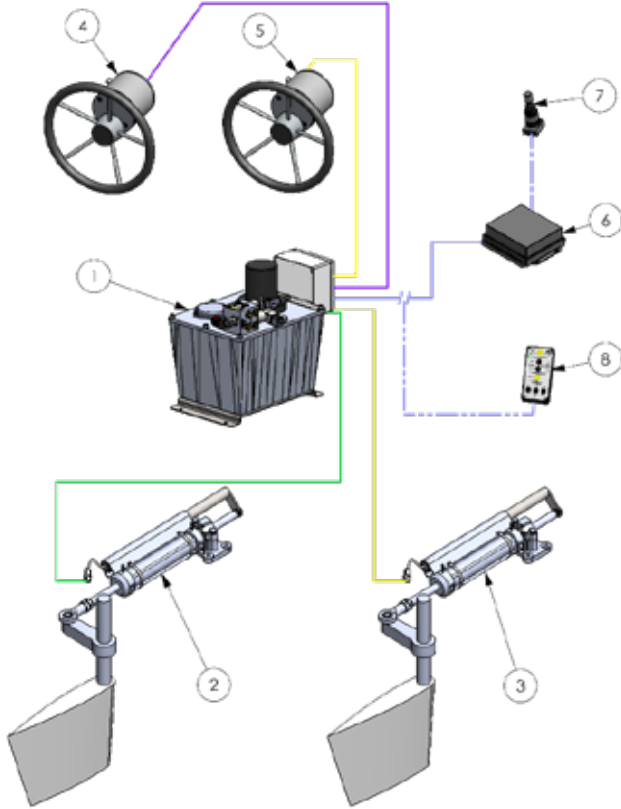
Parts to select:

✓ 1 x 540° Electric Wheel	2203287
✓ 1 x Joystick	2201143
✓ 1 x Cylinder + Linear Sensor	2203874
✓ 1 x Cylinder + Reversed Linear Sensor	2203875
✓ 1 x Hydraulic Power Pack 9 L/mn 24 Vcc	2203804
✓ 2 x Tiller Arms	2203307
✓ 1 x Electrical harness	Lengths to be determined
✓ 1 x Hydraulic piping	Lengths to be determined

ELECTRO-HYDRAULIC STEERING SYSTEMS UP TO 500 kgm

ELECTRICAL HARNESS

The electrical harness consists of all electrical wires connecting the transmitters and receivers to the programmable logic controller. Its definition depends on the number and type of steering system components and on the distances between these components and the programmable logic controller. Each wire is fitted on both ends with paired pre-swaged connector halves.



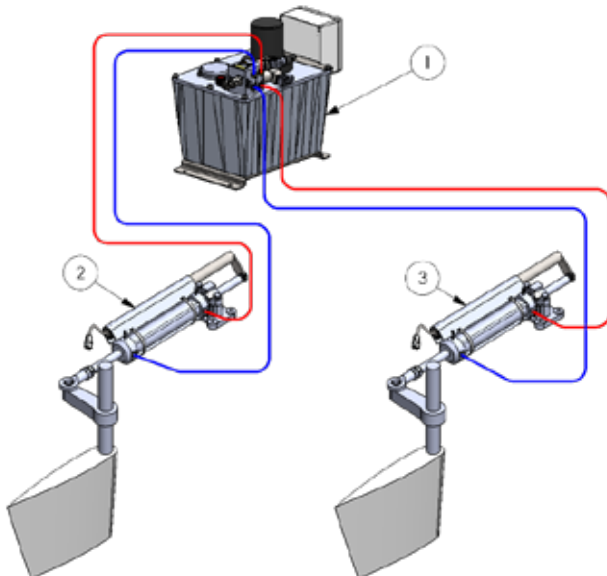
ITEM	DESIGNATION
①	Hydraulic Power Pack
② ③	540° Electric Wheel
④ ⑤	Cylinder / Linear Sensor
⑥	Autopilot Course Computer (not supplied)
⑦	Joystick (optionnal)
⑧	Programming Box

HYDRAULIC PIPING

The hydraulic piping represents all the hydraulic flexible tubes linking together the hydraulic components (power pack, by-pass valve, cylinder...). Its definition depends on the number and type of steering system components and on the distances between these components.

It also depends on the configuration of the hydraulic diagram.

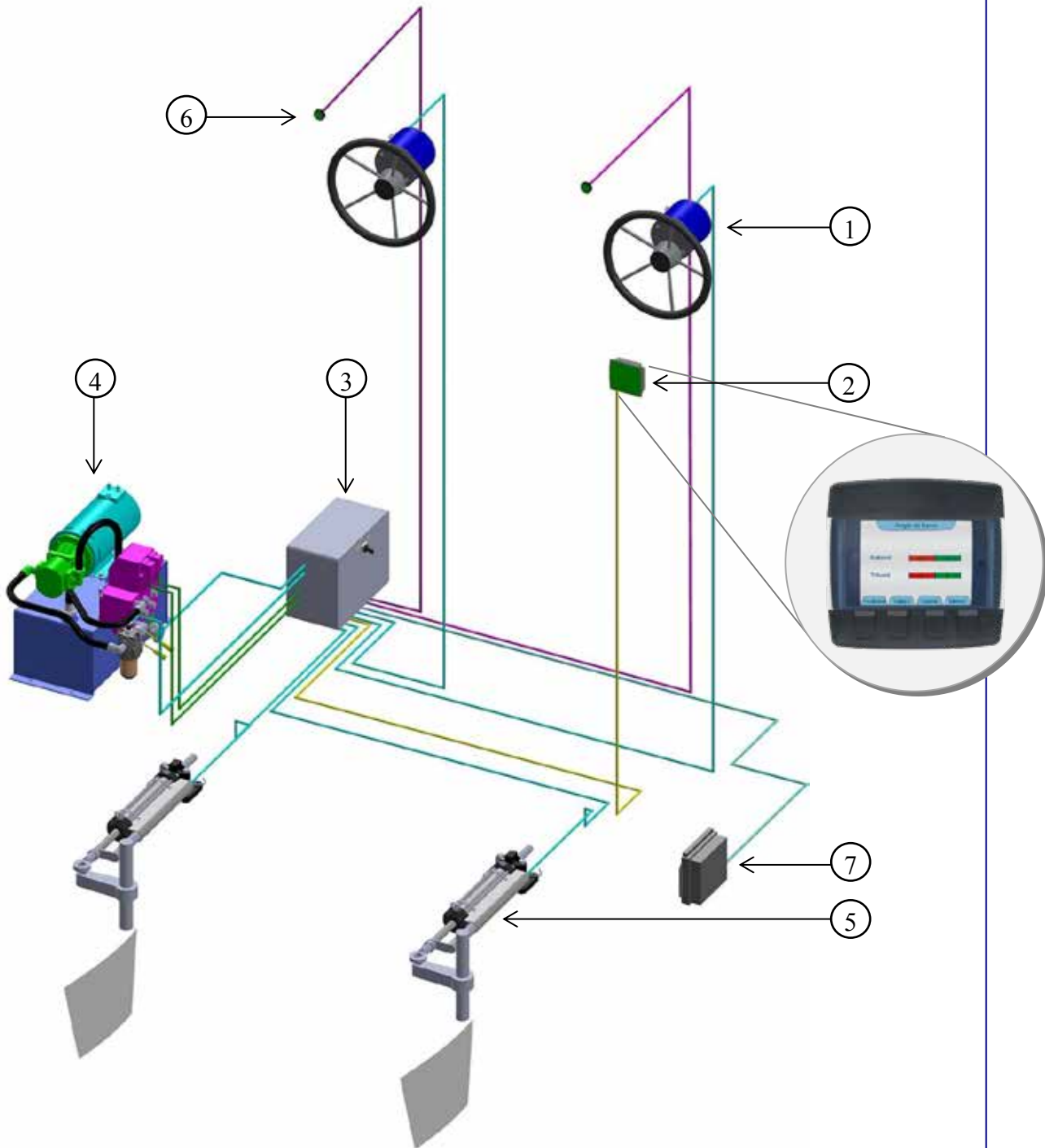
Each hydraulic hose is fitted with swaged fittings and union fittings on both ends.



