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# Optical Level Switch

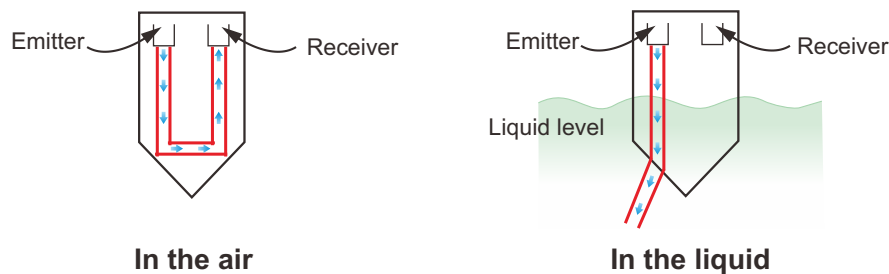


# INTRODUCTION

## WORKING PRINCIPLE

The optical liquid level switch uses the principle of total reflection in a prism. Reflection or penetration, is the basis of the level alarm output. When the sensor is surrounded by air, the angle of incidence is greater than the critical angle and thus total reflection occurs.

Totally reflected light will be transmitted to the receiver. Conversely, when the sensor is surrounded by liquid, due to the refractive index of the liquid and the sensor tip material, almost all light will penetrate the front of the sensor. Using this principle, the optical liquid level switch design is based on light. The receiver can detect and determine a light reflected or penetrated state, and determines the circuit output.



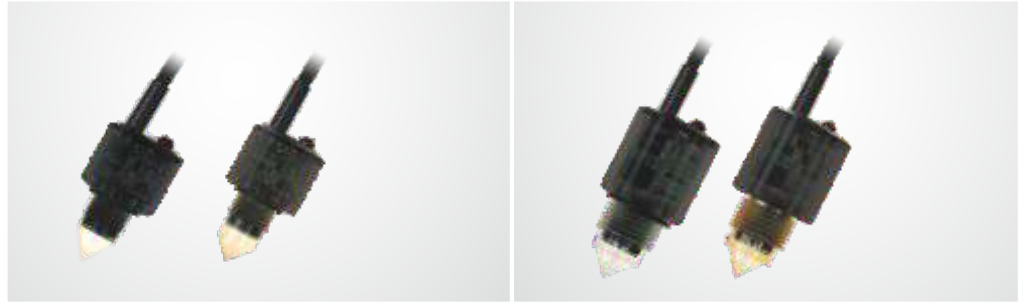
## FEATURES

- Simple, compact, and robust
- No moving parts
- Built-in, solid-state electronics
- Easily removed, cleaned, and reinstalled
- LED switch indication

## APPLICATIONS

- Pharmaceutical systems
- Air conditioning systems
- Industrial compressors
- Food and beverage systems
- Hydraulic reservoirs
- Machine tools
- Liquid holding tanks
- Processing and packaging equipment
- Heavy duty automotive
- Sumps

# SD20 SPECIFICATION



<b>Housing material</b>	PC / PES	
<b>Tip material</b>	PC / PES	
<b>Supply voltage</b>	10~28 Vdc	
<b>Load current</b>	≤100 mA	
<b>Current consumption</b>	<15 mA	
<b>Output mode</b>	NPN / PNP	
<b>Output function</b>	NO / NC	
<b>Electrical protection</b>	reverse polarity protection, short circuit protection	
<b>Ambient temp.</b>	-10~80 °C	
<b>Operation temp.</b>	-10~125 °C	
<b>Process pressure</b>	<10 kg / cm <sup>2</sup>	
<b>IP rating</b>	IP 67	
<b>Indicator light</b>	Red LED	
<b>Cable specifications</b>	PVC, 24 AWG, L=2 m, 3C (blue, green, black, and brown)	
<b>Installation torque</b>	50 kgf-cm	
<b>Thread options</b>	PT / PF / NPT	
<b>Connection size</b>	M12x1.0	3/8"
<b>UL File Number</b>	SA44153	
<b>Dimension</b> (Unit:mm)		

※PES(polyethersulfone) is similar PSU(polysulfone), but its heat resistance, strength, and stiffness is better.

