MAKER STANDARD ECS-1800B 1.1 X 1

ECS COMPONENTS LIST

ITEM	DESCRIPTION	CONNECTION SIZE
CPC	Control PC	NON PIPE CONNECTION
PDE	Power Distributor Equipment	NON PIPE CONNECTION
ECU	Electro Chamber Unit	600B INLET/OUTLET JIS 10K-250A, DRAIN : 10K-25A
PRU	Power Rectifier Unit	INLET/OUTLET SUS TUBE Φ12
EPJ	ECU Power Junction Box	NON PIPE CONNECTION
ESJ	ECU Signal Junction Box	NON PIPE CONNECTION
ANU	Auto Neutralization Unit	INLET/OUTLET SUS TUBE Φ12 (DRAIN SUS316L TUBE Φ12)
TSU-S	TRO Sensor Unit & TSU-S Control Unit	INLET SUS TUBE Φ6 / OUTLET SUS TUBE Φ10
APU	Air Pump Unit	INLET/OUTLET FLANGE JIS 10K-15A (AIR LINE Φ12/Φ10)
FMU	Flow Meter Unit	INLET/OUTLET FLANGE JIS 5K-400A
FTS	F.W Temperature Sensor	INLET/OUTLET FLANGE PT 1/2"
CSU	Conductivity Sensor Unit	INLET/OUTLET FLANGE JIS 5K-50A
GDS	Gas Detection Sensor	NON PIPE CONNECTION
EWU	EM Washing Unit	INLET/OUTLET FLANGE JIS 10K-25A
PS&PI	Pressure Switch & Pressure Indicator	FLANGE JIS 10K-25A
TS&TI	Temperature Switch & Temperature Indicator	FLANGE JIS 10K-40A
T-STR	T-Strainer	INLET/OUTLET FLANGE JIS 5K-500A
(OPTION) FTU	Fresh water Tank Unit	INLET/OUTLET FLANGE JIS 5K-40A
		F.W SUPPLY INLET JIS 5K-25A
HEU	Heat Exchange Unit	INLET/OUTLET FLANGE JIS 5K-50A
COOL.S.W.PUMP		INLET/OUTLET FLANGE JIS XX K-XXX A
PCU	Pump Control Unit	NON PIPE CONNECTION
FCV	Flow Control Valve	INLET/OUTLET FLANGE JIS 5K-100A
MIXING S.W. PUMP		INLET/OUTLET FLANGE JIS XX K-XXX A

⚠ THE DRAWING IS BASED ON THE POS AND MAKER STANDARD,
IF ANY ADDITIONAL EQUIPMENT IS REQUIRED BY SHIPYARD OR SHIP'S OWNER REQUIREMENTS,
THE EXTRA COST CAN BE OCCURED.

SYMBOL

ITEM	DESCRIPTION	ITEM	DESCRIPTION
*	MAKER (TECHCROSS) SUPPLY	N.C	TO BE CLOSED ALWAYS EXCEPT MAINTENANCE OF ECU
	BUTTERFLY VALVE		3-WAY COCK VALVE
	REMOTE BUTTERFLY VALVE		STRAINER
	THROTTLING VALVE		ORIFICE
	GLOBE VALVE	LD	LOCKING DEVICE
	CHECK VALVE	=====	INSULATION
	CHECK VALVE WITHOUT HANDLE		
	BALL VALVE		
	DIAPHRAGM VALVE		
	ANGLE VALVE		
S	SOLENOID VALVE		
	CROSSING PIPES CONNECTED		
	CROSSING PIPES NOT CONNECTED		
	BRANCH PIPES		
	TEE PIECE (FLANGE END)		
	REDUCER		
	EDUCTOR		
	BLIND FLANGE		
	CLOSED PIPE CONNECTION		
	BOSS WITH BLANK FLANGE		
	PUMP		
	STRAINER		
	Y-STRAINER		
	FILTER		
	SIGNAL		
	SCUPPER		
	PRESS REGULATOR		
ZS	LIMIT SWITCH		
M	PUMP MOTOR		
	RECEPTACLE		
	PLUG		
PI	PRESSURE INDICATOR		
PS	PRESSURE SWICH		
LS	LEVEL SWITCH		
TI	THERMOMETER (TEMPERATURE INDICATOR)		
TS	TEMPERATURE SWITCH		
N.O	TO BE OPENED ALWAYS EXCEPT MAINTENANCE OF ECU		

