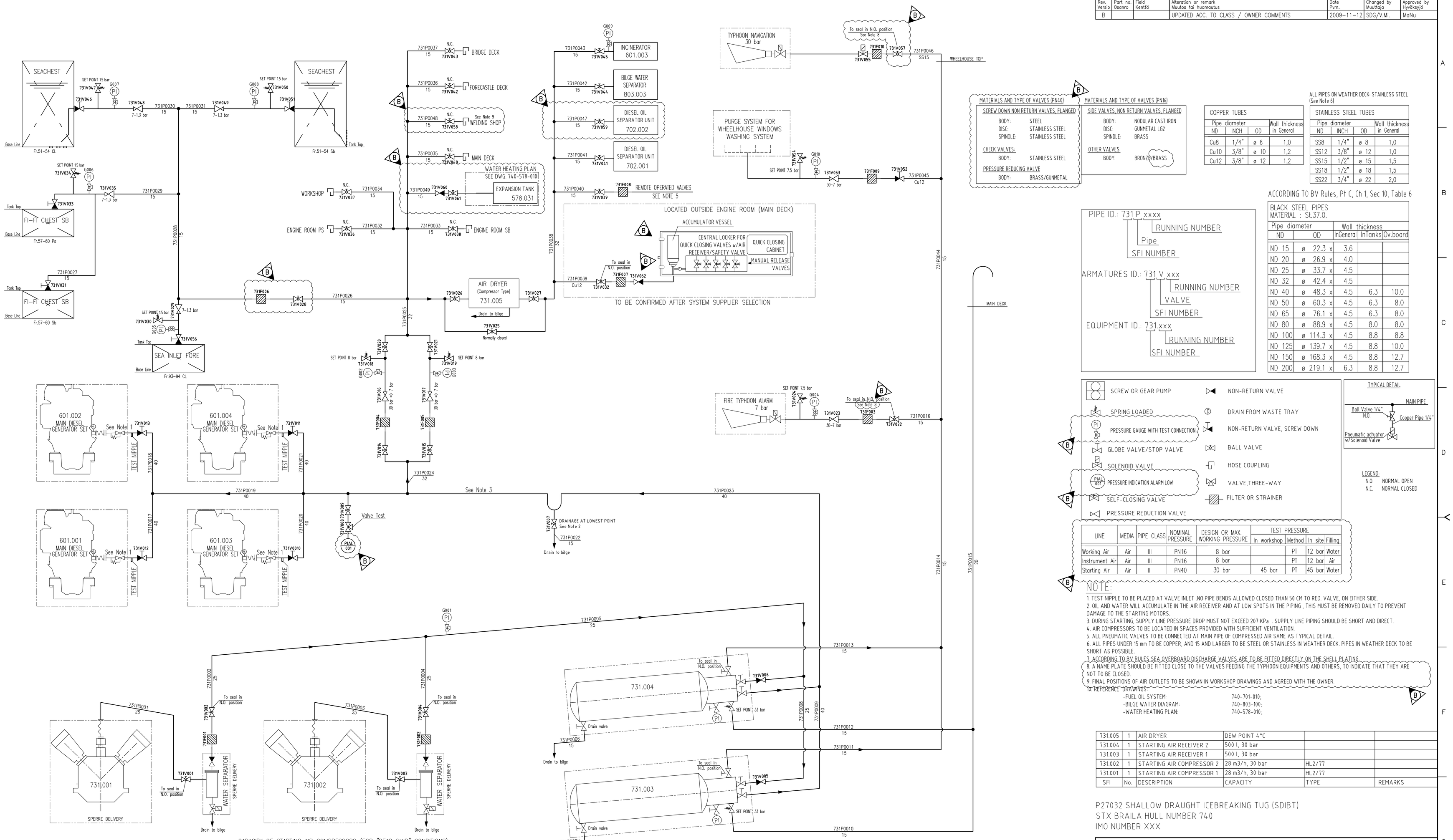
Rev. Versio	Part no. Osanro	Field Kenttä	Alteration or remark Muutos tai huomautus	Date Pvm.	Changed by Muuttaja	Approved by Hyväksyjä
B			UPDATED ACC. TO CLASS / OWNER COMMENTS	2009-11-12	SDG/V.Mi.	MaNu



