

Power Assisted and «Steer-by-Wire» Steering Systems



Lecomble & Schmitt s.A.s.

156 route de Briscous
64240 URT – France

Sales Department: 33 (0) 559 56 24 11 - commercial@ls-france.com

Technical Department: 33 (0) 559 56 26 46 - commercial2@ls-france.com

After Sales Service: 33 (0) 559 56 23 22 - commercial3@ls-france.com

Fax : 33 (0) 559 56 95 71

<https://www.ls-france.com>

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POWER ASSISTED AND ELECTROHYDRAULIC STEERING SYSTEMS

Specifically designed for luxury vessels getting regular and intensive use, LS range of Power Assisted Steering Systems is designed in total compliance with the strictest norms applying to marine equipment.

The recommended solutions for 185 kpm to 2 x 2,000 kpm rudder torque are suitable to equip 15 to 40 metre vessels.

Absolute security comes first in the conception. LS offers modular solutions that can be adapted to your needs (power assisted hydraulic steering systems, electro-hydraulic steering systems "steer-by-wire", hydraulic Electro-Synchronized Steering). Depending on the selected system, the steering remains functional even in case of electrical failure.

Features such as smoothness, accuracy and reduced number of wheel turns give LS power assisted steering systems unequalled comfort.

TORQUE CALCULATION

- **For boats fitted with a rudder**, the torque of the rudder or rudders is calculated as per the following formula and corrections.

It must be known that the torque necessary to manoeuvre a boat depends on :

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

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

C = Torque in kpm

S = Total surface of rudder (H x Lg) in sq. m

H = Height of rudder in m

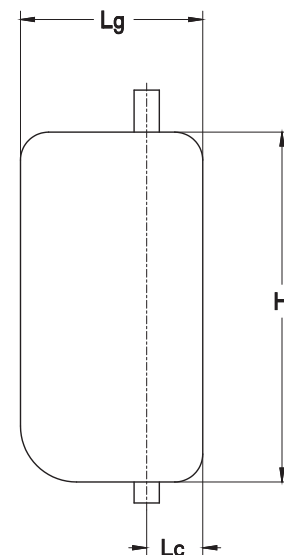
Lg = Width of rudder in m

Lc = Compensation width in m

V = Maximum speed of the boat in knots

K = Coefficient in function of total rudder angle

- Port to starboard 70° **K = 15,89**
- Port to starboard 80° **K = 17,80**
- Port to starboard 90° **K = 19,52**

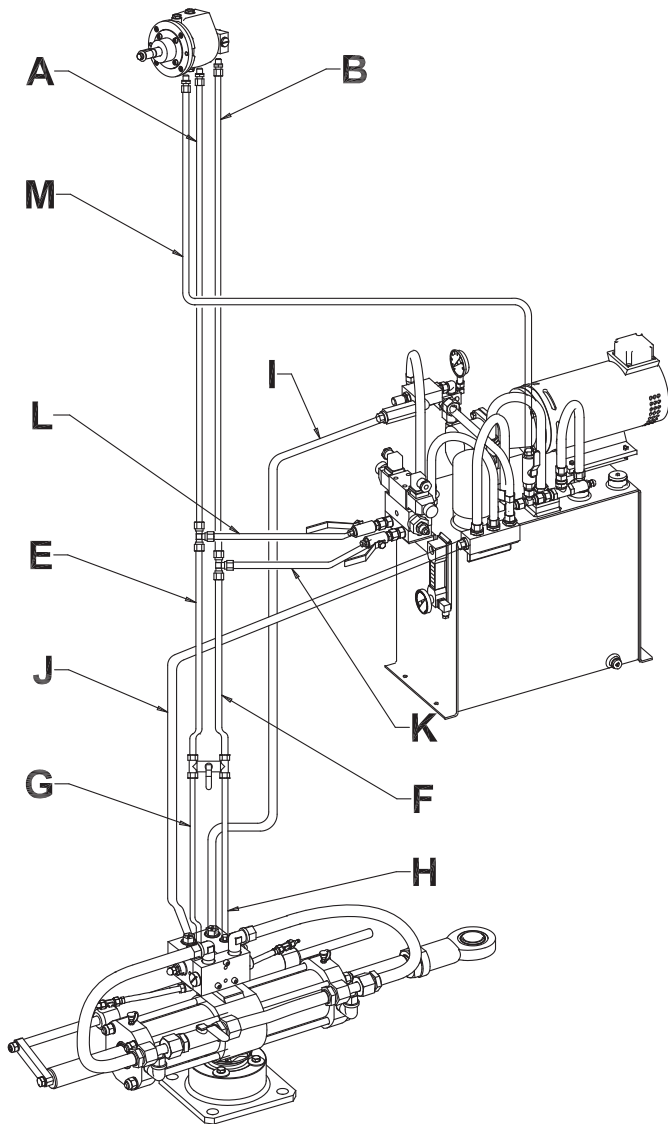


- **Corrections in function of the type of boat :**

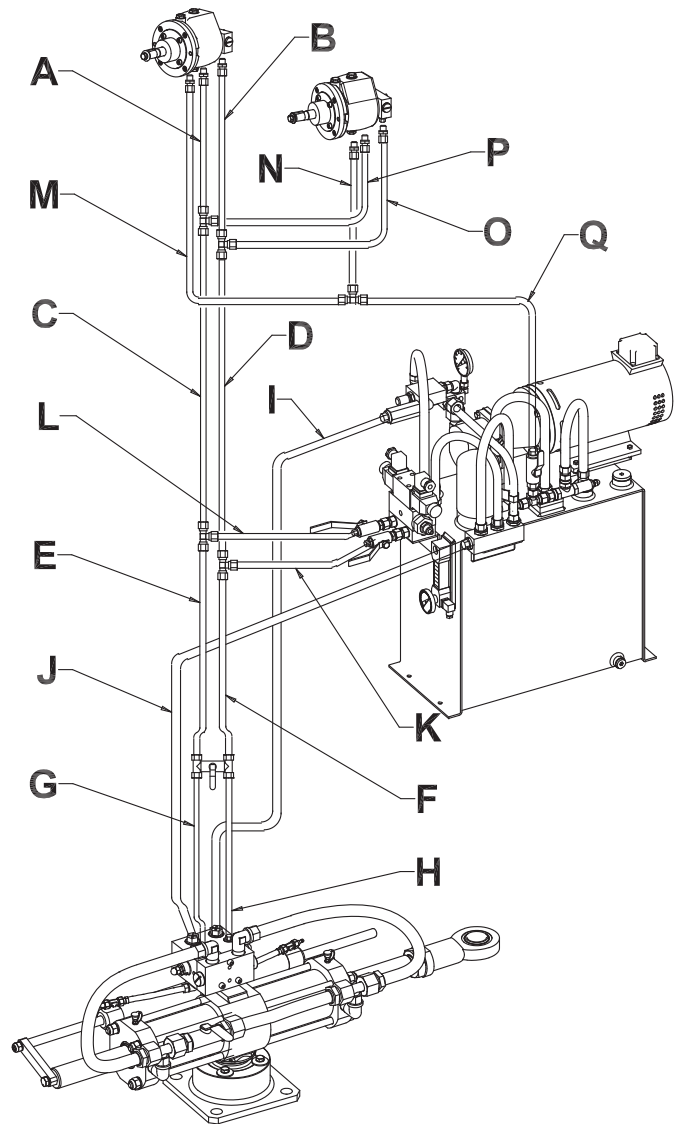
- For a boat with a steering nozzle **C x 2,0**
- For twin engine power boats with 1 rudder **C x 0,5**
- For boats fitted with several rudders (catamarans, monohulls), multiply the calculated torque result by the number of rudders fitted on the boat.

DETERMINATION OF THE LENGTHS OF FLEXIBLE TUBES

Single Steering Station



Double Steering Station



Record in the chart below the dimensions as per the selected configuration above and send this page back to us by mail, fax or e-mail.

A = mm

B = mm

C = mm

D = mm

E = mm

F = mm

G = mm

H = mm

I = mm

J = mm

K = mm

L = mm

M = mm

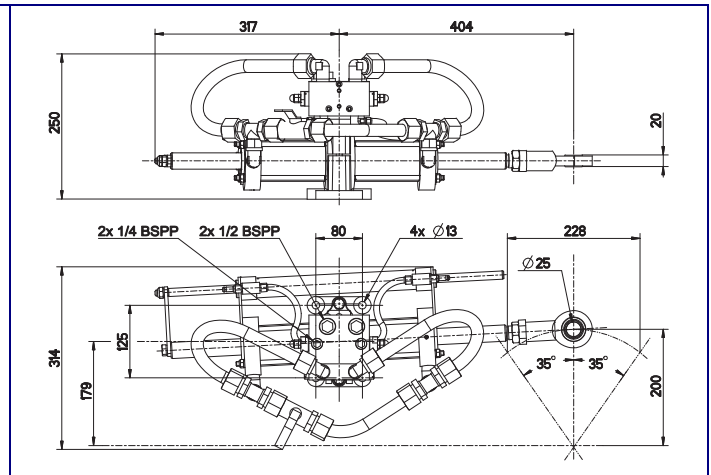
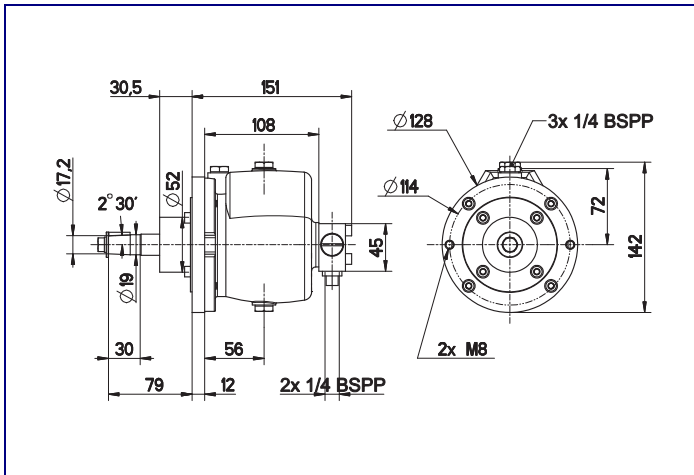
N = mm