# SD20 SPECIFICATION



<b>Housing material</b>	SUS304 / SUS316	
<b>Tip material</b>	PES	
<b>Supply voltage</b>	10~28 Vdc	
<b>Load current</b>	≤100 mA	
<b>Current consumption</b>	<15 mA	
<b>Output mode</b>	NPN / P NP	
<b>Output function</b>	NO / NC	
<b>Electrical protection</b>	reverse polarity protection, short circuit protection	
<b>Ambient temp.</b>	-10~80 °C	
<b>Operation temp.</b>	-10~125 °C	
<b>Process pressure</b>	<40 kg / cm <sup>2</sup>	
<b>IP rating</b>	IP 67	
<b>Indicator light</b>	Red LED	N/A
<b>Cable specifications</b>	PVC, 24 AWG, L=2 m, 3C (blue, green, black, and brown)	N/A
<b>Installation torque</b>	100 kgf-cm	
<b>Thread options</b>	PT /PF / NPT	PF
<b>Connection size</b>	3/8"	1/2"
<b>UL File Number</b>	SA44153	
<b>Dimension</b> (Unit: mm)		

# SD20 SERIES

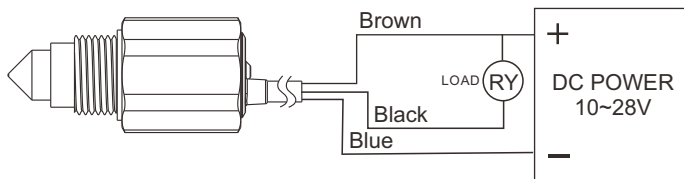
## FEATURE

- NPN, PNP open collector output to energize relay or PLC
- Housing material of PC, PES, SUS304, SUS316 for applicable in water, oil, liquid solution, liquor, alcohol, organic solvent...etc.
- PC, PES for acidity and alkaline
- Over-current and reverse polarity protected
- LED status indication

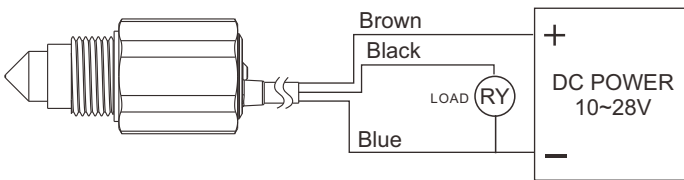
## WIRING

- Lead wire

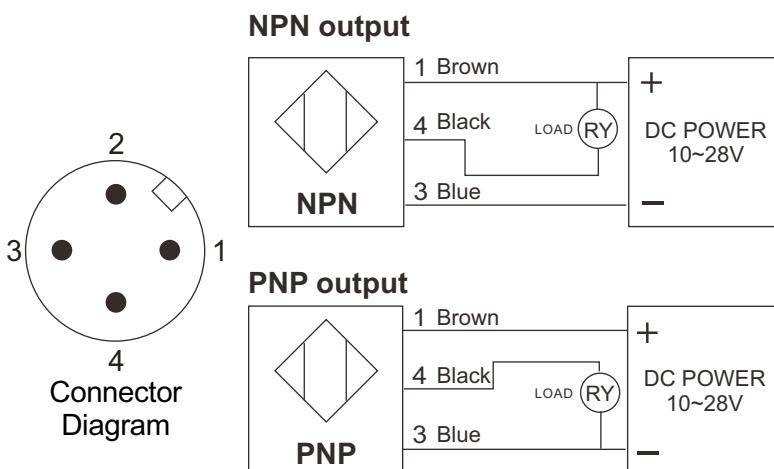
### NPN output



### PNP output



- M12x1 connection



## MODEL NUMBER / ORDER CODE COMPARISON TABLE

Model Number	Order Code
SD20P	SDX1003A-□□□□□□11
SD20G	SDX1003A-□□□□□□35
SD204	SDX1003A-□□□□□□MA
SD206	SDX1003A-□□□□□□MB
SD215	SDX2003A-□□□□□□MA
SD217	SDX2003A-□□□□□□MB
SD220	SDX4003A

