

MEASUREMENT and CONTROL

For Shipbuilding & Offshore



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An underwater photograph of two dolphins swimming in clear blue water. The dolphins are positioned in the lower right quadrant of the frame, swimming towards the left. Sunlight filters down from the surface, creating a shimmering effect on the water. The overall color palette is a range of blues, from deep navy to bright cyan.

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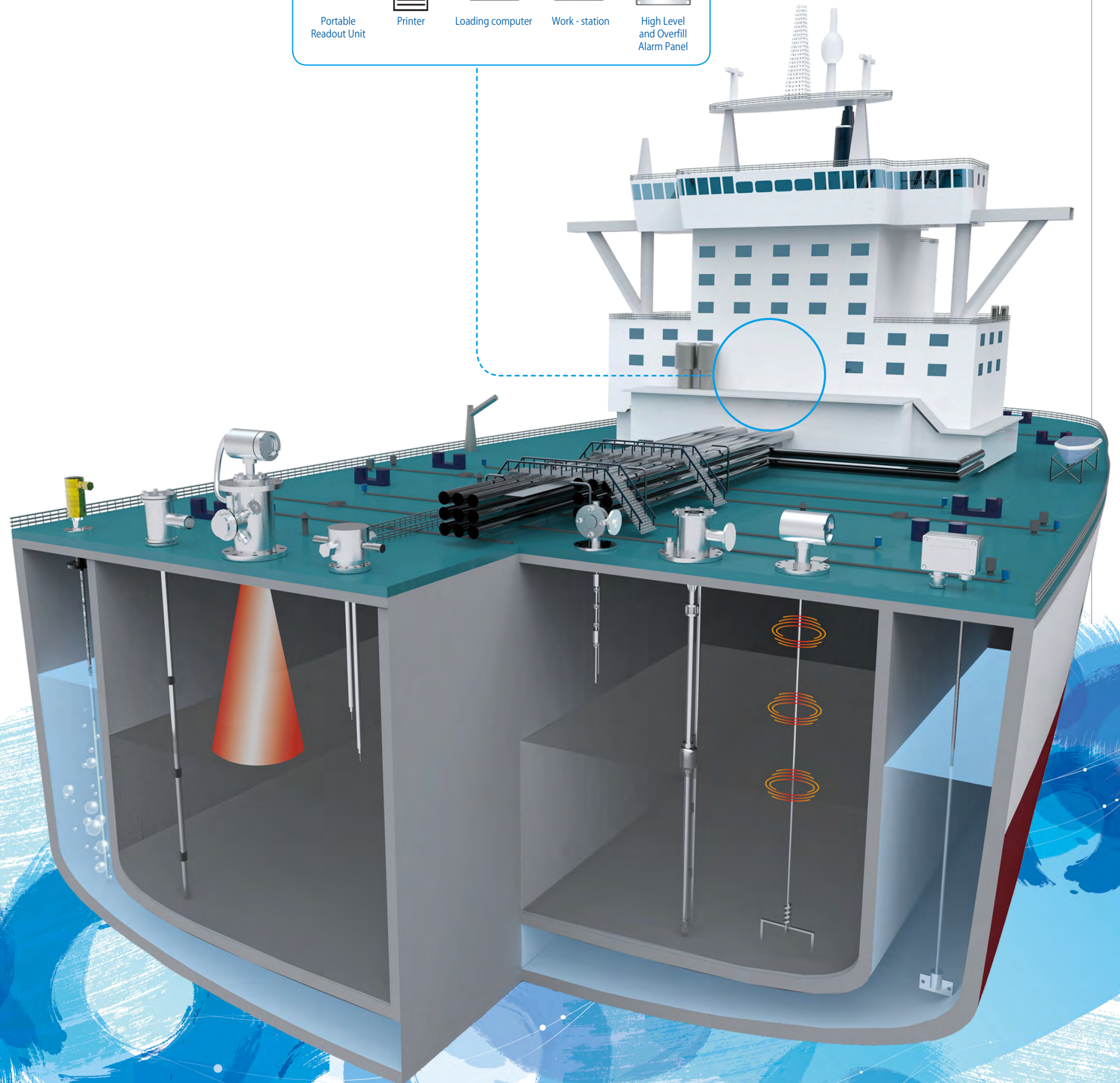
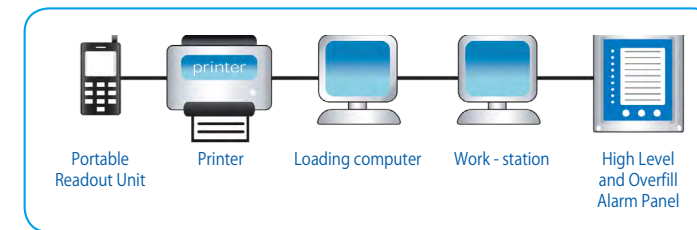
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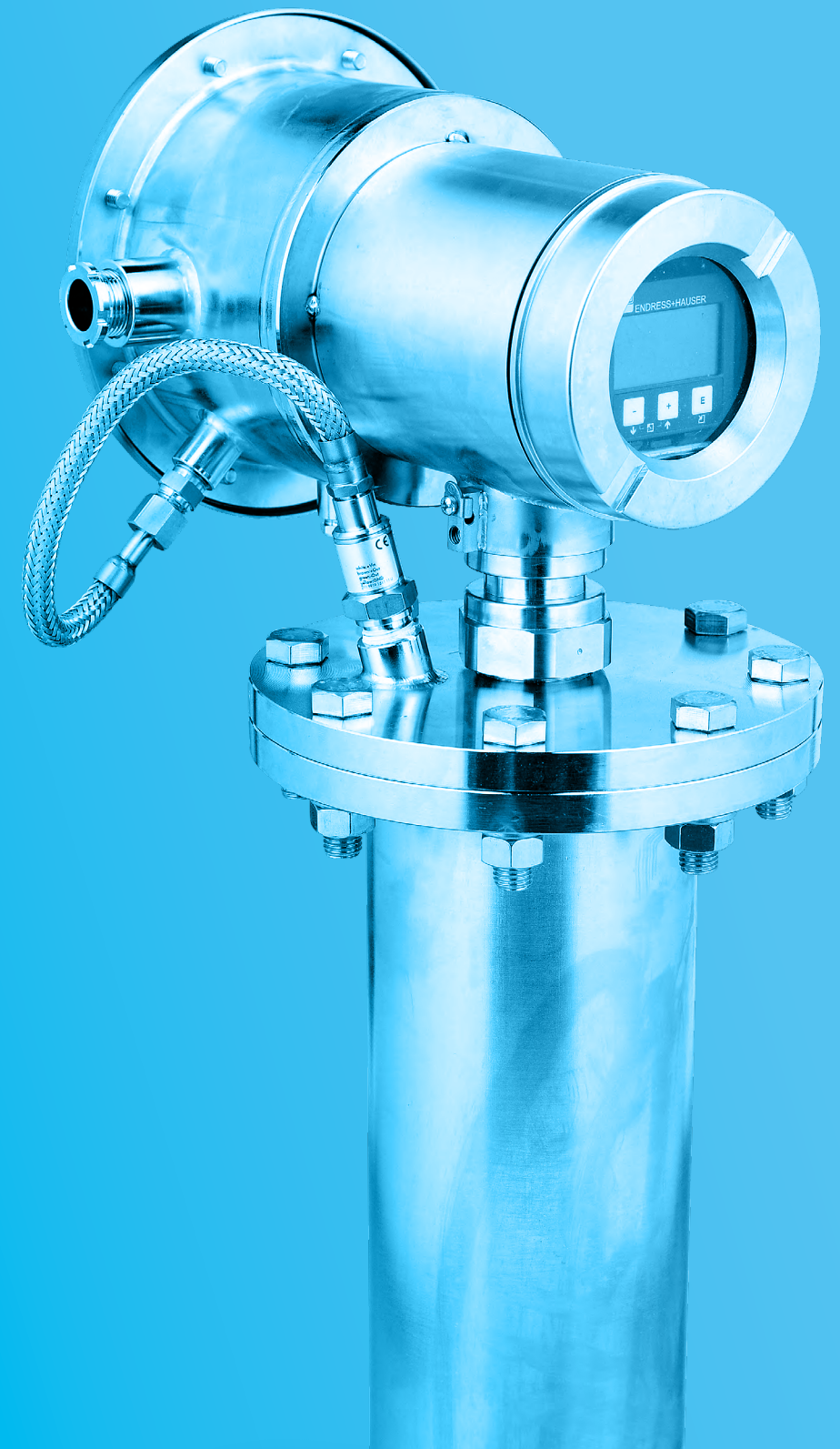
TANK GAUGING SYSTEM

PRODUCT LIST

- 01 Cargo monitoring system
 - Radar beam type
 - Magnetic float type
- 02 High & overfill alarm system
 - Magnetic float type
 - Acoustic type
- 03 Tank level & draft gauging system
 - Air purge type / electric pneumatic type
 - Electric pressure transmitter type
- 04 Vapour Monitoring System
- 05 Fixed gas detection system
- 06 Water ingress alarm system
- 07 Pressure / temperature monitoring system
- 08 Bilge high level alarm system
- 09 Local level gauge / switch
- 10 Pressure switch / temperature sensor / pressure transmitter



CARGO MONITORING SYSTEM



Radar Beam Type Cargo Tank Monitoring System

CARGO
MONITORING
SYSTEM

TANK
LEVEL
GAUGING
SYSTEM

ALARM
SYSTEM

LEVEL
GAUGE

LEVEL
SWITCH

OTHERS

INTRODUCTION

Radar beam type cargo tank monitoring system is especially designed be integrated cargo monitoring system for inland river or ocean going vessels and tank barge. It is based on the utilization of smart sensors, including microprocessors performing signal processing and offer, in addition to transmitting tank level, pressure, and temperature data to the central monitoring system, capabilities such as self-diagnostics, self-monitoring and remote configuring. These capabilities allow for predictive maintenance owing to the continuous tracking of performance drift.

OPERATING PRINCIPLE

Radar beam type cargo tank monitoring system is a 'downward-looking' measuring system, operating based on the time-of-flight method. It measures the distance from the reference point(process connection)to the product surface. Radar impulses are emitted by an antenna, reflected off the product surface and received again by the radar system.

FEATURES

- **2 WIRE TECHNOLOGY, GOOD PRICE.**
A real alternative to differential pressure, floats and displacers. 2-wire technology reduces wiring cost and allows easy implementation into existing systems.
- **NON CONTACT MEASUREMENT.**
Measurement is almost independent from product properties.
- **Easy on-site operation via menu-driven alphanumeric display.**
- **Easy commissioning, documentation and diagnostics via operating software**
- **2 FREQUENCY RANGES-26GHz.**
No compromises, the right frequency for every application.
- **HART or PROFIBUS PA respectively foundation fieldbus protocol.**

TECHNICAL SPECIFICATION

MEASURING RANGE	Up to 40m depending on installation, product, surface conditions and antenna size.
OUTPUT	4...20mA, HART PROFIBUS PA, foundation fieldbus.
MEASURING ACCURACY	±3mm (up to 10mm)
MEASURING CYCLE	1 sec
CERTIFICATION	ATEX II ½ G EEX ia II C T6 ATEX II ½ G EEX d[ia] II C T6
PRODUCT TEMPERATURE	-40 °C to 150 °C
PRESSURE	From vacuum to 40 bar
PROCESS CONNECTION	1 ½ "thread DN50(2") .. DN150 (6") flange
MAJOR MATERIAL	SUS 316
BEAM ANGLE	8°
WEIGHT	20 kg

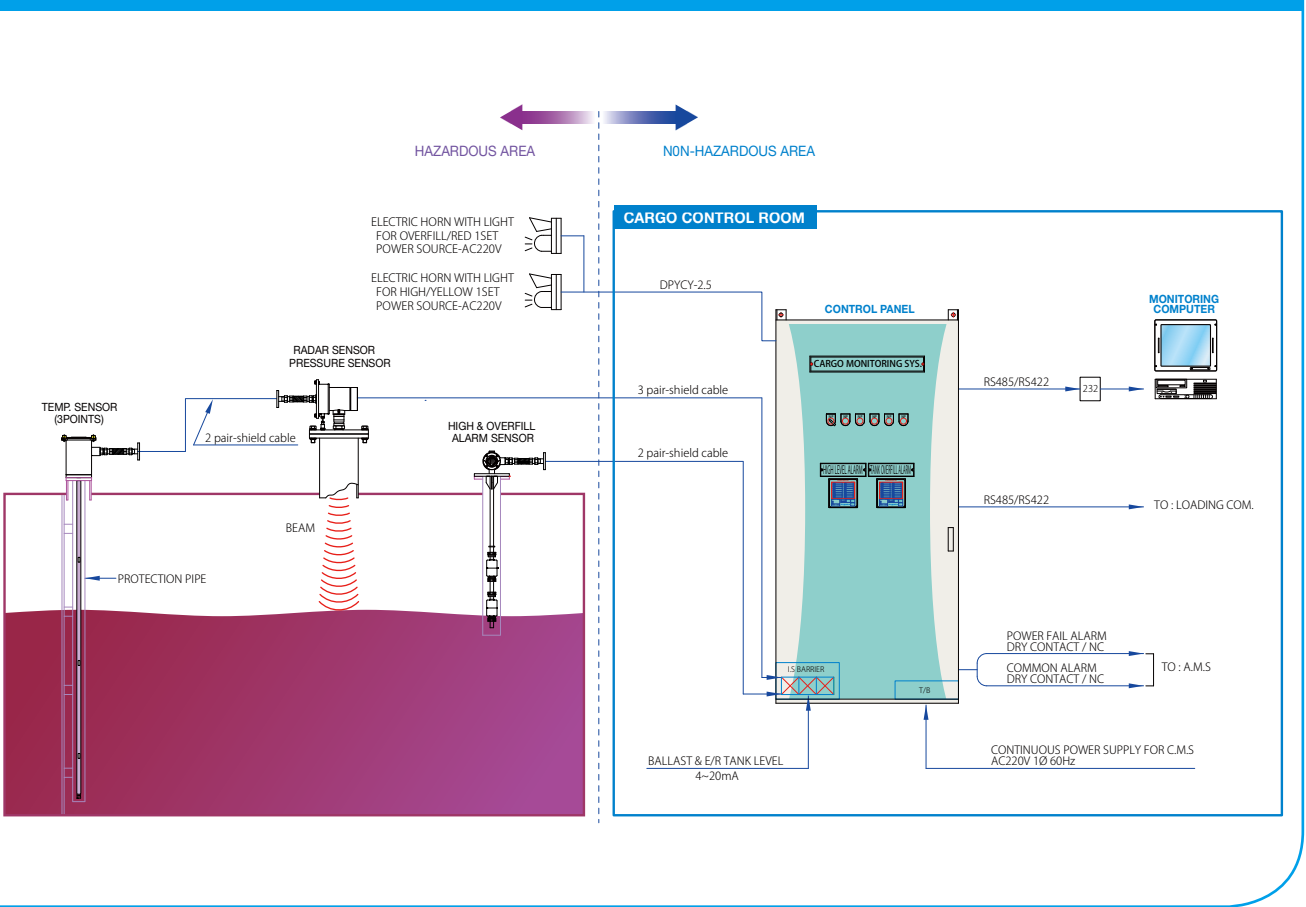
MICROPLOT M FMR 240(Horn type)



LEVELFLEX M FMP40(Guided wire type)



OUTLINE / DIMENSIONS



Likewise, transportation and fitting of the tank monitoring system is also simple. For LNG carrier, this magnetic float type tank level gauge is usually provided in W.B.T & draft gauge system and F.O. tank level gauge system.

OPERATING PRINCIPLE

Sets of reed switches are positioned along the length of the guide pipe. As the float travels up and down the guide pipe in accordance with the level of the liquid in the tank, the flux emitted from magnets within the float works upon the reed switches on or off.

By measuring voltage across the transmitter circuit, the level of the liquid can be calculated according to the changes in circuit resistance. The converted signal is sent to the control box via I.S. barrier in the control room or to a local indicator as the case may be.

TECHNICAL SPECIFICATION

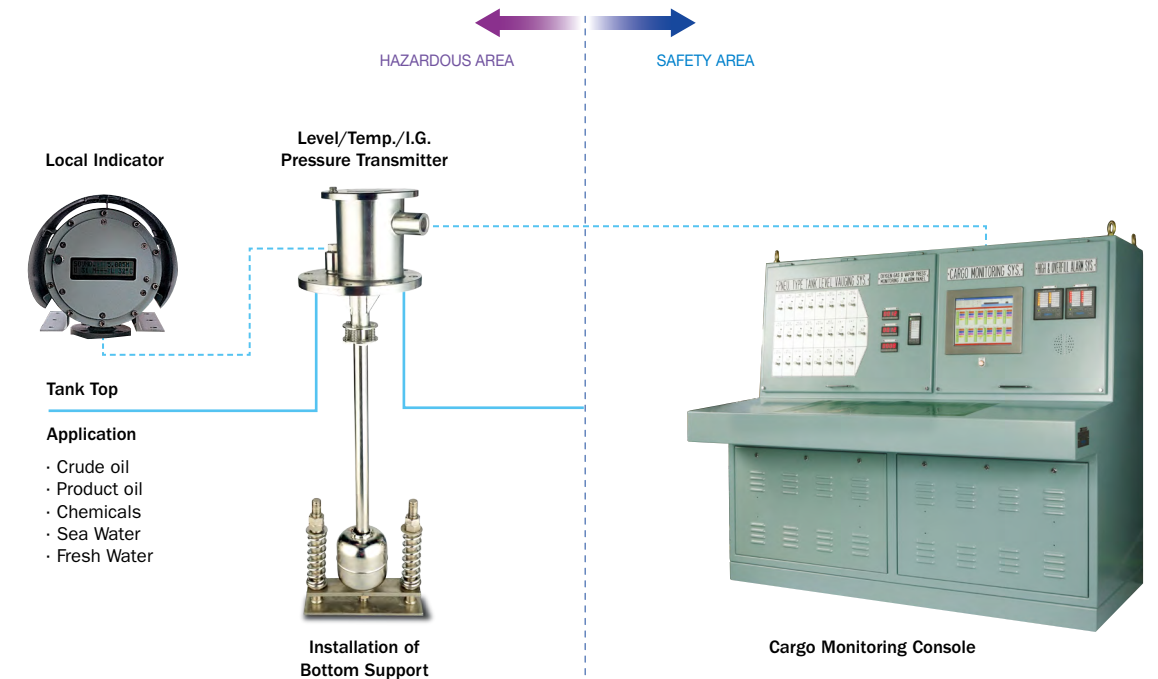
LEVEL DETECTING PART

TYPE	Reed switch with magnetic float
ANTI-EXPLOSION STRUCTURE	EX ia II C T6
MEASURING RANGE	50m, Max
SPECIFIC GRAVITY	0.5 and above (of liquid in tank)
VISCOSITY	15,000 sec. redwood No.1 Max
DETECTING ACCURACY	± 25 mm
ALLOWABLE TEMPERATURE	-40 ... +120 °C
ALLOWABLE PRESSURE	3 kgf/cm ²