ITEM	DESIGNATION
①	Hydraulic Power Pack
② ③	Cylinder / Linear Sensor

ELECTRO-HYDRAULIC STEERING SYSTEMS FROM 334 TO 3832 kgm

WORKING PRINCIPLE

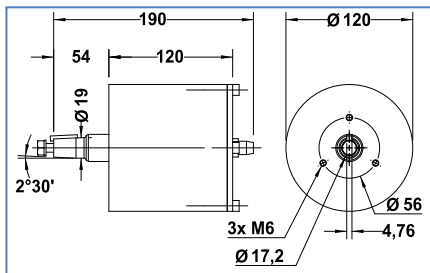


ITEM	DESIGNATION
1	Electric Wheel
2	Screen Display
3	Programmable Logic Controller
4	Hydraulic Power Pack / Proportional Distributor
5	Cylinder / Linear Sensor
6	Selector Knob
7	Autopilot Course Computer (not supplied)

ELECTRO-HYDRAULIC STEERING SYSTEMS FROM 334 TO 3832 kgm

TRANSMITTERS

2203400 Electric Wheel (2.5 turns)

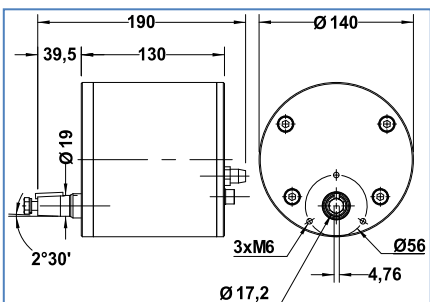


With this sturdy designed electric wheel, it takes 2.5 turns for the cylinder(s) to travel their full strokes. The electric wheel is affixed with three screws behind a bulkhead and is connected to the electric harness with an identified, pre-swaged connecting pin.

It is equipped with a standard conic shaft end. To be used only on single steering station installations with a steering wheel.



2203287 540° Electric Wheel (1.5 turn with automatic recentering)

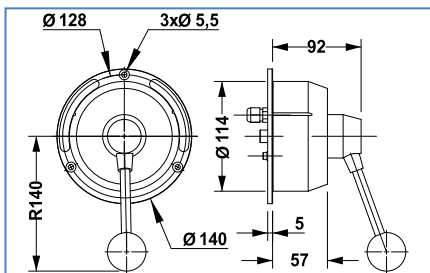


With this sturdy designed electric wheel, it takes 540° (1.5 turn) for the cylinder(s) to travel their full strokes.

The electric wheel is affixed with three screws behind a bulkhead and is connected to the electric harness with an identified, pre-swaged connecting pin.

It is equipped with a standard conic shaft end. Thanks to the automatic recentering function, it can be used for twin steering station installations with two steering wheels.

2203403 Angular Control

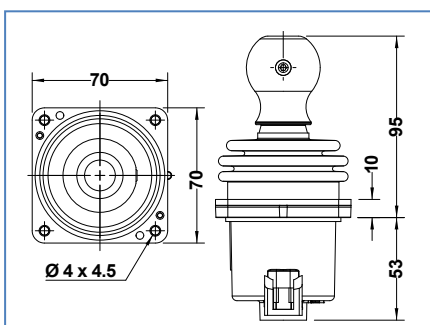


This angular control makes it possible to maintain a selected angle to port or starboard by increments of 10 degrees, without having to operate the lever continuously.

Easy to install, of sturdy design, its operation is intuitive.



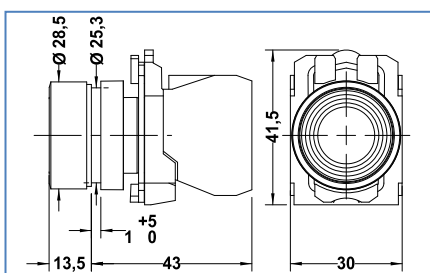
2203288 Proportional Joystick (F.F.U)



Designed to monitor work functions on mobile machinery, this joystick is particularly robust. Featuring centre spring return and digital outputs (CAN), up to four units can be installed at different locations on the boat. Its protection rating corresponds to IP66/67. It also features non-contact detection (Hall Effect) and user-friendly lever ergonomics. Its proportional speed control makes it possible to increase or decrease the cylinder travel speed in function of the lever displacement speed.



2203296 Selector Knob



When the installation includes several transmitters (steering wheel(s), joystick(s)...), the selector knob is pressed to select the transmitter to be used. It then produces a green light and disables all other transmitters.



ELECTRO-HYDRAULIC STEERING SYSTEMS FROM 334 TO 3832 kgm

SCREEN DISPLAY

The screen display allows for Human-Machine Interface (HMI) and communication with the logic controller in order to modify the selected settings. Without screen, it is only possible to communicate with the logic controller by the attendance of a qualified programmer.

The screen display offers four configuration modules:

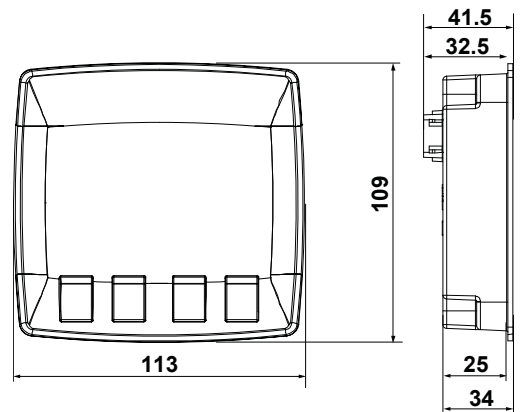
- HMI (Human-Machine Interface) for the settings
- Visualization
- Diagnosis
- Manual steering control

The HMI module gives direct access to the selection settings for the transmitters and cylinders by activation or deactivation; it makes it possible to act on the parallelism of the cylinders by increments on the boat steering, etc. With a private code (secret code), it also gives access to additional settings such as zero relative bearing, adjustment of the transmitters response angle, maximum rudder angles, lock to lock speed adjustments, decelerations, etc.

The visualization module allows viewing the rudder angles and parallelisms in real-time. It also displays the maintenance schedule of some elements in the system (oil change, filter replacement...) and conveys the alarms (oil level, temperature, filter clogging...) in the form of graphic and/or buzzer.

The diagnosis module allows carrying out a global inspection before starting by testing individual elements in order to identify and isolate the possible failure of a system component and it verifies the supply voltage in real time.

The manual steering control module makes it possible to steer the boat via the display screen keys, thus a substitute for the transmitters.

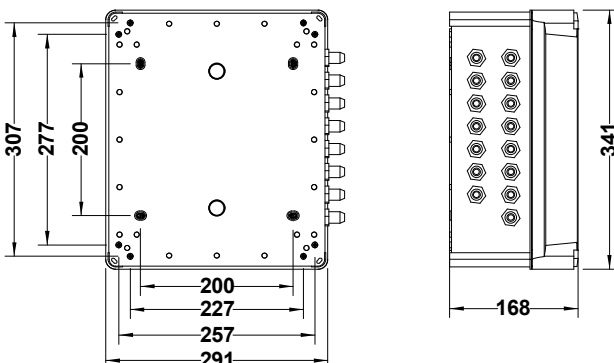


2203295 | Screen Display

PROGRAMMABLE LOGIC CONTROLLER

Intended for use on all-terrain machines, our programmable logic controller is of robust design to operate in hostile environments (temperature, moist atmosphere, impacts, vibrations, etc.) It has been programmed to relay orders to the proportional distributor(s) swiftly by using the input data supplied (cylinder linear sensors), the instructions provided (display screen, steering wheels, joystick...) and the data from its built-in computer program.

This type of micro-controller is very responsive. It features physical inputs and outputs which are pre-wired with pre-swaged connector halves.



2203407 | Programmable Logic Controller

ELECTRO-HYDRAULIC STEERING SYSTEMS FROM 334 TO 3832 kgm

RECEIVERS

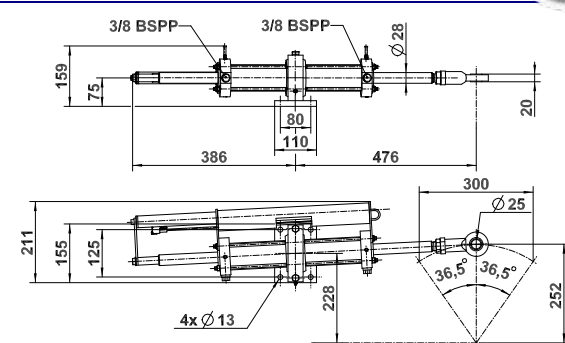
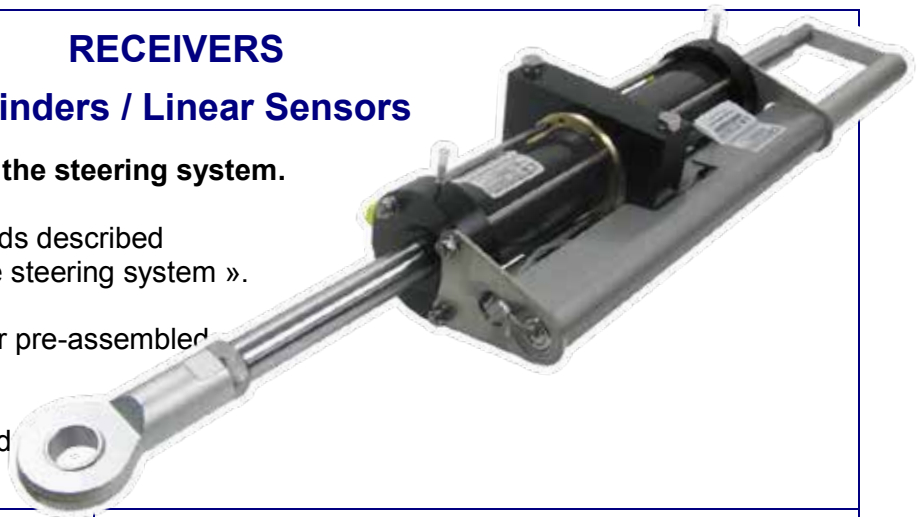
Cylinders / Linear Sensors

The cylinders provide the power of the steering system.