# ORDER INFORMATION

SDX1 0 0   -                        

**⑦ ⑧ Certification**

00: None  
3A: UL

**Connection**

⑨ ⑩

AA: JIS  
AC: ANSI

⑪ ⑫

A4: 3/8"  
A5: 1/2"  
I 3: M12

⑬ ⑭

01: PT male (only SUS304,316)  
03: PF male  
07: NPT male  
17: G NPT(only SUS304,316)  
78: M12X10(only PC,PES)

※SD20 series, choose 3/8" PT male connector, no UL certification

**⑮ ⑯ Body and Probe material**

MA: SUS 304 + PES  
MB: SUS 316 + PES  
11: PC(Only PC body material)  
35: PES

**⑰ Power supply**

A: 10~28Vdc

**⑱ Output**

P: PNP  
N: NPN

**⑲ Wiring**

A: Cable(UL)  
B: M12(only 1/2"G)  
D: Cable + rub

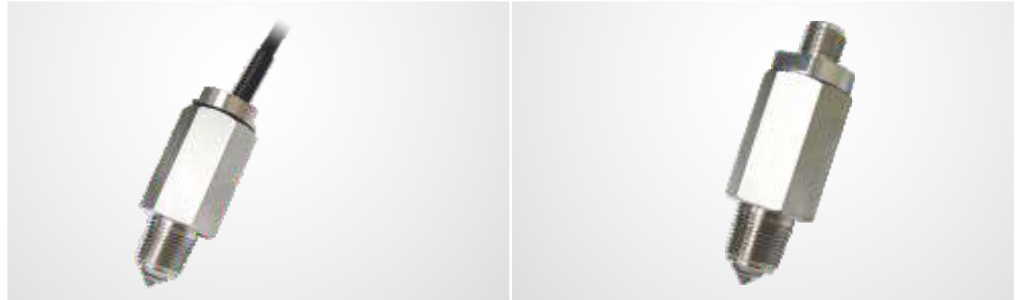
**⑳ Contact**

A: NO  
B: NC

**㉒ ㉓ ㉔ ㉕ Length**

Code	Cable Length
2000	Standard 2000mm
0000	None

# SD21 SPECIFICATION



Model	Cable type	M12 connection type
Tip material	Glass	
Body material	SUS304 / SUS316	
Supply voltage	10 ~ 28 Vdc	
Load current	≤ 200 mA	
Current consumption	< 25 mA	
Output mode	NPN / PNP	
Output function	NO + NC	
Electrical protection	reverse polarity protection, short circuit protection	
Delay time	5 sec ± 1 sec (optional)	
Ambient temp.	-20~80 °C	
Operating temp.	-20~100 °C	
Working pressure	< 60 bar	
Anti-ambient light interference	< 500 lux	
IP rating	IP 67	
Indicator light	Red LED	N/A
Cable specifications	Silicone rubber jacket, 24 AWG, L=2 m, 4C (blue, green, black, and brown)	N/A
Installation torque	75 kgf-cm	
Thread options	PT / PF / NPT	
Connection size	3/8" / 1/2"	
UL File Number	SA44153	
Dimension (Unit: mm)		



# SD21 SERIES

## FEATURES

- NPN / PNP output selection can be connected to the relay or PLC.
- This product provides both NO and NC output for selection.
- Products made of glass and SUS 304/316, diesel fuel, waste water, aqueous solution, alcoholic solution.
- Includes power polarity and over current protection.
- LED indicates contact status.
- There are general cloudy and turbidity for option.
- You can measure turbid solutions.
- Also output a delayed-type output can be selected.