MATERIALS AND TYPE OF VALVES (PN40)

SCREW DOWN NON RETURN VALVES, FLANGED	
BODY:	STEEL
DISC:	STAINLESS STEEL
SPINDLE:	STAINLESS STEEL
CHECK VALVES:	
BODY:	STAINLESS STEEL
PRESSURE REDUCING VALVE	
BODY:	BRASS/GUNMETAL

MATERIALS AND TYPE OF VALVES (PN16)

SIDE VALVES, NON RETURN VALVES, FLANGED	
BODY:	NODULAR CAST IRON
DISC:	GUNMETAL LG2
SPINDLE:	BRASS
OTHER VALVES	
BODY:	BRONZE/BRASS

COPPER TUBES

Pipe diameter			Wall thickness in General
ND	INCH	OD	
Cu8	1/4"	ø 8	1,0
Cu10	3/8"	ø 10	1,2
Cu12	3/8"	ø 12	1,2

ALL PIPES ON WEATHER DECK: STAINLESS STEEL (See Note 6)

STAINLESS STEEL TUBES

Pipe diameter			Wall thickness in General
ND	INCH	OD	
SS8	1/4"	ø 8	1,0
SS12	3/8"	ø 12	1,0
SS15	1/2"	ø 15	1,5
SS18	1/2"	ø 18	1,5
SS22	3/4"	ø 22	2,0

ACCORDING TO BV Rules, Pt C, Ch 1, Sec 10, Table 6

BLACK STEEL PIPES
MATERIAL : St.37.0.

Pipe diameter		Wall thickness		
ND	OD	InGeneral	InTanks	Ov.board
ND 15	ø 22.3 x	3.6		
ND 20	ø 26.9 x	4.0		
ND 25	ø 33.7 x	4.5		
ND 32	ø 42.4 x	4.5		
ND 40	ø 48.3 x	4.5	6.3	10.0
ND 50	ø 60.3 x	4.5	6.3	8.0
ND 65	ø 76.1 x	4.5	6.3	8.0
ND 80	ø 88.9 x	4.5	8.0	8.0
ND 100	ø 114.3 x	4.5	8.8	8.8
ND 125	ø 139.7 x	4.5	8.8	10.0
ND 150	ø 168.3 x	4.5	8.8	12.7
ND 200	ø 219.1 x	6.3	8.8	12.7

PIPE ID.: 731.P.xxxx
- RUNNING NUMBER
- Pipe
- SFI NUMBER

ARMATURES ID.: 731.V.xxx
- RUNNING NUMBER
- VALVE
- SFI NUMBER

EQUIPMENT ID.: 731.xxx
- RUNNING NUMBER
- SFI NUMBER

- SCREW OR GEAR PUMP
- SPRING LOADED
- PRESSURE GAUGE WITH TEST CONNECTION
- GLOBE VALVE/STOP VALVE
- SOLENOID VALVE
- PIAL 601 PRESSURE INDICATION ALARM LOW
- SELF-CLOSING VALVE
- PRESSURE REDUCTION VALVE
- NON-RETURN VALVE
- DRAIN FROM WASTE TRAY
- NON-RETURN VALVE, SCREW DOWN
- BALL VALVE
- HOSE COUPLING
- VALVE,THREE-WAY
- FILTER OR STRAINER

