REV	DATE	CHANGE NUMBER	AMENDMENTS	BY	APPD
A	17SEP10	-	CONSOLIDATED DCV'S, ADDED DRAIN LINE, ADDED PIPE SIZE CHART	SMM	JBH
B	18OCT10	-	ADDED FLEXIBLE CONNECTIONS TO CRANE, UPDATED PIPE SIZE CHART	SMM	JBH
C	07JAN11		UPDATED BOM	MJC	SMM
D	06MAR11	1168	UPDATED LINE SIZES AND TABLE ON SHEET 2	MJC	SMM
AF	29/04/12	--	AS FITTED	TK	FP

Piping chart

Schematic Label	Hydraulic Line	Material	Size	Inside Dia.		Outside Dia.		Tube Wall		Tube Pressure Rating Safety Factor = 4:1		Max pressure		Length		Pressure Drop @ 40 C	
				mm	in	mm	in	mm	in	BAR	PSI	BAR	PSI	m	ft	BAR	PSI
A	Pump Suction	Pipe, A106 GR B	2-1/2" SCH 40	62.74	2.470	73.03	2.875	5.16	0.203	131	1900	10	145	3	10	0.33	4.8
B	Pump To HPU - Pressure	Tube, Steel, DN32	38mm x 4mm WT DIN2391 ST 35 BK	30.00	1.181	38.00	1.496	4.00	0.157	261	3785	275	4000	3	10	4.71	68.3
C	Pump To HPU - Drain	Tube, Steel, DN20	22mm x 2mm WT DIN2391 ST 35 BK	18.00	0.709	22.00	0.866	2.00	0.079	228	3307	275	4000	3	10	1.86	27.0
D	Pump To HPU - Load Sense	Tube, SS	3/8" x .035" WT	7.75	0.305	9.53	0.375	0.89	0.035	*241	*3500	275	4000	3	10	36.18	524.7
E	HPU To Crane - Pressure	Tube, Steel, DN32	38mm x 3mm WT DIN2391, ST 35 BK	32.00	1.260	38.00	1.496	3.00	0.118	200	2901	207	3000	6	20	6.68	96.8
F	Crane to HPU - Return	Pipe, A106 GR B	1-1/2" SCH 40	40.89	1.610	48.26	1.900	3.68	0.145	117	1700	17	250	6	20	2.08	30.2
G	Crane to HPU - CT Return	Tube, Steel, DN25	28mm x 2 mm WT DIN2391 ST 35 BK	24.00	0.945	28.00	1.102	2.00	0.079	182	2640	17	250	6	20	8.67	125.8
H	Crane to HPU - Drain	Tube, Steel, DN20	22mm x 2mm WT DIN2391 ST 35 BK	18.00	0.709	22.00	0.866	2.00	0.079	228	3307	10	145	6	20	3.72	54.0
I	Crane To Crab pot Hauler	SS Tube, DN 20	25mm x 2.5mm WT DIN2462 316L SS	20.00	0.787	25.00	0.984	2.50	0.098	209	2901	172	2500	11	36	35.20	510.5
J	Crane To Net Lifter	SS Tube, DN 20	25mm x 2.5mm WT DIN2462 316L SS	20.00	0.787	25.00	0.984	2.50	0.098	209	2901	172	2500	11	36	5.23	75.8
K	HPU to Capstan	Tube, Steel, DN15	18mm x 2mm WT DIN 2391 ST 35 BK	14.00	0.551	18.00	0.709	2.00	0.079	274	3974	172	2500	12	40	20.35	295.2
L	HPU To Towline Reel	Tube, Steel, DN15	18mm x 2mm WT DIN 2391 ST 35 BK	14.00	0.551	18.00	0.709	2.00	0.079	274	3974	138	2000	11	36	9.33	135.3
M	HPU to Anchor Windlass Control Valve - Pressure	Tube, Steel, DN20	22mm x 2mm WT DIN2391 ST 35 BK	18.00	0.709	22.00	0.866	2.00	0.079	228	3307	172	2500	32	105	33.10	480.1
N	HPU to Anchor Windlass Control Valve - Return	Tube, Steel, DN20	22mm x 2mm WT DIN2391 ST 35 BK	18.00	0.709	22.00	0.866	2.00	0.079	228	3307	17	250	32	105	33.10	480.1
O	Anchor Windlass Control Valve to Windlass	Tube, Steel, DN15	18mm x 2mm WT DIN 2391 ST 35 BK	14.00	0.551	18.00	0.709	2.00	0.079	274	3974	172	2500	32	105	90.45	1311.9
P	HPU To Bow Thruster Control Valve - Pressure	Tube, Steel, DN32	38mm x 4mm WT DIN2391 ST 35 BK	30.00	1.181	38.00	1.496	4.00	0.157	261	3785	275	4000	25	82	39.22	568.8
Q	HPU To Bow Thruster Control Valve - Return	Pipe, A106 GR B	1-1/2" SCH 40	40.89	1.610	48.26	1.900	3.68	0.145	117	1700	17	250	25	82	9.00	130.6
R	HPU To Bow Thruster Control Valve - Drain	Tube, Steel, DN20	22mm x 2mm WT DIN2391 ST 35 BK	18.00	0.709	22.00	0.866	2.00	0.079	2228	32314	10	145	25	82	25.86	375.1
S	Drain to HPU - After Tee	Tube, Steel, DN32	35mm x 2mm WT DIN 2391 ST 35 BK	31.00	1.220	35.00	1.378	2.00	0.079	147	2132	10	145	2	7	0.35	5.1
T	Return to HPU - After Tee	Pipe, A106 GR B	2" SCH 80	49.25	1.939	60.33	2.375	5.54	0.218	172	2500	17	250	3	10	1.50	21.8

