AQUASYNC
INNOVATION

YOUR SHIP'S GUARDIAN IN THE DIGITAL AGE

INTEGRATED GAUGING, MONITORING-ALARM AND CONTROLLING SYSTEM

AQUASYNC INNOVATION(SINGAPORE) PTE. LTD.

Cyber security meets IACS UR E27

Address: Temasek Boulevard #11-01.Suntec city Tower 3, Singapore 038988
Online: E-mail : sales@aquasync.sg Website: www.aquasync.sg

CONTENTS

Integrated Gauging, Monitoring-alarm and Controlling System

Company Profile

AquaSync Innovation (hereinafter referred to as ASI) provides a full package of solutions for comprehensive automation, intelligence, integrated ship-shore information and ship cyber security etc. in marine and offshore industries through cutting-edge technology, empowers the global maritime industry. Our advanced solutions ensure safe, reliable, efficient performance and promote the rapid sustainable development of the maritime industry's digitalization process.

ASI has obtained the **DNV-issued ISO 9001** Quality Management System, **ISO/IEC 27001** Information Security Management System, **ISO/IEC 20000-1** Information Technology Service Management System certificates, and the **ISO/IEC 17025** Marine Cyber Security Laboratory Test Capability Recognition.

- Integrated Gauging Monitoring-Alarm and Controlling System
- Informatization Integration Systems
- Intelligent Ship System
- Ship-shore Fleet Managment Applications
- Ship Cyber Security Solutions
- Sensor Transmitters, Valves, Flow Meters and Other Underlying Hardware

Qualification Certificate

CERTIFICATE OF

Product Design Assessment

This is to certify that a representative of this Bureau did, at the request of

AQUASYNC INNOVATION (ZHEJIANG) CO., LTD

located at

ROOM F402, SUPCON SCIENCE AND TECHNOLOGY PARK, NO. 309 LIUHE ROAD, BINJIANG DISTRICT,, , HANGZHOU, China, 311401

assess design plans and data for the below listed product. This assessment is a representation by the Bureau as to the degree of compliance the design exhibits with applicable sections of the Rules. This assessment does not waive unit certification or classification procedures required by ABS Rules for products to be installed in ABS classed vessels or facilities. This certificate, by itself, does not reflect that the product is Type Approved. The scope and limitations of this assessment are detailed on the pages attached to this certificate.

Product:	Integrated Alarm and Monitoring System
Model:	GCS800
Endorsements:	CyberSecurity
Tier:	2 - PDA Issued

This Product Design Assessment (PDA) Certificate remains valid until 30-Nov-2030 or until the Rules and/or Standards used in the assessment are revised or until there is a design modification warranting design reassessment (whichever occurs first).

Acceptance of product is limited to the "Intended Service" details prescribed in the certificate and as per applicable Rules and Standards.

This Certificate is valid for installation of the listed product on ABS units which exist or are under contract for construction on or previous to the effective date of the ABS Rules and standards applied at the time of PDA issuance. Use of the Product for non-ABS units is subject to agreement between the manufacturer and intended client.

American Bureau Of Shipping

Yu Gang, Engineer Consultant

NOTE: This certificate evidences compliance with one or more of the Rules, Guides, standards or other criteria of ABS for a statutory, industrial or manufacturer's standards. It is issued solely for the use of ABS, its committees, its clients or other authorized entities. Any significant changes to the aforementioned product without approval from ABS will result in this certificate becoming null and void. This certificate is governed by ABS Rules 1-1-A3/3.9 Terms and Conditions of the Request for Product Type Approval and Agreement (2010)

Certificate of Product Design Assessment Rev.2 Page 1 of 1

Sensitivity: Internal & Restricted

ABS Certificate of Product Design Assessment GCS800 (Endorsements: CyberSecurity)

Type Approval Certificate

This is to certify that the undernoted product(s) has/have been tested with satisfactory results in accordance with the relevant requirements of the Lloyd's Register Type Approval System.

Manufacturer	**AquaSync Innovation (Zhejiang) Co., Ltd.**
Address	Room 326, 3rd Floor, Building 1, No. 307 Liuhe Road, Puyan Sub-district, Binjiang District, Hangzhou City, Zhejiang Province, 310053, China
Place of Production	AquaSync Innovation (Zhejiang) Co., Ltd. No.10 Shengke Road, Economic&Technological Development Zone, Huishan District, Wuxi City, 214177, China
Place of Production	AquaSync Innovation (Zhejiang) Co., Ltd. Room 1608, Ping'an Fortune Center, Binhu District, Wuxi City, Jiangsu Province, 214125, China
Type	Integrated Alarm, Monitoring and Control System
Description	Integrated Gauging, Monitoring Alarm and Controlling System. -Monitoring and Alarm (Including Engineer Alarm). -Control System for Valve/Motor/Fan/Cargo/Other aux. machinery and Level Gauging. -Pressure, Temperature and Liquid Level Measurement.
Trade Name	GCS800
Application	Marine and offshore use in environmental categories ENV2for Monitoring and Alarm Unit, E as described in Lloyd' Register Test Specification No. 1- July 2024.
Specified Standard	Manufacture's Specification

Ning Guan

Electrical & Control Technical Manager-Southeast Asia & Great China to Lloyd's Register Classification Society (China) Co.,

Lloyd's Register Group Limited, its affiliates and subsidiaries and their respective officers, employees or agents are, individually and collectively, referred to in this clause as 'Lloyd's Register'. Lloyd's Register assumes no responsibility and shall not be liable to any person for any loss, damage or expense caused by reliance on the information or advice in this document or howsoever provided, unless that person has signed a contract with the relevant Lloyd's Register entity for the provision of this information or advice and in that case any responsibility or liability is exclusively on the terms and conditions set out in that contract.

LR Type Approval Certificate GCS800

Qualification Certificate

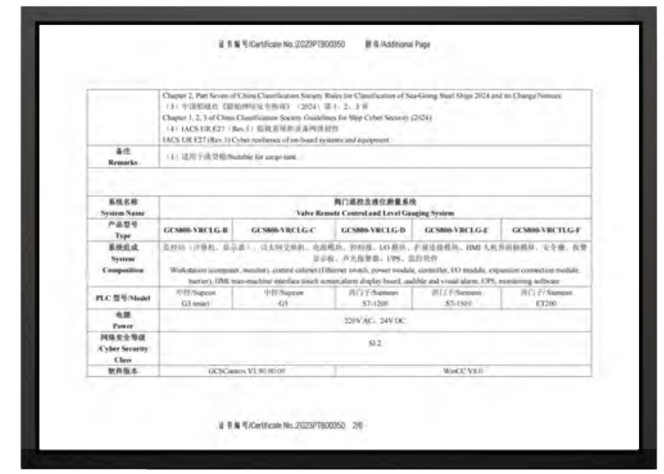

中国船级社
CHINA CLASSIFICATION SOCIETY
型式认可证书
CERTIFICATE OF TYPE APPROVAL
中控海洋装备（浙江）有限公司
AQUASYNC INNOVATION (ZHEJIANG)CO.,LTD.

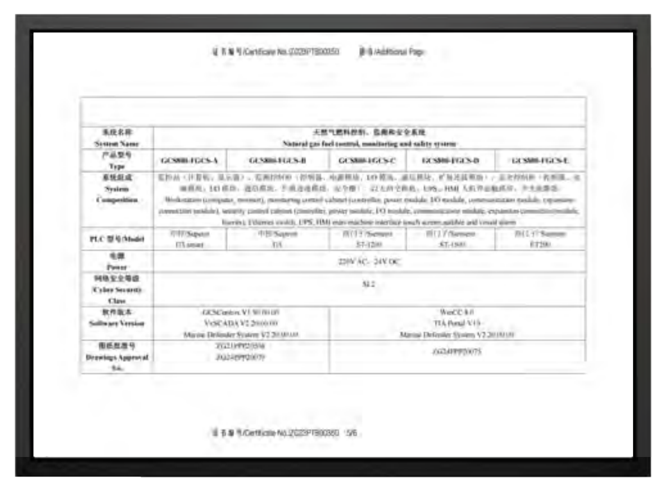
CCS Certificate of Type Approval (Meet Cybersecurity Level SL2)

Integrated Gauging, Monitoring-Alarm and Controlling System includes AMS, VRCS & LGS and CMS, wwhich has obtained the world's first type approval certificate with cybersecurity issued by CCS and supports real-time communication between ship and shore.

Certificate Annex

- Pressure, Temperature and Liquid Level Measurement Alarm System
- Valve Remote Control and Level Gauging System
- Engine Room Monitoring and Alarm System and Engineer Alarm System
- Natural Gas Fuel Control, Monitoring and Safety System
- Energy Management System





Qualification Certificate

Certificate No : NIB48981-CS001

Type Approval Certificate

[Alarm Monitoring and Control System with Cyber Resilience]

Initial Approval	6 January 2025
Applicant	AquaSync Innovation (Zhejiang) Co., Ltd. Rm308, Building 4, No.209 Gaoerfu Road, Dongzhou Subdistrict, Fuyang District, Hangzhou City, Zhejiang Province, China
Product Description	Type : GCS800 - Application : Trusted network only * Manufacturing Place - No. 10 Shengke Road, Economic and Technological Development Zone, Huishan District, Wuxi City, Jiangsu Province, China - Room 402, F Annex Building, Supcon Park, No. 309, Liuhe Road, Binjiang District, Hangzhou City, Zhejiang Province, P.R. China * See Appendix I *
Approval Condition	* See Appendix I *

THIS IS TO CERTIFY that the above-mentioned product has been approved in accordance with the relevant requirement of this Society's Rules and / or of the recognized standards as follows:

Ch. 3 of the Guidance for Cyber Resilience of Ships and Systems
IACS UR E27 Rev.1 Cyber Resilience of On-board Systems and Equipment

This Certificate is valid until 5 January 2030

Issued at Shanghai, China on 6 January 2025

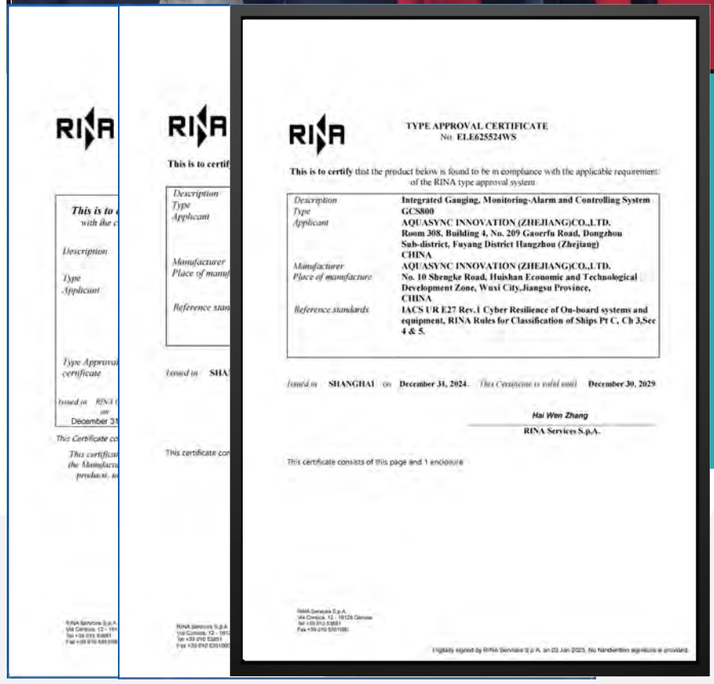
This certificate is signed electronically in accordance with IMO FAL.5/Circ.39/Rev.2 Validation and authentication of the certificate can be confirmed from "http://e-cert.krs.co.kr" by using the tracking No(ME250201733S3) and certificate No.(NIB48981-CS001)

KOREAN REGISTER

General Manager of Ship System Solution Team CHINA KR Co., Ltd.

AC-2A (2021.01) 1/3 KOREAN REGISTER

KR Certificate of Type Approval
(Meet UR E27 Cybersecurity)



RINA

TYPE APPROVAL CERTIFICATE
No. ELE625524WS

This is to certify that the product below is found to be in compliance with the applicable requirement of the RINA type approval system

Description	**Integrated Gauging, Monitoring-Alarm and Controlling System GCS800**
Type	**GCS800**
Applicant	**AQUASYNC INNOVATION (ZHEJIANG)CO.,LTD. Room 308, Building 4, No. 209 Gaoerfu Road, Dongzhou Sub-district, Fuyang District Hangzhou (Zhejiang) CHINA**
Manufacturer	**AQUASYNC INNOVATION (ZHEJIANG)CO.,LTD.**
Place of manufacture	**No. 10 Shengke Road, Huishan Economic and Technological Development Zone, Wuxi City,Jiangsu Province, CHINA**
Reference standards	**IACS UR E27 Rev.1 Cyber Resilience of On-board systems and equipment, RINA Rules for Classification of Ships Pt C, Ch 3,Sec 4 & 5.**

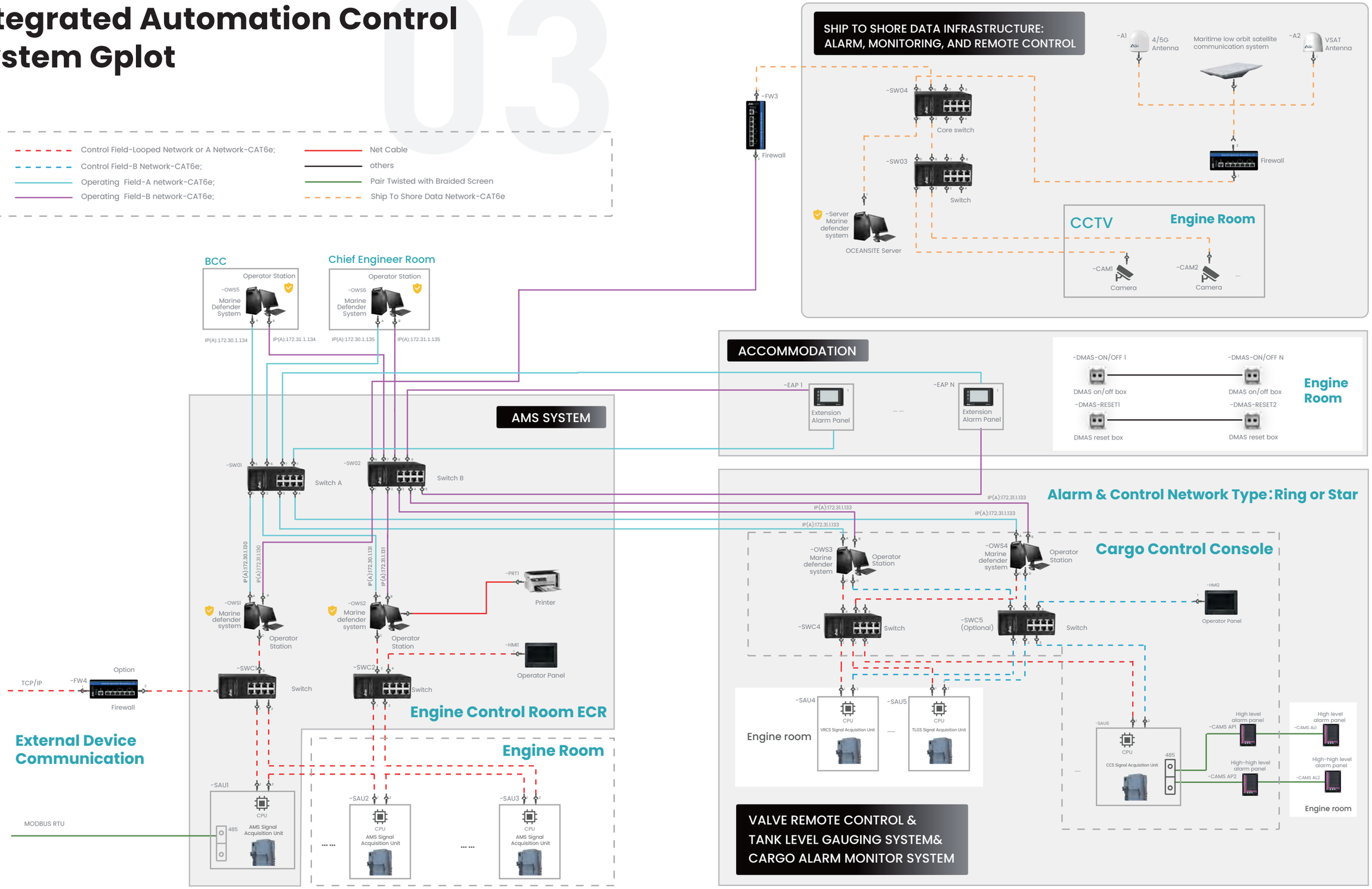
Issued in **SHANGHAI** *on* **December 31, 2024.** *This Certificate is valid until* **December 30, 2029**

Hai Wen Zhang
RINA Services S.p.A.

This certificate consists of this page and 1 enclosure

RINA Certificate of Type Approval
(Meet UR Rules for the Classification of Ship)

Integrated Automation Control System Gplot



System Introduction

As part of ASI' s marine automation solutions, the GCS-800 system signal acquisition and control adopt the redundant looped network or A/B network structure as the control domain network. A/B network structure, dual network redundancy, as the operation domain network. The control domain network is physically isolated from the operation domain network. In the case of any single network disconnection failure and network equipment failure, the normal operation of the system is not affected at all. GCS-800 is a ship integrated automation system built on Siemens .The system' s modular design ensures high efficiency and reliability, making it adaptable to a wide range of vessel types and sizes, including bulk carriers, oil tankers, container ships, refrigerated ships, and other special-purpose vessels.

GCS-800

PLC: S7-1200/1500 ET200SP I/O Modules LOGO! Serie
HMI: WinCC Monitoring Software

PLCs and Software Components

Control Domain Network (looped network & A/B Network)
Operation Domain Network (A/B Network Dual Redundancy)
The control domain and operation domain networks are completely independent

Network Architecture

E/R Monitoring and Alarm System
Valve Remote Control and Level Gauging System
Pressure, Temperature and Liquid Level Measurement Alarm Syste

Main Systems

01 Multi-language support, applicable worldwide

02 Fast and efficient system configuration

03 Open standards make system integration easier and more convenient

04 Extensions based on options and add-ons

05 Meet network security requirements

06 Integrate all HMI functions

07 Strong scalability, multiple architectures to choose from

Extension Alarm Panel

As an extension unit of the engine room monitoring and alarm system, it is usually distributed in different positions of the ship and used to receive and display the alarm information of the engine room monitoring and alarm system.

01 Redundant design, dual network communication

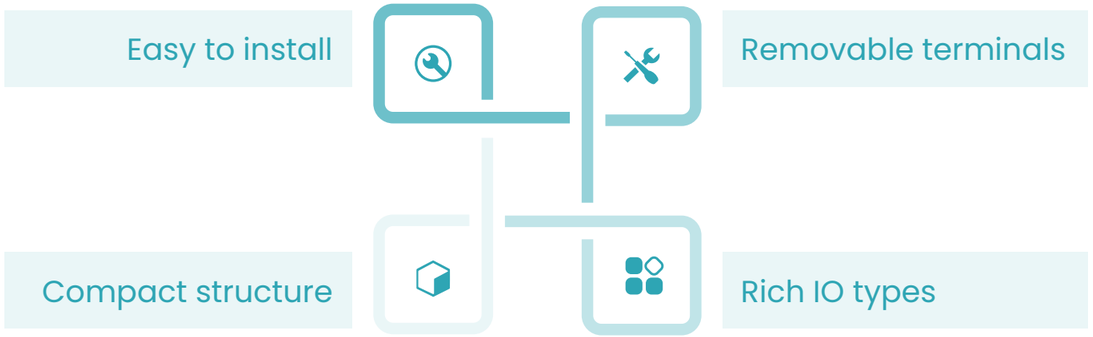
02 Integrated engineer call, engineer duty functions

03 Multi-language support, synchronous language display with the server

Product Introduction

SIMATIC S7-1200 series

With integrated PROFINET interface, powerful integrated process functions and flexible scalability, it provides simple communication and effective solutions for various process tasks, especially to meet the completely different automation needs in a variety of applications.



ET200SP

01 Simple to use, small size, powerful.

Compact modular design for easy installation 02

03 he system supports hot swap, and the module runs without a vacancy

Rich IO types 04

05 Can be mounted as a 1500R/H redundant system remote expansion module

Support PROFINET or PROFIBUS IM communication interface module, multi-type bus adapter is optional. 06

07 Supports up to 64 racks of remote expansion, and each remote module can expand up to 64 signal modules

SIMATIC S7-1500R/H Redundant Controller

The S7-1500 redundant control system can effectively avoid the risk of downtime and data loss caused by controller failure, ensure high availability of equipment, and improve operational efficiency.

S7-1500 CPU and PROFINET Redundancy Overview

Based on standard S7-1500 CPU and PROFINET

-Based on standard S7-1500 CPU /Fail-safe CPU
-ProFINET-based system redundancy

Transparent programming

-Standard engineering development tools
-Programming is the same as standard CPU

Flexible expansion

- Flexible redundant architecture
- Multiple CPU options (1513 →1518)

6.1 Engine Room Monitoring and Alarm System and Engineer Alarm System

6.1.1 AMS Introduction

Real-Time Data Acquisition & Monitoring System

The system enables real-time acquisition and monitoring of operating parameters for all engine room equipment. It utilizes decentralized signal acquisition to ensure comprehensive coverage across diverse machinery, while maintaining centralized remote access to critical data.

Decentralized Signal Acquisition & Centralized Monitoring

By adopting a distributed architecture, the system collects signals from multiple sources without single-point failure risks. Data is aggregated into a centralized graphical interface for real-time visualization, alarm logging, and extended alarm functionalities such as threshold customization and escalation protocols.

Safety & Alarm Management Integration

The system provides robust alarm record-keeping and extension features, including an engineer safety alarm system and a duty selection module. It delivers complete technical and operational data to support ship safety, fault diagnosis, remote maintenance, and performance optimization.

Unmanned Engine Room Compliance & Functionality

Designed to meet periodic unmanned engine room requirements, the system integrates an engineer call system, extended alarm functions, and automated duty scheduling. These features ensure compliance with safety standards while enabling efficient resource allocation and rapid response during emergencies.

System functions:

1.Engineer Safety

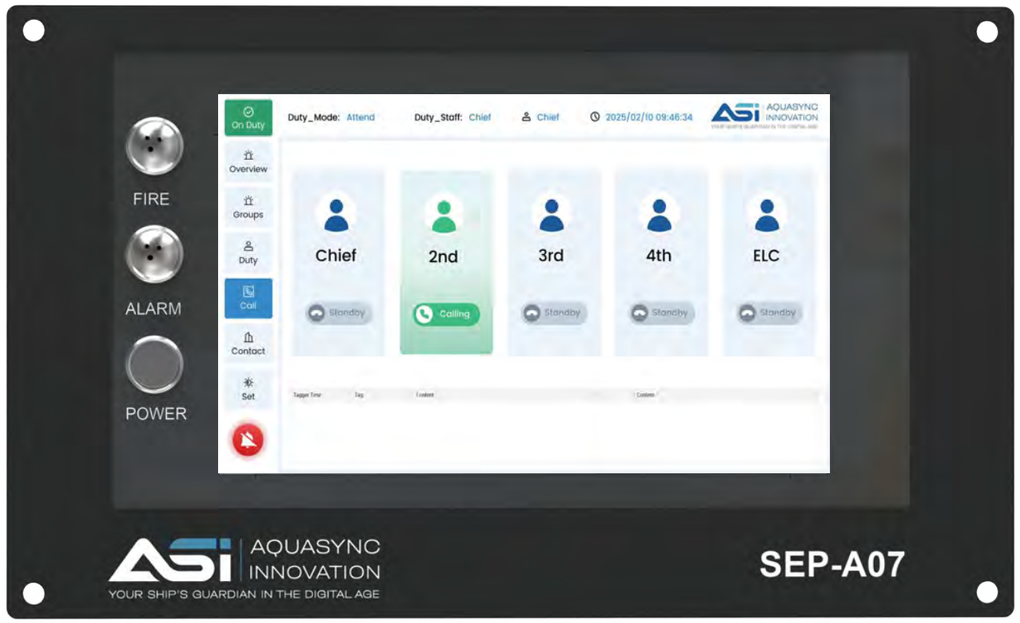
Engineer safety system is an important part of ship safety, especially in unattended or high-risk areas, which can effectively protect the safety of crew. When the system triggers the engineer's safety alarm, the audible and visual alarm is extended to the extended alarm board throughout the ship.