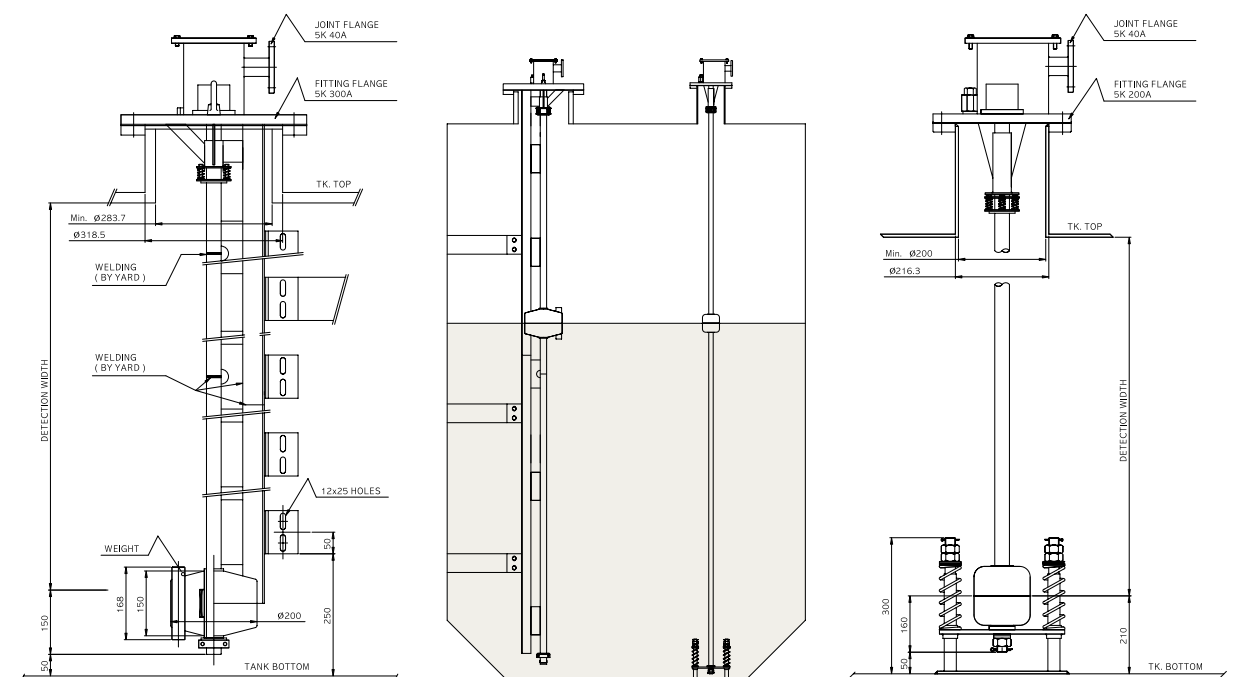
TEMPERATURE DETECTING PART

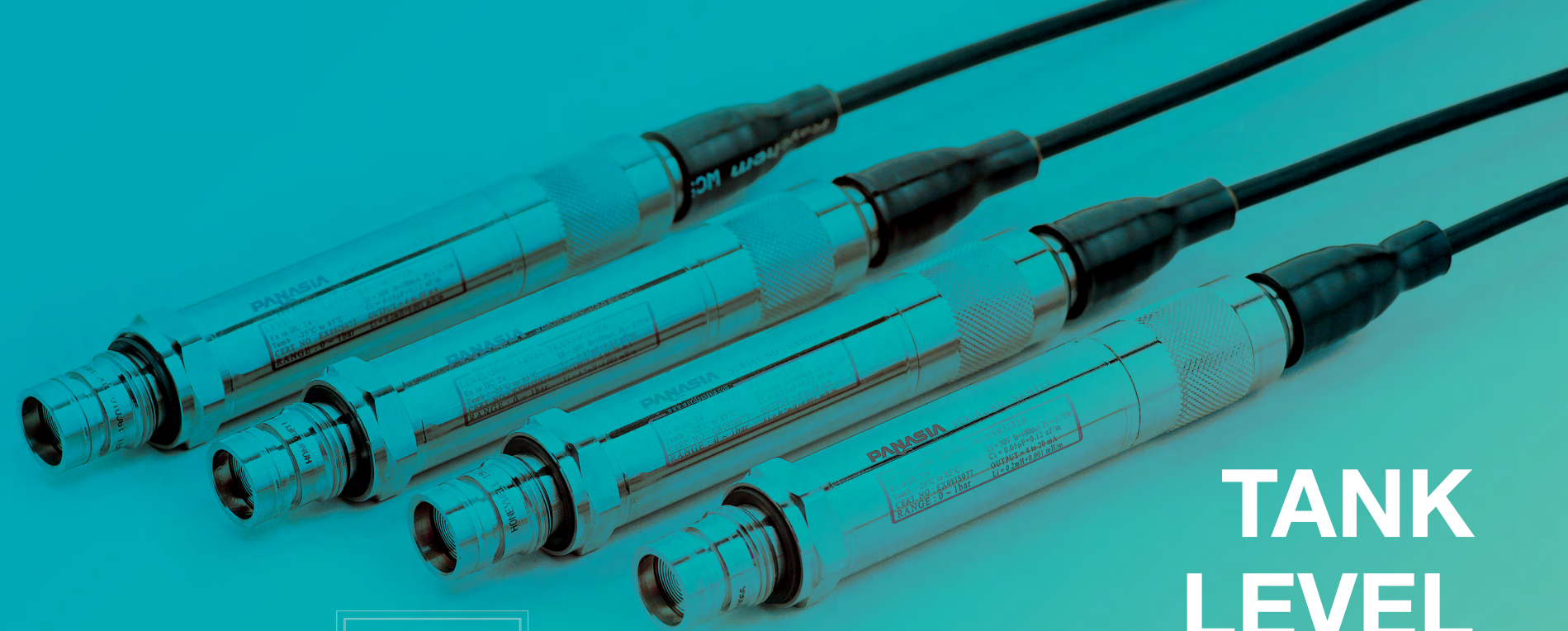
TYPE 1	Two-terminal IC, temp, transducer
MEASURING RANGE	-55 / + 150 °C
DETECTING ACCURACY	± 2 °C
TYPE 2	PT 100 ohm
MEASURING RANGE	-50 °C ~ +200 °C
SENSOR TOLERANCE	EN 60751 class B

OUTLINE / DIMENSIONS

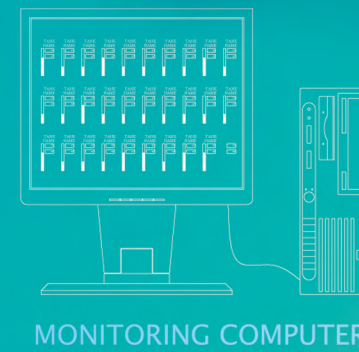


OUTLINE / DIMENSIONS





TANK LEVEL GAUGING SYSTEM

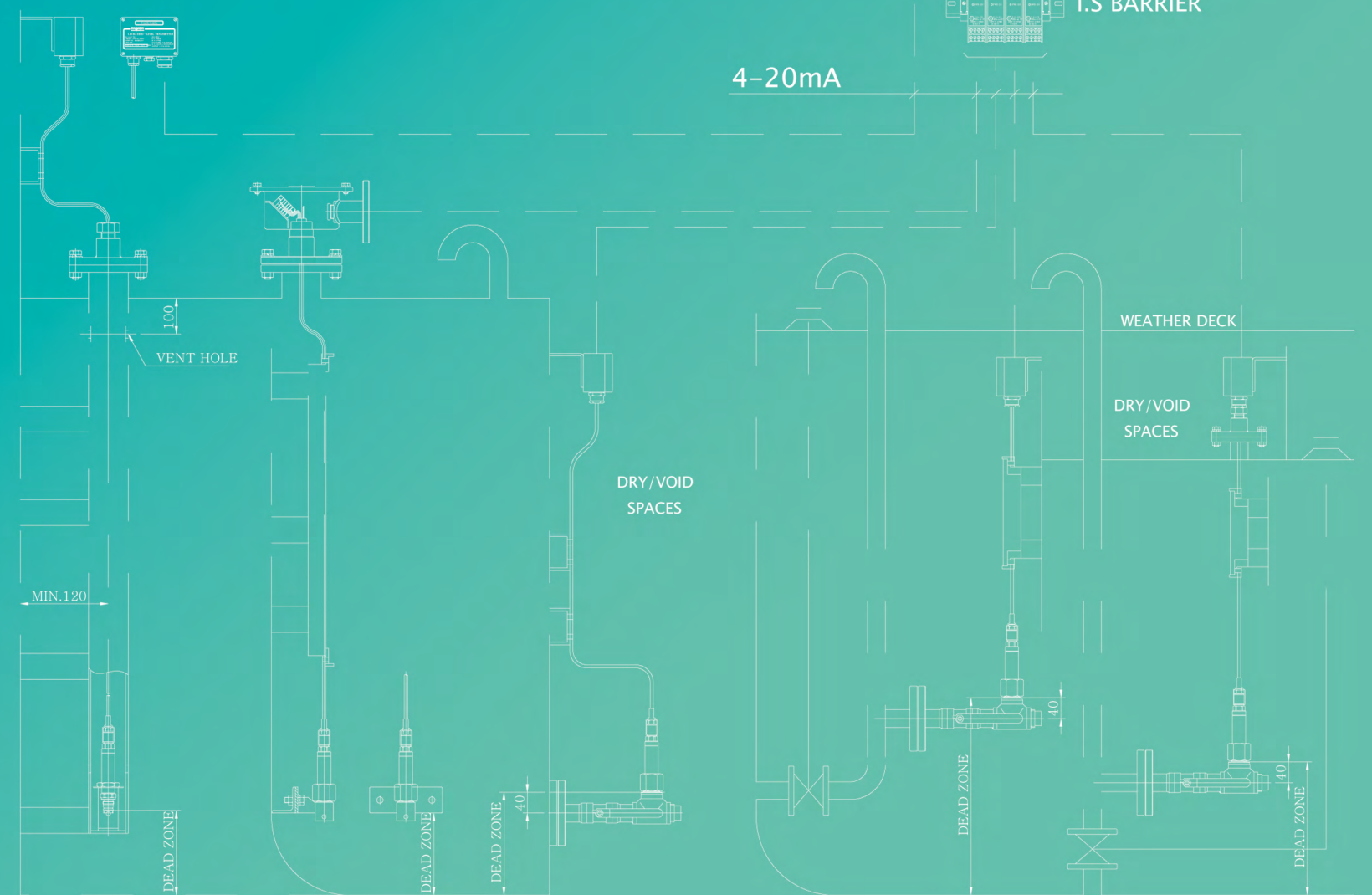


RS-485



I.S. BARRIER

4-20mA



Air Purge Type Tank Level & Draft Gauging System

INTRODUCTION

Air purge type tank level & draft gauging system is designed to indicate liquid level or measuring depth pressure for direct reading and achieve the high precision.

OPERATING PRINCIPLE

The operating principle is based on the measuring the hydrostatic head of the liquid by providing constant low flow of air into a probe, called as sounding pipe, which opens at the tank bottom.

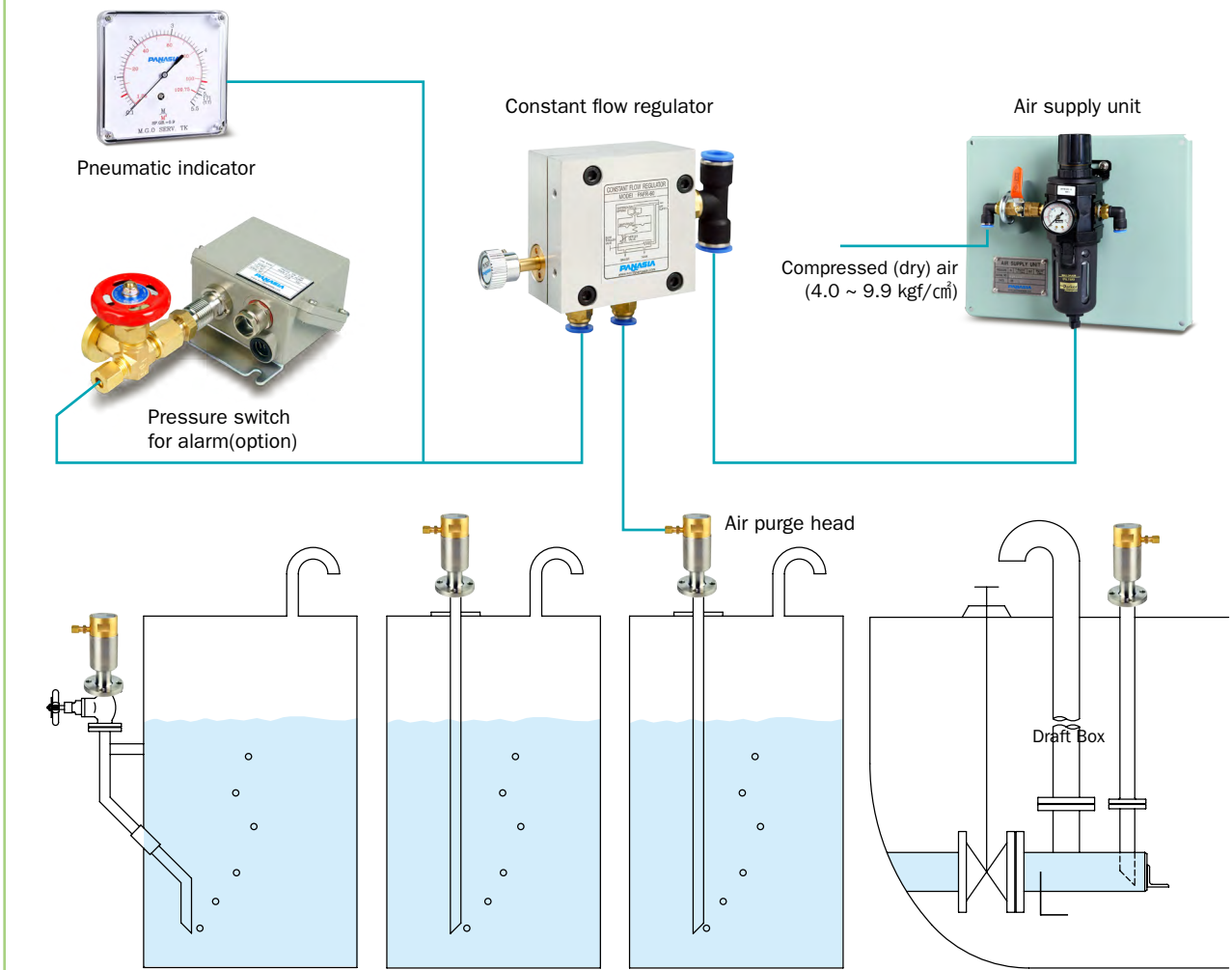
When a light quantity of air is discharged through the purge mouth at the tank bottom, an air pressure corresponding to the liquid level will be built up in the sounding pipe.

If the specific gravity of the liquid is known and a pressure in the sounding pipe is measured, it is possible to calculate the distance from the pipe opening to the surface by means of the above expression. The pressure is read on the indicator graduated scale in meters or volume or percent of full tank.

TECHNICAL SPECIFICATION

TYPE OF SYSTEM	One line air purge system
ACCURACY	1% of F.S
WORKING TEMPERATURE	-25°C to +75°C (It must be secured that the dew point of the air lies below min. temperature)
AIR FLOW CONSUMPTION	5 to 50 Nℓ/min
OPERATING AIR PRESSURE RATING	4 kgf/cm ² to 9.9 kgf/cm ²
SIGNAL PIPE	OD 8 mm or 10 mm

CONNECTION DIAGRAM



Electric Pneumatic Type Tank Level & Draft Gauging System

INTRODUCTION

Electric pneumatic type tank level & draft gauging system is designed to indicate liquid level or measuring depth pressure for direct reading and achieve the high precision.

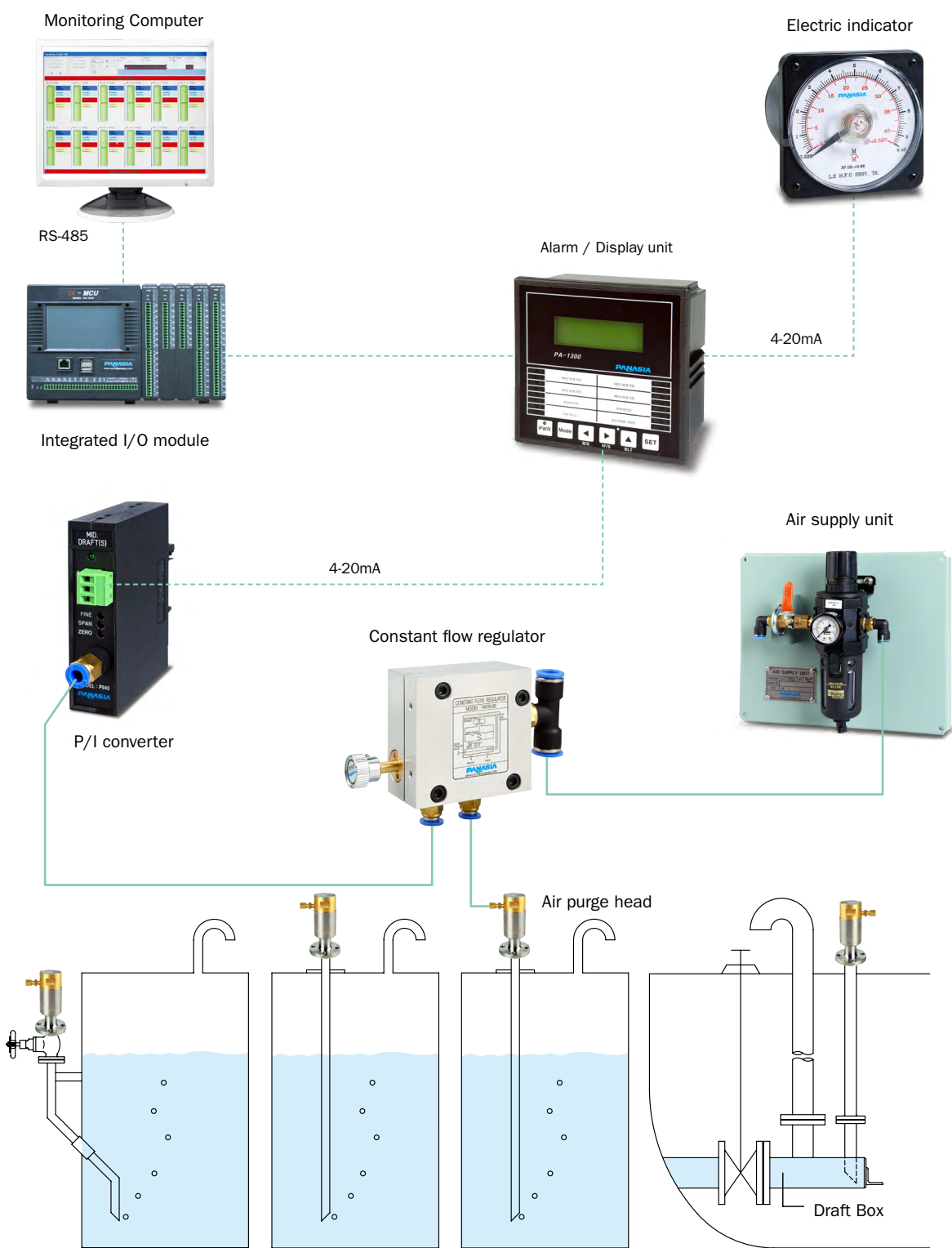
OPERATING PRINCIPLE

The operating principle is basically the same as the level measurement of air purge type tank level monitoring system. But electric pneumatic type tank level gauging system has electric reading and P/I converter that converts pneumatic input signal to 4-20 mA output signal in addition to air purge type system.