They are selected by using the methods described on pages 12 and 13 « Selection of the steering system ».

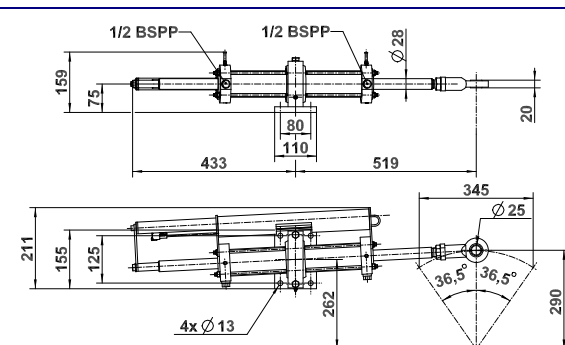
All the cylinders are supplied with their pre-assembled and adjusted linear sensors.

The linear sensor is supplied pre-wired with a pre-swaged connector half.



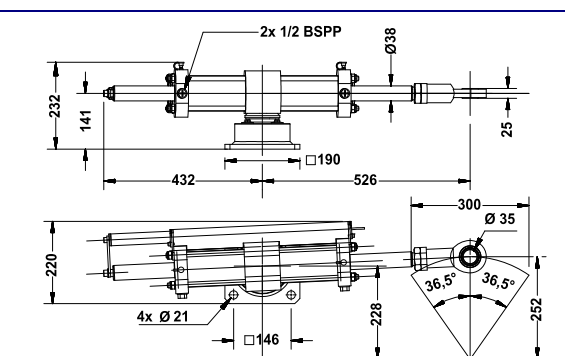
2203438 VHM 60 DT C300 + Linear Sensor

Maximum torque	334 kgm	2463 ft.lbs
Stroke	300 mm	11 13/16"
Maximum pressure	60 bars	870 PSI
Volume	664 cc	40.5 cu.in
Radius of tiller arm	252 mm	9 59/64"
Total rudder angle	73° (2 x 36,5°)	
Weight	18 kg	39.5 lbs



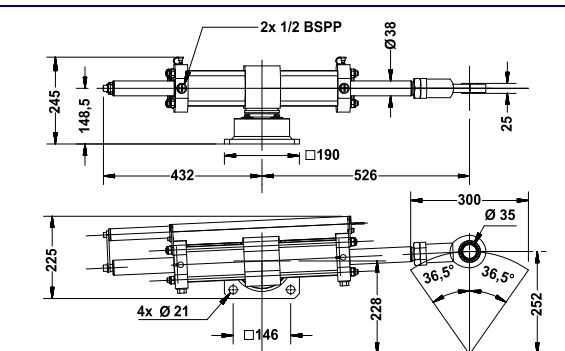
2203439 VHM 63 DT C345 + Linear Sensor

Maximum torque	435 kgm	3208 ft.lbs
Stroke	345 mm	13 19/32"
Maximum pressure	60 bars	870 PSI
Volume	862 cc	52.6 cu.in
Radius of tiller arm	290 mm	11 27/64"
Total rudder angle	73° (2 x 36,5°)	
Weight	27 kg	59.5 lbs



2203440 VHM 80 DT + Linear Sensor

Maximum torque	588 kgm	4336 ft.lbs
Stroke	300 mm	11 13/16"
Maximum pressure	60 bars	870 PSI
Volume	1167 cc	71.2 cu.in
Radius of tiller arm	252 mm	9 59/64"
Total rudder angle	73° (2 x 36,5°)	
Weight	32 kg	70.5 lbs



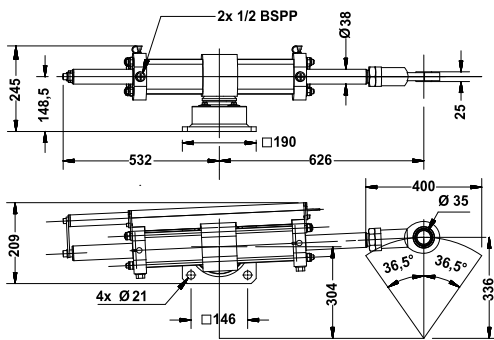
2203441 VHM 90 DT + Linear Sensor

Maximum torque	790 kgm	5826 ft.lbs
Stroke	300 mm	11 13/16"
Maximum pressure	60 bars	870 PSI
Volume	1567 cc	95.6 cu.in
Radius of tiller arm	252 mm	9 59/64"
Total rudder angle	73° (2 x 36,5°)	
Weight	37 kg	81.5 lbs

ELECTRO-HYDRAULIC STEERING SYSTEMS FROM 334 TO 3832 kgm

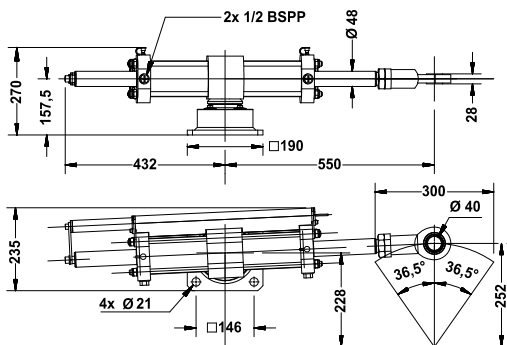
RECEIVERS

Cylinders / Linear Sensors



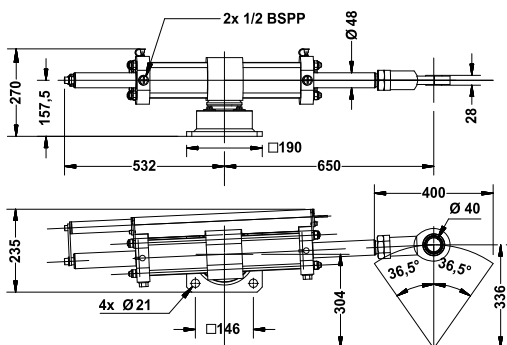
2203442 VHM 90 DT C400 + Linear Sensor

Maximum torque	1000 kgm	7233 ft.lbs
Stroke	400 mm	15 3/4"
Maximum pressure	60 bars	870 PSI
Volume	2090 cc	128 cu.in
Radius of tiller arm	336 mm	13 25/32"
Total rudder angle	73° (2 x 36,5°)	
Weight	47.5 kg	100 lbs



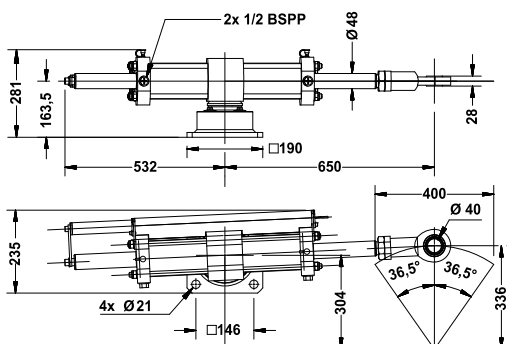
2203443 VHM 110 DT C300 + Linear Sensor

Maximum torque	1164 kgm	8565 ft.lbs
Stroke	300 mm	11 13/16"
Maximum pressure	60 bars	870 PSI
Volume	2307 cc	141 cu.in
Radius of tiller arm	252 mm	9 59/64"
Total rudder angle	73° (2 x 36,5°)	
Weight	52 kg	115 lbs