## WIRING

Type	High position delay		Low position delay		Standard type	
Position						
LED						
Green wire						
Black wire						

Output function	Wire color	Wiring		
NO	Green			
BC	Black			



# SD22 SPECIFICATION



Model	Typical	Motor power detection
Tip material	Glass	
	Zinc-plated steel / SUS304 / SUS316	
Body material	PA66 glass fiber reinforced	
Supply voltage	AC 50/60 Hz 115 V ±20%	
	AC 50/60 Hz 230 V ±20%	
Relay specifications	AC 240 V, 2.5 A, C300	
Switch life time	10 <sup>5</sup> switching cycles	
Ambient temp.	-40 ~ 85 °C	
Operating temp.	-40 ~ 100 °C or 120°C (<1h)	
Delay time (customization)	-Relay ON after applying the supply voltage (3s ± 1s) -Relay OFF after level continue missing (5s ± 1s)	-Relay ON after applying the supply voltage (3s ± 1s) -Level monitoring after relay ON (30s ± 1s) -Relay OFF after level continue missing (5s ± 1s)
Self-test function	Yes	
process pressure	65 bar	
Anti-ambient light interference	< 500 lux	
IP rating	IP 65	
Cable specifications	PVC, 18 AWG, L=1m, 5C color coded	PVC, 18 AWG, L=1m, 6C color coded
Installation torque	75 Nm	
Connecting screw	1/2" (PT, PF, NPT) / M20X1.5 mm	
Tip part weight	around 51 g	
Body part weight	around 167 g	
UL File Number	SA44153	
Dimension (Unit:mm)		

# SD22 SERIES

## APPLICATION

- SD22 uses optical technology to achieve level monitoring and is durable to shocks in the environment.
- Uniquely different design (2 separate parts) compared to the traditional optical switch model.
- SD 22's switch body can be removed while the tip remains installed on tank. No tank drainage or leakage required when removing switch.
- Intelligent process control for not only do liquid level detection, but also with other sensors connected in series so that the full system has protection.
- According to customer demand, adjustable delay time length.
- Self-test function.
- The device is able to detect whether sensor body and tip are installed incorrectly.
- The LED indicator is readily apparent users to see.
- Quick coupling provide faster installation and reliable fix.

	Color	Status	LED lights
<b>Power</b>	Green	Supply in	ON
<b>Status</b>	Red	High level	OFF
		Low level	ON
		Error	Blinking

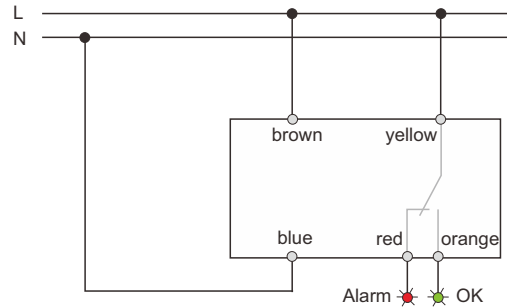
## WORKING FLOW

### ◆ SDB-B0□T□ (5 wire, typical)

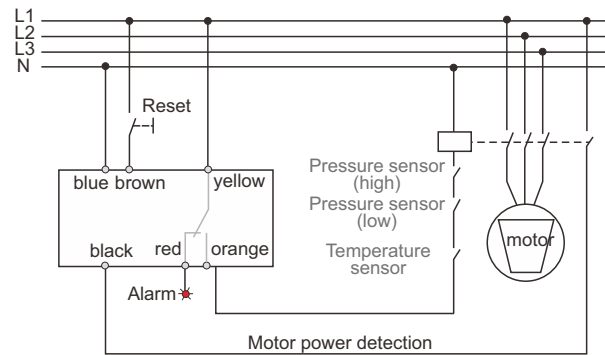
1. Three seconds after the power is turned on, the relay is on.
2. Liquid level detection, level required sustained low 5 seconds, the relay OFF and status light turns on.
3. Liquid level detection, level requires continuous contact for five seconds, the relay turns on, the status light turns off.