51-Q-02-07

NOTE OF P&ID FOR BWTS

1. SYSTEM
 1) VALVE SIGNAL IS USED TO OPERATE ELECTRO CLEEN SYSTEM.

2. G-2 SAMPLING PORT
 1) G-2 SAMPLING PORT SHALL BE COMPLIED WITH IMO REGULATION.
 2) G2 SAMPLING PORT(S) MUST BE PLACED AT HORIZONTAL OR UP-STREAM OF VERTICAL MAIN BALLAST WATER PIPE. IT SHALL NOT BE INSTALLED AT THE DOWN-STREAM OF VERTICAL MAIN BALLAST WATER PIPE.

3. ECU
 1) ECU OUTLET PIPE SHOULD BE ARRANGED HIGHER THAN ECU IN ORDER TO KEEP FULL WATER INSIDE ECU.
 2) PS&PI AND TS&TI FOR ECU SHALL BE PROVIDED BY MAKER, BUT THE INSTALLATION WORK SHALL BE CARRIED OUT BY YARD. (IF NECESSARY)
 3) EXCESSIVE VACUUM MAY BE FOUND IN THE BALLAST PIPES WHEN SHIFTING THE BALLAST WATER DOWNSTREAM FROM AN ELEVATED PLACE, HENCE COUNTERMEASURES SUCH AS INSTALLATION OF VACUUM VALVES SHOULD BE CONSIDERED.

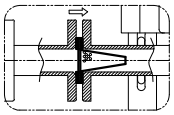
4. TSU
 1) BETWEEN TSU SAMPLING PORT AND APU TO BE ARRANGED AS SHORT AS POSSIBLE(WITHIN 5M).
 2) TSU SAMPLING PORT(S) MUST BE PLACED AT HORIZONTAL OR UP-STREAM OF VERTICAL MAIN BALLAST WATER PIPE. IT SHALL NOT BE INSTALLED AT THE DOWN-STREAM OF VERTICAL MAIN BALLAST WATER PIPE.
 2-1) THE ECUS OUTLET PIPING IS INSTALLED OF VERTICAL DOWNSTREAM WITH LONG DISTANCE, THERE IS A HIGH POSSIBILITY OF VACUUM. TRO SAMPLING PORT SHOULD BE INSTALLED AFTER VERTICAL DOWNSTREAM.
 3) KEEP MIN' 5D INSTALLATION POSITION DISTANCE BETWEEN TSU PORT AND ANU PORT.
 4) FLUSHING AND DRAIN NEED TO BE IMPLEMENTED BEFORE USING TRO SENSOR(FOR SPARE)
 5) THE VALVE OF TSU SAMPLING LINE SHOULD BE ARRANGED NEAR TSU.
 6) THE MATERIAL FOR PIPE AND VALVE OF TSU SAMPLING LINE SHOULD BE SUS316L.

5. ANU
 1) BETWEEN ANU INJECTION PORT AND ANU TO BE ARRANGED AS SHORT AS POSSIBLE(WITHIN 10M).
 1-1) IF ANU DOSING LINE IS FAR(ABT.10M) FROM THE ANU, THE "PREPARATION" BUTTON IN ANU ICON OF HMI SHALL BE CLICKED BY THE CREW TO FILL THE NEUTRALIZING AGENT IN THE DOSING LINE.
 2) ANU INJECTION PORT(S) MUST BE PLACED AT HORIZONTAL OR UP-STREAM OF VERTICAL MAIN BALLAST WATER PIPE. IT SHALL NOT BE INSTALLED AT THE DOWN-STREAM OF VERTICAL MAIN BALLAST WATER PIPE.
 3) KEEP MIN' 5D INSTALLATION POSITION DISTANCE BETWEEN TSU PORT AND ANU PORT.
 4) THE VALVE OF ANU INJECTION PIPE SHOULD BE ARRANGED NEAR ANU.
 5) IN CASE OF EACH OF THE ANU INJECTION PIPE IS CONNECTED TO ONE, THIS SHOULD BE INCLINED AS SHOWN IN THE DETAIL "D". (IF NECESSARY)
 6) EXCESSIVE VACUUM MAY BE FOUND IN THE ANU PIPES WHEN SHIFTING THE NEUTRALIZATION REAGENT DOWNSTREAM FROM AN ELEVATED PLACE, HENCE COUNTERMEASURES SUCH AS INSTALLATION OF VACUUM VALVES SHOULD BE CONSIDERED.
 7) THE MATERIAL FOR PIPE AND VALVE OF ANU DOSING LINE SHOULD BE SUS316L.
 8) MINIMUM TEMPERATURE OF F.W. TO BE SECURED ABOVE 20℃. IF THE TEMPERATURE OF F.W IS ALWAYS MORE THAN 20℃, THE HOT WATER LINE COULD BE DELETED. IT SHOULD BE ABOVE 20℃, EVEN IN WINTER.