LEVEL INDICATING PANEL



CONNECTION DIAGRAM



APPLICATION

Electric pneumatic type tank level & draft gauging system is widely used for ballast tank level measurement, draft measurement and engine room tank level measurement, etc.

P/I CONVERTER



The upgraded P/I converts are provided to convert an pneumatic pressure into an electronic signal for remote display of tank level and draft gauge on CRT and / or electric indicator. Unlike the pneumatic indicator possible to be damaged by excess-pressure, this P/I converter is free from inlet excess-pressure without even gauge saver.

MODEL	P 940
OUTPUT CURRENT	4 to 20 mA DC, 2 wire system
PROTECTION	against inlet excess-pressure.
ACCURACY	± 0.25 % of F.S (option : ± 0.1% of F.S)

High Precision Electric Pneumatic Type Level Transmitter

INTRODUCTION

High precision electric pneumatic type level transmitter is able to be used for measuring level contents in open such as WBT. It is easy to install in all types of vessels because all of the parts is in one. Also it has developed focused on saving on installation cost with best reliability.



OPERATING PRINCIPLE

The operating principle is based on the measurement of the hydrostatic pressure at the bottom of a tank where air is injected continuously through a sounding pipe. A pressure corresponding to the level of the liquid will be built up in the sounding pipe. This pressure will be measured by the transmitter and converted into a 4 to 20mA signal.

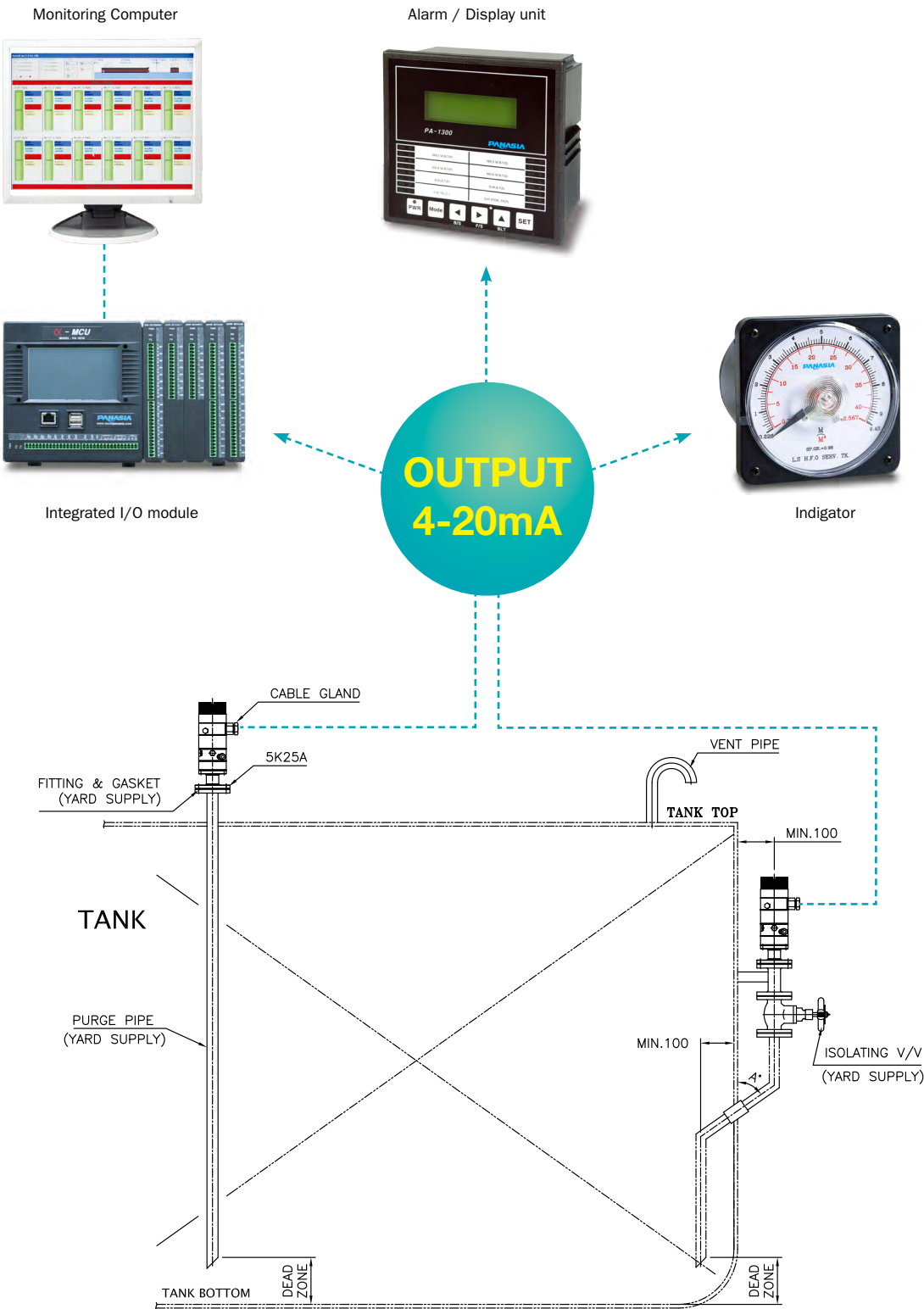
TECHNICAL SPECIFICATION

OUTPUT	4- 20mA, 2 wire system
LOAD EQUATION	$RL = (V_{cc}-10)/22[k\Omega]$
E.G ; 24V SUPPLY	$RL < 636 \Omega$
ACCURACY	$\pm 20 \text{ mm}$ from 0 to 10 meter level $\pm 40 \text{ mm}$ from 10 to 35 meter level
TEMPERATURE STABILITY	$-10^{\circ}\text{C} \sim +70^{\circ}\text{C} = 0.5 \%$ for main range (overall temperature-range)
POWER SUPPLY	nominal 24V DC
EFFECT OF VOLTAGE VARIATION	range 10... 30V zero point 0.005% pro V span 0.001% pre V
DAMPING	0-200s adjustable
INSULATING CURRENT	500V
MATERIAL	naval brass stainless steel
AIR SUPPLY	clean dry air 4 ~ 8 bar
MIN.PRESSURE	0.5 bar above range
AIR CONSUMPTION	approx. 30 IN/h

FEATURES

- High accuracy
- Long term stability
- 4-20mA output signal
- Easy installation
- Easy maintenance

CONNECTION DIAGRAM



1:1 Converter (Pneumatic Tank Level Gauge)

OPERATING PRINCIPLE

On one side, the diaphragm is affected by the medium in the tank which is to be measured the pressure by which the diaphragm is affected is the hydrostatic pressure of the fluid or gaseous medium.

On the other side, the diaphragm is fastened with the pressure converter, forming so a pressure chamber. Via an air supply and a throttle, measuring air is applied to the pressure chamber where a pressure corresponding to the hydrostatic pressure of the medium develops. This pressure can be shown by an indicating instrument. The pressure on the supply of measuring air must always exceed the highest media pressure. Excess air is blown out through the nozzle in the center of the pressure converter.

To avoid distortion, the flange must be fastened at least 4 points before final welding. Connecting tubes of stainless steel or copper are to be used between pressure converter and indicating instrument air supply.

APPLICATION

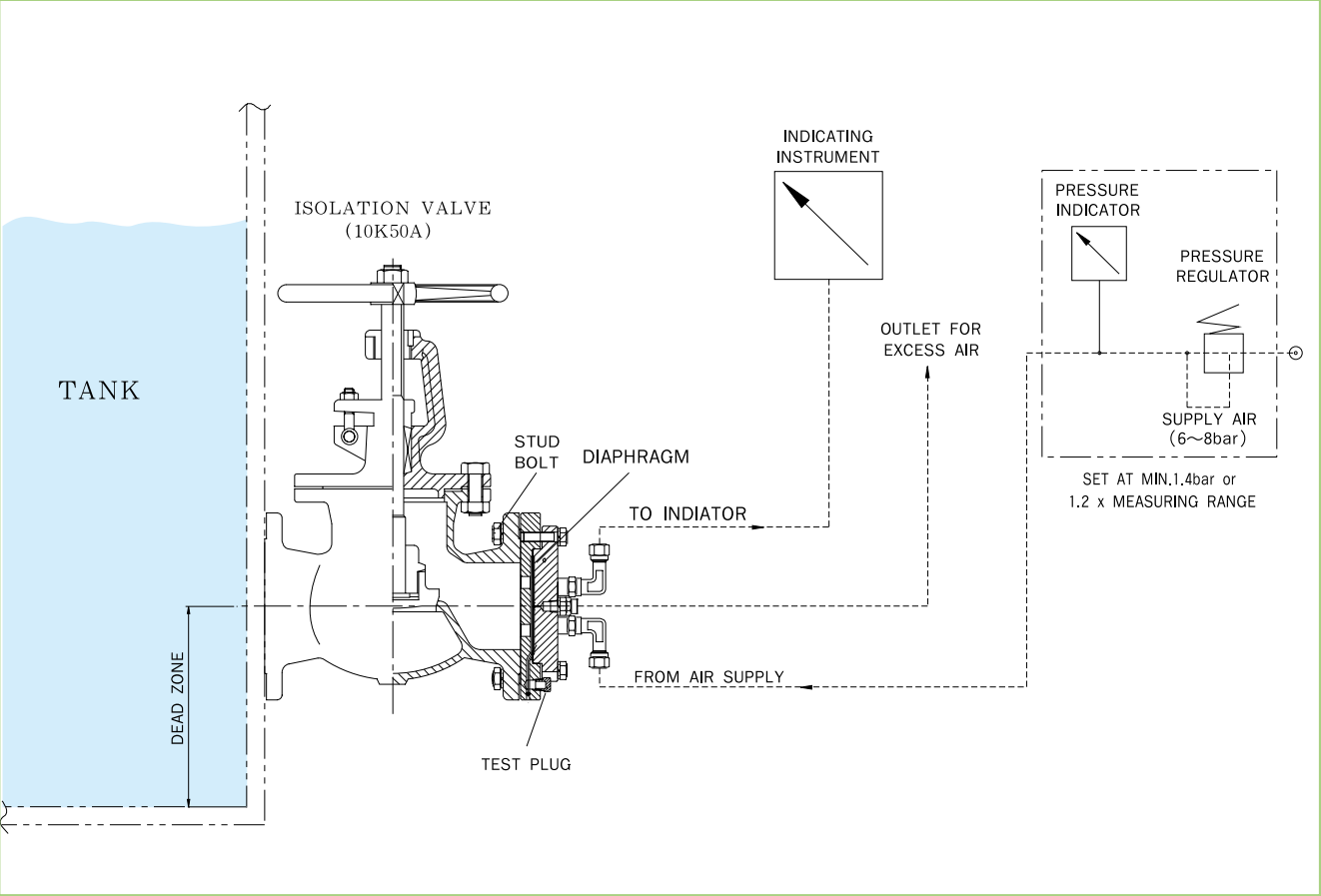
Primarily for as an indirect continuous measurement of level and cubic contents respectively of liquid in containers and tanks. 1:1 converter is especially suitable for hygienic purposes within the food, beverage and chemical industries as well as for potable water tank.

TECHNICAL SPECIFICATION

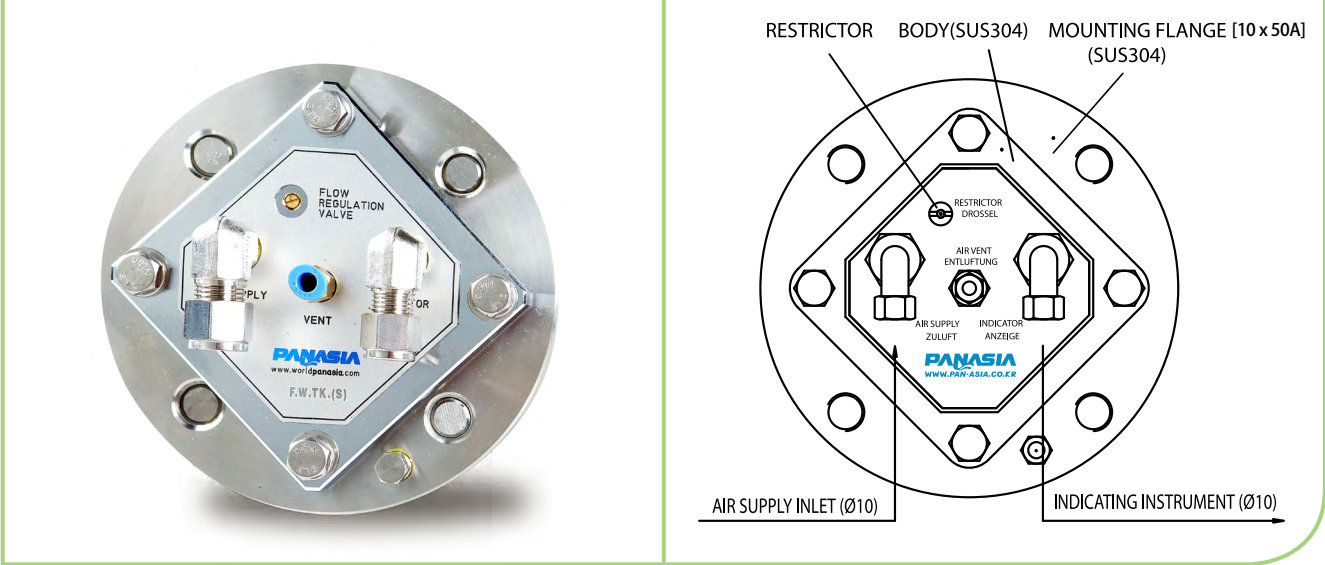
MEASURING RANGE	0 ~ 30m H2O
AIR SUPPLY	1.4 bar or minimum 1.2 x measuring range
AIR CONSUMPTION	at 1.4 bar air supply approx. 30l/h
VISCOSITY	at 2.5 bar air supply approx. 40l/h = 3,500 redwood 1 sec
TOLERANCES	(measured with water) Including reaction sensitivity and hysteresis at 1.4 bar. at empty tank and free discharge nozzle : max.25mm > 0.1 m tank level measured from middle of diaphragm : max.±25mm , ±0.75% The 0-point drift depends on the pressure loss caused by possible hose, tube mounted on the discharge nozzle.
TEMPERATURE RANGE RASPONSE TIME	0 to +80 °C (4bar) Depends on tube dimension and tube length from pressure converter to indicating instrument as well as supply.

AIR SUPPLY	INTERNAL TUBE	PIPE LENGTH	RESPONSE TIME	CHANGE IN LEVEL
1.4 bar	Ø 6 mm	30 m	approx. 10 s	55 mm/s
1.4 bar	Ø 6 mm	50 m	approx. 20 s	55 mm/s
1.4 bar	Ø 6 mm	100 m	approx. 50 s	55 mm/s
1.4 bar	Ø 6 mm	300 m	approx.4 min	55 mm/s
2.4 bar	Ø 6 mm	100 m	approx. 5s	55 mm/s

OUTLINE / DIMENSIONS

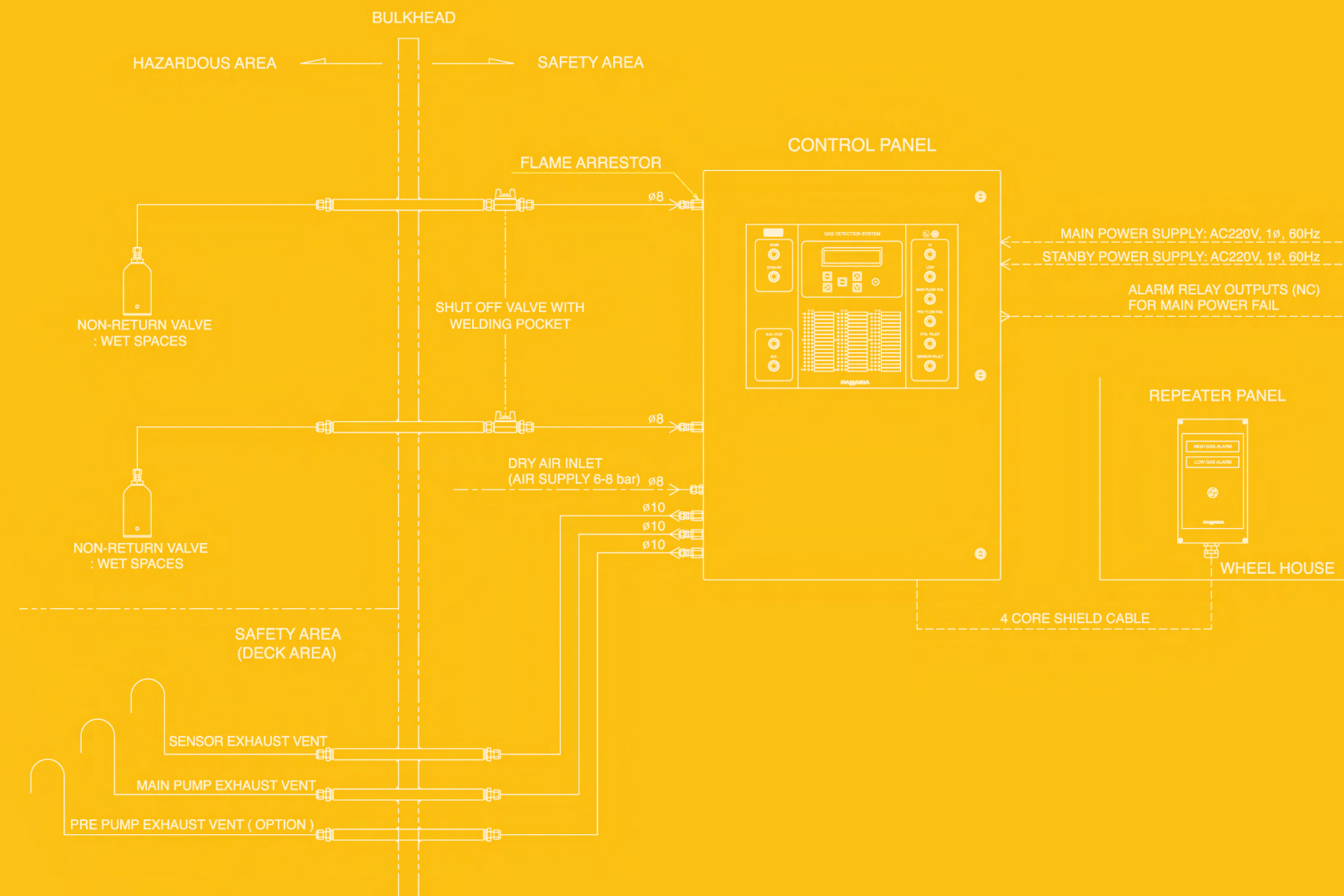


OUTLINE / DIMENSIONS





ALARM SYSTEM



Magnetic Float Type High & Overfill Alarm System

INTRODUCTION

High level alarm sensor consists of magnetic float and reed switch built in guide pipe. When the liquid level reaches a set point, the reed switch in the alarm sensor is actuated by magnetic float.