TYPICAL DETAIL

LEGEND:
N.O. NORMAL OPEN
N.C. NORMAL CLOSED

LINE	MEDIA	PIPE CLASS	NOMINAL PRESSURE	DESIGN OR MAX. WORKING PRESSURE	TEST PRESSURE In workshop	Method	In site	Filling
Working Air	Air	III	PN16	8 bar		PT	12 bar	Water
Instrument Air	Air	III	PN16	8 bar		PT	12 bar	Air
Starting Air	Air	II	PN40	30 bar	45 bar	PT	45 bar	Water

NOTE:

1. TEST NIPPLE TO BE PLACED AT VALVE INLET NO PIPE BENDS ALLOWED CLOSED THAN 50 CM TO RED. VALVE, ON EITHER SIDE.
2. OIL AND WATER WILL ACCUMULATE IN THE AIR RECEIVER AND AT LOW SPOTS IN THE PIPING , THIS MUST BE REMOVED DAILY TO PREVENT DAMAGE TO THE STARTING MOTORS.
3. DURING STARTING, SUPPLY LINE PRESSURE DROP MUST NOT EXCEED 207 KPa . SUPPLY LINE PIPING SHOULD BE SHORT AND DIRECT.
4. AIR COMPRESSORS TO BE LOCATED IN SPACES PROVIDED WITH SUFFICIENT VENTILATION.
5. ALL PNEUMATIC VALVES TO BE CONNECTED AT MAIN PIPE OF COMPRESSED AIR SAME AS TYPICAL DETAIL.
6. ALL PIPES UNDER 15 mm TO BE COPPER, AND 15 AND LARGER TO BE STEEL OR STAINLESS IN WEATHER DECK. PIPES IN WEATHER DECK TO BE SHORT AS POSSIBLE.
7. ACCORDING TO BV RULES SEA OVERBOARD DISCHARGE VALVES ARE TO BE FITTED DIRECTLY ON THE SHELL PLATING.
8. A NAME PLATE SHOULD BE FITTED CLOSE TO THE VALVES FEEDING THE TYPHOON EQUIPMENTS AND OTHERS, TO INDICATE THAT THEY ARE NOT TO BE CLOSED.
9. FINAL POSITIONS OF AIR OUTLETS TO BE SHOWN IN WORKSHOP DRAWINGS AND AGREED WITH THE OWNER.

TO REFERENCE DRAWINGS:

-FUEL OIL SYSTEM:	740-701-010;
-BILGE WATER DIAGRAM:	740-803-100;
-WATER HEATING PLAN:	740-578-010;

731.005	1	AIR DRYER	DEW POINT 4°C	
731.004	1	STARTING AIR RECEIVER 2	500 l, 30 bar	
731.003	1	STARTING AIR RECEIVER 1	500 l, 30 bar	
731.002	1	STARTING AIR COMPRESSOR 2	28 m3/h, 30 bar	HL2/77
731.001	1	STARTING AIR COMPRESSOR 1	28 m3/h, 30 bar	HL2/77
SFI	No.	DESCRIPTION	CAPACITY	TYPE

REMARKS

P27032 SHALLOW DRAUGHT ICEBREAKING TUG (SDIBT)
STX BRAILA HULL NUMBER 740
IMO NUMBER XXX

CAPACITY OF STARTING AIR COMPRESSORS

1. RULES

Ref. BV rules Pt.C, Ch1. 17.3.2 Number and capacity of air compressors; a) Where main and auxiliary engines are arranged for starting by compressed air, two or more air compressors are to be fitted with a total capacity sufficient to supply within one hour the quantity of air needed to satisfy the provisions of [17.3.1] charging the receivers from atmospheric pressure.

2. INPUT DATA

– Number of compressors (nc)	2	[pcs]
– Running time of compressors (t) acc Bv rules:	1	[h]
– Volume of air required (V)	1	[m^3]
– Minim pressure in receiver (P0)	0	[bar]
– Max pressure in receiver (Pm)	30	[bar]

3. CALCULATION

– Total capacity for compressors (Qt=V*(Pm–P0)/(t))	30	[m^3/h(normal)]
– Capacity required for each air compressors (Q=Qt/nc)	15	[m^3/h(normal)]

4. CONCLUSION:

– Capacity of each air compressor purchased	28	[m^3/h(normal)]

Air compressors capacity cover the capacity requested by rules mentioned above.