## WIRING DIAGRAM

### ◆ SDB-B0□T□ (5 wire, typical)

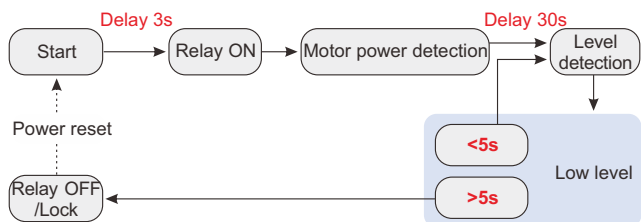
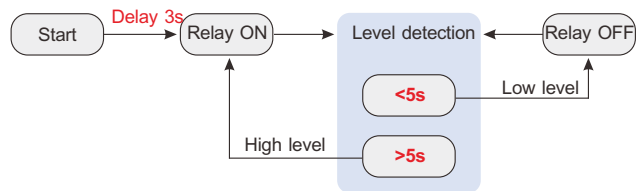


### ◆ SDB-B0□M□ (6 wire, motor power detection)



### ◆ SDB-B0□M□ (6 wire, motor power detection)

1. Three seconds after the power is turned on, the relay turns ON.
2. Detects the motor power supply is normal after a delay of 30 seconds to enter the liquid level detection state.
3. Liquid level detection, level required sustained low for 5 seconds, the relay turns off and status light is turned on lit, enters the Locked state.
4. Need to restart the power to cancel the alarm state and re-start the process.



# ORDER INFORMATION

## Refrigeration-glass Probe

SDX4 0 0   -                  

**⑦ ⑧ Certification**

00: None  
3A: UL

**Connection**

⑨ ⑩

AA: JIS  
AC: ANSI

⑪ ⑫

A5: 1/2"  
J2: M20

⑬ ⑭

01: PT male  
03: PF male  
07: NPT male  
B2: M12X1.5

**⑮ ⑯ Body and Probe material**

MA: glass+SUS304  
MB: glass+SUS316  
ME: glass+SUS Zinc +Plated steel

**⑰ Power supply**

A: Vac 115V  
B: Vac 230V

**⑱ Output**

R: Relay

**⑲ Function**

T: Typical (5 wire)  
M: Motor power detection (6 wire)

**⑳ Connector of tip and body**

A: Crew joint (F)  
B: Quick coupling (F)  
C: Crew joint (Glass welding)

**㉑ ㉒ ㉓ ㉔ Length**

Code	Cable Length
1000	Standard 1000mm

# ORDER INFORMATION

## Tip

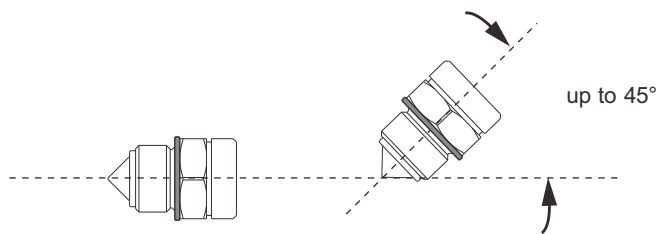
Order code	Connector of tip and body	Connector type	Power supply
Options	A: Crew joint (F) N: Quick coupling (F)	T: Typical (5 wire) M: Motor power detection (6 wire)	AC115V ± 20% AC230V ± 20%
SDXAA1X-0016	A: Crew joint (F)	T: Typical (5 wire)	AC230V ± 20%
SDXAA1X-0009	A: Crew joint (F)	M: Motor power detection (6 wire)	AC115V ± 20%
SDXAA1X-0010	A: Crew joint (F)	M: Motor power detection (6 wire)	AC230V ± 20%
SDXAA1X-0013	N: Quick coupling (F)	T: Typical (5 wire)	AC115V ± 20%
SDXAA1X-0014	N: Quick coupling (F)	T: Typical (5 wire)	AC230V ± 20%
SDXAA1X-0011	N: Quick coupling (F)	M: Motor power detection (6 wire)	AC115V ± 20%
SDXAA1X-0012	N: Quick coupling (F)	M: Motor power detection (6 wire)	AC230V ± 20%