2203444 VHM 110 DT + Linear Sensor

Maximum torque	1552 kgm	11446 ft.lbs
Stroke	400 mm	15 3/4"
Maximum pressure	60 bars	870 PSI
Volume	3076 cc	87.7 cu.in
Radius of tiller arm	336 mm	13 25/32"
Total rudder angle	73° (2 x 36,5°)	
Weight	55.5 kg	122 lbs



2203445 VHM 120 DT + Linear Sensor

Maximum torque	1916 kgm	14131 ft.lbs
Stroke	400 mm	15 3/4"
Maximum pressure	60 bars	870 PSI
Volume	3798 cc	231.8 cu.in
Radius of tiller arm	336 mm	13 25/32"
Total rudder angle	73° (2 x 36,5°)	
Weight	62.5 kg	138 lbs

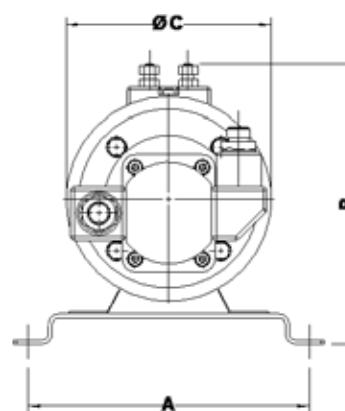
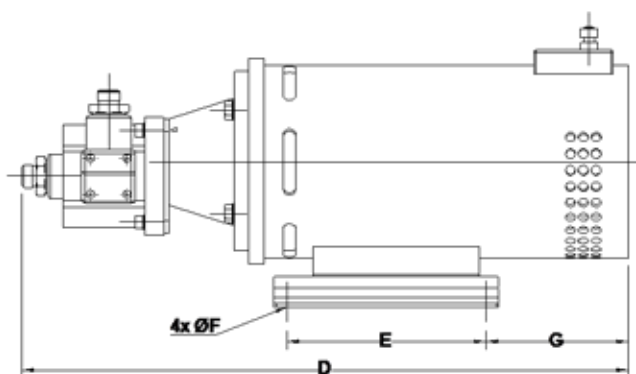
ELECTRO-HYDRAULIC STEERING SYSTEMS FROM 334 TO 3832 kgm

POWER PACKS, TANKS AND PROPORTIONAL DISTRIBUTORS

Power Packs

Power packs are complete assembled units consisting of an electric motor, a hydraulic pump with fittings, a coupling between the pump and the motor and a support plate. Pump and motor capacities vary in function of the volume and the number of cylinders to be driven.

Electric motors can be supplied within certain limits (see pages 12 and 13) in 24V direct-current, single-phase or three-phase alternating current. They can be delivered assembled on the equipped tank or separately for on-line installation between the tank and the proportional distributor.



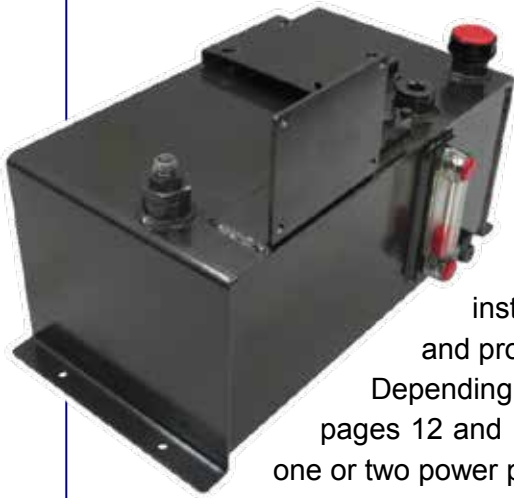
Power Packs

		A	B	C	D	E	F	G	H
2203409	0,9 kW - 8 l/mn - 24 VDC + support plate	220	210	150	435	155	9	65	220
2203410	1,9 kW - 12 l/mn - 24 VDC + support plate	220	240	160	465	155	9	105	220
2203411	3 kW - 22 l/mn - 24 VDC + support plate	270	240	195	545	150	11	155	270
2203412	1,1 kW - 9 l/mn - 400 VAC 3-PHASE + support plate	220	250	190	395	155	9	45	220
2203413	2,2 kW - 17 l/mn - 400 VAC 3-PHASE + support plate	270	265	200	475	150	11	85	270
2203414	3 kW - 22 l/mn - 400 VAC 3-PHASE + support plate	270	265	220	480	150	11	85	270
2203415	4 kW - 32,5 l/mn - 400 VAC 3-PHASE + support plate	270	285	235	530	150	11	125	270
2203416	7,5 kW - 59 l/mn - 400 VAC 3-PHASE + support plate	410	335	300	630	190	11	110	410
2203417	1,1 kW - 9 l/mn - 230 VAC 1-PHASE + support plate	220	270	185	420	155	9	40	220
2203418	2,2 kW - 17 l/mn - 230 VAC 1-PHASE + support plate	270	285	200	475	150	11	85	270
2203419	3 kW - 22 l/mn - 230 VAC 1-PHASE + support plate	270	300	220	480	150	11	80	270

ELECTRO-HYDRAULIC STEERING SYSTEMS FROM 334 TO 3832 kgm

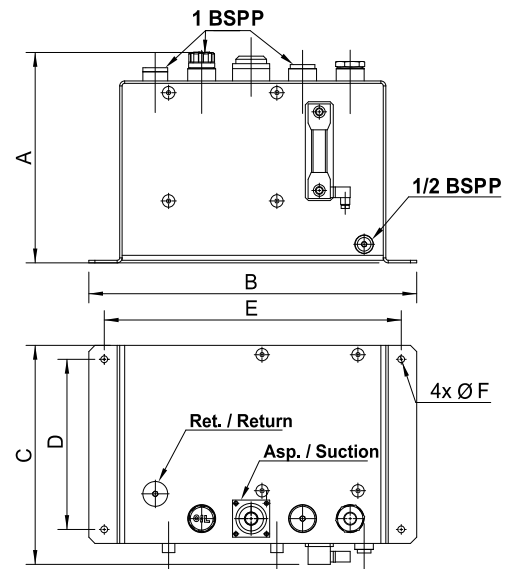
POWER PACKS, TANKS AND PROPORTIONAL DISTRIBUTORS

Equipped Tanks



Their volumes are determined by the flow rates generated by the power packs. They are fitted with filling and emptying apertures and oil level sight glass with alarm. They also feature anchoring studs for the installation of the power packs and proportional distributors.

Depending on the system setup (see pages 12 and 13), they can accommodate one or two power packs.

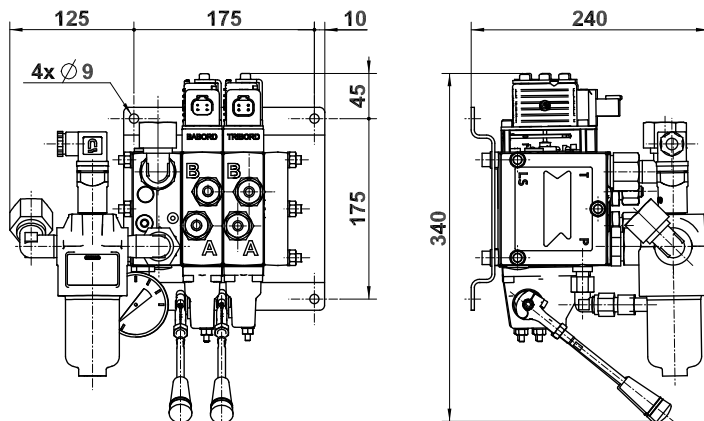


		A	B	C	D	E	ØF
2203425	25 L equipped tank	325	530	350	275	480	11
2203426	50 L equipped tank	340	650	440	350	600	11
2203427	80 L equipped tank	390	730	500	400	680	11
2203428	120 L equipped tank	430	865	550	450	815	11

Proportional Distributors

In accordance with the analogue order received by the programmable logic controller, the proportional hydraulic distributor will provide the flow and hydraulic pressure needed to move the cylinder(s) at the speed and to the positions commanded by the steering wheel, the joystick or any other transmitter.

In the case of a double cylinder installation, its independent modules allow for permanent synchronization of the cylinders. The modules are fitted with relief valves which protect the circuit against excessive pressure rise. They feature manual overrides in the event of a loss of power and are protected by a filter with clogging detection alarm. They can be delivered assembled on the equipped tank or separately for on-line installation between the equipped tank and the cylinders.