O = mm

P = mm

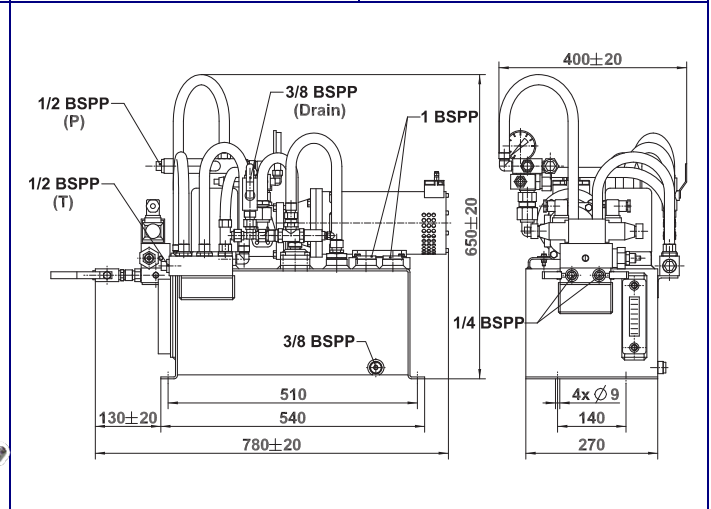
Q = mm

POWER ASSISTED STEERING SYSTEM LS 265 kgm

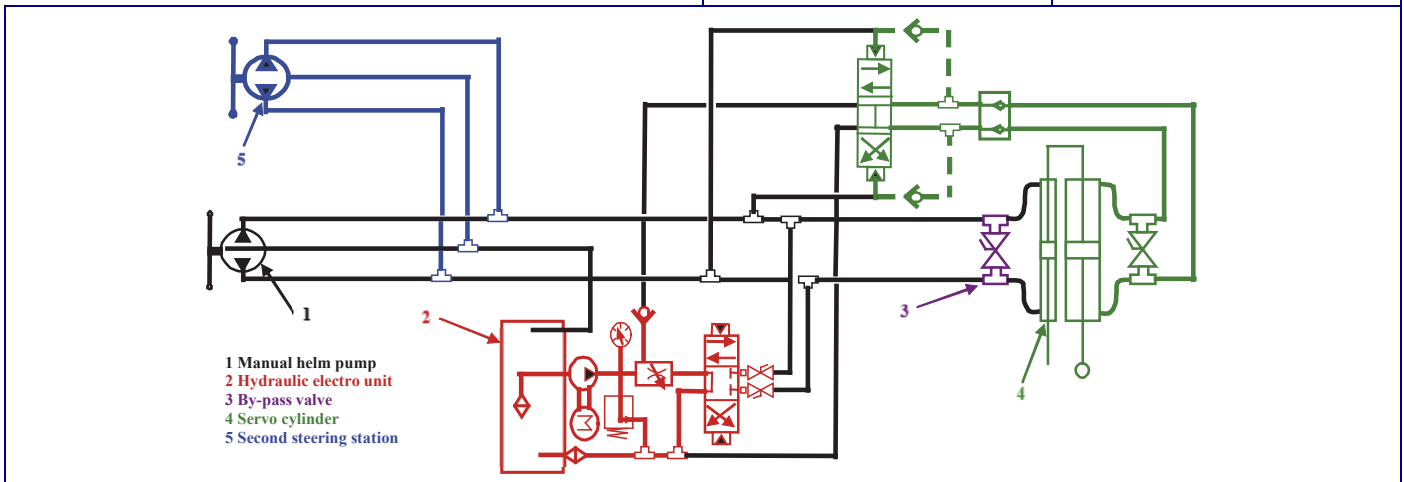


2201151	Pump 29 CT LV DB		
Flow rate	1.7 cu.in/rev	Volume	24.4 cu.in
Minimum size of tubing	.31"x.39"	Recommended wheel diam.	Ø 16 1/2"
Weight	8.8 lbs	Number of turns	3.5 turns

2200959	VHM 60 DT - 28 DT		
Maximum torque	1957 ft.lbs	Radius of tiller arm	7 7/8"
Stroke	9"	Total rudder angle	70°
Maximum pressure	870 PSI	Weight	55.1 lbs



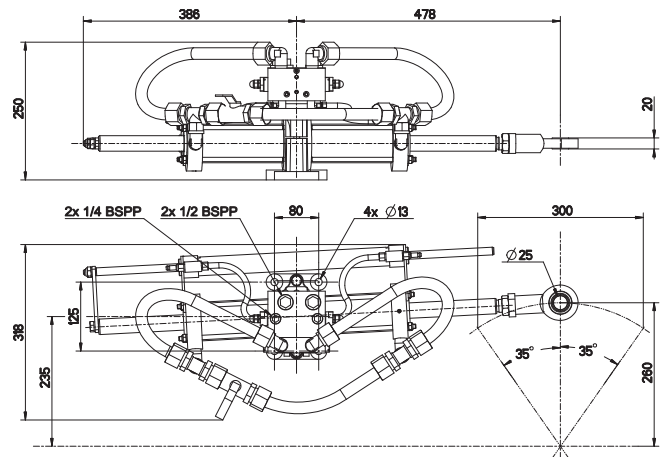
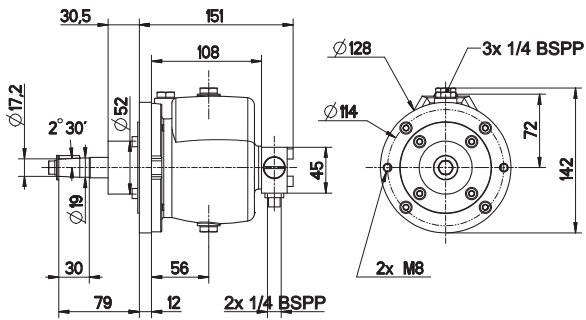
2201206	Hydraulic Electro Unit HF 1-8-24 V – Autopilot function		
2202555	Hydraulic Electro Unit HF 1-8-230 V – Autopilot function		
2202556	Hydraulic Electro Unit HF 1-8-400 V – Autopilot function		
Maximum flow rate	8 l/mn	Maximum pressure	870 PSI
Volume	6.62 US gall	Weight	99.20 lbs



REFERENCE	24 VDC	230 VAC single-phase	400 VAC three-phase
Single steering station + autopilot function + fittings	2202500	2202501	2202502
Double steering station + autopilot function + fittings	2202503	2202504	2202505

Each reference refers to a complete set without flexible tubes. See page 3 to determine the lengths of the flexible tubes required.

POWER ASSISTED STEERING SYSTEM LS 344 kgm

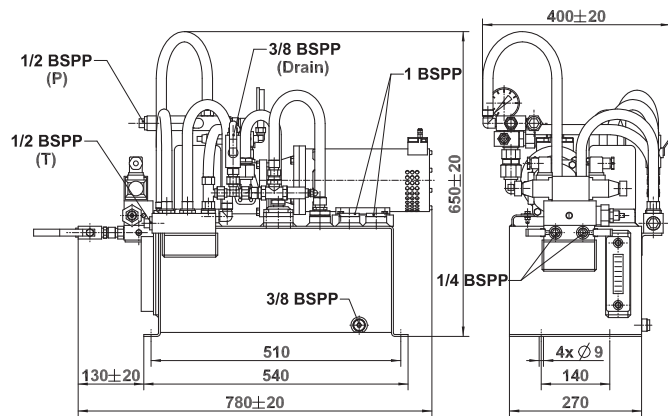


2201151 Pump 29 CT LV DB

2200960 VHM 60 DT C300 – 28 DT

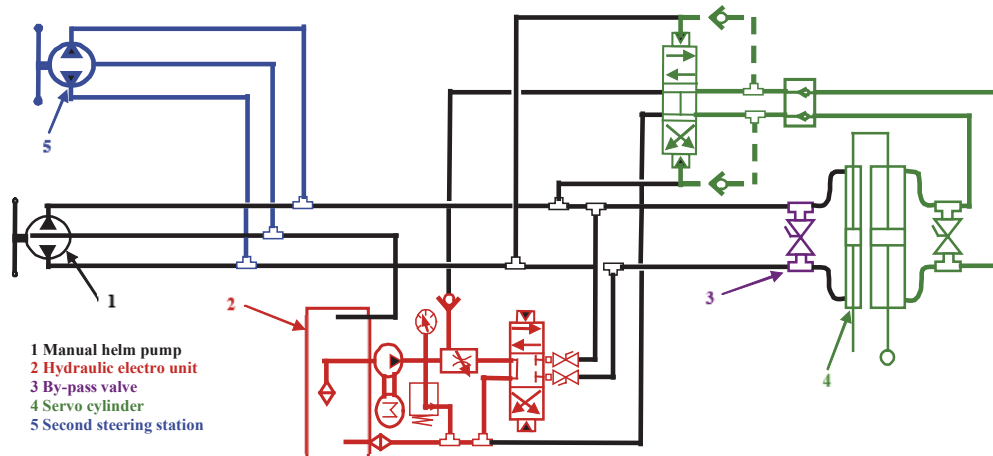
Flow rate	1.7 cu.in/rev	Volume	24.4 cu.in
Minimum size of tubing	.31"x.39"	Recommended wheel diam.	Ø 16 1/2'
Weight	8.8 lbs	Number of turns	4 turns

Maximum torque	2540 ft.lbs	Radius of tiller arm	10 1/4"
Stroke	11 13/16"	Total rudder angle	70°
Maximum pressure	870 PSI	Weight	53.8 lbs



2201206 Hydraulic Electro Unit HF 1-8-24 V – Autopilot function
2202555 Hydraulic Electro Unit HF 1-8-230 V – Autopilot function
2202556 Hydraulic Electro Unit HF 1-8-400 V – Autopilot function

Maximum flow rate	8 l/mn	Maximum pressure	870 PSI
Volume	6.62 US gall	Weight	99.20 lbs

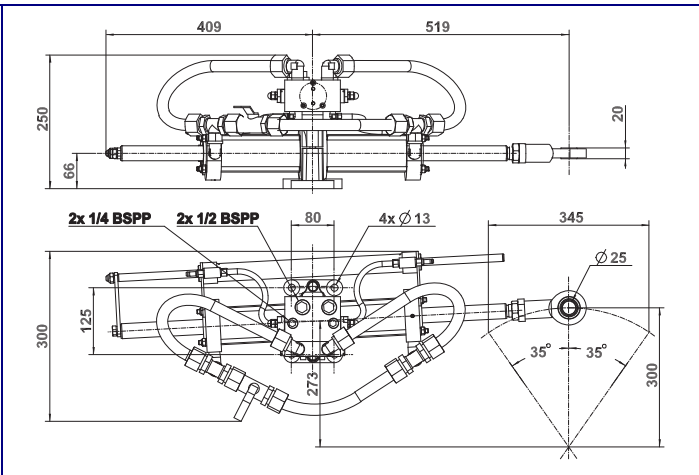
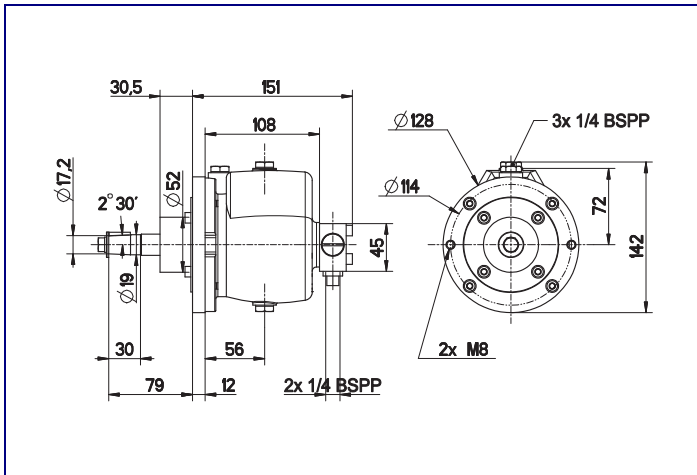


- 1 Manual helm pump
- 2 Hydraulic electro unit
- 3 By-pass valve
- 4 Servo cylinder
- 5 Second steering station

REFERENCE	24 VDC	230 VAC single-phase	400 VAC three-phase
Single steering station + autopilot function + fittings	2202506	2202507	2202508
Double steering station + autopilot function + fittings	2202509	2202510	2202511

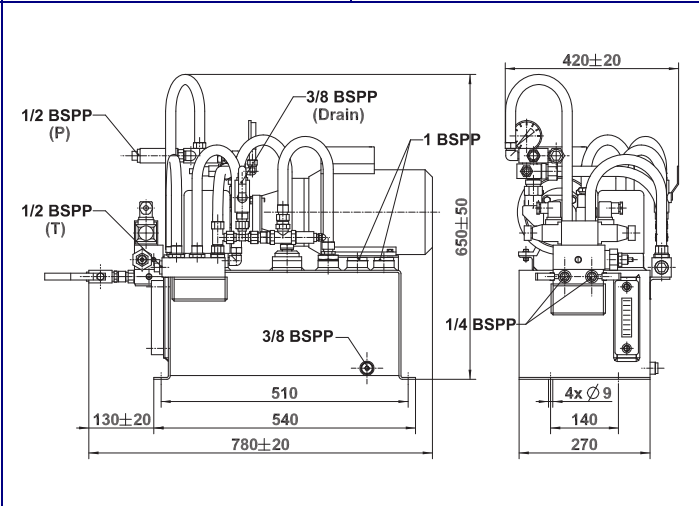
Each reference refers to a complete set without flexible tubes. See page 3 to determine the lengths of the flexible tubes required.