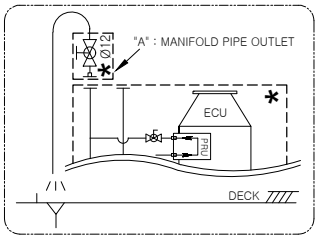
6. EWU
 1) FRESH WATER SUPPLY LINE AND DRAIN CONNECTION LINE FOR EWU(EM WASHING UNIT) SHOULD BE ARRANGED WITHIN APPROXIMATELY 3 METER AROUND ECU.
 2) THE USED EM CLEANING WATER CONTAINING CHEMICAL AGENT SHOULD BE STORED IN EWU TANK AND DISCHARGED AT SEA MORE THAN 12 NAUTICAL MILES AND 25M IN DEPTH.

7. GDS
 1) GDS SHOULD BE INSTALLED ABOVE THE ECU.

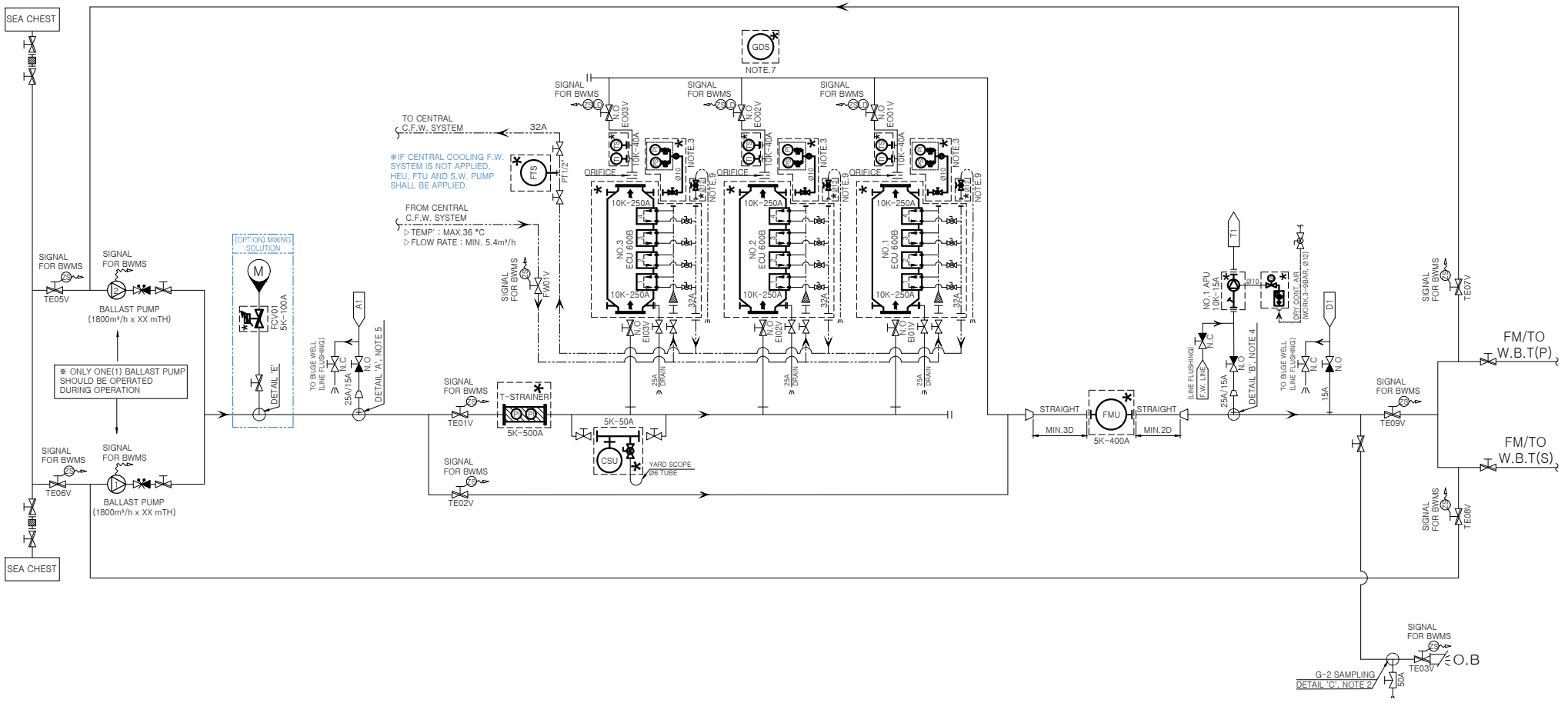
8. PRU COOLING MANIFOLD STRAINER
 1) STRAINER HAVE BEEN INSTALLED TO PREVENT THE BLOCKAGE OF COOLING WATER LINE FROM PRU.
 CREW SHOULD BE CHECK THE CONDITION ONCE EVERY QUARTER.