2203431	10 L single proportional distributor	2203434	10 L double proportional distributor
2203432	25 L single proportional distributor	2203435	25 L double proportional distributor
2203433	40 L single proportional distributor	2203436	40 L double proportional distributor

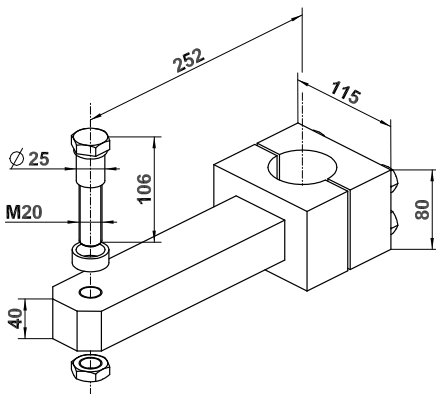
ELECTRO-HYDRAULIC STEERING SYSTEMS FROM 334 TO 3832 kgm

TILLER ARMS



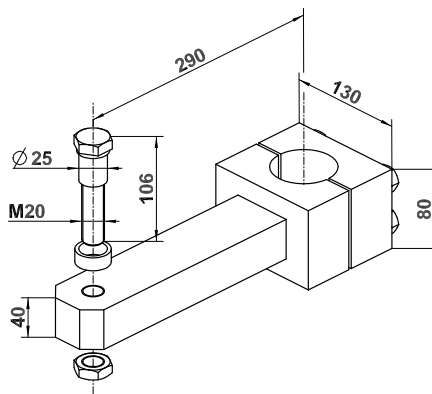
2203300

334 kgm equipped tiller arm
Pilot bored $\varnothing 20$ - Maxi $\varnothing 64$



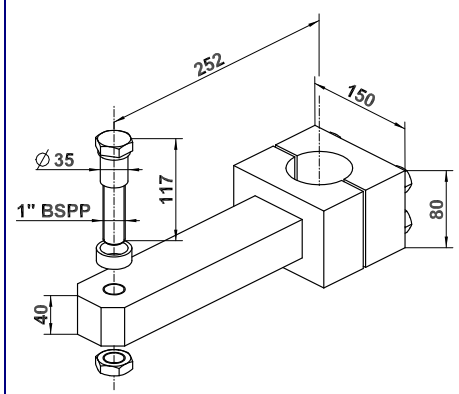
2203301

435 kgm equipped tiller arm
Pilot bored $\varnothing 20$ - Maxi $\varnothing 64$



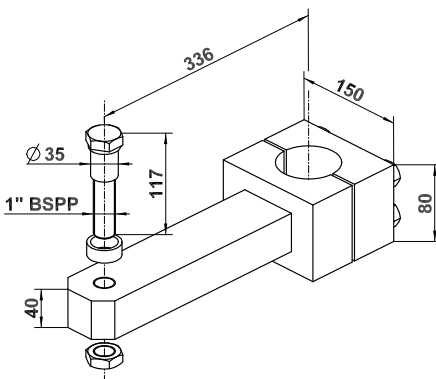
2203302

588 / 790 kgm equipped tiller arm
Pilot bored $\varnothing 20$ - Maxi $\varnothing 88$



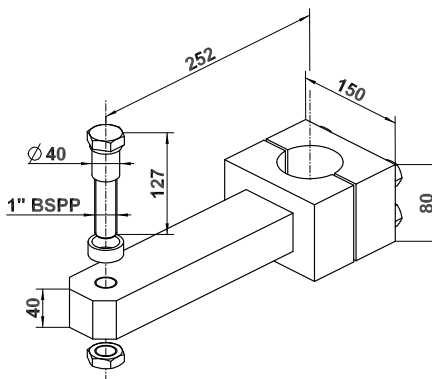
2203303

1000 kgm equipped tiller arm
Pilot bored $\varnothing 20$ - Maxi $\varnothing 88$



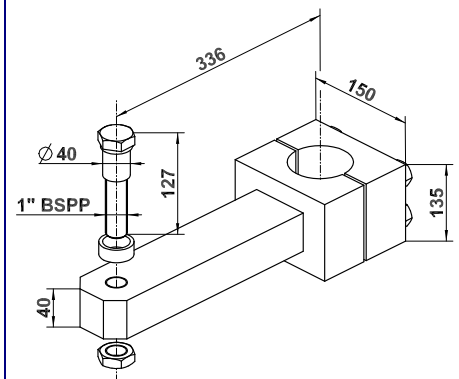
2203304

1164 kgm equipped tiller arm
Pilot bored $\varnothing 20$ - Maxi $\varnothing 88$
For 2328 kgm double cylinder only



2203305

1552 / 1916 kgm equipped tiller arm
Pilot bored $\varnothing 20$ - Maxi $\varnothing 100$



ELECTRO-HYDRAULIC STEERING SYSTEMS FROM 334 TO 3832 kgm

SELECTION OF THE STEERING SYSTEM

Electro-Hydraulic Steering System with Single Cylinder

		Single Steering Station	Double Steering Station
2203400	*Electric Wheel (2.5 turns)	1	N/A
2203287	*540° Electric Wheel	1	2
2203288	Proportional Joystick (FFU)	1 to 4	1 to 4
2203296	Selector Knob	1 to 5	2 to 6
2203403	*Angular Control	1 or more	1 or more
2203295	Screen Display	1	1
2203407	Programmable Logic Controller	1	1

* Analog transmitters. Maximum three transmitters of all types per system.

Torque in kgm	334	435	588	790	1000	1552	1916
Cylinder + Sensor	2203438	2203439	2203440	2203441	2203442	2203444	2203445
Hydraulic Power Pack – 3-phase	2203412		2203413		2203414		2203415
Equipped Reservoir	2203425		2203426				2203427
Single Proportional Distributor	2203431		2203432				2203433
Hydraulic Power Pack – 1-phase	2203417		2203418		2203419		
Equipped Reservoir	2203425		2203426				
Single Proportional Distributor	2203431		2203432				
Hydraulic Power Pack – 24 VDC	2203409		2203410		2203411		
Equipped Reservoir	2203425		2203426				
Single Proportional Distributor	2203431		2203432				
Tiller Arm	2203300	2203301	2203302	2203303	2203305		
Electrical Harness / Hydraulic Piping: in function of the steering system setup (see pages 14 and 15)							

Example of a Steering System Setup

Specifications of the steering system: 900 kgm rudder torque – Double steering station + 1 Joystick – Voltage available: single-phase 230V / 50 Hz

Parts to select:

✓ 2 x 540° Electric wheels	2203287
✓ 1 x Proportional joystick (FFU)	2203288
✓ 3 x Selector knobs	2203296
✓ 1 x Screen display	2203295
✓ 1 x Programmable logic controller	2203407
✓ 1 x Cylinder + sensor	2203442
✓ 1 x Equipped reservoir	2203426
✓ 1 x Single-phase hydraulic power pack	2203418
✓ 1 x Single proportional distributor	2203432
✓ 1 x Tiller arm	2203303
✓ 1 x Electrical harness / 1 Hydraulic piping	Lengths to be determined

ELECTRO-HYDRAULIC STEERING SYSTEMS FROM 334 TO 3832 kgm

SELECTION OF THE STEERING SYSTEM

Electro-Hydraulic Steering System with Double Cylinder

		Single Steering Station	Double Steering Station
2203400	*Electric Wheel (2.5 turns)	1	N/A
2203287	*540° Electric Wheel	1	2
2203288	Proportional Joystick (FFU)	1 to 4	1 à 4
2203296	Selector Knob	1 to 5	2 to 6
2203403	*Angular Control	1 or more	1 or more
2203295	Screen Display	1	1
2203407	Programmable Logic Controller	1	1

* Analog transmitters. Maximum three transmitters of all types per system.