Notes:

1) Allowable working pressures are based on equations from DIN 2413 part III for dynamic stress using a material characteristic value (K) of 226 Mpa (32,780 psi)
Yield stength = 235 Mpa (34,000 psi)
Tensile stength = 340 Mpa (49,000 psi)
Carbon Steel St. 37.4 tubing material per DIN 1630
Seamless, cold drawn under inert gas, normal annealed per DIN 2391C, Part 2
Ref Parker "Table R3 - Seamless EO Steel tubes"

2) Allowable working pressures for pipe (Bow Thruster P & T) is based on equations from ANSI B31.1 for ASTM A53 Grade B or ASTM A106 Grade B seamless pipe

3) Piping above deck is to be stainless steel; Material-No.: 1.4571

4) * Indicates a 3:1 Safety Factor (min)

MODE	ENABLED FUNCTIONS	FLOW (GPM)
BOAT HANDLING	CRANE (DAVIT) AND THRUSTER	74 GPM
MOORING/ANCHOR/TOWING	CAPSTAN, WINDLASS, TOWLINE REEL & THRUSTER	68 GPM
FISHING	NET/CRAB POT HAULER, CRANE AND THRUSTER	73 GPM
THRUSTER	THRUSTER	49 GPM
ALONGSIDE	CAPSTAN, WINDLASS AND CRANE	32 GPM

SOLENOID CHART

SOL. TAG	FUNCTION	POWER	VOLTAGE
DV1	FLOW SETTING FOR CRANE/FISHING EQUIP	8W	24VDC SUPPLY + SIG
DV2	FLOW SETTING FOR ANCHOR WINDLASS/CAPSTAN	8W	24VDC (ON/OFF)
DV3	CAPSTAN SPEED/DIRECTION CONTROL	7W	24VDC SUPPLY + SIG
DV4	TOWLINE REEL SPEED/DIRECTION CONTROL	7W	24VDC SUPPLY + SIG
DV5	THRUSTER FLOW (HIGH/LOW)	8W	24VDC SUPPLY + SIG
T1	THRUSTER SPEED/PRESSURE CONTROL		
A1	THRUSTER DIRECTION CONTROL (PORT)	23W	24VDC (ON/OFF)
B1	THRUSTER DIRECTION CONTROL (STBD)	23W	24VDC (ON/OFF)
SV1	PUMP ENABLE (PORT)	22W	24VDC (ON/OFF)
SV2	PUMP ENABLE (STBD)	22W	24VDC (ON/OFF)

Applicable to Hull: 6094, 6095, 6096, 6097, 6098, 6099, 6101, 6102, 6103

PRIVATE ROBERTSON V.C. (6094)
CAPORAL KAEBLE V.C. (6095)
CORPORAL TEATHER C.V. (6096)
CONSTABLE CARRIÈRE (6097)
G. PEDDLE (6098)
CORPORAL MCLAREN M.M.V. (6099)
LeBLANC (6101)
M. CHARLES (6102
CAPTAIN GODDARD M.S.M. (6103)

NOTES:

1) PUMP SIZE : 145 cc/rev, Qmax.=84 gpm
2) ALL FLOWS SHOWN IN US GPM, PRESSURES IN PSI
3) ALL LINE SIZES ARE INSIDE DIAMETERS
4) LOW LEVEL SWITCHES ARE CLOSED WHEN LEVEL IS HIGH
5) CONNECT PUMP DRAIN TO UPPERMOST PORT ON CASE
6) HYDRAULIC OIL TO BE ISO VG32
7) PRESSURE DROP FIGURES DO NOT INCLUDE LOSSES FOR FITTINGS AND VALVESLOSSES AT 20C ARE APPROXIMATELY DOUBLE
8) SYSTEM PIPING MUST BE FLUSHED TO A MINIMUM CLEANLINESS LEVEL OF 19/17/14 IN ACCORDANCE WITH ISO 4406

ITEM	PART NUMBER	OPER DESC	DESCRIPTION	MATERIAL	UNIT QTY.

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UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE INCHES
DIMENSIONS IN [ ] ARE MM
-TOLERANCES-
A) ANGULAR ± 1/2°
B) DECIMAL (ONE) .X ± .06
(TWO) .XX ± .02
(THREE) .XXX ± .01
C) FRACTIONAL
1. GENERAL ± 1/32
2. SAWING, FLAME CUTTING, SHEARING ± 1/16
4. BREAKING
3. WELDING ± 1/8

HAWBOLD INDUSTRIES Chester, Nova Scotia, Canada

MATL CERT	N/R	TITLE	MSPV HYDRAULIC SYSTEM DIAGRAM
MATL TEST	N/R	NEXT ASSEMBLY	DERIVED FROM AF8400019
WELD TEST	N/R	FIRST USED ON: VD 1223	SHEET 2 OF 2
EST L&S	N/A	DRAWN JBH / CHECKED / APPROVED	
ACT L&S	N/A	DATE 09AUG10 / SCALE 1/4	AF8400020 REV AF

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