## Body

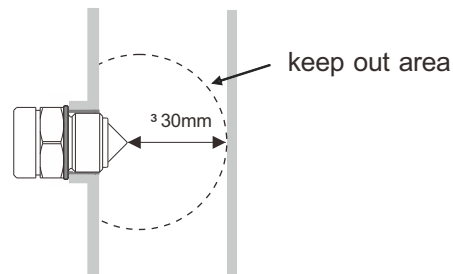
Order code	Connector of tip and body	Connector type	Power supply
Options	A: Crew joint (F) N: Quick coupling (F)	BQ:1/2"PT BR:1/2"PF BU:1/2"NPT M2:M20X1.5	0: SUS304 6: SUS316 Z: Zinc-plated steel
SDXAM1A-MAA5030001	A: Crew joint (F)	BR:1/2"PF	0: SUS304
SDXAM1A-MAA5070001	A: Crew joint (F)	BU:1/2"NPT	0: SUS304
SDXAM1A-MPJ2820001	A: Crew joint (F)	M2:M20X1.5	Z: Zinc-plated steel
SDXAM1A-MAA5010001	N: Quick coupling (F)	BQ:1/2"PT	0: SUS304
SDXAM1A-MAA5030002	N: Quick coupling (F)	BR:1/2"PF	0: SUS304
SDXAM1A-MPA5030001	N: Quick coupling (F)	BR:1/2"PF	Z: Zinc-plated steel
SDXAM1A-MAA5070002	N: Quick coupling (F)	BU:1/2"NPT	0: SUS304

# CAUTION

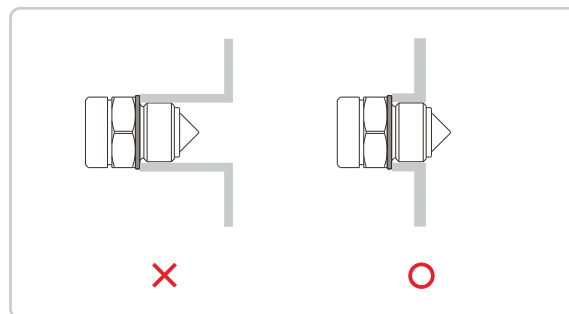
- Cable wiring to be done in accordance with the operating manual connection.
- SD22's parts and body part manually tightened (torque about 10Kgf-cm).
- During installation note that the cable outlet direction is downward.
- This product is not for solids in solution, solids containing adhesion of suspended or viscous liquids.
- Do not scratch the tip of sensor.
- SD21 turbid type and SD22 can measure 4000NTU standard turbidity solution.
- This product can not be used in the environment with an infrared light source.
- We recommend the following installation below. The horizontal plane parallel to the  $0^{\circ} \sim 45^{\circ}$  for optimal installation angle.



- This product can not be installed in the liquid at the flow entry point.
- Don't have any reflective surface or other interference at the front cone radius 30mm, as shown.
- The tip of optical level switches front of the sensor and the tank wall must be at least distance 30mm, as shown.