9. COOLING F.W CONDITION FOR PRU
 1) COOLING S.W TEMPERATURE (INLET) : +32°C
 2) COOLING F.W TEMPERATURE (INLET) : +36°C
 3) COOLING F.W PRESSURE DROP : 0.5BAR
 4) FLOW RATE VOLUME : 0.45m3/h (PER PRU)
 5) INLET VALVE SHOULD BE PLACED NEAR THE ECU.
 6) AIR VENT AND VALVE MUST BE INSTALLED AT COOLING WATER PIPE COMMON OUTLET. ("A" POSITION)
 AIR VENT AND VALVE ONLY REQUIRED FOR THE VERTICAL TYPE OF ECU (MAKER STANDARD), NOT FOR HORIZONTAL TYPE OF ECU.



ENGINE ROOM (SAFETY AREA)

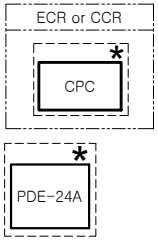


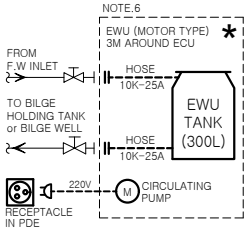
TECHCROSS	P&ID FOR BWTS	
	HULL NO.	STANDARD
	MODEL	ECS1800B 1.1 x 1
	DWG NO.	TPD024-GA-A001Z-STANDARD

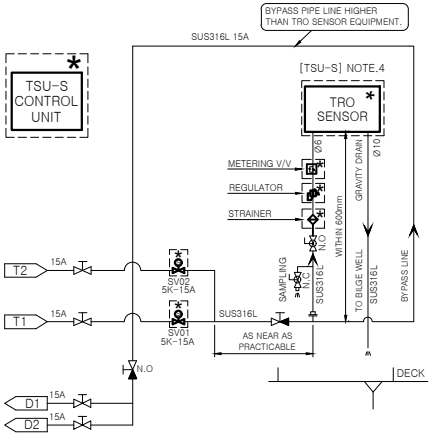
SHEET 1/2

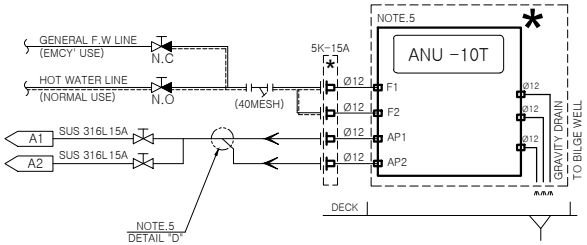
51-Q-02-08

ENGINE ROOM (SAFETY AREA)