Reset Button

Start Button

2.Engineer Call

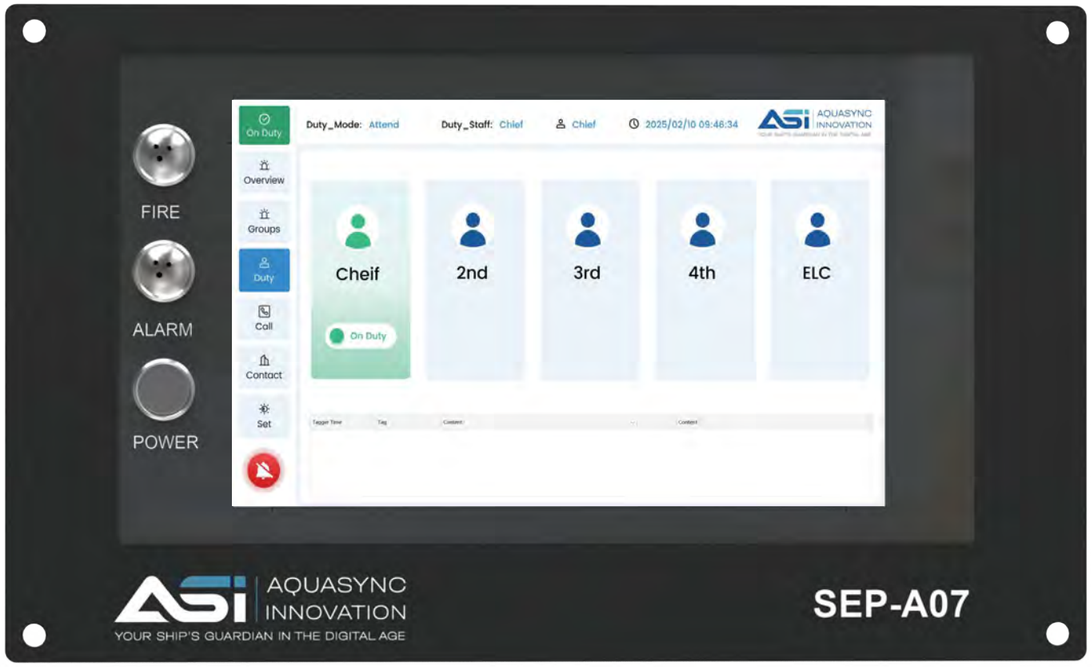
when the on-duty engineer needs to get help from other engineers in the central control room, or reminds to change shifts, he can click on the engineer to be called at the operater station of the engine control room. In an emergency, all engineers can be called.



3. Engineer on Duty

The monitoring alarm system that meets certain monitoring point conditions can be set up as a periodic unguarded cabin. Select the personnel who need to be on duty at the operation station in the central control room for shift switching. After the switch is complete, the current duty personnel and cabin status information can be displayed on the background template of all OWS and extended alarm boards.

In the unmanned engine room mode, when the alarm is not confirmed for a certain period of time, the engineer's dereliction of duty alarm will be triggered and extended to the delayed declaration alarm board in each engineer's room.



4. Synchronize the Clock

The system can accept NMEA0183 statements from the GPS, automatically set the UTC time of the system, and synchronize to all computer operating stations and extended alarm boards, and PLC (if necessary). All alarms and events are recorded in UTC time.

5. Fan and Water Pump Control

Fans and water pumps can be started and stopped manually in remote control, and fault monitoring of motors can be carried out at the same time. Automatic control can also be added, such as automatic start in case of black-out recovery, and automatic switchover between main and standby pumps.

6. Alarm Message Trigger, Confirm, Archive

The alarm can be generated by triggering each bit of an external variable or by an analog alarm when the limit is exceeded. According to the different content of each alarm block, alarms can be filtered and grouped according to priority, fault location or time order. Including basic shielding, suppression, delay, grouping, alarm limit online modification, alarm description online modification and so on.

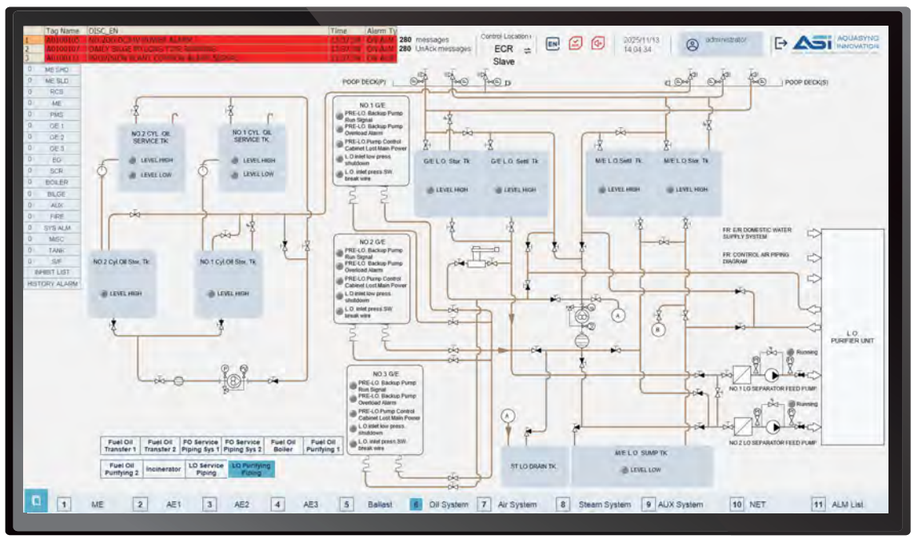
7. User Management

With the User Manager, you can assign and control users' access to configuration and runtime software editions.

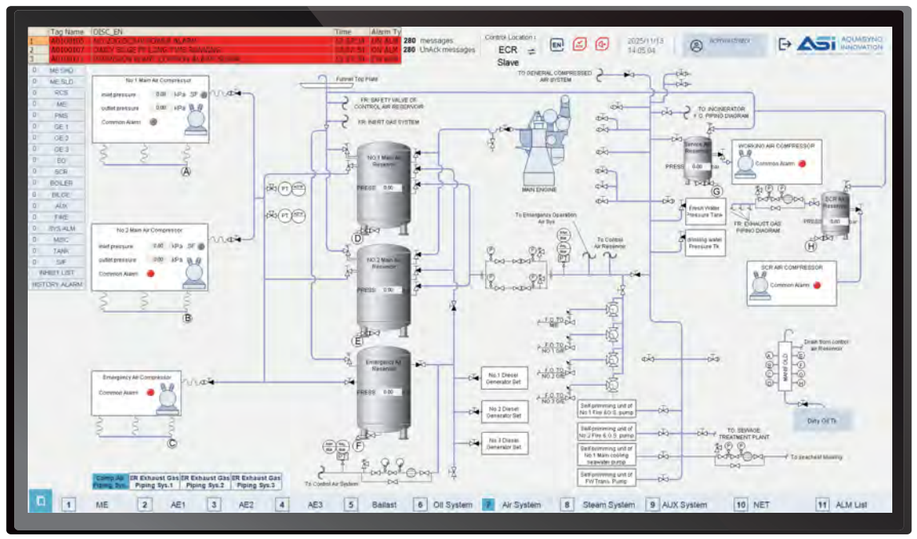
8. Data Archiving

Integrated high-performance MS SQL Server database for archiving historical value/value sequences, as well as alarm and user data, is not only powerful but also easy to scale. The adoption of high efficiency and lossless compression means that the requirements on memory are very low.

6.1.2 Software Interface



LO Purifying System



Compress Air System

Generator

Main Engine

6.2 Valve Remote Control and Level Gauging System

6.2.1 Valve Remote Control System

System Overview

Valve remote control systems can be classified according to their driving methods into hydraulic, electro-hydraulic, pneumatic, and electric types. Among these, hydraulic and electro-hydraulic systems are the most widely used in the field of marine valve control.

These systems allow operators to remotely control the opening and closing of valves in pipelines, display valve positions or openings, and trigger alarms, thereby ensuring the reliable operation of systems such as ballast water, bilge water, firefighting water, and engine room water supply. A typical valve remote control system consists of signal acquisition modules, control units, valves, actuators, emergency operation devices, valve position indicators, and power sources.

According to the Power Source of the Actuator

Hydraulic drive valve control system

The hydraulic drive system mainly comprises a computer control system, signal acquisition module, hydraulic actuators and valves, a hydraulic power unit (HPU), accumulator, solenoid valve box, and an emergency operation device.

Electro-hydraulic drive valve control system

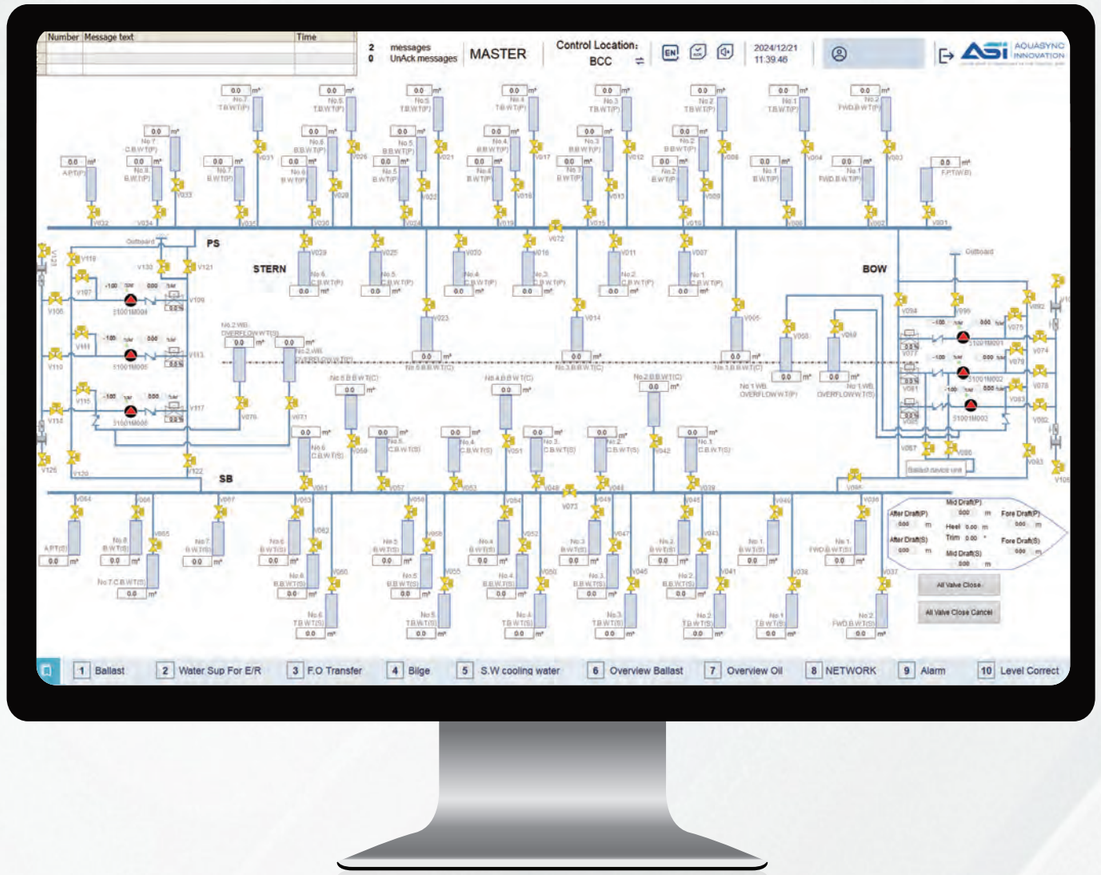
The electro-hydraulic valve remote control system integrates the electro-hydraulic power unit into the drive head and mainly comprises a computer control system, signal acquisition module, electro-hydraulic actuator, and valve.

Pneumatic drive valve control system

The pneumatic drive system mainly comprises a computer control system, signal acquisition module, solenoid valve box, pneumatic actuators and valves, and an emergency operation unit.

Electric drive valve control system

The electric drivevalve remote control system mainly comprises a computer control system and electric actuated valves.



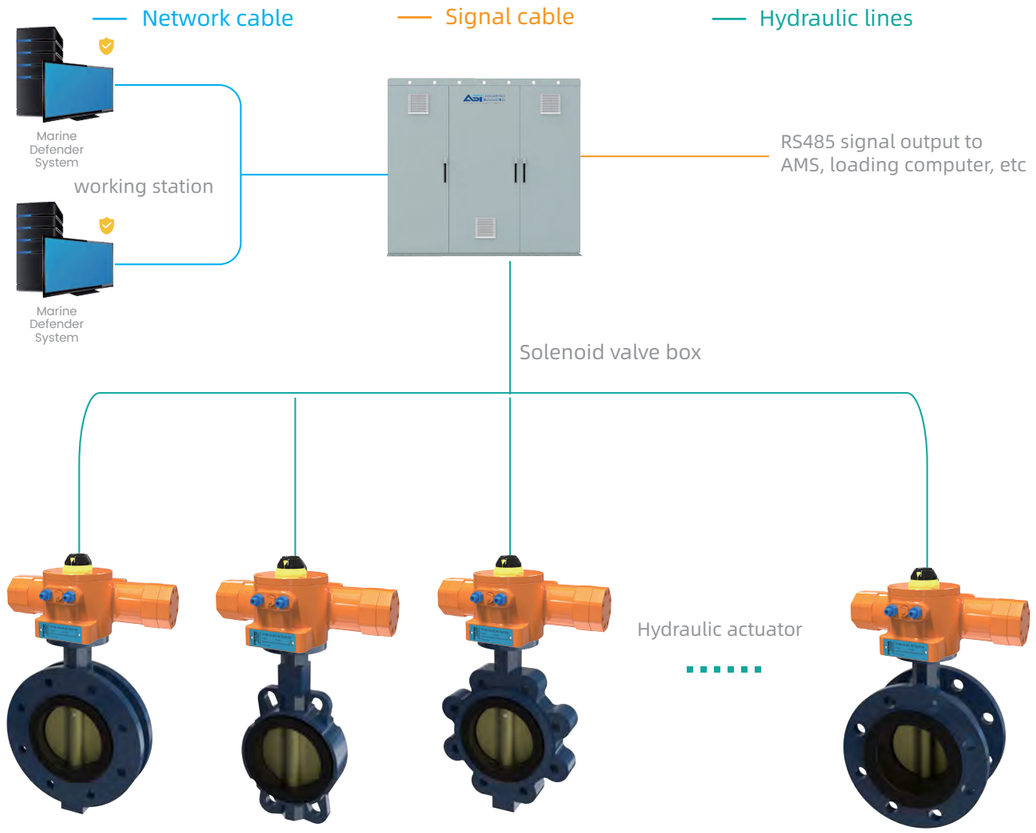
Computer System

The computer system is a PC-based monitoring unit running a licensed Windows 10 operating system. It supports serial communication interfaces and the MODBUS RTU communication protocol. The system is equipped with independently developed SCADA software, with an optional Siemens WINCC version available. The image above shows the MIMIC control interface for the computer-based valve remote control system, where valves correspond one-to-one with the pipeline layout, and level measurements and alarms correspond one-to-one with the designated compartments. The interface is clear and intuitive, integrating control and monitoring functions for convenient operation.

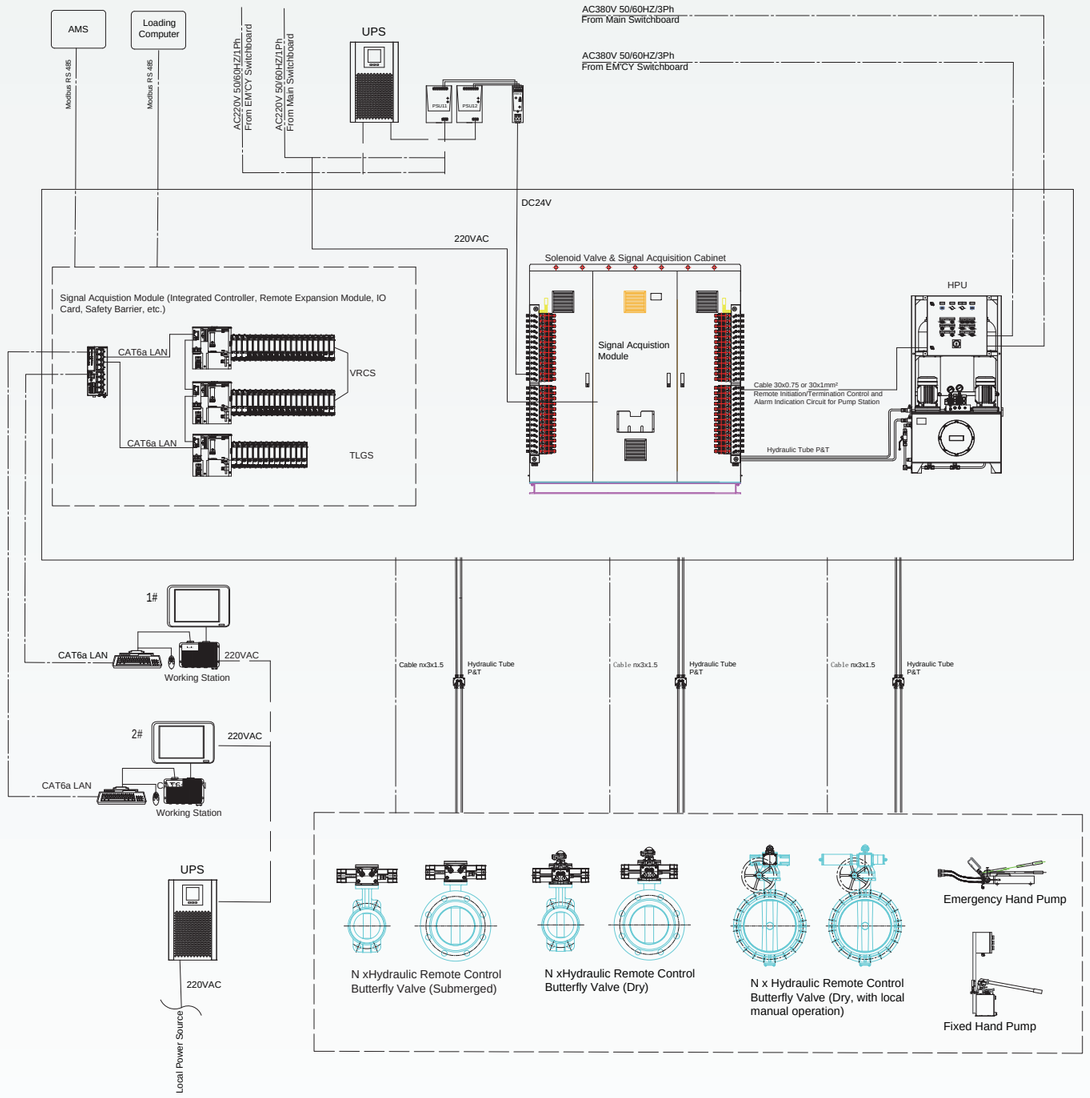
Hydraulic Drive Valve Control System

System Overview

The hydraulic valve remote control system is suitable for various types of marine applications and mainly comprises hydraulic actuators, a hydraulic power unit (HPU), a solenoid valve box (including an electrical control module and a feedback module), and a computer control system. The solenoid valve box is connected to the actuators and the HPU through hydraulic pipelines, and to the computer control system via electrical cables.



System Diagram



Double Acting Hydraulic Actuator

The hydraulic actuator is a device that utilizes hydraulic oil to drive piston movement, enabling valve opening, closing, and position adjustment. It features a simple structure, quick response, and high output force, making it particularly suitable for marine and offshore applications.

The double-acting hydraulic actuator is directly mounted on the valve. In the event of hydraulic power loss (such as oil leakage) or electrical failure, the valve and actuator will stop and remain hydraulically locked in their current position.

Characteristic Description

The system features a compact and simple structure with a high level of safety.

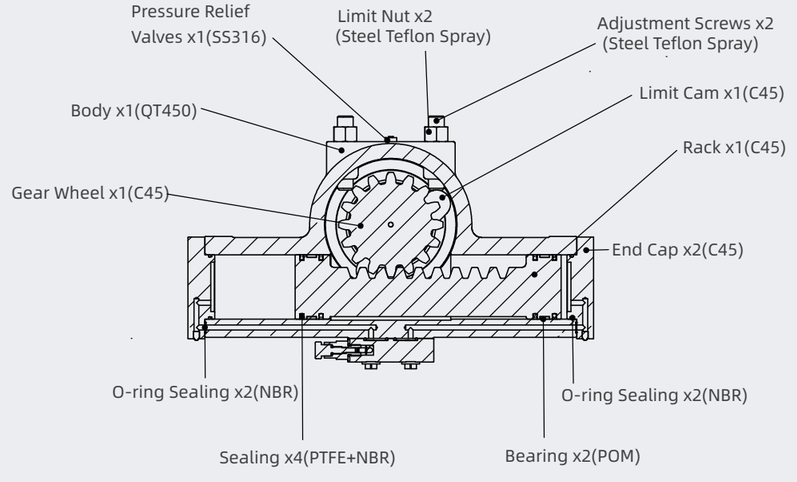
The actuator, though small in size, provides a large driving force, making it ideal for operating large-diameter and high-pressure valves.

Maintenance is straightforward and required only infrequently.

It has low environmental requirements, can be installed at any angle, and is easy to operate, making it well-suited for use in both dry and submerged environments.

The position of the limit bolt has been optimized to be located away from the actuator's gear drive area and completely isolated from the cylinder, effectively resolving the oil leakage issue caused by improper bolt positioning. The system features a compact and simple structure with a high level of safety.

Parts List



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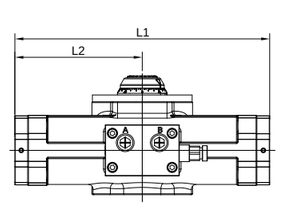
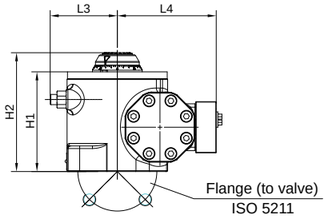




Flange Dimensions Acc. to ISO5211		
Flange Type	Bolt Circle [Mm]	Number of Threads
F05	50	4XM6
F07	70	4XM8
F10	102	4XM10
F12	125	4XM12
F14	140	4XM16
F16	165	4XM20
F25	254	8XM16

Model	Torque [Nm]	Piston Displacement [Cm³]	Hollow Shaft/Depth	Flange ISO 5211	L1	L2	L3	L4	H1	H2
FHD(S*)180	180	37	□ 9 / 21 □ 11 / 21 □ 14 / 21 □ 17 / 21	F05 ; F07	245	122.5	64	98	83	103
FHD(S*)380	380	75	□ 17 / 28 □ 22 / 28	F07 ; F10	290	145.0	80	105	105	125
FHD(S*)700	700	142	□ 22 / 31 □ 27 / 31	F10 ; F12	300	150.0	79	116	117	135
FHD(S*)1500	1500	297	□ 27 / 40 □ 36 / 40	F14	410	205.0	105	140	154	184
FHD(S*)3000	3000	598	□ 36 / 40 □ 46 / 40	F16	506	253.0	146	171	200	230
FHD(S*)6800	6800	1359	□ 46 / 40	F25	592	296.0	168	209	245	275

Single Acting Hydraulic Actuator

The hydraulic actuator is a device that utilizes hydraulic oil to drive piston movement, enabling valve opening, closing, and position adjustment. It features a simple structure, quick response, and high output force, making it particularly suitable for marine and offshore applications.The single-acting hydraulic actuator is directly mounted on the valve. In the event of hydraulic or electrical power failure, the actuator automatically drives the valve back to its original (fail-safe) position.

Characteristic Description

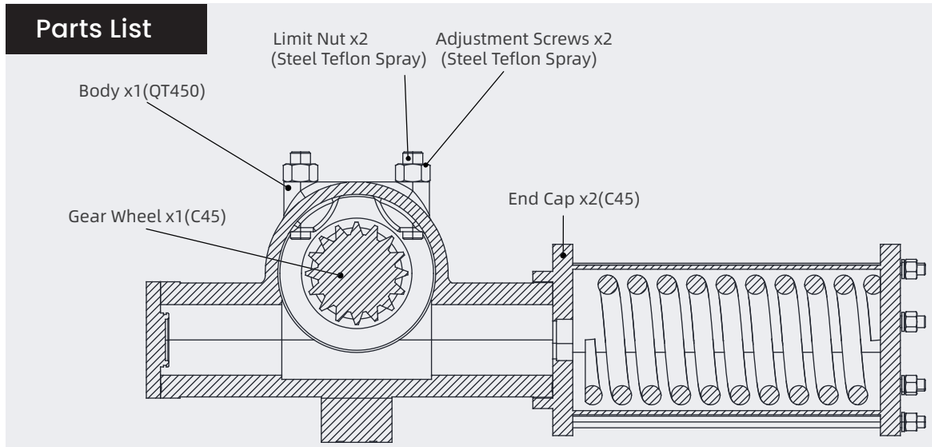
The system has a compact and simple structure, ensuring high safety.

Compact yet powerful, the actuator delivers exceptional driving force, making it ideal for large-diameter and high-pressure valves.

Maintenance is straightforward and infrequently required.

It has minimal environmental constraints, can be installed at any angle, and is easy to operate, making it suitable for both dry and submerged environments.

Parts List



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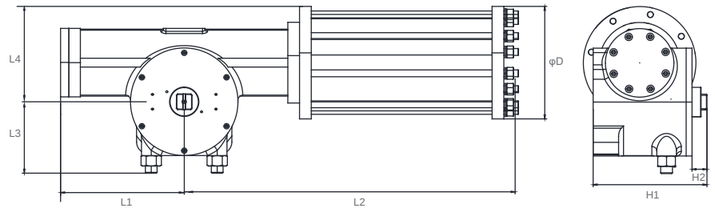

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F14	140	4XM16
F16	165	4XM20
F25	254	8XM16

Model	Fiston Displacement [Cm³]	Hollow Shaft/Depth	Flange ISO 5211	L1	L2	L3	L4	H1	H2	φD
EFHS0070	37	□ 17/21	FO5;FO7	125	330	75	100	105	20	142
EFHS0090	75	□ 22/26	FO7;F10	145	370	90	130	125	20	160
EFHS0170	142	□ 27/31	F10;F12	150	410	90	130	137	20	158
EFHS0400	297	□ 36/40	F12;F14	205	533	115	170	185	30	205
EFHS0700	598	□ 46/50	F16;F25	253	684	150	210	205	30	230
EFHS1300	720	φ80*110	F16;F25	490	765	170	280	215	30	285
EFHS2400	870	φ80*110	F25;F30	490	860	155	300	215	30	330
EFHS3900	1450	φ80*110	F25;F30	520	822	360	360	400	30	355

Hydraulic Drive System

Hydraulic Power Pump Station HPU

Accumulators serve three main purposes:

The accumulators serve three main purposes:

1. They allow the system to meet customer requirements by providing a reasonable pump start-stop interval within a specified time frame, compensating for internal leakage in the valve remote control system.
2. They ensure a stable supply of hydraulic pressure.
3. They guarantee the full operation of designated valves in emergency situations according to customer requirements.