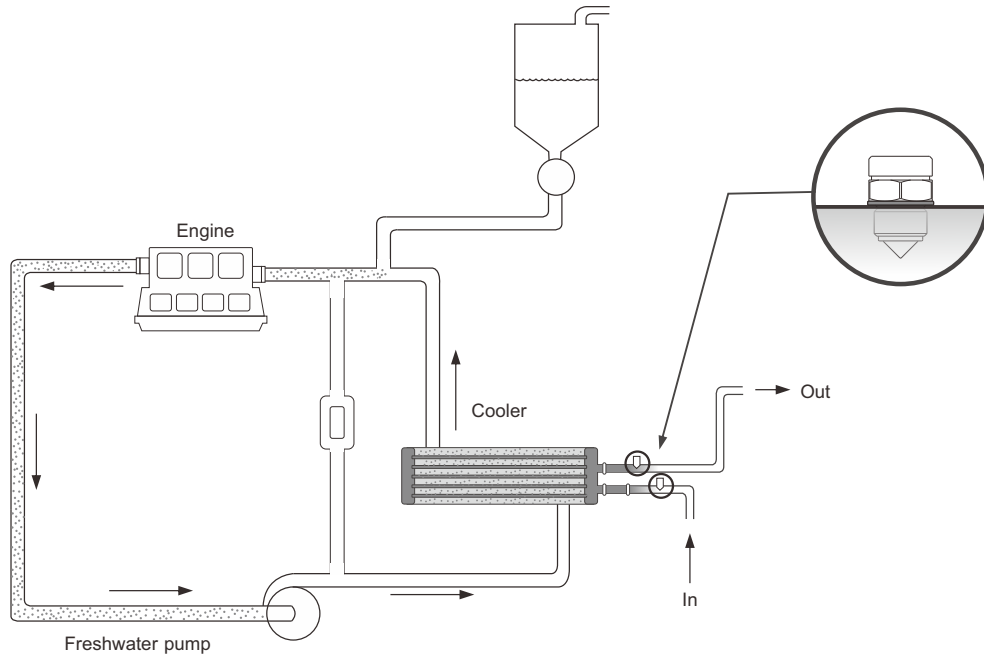


- Install the threaded sleeve photoelectric switch, the tip of switch must break the casing.