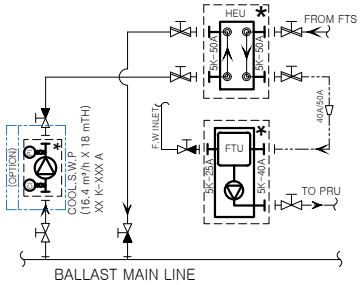




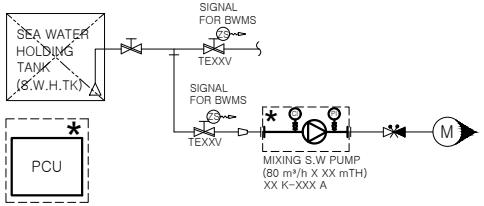




(OPTION) COOLING SYSTEM



(OPTION) MIXING SOLUTION



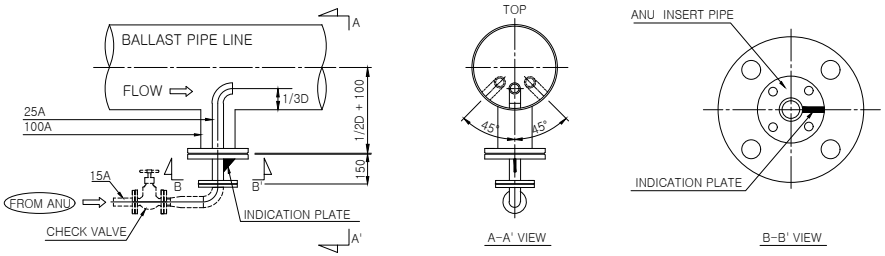
[MIXING OPERATION]

1) THE VOLUME OF SEA WATER HOLDING TANK SHALL BE MINIMUM 4.3% OF TOTAL BALLASTING CAPACITY.
   [S.W.(34.7 PSU) : 4.3% + F.W.(0 PSU) : 95.7 % = MIXING (1.5 PSU)]
2) IF A.P.TK IS USED FOR MIXING SEA WATER HOLDING TANK,
   · BALLAST WATER CAN BE TREATED ABT. XXX m3.
   · THIS AMOUNT IS APPROX. XX % OF TOTAL BALLAST VOLUME.
   · IN VIEW OF SUCTION CAPABILITY AT RATED FLOW RATE, THE SUCTION CENTER OF MIXING PUMP SHOULD BE POSITIONED LOWER THAN THE LEVEL OF BOTTOM PLATE OF A.P.TK.
3) IF ONE OF W.B.TK IS USED FOR MIXING SEA WATER HOLDING TANK,
   · AIR EJECTOR AT MIXING S.W.PUMP SHALL BE ADDITIONALLY APPLIED. (MAKER SCOPE)
   · THE MIXING PUMP SHOULD BE OPERATED CONSIDERING THE VALUE OF NPSH.
   · IF THE SEAWATER LEVEL OF D.B.W.TANK IS LOW, SEA WATER SUCTION WILL BE DIFFICULT AND THE MECHANICAL SEAL OF MIXING PUMP WILL BE DAMAGED.
4) WHEN THE MIXING OPERATION, THE SUCTION LINE OF MIXING PUMP SHOULD BE ARRANGED TO BE FULL FILL SEAWATER CONDITION.

TECHCROSS	P&ID FOR BWTS		
	HULL NO.	STANDARD	SHEET
	MODEL	ECS1800B 1.1 x 1	2 / 2
	DWG NO.	TPD024-GA-A001Z-STANDARD	

DETAIL 'A' ANU DOSING PORT (YARD/OWNER SUPPLY)

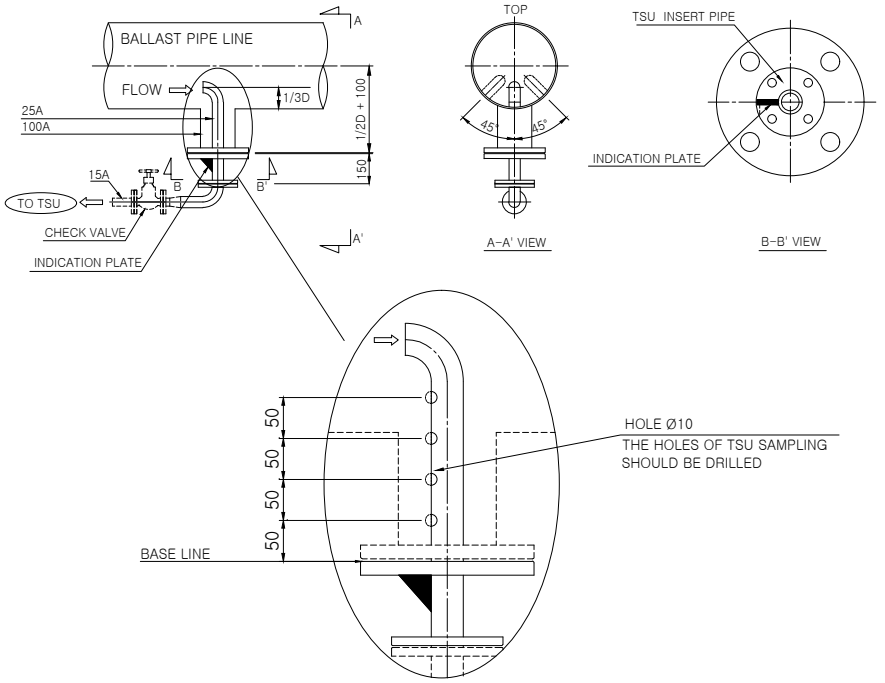
1) ANU DOSING PORT SHOULD BE INSTALLED AT THE BOTTOM OF BALLAST PIPE LINE.
2) THE INDICATION PLATE IS FOR INDICATION OF INSERT PIPE DIRECTION. THIS SHOULD BE INSTALLED IN THE SAME DIRECTION WITH DOSING PORT.