The driving force for the valve comes from hydraulic oil. The hydraulic pump unit (HPU) supplies high-pressure hydraulic oil to the accumulator. Controlled by the directional valve in the solenoid valve box and the pressure from the accumulator, the hydraulic oil flows through different pipelines, driving the valve to open or close.

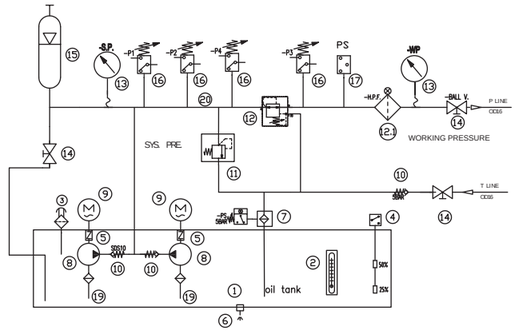
The HPU mainly consists of a hydraulic gear pump, motor, control valve assembly, pressure relief valve, safety valve, oil tank, accumulator, and control accessories. Core components are selected from renowned brands — such as Rexroth and Marzocchi for hydraulic parts (e.g., gear pumps), and ABB motors certified by classification societies.

All components are carefully selected to ensure a simple structure and easy control, guaranteeing stable pump station operation and convenient routine maintenance.

The hydraulic power unit control box allows selection and control of the hydraulic pump (main/standby) and motor, as well as monitoring abnormal alarms for pressure, liquid level, and temperature.

To ensure sufficient accumulator capacity, the hydraulic output pressure is set higher than the design working pressure of the valve remote control system. A pressure relief valve limits the working pressure of the system within the required operating range.

Typical Hydraulic Schematic



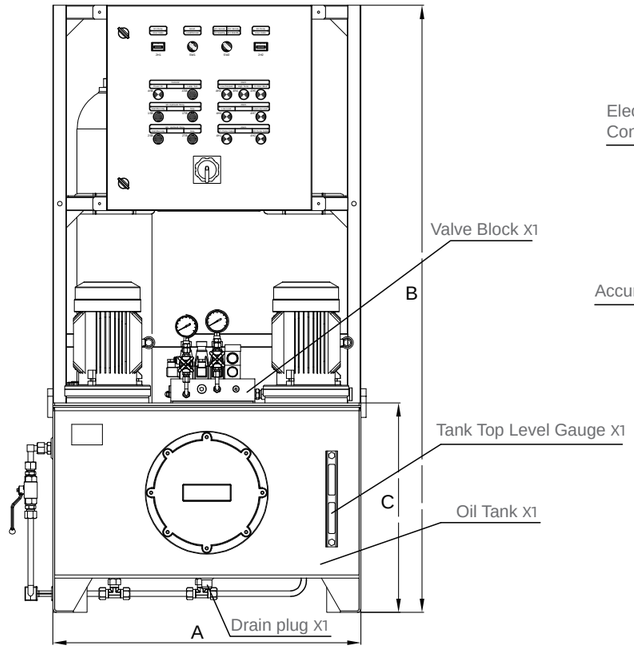
The design is simple and compact, making it easy to arrange and install.

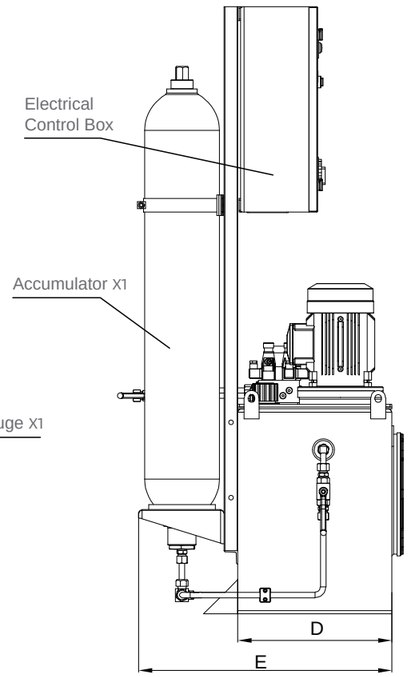
Easy operation;

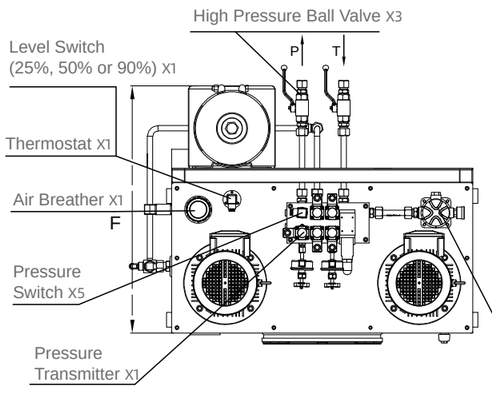
Easy routine maintenance ;

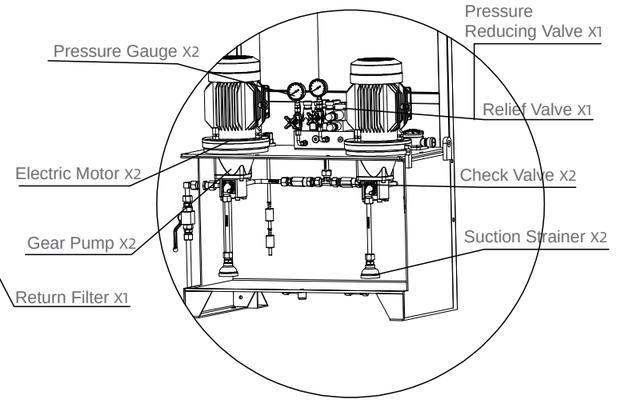
The pressure output is stable and reliable.

Selection Table









Model	A	B	C	D	E	F
HPU 100L	800	1700	483	450	740	740
HPU 150L	800	1800	583	450	740	740
HPU 200L	900	1775	550	450	740	740
HPU 250L	900	1775	613	450	740	740

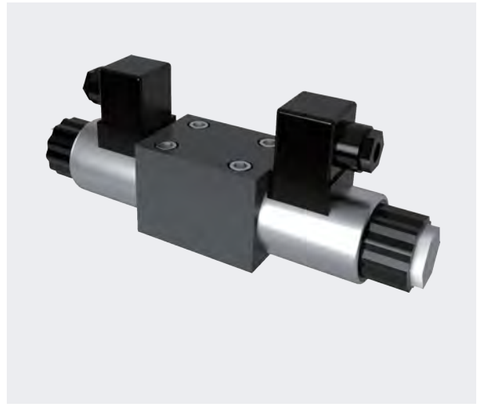
Hydraulic Drive System

Solenoid Valve Box

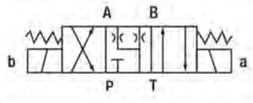
The solenoid valve box integrates both hydraulic and electrical control and signal acquisition components. The hydraulic section consists of solenoid valves, manifolds, throttle valves, pressure switches, flow switches, and flow meter feedback elements.
The electrical control and acquisition section comprises a PLC-based signal acquisition and processing module. The solenoid valve box collects and processes signals according to the actual requirements of each hydraulic remote control valve. It transmits valve position signals and receives control commands from the supervisory computer control system, thereby enabling remote valve operation.

Electromagnetic Valve

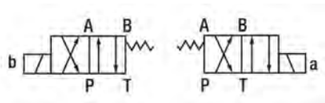
• Standard mounting-hole design for easy installation and replacement.
• Low power consumption, stable performance, and long relay lifespan.
• Minimal surge voltage ensures no interference with the electronic control system.
• High pressure and large flow rates are achieved through the use of powerful wet-type solenoid coils and a well-designed cast flow path.
• Low leakage and low pressure loss improve system efficiency and effectively prevent frequent startup of the hydraulic pump station.



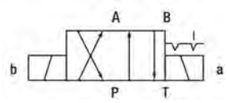
Common Type



FSA-43D
3-position 4-way solenoid valve, double electric control, with neutral pressure relief function



FSA-42S
2-position 4-way solenoid valve, single solenoid, self-resetting



FSA-42D
2-position 4-way solenoid valve, double electric control, with manual emergency operation

Technical Parameter

PROJECT	PARAMETER
Type	3-position 4-way，2-position 4-way
Working Pressure	Standard interface allows for direct installation on manifolds.
Interface	P：Import (hydraulic pump) ; A，B Actuator interface ; T：Oil return port (hydraulic pump)
Max.working Pressure	P to A or B：305bar ；T：140bar
Max.flow	80 L/min
Working Temperature	（-20~60）℃
Medium Temperature	（-20~70）℃
Medium Viscosity Range	(2.8~500)cst
Burst Pressure	680bar

Hydraulic Drive System

Mainfolds

Compact structure;

Each channel group is equipped with a throttle valve, making maintenance and flow adjustment easy.

Technical Parameter

PROJECT	PARAMETER
Design Pressure	200 bar
Installation Interface	1/4'' BSPP
Maximum Number of Channels	13 Group
Body Material	45# Steel
Sealing Material	NBR

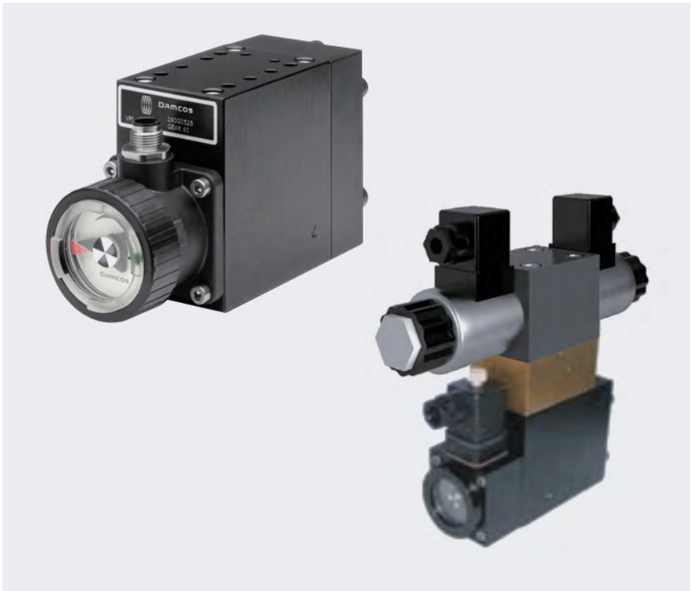
Parts List

PICTURE	NAME	DESCRIPTION
	Top Block	Used to seal the upper end of the manifold and include a pressure gauge in the P channel to monitor system pressure.
	Bottom Block	Used to seal the bottom end of the manifold, with a set of quick connectors on the PT channel for emergency manual pump operation.
	Blind Plate	For sealing unused or system spare channels
	Check Valve	Installed on the return line of the manifolds to ensure proper hydraulic flow and prevent backflow.
	Throttle Valve	Used to shut off the fluid or throttle the hydraulic system to adjust the valve opening and closing speed.

VPI Flow Meter Valve Position Indication

The VPI flow-type valve position indicator operates based on an internal precision gear mechanism that delivers a constant flow rate per revolution. By measuring the actuator's displacement volume, it calculates and displays the corresponding valve position.

The VPI flow-type valve position indicator is mainly used for submerged hydraulic actuators or those installed in explosive environments. It is typically mounted between the manifold and the solenoid valve.



Technical Parameter

PROJECT	PARAMETER
Max.working Pressure	135 bar
Design Pressure	200 bar
Display Method	Pointer
Applicable Temperature Range	(-18°C ~ 80)°C
Medium	Acid-free Anti-wear Hydraulic Oil
Viscosity Range	(15~200)cst
Max. Flow	15 L/min
Body Material	Aluminum Alloy
Internal Material	Stainless Steel

Hydraulic Drive System

Fixed Hydraulic Hand Pump

The double-acting/single-acting fixed hydraulic manual pump is equipped with a 5 L oil tank and features a three-position, four-way manual directional valve. It is also fitted with pressure gauges and hydraulic ball valves at both the inlet and outlet.

Special safety design, with internal relief valve;

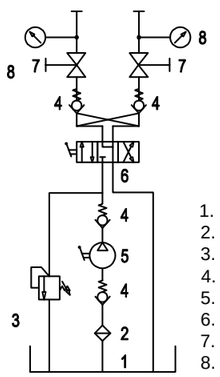
Stainless steel shell design, suitable for a variety of marine conditions;

With valve position opening and closing indication;

Small size, easy to arrange, easy installation and operation, convenient for daily maintenance.

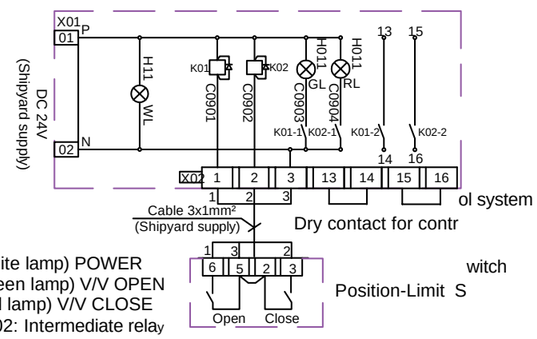
Schematic

SCHEMATIC DIAGRAM



1. Oil tank
2. Filter
3. Safety valve
4. Check valve
5. Wobble pump
6. Reversing valve
7. Ball valve
8. Pressure gauge

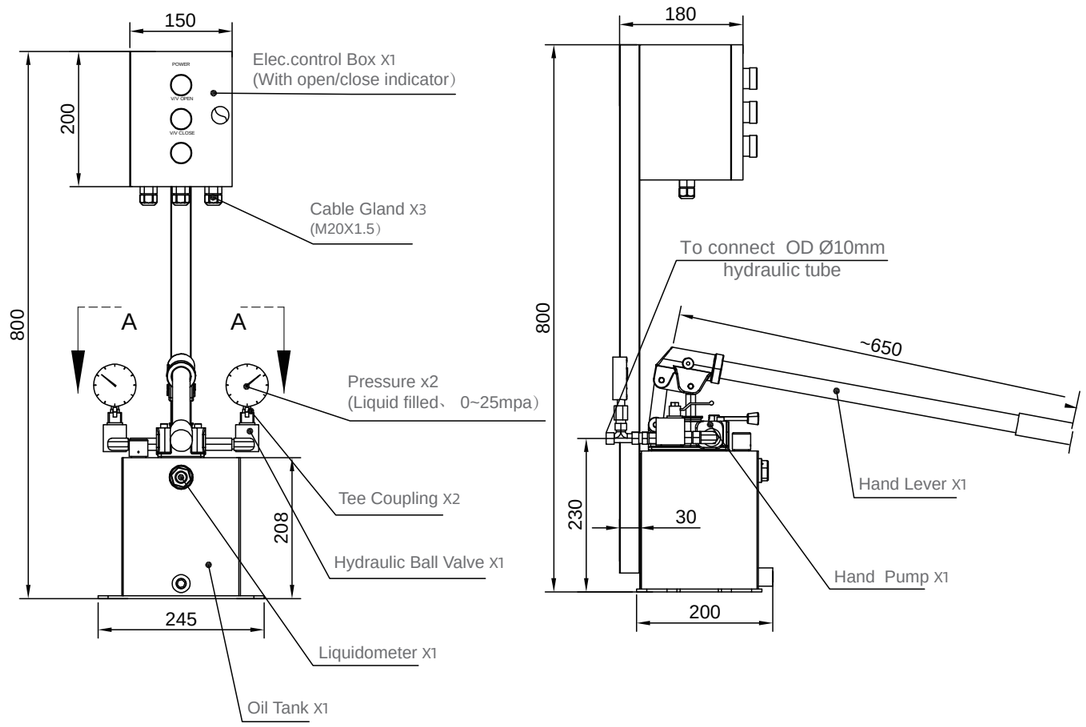
VALVE OPEN/CLOSE INDICATING ELECTRIC DIAGRAM



Technical Parameter

PROJECT	PARAMETER
Model	DAH130
Working Pressure	(100~130) bar
Max.working Pressure	180 bar
Working Temperature	(-20~80)℃
Hydraulic Media	Acid-free hydraulic oil with viscosity range 15-64cst
Volume Of Oil Tank	5 liter
Hydraulic Pump With Relief Valve	180barSetting pressure 180 bar
Pressure Gauge	(0 ~ 250) bar
Paint Color	Maker Standard
Other	With detachable lever and ferrule for connection to shipyard piping

Selection Table



Hydraulic Drive System

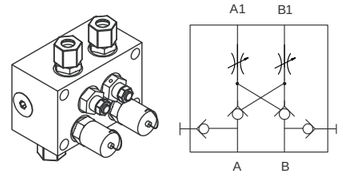
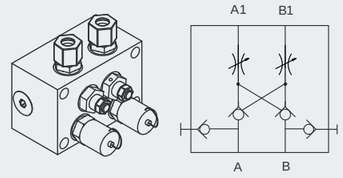
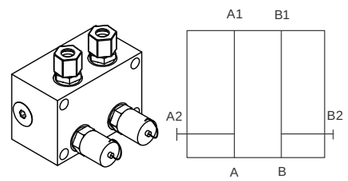
Emergency Hand Pump

The portable emergency manual pump is equipped with a standard 3L oil tank, with an optional 5L tank available. It comes with 5-meter-long hydraulic hoses at both the inlet and outlet, which can be connected to quick couplings on the actuator.

Technical Parameter

PROJECT	PARAMETER
Model	PHDA135
Working Pressure	(100~130) bar
Max.working Pressure	180 bar
Working Temperature	Acid-free hydraulic oil with viscosity range 15-64cst.
Hydraulic Media	(-20°C ~ 80)°C
Volume of Oil Tank	3 liter
Hydraulic Pump With Relief Valve	Setting Pressure 180 Bar.
Pressure Gauge	(0 ~ 250) bar
Paint Color	Maker Standard
Other	Equipped with removable handle, two hydraulic hoses with quick connectors, each with a length of 5 meters.

Hydraulic Emergency Valve Block

PICTURE	NAME	DESCRIPTION
	Emergency Valve Block FWB1	Bulkhead-mounted valve block equipped with a flow control valve and hydraulic quick couplings for emergency operation. Designed for dry installation with double-acting hydraulic actuators (customized versions available for single-acting types).
	Emergency Valve Block FWB2	Face-mounted on dry-type hydraulic actuators and equipped with a flow control valve and hydraulic quick couplings for emergency operation. Designed for dry installation with double-acting hydraulic actuators, with customized options available for single-acting types.
	Valve Block FWB3 Emergency	Bulkhead-mounted valve block designed for integrating two different types of hydraulic systems. Suitable for dry installation with double-acting hydraulic actuators, with customized options available for single-acting types.

Limit Switch

Electro-hydraulic Drive Valve Control System

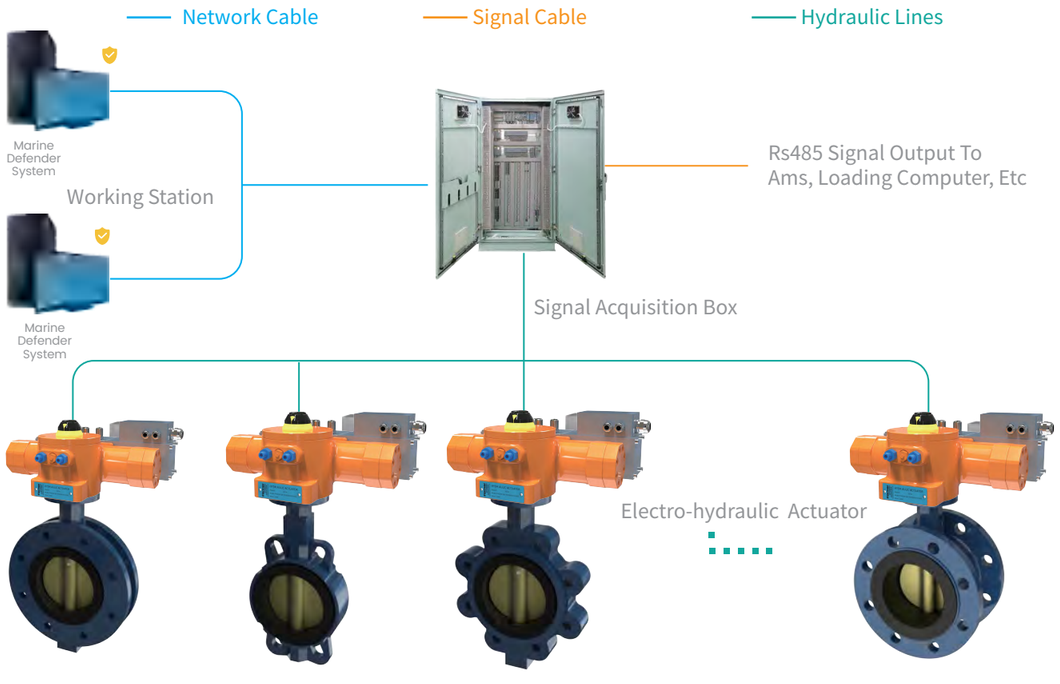
System Overview

The electro-hydraulic valve remote control system is an integrated solution that embeds the hydraulic power unit into the actuator head. It mainly consists of a computer control system, signal acquisition module, electro-hydraulic actuator, and valve.

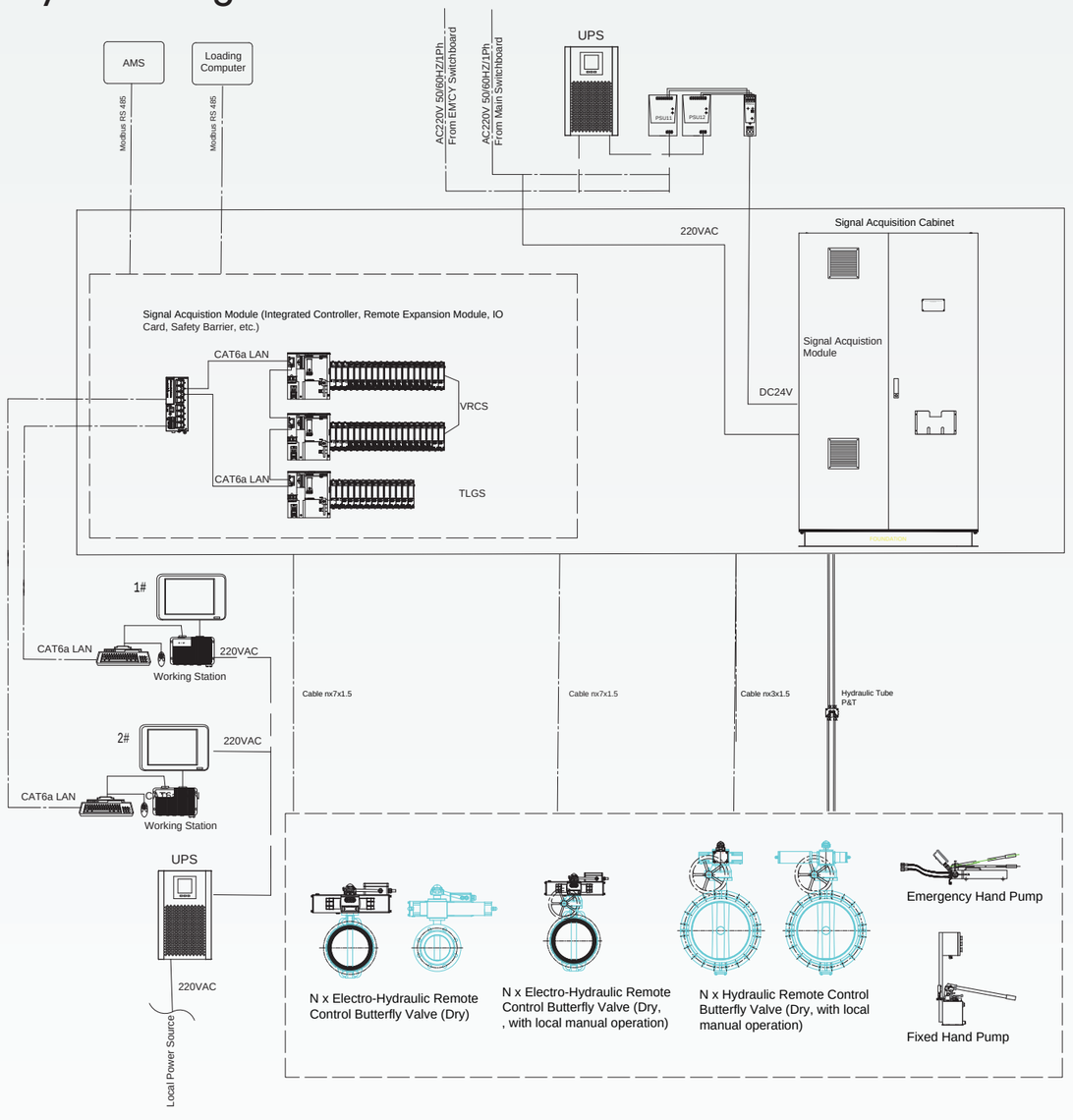
At the core of the system is the electro-hydraulic actuator, which combines the hydraulic oil tank, motor, valve position indicator, and control module into a single compact unit. The actuator is controlled by an automation computer connected to the control module.

The control module receives valve operation commands from the automation computer and drives the electro-hydraulic servo mechanism to open or close the valve. Once the operation is complete, the valve position indicator transmits real-time position feedback to the control module, which then sends the corresponding signal back to the automation computer for display and monitoring.