POWER ASSISTED STEERING SYSTEM LS 450 kgm

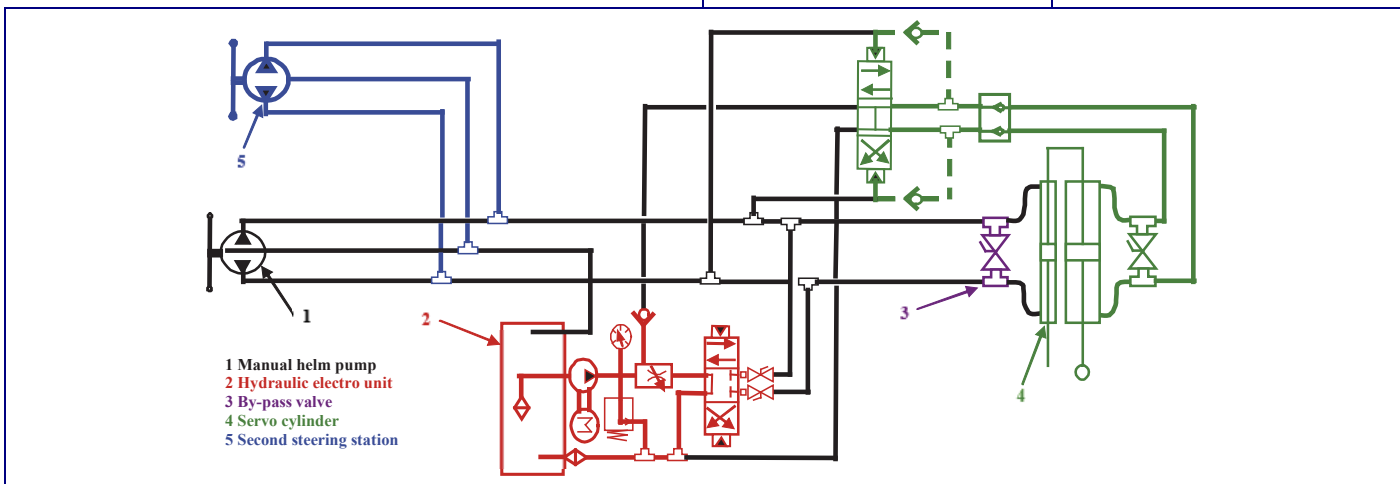


2201055	Pump 40 CT LV DB		
Flow rate	2.44 cu.in/rev	Volume	24.4 cu.in
Minimum size of tubing	.31"x.39"	Recommended wheel diam.	Ø 16 1/2"
Weight	9 lbs	Number of turns	4 turns

2202941	VHM 63 DT C345 – 28 DT		
Maximum torque	3250 ft.lbs	Radius of tiller arm	11 13/16"
Stroke	13 19/22"	Total rudder angle	70°
Maximum pressure	870 PSI	Weight	55.1 lbs



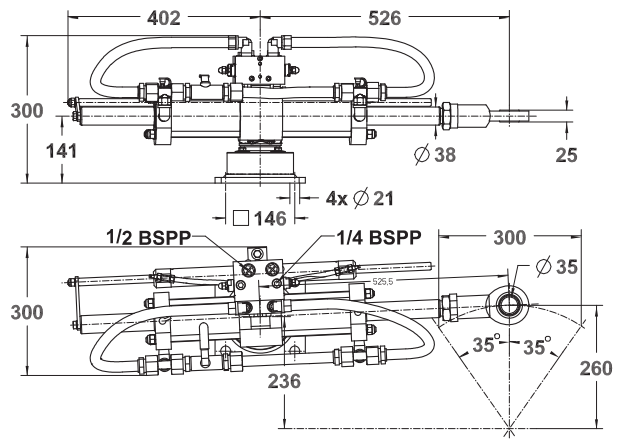
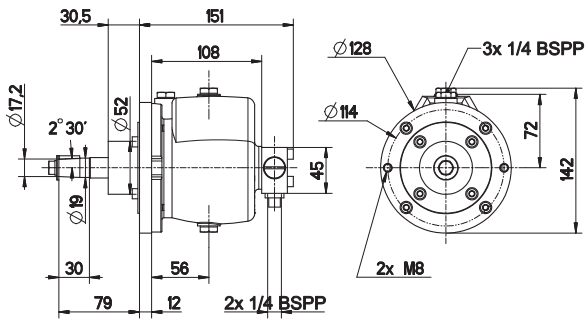
2201361	Hydraulic Electro Unit HF 1.5-11-24 V – Autopilot function		
2202570	Hydraulic Electro Unit HF 1.5-12-230 V – Autopilot function		
2203320	Hydraulic Electro Unit HF 2-12- 400 V – Autopilot function		
Maximum flow rate	12 l/mn	Maximum pressure	870 PSI
Volume	6.62 US gall	Weight	132.3 lbs



REFERENCE	24 VDC	230 VAC single-phase	400 VAC three-phase
Single steering station + autopilot function + fittings	2202513	2202514	2202515
Double steering station + autopilot function + fittings	2202516	2202517	2202518

Each reference refers to a complete set without flexible tubes. See page 3 to determine the lengths of the flexible tubes required.

POWER ASSISTED STEERING SYSTEM LS 600 kgm



2201151 Pump 29 CT LV DB

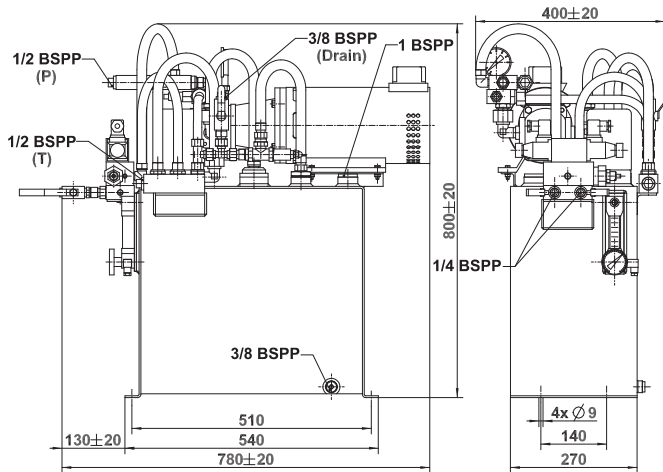
Flow rate 1.7 cu.in/rev
 Minimum size of tubing .31"x.39"
 Weight 8.8 lbs

Volume 24.4 cu.in
 Recommended wheel diam. Ø 16 1/2"
 Number of turns 6 turns

2202564 VHM 80 DT – 32 DT

Maximum torque 4430 ft.lbs
 Stroke 11 13/16"
 Maximum pressure 870 PSI

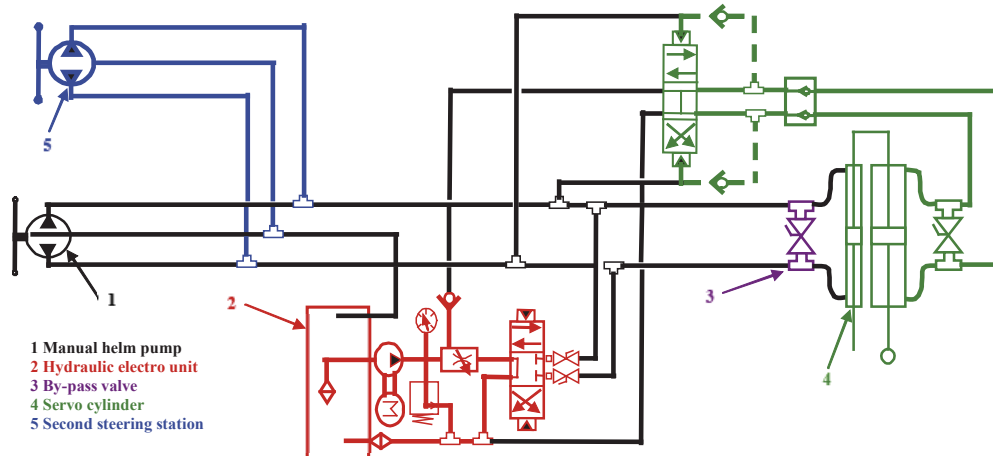
Radius of tiller arm 10 1/4"
 Total rudder angle 70°
 Weight 88 lbs



- 2201469 Hydraulic Electro Unit HF 1.5-18-24 V – Autopilot function**
- 2201548 Hydraulic Electro Unit HF 3-17-230 V – Autopilot function**
- 2201213 Hydraulic Electro Unit HF 3-17-400 V – Autopilot function**

Maximum flow rate 18 l/mn
 Volume 13.21 US gall

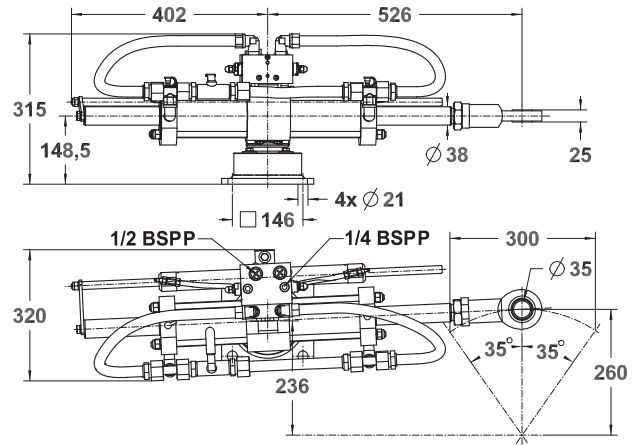
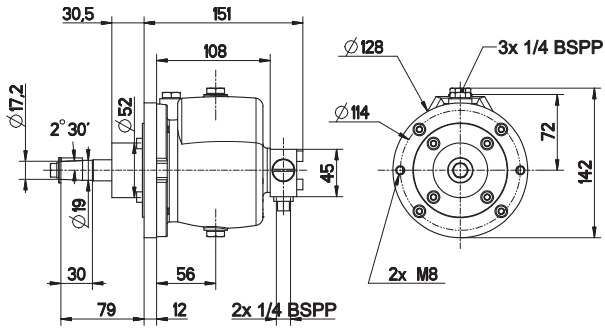
Maximum pressure 870 PSI
 Weight 143 lbs



REFERENCE	24 VDC	230 VAC single-phase	400 VAC three-phase
Single steering station + autopilot function + fittings	2202506	2202507	2202508
Double steering station + autopilot function + fittings	2202509	2202510	2202511

Each reference refers to a complete set without flexible tubes. See page 3 to determine the lengths of the flexible tubes required.

