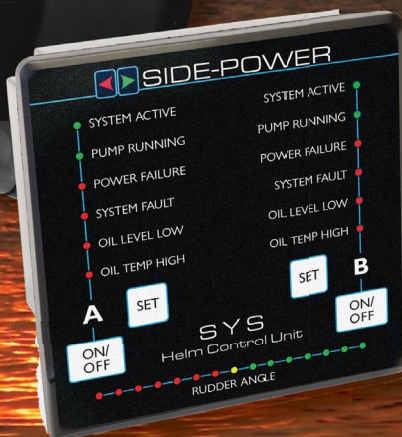




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Confidence
by Control!



Steering
by Side-Power

Confidence by Control





Sleipner
since 1908

Side-Power by Sleipner Motor

In addition to traditional hydraulic steering systems and electro-hydraulic power steering systems, Side-Power has also developed a Superyacht-specific steering system. While designing this, we have been able to draw from almost 100 years of experience with steering systems, and from our extensive knowledge on hydraulic systems.

The Side-Power Superyacht Steering is a RINA-classed system which fills all demands to a commercial grade steering system.

The Superyacht steering control system is a “fly-by-wire” system based around the same S-link bus as the Thruster and Stabilizer systems - the difference is that in the Steering System everything is made with dual configurations, to meet the required redundancy level. This dual configuration extends to the mechanical and hydraulic side of the system as well.

The Superyacht Steering can be operated from a traditional helm or by joystick and the system is ready for autopilot interfacing.





System description.

The system is build as a redundancy rudder control system based on "RINA Rules for Yachts Designed for Commercial Use 2009"

Main steering gear hydraulic system:

The SYS1500 system consists of 2 independent hydraulic power, filtration, control and monitoring systems.

The 2 systems are mounted on a common tank unit with 2 separate oil reservoirs.

Rudder movement are controlled by a 3-way on/off 24V solenoid operated valve. The valve is spring loaded to neutral, and can be manually operated if needed. Valve systems are based on Cetop standardized components. Filtration system consists of a filler/breather unit, and a 10 micron return line filter.

Hydraulic power is generated from a gear pump driven by a 3-phase 400V AC motor. Fluid temperature and fluid level is controlled by a level/temp switch with high temp and low level set points.

Auxiliary steering gear:

The auxiliary steering gear consists of a manually operated helm pump connected to the steering rams via manually operated ball valves. The ball valves connect the steering rams either to the main steering unit, or to the manually operated pump.

Auxiliary steering gear is hydraulically insulated from the main steering gear and its piping system when the valves are set to auxiliary position.

Each ram can be hydraulically insulated and set to "float" position.

Control system:

Steering is operated via a "System select and monitoring panel" (SMP) mounted at the main steering position(s).

A start/stop device for each motor/system and select station functionality is integrated in the SMP.

Independent encoders for the 2 systems are mounted in the helm unit(s). The encoders detect requested direction and rudder movement based on steering wheel rotation. Steering input signals are transferred to the SMP and distributed as CAN signals to the electronic control unit installed in the main steering electronic enclosure.

The control unit transforms CAN input to power for the directional control valve according to controller software setup.

Rudder angle position indicators give position feedback to the control unit.

Max rudder angle are limited by the max angle set point defined in the system setup (adjustable as a part of the setup routines). The movement will be stopped before the gear hits mechanical stop.

Design parameters and performance:

- Design pressure: 75 bar
- Pressure relief valve setting. 60 bar
- Cylinder stroke 200 mm
- Rudder angle +/- 35°
- Stop-Stop time: Approximately 9,5 seconds.
- Reservoir capacity: 30 L net. each system

Required power supply:

- 400V AC 3-phase for hydraulic power unit electric motors.
- 24V DC for control system

AC motor specifications:

- S1, 1.5 kw. 400V 50Hz
- S6-25%, 2,4 kw. 400V 50Hz

Available helm types:

- Surface mounted
- Semi-recessed
- Tilt - 5 positions: -10, 0, 10, 20 and 30 degrees



Surface



Recessed

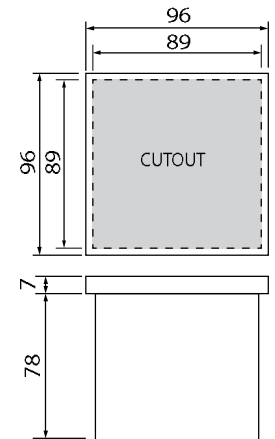


Tilt

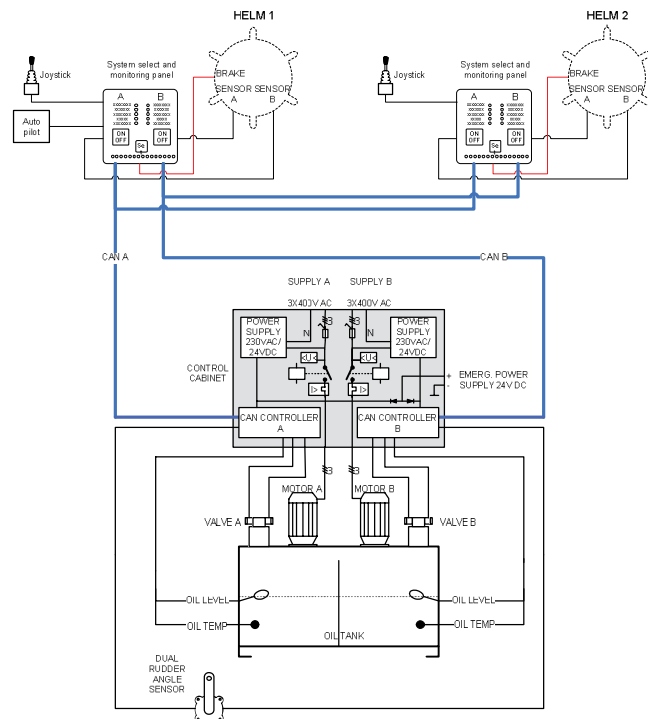
Displays and alarms:

Item	SMP Display	Alarms Audible & Visible	Navigation Bridge Panel
System active	X		X
Power failure of each power unit	X	X	X
Indication that electric motor of each power unit is running	X		X
Overload of electric motor of each power unit	X	X	X
Phase failure of electric motor of each power unit.	X	X	X
Low level of each hydraulic fluid reservoir.	X	X	X
High temp of each hydraulic fluid reservoir	X	X	X
Rudder angle indicator	X		

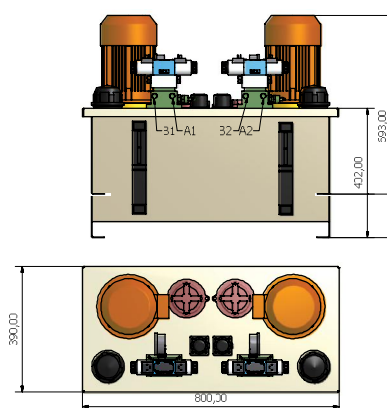
Measurements, control panel



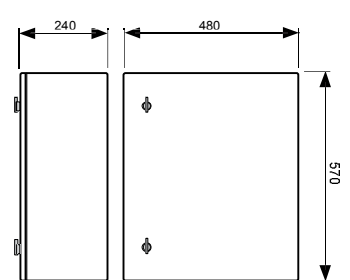
Control system overview:



Measurements, tank/pump unit:



Measurements, control cabinet:



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