CAPACITY OF STARTING AIR COMPRESSORS (FOR "DEAD SHIP" CONDITIONS)

1. RULES

Ref. BV rules Pt.C, Ch1. 17.2.2 Availability c) Where compressed air is necessary to restore propulsion, the arrangements for bringing main and auxiliary machinery into operation are to have capacity such that the starting energy and any power supplies for engine operation are available within 30 minutes of a dead ship condition.

INPUT DATA

– Air consumption for start of each ME (@6.9bar)Qm:	0,280	[m^3/s(normal)]
– Number of compressors el. supplied from ESB (nc)	1	[pcs]
– Running time of compressors (tds) acc Bv rules:	0.5	[h]
– Number of engines which should be started (neds)	1	[pc]
– Number of starts in "dead ship" condition for each engine(nds)	3	[starts]
– Air pressure (in air receiver) in "dead ship" condition (Pds)	0	[bar]
– Minim pressure (in air receiver), necessary for engine start (P0)	6.9	[bar]

3. CALCULATION

– Air volume to get min usable pressure in receiver(6.9bar) V0=Vs*(P0–Pds)	6.9	[m^3(normal)]
– Air volume for "dead ship" condition Vds=Qm*tck*nds*neds	4.2	[m^3(normal)]
– Total air volume in dead ship conditions Vtds=V0+Vds	11.1	[m^3(normal)]
– Compressor capacity necessary in "dead ship condition Qds=Vtds/tds	22.2	[m^3/h(normal)]

4. CONCLUSION:

Chosen air compressor have 28cubm/h capacity, which is bigger than requested capacity in "dead ship" condition

CAPACITY OF STARTING AIR RECEIVERS

1. RULES

Ref. BV rules Pt.C, Ch1. 17.3.1 b) For multi–engine propulsion plants, the capacity of starting air receivers is to be sufficient to ensure at least 3 consecutive starts per engine. However, the total capacity is not to be less than 12 starts and need not exceed 18 starts.

2. INPUT DATA

– Air consumption for start of each ME (@6.9bar):	0,280	[m^3/s]
– Crank time for ME start (tck)	5	[sec]
– Number of engines	4	[pcs.]
– Minimum number of starts according to BV rules	12	[starts]
– Number of air receivers	2	[pcs.]
– Air receiver max pressure	30	[bar]
– Air receiver min pressure (usable)	6.9	[bar]

3. CALCULATION:

– Air necessary for one start in crank time:	0.28*5=1.4	[m^3(normal)]
– Air necessary for 12 starts	1.4*12=16.8	[m^3(normal)]
– Total volume requested for air receivers	16.8/(30–6.9)=0.73	[m^3] (for min6.9bar and max30bar)

4. CONCLUSION:

– Chosen air receivers have 2x500liters at 30 bar (Vs), which is bigger than ~730 liter requested by BV rules.

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SDG

STATUS Date Pvm. 2009-11-12

☐ 1 VERY PRELIMINARY ☒ 2 FOR OTHER DESIGN ☐ 2P FOR OTHER DESIGN
☐ 3 FOR WORKSHOP DESIGN ☐ 4 AS DESIGN ☐ 5 AS BUILT

Based on/Perustuu
Part of/Liittyy
Replaces/Korvaa

Aker Arctic

Design/ Suunn.	SDG/A.R.	Dpt. Osasto
To Pvm.	Date Pvm. 2009-09-04	
Check/ Tark.	SDG/V.Mi.	Dpt. Osasto
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AARC Project/AARC Projekti	P27032	Scale/ Mittak. 1:1

Title/Nimitys
COMPRESSED AIR SYSTEM SCHEME

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