POWER ASSISTED STEERING SYSTEM LS 840 kgm

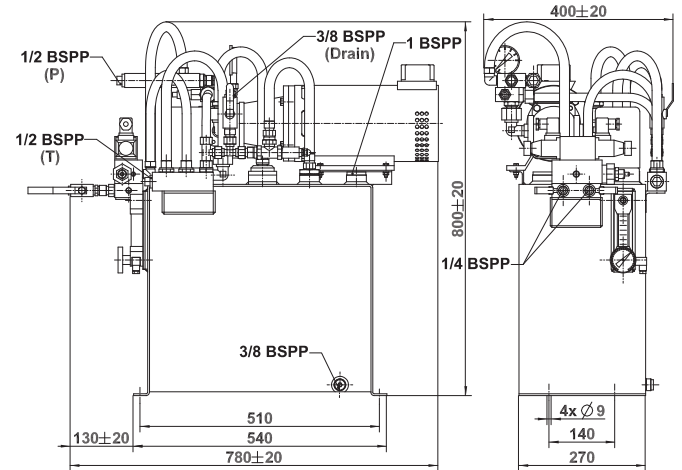


2201151 Pump 29 CT LV DB

Flow rate	1.7 cu.in/rev	Volume	24.4 cu.in
Minimum size of tubing	.31"x.39"	Recommended wheel diam.	Ø 16 1/2"
Weight	8.8 lbs	Number of turns	6 turns

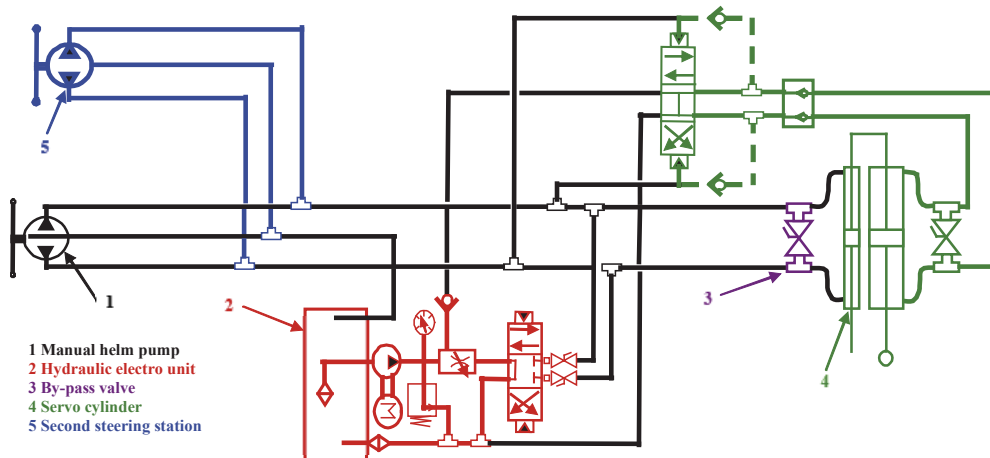
2202565 VHM 90 DT – 32 DT

Maximum torque	6076 ft.lbs	Radius of tiller arm	10 1/4"
Stroke	11 13/16"	Total rudder angle	70°
Maximum pressure	870 PSI	Weight	88 lbs



2201469 Hydraulic Electro Unit HF 1.5-18-24 V – Autopilot function
2201548 Hydraulic Electro Unit HF 3-17-230 V – Autopilot function
2201213 Hydraulic Electro Unit HF 3-17-400 V – Autopilot function

Maximum flow rate	18 l/mn	Maximum pressure	870 PSI
Volume	13.21 US gall	Weight	143 lbs

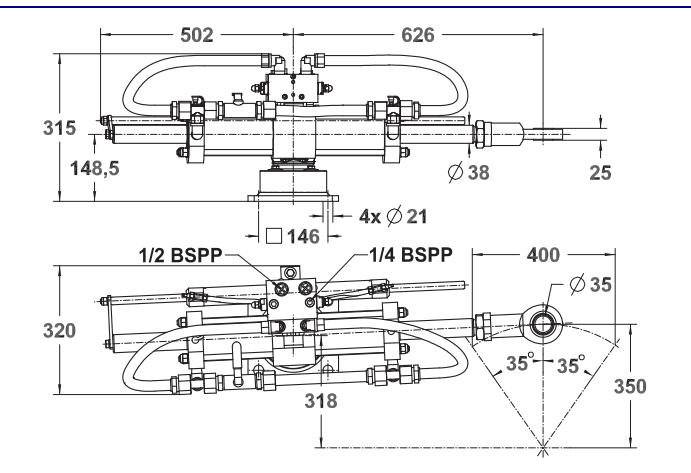
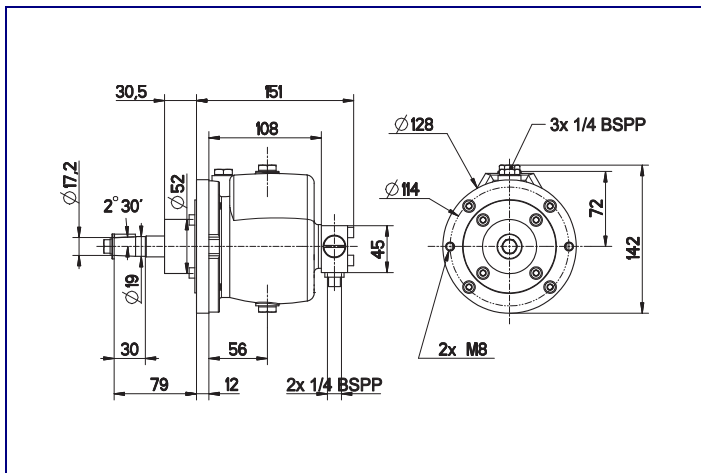


- 1 Manual helm pump
- 2 Hydraulic electro unit
- 3 By-pass valve
- 4 Servo cylinder
- 5 Second steering station

REFERENCE	24 VDC	230 VAC single-phase	400 VAC three-phase
Single steering station + autopilot function + fittings	2202525	2202526	2202527
Double steering station + autopilot function + fittings	2202528	2202529	2202530

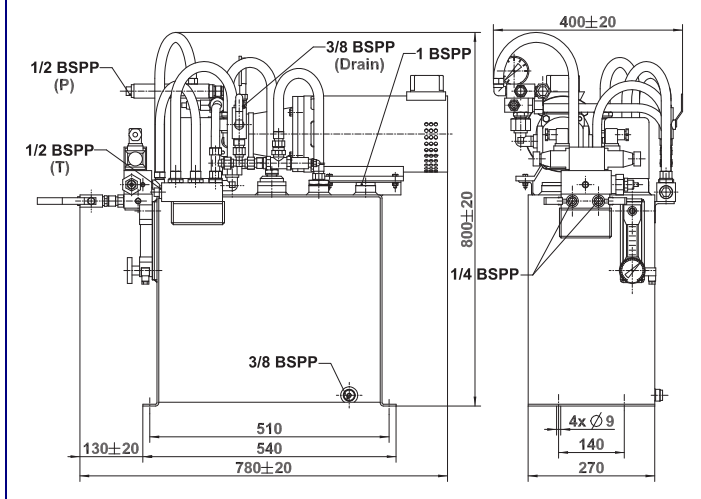
Each reference refers to a complete set without flexible tubes. See page 3 to determine the lengths of the flexible tubes required.

POWER ASSISTED STEERING SYSTEM LS 1,000 kgm



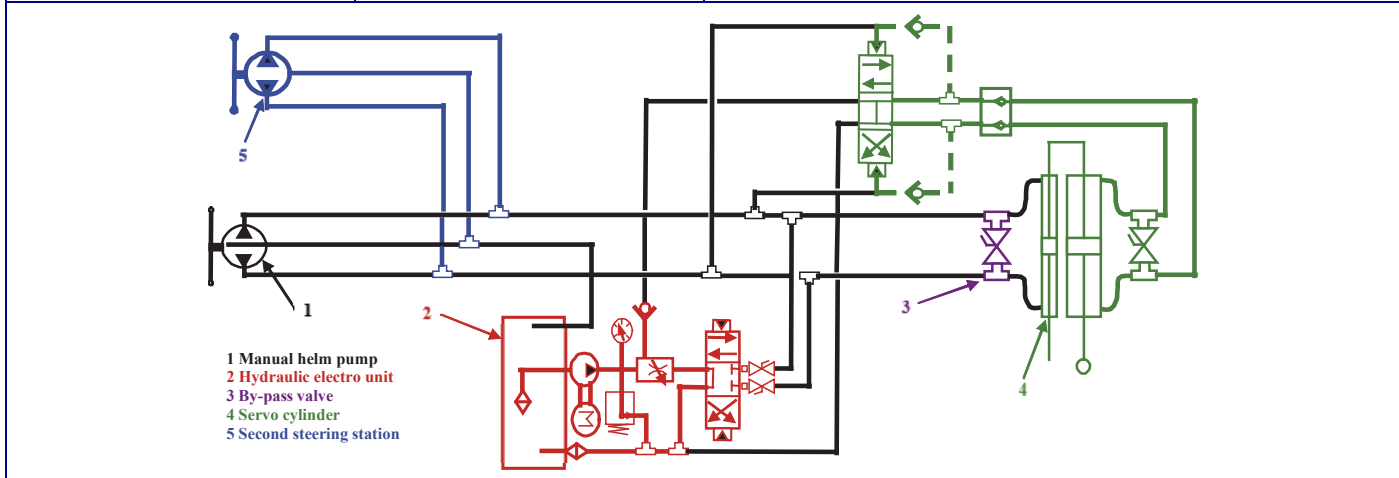
2201055	Pump 40 CT LV DB		
Flow rate	2.44 cu.in/rev	Volume	24.4 cu.in
Minimum size of tubing	.31"x.39"	Recommended wheel diam.	Ø 16 1/2'
Weight	9 lbs	Number of turns	6 turns

2202566	VHM 90 DT C400 – 32 DT		
Maximum torque	7233 ft.lbs	Radius of tiller arm	13 3/4"
Stroke	15 3/4"	Total rudder angle	70°
Maximum pressure	870 PSI	Weight	110 lbs



- 2201469** Hydraulic Electro Unit HF 1.5-18-24 V – Autopilot function
- 2201548** Hydraulic Electro Unit HF 3-17-230 V – Autopilot function
- 2201213** Hydraulic Electro Unit HF 3-17-400 V – Autopilot function

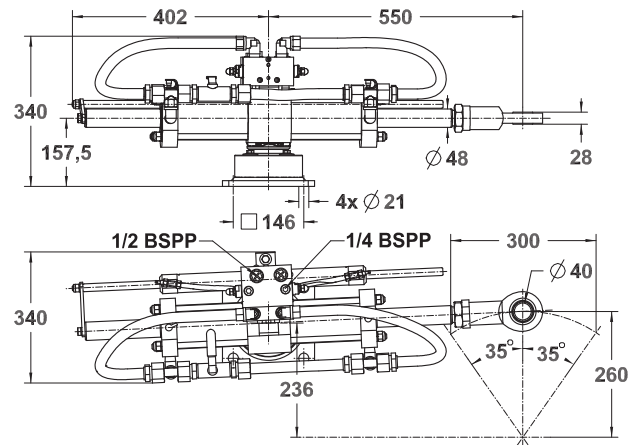
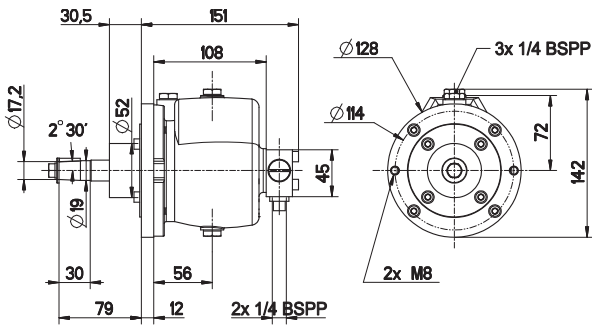
Maximum flow rate	18 l/mn	Maximum pressure	870 PSI
Volume	13.21 US gall	Weight	143 lbs



REFERENCE	24 VDC	230 VAC single-phase	400 VAC three-phase
Single steering station + autopilot function + fittings	2202531	2202532	2202533
Double steering station + autopilot function + fittings	2202534	2202535	2202536

Each reference refers to a complete set without flexible tubes. See page 3 to determine the lengths of the flexible tubes required.