The system features a closed-loop feedback mechanism to ensure precise, responsive, and reliable operation. It is ideally suited for applications requiring high accuracy and reliability—such as in the marine, petrochemical, and power industries—enabling efficient automation and remote control.



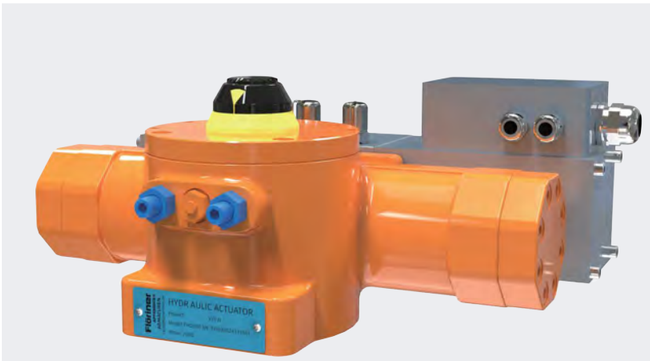
System Diagram



Double Acting Electro-hydraulic Actuator

The electro-hydraulic actuator integrates a hydraulic pump, motor, and control accessories into a compact design. Each valve is equipped with its own electro-hydraulic actuator, allowing the control units to function independently while complementing one another to enhance overall system reliability. This modular independence simplifies fault diagnosis and routine maintenance, while reducing system complexity and maintenance costs. The design significantly improves operational stability and efficiency, making it ideal for applications requiring high reliability.

The double-acting electro-hydraulic actuator is directly mounted on the valve. In the event of hydraulic pressure loss (e.g., due to leakage) or electrical failure, the actuator and valve will stop and remain hydraulically locked in their last position, ensuring system safety and operational integrity.



Characteristic Description

The compact and straightforward structure ensures that each valve operates independently, delivering high reliability.

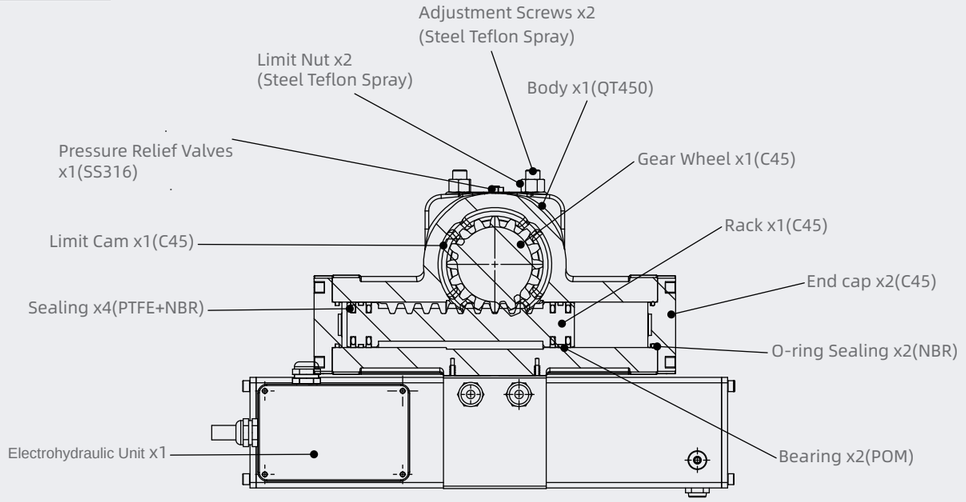
Its easy installation eliminates the need for complex hydraulic piping.

Both integrated and separate installation options are available to accommodate a wide range of operating conditions.

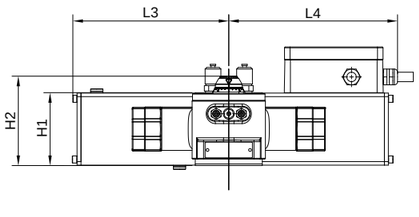
The limit bolt position has been optimized to be located away from the actuator's gear drive area and fully isolated from the cylinder, effectively eliminating oil leakage issues caused by improper limit bolt placement.

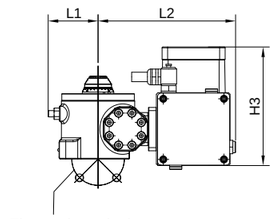
Maintenance is straightforward and convenient.

Parts List



Selection Table



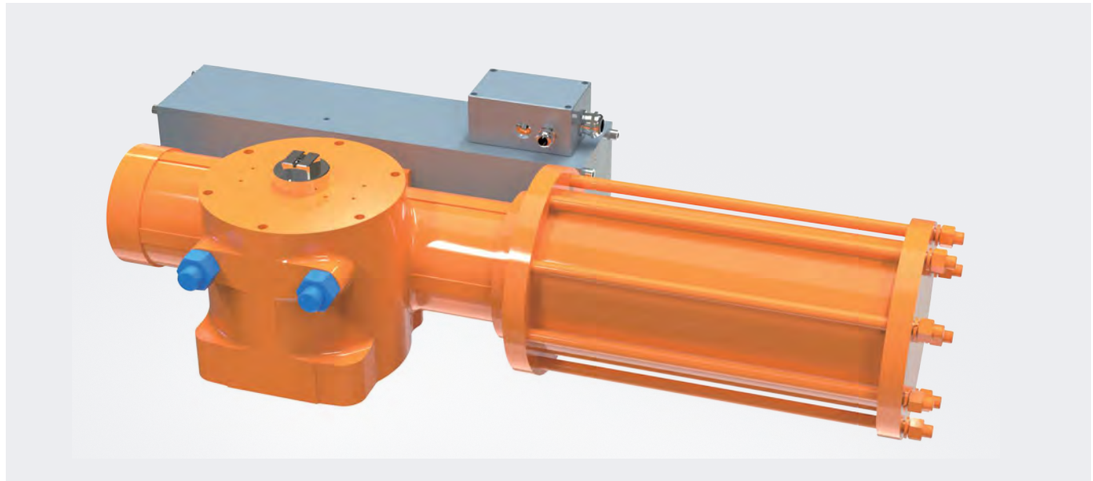


Flange Dimensions Acc. to ISO5211		
Flange Type	Bolt Circle [Mm]	Number of Threads
F05	50	4XM6
F07	70	4XM8
F10	102	4XM10
F12	125	4XM12
F14	140	4XM16
F16	165	4XM20
F25	254	8XM16

Model	Torque [Nm]	Piston Displacement [Cm^3]	Hollow Shaft/Depth	Flange ISO 5211	L1	L2	L3	L4	H1	H2	H3
FHD(S*)180	180	37	□ 9 / 21 □ 11 / 21 □ 14 / 21 □ 17 / 21	F05 ; F07	65	175	200	210	95	115	155
FHD(S*)380	380	75	□ 17 / 28 □ 22 / 28	F07 ; F10	80	175	200	215	105	130	150
FHD(S*)700	700	142	□ 22 / 31 □ 27 / 31	F10 ; F12	80	190	200	215	117	140	150
FHD(S*)1500	1500	297	□ 27 / 40 □ 36 / 40	F14	110	210	200	215	155	190	175
FHD(S*)3000	3000	598	□ 36 / 40 □ 46 / 40	F16	146	280	260	260	200	230	250
FHD(S*)6800	6800	1359	□ 46 / 40	F25	168	315	300	300	245	275	250

Single Acting Electro-hydraulic Actuator

The electro-hydraulic actuator integrates the hydraulic pump, motor, and control components into a compact unit. Each valve is equipped with its own actuator, and the control units function independently while maintaining coordinated operation, thereby enhancing overall system reliability. This modular and autonomous design simplifies fault diagnosis and routine maintenance, while reducing system complexity and maintenance costs. It also improves operational stability and efficiency, making the system well-suited for applications requiring high reliability.
The single-acting electro-hydraulic actuator is directly mounted on the valve. In the event of a hydraulic or electrical power failure, the actuator automatically returns the valve to its original position



Characteristic Description

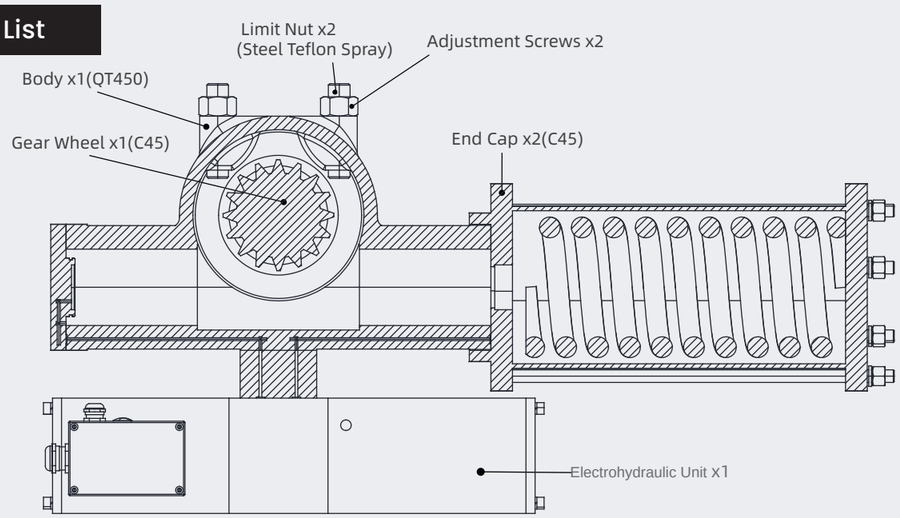
The compact and simple structure ensures independent operation of each valve, providing high reliability.

Integrated or separate installation options are available to accommodate a wide range of operating conditions.

Installation is easy and eliminates the need for complex hydraulic pipelines.

Maintenance is straightforward and convenient.

Parts List



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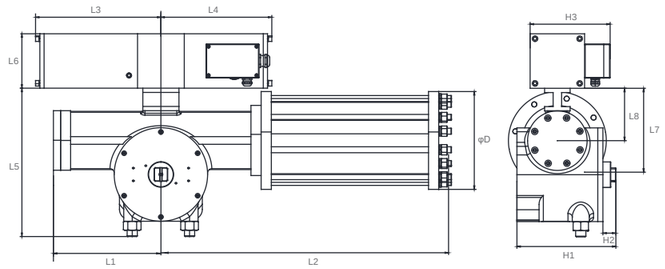

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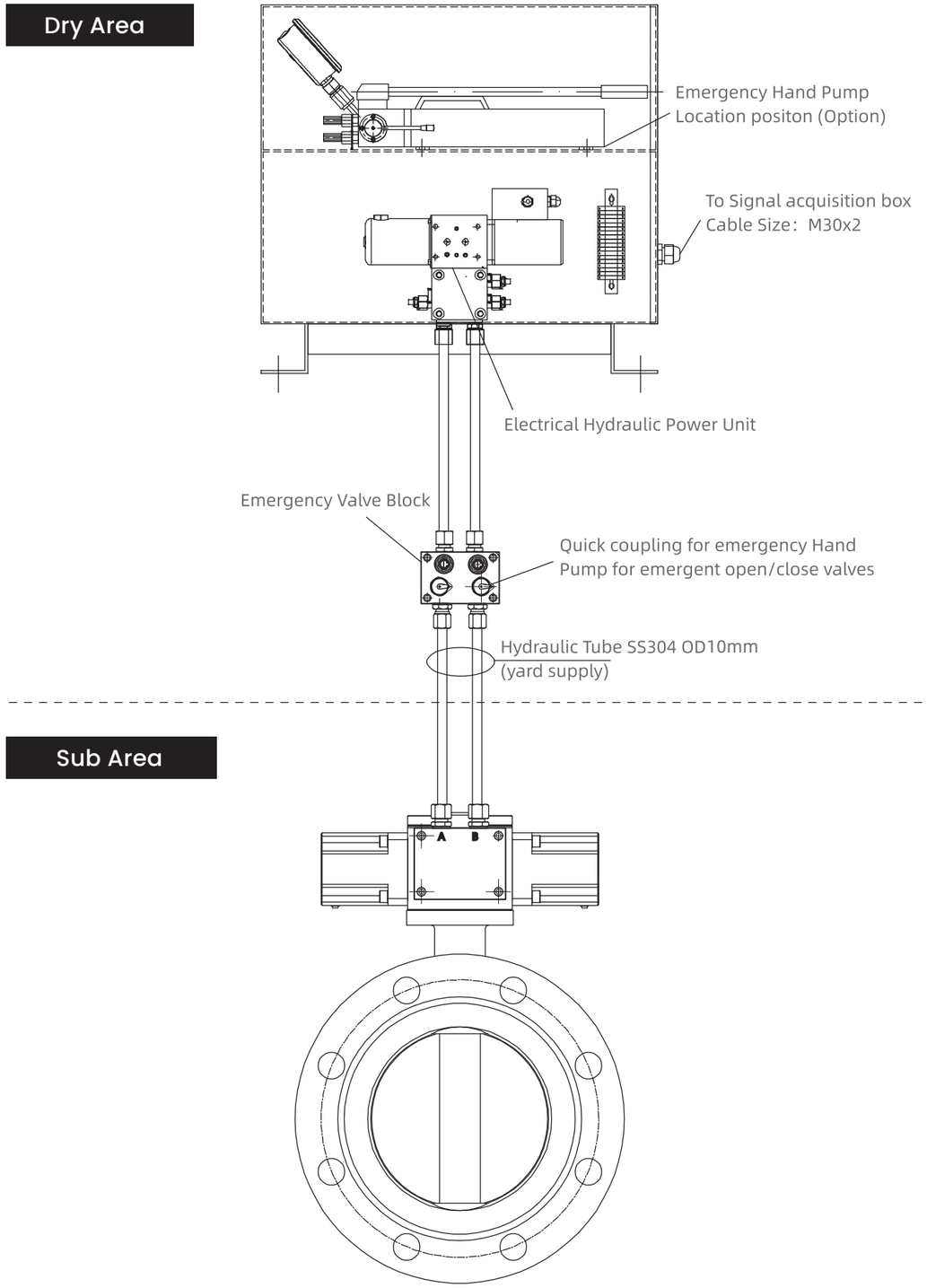
F05	50	4XM6
F07	70	4XM8
F10	102	4XM10
F12	125	4XM12
F14	140	4XM16
F16	165	4XM20
F25	254	8XM16

Model	Fiston Displacement [Cm³]	Hollow Shaft/Depth	Flange ISO 5211	L1	L2	L3	L4	L5	L6	L7	H1	H2	H3	φD
EFHS0070	37	□ 17/21	FO5;FO7	125	330	215	216	190	90	120	105	20	150	142
EFHS0090	75	□ 22/26	FO7;F10	145	370	215	216	223	90	135	125	20	150	160
EFHS0170	142	□ 27/31	F10;F12	150	410	215	176	225	90	140	137	20	150	158
EFHS0400	297	□ 36/40	F12;F14	205	533	206	190	285	105	175	185	30	165	205
EFHS0700	598	□ 46/50	F16;F25	253	684	215	285	200	130	200	205	30	165	230
EFHS1300	720	φ80*110	F16;F25	490	765	215	285	445	130	280	215	30	165	285
EFHS2400	870	φ80*110	F25;F30	490	860	250	550	445	150	290	215	30	165	330
EFHS3900	1450	φ80*110	F25;F30	520	822	250	750	530	150	420	400	30	165	355

Installation Scheme

If a submerged installation of the remote-controlled butterfly valve is required, we can provide a split-type solution. In this configuration, the electro-hydraulic unit is installed in a dry area, while the hydraulic actuator and butterfly valve are installed in a submerged environment (as shown in the diagram), ensuring system stability and safety.

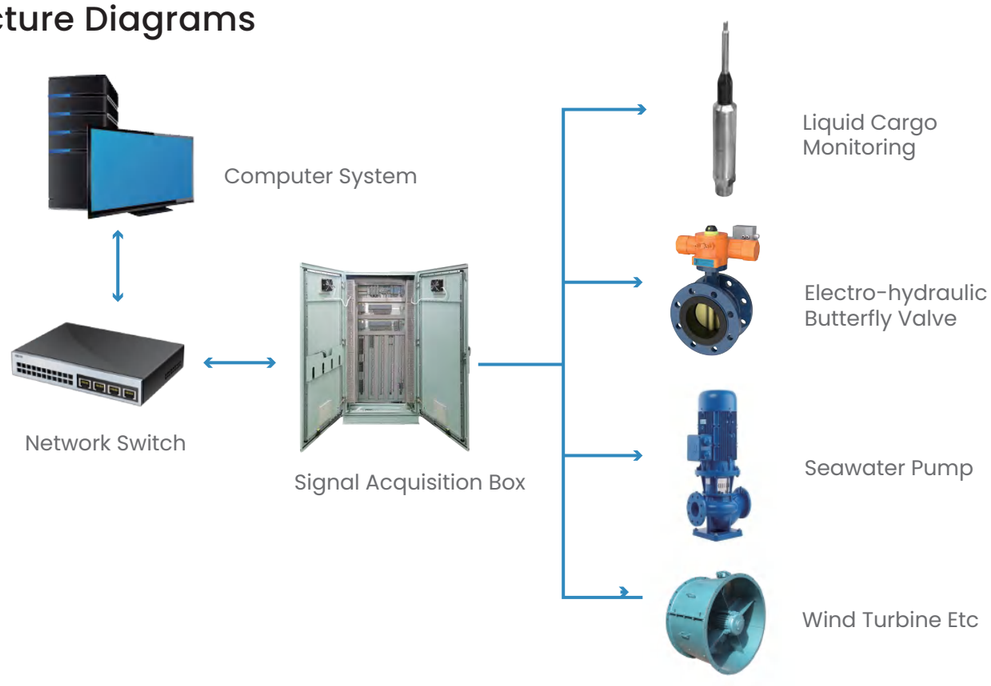


Electro-hydraulic Drive Valve Control System

Signal Acquisition Box

The signal acquisition box is equipped with a central processor and I/O modules that accurately collect key signals, including valve open/close status, pump start/stop status, tank liquid level, and temperature. These data form the basis for program operation and are transmitted in real time to the computer system through communication interfaces. Upon receiving the information, the computer system performs comprehensive monitoring of valves, pumps, and other equipment. It then automatically executes the corresponding operations by outputting control commands to adjust valve and pump actions, ensuring system stability and efficiency while enhancing operational accuracy and reliability.

Structure Diagrams



Other Accessories

Compared with hydraulic valve control systems, electro-hydraulic drive systems feature a simpler layout and eliminate the need for additional components such as HPUs and solenoid valves.

Stationary Hand Pump

Pressure Switch, Flow Switch

Emergency Hand Pump

Limit Switch

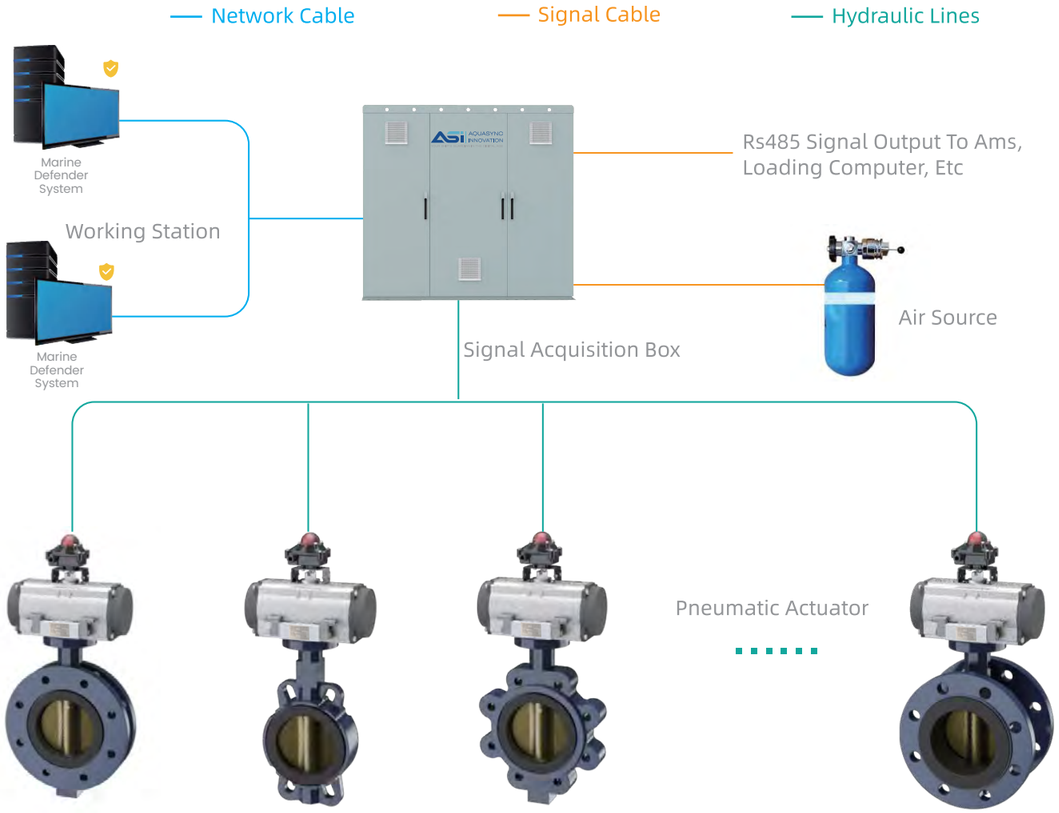
Pneumatic Drive Valve Control System

System Overview

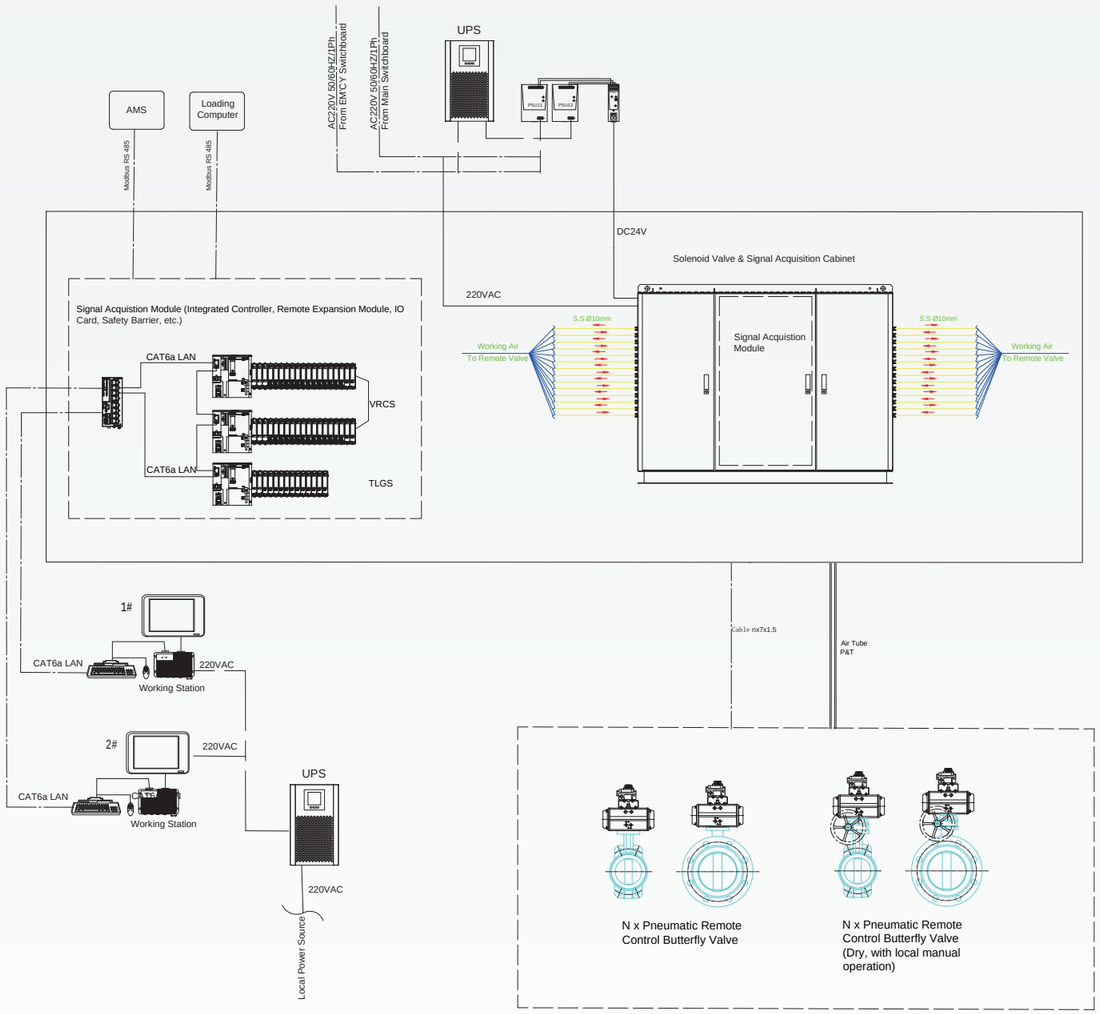
The pneumatic drive valve control system features a relatively simple configuration. Its working principle involves using compressed air to actuate a solenoid valve, which then drives a piston within a cylinder to open or close the valve. The main components of the system include the control system, pneumatic actuators, a 2-position 5-way solenoid valve, and the valve itself.

The system uses the ship's existing 5–7 bar control air as the power source, simplifying installation and maintenance. Only a single air control line needs to be connected to the solenoid valve, enabling efficient and reliable valve operation.

Due to its simple configuration and ease of use, the pneumatic drive system is particularly suitable for applications requiring fast response and high reliability.