OPERATING PRINCIPLE

When the magnetic float moves upward with rising level, the hermetically sealed magnetic reed switch inside the pipe will be de-activated. This switch will be in an open-state position (non alarm position). This means a normally operated fail to safe loop. The 95% switch is normally for high alarm, and the 98% switch is for high-high alarm (overfill alarm).
A test level is provided for manually functional test to check integrity of high level alarm system before cargo loading.

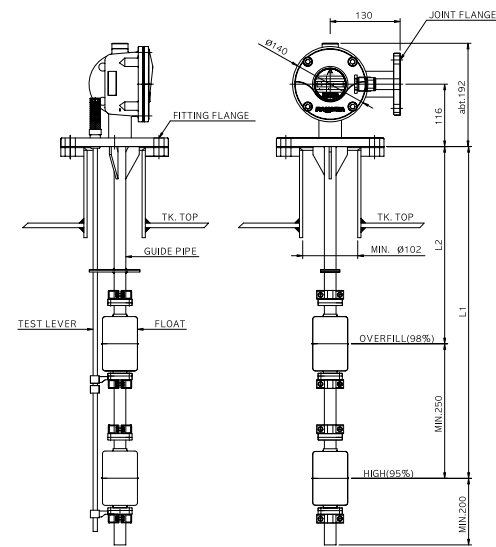
TECHNICAL SPECIFICATION

DETECTION UNITS	Reed switch with magnetic float
DETECTING ACCURACY	± 5 mm
SWITCH CONTACT RATING	230 VAC, 3A
SPECIFIC GRACITY	0.6 above
MATERIAL	Housing - SUS316 Flange - SUS304 / SUS316 Guide pipe - SUS304 / SUS316 Float - SUS316
ANTI-EXPLOSION STRUCTURE	intrinsically safe type
ALLOWABLE PRESSURE	5 kgf/cm ²
CONNECTION SIZE	Installation - JIS 5K 125A FF JIS 5K 125A FF (with chamber) Conduit - JIS 20C
ALARM POINT	High alarm - at 95% of cargo volume Over fill alarm - at 98% of cargo volume
TYPE APPROVED BY	KR, ABS, DNV, LR, BV, GL, NK, RINA

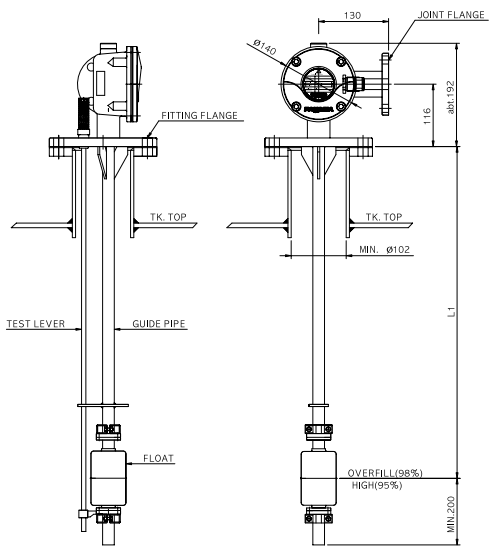
PR-30EX-□



HIGH & OVERFILL ALARM SWITCH



HIGH or OVERFILL ALARM SWITCH



OUTLINE / DIMENSIONS

PR - 30EX - □
Number of float
1: 1 float
2: 2 floats



Electric Horn with Strobe light



High & Overfill Alarm Unit



Air Horn

Air supply 6~8 bar

Water Ingress Alarm System

INTRODUCTION

Water ingress alarm system is designed to detect the presence of water in the cargo holds and intended for usage on bulk carriers. It is in accordance with SOLAS chapter XII/12, IMO Res. MSC.145(77), IACS SC 180.

OPERATING PRINCIPLE

Electrode type level switch is suitable for level detection in conductive liquid. If the electrode comes into contact with the liquid, the A.C current will flow through the liquid and complete the circuit. This AC current can be amplified and fed into electronic converter in sensor housing that detects changes in its input current caused by rising medium. This changes are converted into a corresponding current changes. If the changes exceed an adjustable limit value, the output current rises discontinuously to > 3.4 mA. This I.S barrier signal converter in alarm panel uses this information to switch isolated contacts.

FEATURES

- No moving part
- Reliable
- No damage by cargo
- Easy to maintenance
- Insensitive to cargo solids

TECHNICAL SPECIFICATION

CERTIFIED TO	EX ia II C T6
AMBIENT TEMPERATURE	-25°C ~ + 70°C
LIQUID TEMPERATURE	-20°C ~ + 70°C
PRESSURE	0 ~ 10 bar
HOUSING MATERIAL	SUS316
PROCESS CONNECTION	Thread G1-1/4A or flange
PROTECTION CLASS	IP 68
NORMAL VOLTAGE	4.6 V to 30V DC
NORMAL CURRENT	un-switched <1 mA switched >3.46 mA
MEASURING VOLTAGE	AC5V
MAX. NO-LOAD CURRENT	1 μA
FREQUENCY	50 KHz

PR-30EX(Float type)



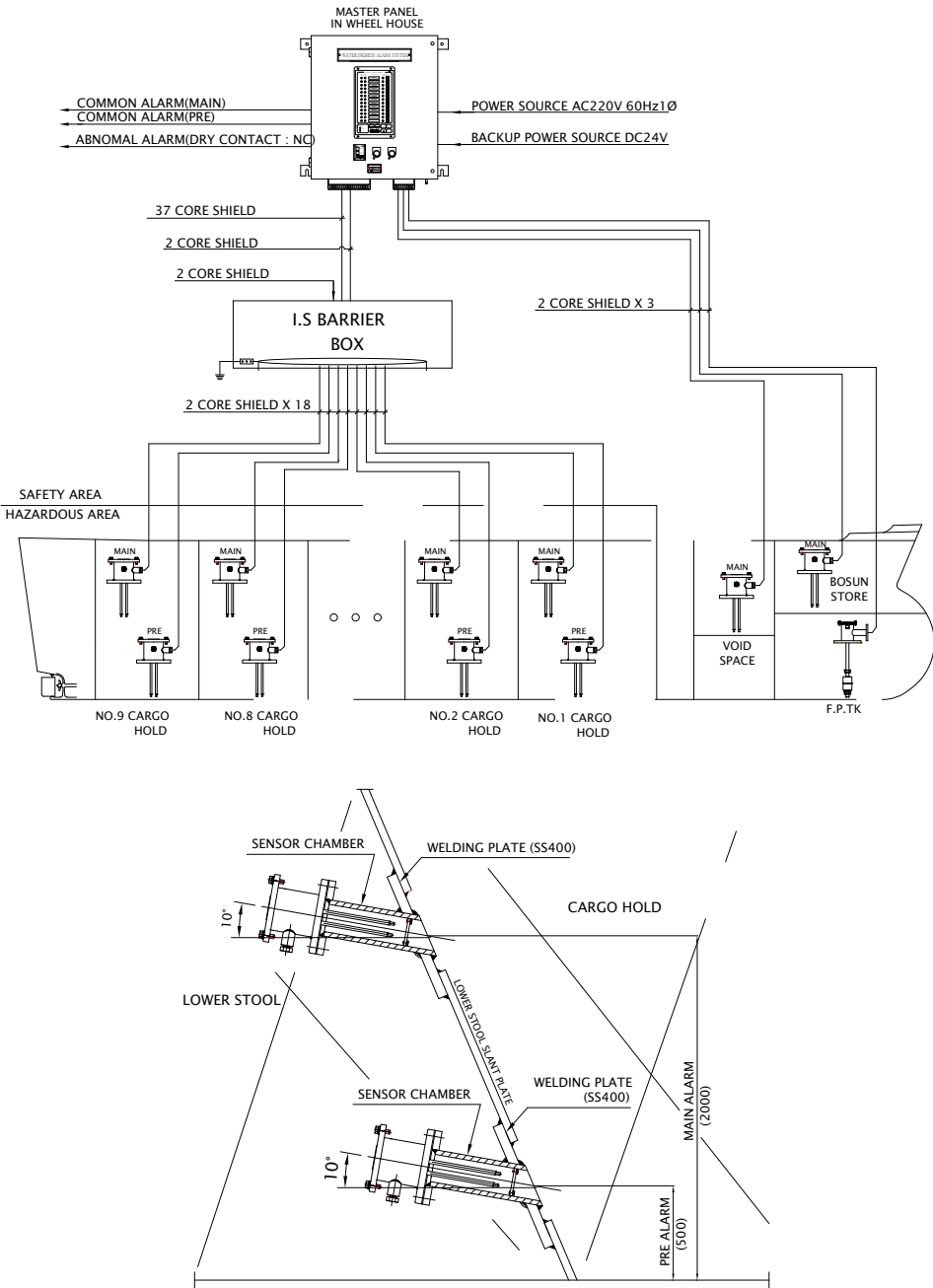
HR-665261 (Electrode type)



APPLICATION

The water detectors are installed at a height of 0.5m above inner bottom and another at a height not less than 15% of the depth of the cargo hold but not more than 2.0m. In any ballast tank forward of the collision bulk head, the detector is installed at a height not exceeding 10% of the tank capacity. In any dry or void space other than chain locker, any part of which extends forward of the foremost cargo hold and the volume of which exceeds 0.1% of the ship's maximum displacement volume, the detector is installed at a height of 0.1m above the deck.

OUTLINE / DIMENSIONS



Pressure Monitoring System

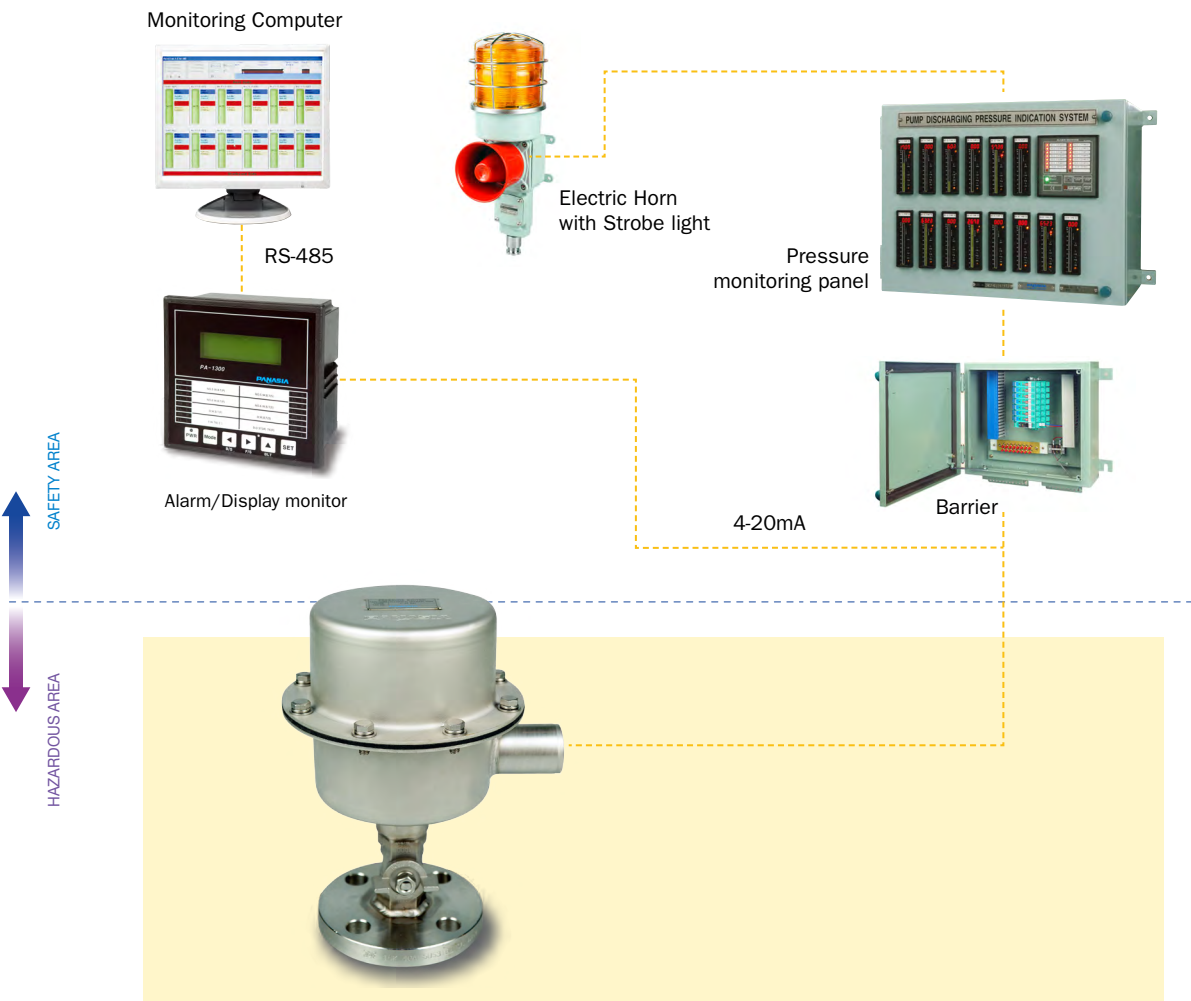
INTRODUCTION

Pressure monitoring system is designed for cargo tank & manifold pressure monitoring for any number of tanks. It is intended for pressure monitoring of waste return lines. The pressure transmitter is carefully designed to meet a harsh marine application for the tank pressure monitoring system in accordance with SOLAS II-2/59 amended in 1996, and vapour pressure monitoring system required under 46CFR part 39. 20-13 of VECS. The transmitter is a high quality and accuracy semi-conductor type especially suitable for the low pressure to be measured.

OPERATING PRINCIPLE

The transmitter measures the pressure by means of a semi-conductor sensor. Pressure changes in front of the diaphragm will bring about a resistance change. The change in resistance is linearly proportional to the applied pressure and is amplified by an integrated electronic amplifier to give an output signal. The electrical signals from the pressure transmitters on deck are connected to zener barriers in the monitoring cabinet equipped with pressure alarm lamp, buzzer and pressure indicator in the cargo control room.

OUTLINE / DIMENSIONS



TECHNICAL SPECIFICATION

POWER SUPPLY	DC 10-30 VDC
ACCURACY	± 0.5% FS
RESPONSE TIME	< 1ms / 10 ... 90 % FS
MEASURING RANGE	-1 ~ 25 bar
OVER LOAD PRESSURE	Min. 3xFS
BURST PRESSURE	> 200 bar
OUTPUT SIGNAL	4 - 20 mA
ENCLOSURE	IP68

PUMP DISCHARGING PRESSURE INDICATION SYSTEM



Vapour Monitoring System (O2 Content and Vapour Emission Pressure)

INTRODUCTION

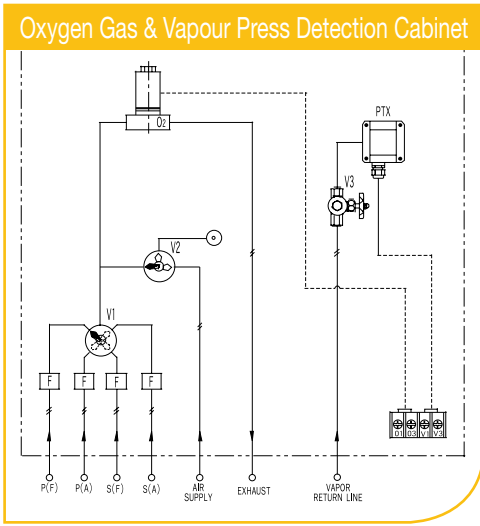
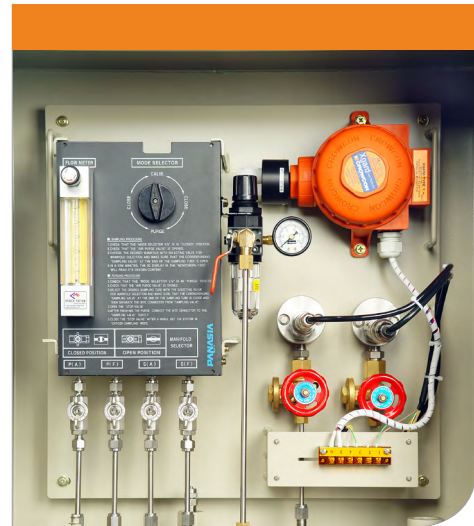
Vapour monitoring system is a complete system to monitor oxygen gas content and vapour pressure in the waste vapour and manifold lines from vessels. It complies with USCG regulation for cargo vapour monitoring system for tanks. All necessary parts are intrinsically safe and protected.