POWER ASSISTED STEERING SYSTEM LS 1,200 kgm

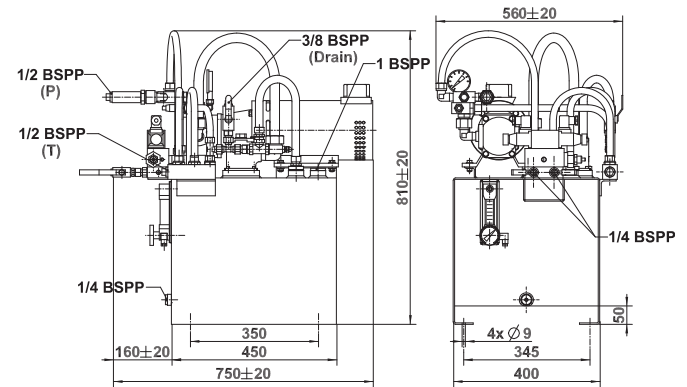


2201055 Pump 40 CT LV DB

Flow rate	2.44 cu.in/rev	Volume	24.4 cu.in
Minimum size of tubing	.31"x.39"	Recommended wheel diam.	Ø 16 1/2'
Weight	9 lbs	Number of turns	4 turns

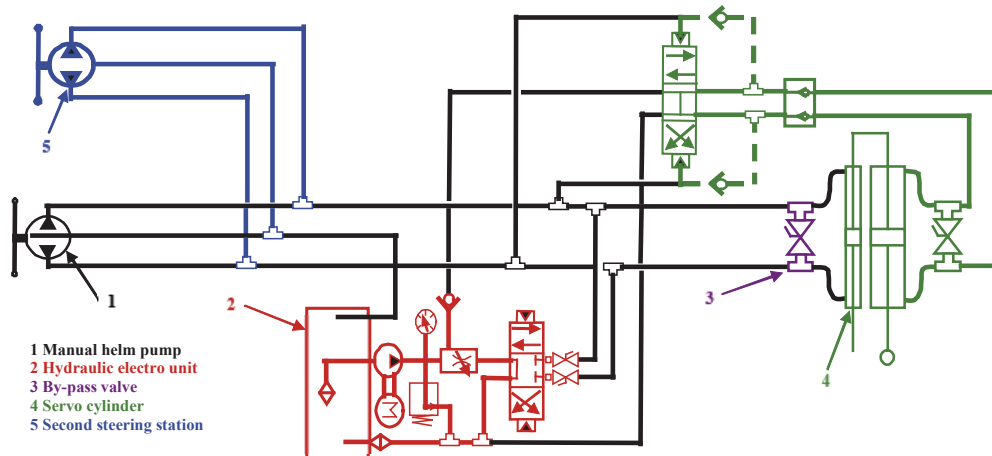
2202568 VHM 110 DT C300 – 32 DT

Maximum torque	8680 ft.lbs	Radius of tiller arm	10 1/4"
Stroke	11 13/16"	Total rudder angle	70°
Maximum pressure	870 PSI	Weight	124.6 lbs



2203284 Hydraulic Electro Unit HF 23 I.-24 V – Autopilot function
2203362 Hydraulic Electro Unit HF 22 I.-230 V – Autopilot function
2203361 Hydraulic Electro Unit HF 22 I.-400 V – Autopilot function

Maximum flow rate	22 l/mn	Maximum pressure	870 PSI
Volume	15.85 US gall	Weight	220 lbs

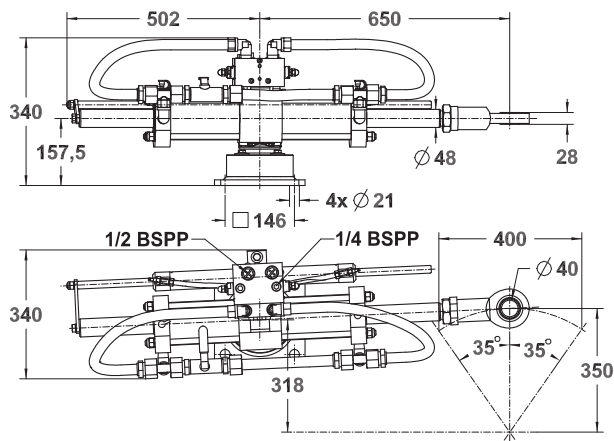
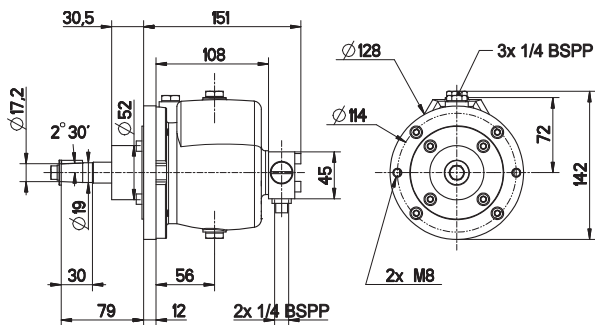


- 1 Manual helm pump
- 2 Hydraulic electro unit
- 3 By-pass valve
- 4 Servo cylinder
- 5 Second steering station

REFERENCE	24 VDC	230 VAC single-phase	400 VAC three-phase
Single steering station + autopilot function + fittings	2202537	2202538	2202539
Double steering station + autopilot function + fittings	2202540	2202541	2202542

Each reference refers to a complete set without flexible tubes. See page 3 to determine the lengths of the flexible tubes required.

POWER ASSISTED STEERING SYSTEM LS 1,600 kgm

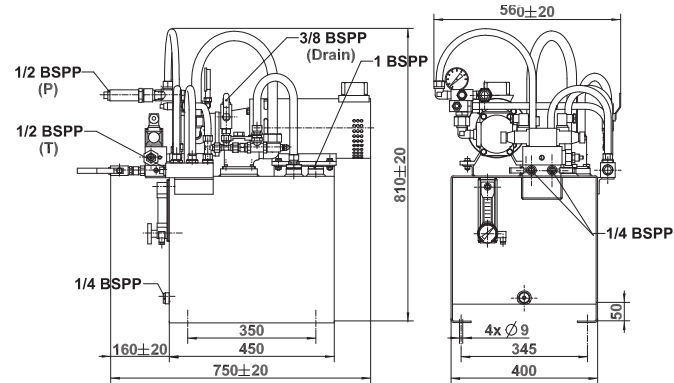


2201055 Pump 40 CT LV DB

2202567 VHM 110 DT – 32 DT

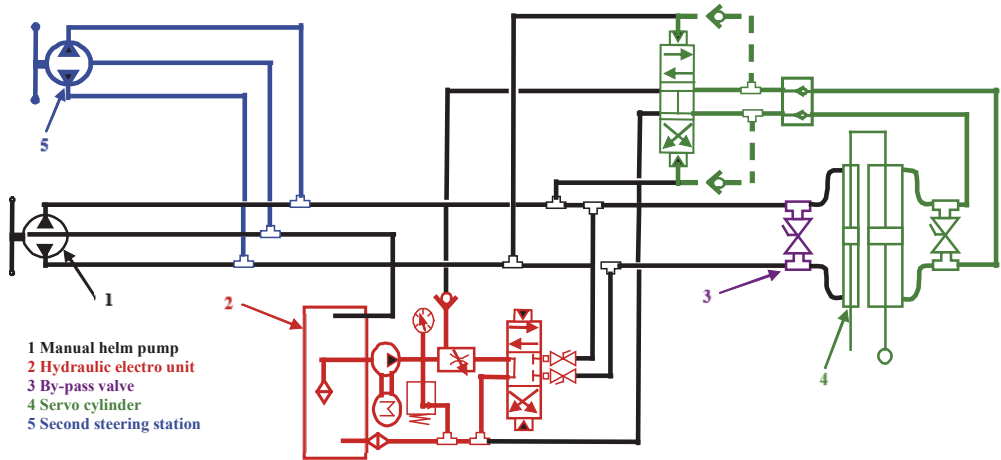
Flow rate	2.44 cu.in/rev	Volume	24.4 cu.in
Minimum size of tubing	.31"x.39"	Recommended wheel diam.	Ø 16 1/2'
Weight	9 lbs	Number of turns	4 turns

Maximum torque	11800 ft.lbs	Radius of tiller arm	13 3/4"
Stroke	15 3/4"	Total rudder angle	70°
Maximum pressure	870 PSI	Weight	143 lbs



- 2203284 Hydraulic Electro Unit HF 23 I.-24 V – Autopilot function**
- 2203362 Hydraulic Electro Unit HF 22 I.-230 V – Autopilot function**
- 2203361 Hydraulic Electro Unit HF 22 I.-400 V – Autopilot function**

Maximum flow rate	22 l/mn	Maximum pressure	870 PSI
Volume	15.85 US gall	Weight	220 lbs

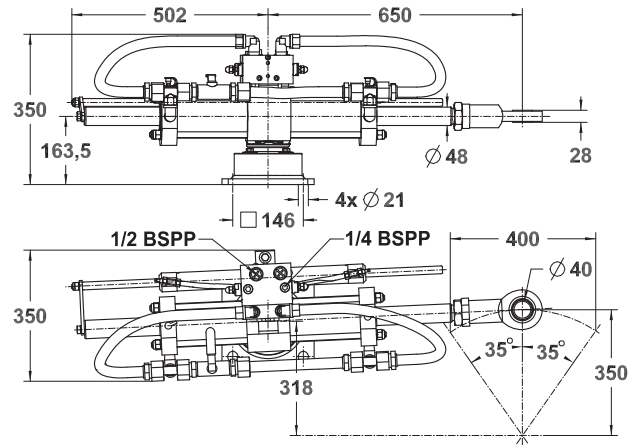
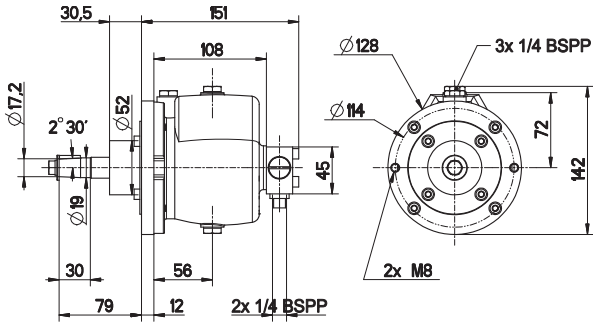


- 1 Manual helm pump**
- 2 Hydraulic electro unit**
- 3 By-pass valve**
- 4 Servo cylinder**
- 5 Second steering station**

REFERENCE	24 VDC	230 VAC single-phase	400 VAC three-phase
Single steering station + autopilot function + fittings	2202543	2202544	2202545
Double steering station + autopilot function + fittings	2202546	2202547	2202548

Each reference refers to a complete set without flexible tubes. See page 3 to determine the lengths of the flexible tubes required.

POWER ASSISTED STEERING SYSTEM LS 2,000 kgm

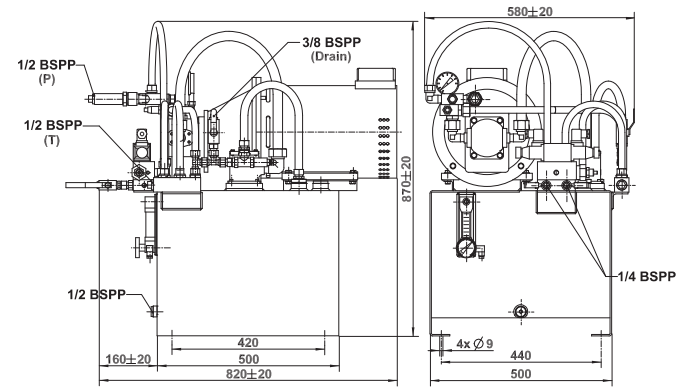
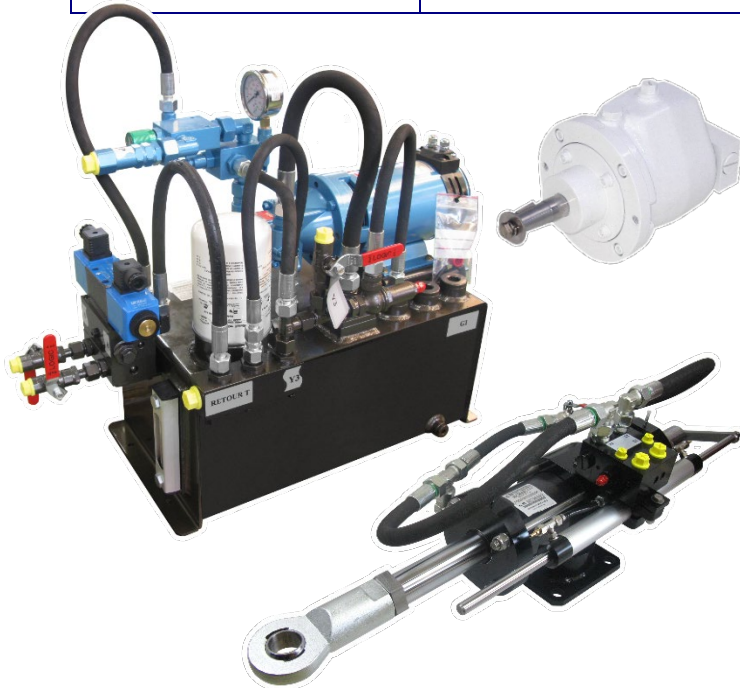