System Architecture Diagram

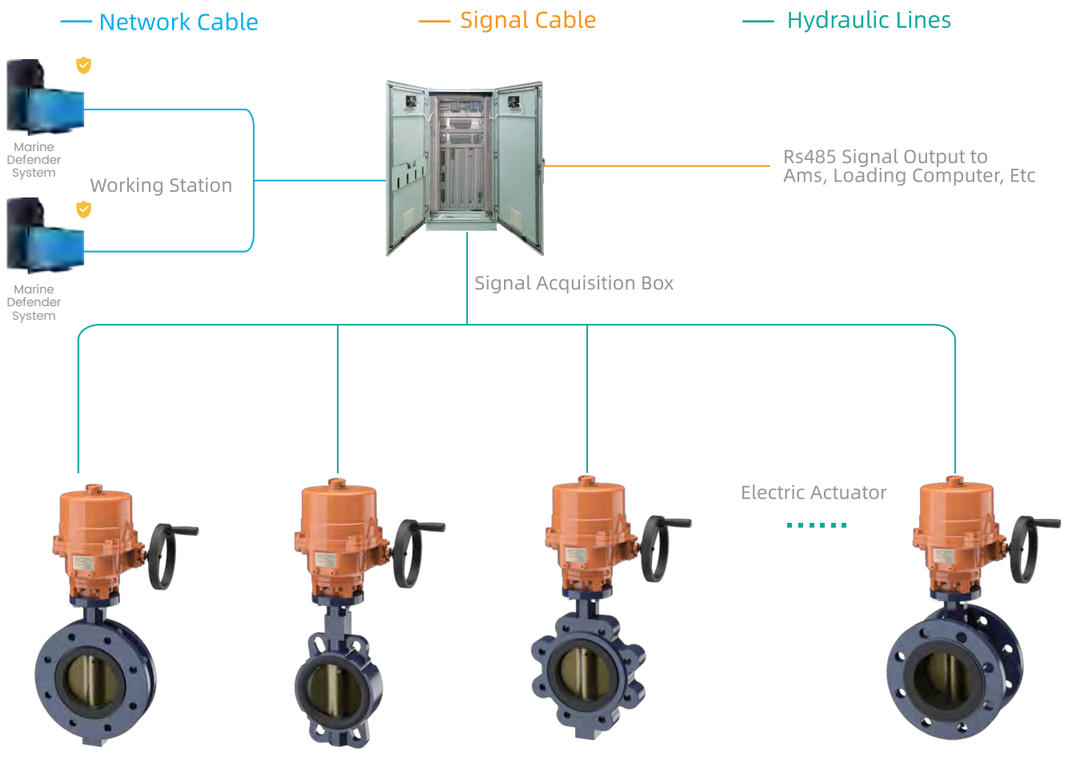


Electric Drive Valve Control System

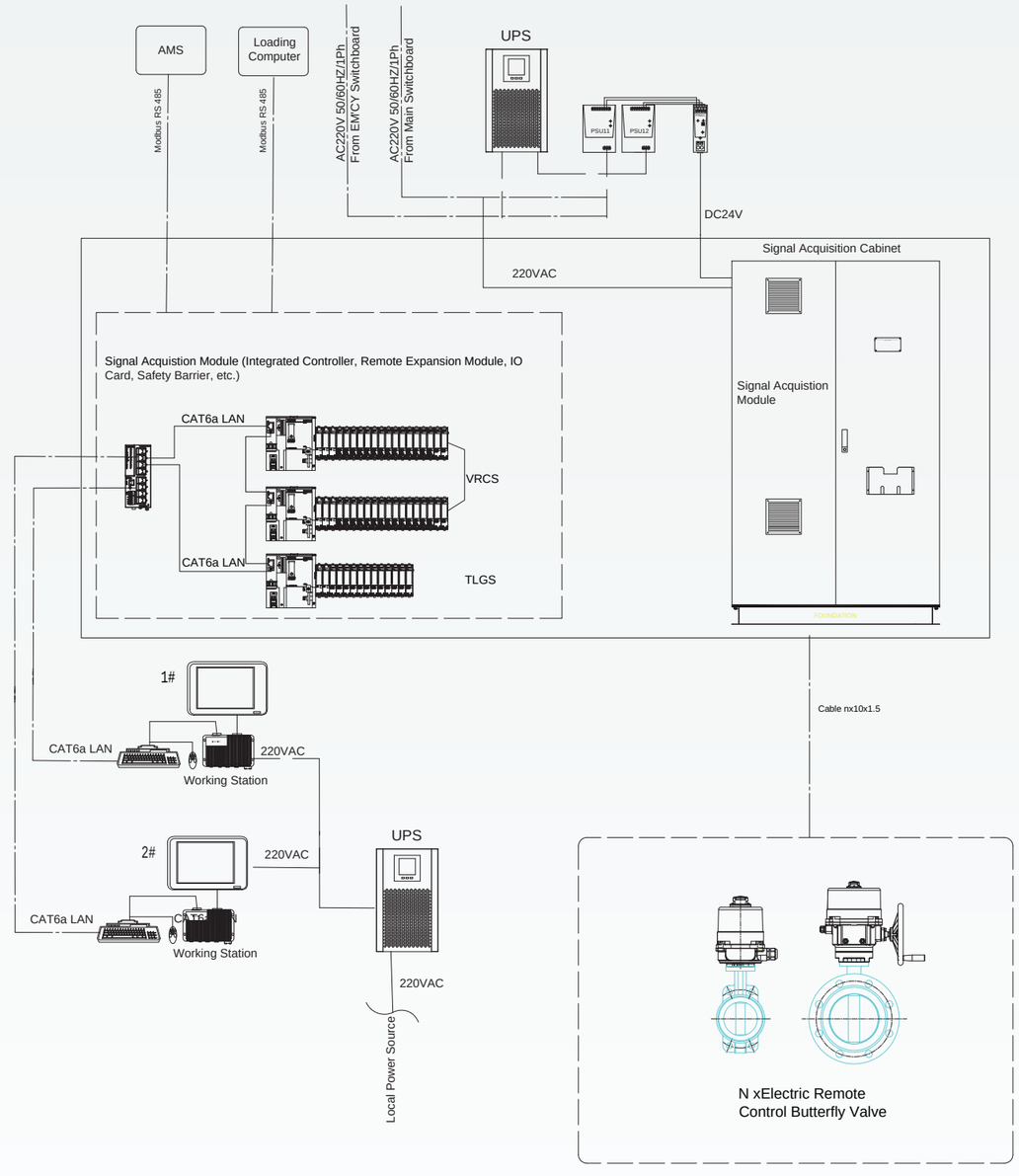
System Overview

The electric drive valve remote control system is similar to the electro-hydraulic drive valve remote control system, with the primary difference being the replacement of the electro-hydraulic actuator with an electric actuator. The electric drive system retains the main control functions of the electro-hydraulic system, using a computer control system to achieve precise valve operation and monitoring.

The electric actuator, powered directly by electricity, provides faster response and improved stability. By replacing the traditional electro-hydraulic actuator with an electric one, the overall system simplifies equipment configuration and maintenance while maintaining high efficiency and reliability. efficiency and reliability.



System Diagram



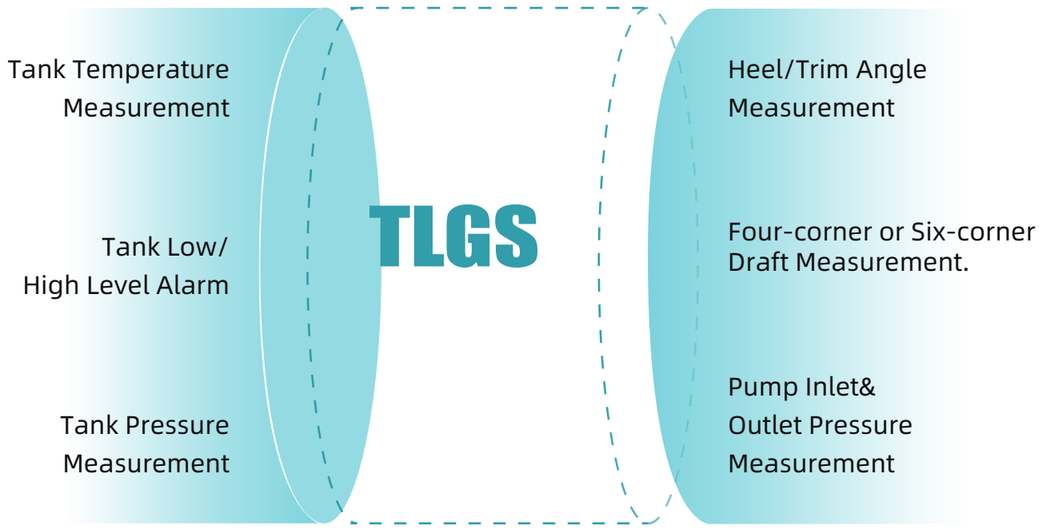
6.2.2 Tank Level Gauging System

System Overview

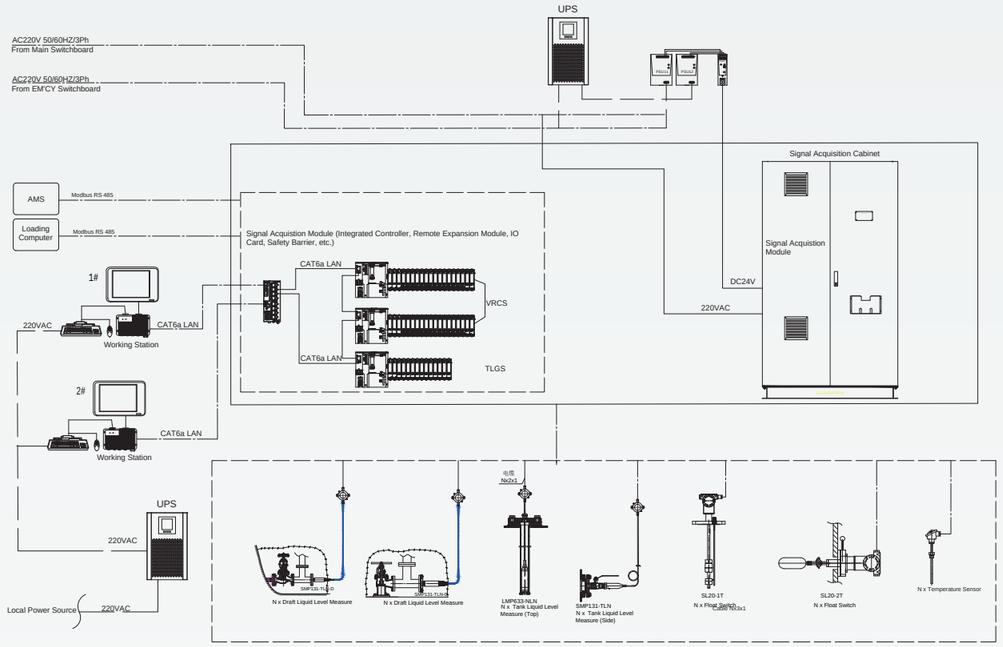
The GCS-800 Liquid Level Gauging System, independently developed by ASI, is designed for real-time monitoring of key parameters—such as pressure, temperature, and liquid-level alarms—in ship compartments. The system acquires data through a PLC module and transmits it to the upper-level SCADA platform with high reliability and low latency.

The system provides multiple user interfaces, including the main control interface, parameter-setting interface, historical data reports, and alarm records. These interfaces enable operators to accurately monitor buoyancy conditions during ballast-water operations and automatically trigger alarms when abnormal conditions occur. In addition, the system monitors the operating status of critical equipment—such as ballast-tank valves and ballast pumps—to ensure safety during loading, unloading, and navigation.

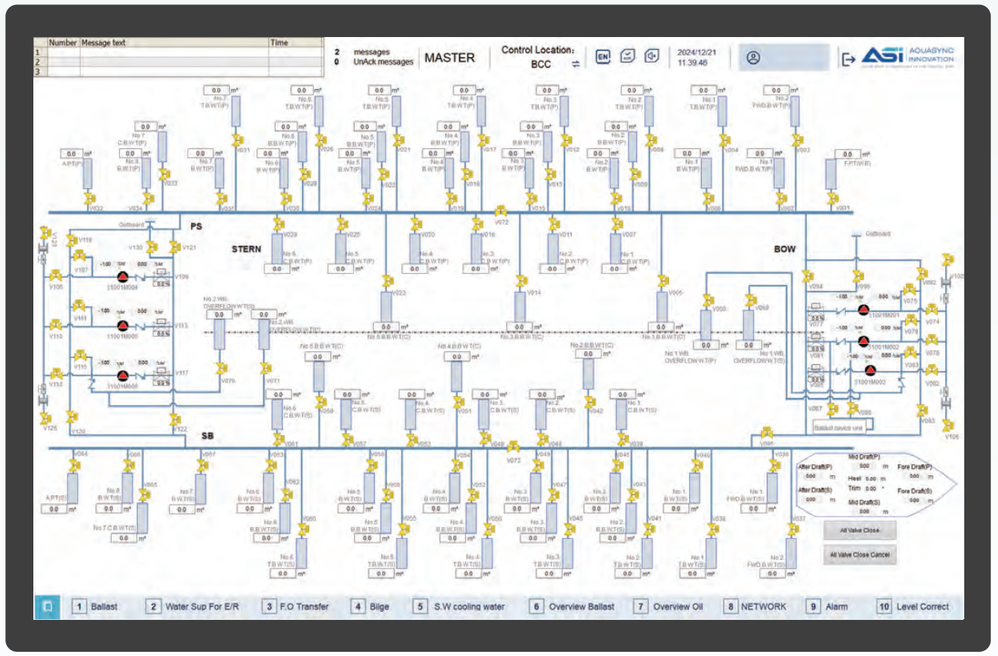
For shipboard liquid-level measurement, commonly used sensors include pressure sensors, radar sensors, float sensors, air-blast sensors, and ultrasonic sensors. Among these, pressure sensors are the most widely adopted due to their resistance to structural installation constraints and cost-effectiveness. By measuring hydrostatic pressure, they provide accurate, stable, and reliable liquid-level readings, making them highly suitable for a wide range of marine applications.



System Diagram



GCS-800 HMI



Pressure Transmitter ▶ SMP131-TLN

Product characteristics

Side Mounting Liquid Level/Pressure Measuring;
Wide measurement range: -0.1~4MPa
Stainless steel integrated fully welded process structure, leak free, corrosion-resistant
Application in hazardous areas: intrinsically safe explosion-proof
Environmental protection: IP67/IP68

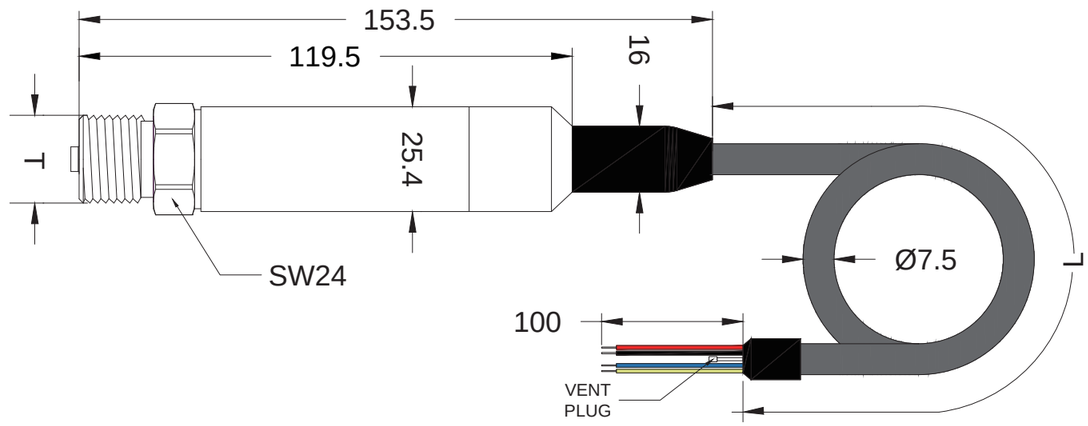
Product usage This pressure transmitter is suitable for liquid level measurement in side mounted oil, water, and service tanks with a protection level of IP67/IP68;

Technical Parameters

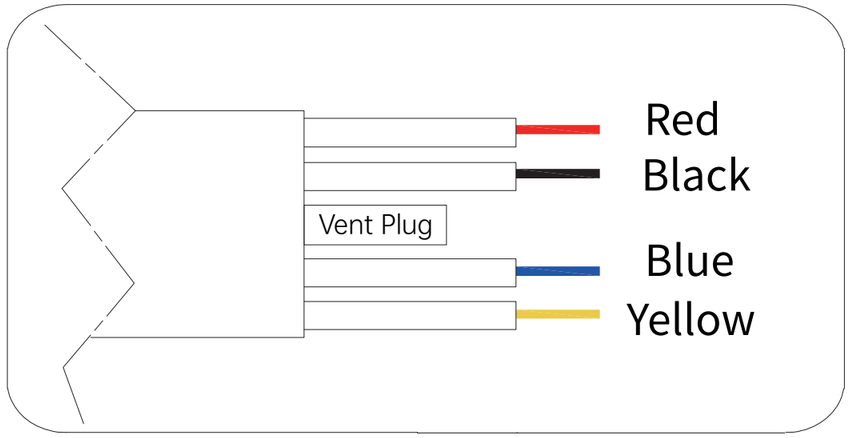
Voltage:	24VDC
Signal Output:	(4~20)mA
Accuracy:	±0.2%
Measuring Range:	GP; AP; customized
Ex-proof:	ExiaIICT4Ga; N/A
Protection Grade:	IP67; IP68
Ambient Temp:	(-40~85)°C
Material:	SS316L
Cable Gland:	PE Cable; ϕ7.5mm TPU Cable (Oil 125°C); ϕ7.5mm
Wiring:	Red: + ; Black: -
Overload:	150% Range

Product and Installation Diagram

Dimensions (Unit: mm)



Electrical Connection



Mark	Red	Black	Blue	Yellow
2-wries	Power+	Power-		

Pressure Transmitter ▶ SMP131-TLN

Product characteristics

Four /Six Conner Draft Level Measuring;
Wide measurement range: -0.1~4MPa
Stainless steel integrated fully welded process structure, leak free, corrosion-resistant
Application in hazardous areas: intrinsically safe explosion-proof
Environmental protection: IP67/IP68

Product usage

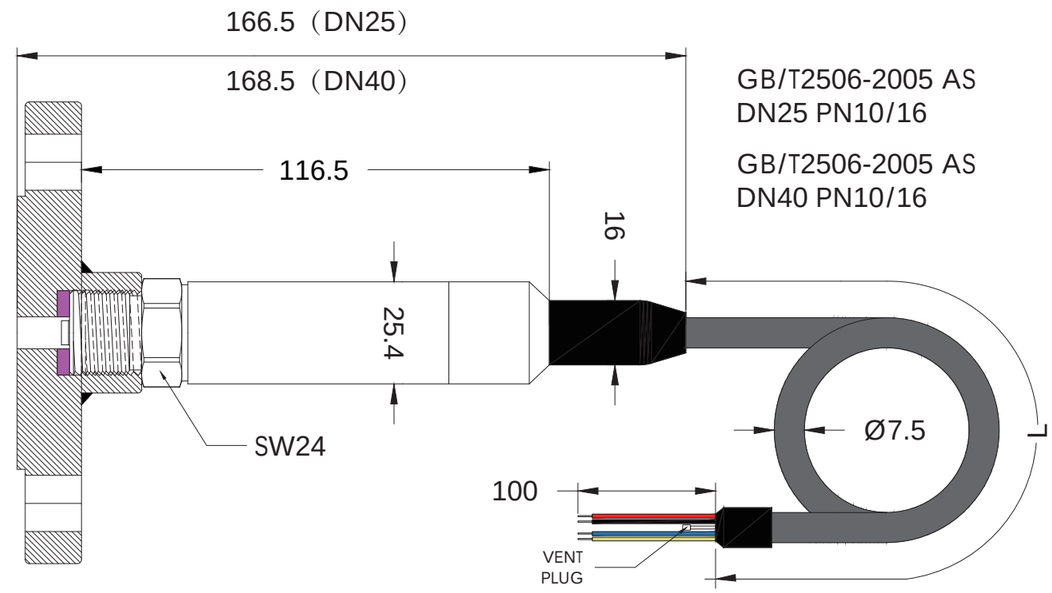
This pressure sensor is installed on the vessel to measure the draft at four corners (or six corners), thereby monitoring the ship's heel (transverse inclination) and trim (longitudinal inclination).

Technical Parameters

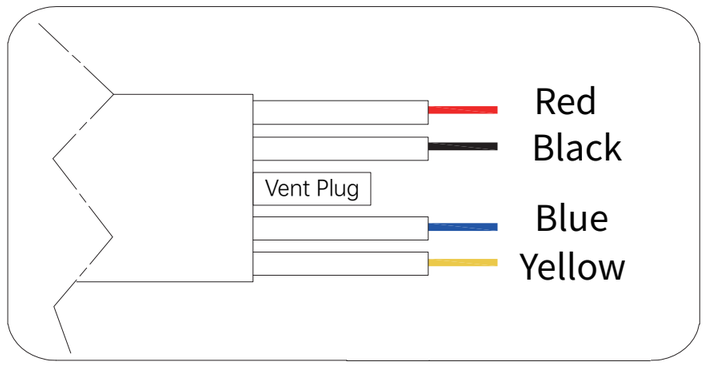
Voltage:	24VDC
Signal Output:	(4~20)mA
Accuracy:	±0.2%
Measuring Range:	GP ; AP; customized
Ex-proof:	ExiaIICT4Ga; N/A
Protection Grade:	IP68
Ambient Temp:	(-40~85)°C
Material:	SS316L
Cable Gland:	PE Cable; ϕ7.5mm TPU Cable（Oil 125°C）; ϕ7.5mm
Wiring:	Red: + ; Black: -
Overload:	150% Range

Product and Installation Diagram

Dimensions (Unit: mm)



Electrical Connection



Mark	Red	Black	Blue	Yellow
2-wries	Power+	Power-		

Pressure Transmitter ▶ LMP633-NLN

Product characteristics

Wide measurement range: -0.1~4MPa

Stainless steel integrated fully welded process structure, leak free, corrosion-resistant

Application in hazardous areas: intrinsically safe explosion-proof

Environmental protection: IP68

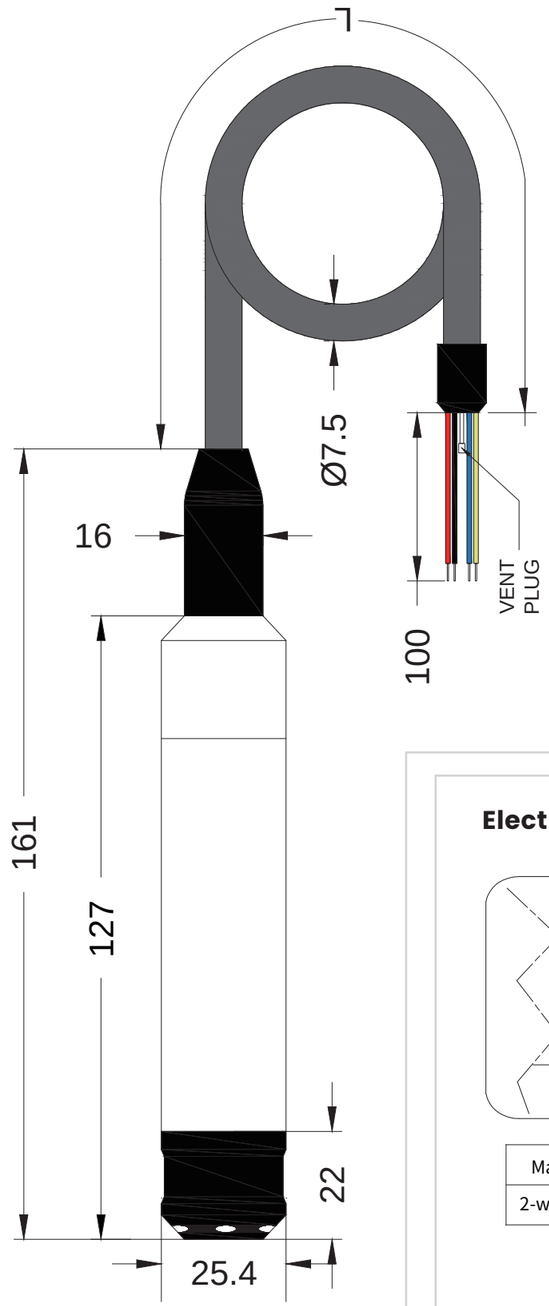
Product usage This pressure transmitter is suitable for liquid level measurement in top mounted oil, water, and service tanks with a protection level of IP68;

Technical Parameters

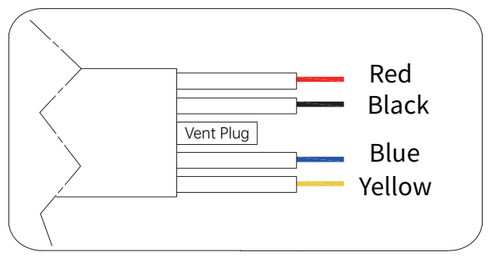
Voltage:	24VDC
Signal Output:	(4~20)mA
Accuracy:	±0.2%
Measuring Range:	GP ; AP; customized
Ex-proof:	ExiaIICT4Ga; N/A
Protection Grade:	IP68
Ambient Temp:	(-40~85)°C
Material:	SS316L
Cable Gland:	PE Cable; ϕ7.5mm TPU Cable（Oil 125°C）; ϕ7.5mm
Wiring:	Red: + ; Black: -
Overload:	150% Range