DETAIL 'B' TSU SAMPLING PORT (YARD/OWNER SUPPLY)

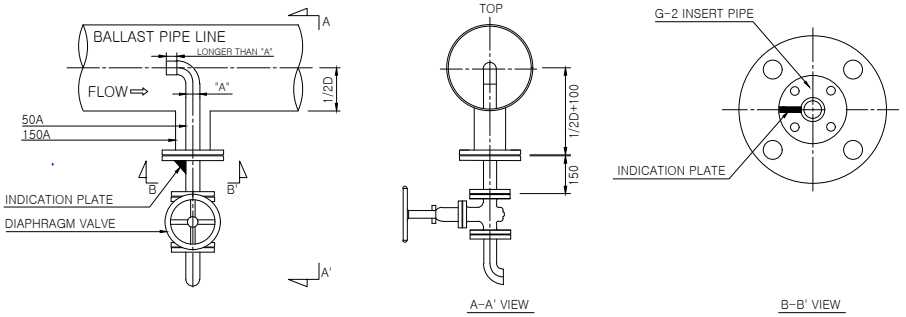
1) TSU SAMPLING PORT SHOULD BE INSTALLED AT THE BOTTOM OF BALLAST PIPE LINE.
2) THE INDICATION PLATE IS FOR INDICATION OF INSERT PIPE DIRECTION. THIS SHOULD BE INSTALLED IN THE SAME DIRECTION WITH SAMPLING PORT.

[NOTE] THE ECUS OUTLET PIPING IS INSTALLED OF VERTICAL DOWNSTREAM WITH LONG DISTANCE, THERE IS A HIGH POSSIBILITY OF VACUUM. TRO SAMPLING PORT SHOULD BE INSTALLED AFTER VERTICAL DOWNSTREAM.

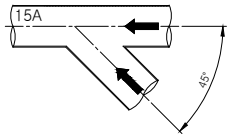


DETAIL 'C' G2 SAMPLING PORT (YARD/OWNER SUPPLY)

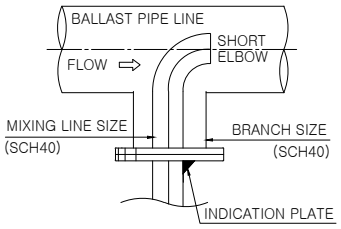
1) WHEN THE SIZE OF G-2 SAMPLING PORT PIPE IS 50A, THE SIZE OF BRANCH PIPE FROM BALLAST PIPE LINE SHOULD BE MORE THAN 150A.
2) G2 SAMPLING PORT SHOULD BE INSTALLED AT THE BOTTOM OR SIDE OF BALLAST PIPE LINE.
3) THE INDICATION PLATE IS FOR INDICATION OF INSERT PIPE DIRECTION. THIS SHOULD BE INSTALLED IN THE SAME DIRECTION WITH SAMPLING PORT.



DETAIL 'D' PIPE CONNECTION PARTS (IF APPLICABLE)



DETAIL 'E' MIXING POINT (IF APPLICABLE)



MIXING LINE	BRANCH SIZE
50A	100A
65A	125A
80A	150A
100A	200A
125A	250A
150A	300A
200A	350A
250A	400A

1) THE INDICATION PLATE IS FOR INDICATION OF MIXING INSERT PIPE DIRECTION. THIS SHOULD BE INSTALLED IN THE SAME DIRECTION WITH MIXING PORT.

TECHCROSS

SAMPLING DETAIL DRAWING		
HULL NO.	STANDARD	SHEET
MODEL	ECS1800B 1.1 x 1	1 / 1
DWG NO.	TPD0241019-GA-A001A-SAMPLING	