2201055 Pump 40 CT LV DB

2202569 VHM 120 DT – 32 DT

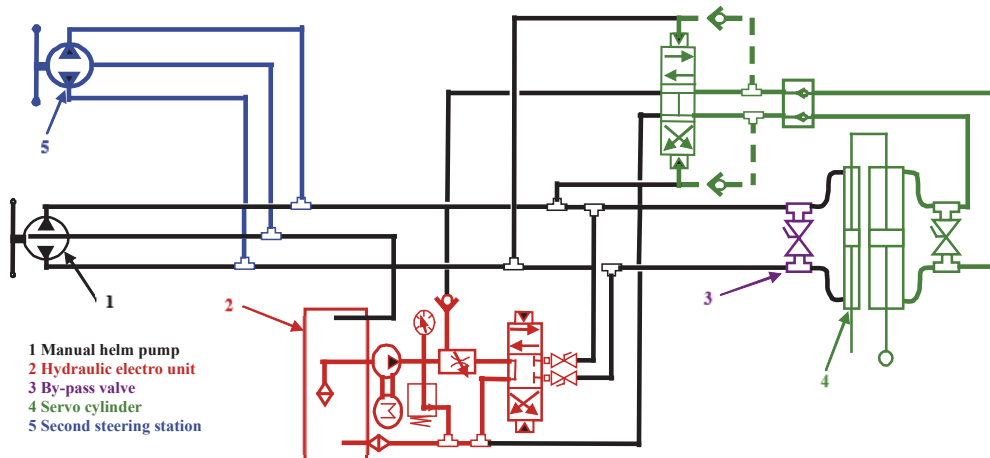
Flow rate	2.44 cu.in/rev	Volume	24.4 cu.in
Minimum size of tubing	.31"x.39"	Recommended wheel diam.	Ø 16 1/2'
Weight	9 lbs	Number of turns	4 turns

Maximum torque	14770 ft.lbs	Radius of tiller arm	13 3/4"
Stroke	15 3/4"	Total rudder angle	70°
Maximum pressure	870 PSI	Weight	143 lbs



2203364 Hydraulic Electro Unit HF 27 I.-230 V – Autopilot function
2203365 Hydraulic Electro Unit HF 27 I.-400 V – Autopilot function

Maximum flow rate	27 l/mn	Maximum pressure	870 PSI
Volume	26.4 US gall	Weight	331 lbs

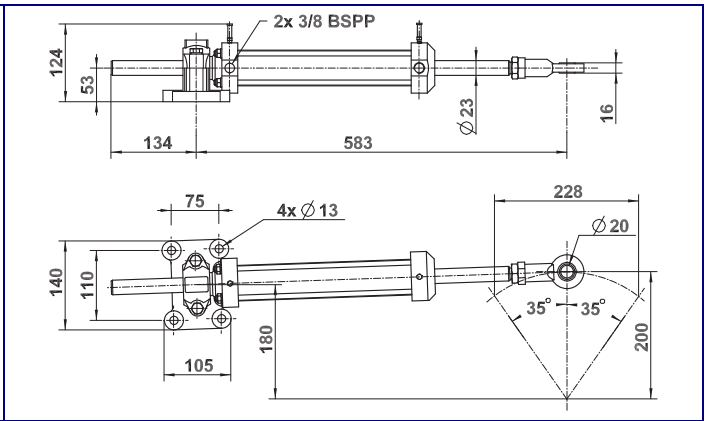
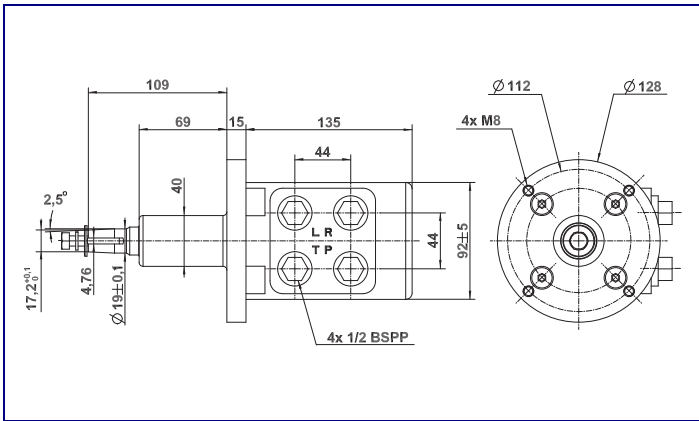


- 1 Manual helm pump
- 2 Hydraulic electro unit
- 3 By-pass valve
- 4 Servo cylinder
- 5 Second steering station

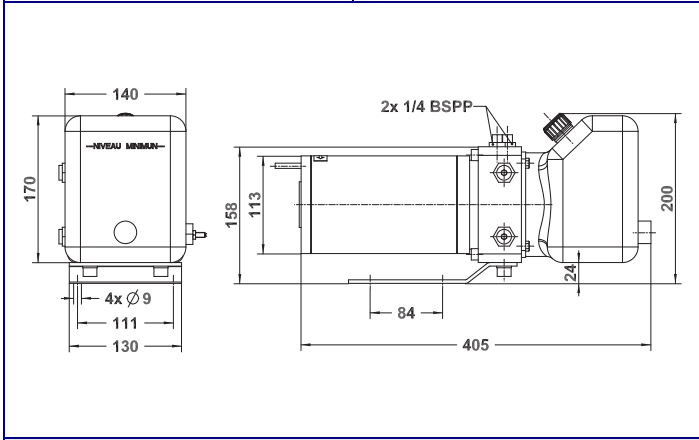
REFERENCE	24 VDC	230 VAC single-phase	400 VAC three-phase
Single steering station + autopilot function + fittings	On demand	2202550	2202551
Double steering station + autopilot function + fittings	On demand	2202553	2202554

Each reference refers to a complete set without flexible tubes. See page 3 to determine the lengths of the flexible tubes required.

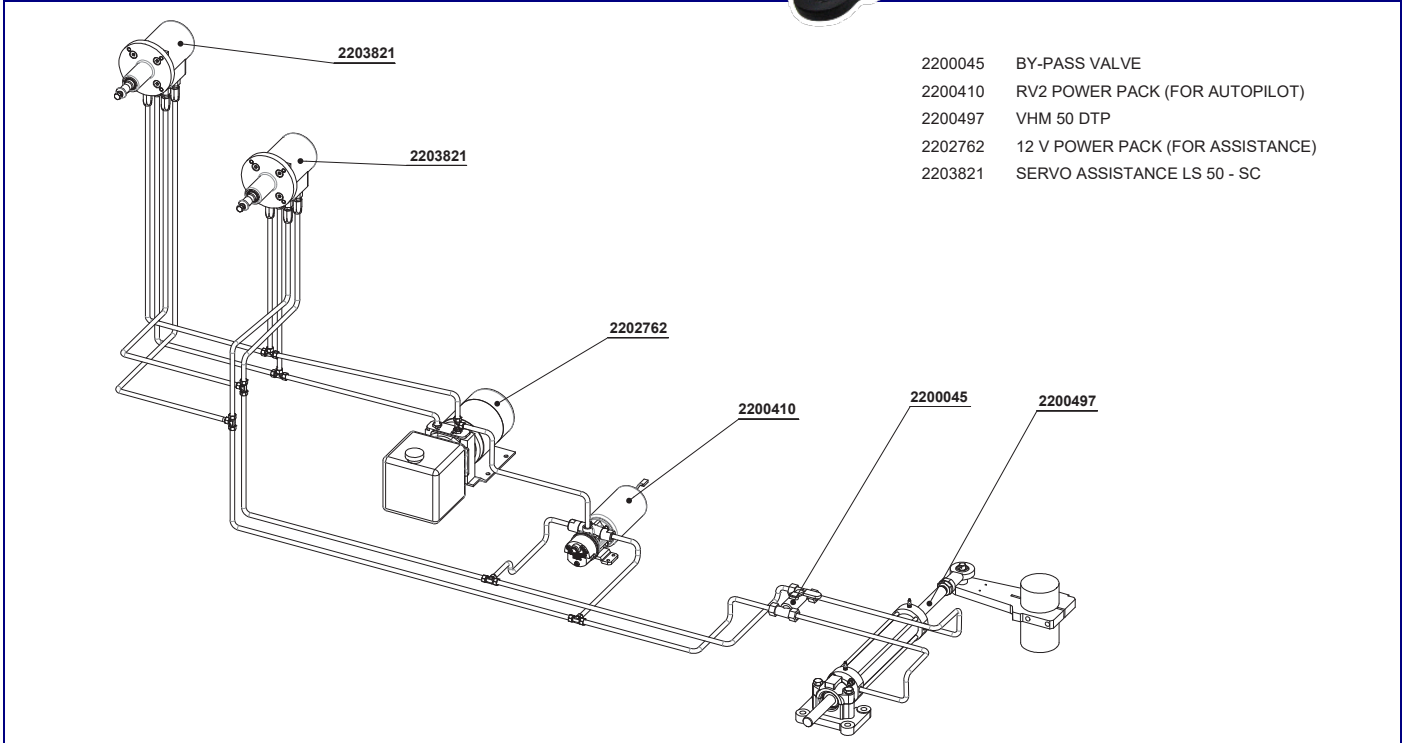
POWER ASSISTED STEERING SYSTEM LS 185 kgm



2203821 Servo assistance LS 50 - SC		2200497 VHM 50 DTP		
Flow rate	3.1 cu.in/rev	Maximum torque	1350 ft.lbs	
Minimum size of tubing	.31"x.39"	Stroke	9"	
Weight	15.2 lbs	Maximum pressure	870 PSI	
		Volume	21.5 cu.in	
	Recommended wheel diam. Ø 16 1/2"		Radius of tiller arm	7 7/8"
	Number of turns		Total rudder angle	70°
	7 turns		Weight	11 lbs



2202762	12 V power pack		
2202763	24 V power pack		
Maximum flow rate	4 l/mn	Maximum pressure	870 PSI
Volume	0.26 US gall	Weight	27.6 lbs



- 2200045 BY-PASS VALVE
- 2200410 RV2 POWER PACK (FOR AUTOPILOT)
- 2200497 VHM 50 DTP
- 2202762 12 V POWER PACK (FOR ASSISTANCE)
- 2203821 SERVO ASSISTANCE LS 50 - SC

Please contact us to determine the lengths of the flexible tubes required.

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 2 x 2,000 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.