Product and Installation Diagram

Dimensions (Unit: mm)



Electrical Connection



Mark	Red	Black	Blue	Yellow
2-wries	Power+	Power-		

6.3 Pressure, temperature and liquid level measurement alarm system

6.3.1 CMS System

Pressure, temperature,
liquid level Measurement alarm system

System Overview

GCS800-CM is a pressure, temperature, liquid level measurement and alarm system specially designed for production oil & chemical tankers, which can provide monitoring and alarm of the following parameters of cargo tanks and equipments:

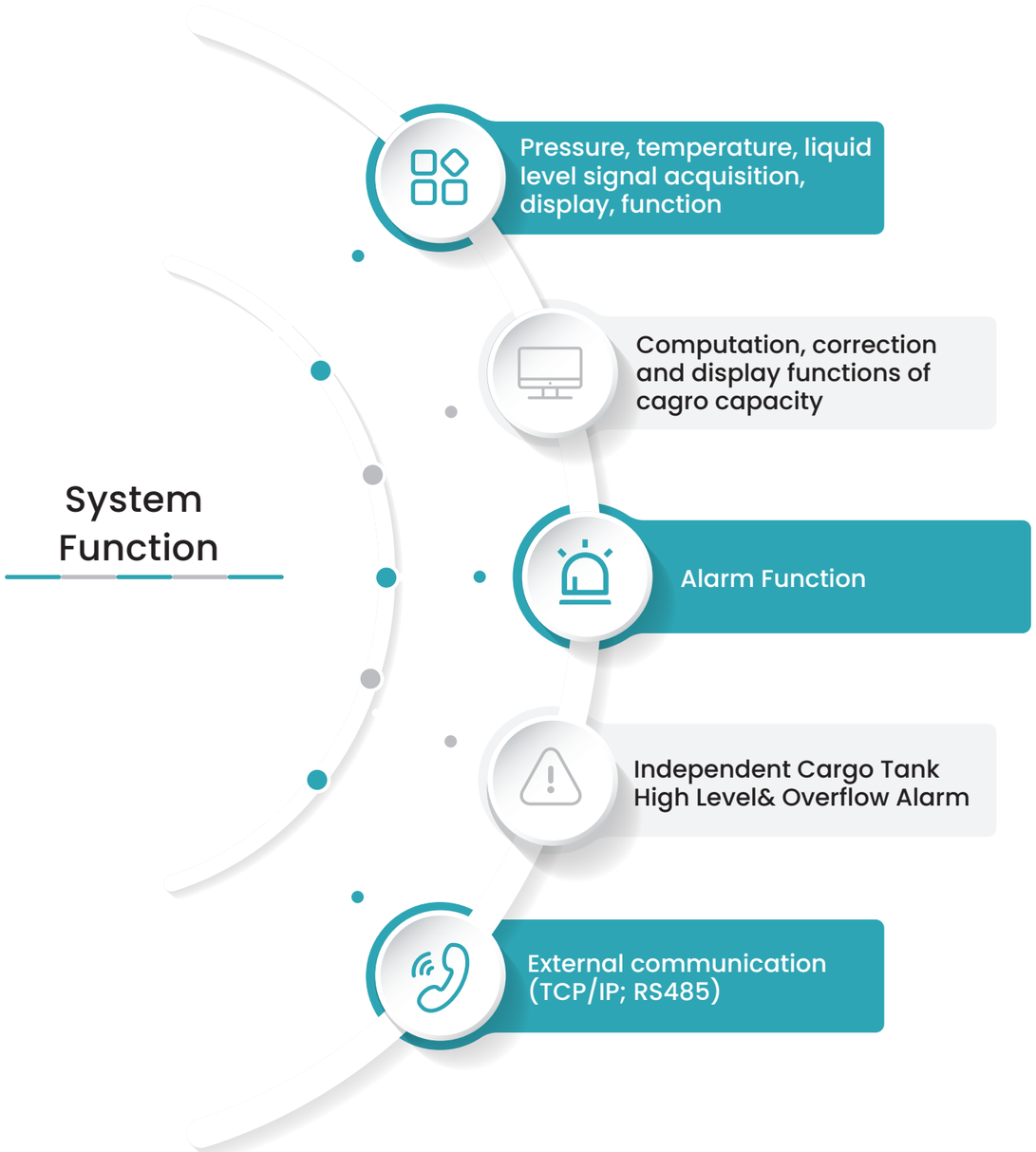
GCS800-CM

- Cargo Tank Pressure Measurement
- Cargo Tank Liquid Level Measurement
- Cargo Tank Temperature Measurement
- Cargo Tank High&Overflow Level Alarm
- Pump/Pipe Pressure Measurement
- Pump/Pipe Temperature Measurement
- Inert gas Pressure Measurement
- Other External Signals

The system consists of workstations, monitors、 PLC、network switches, on-site sensor&Transmitters, and other software and hardware components.

Tank level measurement enables accurate calculation of the volume of stored and transferred cargo. The system is able to provide online cargo information during cargo operations. The cargo location and cargo quantity information collected from the sensor can be transmitted to the loading computer through TCP/IP, RS485 and other protocols, and control the safety of operating parameters under the current loading conditions.

Function Overview

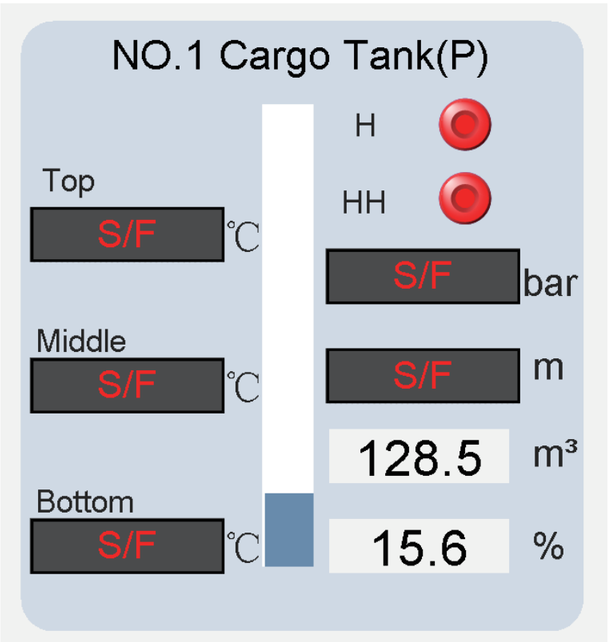


Pressure, Temperature, Liquid Level Signal Acquisition, Display Function

The system adopts Siemens PLC to collect pressure, temperature, liquid level and other related measurement signals of the cargo tanks, which can monitor and display measurement point information in real time. According to customers' requirement, it can be configured with AB dual network redundancy or form a ring network redundancy type with other automation monitoring and alarm control systems provided by ASI to ensure more reliable system operation.
In addition, it is equipped with 2 sets of independent alarm panels with sounding and lighting alarms, which are used for alarming of high-level and overflow alarm for Cargo Tank.

Computation, Correction and Display Functions of cagro Capacity

GCS800-CM adopts our proprietary cargo capacity calculation and correction software, which meets the requirements of OIML R95,
The system collects the liquid signals from the cargo tank sensors on site. Based on the actual measurement parameters, it can use our company's unique tank capacity calculation software, combined with the actual metering tank capacity table of the ship, to calculate the actual quantity of goods loaded and transported on the ship. When the trim and heel values of the ship are inputted, the system supports the automatic compensation and correction of the tank capacity data. At the same time, the system supports the transmission of the level gauge and tank capacity status data outward through the network port or serial port.



Alarm Function

In the actual operation and production process of ships, the viewing and analysis of real-time data and historical data collected by the system are indispensable auxiliary information for related operations, maintenance and other work. The system has functions such as real-time alarm display, historical alarm record, signal trend query, etc. When system-related events occur, real-time alarm will be triggered, and alarm records will be stored, and historical alarm records will be retained. At the same time, each collected signal can be freely selected Time period, draw the historical trend curve of the measuring point, find the change law of the data from the change of the trend curve, and assist in judging the status of the system and related equipment.

For all the sensors connected to the IO module of the PLC, the PLC will read the quality code of each channel. When the sensor fails, the system will generate a sensor failure alarm corresponding to the channel and identify the short circuit or disconnection alarm.
For the PLC and IO cards configured in the system, when the relevant channel of the card or the card itself fails, on the one hand, the fault location and type can be judged according to the fault indicator on the card. On the other hand, the system can identify the relevant card and module status by itself, and display the card's working fault type and status on the host computer. When the network disconnection or switch failure occurs, the system will recognize the communication failure. All system fault information can be identified on the host computer and alarmed in real time.

Independent Cargo Tank High Level& Overflow Alarm

Independent Cargo Tank High-Level and Overflow Alarm System Overview

The system is equipped with an independent cargo tank high-level and overflow alarm unit. When the cargo tank reaches a high-level/overflow condition or the sensor malfunctions, the alarm is triggered to ensure operational safety.

Normally Closed Contact Sensor and Alarm Activation Mechanism

The system employs sensors with normally closed contacts for liquid level detection. When an abnormal rise in the cargo tank liquid level or a sensor failure occurs, the contacts disconnect, thereby activating the alarm signal.

Manual Self-Testing Device and Operational Procedure

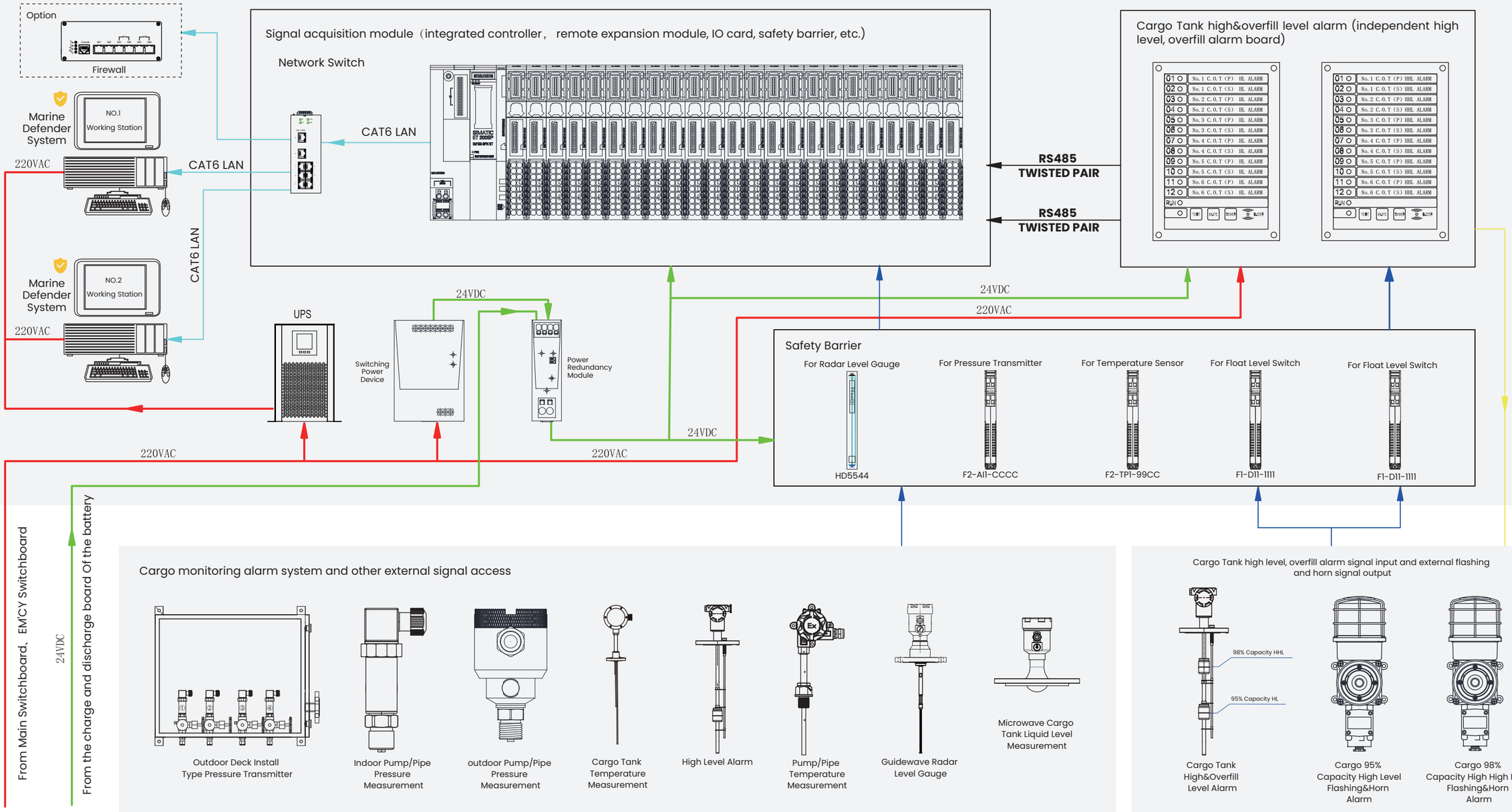
To verify system reliability, the high-level and overflow alarm sensor has a manual self-testing function. Before loading goods into the cargo tank , the alarm system's functionality can be manually tested to identify and address potential failures proactively.

External Communication (MODBUS TCP/RTU)

The system data is stored in the PLC controller, and the external data transmission supports the MODBUS TCP/RTU function. It can transmit system-related alarms, sensor signals, tank liquid level and other information to external systems such as AMS, loading computer, etc. At the same time, it can receive external related protocol signals, and configure and display on the system.

System Diagram of GCS800-CM

Cargo Control Conclose



Cargo monitoring alarm system and other external signal access

Outdoor Deck Install Type Pressure Transmitter

Indoor Pump/Pipe Pressure Measurement

outdoor Pump/Pipe Pressure Measurement

Cargo Tank Temperature Measurement

High Level Alarm

Pump/Pipe Temperature Measurement

Guidewave Radar Level Gauge

Microwave Cargo Tank Liquid Level Measurement

Cargo Tank high level, overfill alarm signal input and external flashing and horn signal output

Cargo Tank High&Overfill Level Alarm

Cargo 95% Capacity High Level Flashing&Horn Alarm

Cargo 98% Capacity High High Level Flashing&Horn Alarm

6.3.2 Sensor

SL20 Float Level Switch

SL20 float level gauge, also known as float level switch, is one of the most simple and practical level control and alarm switches. According to its installation form, it can be divided into side-mounted type (sidehorizontal installation) and top-mounted type (top vertical installation). According to its application, it can be divided into ordinary type, explosion-proof type. According to its detection method, it can be divided into ordinary type and self-inspection type.

The explosion-proof float level controller can withstand a pressure of up to 4MPa, which is especially suitable for level control or alarm in flammable, explosive,and airtight high-pressure occasions;

The marine float level controller is suitable for controlling and alarming the level of the medium in the tanks of marine ships;

The self-checking float level controller is equipped with a manual self-checking mechanism,which can test the controller and the system by rotating or pressing the control handle when there is no liquid level to ensure the safe operation of the controller and the system.

SMP131 Pressure Transmitter

The SMP131 series pressure transmitter has a pressure chamber made of stainless steel single piece structure, with a fully metal sealed structure. The sensor adopts digital calibration and has fully automatic linear and temperature compensation functions. The electrical protection of the full welding process and the independent breathable chamber design ensure the long-term reliability of the product. The product is suitable for large-scale applications by customers, with high cost-effectiveness. It can be widely used for monitoring pressure and liquid level in industrial or civilian sites, such as air pressure, hydraulic pressure, and even harsh media environments, such as sewage, steam, light corrosive gases and liquids.

SL90 Radar Level Gauge

The SL90 series sensor is a high-frequency radar level measuring instrument, and the new fast microprocessor can perform higher speed signal analysis. The beam energy is low and can be installed in various metal and non-metal containers, reaction vessels, or solid material silos under complex measurement conditions, for non-contact continuous measurement of liquid, slurry, and granular material levels. Suitable for large changes in dust, temperature, and pressure, the radar level gauge has no harm to the human body and the environment. It also has the advantages of not being affected by the specific gravity of the medium, not being affected by changes in dielectric constant, and not requiring on-site calibration.

WZPD WZPB WZPk Temperature Sensor

The temperature sensor outputs a RTD signal with a standard division mark, which can be directly output as a RTD signal, or combined with a transmitter module to form an integrated temperature transmitter. The transmitter module converts it into a linear (4-20) mA current signal, and the product has temperature detection, transmission, and LCD (LED) display functions. It can directly measure the temperature of liquid, gas or vapor media, and be matched with computer systems to achieve detection and control of various temperatures.

Float Level Switch（Top Mounting）▶ SL20-1T-D

Product Characteristics

Simple structure, economical and practical.

Safe and reliable operation, high stability.

Easy installation and maintenance-free.

Two groups of normally open and normally closed passive contacts is used for liquid level alarm or control.

Product Usage This liquid level switch controller is suitable for outdoor tank top mounted HL/HHL alarm and control;

Technical Parameters

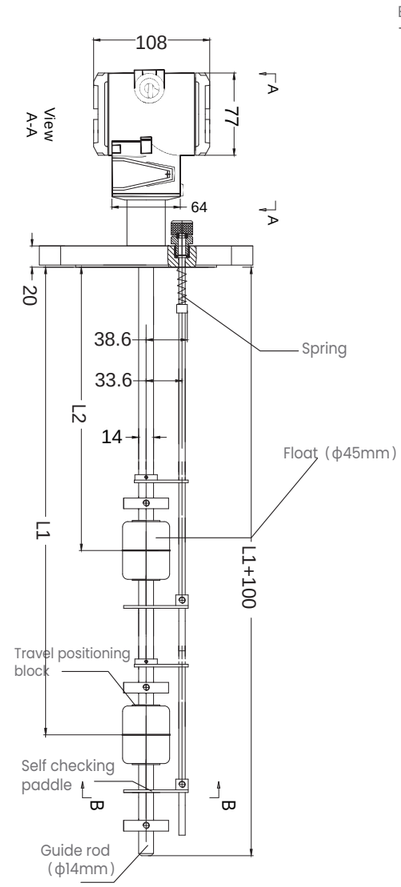
Measuring Medium:	Liquid	Ex-proof:	ExiaIICT6Ga；N/A
Signal Output:	SPDT	Measuring Range:	95/98% Capacity; customized
Contact Capacity:	Standard：AC220V 0.3A /DC24V 3A Exia：24VDC 100mA	Process Press:	（-0.1~1）MPa
		Material:	Process：SS316L; Housing：SS316L
Protection Grade:	IP67	Cable Gland:	M20X1.5

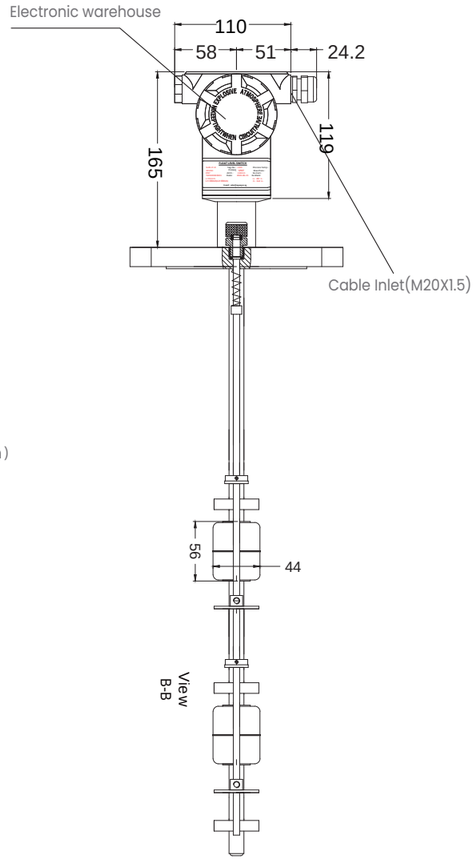
Working Principle

The SL20 float level controller is suitable for the detection and control of the liquid level in the open or pressurized container in the industrial production process.When the liquid level is at the high or low limit, the switch action sends out an alarm signal or controls the opening and closing of pumps and valves.It consists of two disconnected measuring parts and output parts. When the measured liquid level changes, the floating ball changes accordingly, so that the magnetic steel at the end of the floating ball connecting rod swings up and down. According to the principle of repulsion of the same sex of the magnetic steel, the magnetic steel installed in the watch case swings in the opposite direction, and drives the micro switch contact action to send an on or off signal, so the liquid level alarm and control are realized.

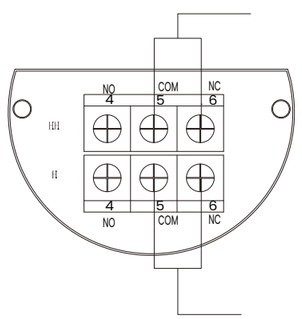
Product and Installation Diagram

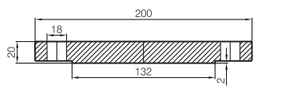
Dimensions (Unit: mm)

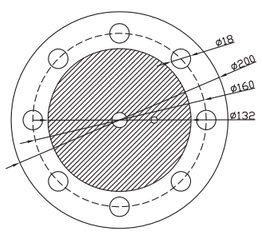




Electrical Connection







GB/T2506-2005
DN80 PN10 RF

Float Level Switch（Top Mounting）▶ SL20-1T-S

Product Characteristics

Simple structure, economical and practical.
Safe and reliable operation, high stability.
Easy installation and maintenance-free.
A group of normally open and normally closed passive contacts is used for liquid level alarm or control.

Product Usage This liquid level switch controller is suitable for outdoor tank top mounted HL/HHL alarm and control;

Technical Parameters

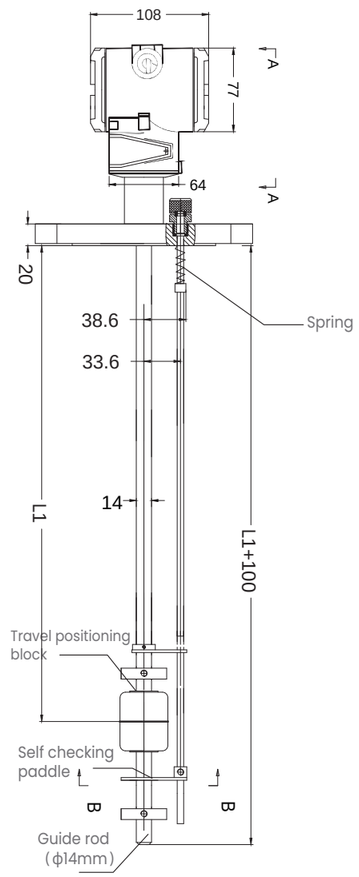
Measuring Medium:	Liquid	Ex-proof:	ExiaIICT6Ga；N/A
Signal Output:	SPDT	Measuring Range:	(0~6) m
Contact Capacity:	Standard：AC220V 0.3A /DC24V 3A Exia：24VDC 100mA	Process Press:	(-0.1~1) MPa
		Material:	Process：SS316L；Housing：SS316L/Alloy
Protection Grade:	IP67	Cable Gland:	M20X1.5

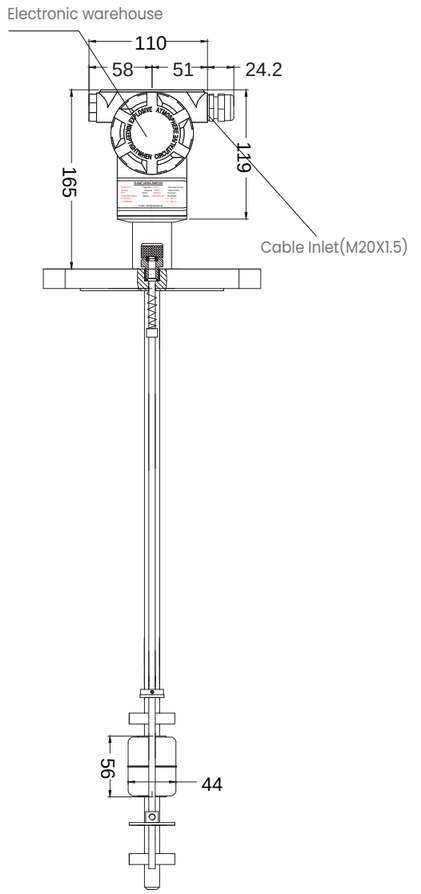
Working Principle

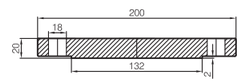
The SL20 float level controller is suitable for the detection and control of the liquid level in the open or pressurized container in the industrial production process.When the liquid level is at the high or low limit, the switch action sends out an alarm signal or controls the opening and closing of pumps and valves.It consists of two disconnected measuring parts and output parts. When the measured liquid level changes, the floating ball changes accordingly, so that the magnetic steel at the end of the floating ball connecting rod swings up and down. According to the principle of repulsion of the same sex of the magnetic steel, the magnetic steel installed in the watch case swings in the opposite direction, and drives the micro switch contact action to send an on or off signal, so the liquid level alarm and control are realized.

Product and Installation Diagram

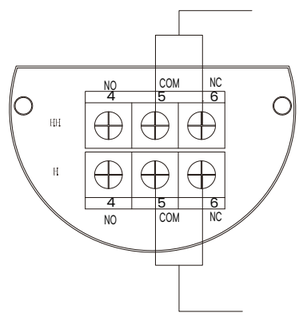
Dimensions (Unit: mm)

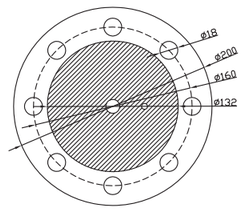






Electrical Connection





GB/T2506-2005
DN80 PN10 RF

Float Level Switch(Side Mounting) ▶ SL20-2T

Product characteristics

Simple structure, economical and practical.
Safe and reliable operation, high stability.
Easy installation and maintenance-free.
A group of normally open and normally closed passive contacts is used for liquid level alarm or control.