Torque in kgm	640	870	1176	1580	2000	2328	3104	3832
Cylinder + Sensor	2203438	2203439	2203440	2203441	2203442	2203443	2203444	2203445
Hydraulic Power Pack – 3-phase	2203413		2203415		2203416			
Equipped Reservoir	2203426		2203427		2203428			
Double Proportional Distributor	2203434		2203435		2203436			
Hydraulic Power Pack – 1-phase	2203418		2203419					
Equipped Reservoir	2203426							
Double Proportional Distributor	2203434		2203435					
Hydraulic Power Pack - 24 VDC	2203410		2203411		2 x 2203411			
Equipped Reservoir	2203425		2203426		2203428			
Double Proportional Distributor	2203434		2203435					
Tiller Arm	2203300	2203301	2203302		2203303	2203304	2203305	
Electrical Harness / Hydraulic Piping: in function of the steering system setup (see pages 14 and 15)								

Example of a Steering System Setup

Specifications of the steering system: 900 kgm rudder torque – Double steering station + 1 joystick – Voltage available: single-phase 230V / 50 Hz

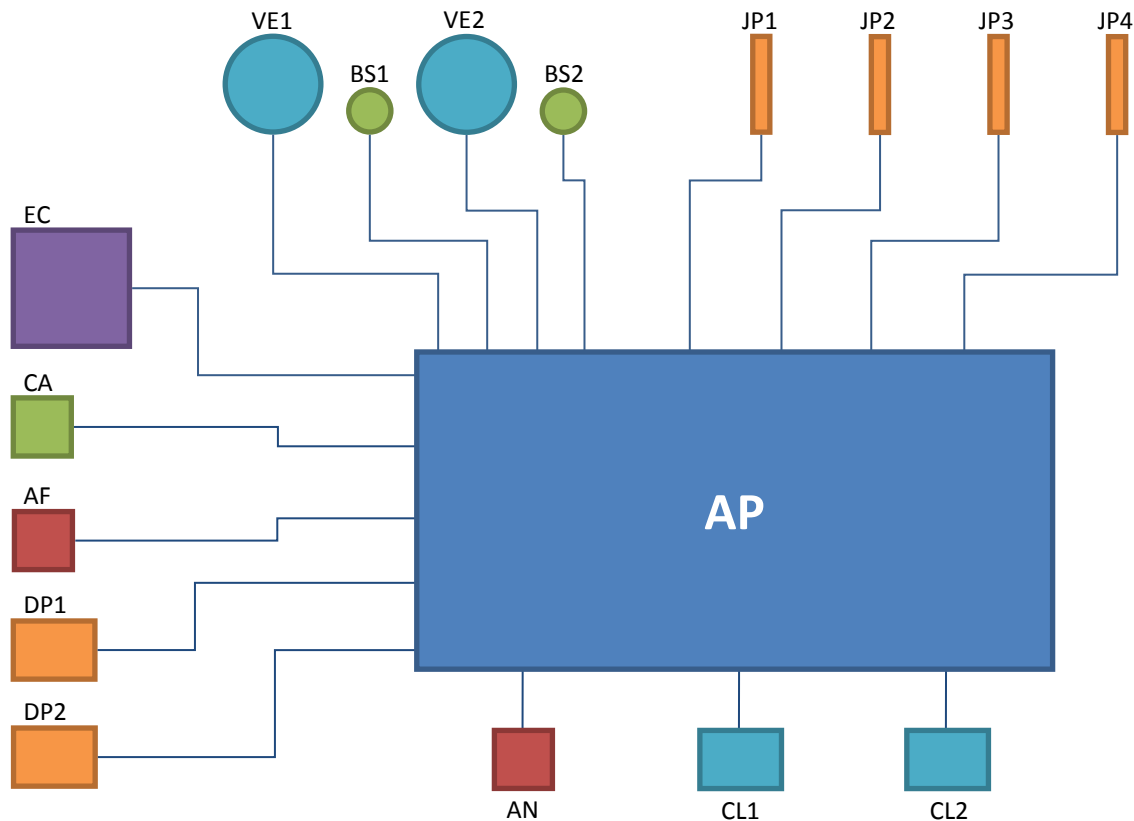
Parts to select:

✓ 2 x 540° Electric wheels	2203287
✓ 1 x Proportional joystick (FFU)	2203288
✓ 3 x Selector knobs	2203296
✓ 1 x Screen display	2203295
✓ 1 x Programmable logic controller	2203407
✓ 2 x Cylinders + sensors	2203440
✓ 1 x Equipped reservoir	2203426
✓ 1 x Single-phase, single-motor power pack	2203418
✓ 1 x Double proportional distributor	2203434
✓ 2 x Tiller arms	2203302
✓ 1 x Electrical harness / 1 Hydraulic piping	Lengths to be determined

ELECTRO-HYDRAULIC STEERING SYSTEMS FROM 334 TO 3832 KGM

ELECTRICAL HARNESS

The electrical harness consists of all electrical wires connecting the transmitters and receivers to the programmable logic controller. Its definition depends on the number and type of steering system components and on the distances between these components and the programmable logic controller. Each wire is fitted on both ends with paired pre-swaged connector halves.



AP	Programmable Logic Controller	CA	Angular Control
VE	Electric Wheel	DP	Proportional Distributor
BS	Selector Knob	AN	Oil Level Alarm
JP	Proportional Joystick	AF	Filter Clogging Alarm
EC	Screen Display	CL	Linear Sensor

Example of an Electrical Harness Setup

Specifications of the steering system:

Twin steering station + 1 joystick + 2 selector knobs + 1 screen display + 1 programmable logic controller + 2 cylinders/linear sensors + 1 power pack + 1 equipped tank + 1 double proportional distributor (double cylinder).

Define the individual wire lengths on the above diagram:

VE1/AP - BS1/AP - V2/AP - BS2/AP

JP1/AP

EC/AP

DP1/AP - DP2/AP

AN/AP - AF/AP

CL1/AP - CL2/AP

ELECTRO-HYDRAULIC STEERING SYSTEMS FROM 334 TO 3832 kgm

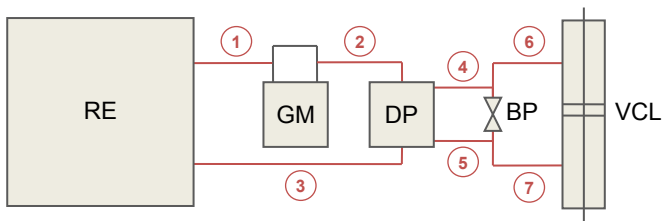
HYDRAULIC PIPING

The hydraulic piping represents all the hydraulic flexible tubes linking together the hydraulic components (equipped tank, proportional distributor, by-pass valve, cylinder...). Its definition depends on the number and type of steering system components and on the distances between these components. It also depends on the configuration of the hydraulic diagram (single or double cylinder, elements supplied on the equipped tank or separately).

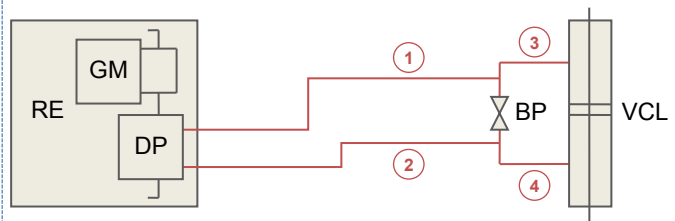
Each hydraulic hose is fitted with pre-swaged fittings and union fittings on both ends.

ELECTRO-HYDRAULIC STEERING SYSTEM WITH SINGLE CYLINDER

I Separate power pack and single proportional distributor



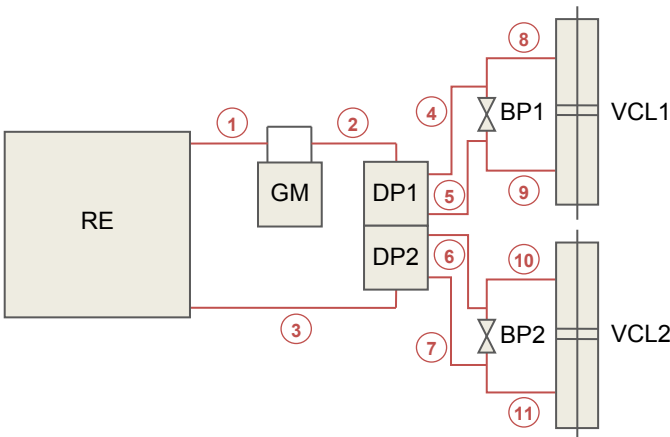
I' Power pack and single proportional distributor mounted on the equipped tank



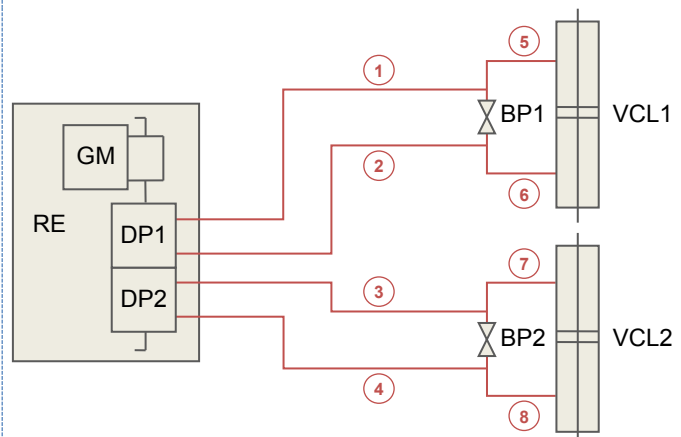
RE	Equipped Tank	BP	By-Pass Valve
GM	Power Pack	VCL	Cylinder / Linear Sensor
DP	Single Proportional Distributor		

ELECTRO-HYDRAULIC STEERING SYSTEM WITH DOUBLE CYLINDER

II Separate power pack and double proportional distributor



II' Power pack and double proportional distributor mounted on the equipped tank



RE	Equipped Tank	BP	By-Pass Valves 1 and 2
GM	Power Pack	VCL	Cylinders / Linear Sensors 1 and 2
DP	Double Proportional Distributor 1and- 2		

Example of Hydraulic Piping Setup

Specifications of the steering system configuration:

Electro-hydraulic steering system with double cylinder and separate elements.