OPERATING PRINCIPLE

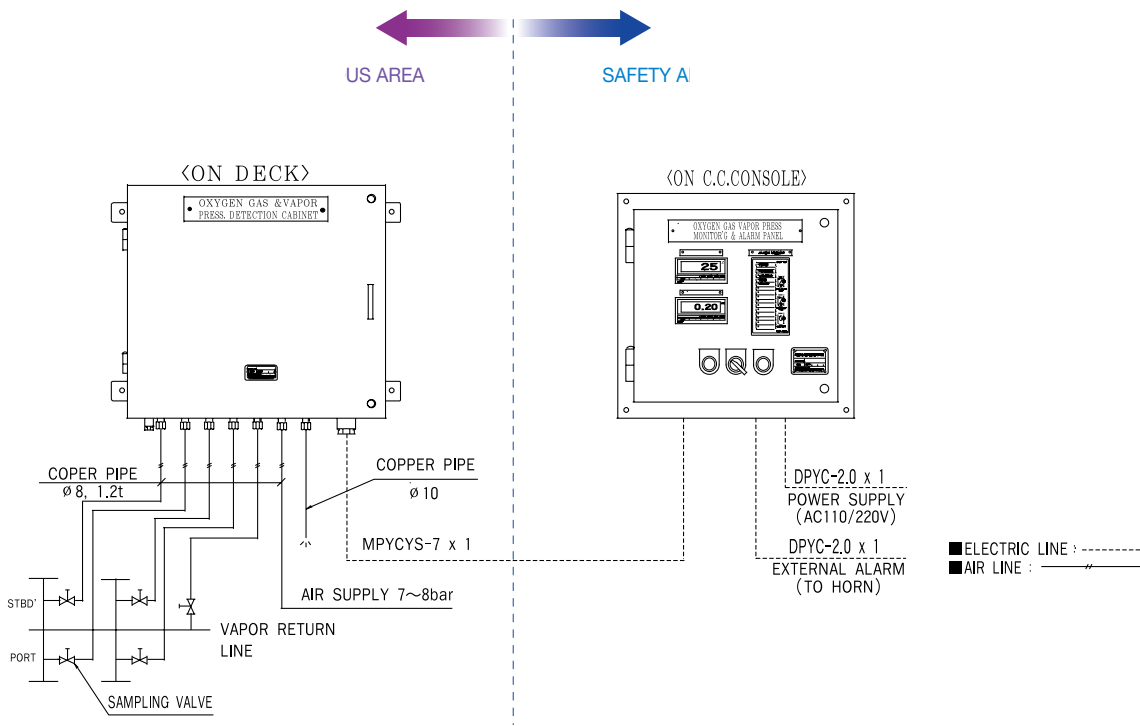
The system has four sample points and only one sample is directed and monitored individually through selecting valve at the time. The sampling lines are run from the respective sample point to the panel in a hazardous area. Sampling gas is purged to a atmosphere. Oxygen sensor is designed for monitoring content from 0 to 25 V%. Indicator in control room activates High O2 alarm at 8% which was preset and gives audible and visual. Flowsensor fitted on flowmeter monitors sampling gas low flow and activates alarm when flow rate is under minimum flow level. Pressure transmitter monitors the pressure in waste vapour and manifold line. Low and high pressure alarm is set at 10m bar and 120m bar respectively.

TECHNICAL SPECIFICATION

POWER SUPPLY	DC 24V (OPTION : 110/220 VAC, 50-60HZ)
AIR SUPPLY	6-8 bar
OXYGEN SENSOR	0-25% Volume
ALARM POINTS	High
EXPLOSION PROOF	EX ia IIC T4
PRESSURE TRANSMITTER	- 0.6 ~ 1 bar
ALARM POINTS	High & Low



OUTLINE / DIMENSIONS



Fixed Gas Detection System



INTRODUCTION

Fixed gas detection system is a multi point gas-sampling unit designed to detect and provide alarm for the presence of flammable and hydrogen sulphide gases within the water ballast tanks and void spaces.

It is designed to extract a gas sample from each sample point via sample piping to the analyzing unit where the flammable and hydrogen sulphide gas content is measured. By using solenoid valves, the unit provides an effective way of sampling multiple locations using only one sensor for gas detection.

It utilizes a heavy-duty sample pump to extract a sample of gas from each of the sample point locations. The extraction circuit incorporates a flow sensing device to annunciate a flow failure if the pump cease to operate or sample lines become blocked. Solenoid valves are used to select each sampling line for analysis in a sequential or pre-programmed sampling sequence. Furthermore, the system is extendable by adding additional valves, which are automatically recognized and activated. Flame arrestors are installed on all sample lines in accordance with class regulations.

It is able to supply information to the vessels AMS system via a communications protocol which allows for a real time flow of information including the current location being sampled and the gas concentration level at this location.

Fixed Gas Detection System



The system is designed to provide protection of the following areas ; cargo pump rooms, cofferdams, pipe tunnels, ballast tanks and double bottoms, void spaces, other empty area's adjacent to slop tanks. Additionally stool tanks and other empty areas adjacent to cargo tanks can be protected.

When locating fixed sampling points within ballast tanks, areas where an explosion is most likely to occur must be assessed. The risk of explosion is mainly related to the release of cargo vapours through the ballast vents in the top of the tank, during ballasting filling. Hence it is considered sufficient that detection takes place in the upper part of the spaces when gas concentrations reach detectable levels. We advise that ballast tank-sampling positions be located at the top of the tank.

The sampling system extracts as samples from a maximum of 48 lines and the default sample sequence is to cycle from channel 1 to 48 and then back to channel 1 again. The time that the system samples on a channel can be altered for each sample line to compensate for varying sample line lengths.

Flame arrestors are constructed from stainless steel and designed to prevent the propagation of flames from the analyzing unit if a fire occur within the unit. Flame arrestors are provided as loose items to avoid any damage to the unit during dispatch.

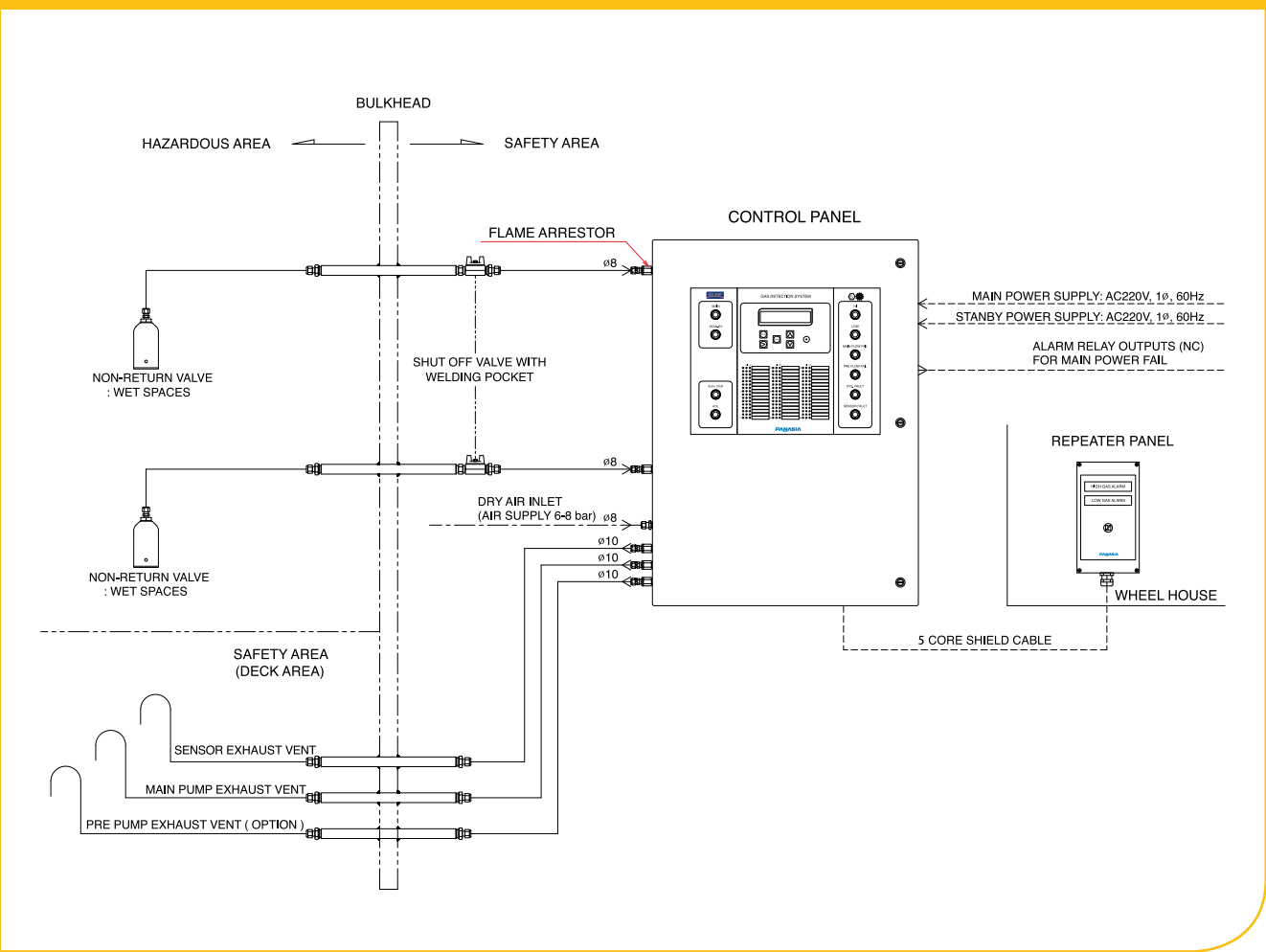
APPLICATION

OPERATING PRINCIPLE

TECHNICAL SPECIFICATION

MAIN SUPPLY	220VAC 60Hz	SENSOR NO.	Sensor No.1	Sensor No.2	Sensor No.3
EMERGENCY SUPPLY	220VAC 60Hz	SENSOR TYPE	Infra-red	Electrochemical	Electrochemical
NO. SAMPLE POINTS	Up to 48	RANGE	0 ~ 100 % LEL	0 ~ 50 ppm	0 ~ 25 % VOL
SAMPLE TIME PER LINE	60 seconds	CALIBRATED GAS	Butane	Hydrogen Sulphide	Oxygen
POWER SHUT DOWN	30% LEL	LOW ALARM TRIP POINT &TYPE	10 % rising	5ppm rising	16 % falling
		HIGH ALARM TRIP POINT &TYPE	30 % rising	10ppm rising	24 % rising

OUTLINE / DIMENSIONS



* This system is in accordance with ISGOTT, IBC CODE, IGC CODE.

Pump Room Bilge High Level Alarm System

INTRODUCTION

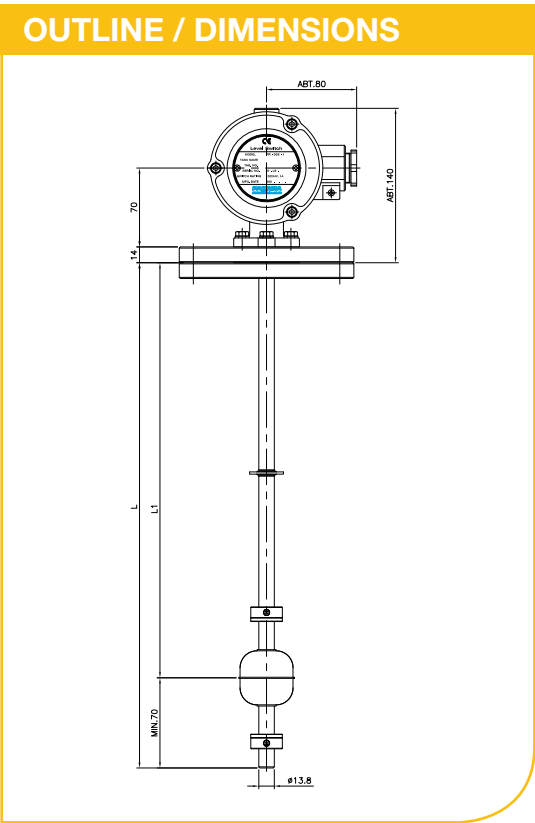
IMO MSC-67 issued a safety circular recommending measures to take to prevent explosion in cargo pump room of oil tanker for new and existing tankers. OCIMF also recommends that all pump rooms should be provided with a high level alarm which activates audible and visual alarms.

OPERATING PRINCIPLE

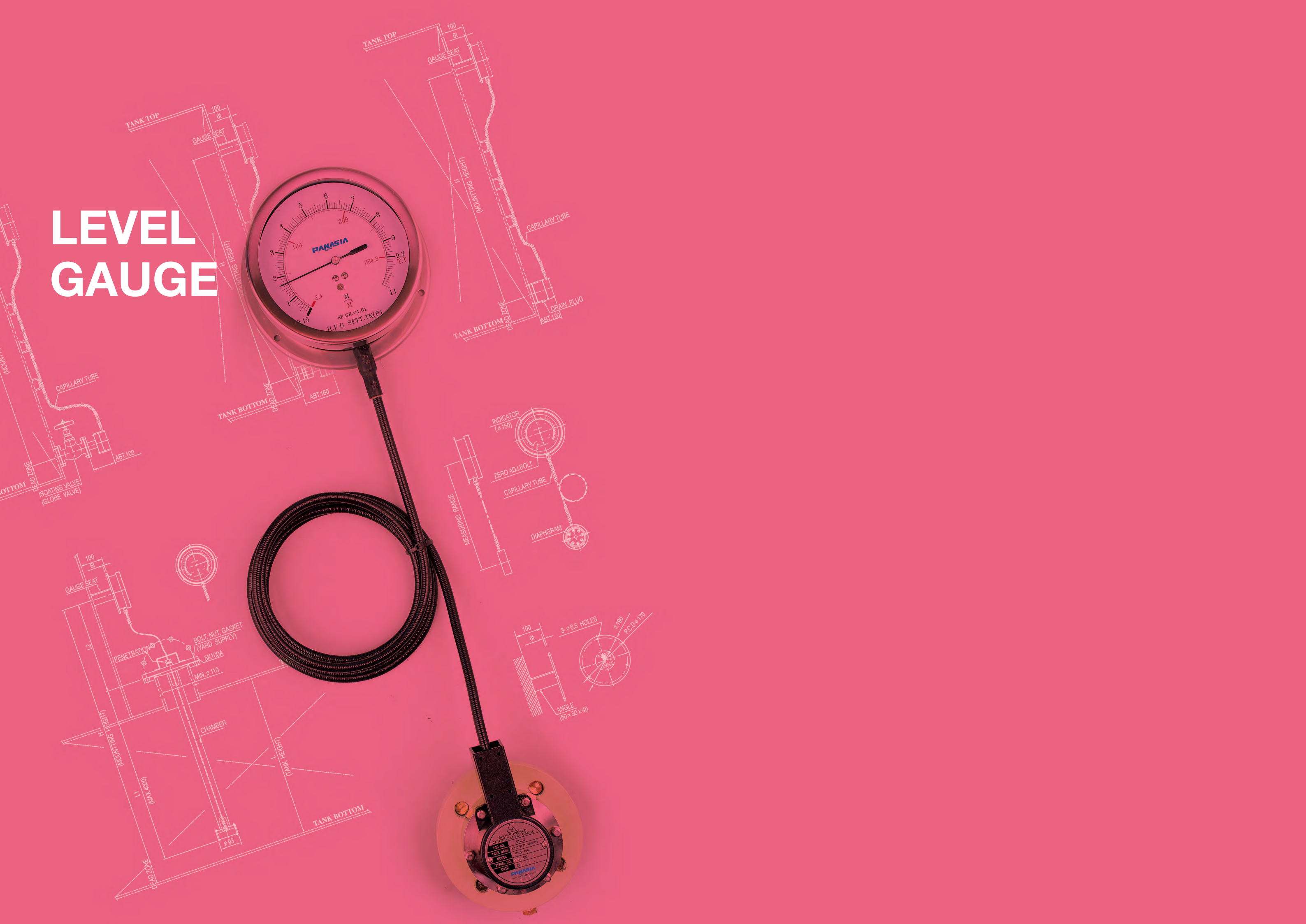
Level switch monitors level in bilge well. With rising level, switch gives output signal to alarm panel and then activates audible and visual alarms.

APPLICATION

Magnetic float type level switches are widely used for pump room bilge, engine room bilge.



LEVEL GAUGE



Flat Type Glass Level Gauge

CARGO
MONITORING
SYSTEM

TANK
LEVEL
GAUGING
SYSTEM

ALARM
SYSTEM

LEVEL
GAUGE

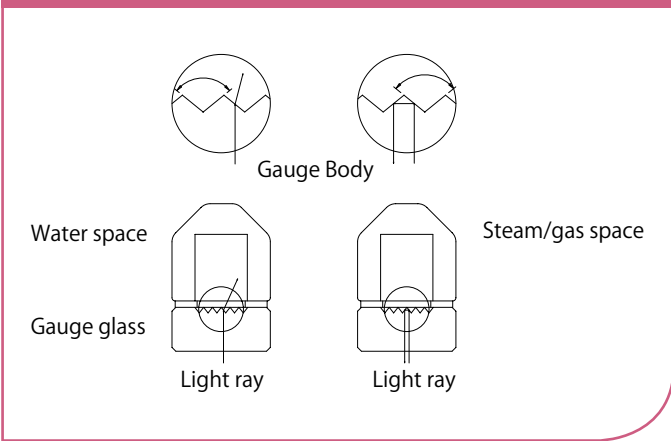
LEVEL
SWITCH

OTHERS

INTRODUCTION

Flat type level gauge is designed according to JIS standard specifications. This type level gauge is used for marine oil tanks, excluding those of flash point of 60°C below. It allows an excellent observation of colorless liquid level through reflection of several parallel grooved glass.

OUTLINE / DIMENSIONS



OPERATING PRINCIPLE

The principle of reflex glass is based on the difference in the refractive indices of liquid and gas or in particular of water and steam. The liquid column is contained within the recess of the centre-piece behind the gauge glass which is clamped within the gauge body. If a ray of light encounters the surface of one of the 45° slanted grooves in the gas or steam space. It is reflected to the opposite surface of the groove and from there totally reflected-back into the direction of observation.

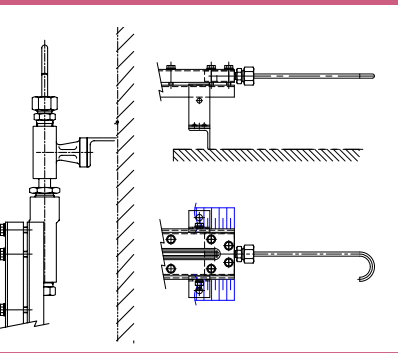
The steam or gas space therefore appears as silver-white. The gauge glass has prismatic right angled grooves. On the side facing the water and steam spaces. Light rays entering from outside the gauge are either absorbed or reflected depending upon whether they enter the water or steam space.

The light ray which encounters the surface of a groove in the liquid space is almost totally absorbed. The liquid behind the reflex glass therefore appears back.