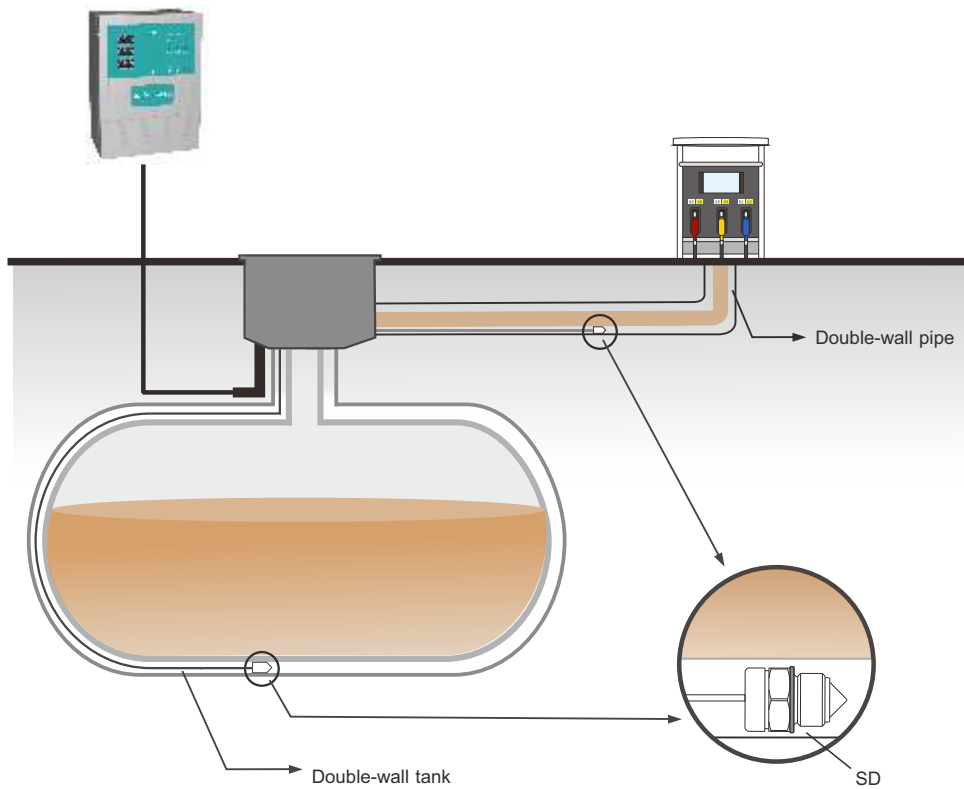


# APPLICATIONS

## Sea water cooling system



## Double-wall pipe and double-wall tank leakage detection



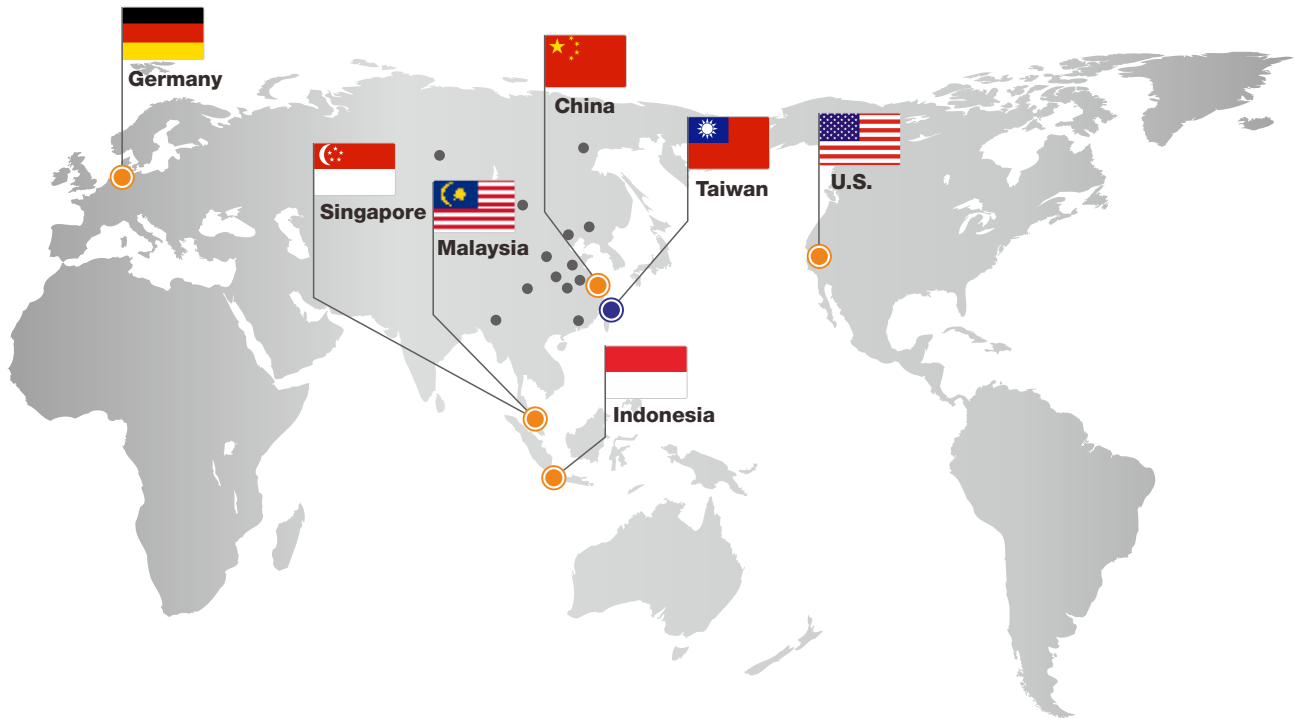


# APPENDIX

## M12 Cable list

Item	Part number	Connector type	Length	Temperature	IP rating	SD20	SD21
1	PC312-1231415M01	Right Angle Straight	5m	-25 ~ +100°C	IP 67 IP 68 IP 69K	V	
2	PC312-2221410501	Right Angle	5m	-25 ~ +90°C	IP67	V	V
3	PC312-1221415M01	Straight	5m	-25 ~ +90°C	IP67	V	V
4	PC312-1221422M01	Right Angle	2m	-25 ~ +80°C	IP67	V	V
5	PC312-2101422M01	Straight	2m	-25 ~ +80°C	IP67	V	V
6	PC312-2101425M01	Straight	5m	-25 ~ +80°C	IP67	V	V
7	PC312-2101421001	Straight	10m	-25 ~ +80°C	IP67	V	V

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