Product usage This liquid level switch controller is suitable for indoor tank side mounted liquid level alarm and control;

Technical Parameters

Operation temperature:	(-40~150)℃
Signal Output:	SPDT
Contact Capacity:	Standard: AC220V 0.3A /DC24V 3A Exia: 24VDC 100mA

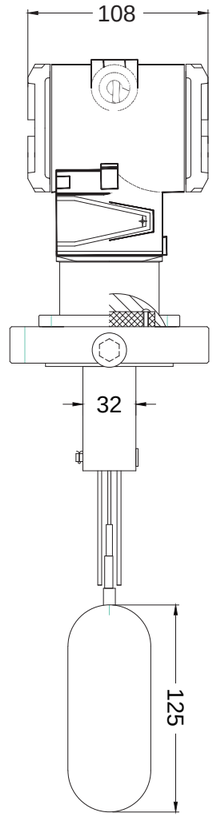
Ex-proof:	ExiaIICT6Ga; N/A
Protection Grade:	IP67
Process Press:	0.6MPa
Material:	Process: SS316L; Housing: SS316L
Cable Gland:	M20X1.5

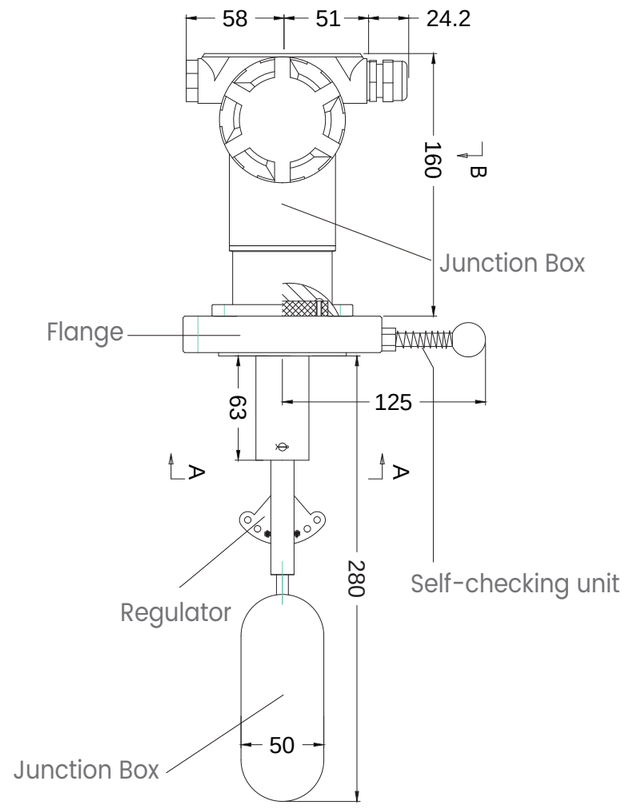
Working Principle

The SL20 float level controller is suitable for the detection and control of the liquid level in the open or pressurized container in the industrial production process.When the liquid level is at the high or low limit, the switch action sends out an alarm signal or controls the opening and closing of pumps and valves.It consists of two disconnected measuring parts and output parts. When the measured liquid level changes, the floating ball changes accordingly, so that the magnetic steel at the end of the floating ball connecting rod swings up and down. According to the principle of repulsion of the same sex of the magnetic steel, the magnetic steel installed in the watch case swings in the opposite direction, and drives the micro switch contact action to send an on or off signal, so the liquid level alarm and control are realized.

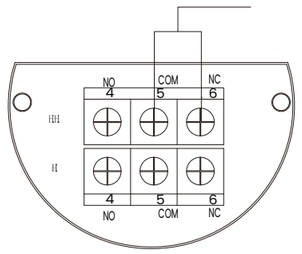
Product and Installation Diagram

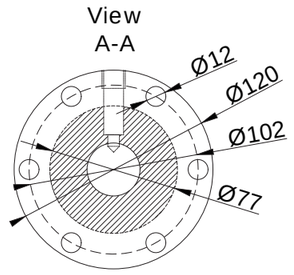
Dimensions (Unit: mm)





Electrical Connection





Flange
GB/T2501-2010
DN50 PN6

Pressure Transmitter ▶ SMP131-TLH

Product Characteristics

Wide measurement range: -0.1~40MPa

Stainless steel integrated fully welded process structure, leak free, corrosion-resistant

Application in hazardous areas: intrinsically safe explosion-proof

Environmental protection: IP66/67

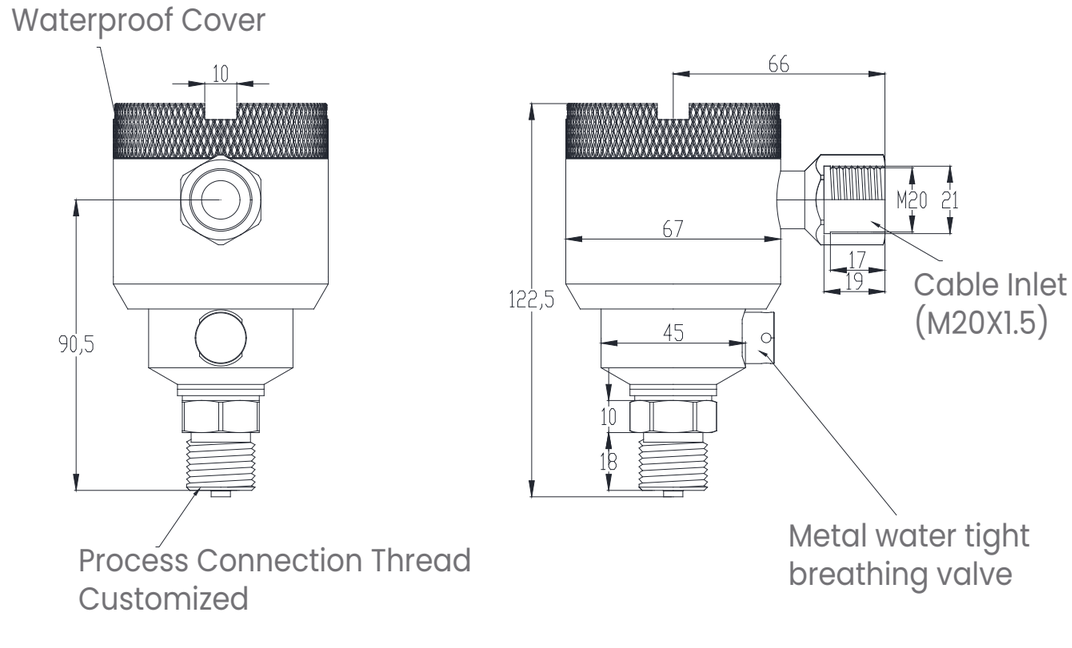
Product usage This pressure transmitter is suitable for outdoor pressure measurement of pipes, pumps, and containers;

Technical Parameters

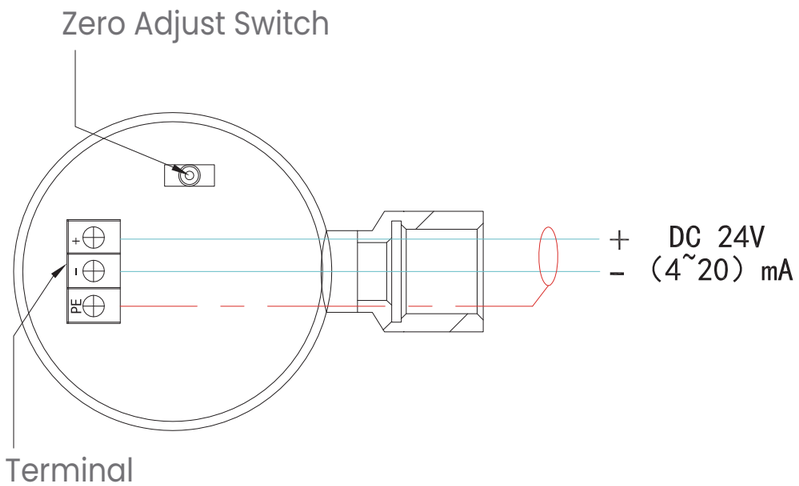
Voltage:	24VDC
Signal Output:	(4~20)mA
Accuracy:	±0.2%
Measuring Range:	GP ; AP; Customized
Ex-proof:	ExiaIICT4Ga; N/A
Protection Grade:	IP66/67
Ambient Temp:	(-40~85)℃
Material:	SS316L
Cable Gland:	M20X1.5
Wiring:	P+; P-; PE
Overload:	150% Range

Product and Installation Diagram

Dimensions (Unit: mm)



Electrical Connection



Pressure Transmitter ▶ SMP131-TLD

Product Characteristics

Wide measurement range: -0.1~40MPa
Stainless steel integrated fully welded process structure, leak free, corrosion-resistant
Application in hazardous areas: intrinsically safe explosion-proof
Environmental protection: IP66

Product Usage

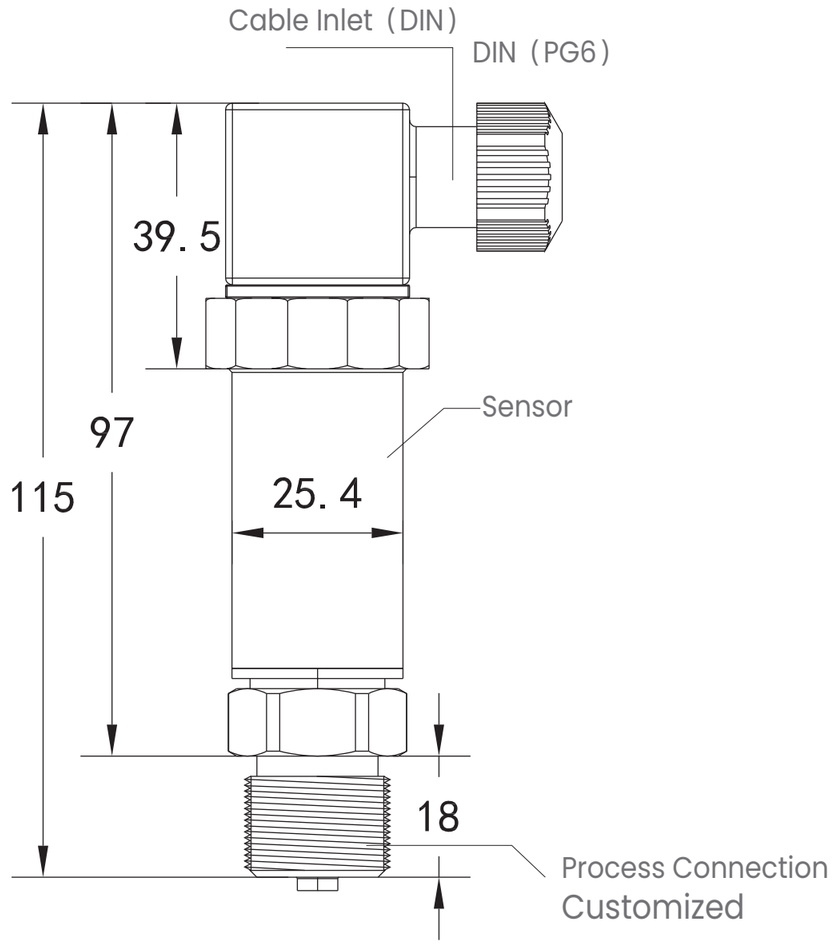
This pressure transmitter is suitable for indoor pressure measurement of pipes, pumps, and containers;Combined with a watertight installation box, it can be used for outdoor pressure measurement, measuring the pressure of pipes, pumps, and tanks;

Technical Parameters

Voltage:	24VDC
Signal Output:	(4~20)mA
Accuracy:	±0.2%
Measuring Range:	GP ; AP; customized
Ex-proof:	ExiaIICT4Ga; N/A
Protection Grade:	IP66
Ambient Temp:	(-40~85)℃
Material:	SS316L
Cable Gland:	DIN(PG11)
Wiring:	1 + ; 2-
Overload:	150% Range

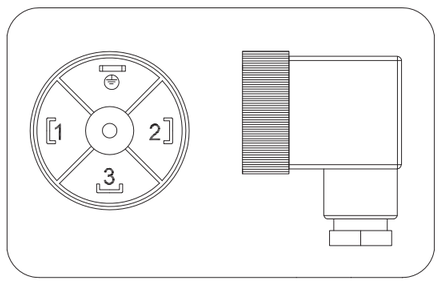
Product and Installation Diagram

Dimensions (Unit: mm)



Electrical Connection

Mark	1	2	⏚
2-wries	Power+	Power-	



Microwave Radar Level Gauge ▸ SL906

Product Characteristics

Small antenna size, easy to install; Non-contact radar, no wear, no pollution.

Almost no corrosion, bubble effect; almost not affected by water vapor in the atmosphere, the temperature and pressure changes.

A shorter wavelength, the reflection of solid surface inclination is better.

Beam angle is small, the energy is concentrated, can enhance the ability of echo and to avoid interference.

The measuring range is smaller, for a measurement will yield good results.

High signal-to-noise ratio, the level fluctuation state can obtain better performance.

High frequency, measurement of solid and low dielectric constant of the best choice.

Product Usage This radar level transmitter is suitable for liquid level measurement in oil, chemicals, water, and service tanks;

Technical Parameters

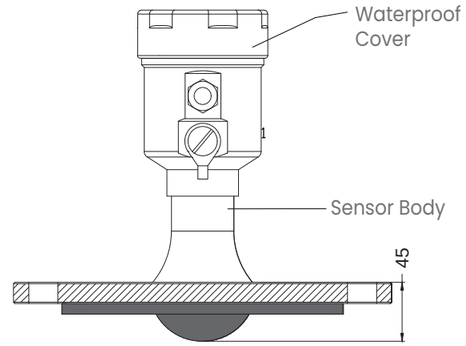
Measuring Medium:	Liquid
Signal Output:	24VDC; (4~20) mA+Hart
Accuracy:	±2mm
Measuring Range:	0~35m
Ex-proof:	ExiaIICT6Ga；N/A
Protection Grade:	IP67
Process Temp	(-40~150)℃
Material:	SS316L+PTFE
Process Press:	(-0.1~2.5)MPa
Beam Width:	3°
Pulse Frequency:	80`GHz
Cable Gland:	M20X1.5

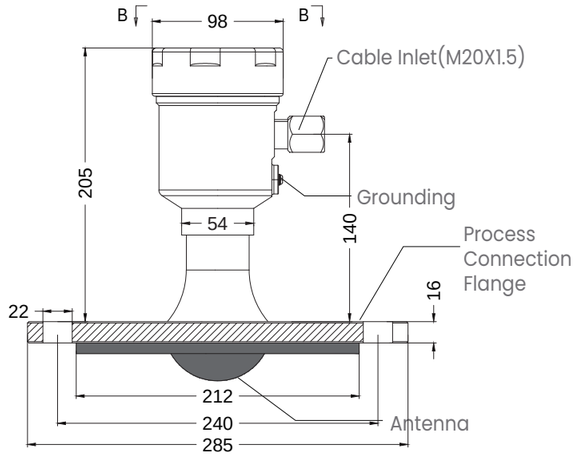
Working Principle

Radar level transmitter antenna microwave pulse is narrow, the downward transmission antenna. Microwave exposure to the medium surface is reflected back again by the antenna system receives, sends the signal to the electronic circuit automatically converted into level signals (because the microwave propagation speed, electromagnetic wave to reach the target and the reflected back to the receiver this time is almost instantaneous).

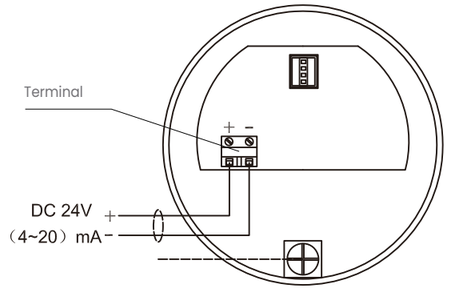
Product and Installation Diagram

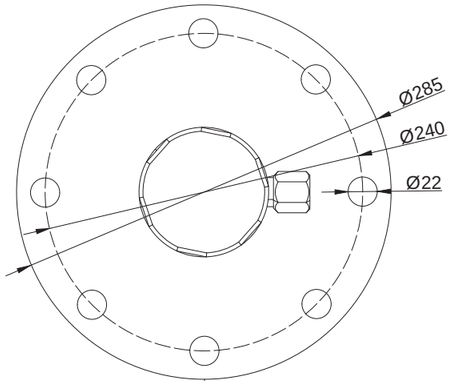
Dimensions (Unit: mm)





Electrical Connection





Flange
Imitation of
GB/T9119-2010
DN150 PN10（Thickness：16mm）

Microwave Radar Level Gauge ▶ SL906S(H.T.)

200°C

Product characteristics

Small antenna size, easy to install; Non-contact radar, no wear, no pollution.

Almost no corrosion, bubble effect; almost not affected by water vapor in the atmosphere, the temperature and pressure changes. Serious dust environment on the high level meter work has little effect.

A shorter wavelength, the reflection of solid surface inclination is better.

Beam angle is small, the energy is concentrated, can enhance the ability of echo and to avoid interference.

The measuring range is smaller, for a measurement will yield good results.

High signal-to-noise ratio, the level fluctuation state can obtain better performance.

High frequency, measurement of solid and low dielectric constant of the best choice.

Product usage This radar level transmitter is suitable for liquid level measurement in oil, chemicals, water, and service tanks;

Technical Parameters

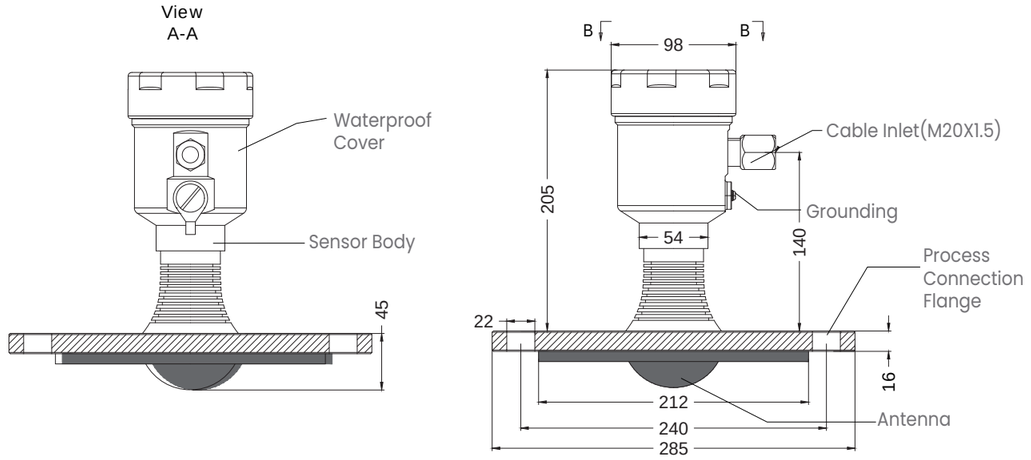
Measuring Medium:	Liquid
Signal Output:	24VDC; (4~20) mA+Hart
Accuracy:	±2mm
Measuring Range:	0~35m
Ex-proof:	ExiaIICT6Ga；N/A
Protection Grade:	IP67
Process Temp	(-40~200)℃
Material:	SS316L+PTFE
Process Press:	(-0.1~2.5)MPa
Beam Width:	3°
Pulse Frequency:	80GHz
Cable Gland:	M20X1.5

working principle

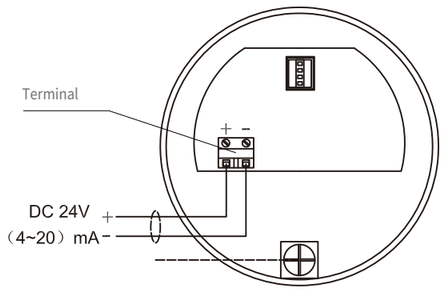
Radar level transmitter antenna microwave pulse is narrow, the downward transmission antenna. Microwave exposure to the medium surface is reflected back again by the antenna system receives, sends the signal to the electronic circuit automatically converted into level signals (because the microwave propagation speed, electromagnetic wave to reach the target and the reflected back to the receiver this time is almost instantaneous).

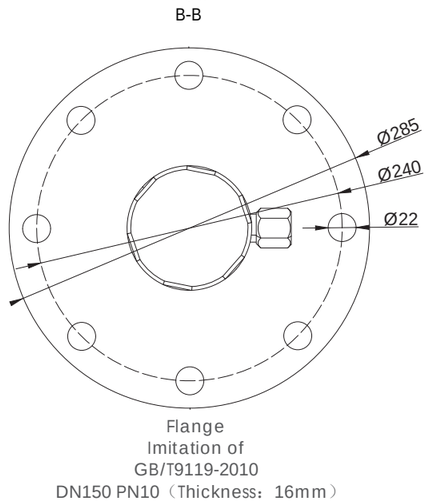
Product and Installation Diagram

Dimensions (Unit: mm)



Electrical Connection





Temperature Transmitter ▶ WZPB

Product Characteristics

High precision and stability, with the integrated temperature transmitter provided with built-in cold end compensation ;

Various forms of protection pipes

The protection grade of the junction box is to IP67

Explosion-proof grade is intrinsic safety grade is ExiaIICT6Ga;

Product Usage

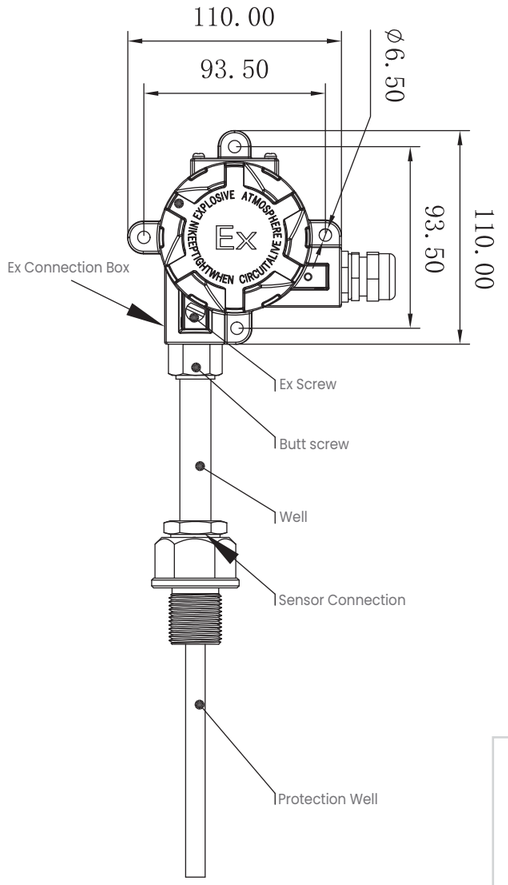
This temperature transmitter is suitable for measuring the temperature of pipes, pumps, and containers in Ex areas;Stainless steel shell for outdoor installation, cast aluminum shell for indoor installation

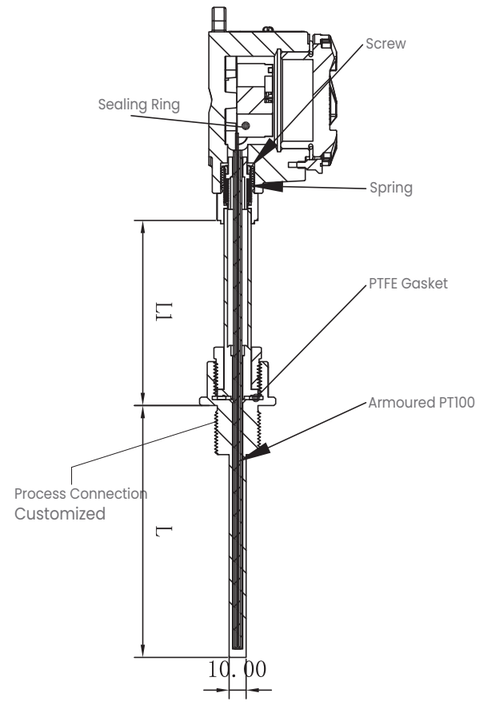
Technical Parameters

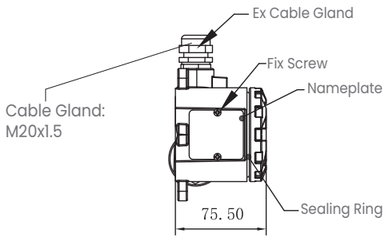
Signal Output:	24VDC (4~20)mA;
Accuracy:	PT100:A/B-class; Transmitter: ±0.1%
Measuring Range:	(-200~850) ℃; Customized
Ex-proof:	ExiaIICT6Ga; N/A
Protection Grade:	IP67
Ambient Temp:	(-40~85)℃
Material:	Junction box: SS316L/Alloy; Process Connection: SS316L Thermal protection sleeve: SS316L
Cable Gland:	M20X1.5

Product and Installation Diagram

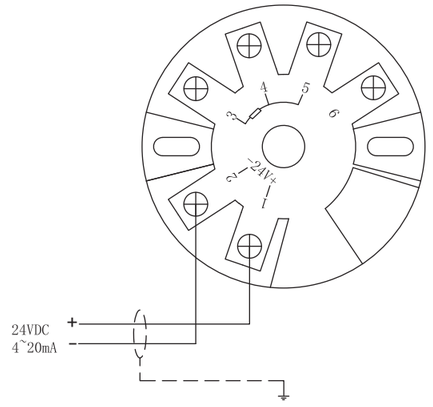
Dimensions (Unit: mm)