In function of the chosen locations for the installation of the elements on the boat, the distances numbered

① to ⑪ in the above diagram II must be determined.

ACCESSORIES FOR ELECTRO-HYDRAULIC STEERING SYSTEMS

FLEXIBLE TUBES WITH PRE-CRIMPED CONNECTIONS

High pressure flexible tubes of various lengths with pre-crimped connections of various kinds (several diameters, straight fittings, 90° elbow fittings). Stainless steel fittings available.

A few references in 10 L :

- Flex. tube R1T8 lg 500 – 2 x EFT10L **1290013**
- Flex. tube R1T8 lg 1000 – 2 x EFT10L **1290023**
- Flex. tube R1T8 lg 1500 – 2 x EFT10L **1290025**
- Flex. tube R1T8 lg 2000 – 2 x EFT10L **1290027**
- Flex. tube R1T8 lg 3000 – 2 x EFT10L **1290117**

A few references in 12 L :

- Flex. tube R1T10 lg 500 – 2 x EFT12L **1290042**
- Flex. tube R1T10 lg 1000 – 2 x EFT12L **1290052**
- Flex. tube R1T10 lg 1500 – 2 x EFT12L **1290054**
- Flex. tube R1T10 lg 2000 – 2 x EFT12L **1290056**
- Flexi. tube R1T10 lg 3000 – 2 x EFT12L **1290130**

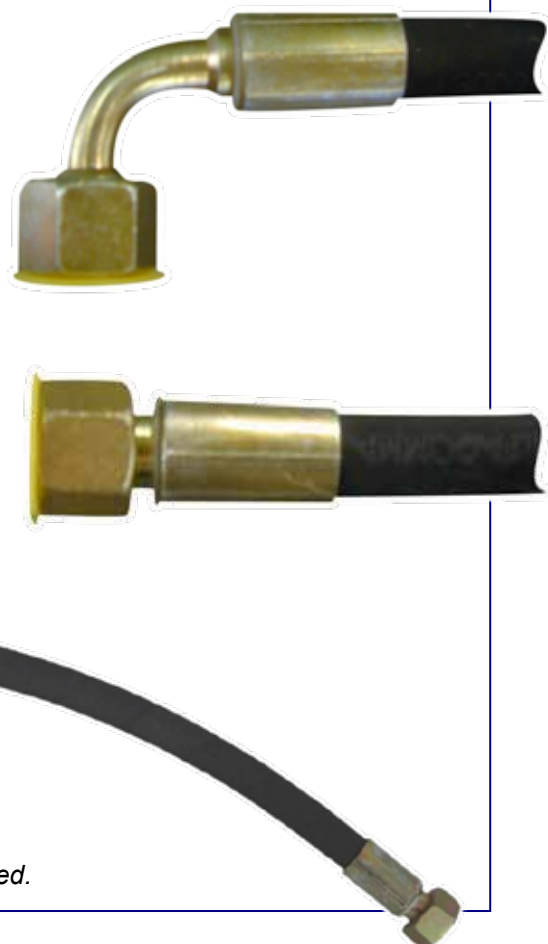
A few references in 15 L :

- Flex. tube R1T13 lg 500 – 2 x EFT15L **1290385**
- Flex. tube R1T13 lg 1000 – 2 x EFT15L **1290376**
- Flex. tube R1T13 lg 2000 – 2 x EFT15L **1290387**
- Flex. tube R1T13 lg 2500 – 2 x EFT15L **1290378**

A few references in 18 L :

- Flex. tube R1T16 lg 500 – 2 x EFT18L **1290077**
- Flex. tube R1T16 lg 1000 – 2 x EFT18L **1290087**
- Flex. tube R1T16 lg 1500 – 2 x EFT18L **1290089**
- Flex. tube R1T16 lg 2000 – 2 x EFT18L **1290091**
- Flex. tube R1T16 lg 3000 – 2 x EFT18L **1290112**

Other lengths on request. Possibility to make up specific kits as needed.



STEERING OIL



2203045 20 Litre oil can
white oil ISO 22

2203201 20 Litre oil can
Dexron II

2200017 2 Litre oil can
Dexron II



ACCESSORIES FOR ELECTRO-HYDRAULIC STEERING SYSTEMS

BY-PASS VALVES



By-pass valve–inflexible tube 6 x 8	2200683
By-pass valve–inflexible tube 8 x 10	2200045
By-pass valve–inflexible tube 10 x 12	2200097
By-pass valve–inflexible tube 13 x 15	2202022
By-pass valve–inflexible tube 15 x 18	2200015

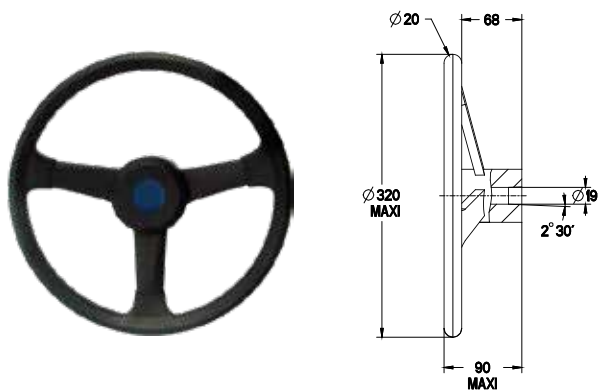
FITTINGS FOR INFLEXIBLE TUBE

 Straight fittings	1/4 BSPP diam. 8	2200435
	1/4 BSPP diam. 10	2200436
	3/8 BSPP diam. 10	2200437
	3/8 BSPP diam. 12	2200438
	3/8 BSPP diam. 17	2201016
	1/2 BSPP diam. 18	2200439
	1/2 BSPP diam. 21	2200388
 Elbow fittings	1/4 BSPT diam. 10	2200440
	3/8 BSPT diam. 12	2200306
	3/8 BSPT diam. 17	2201541
	1/2 BSPT diam. 18	2200441
	1/2 BSPT diam. 21	1202330
 Tee fittings	1/4 BSPT diam. 10	2200442
	3/8 BSPT diam. 12	2200443
	3/8 BSPT diam. 17	2201542
	1/2 BSPT diam. 18	2200339
	1/2 BSPT diam. 21	2201543
 Connection fittings	Diam. 10	2200469
	Diam. 12	2200585
	Diam. 17	2201302
	Diam. 18	2200270
	Diam. 21	2201303
 Equal tee fittings	Diam. 8	2200444
	Diam. 10	2200259
	Diam. 12	2200445
	Diam. 17	2201544
	Diam. 18	2200446
	Diam. 21	2201545
 Reductions	1/8 BSPP M – 1/4 BSPP F	1202438
	1/4 BSPP M – 3/8 BSPP F	2200390
	1/4 BSPP M – 1/2 BSPP F	2200389
	3/8 BSPP M – 1/4 BSPP F	2200374
	3/8 BSPP M – 1/2 BSPP F	2200396
	1/2 BSPP M – 1/4 BSPP F	2200221
	1/2 BSPP M – 3/8 BSPP F	2200332

ACCESSORIES FOR ELECTRO-HYDRAULIC STEERING SYSTEMS

RANGE OF STEERING WHEELS

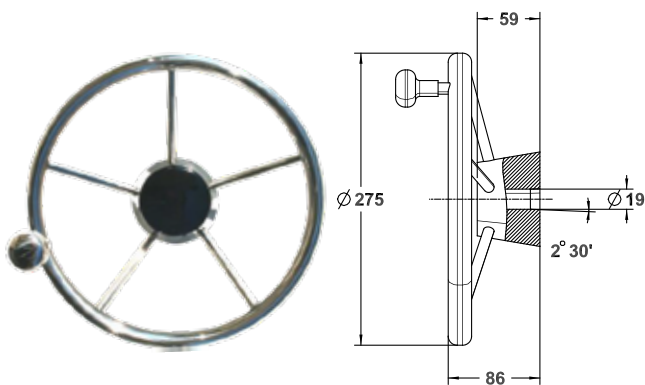
2200181 Plastic Wheel Ø 320



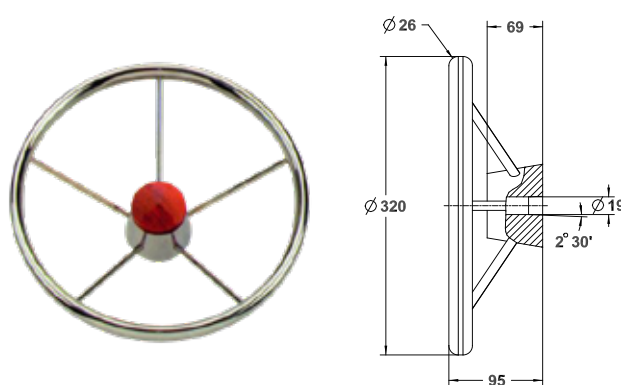
2200182 Imitation Leather/Anodised Alu Ø 320