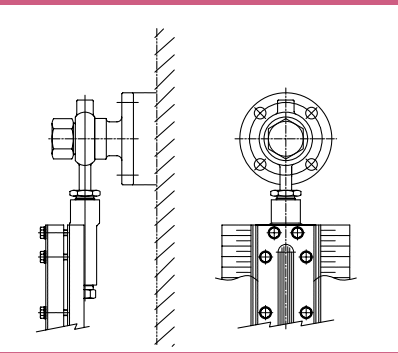
TECHNICAL SPECIFICATION

JIS CODE	TYPE	VALVE TYPE		CONNECTION SIZE	DESIGN PRESSURE	MAX. TEMP.	MATERIAL		
		UPPER	LOWER				VALVE	CHANNEL	GLASS
PA-FLG-P100	A	Top vent	Self-closing	JIS 5K20A 25A	3 kg/cm ²	100 °C	BC6	SUS304	Borosilicate
	B	Tank Return	Self-closing	JIS 5K20A 25A	3 kg/cm ²	100 °C	BC6	SUS304	Borosilicate
	C	Self-closing	Self-closing	JIS 5K20A 25A	3 kg/cm ²	100 °C	BC6	SUS304	Borosilicate

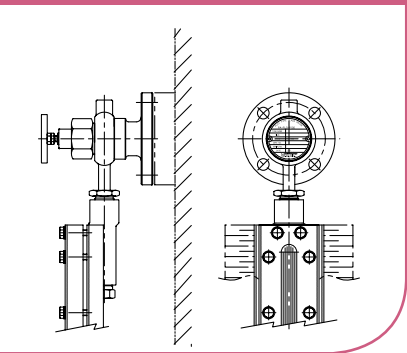
A-TYPE(AIR VENT)



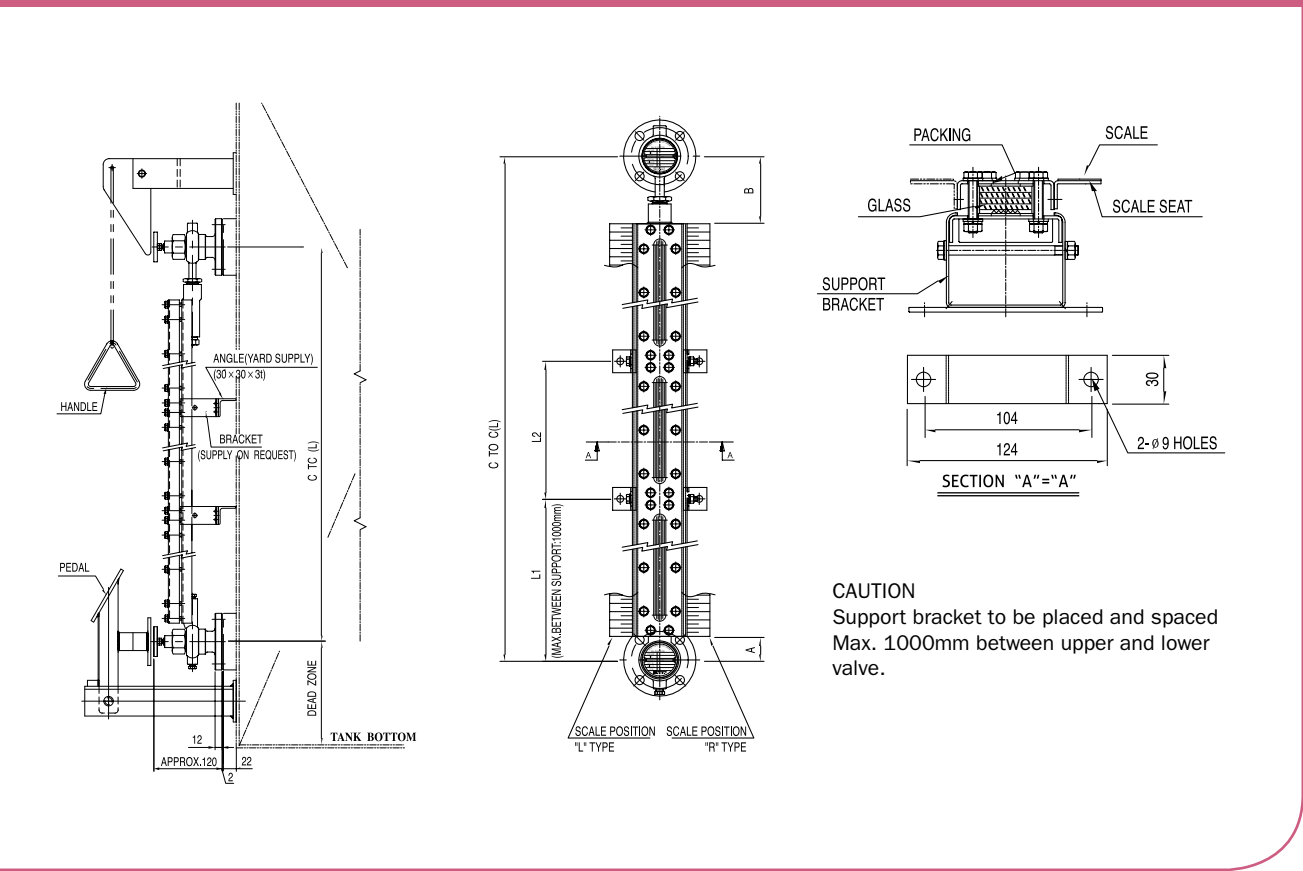
B-TYPE(TANK RETURN)



C-TYPE(SELF-CLOSING)



OUTLINE / DIMENSIONS



Magnetic Float Type Level Gauge

INTRODUCTION

The measuring pipe (chamber) is connected to the tank to form a float chamber that has the same level as the tank. A float with a built-in magnetic floats freely on the surface of the liquid and transmits its movement in the pipe, without physical contact, to an externally mounted indicating strip (indicator).

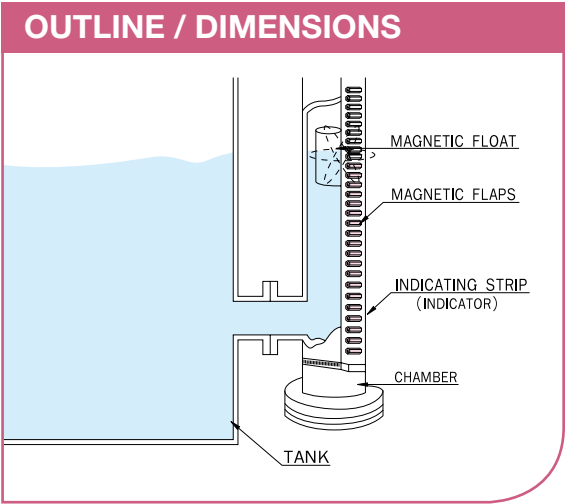
The indication strip is placed on the outside of the pipe and consists of numerous magnetic flaps which are white on one side and red on the other, as the float passes the red/white flaps, the flaps are one after the other turned 180 around their own axis. the flaps change from white to red with rising level and from red to white with falling level.

The magnetic level gauge is particular advantage wherever dangerous and toxic media calling for careful level monitoring.

TECHNICAL SPECIFICATION

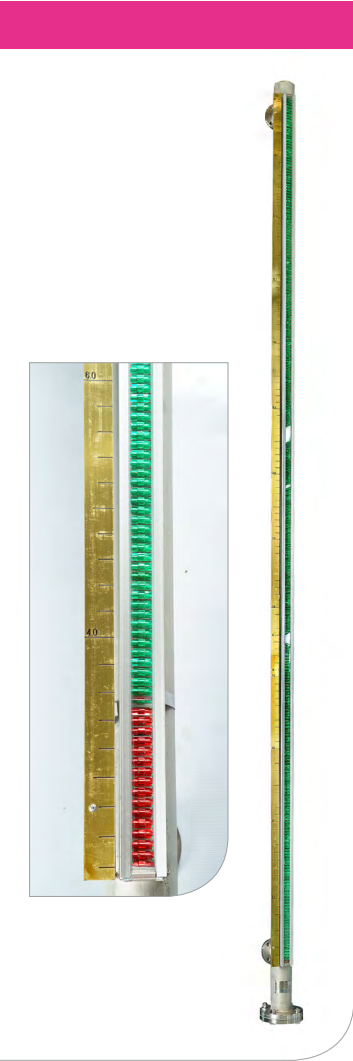
SYMBOL	MOUNTING TYPE	CONNECTION SIZE	MEASURING RANGE	WORKING DONDITION		SPECIFIC GRAVITY	ACCURACY	MATERIAL		
				PRESS.	TEMP.			CHAMBER	FLOAT	ROTOR COLUMNN
PLG-65MS- □-□	Side	JIS 5K 25A	Max. 5000mm	5 kg/cm ²	200 °C	Over 0.8	± 10m/m	SUS 304	SUS304	Aluminum

OPERATING PRINCIPLE

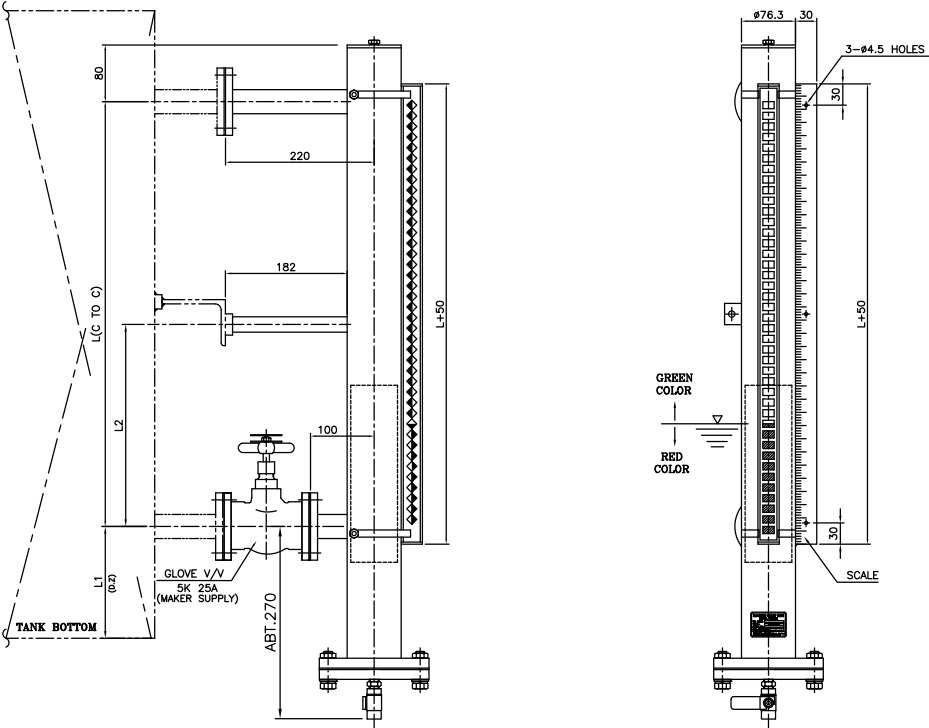


FEATURES

- No harms to the environment. Safety guarantee.
- No leakage to atmosphere
- No maintenance costs
- Easy to read
- Suitable for pressure tank



OUTLINE / DIMENSIONS



Self-Powered Contents Gauge

INTRODUCTION

PCG-150 series tank contents gauge requires no external power source for operation. The instrument is completely automatic and provides continuous indication of tank contents without the aid of batteries or hand pumps. This gauge unit is simply composed of diaphragm, capillary tube and dial type indicator.

OPERATING PRINCIPLE

The diaphragm is affected by the hydrostatic head medium column in tank, which apply pressure to the oil filled capillary. The pressure applied to capillary expands bourdon tube of indicator, so that the indicator displays the level corresponding to actual tank level.

TECHNICAL SPECIFICATION

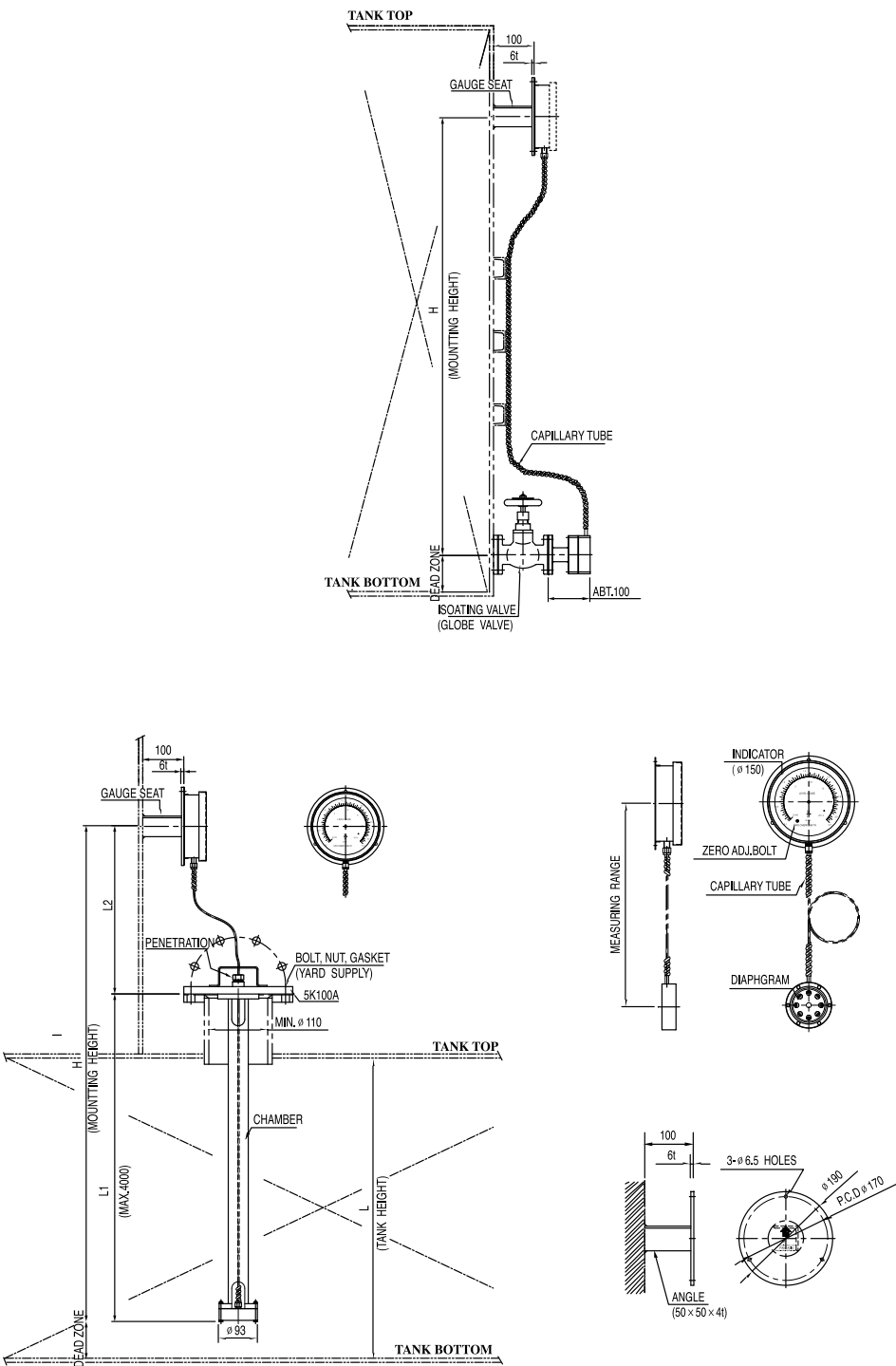
GAUGE SIZE	Dial ø 150
MOUNTING TYPE	side, submersible mounting
SCALE OF INDICATION	Height(m) & volume (m³)
ACCURACY	± 1.5% of full scale
OPERATING TEMPERATURE RANGE	-20 °C to + 100 °C
ENCLOSURE	Weather proof
OVERLOAD	Min, 100% of full scale
LENGTH OF CAPILLARY TUBE	5 meters, 2 meters (standard), other(option)



Generally applied to fresh water, Lub oil, Diesel oil, Heavy fuel oil, solvent gasoil and noncorrosive liquid.

APPLICATION

OUTLINE / DIMENSIONS



Dial Type Float Level Gauge

INTRODUCTION

Dial type float level gauge consists of float, measuring steel wire and indicating unit as main components.

OPERATING PRINCIPLE

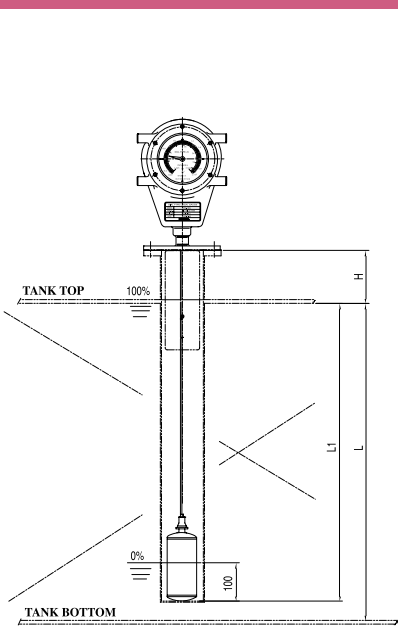
A float accurately follows liquid level variations in the vertical direction (horizontal movement of the float is well restricted by guide pipe). Vertical movement of the float is transmitted through a measuring wire to the indication unit, in which the measuring wire is wound around a tape pulley kept under constant torque by constant spring. The vertical movement is converted into rotation of the tape pulley in this way. This rotation is transmitted through a gear system to an indicator pointer which reads the liquid level on a scale dial of indicating unit.



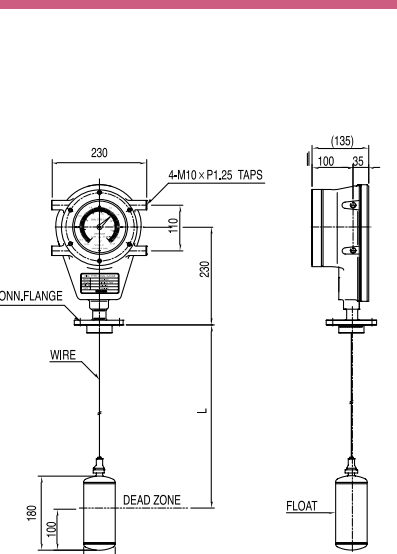
TECHNICAL SPECIFICATION

TYPE	MODEL	MOUNTING TYPE	MEASURING RANGE	INDICATION SYSTEM
DIRECT CONNECTION TYPE	PDG-150SC-T	Top (with chamber)	0 ~ 5 m	One-point
	PDG-150SW-T	Top (with guide wire)	0 ~ 5 m	One-point
	PDG-150SW-S	Top (with guide wire)	0 ~ 5 m	One-point
	PDG-150SC-S	Top (with chamber)	0 ~ 5 m	One-point
MAGNETIC COUPLING TYPE (INDIRECT TYPE)	PDG-150SI-T	Top	0 ~ 5 m	One-point
	PDG-150SI-S	Side	0 ~ 5 m	One-point

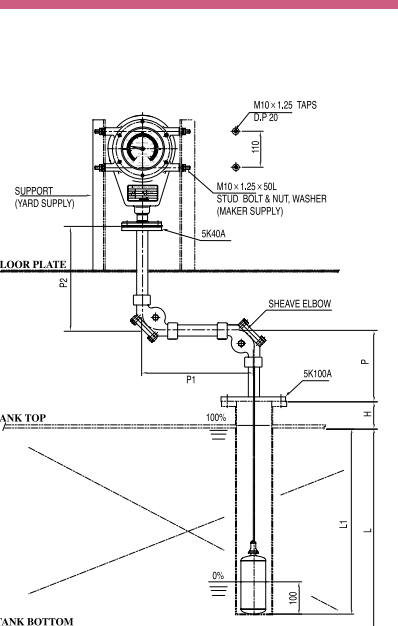
OUTLINE / DIMENSIONS



OUTLINE / DIMENSIONS



OUTLINE / DIMENSIONS



SPECIFIC GRAVITY	ACCURACY	WORKING CONDITION		MATERIAL			
		TEMP.	PRESS.	G/G HEAD	TAPE	FLOAT	GUIDE PIPE
0.7 ~ 1.5	± 15m/m	150 °C	0.2 kg/cm ²	AC	MC / SUS	SUS304	N/A
0.7 ~ 1.5	± 15m/m	150 °C	0.2 kg/cm ²	AC	MC / SUS	SUS304	N/A
0.7 ~ 1.5	± 15m/m	150 °C	0.2 kg/cm ²	AC	MC / SUS	SUS304	N/A
0.7 ~ 1.5	± 15m/m	150 °C	0.2 kg/cm ²	AC	MC / SUS	SUS304	N/A
0.65 ~ 1.5	± 15m/m	150 °C	2 kg/cm ²	AC	MC / SUS	SUS316	SUS316
0.65 ~ 1.5	± 15m/m	150 °C	2 kg/cm ²	AC	MC / SUS	SUS316	SUS316
* PLEASE CONTACT OUR FACTORY IF OTHER CONDITIONS ARE REQUIRED.							