Electrical Connection



Temperature Sensor ▶ WZPK

Product Characteristics

High precision and stability, with the integrated temperature transmitter provided with built-in cold end compensation ;
Various forms of protection pipes
The protection grade of the junction box is to IP67
Explosion-proof grade is intrinsic safety grade is ExiaIICT6Ga;

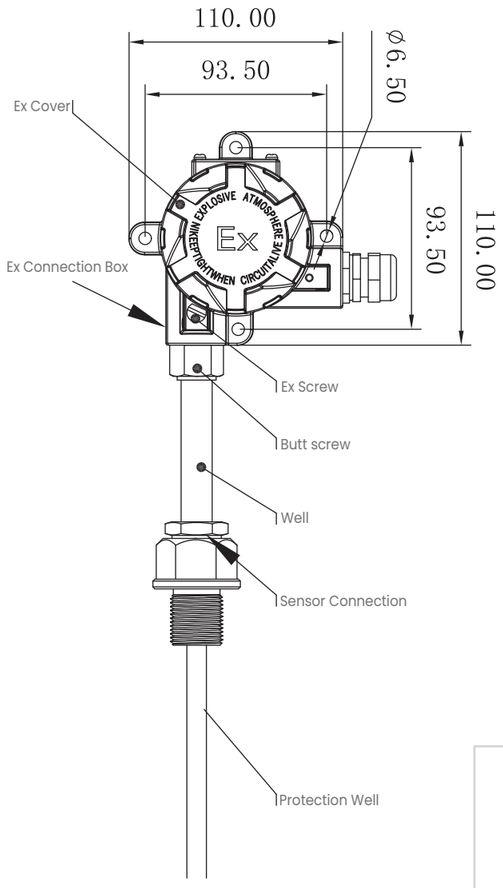
Product Usage This temperature sensor r is suitable for measuring the temperature of pipes, pumps, and containers in Ex areas;Stainless steel shell for outdoor installation, cast aluminum shell for indoor installation

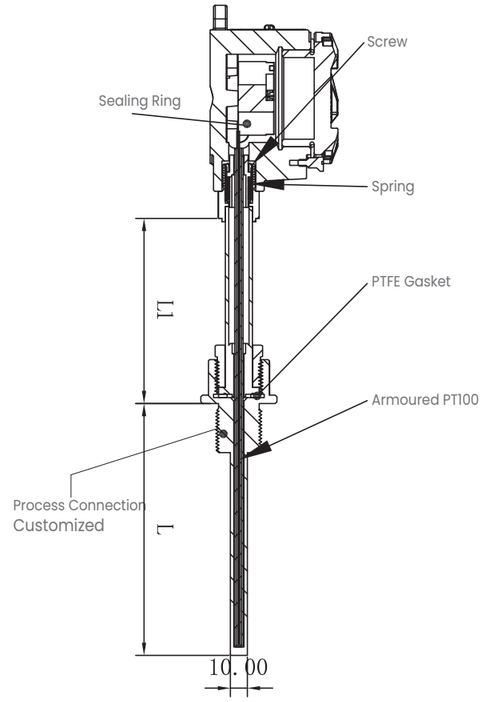
Technical Parameters

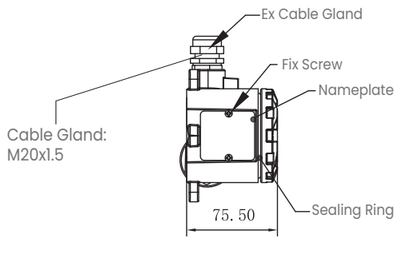
Signal Output:	PT100;3-wries
Accuracy:	PT100:A/B-class;
Measuring Range:	（-200~850）℃; customized
Ex-proof:	ExiaIICT6Ga; N/A
Protection Grade:	IP67
Ambient Temp:	(-40~85)℃
Material:	Junction box: SS316L/Alloy; Process Connection: SS316L Thermal protection sleeve: SS316L
Cable Gland:	M20X1.5

Product and Installation Diagram

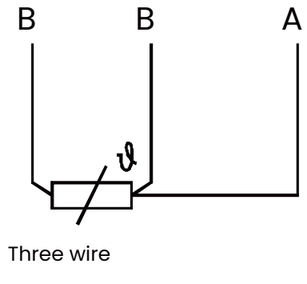
Dimensions (Unit: mm)







Electrical Connection



Temperature Transmitter ▶ WZPBS

Product Characteristics

High precision and stability, with the integrated temperature transmitter provided with built-in cold end compensation ;

Various forms of protection pipes

The protection grade of the junction box is to IP67

Explosion-proof grade is intrinsic safety grade is ExiaIICT6Ga;

Product Usage

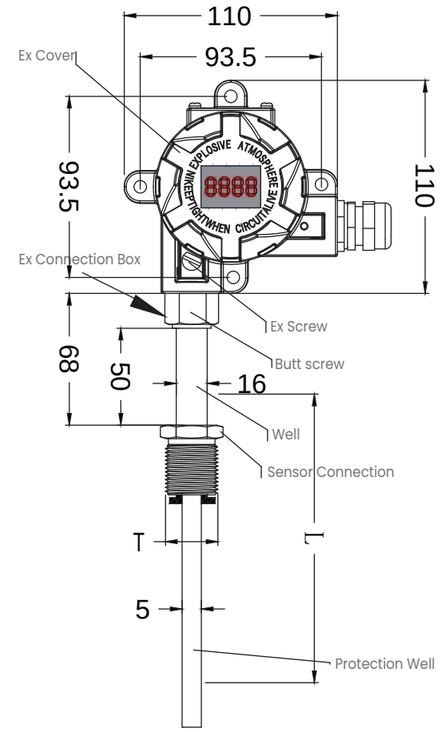
This temperature transmitter is suitable for measuring the temperature of pipes, pumps, and containers in Ex areas;Stainless steel shell for outdoor installation, cast aluminum shell for indoor installation

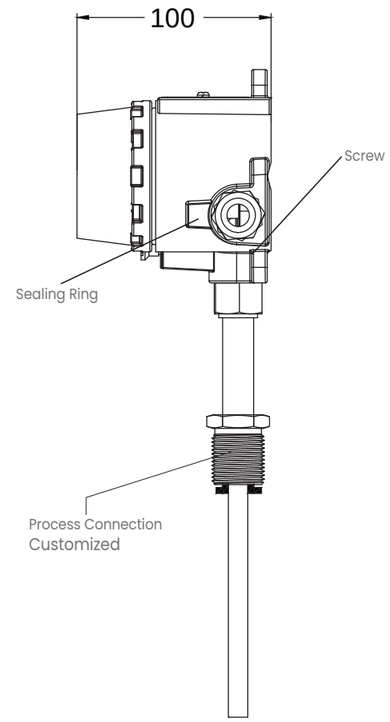
Technical Parameters

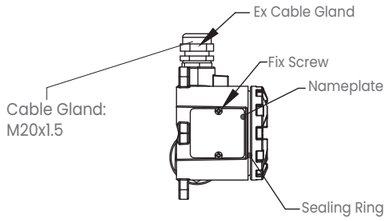
Signal Output:	24VDC (4~20)mA;
Accuracy:	PT100:A/B-class；Transmitter：±0.1%
Measuring Range:	（-200~850）℃; Customized
Ex-proof:	ExiaIICT6Ga；N/A
Protection Grade:	IP67
Ambient Temp:	(-40~85)℃
Material:	Junction box：SS316L/Alloy； Process Connection：SS316L Thermal protection sleeve：SS316L
Cable Gland:	M20X1.5

Product and Installation Diagram

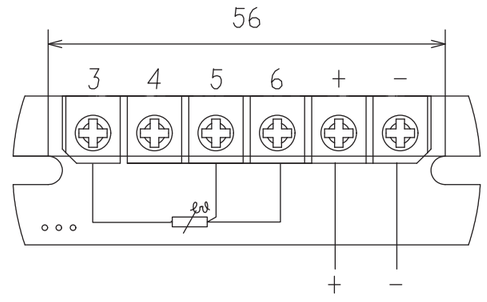
Dimensions (Unit: mm)







Electrical Connection



Multipoints Temperature Sensor ▶ WZPD3

Product Characteristics

High precision and stability, with the integrated temperature transmitter provided with built-in cold end compensation ;

Multiple point measurements

The protection grade of the junction box is to IP67

Explosion-proof grade is intrinsic safety grade is ExiaIICT6Ga;

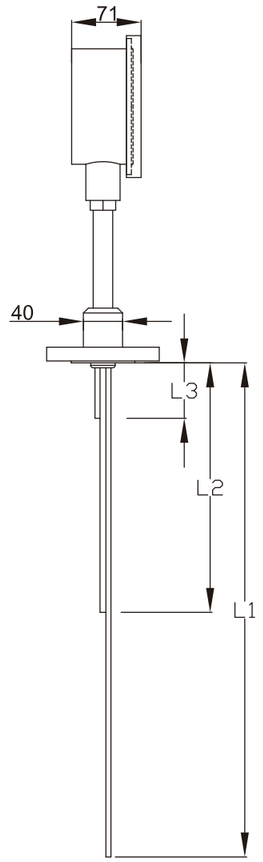
Product Usage This temperature sensor is suitable for multi-points temperature measurement in outdoor liquid cargo tanks;

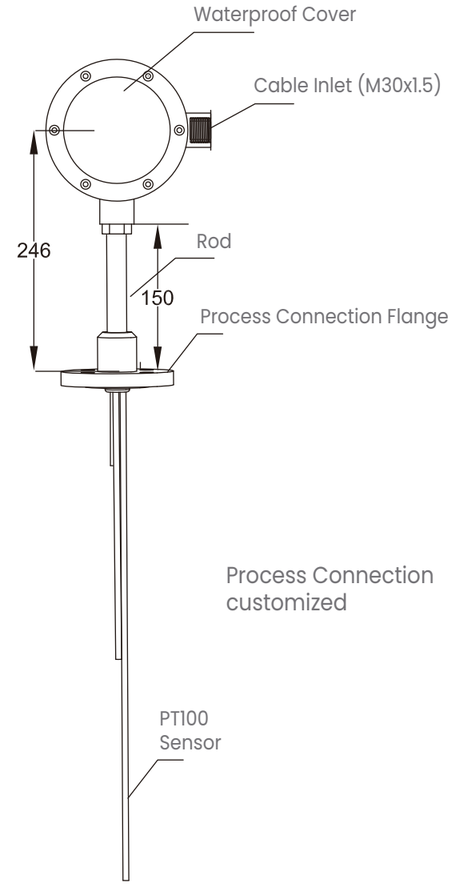
Technical Parameters

Signal Output:	3-PT100 3-wires
Accuracy:	PT100 A/B-Class
Measuring Range:	(-50~150)℃; customized
Ex-proof:	ExiaIICT6Ga
Protection Grade:	IP67
Ambient Temp:	(-40~85)C
Material:	SS316L
Cable Gland:	M30X1.5

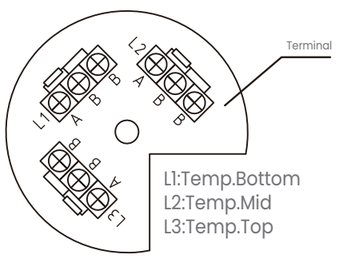
Product and Installation Diagram

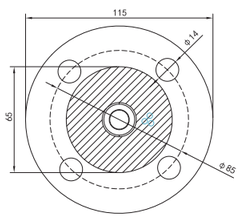
Dimensions (Unit: mm)





Electrical Connection





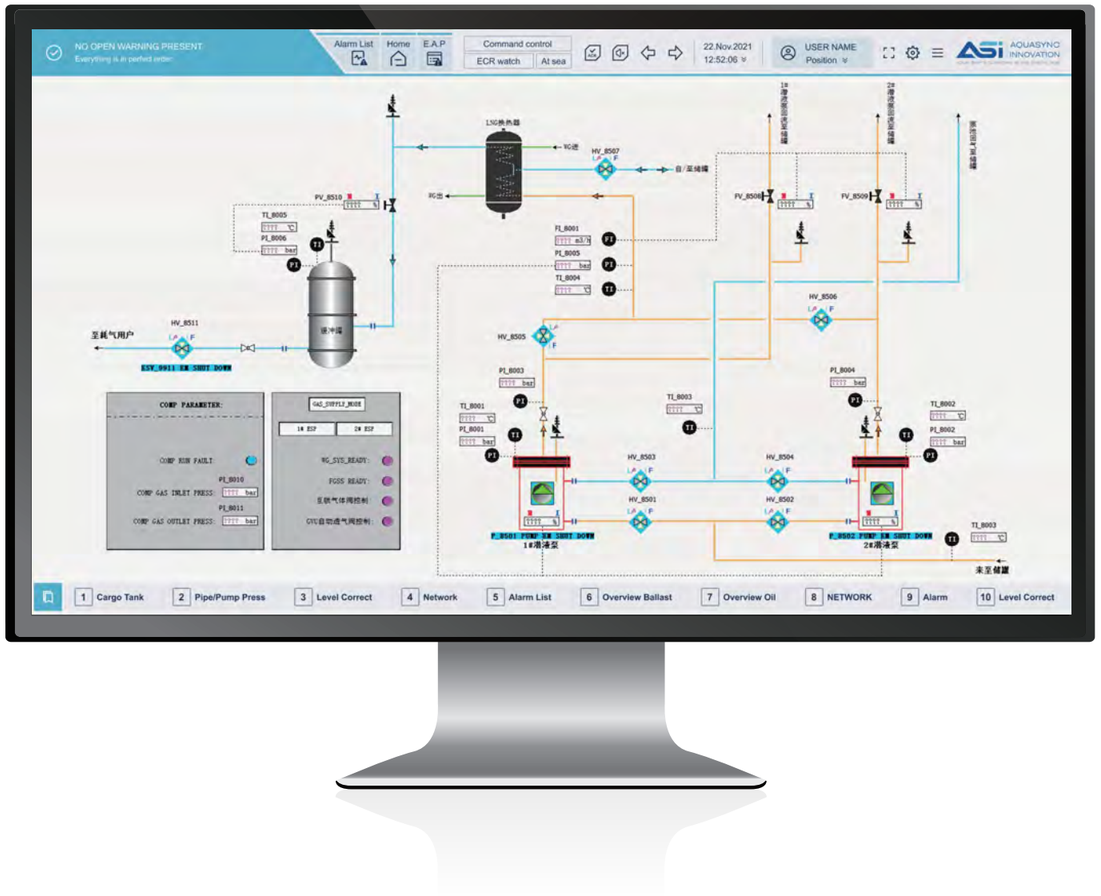
GB/T2506-2005
DN25 PN10 RF

6.4 Energy Management System

System Features

- Charge and discharge power equalization function.
- Peak shaving function.
- Heavy consumer request function.
- Black-out recovery function.
- Priority trip function.
- Sequential start function for critical loads.
- Support third party communication.
- Support remote monitoring.
- Compliant with IACS UR E27 network security requirements.

6.5 Natural Gas Fuel Control , Monitoring and Safety System



System Features

- Process control for pump, fan, compressor, valve.
- Fire and gas detection.
- Process shutdown and emergency shutdown.
- Audible and visual alarm.
- Support third party communication.
- Support remote monitoring.
- Compliant with IACS UR E27 network security requirements.

6.6 Emergency Shutdown Link

6.6.1 The New Guidelines

ESD systems for cargo transfers are used to stop the flow of cargo liquid and vapour in an emergency and to bring the cargo handling system to a safe, static condition. The linked ESD systems are installed so that an ESD trip activated on the ship will send an ESD signal to the terminal and vice versa.
Linked ship and terminal ESD systems reduce the risk of hose or pipeline failure causing cargo spills in two ways. Excessive pressure surges caused by a unilateral shutdown can cause hose rupture and mechanical damage to valves, pipelines and supporting structures. Excessive vessel movement alongside the berth or vessel breakout from the berth may result in hose or MLA failure. The linked system should therefore be considered a critical safety system for cargo transfer operations.

Evolving from the IGC code established in 1986, and the SIGTTO recommendations of 2009, new guidelines have been set out in a joint paper from the Oil Companies International Marine Forum (OCIMF) and Chemical Distribution Institute (CDI): "Linked Ship/Shore Emergency Shutdown Systems for Oil and Chemical Transfers" .

The following minimum requirements should be met to achieve a functional and safe ESD system:

- Ability for either party to manually activate the other's ESD.
- On activation of own ESD, the other party's ESD is automatically activated.
- Electrical classification is appropriate for the working environment.
- Uses an electrical umbilical that has recommended male 5-pin twist connectors at each end, for connection to female 5-pin twist connectors on the ship and jetty.
- Can be de-energised during connection.
- Interfaces electrically with existing ship and terminal ESD systems.
- When connected, includes an indication of the system's health.
- Is automatically activated if electrical power is lost or the circuitry is damaged.
- Raises an audible and visual alarm when activated.
- Indicates system re-set status.
- Can be tested; for ships, both at sea and in port.

An indication of the activating party may be included as an enhancement.
Programmable electronic equipment, including operating systems and configuration software, should be proven for use in safety applications.

6.6.2 Emergency Shutdown Link

System Overview & Application Scope

ASI's Emergency Shutdown Link (ESL) system is designed for oil and liquid chemical transfer operations, fully compliant with industry guidelines. It ensures safe and coordinated emergency shutdown procedures during cargo transfers in marine environments.

Critical Interoperability Function

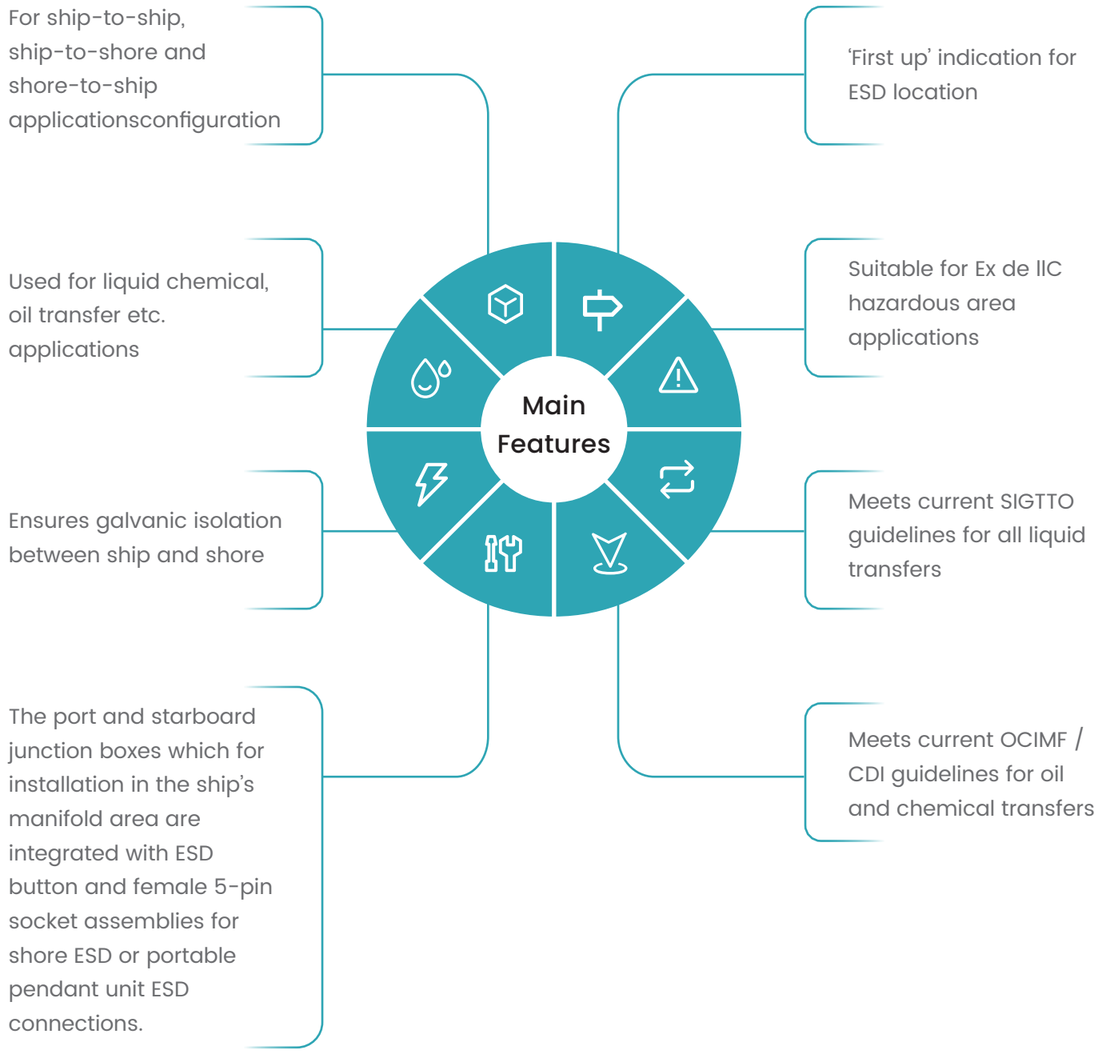
The ESL system establishes a vital connection between the emergency shutdown systems of cargo receivers and dischargers. This enables synchronized, controlled shutdowns in emergencies, minimizing risks during liquid cargo transfers and enhancing operational safety.

Hardware Configuration & Safety Design

Featuring an industry-standard 5-pin twist connector for ship-side wired junction boxes, the system supports optional wireless connectivity and portable cable reels. Its intrinsically safe circuitry guarantees galvanic isolation between ship and shore, making it suitable for hazardous area operations.

Alarm Mechanism & Operational Validation

Audible and visual alarms activate immediately upon ship- or shore-initiated ESD triggers. A standardized pre-transfer test function ensures system operability, verifying readiness before cargo transfer operations commence.



6.6.3 Configuration of a linked ship/shore ESD system

The standard terminal configuration comprises:

- A terminal control unit for installation in the terminal's control room;
- A jetty control unit;
- A ship/shore umbilical cable fitted with a recommended male 5-pin twist connector.

The standard ship configuration comprises:

- A ship control unit, for installation in the ship's control room;
- A ship side box fitted with fixed recommended female 5-pin socket assemblies for installation in the ship's manifold area, port and starboard.

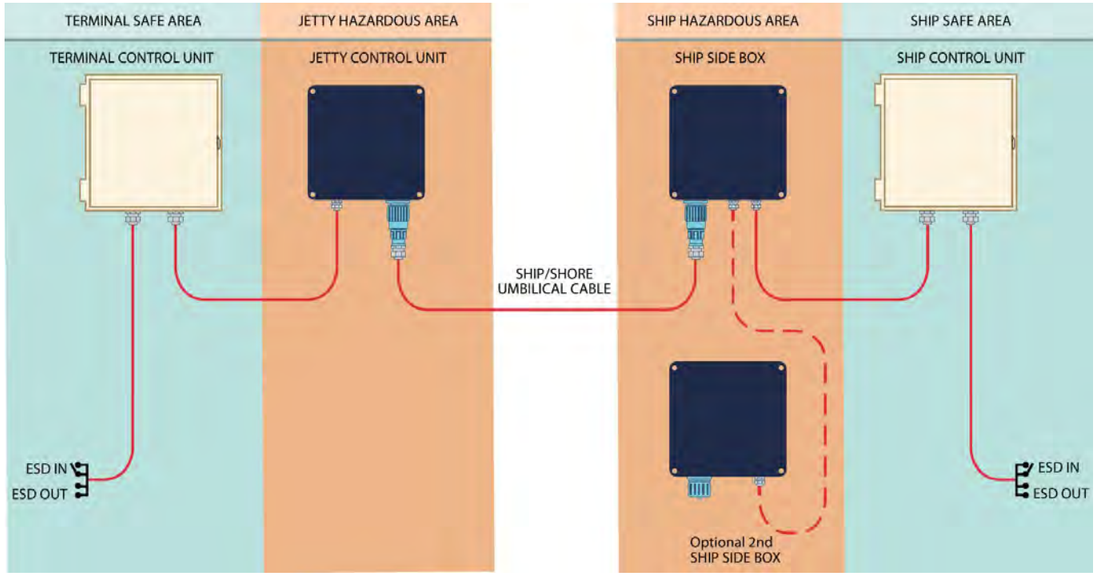
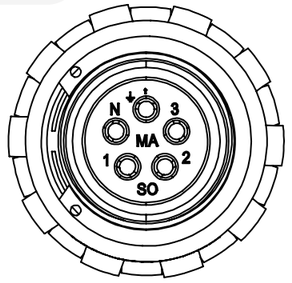


Figure A: Example of ship/shore ESD link configuration

Appendix ARecommended 5-pin twist connector

Appendix A



Recommended 5-pin twist connector

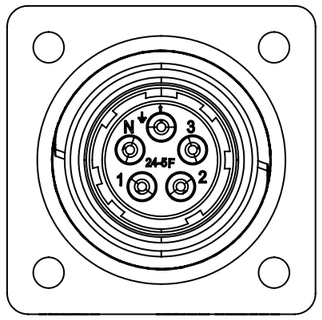


Figure A1: Pin designotion

The ship/shore electrical umbilical should comprise twisted pairs of wires without armour orscreen, to avoid the hazard of a potentially incendive spark if the insulating sheath is cut by anearthed object on the jetty. The pin designations are as follows:

1	+	Intrinsically safe circuit,nominal 24v DC,20mA
2	_	Intrinsically safe circuit,nominal 24v DC, 20mA
3	+	Spare
N	_	Spare
E		Not connected

Figures A2 and A3 give more details of the male and female connectors

6.6.4 Typical ESL System Diagram