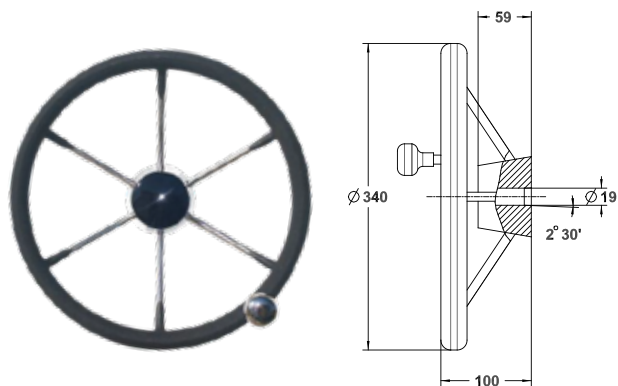
2202462 S/Steel Wheel with knob Ø 275



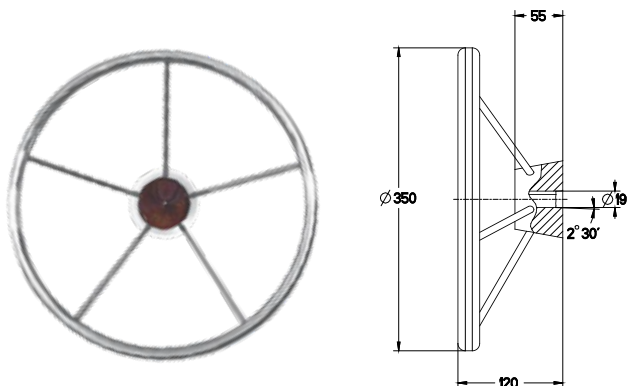
2203376 S/Steel Wheel Ø 320



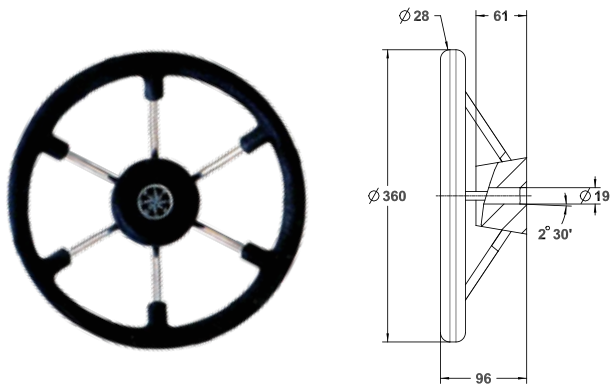
2202464 Covered S/Steel Wheel with knob Ø 340



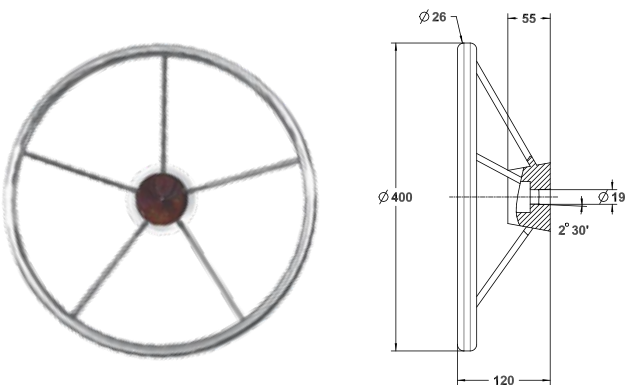
2200985 S/Steel Wheel Ø 350



2203377 Covered S/Steel Wheel Ø 360



2200986 S/Steel Wheel Ø 400



GUARANTEE

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

2) The guarantee is applicable only if the client has satisfied the general obligations of this contract, in particular, the terms of payment.

3) The guarantee only includes equipment sold by the manufacturer. It does not extend to equipment in which the manufacturer's supply has been installed and, in particular, to the performances of this equipment.

4) When the manufacturer's supplies are installed by the client or a third party into any other equipment, they remain solely responsible for this installation, the selection and suitability of the manufacturer's supplies as the manufacturer's diagrams, designs and proposals are given as an indication only, unless otherwise specified in the order. In particular, the manufacturer does not guarantee components or equipment not sold by him, nor the assembly, adaptation, design or operation of the assembly or parts of the assembly thus created. The manufacturer's supply, as well as the assembly created by the client or a third party, are assumed to be operated under the exclusive control of the client or the third party.

5) The period of the guarantee is eighteen months starting from the date of first use by the original consumer or twenty four months from the date of delivery of the products to the transporter, distributor or wholesaler. The manufacturer has the right to require from the client proof of the commissioning date specified on the guarantee request. 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.

6) The obligation of the guarantee only applies if the client establishes that the defect appeared under normal operating conditions stipulated for this type of supply, or indicated by the manufacturer in writing and during normal operation. It does not apply in case of negligence, faulty maintenance or supervision, operator's responsibility, imprudence, non observance of recommended or operating instructions, or the use of oil of insufficient quality for the equipment. The manufacturer is released from responsibility for any damage caused by loss of oil or leaks. The guarantee also does not apply for any incidents resulting from a case of force majeure or Acts of God, as well as any damage, replacement or repairs exceeding the normal material wear.

7) The guarantee is limited to the repair in the manufacturer's shop at his own cost within the shortest possible time, of the equipment and parts supplied by him, identified as defective by the technical department. These parts must be sent pre-paid. No claim may be made for compensation for any damage such as personal injury, damage to goods other than those concerned in this contract, privation of possession, operating losses, commercial damage or loss of earnings. During the guarantee period, the cost of labor, dismantling and reassembly of the equipment outside the manufacturer's plant, the shipping costs for repaired, replaced or faulty equipment, travelling and accommodation expenses for technicians are the responsibility of the client.

When the guarantees are given according to the industrial results for a given equipment, these results and the consequences of this undertaking will result in a special agreement between the parties.

8) In order to take advantage of this guarantee, the client must notify the manufacturer in writing as soon as possible of the defects attributed to the equipment and provide any proof concerning these defects. He must do his best for the manufacturer to be able to ascertain these defects and to perform corrective actions. 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. After receiving proper notification of the equipment defect, the manufacturer 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.

9) The client agrees that the manufacturer will not be responsible for damage due to the fact that the client has not satisfied any of the obligations defined above.

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Brief history

At the time of its setting up in the Paris region in 1944, Lecomble & Schmitt was designing and manufacturing volumetric pumps with floating regulators. It was not until 1950 that devoted to 40 years of experience in hydraulics the adventure in the nautical industry started in the meanwhile, the company had moved to the Basque Country in the middle south-west of France.

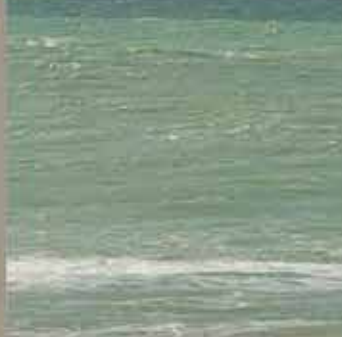
Nowadays, Lecomble & Schmitt is the only French manufacturer to offer hydraulic and mechanic steering systems for pleasure boats, fishing and work crafts.

Since 1998 L.S. has been a subsidiary of the industrial group Arcturax which is also established in the Basque Country. The activities of the group and its know-how are so varied as to encompass and include design, precision machining, sheet metal working, plastics technology, injection and thermodynamics and composite moulding.

LECOMBLE & SCHMITT is a French company specialized in the design and manufacture of hydraulic steering systems for boats.

LECOMBLE & SCHMITT offers an extensive service that includes all aspects of technical and marine gear (boats) as well as for yachts.

LECOMBLE & SCHMITT is here to advise you and offer you the most suitable system of steering in the opportunity of your needs.



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