LEVEL SWITCH





Horizontal Mounted Float Type Level Switch

INTRODUCTION

Magnetic float type level switches monitor and control liquid levels in open or closed tank.



OPERATING PRINCIPLE

A permanent magnet is part of a float which rises or falls with the changing liquid level. This magnetic repels another magnet located opposite in the switch housing. In this way it causes a snap action contact effect. A switch unit provides on-off contacts.

FEATURES

- Easy maintenance
- Safe operating conditions
- Reliable
- Fully sealed
- Durable float

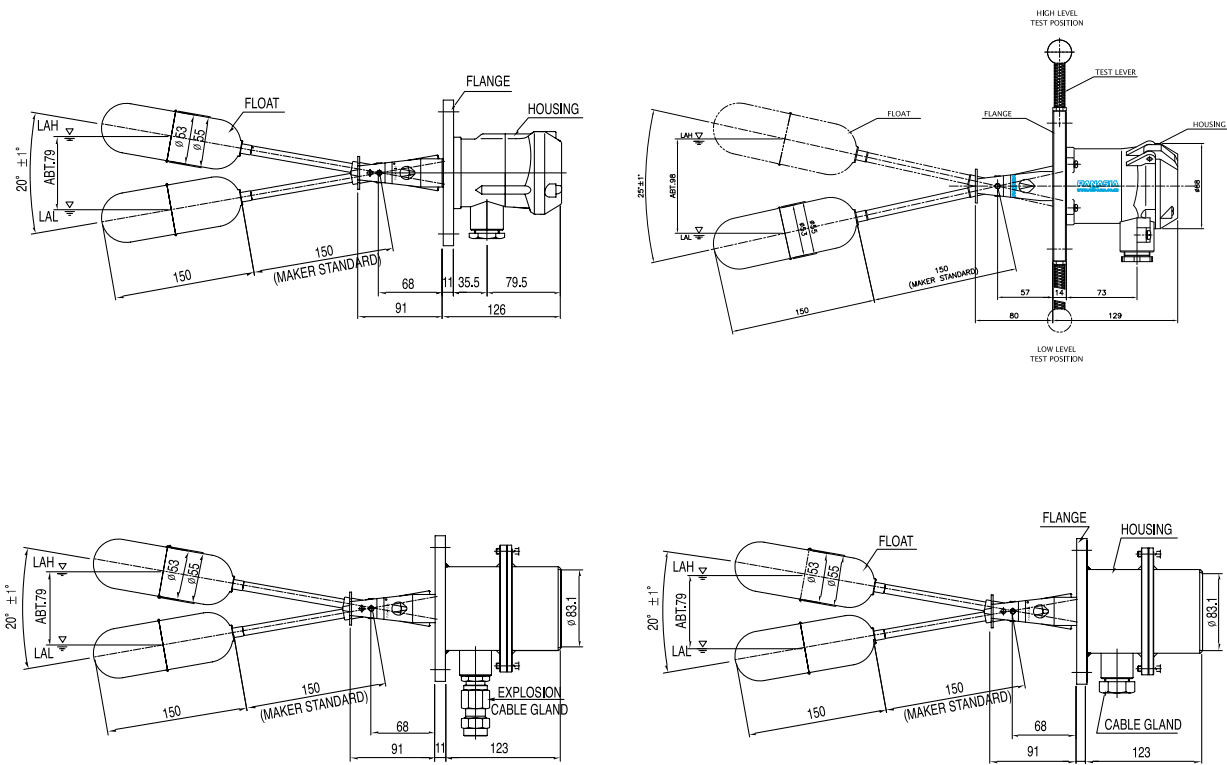
TECHNICAL SPECIFICATION

CONTACT	Electrical microswitch, Change contact, SPDT
SWITCH RATING	250V AC, 3A
LIQUID DENSITY	Min. 0.7kg/dm ³
SWITCH HYSTERESIS	20mm height at 0.9kg/d Specific weight
AMBIENT TEMPERATURE	-30 to +70 °C
MEDIUM TEMPERATURE	-25 to +135 °C
RATED PRESSURE	3kg/cm ² (standard)
INSTALLATION	Horizontal
PROTECTION OF SWITCH HOUSING	IP 56, IP 68 (option)
FLOAT MATERIAL	SUS 316
FLANGE, HOUSING	SS 400, ALDC 8

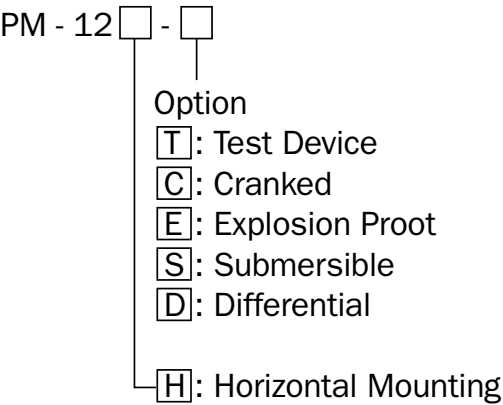
APPLICATION

Magnetic float type level switches are widely used for heavy fuel oil tanks, settling tanks, sludge tanks, sewage tanks, fresh water tanks, lub oil tanks, D.O tanks and others.

OUTLINE / DIMENSIONS



MODEL NUMBER CODE SYSTEM



Vertical Mounted Float Type Level Switch

INTRODUCTION

Magnetic float type level switches monitor and control liquid levels in open or closed tank.



OPERATING PRINCIPLE

A permanent magnet is part of a float which rises or falls with the changing liquid level. This magnet repels another magnet located opposite in the switch housing. In this way it causes a snap action contact effect. A switch unit provides on-off contacts.

FEATURES

- Easy maintenance
- Safe operating conditions
- Reliable
- Fully sealed
- Durable float

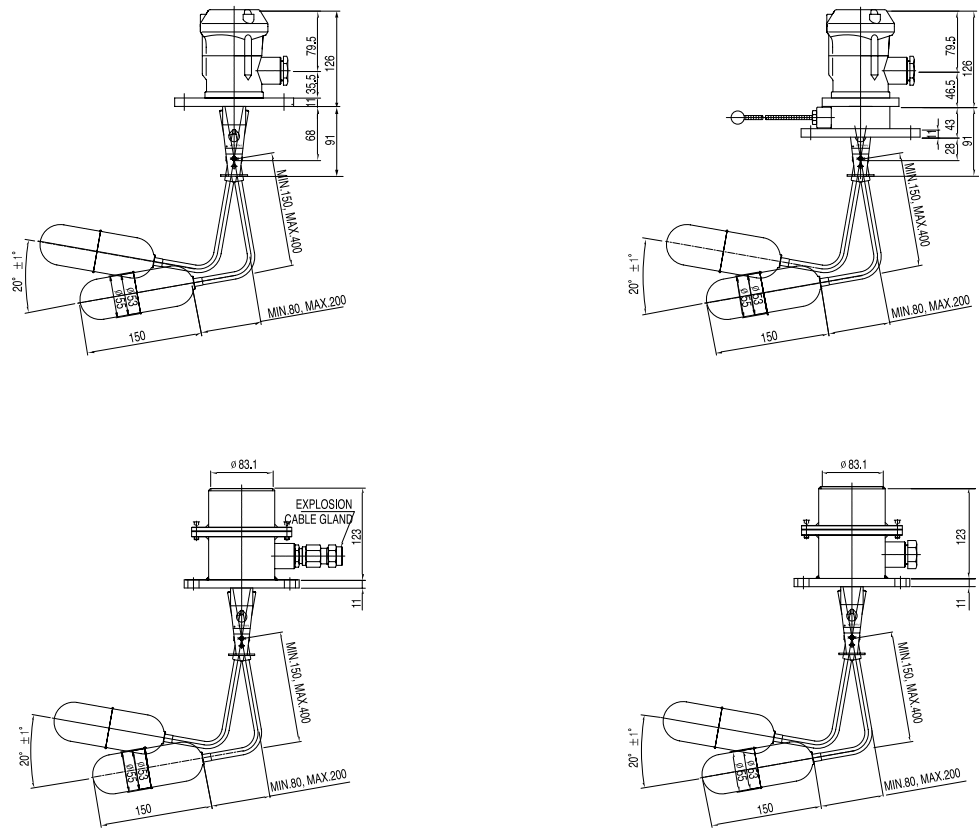
TECHNICAL SPECIFICATION

CONTACT	Electrical micro switch, change contact, SPDT
SWITCH RATING	250V AC, 3A
LIQUID DENSITY	min. 0.7 kg/dm³
SWITCH HYSTERESIS	20mm height at 0.9kg/d Specific weight
AMBIENT TEMPERATURE	-30 to + 70 °C
MEDIUM TEMPERATURE	-25 to + 100 °C
RATED PRESSURE	3 kg/cm² (standard)
INSTALLATION	vertical
PROTECTION OF SWITCH HOUSING	IP 56, IP 65 (option)
FLOAT MATERIAL	SUS 316
FLANGE, HOUSING	SS 400, ALDC 8

APPLICATION

Magnetic float type level switches are widely used for heavy fuel oil tanks, settling tanks, sludge tanks, sewage tanks, fresh water tanks, lub oil tanks, D.O tanks and others.

OUTLINE / DIMENSIONS



MODEL NUMBER CODE SYSTEM

PM - 12 ☐ - ☐

Option

- ☐ T: Test Device
- ☐ C: Cranked
- ☐ E: Explosion Proof
- ☐ S: Submersible
- ☐ D: Differential
- ☐ V: Vertical Mounting

The image displays two mechanical stirrers. The one on the left has a blue motor housing with a label that includes 'MAGNETIC' and 'STIRRER'. It features a central shaft with a flat circular plate near the motor and a cylindrical magnetic stirrer bar at the bottom. The one on the right has a grey motor housing and is equipped with a coiled spring and three spherical weights hanging from the shaft, suggesting it is designed for applications requiring variable resistance or specific mixing dynamics.

The diagram illustrates a differential level switch mechanism. It consists of two vertical rods. The left rod is labeled 'CORE' at the top and has a 'MICRO SWITCH' attached to it. The right rod has a 'SPRING' at the top and a 'Displacer' attached to it. A 'ROD or WIRE' connects the two rods. A vertical double-headed arrow between the two rods is labeled 'LEVEL DIFFERENTIAL'. Ground symbols are at the bottom of each rod.

MODEL	APPLICATION	MAX. PRESS (kg/cm ²)	MAX. TEMP. (° C)	SETTING ACCURACY (mm)	MOUNTING FLANGE (STANDARD)	MIN. SP.GR.	CONNECTION
PM-90AT-1C	High or low alarm / control	10	100° C	± 10	JIS 5K 80A 5K 100A 10K 80A 10K 100A	0.85	Top Flange
PM-90AT-2C	High or low alarm / control	10	100° C	± 10		0.85	Top Flange
PM-90AT-3C	High or low alarm / control	10	100° C	± 10		0.85	Top Flange

ABT 315

315

MIN. 150

MIN. 300

MIN. Ø97.1

MIN. Ø114.3

ABT HOLE
Ø17.0

"A"

(VIEW "A")

HIGH LEVEL
TEST POSITION

LOW LEVEL
TEST POSITION

(OPERATING SIGNAL)

NO COM NC

DISPLACEMENT

PM-90AT-3C

CABLE GLAND	SWITCH CONTACT RATING	MATERIAL				MODES	PM-90AT-1C	PM-90AT-1C	PM-90AT-1C
		HOUSING	FLANGE	DISPLACER	CHAMBER	DIFFERENTIAL (mm) *1	UPPER ; 30 to 50	UPPER ; 30 to 50	UPPER ; 30 to 50
							LOWER ; 30 to 50	LOWER ; 30 to 50	LOWER ; 200 to 4500
15/20 a,b,c	250V AC 5A	ALDC	SS400 or SUS304	SUS 304 76.8Ø 100L	SS400 or SUS304	Contact configuration			
15/20 a,b,c	250V AC, 5A X 2	ALDC	SS400 or SUS304	SUS 304 76.8Ø 100L	SS400 or SUS304				
15/20 a,b,c	250V AC, 5A X 2	ALDC	SS400 or SUS304	SUS 304 76.8Ø 100L	SS400 or SUS304				



Reed Switch Type Float Level Switch

INTRODUCTION

Reed switch type level switches consist of a magnetic float and reed switch as main components.

OPERATING PRINCIPLE

A float equipped with permanent magnet moves up and down with the fluid level between two stoppers and its magnetic field actuates a hermetically sealed reed switch incorporated in guide pipe.

The switches can be normally open, normally closed or change-over contacts. The advantage of this principle is that there is only one moving part, the float. This actuates the reed switch with its magnetic field without causing any wear.

The reed switch is itself totally isolated from the media. These advantages give the user safe, repeatable, accurate and high operational reliability with low maintenance over a long and trouble free life.



FEATURES

- High load carrying capacity
- Environmental safety
- Vibration resistance

TECHNICAL SPECIFICATION

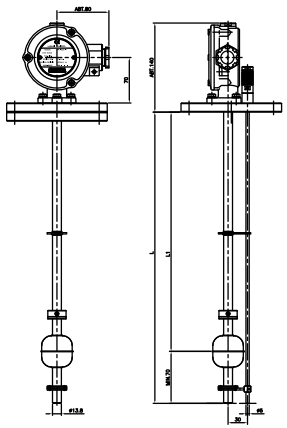
OPERATING TEMPERATURE		-20 ~ 100 °C
DESIGN PRESSURE		5kg/cm ² (Ø 50 float), 8kg/cm ² (Ø 65 float above)
PROCESS MEDIUM S.G		0.6 ~ 1.025
PROTECTION TYPE		EX ia IIC T6 for PR-30EX And EX d IIC t6 for PR-30EXD
SWITCH OUTPUT		SPST, SPDT, DPDT (option)
SWITCH RATING		1.2A 200VDC(SPST), 2.5A 250VDC(SPST), 1A 200VDC(SPDT)
MATERIAL	FLOAT	SUS 316
	FLANGE	SS 400
	GUIDE PIPE	SUS 304
	HOUSING	ALDC 8, SS 400

Reed switch type level switches are widely used for fresh water, sea water, oil and general liquids.

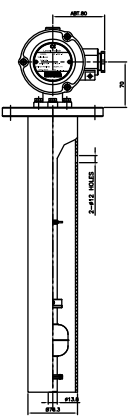
APPLICATION

OUTLINE / DIMENSIONS

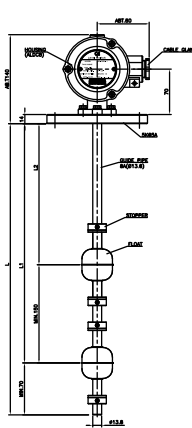
PR-30S (with test device)



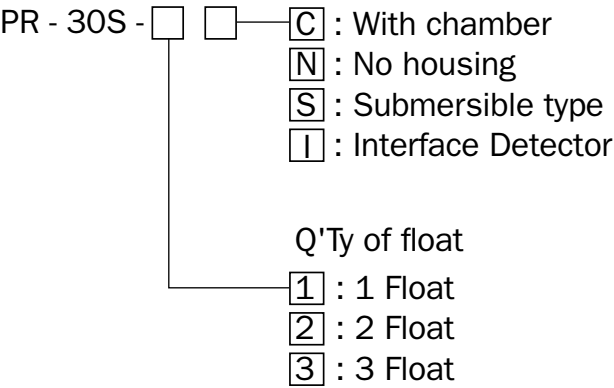
PR-30S-2 (with chamber)



PR-30S-2



MODEL NUMBER CODE SYSTEM



OTHERS



Pressure Switch (PPS-100)

CARGO
MONITORING
SYSTEM

TANK
LEVEL
GAUGING
SYSTEM

ALARM
SYSTEM

LEVEL
GAUGE

LEVEL
SWITCH

OTHERS

INTRODUCTION

PPS-100 pressure switch, having superior durability and compact structure of high IP level, resists shock and vibration. Product family of PPS-100 can be used regardless of enclosed to weather part and exposal to weather part. In particular, this product is designed for alarm or control system in plant, compressor, power plant, ship.

FEATURES

- Rigid compact size structure
- Superior in resistance of shock and vibration
- Marine approvals



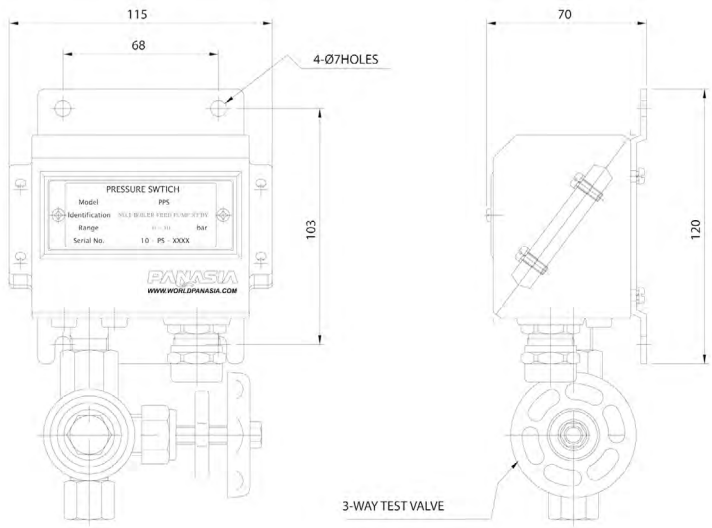
TECHNICAL
SPECIFICATIONS

AMB. TEMPERATURE		70 °C
TEMPERATURE OF MEDIUM		-25 ~ +100 °C
SWITCH CONTACT		SPDT[single pole changeover]
CONTACT RATING		3A at 250VAC, 5A at 125VAC
ENCLOSURE		IP56
CABLE ENTRY		PG13.5
METARIALS	BELLOWS	Phosphor bronze(C5212R-0)
	PROCESS CONNECTION	Brass
	HOUSING	Die cast aluminum(ALDC8)

ORDERING
CODE
& TABLE

RANGE	MIN. SETT. RANGE	FIXED DIFF.	PERMISSIBLE OVERPRESSURE	M.T.P (Maximum Test Pressure)	M.B.P (Minimum Burst Pressure)	CODE
0~2.5 bar	0.2 bar	0.05~0.2 bar	12 bar	15 bar	20 bar	PPS01
0~4 bar	0.2 bar	0.13~0.3 bar	12 bar	15 bar	20 bar	PPS02
1~10 bar	1 bar	0.3~0.7 bar	12 bar	15 bar	20 bar	PPS03
2~10 bar	2 bar	0.3~1.2 bar	42 bar	45 bar	50 bar	PPS04
2~20 bar	2 bar	0.4~2.5 bar	42 bar	45 bar	50 bar	PPS05
4~40 bar	4 bar	0.7~7 bar	42 bar	45 bar	50 bar	PPS06

OUTLINE / DIMENSIONS



Temperature Sensor (PPT-100 SERIES)

INTRODUCTION

PPT-100 SERIES temperature senor is designed to measure temperature of ship's specific part including system, cooling facility, piping etc. With superior durability and compact structure of high IP level, it resists shock and vibration. This temperature sensor, based on standardized PT100 element, enables uses to have stabilized and accurate measured value.