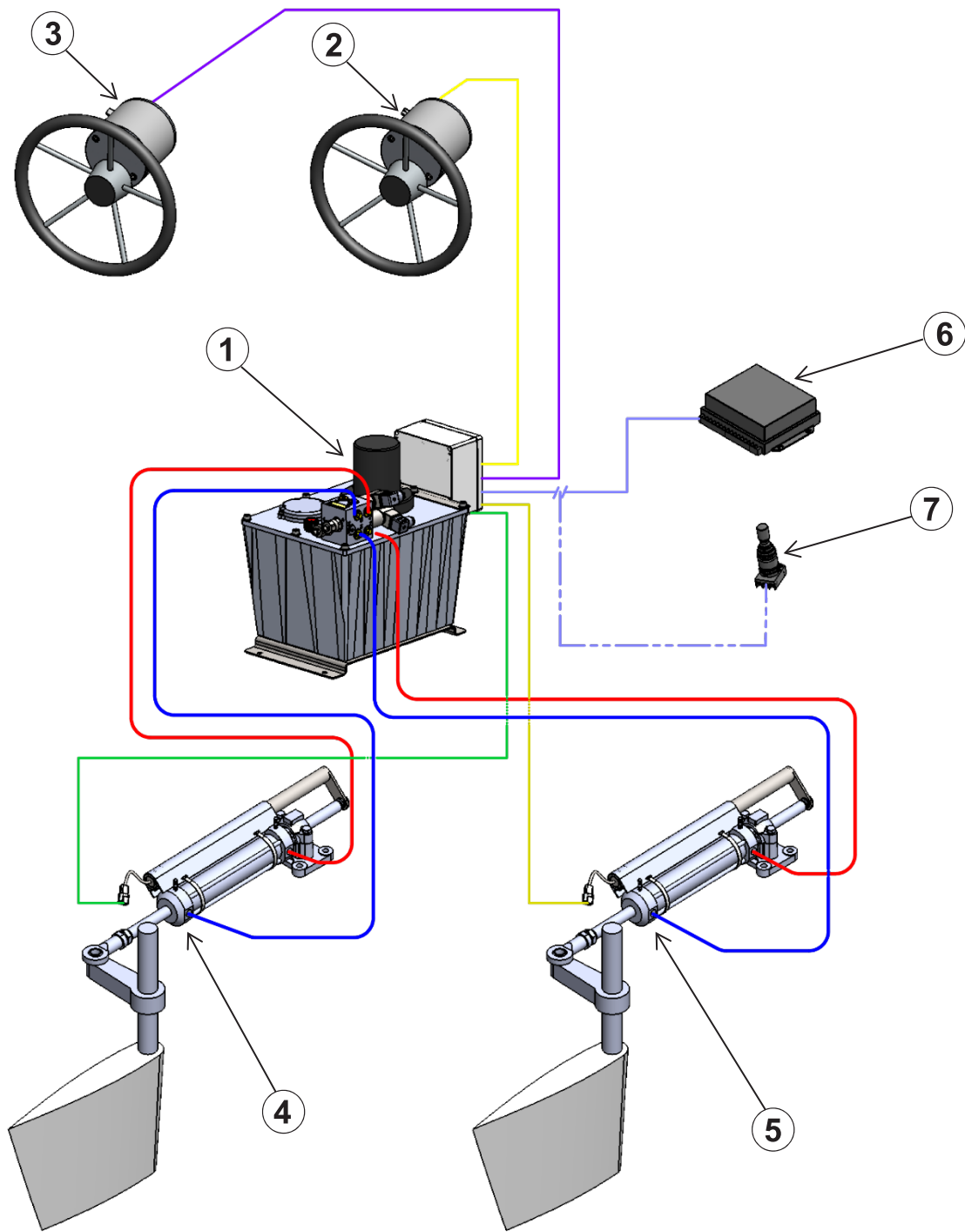
It manages the position and the displacement of each cylinder by means of the hydraulic power pack and the hydraulic distribution system.

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.

DEH ECO UP TO 500 kgm

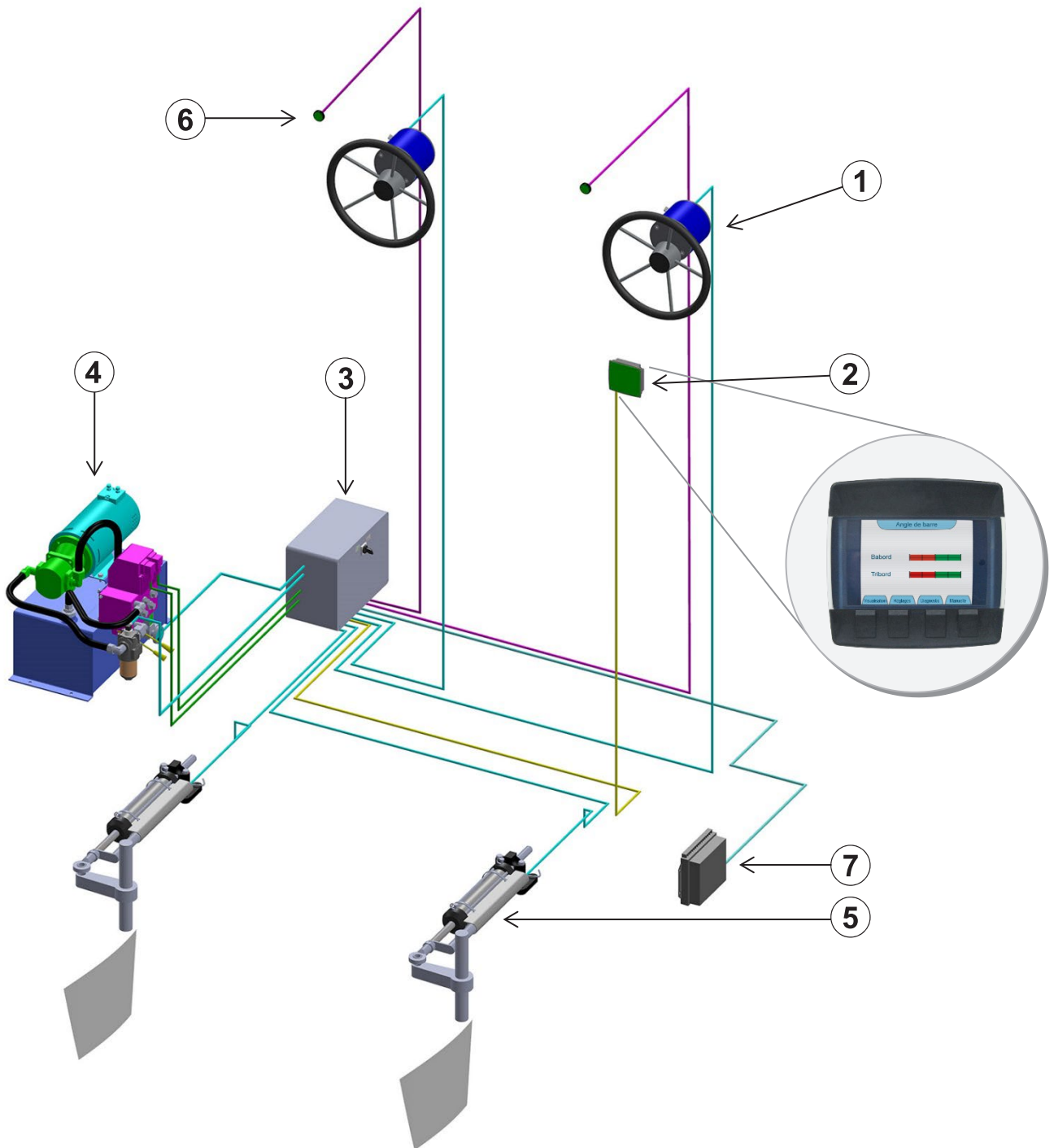
WORKING PRINCIPLE



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)

DEH UP TO 2 x 2,000 kgm

WORKING PRINCIPLE



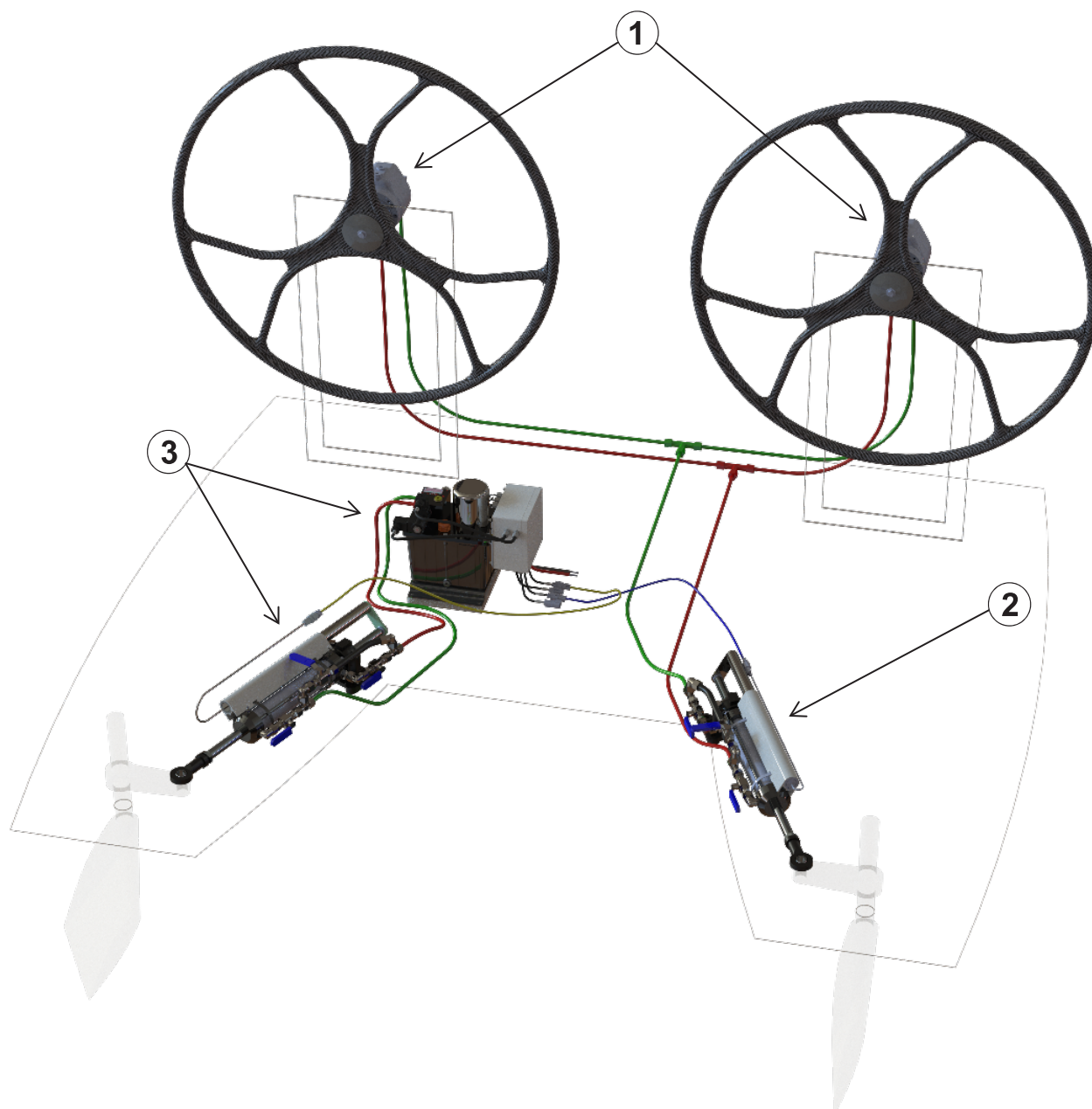
ITEM	DESIGNATION
①	Electric Wheel
②	Screen Display
③	Programmable Logic Controller
④	Hydraulic Power Pack / Proportional Distributor
⑤	Cylinder / Linear Sensor
⑥	Selector Knob
⑦	Autopilot Course Computer (not supplied)

DHES UP TO 600 kgm

The hydraulic steering Electro-Synchronized combines the smoothness, reliability and durability of a hydraulic steering with the intelligence of an electro-hydraulic steering.

This hybrid system allows the perfect synchronization of the two steering cylinders without any mechanical tie bar or hydraulic link.

It can be installed on a new boat or in addition to an old hydraulic steering system (retrofit).