FEATURES

- Air, gas, steam or liquid medium, such as water, oil
- Maximum medium temperature [PPT-100A/B : +200°C , PPT-100C : +100°C]
- Marine approvals



TECHNICAL
SPECIFICATIONS

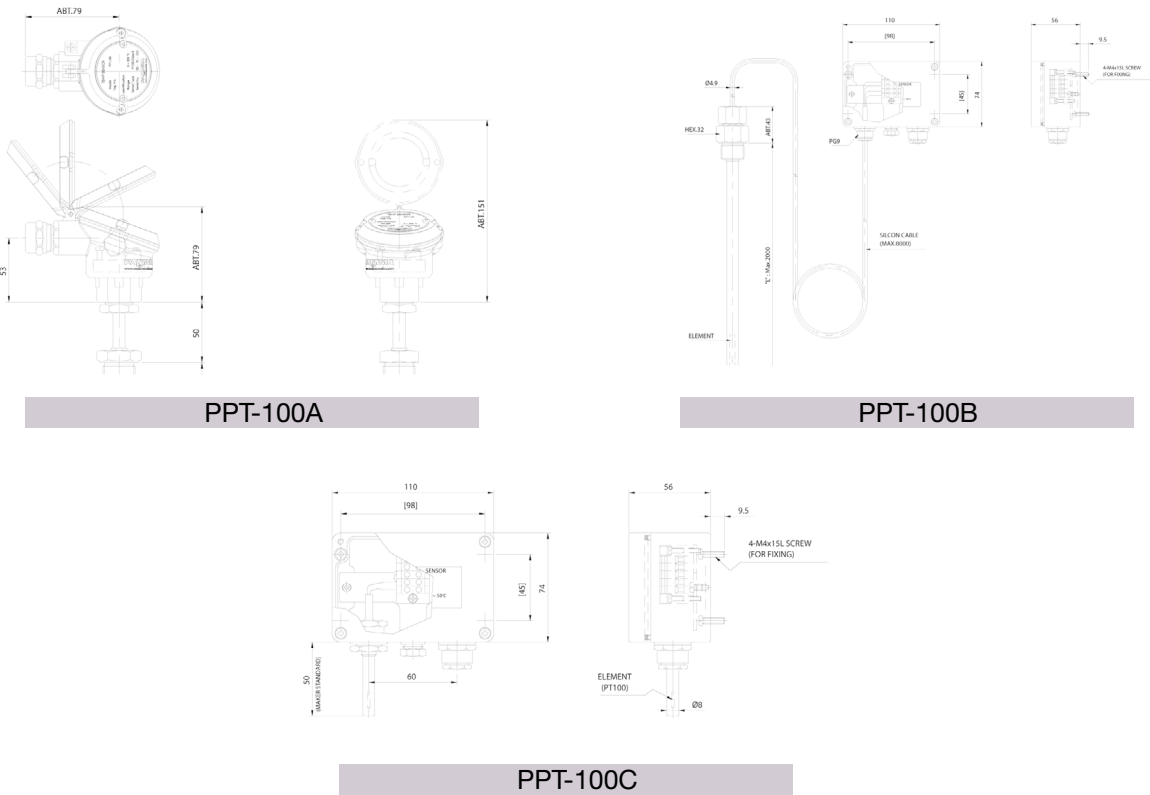
AMB. TEMPERATURE		85 °C
SENSOR TOLERANCE		EN 60751 Class B : $\pm(0.3 + 0.005 \times t)$ t = temperature of medium numerical value.
ENCLOSURE		IP56
CABLE ENTRY		PG16
MATERIALS	PROTECTION TUBE & CONNECTION FITTINGS CONTACT WITH MEDIA	Stainless steel(SUS316)
	HOUSING	Die cast aluminum(ALDC8)

ORDERING
CODE
& TABLE

MODEL	RANGE (°C)	LENGTH OF PROBE [mm]	CONNECTION	PROCESS CONNECTION			
				PF 1/2"	PF 3/4"	PT 1/2"	PT 3/4"
PPT-100A	-50 to +200	50	2-wire, 3terminals	A011	A012	A013	A014
		100		A021	A022	A023	A024
		150		A031	A032	A033	A034
		200		A041	A042	A043	A044
		250		A051	A052	A053	A054
PPT-100B	-50 to +200	50	2-wire, 3terminals	B011	B012	B013	B014
		100		B021	B022	B023	B024
		150		B031	B032	B033	B034
		200		B041	B042	B043	B044
		250		B051	B052	B053	B054
		Customize Max.2000		C1XXXX	C2XXXX	C3XXXX	C4XXXX
PPT-100C	-50 to +100	50	4-wire, 4 terminals	C011			

* XXXX : Length of probe

OUTLINE / DIMENSIONS



Pressure Transmitter (PTX-100)

INTRODUCTION

PTX-100 pressure transmitter, having superior durability and compact structure of high IP level, resists shock and vibration. Product family of PTX-100 can be used regardless of enclosed to weather part and exposal to weather part. The equipment which measures pressure of gas, liquid and steam, transforms the measured value into continuous signal and provides stabilized function by having sophisticated and accurate performance.

FEATURES

- Rigid compact size structure
- Superior in resistance of impact and vibration
- Marine approvals



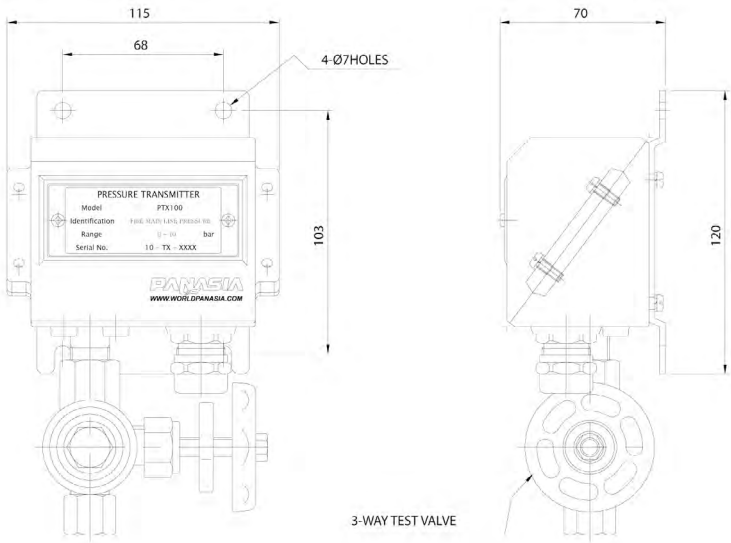
TECHNICAL
SPECIFICATION

AMB. TEMPERATURE		25 ~ 70 °C
PROCESS TEMPERATURE		Up to 125 °C
ENCLOSURE		IP56
POWER SOURCE		DC 10 ~ 36V
OUTPUT		4...20mA(2-wire current transmitter) (Limited at 28mA)
ACCURACY		≤ 0.3% of F.S
THERMAL ZERO/SPAN SHIFT		±0.06% F.S/°C
RESPONSE TIME		< 1ms / 10 ... 90% F.S
LONG TERM STABILITY(1YEAR)		< 0.1% F.S
MAX. OVERPRESSURE		F.S x 3
BURST PRESSURE		> 200bar
CABLE ENTRY		PG13.5
LOAD RESISTANCE		Max.600 Ohm at 24VDC
MATERIALS	DIAPHRAGM	Stainless steel(SUS316L)
	PROCESS CONNECTION	Stainless steel(SUS316)
	HOUSING	Die cast aluminum(ALDC 8)

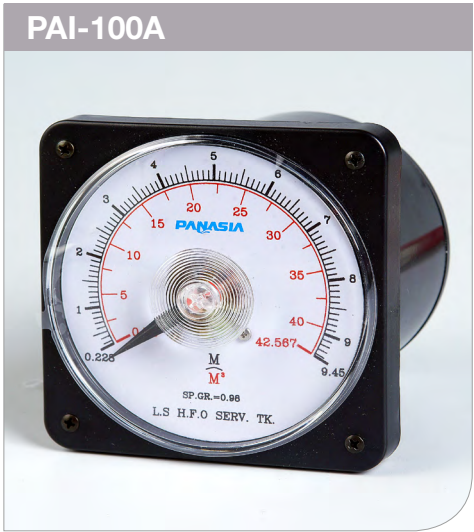
RANGE	M.T.P (Maximum Test Pressure)	M.B.P (Minimum Burst Pressure)	CODE
-1 ~ 5 bar	15 bar	200 bar	PTX01
0~4 bar	15 bar	200 bar	PTX02
0 ~ 6 bar	15 bar	200 bar	PTX03
0 ~ 10 bar	30 bar	200 bar	PTX04
0 ~ 25 bar	50 bar	200 bar	PTX05
0 ~ 40 bar	80 bar	200 bar	PTX06

ORDERING
CODE
& TABLE

OUTLINE / DIMENSIONS



1. ELECTRIC
INDICATOR



MODEL	PAI-100A
SIZE	110×110 Square
MOUNTING METHOD	Panel front mounting
INPUT	DC 4~20mA
INTERNAL RESISTANCE	1.5 Ω
ACCURACY	± 1.5% F.SAT 20 °C
MEASURING RANGE	0~100%(Standard)
INDICATING ANGLE	250deg
WEIGHT	450g
OPERATING TEMPERATURE	0 to + 40 °C
COLOR	Black
APPLICATION	Panel, local gauge box and console

2. BARGRAPH
TYPE
INDICATOR



MODEL	PAI-4000
ACCURACY	0.1% of F.S
SCALE	Display dual mode.(level & volume)
HEIGHT	Display(M/M³)
VOLUME	Max. 16 Gradient %Display
INPUT	A) DC 4~20mA(1-5V) or variable resistance B) RS-485
DIGIT	4 Digit
OUTPUT	Alarm contact, RS485
ALARM POINT	2point, 4point (option)
HH	Dry contact notmal open or close (option)
H	Dry contact notmal open or close
L	Dry contact notmal open or close
LL	Dry contact notmal open or close (option)
MATERIAL	ABS
POWER	DC24V, 6W(MAX.)
TEMPERATURE	0 °C~50 °C
WEIGHT	1.0Kg

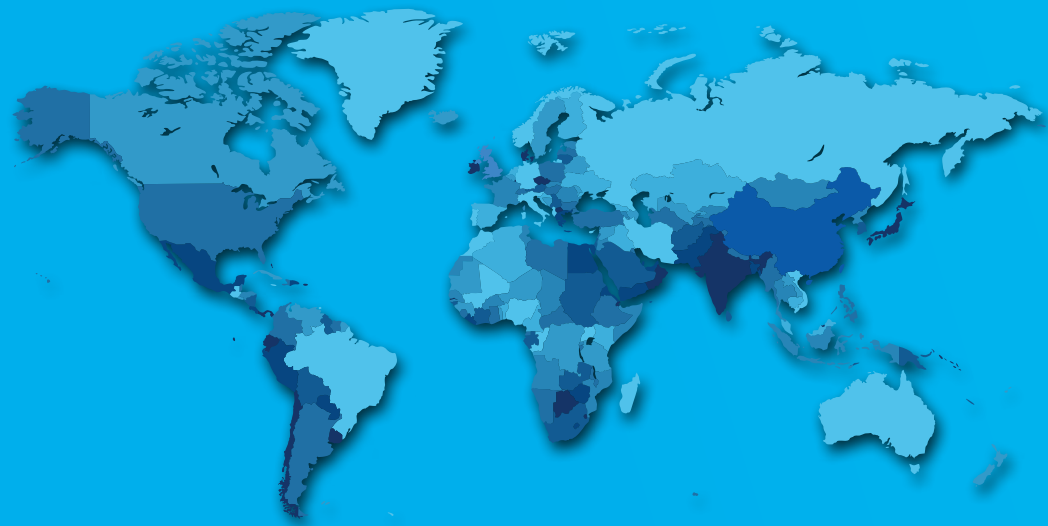
MODEL	PA 1300
INPUT POWER	24 Vdc reverse polarity protected ripple
INPUT CHANNEL	8 channel
INPUT SIGNAL	4 - 20 mA, 2 wire
ACCURACY	≤ ± 0.1 % of F.S
LINEARITY ERROR	≤± 0.05 % of F.S
TEMPERATURE INFLUENCE	≤± 0.01 % on zero and span for a 1 °C change
ALARM DELAY	0 - 99 sec. (Maker standard : 0 sec.)
LCD	20 Cha. X 4 Lines (Backlight type)
OPERATING TEMPERATURE	- 20 ... + 60 °C
STORAGE TEMPERATURE	- 25 ... + 75 °C
PROTECTION CLASS	IP 22
WEIGHT	400 g

PA 1300



3. ALARM &
DISPLAY
MONITOR

CLASS APPROVALS & WORLD WIDE SERVICE NETWORK



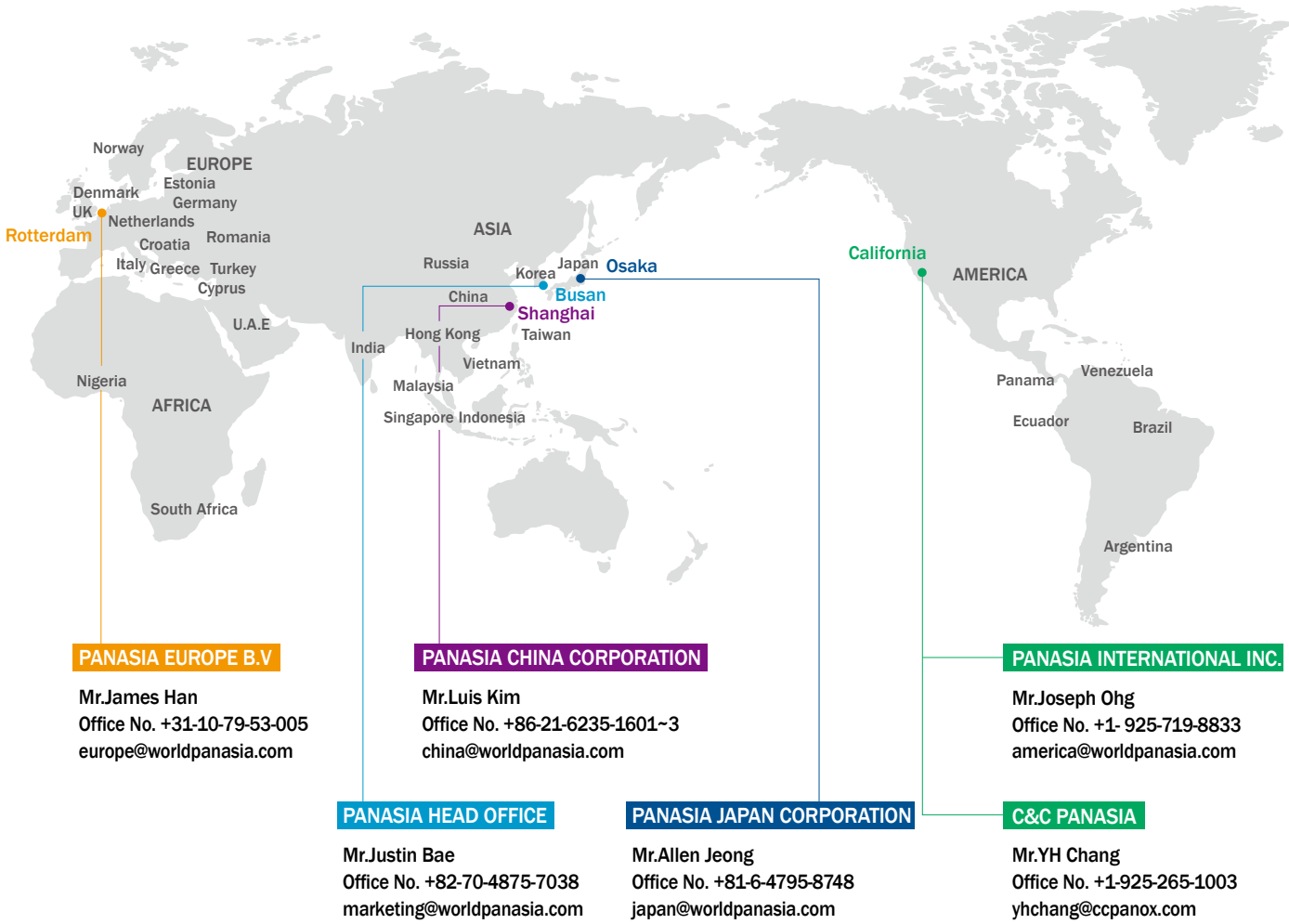
CLASS APPROVALS

WORLD WIDE SERVICE NETWORK

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CLASSIFICATION SOCIETY PRODUCTS	CLASS								
	KR	ABS	BV	DNV	LRS	NK	GL	RINA	CCS
RADAR BEAM TYPE CARGO MONITORING SYSTEM	O	O	O	O	O	O	O	O	O
MAGNETIC FLOAT TYPE CARGO MONITORING SYSTEM	O	O	O	O	O	O	O	O	O
HIGH LEVEL ALARM SYSTEM	O	O	O	O	O	O	O	O	
AIR PURGE TYPE & ELECTRIC PNEUMATIC TYPE LEVEL GAUGING SYSTEM	O	O	O	O	O	O	O	O	O
ELECTRIC PRESSURE TYPE LEVEL TRANSMITTER	O	O	O	O	O	O	O	O	O
WATER INGRESS ALARM SYSTEM	O	O	O	O	O	O	O	O	O
LEVEL GAUGE - SELF POWER CONTENT GAUGE - FLAT TYPE GLASS LEVEL GAUGE - MAGNETIC FLOAT TYPE LEVEL GAUGE	O	O	O	O	O	O	O	O	
LEVEL SWITCH - PM -12 SERIES - PM-90 SERIES - PR-30 SERIES	O	O	O	O	O	O	O	O	
PRESSURE SWITCH PRESSURE TRANSMITTER TEMPERATURE SENSOR	O	O		O	O	O	O	O	O





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