ITEM	DESIGNATION
①	Hydraulic helm pumps
②	Master cylinder
③	Electronic synchronization

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

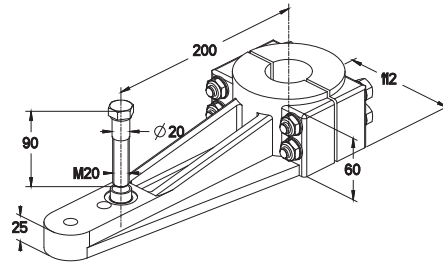
2200017 2 Litre oil can
Dexron II



TILLER ARMS



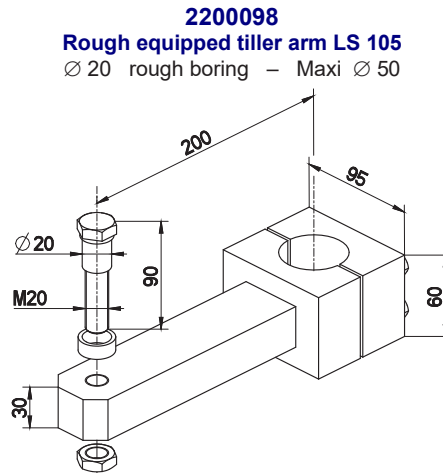
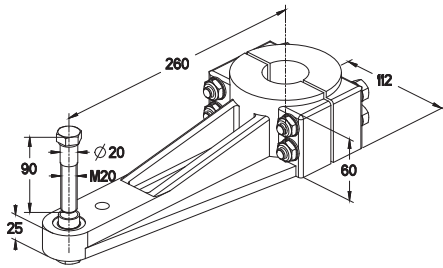
2200535
Rough equipped tiller arm LS 240 P
Ø 28 rough boring – Maxi Ø 50



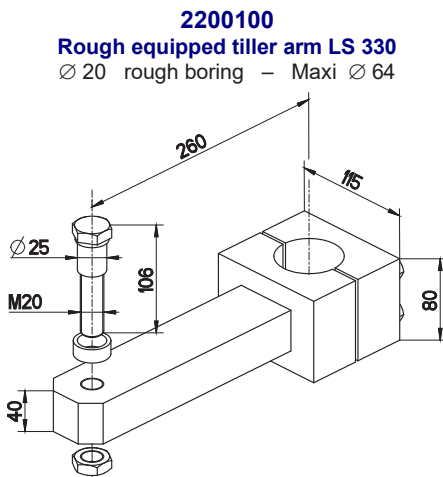
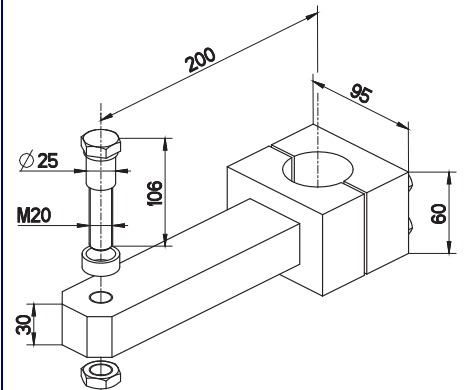
2200534
Rough equipped tiller arm LS 185 P
Ø 28 rough boring – Maxi Ø 50



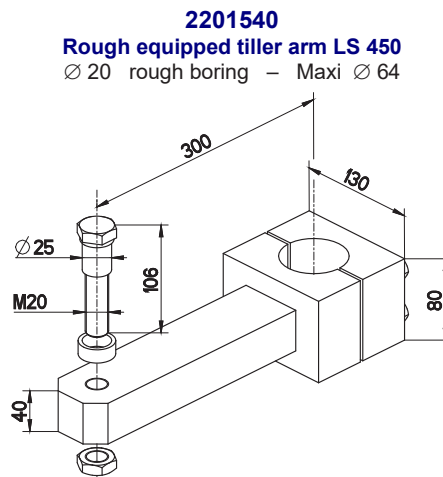
2200099
Rough equipped tiller arm LS 155
Ø 20 rough boring – Maxi Ø 50



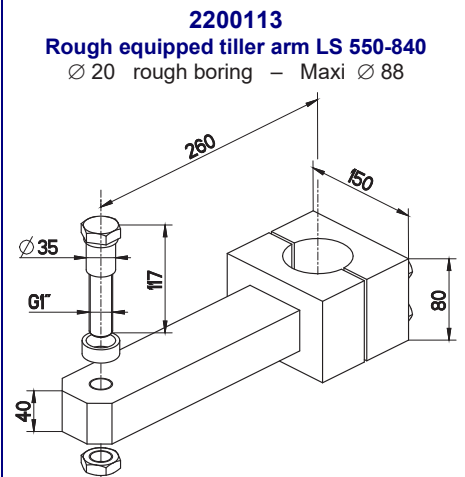
2200098
Rough equipped tiller arm LS 105
Ø 20 rough boring – Maxi Ø 50



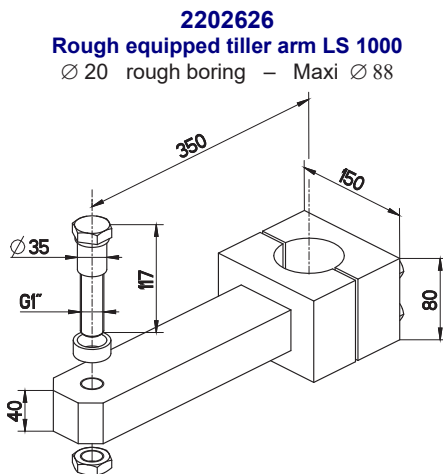
2200100
Rough equipped tiller arm LS 330
Ø 20 rough boring – Maxi Ø 64



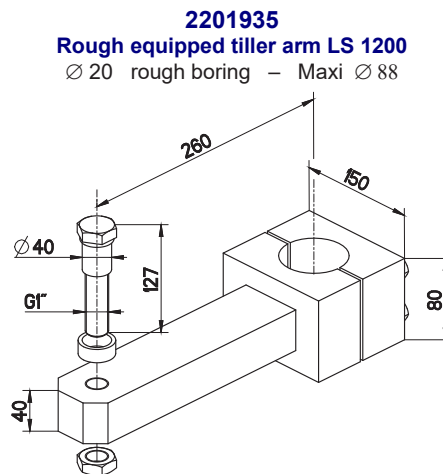
2201540
Rough equipped tiller arm LS 450
Ø 20 rough boring – Maxi Ø 64



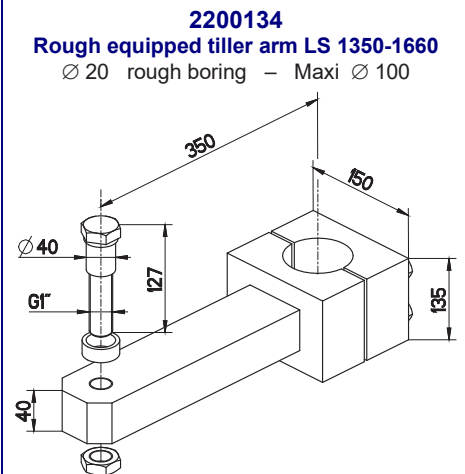
2200113
Rough equipped tiller arm LS 550-840
Ø 20 rough boring – Maxi Ø 88



2202626
Rough equipped tiller arm LS 1000
Ø 20 rough boring – Maxi Ø 88



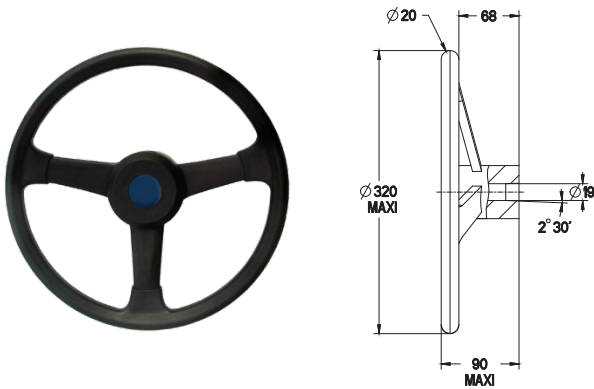
2201935
Rough equipped tiller arm LS 1200
Ø 20 rough boring – Maxi Ø 88



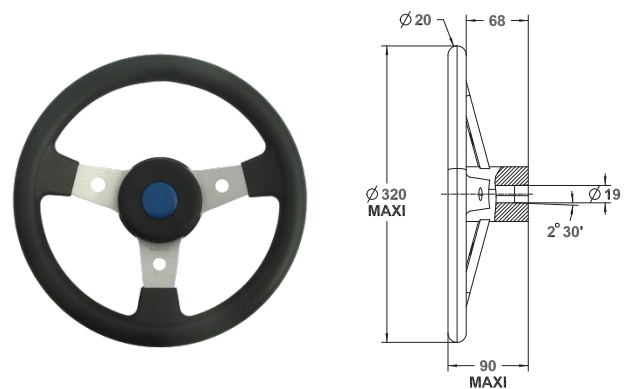
2200134
Rough equipped tiller arm LS 1350-1660
Ø 20 rough boring – Maxi Ø 100

RANGE OF STEERING WHEELS

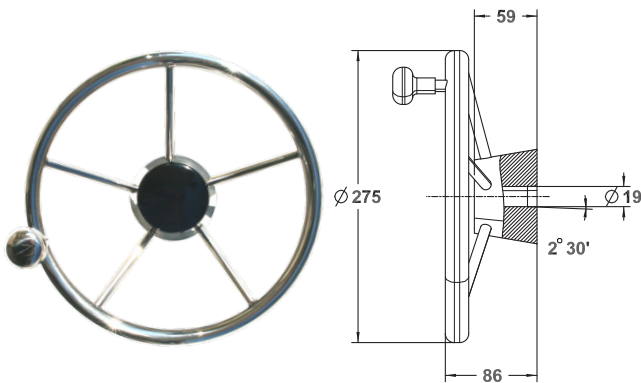
2200181 Black "sport" steering wheel Ø 320-19



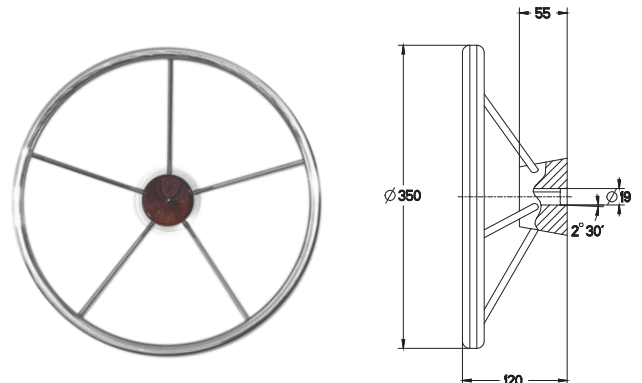
2200182 Black "racing" steering wheel Ø 320-19



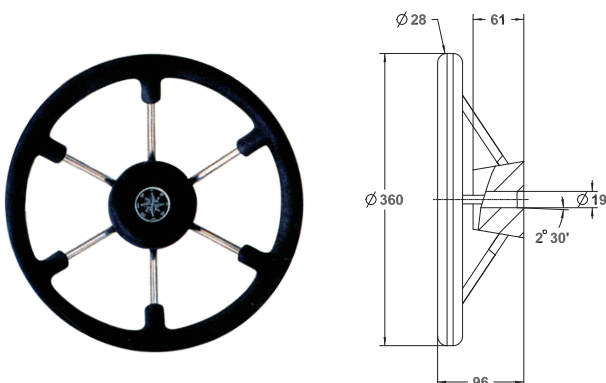
2202462 S/Steel Wheel with knob Ø 275-19



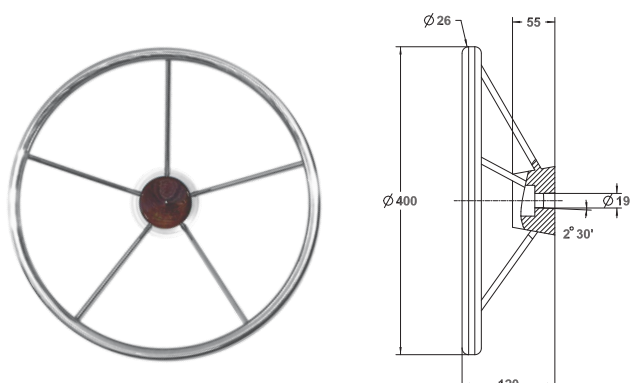
2200985 S/Steel Wheel Ø 350-19



2203377 Covered S/Steel Wheel Ø 360-19



2200986 S/Steel Wheel Ø 400-19



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 anyone of the obligations defined above.

Sales Department

☎ +33 (0)559 562 411
commercial@ls-france.com

Technical Department

☎ +33 (0)559 562 646
commercial2@ls-france.com



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LECOMBLE & SCHMITT - 156 Route de Briscous - 64240 Urt

☎ +33 (0)559 562 222 - commercial@ls-france.com



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