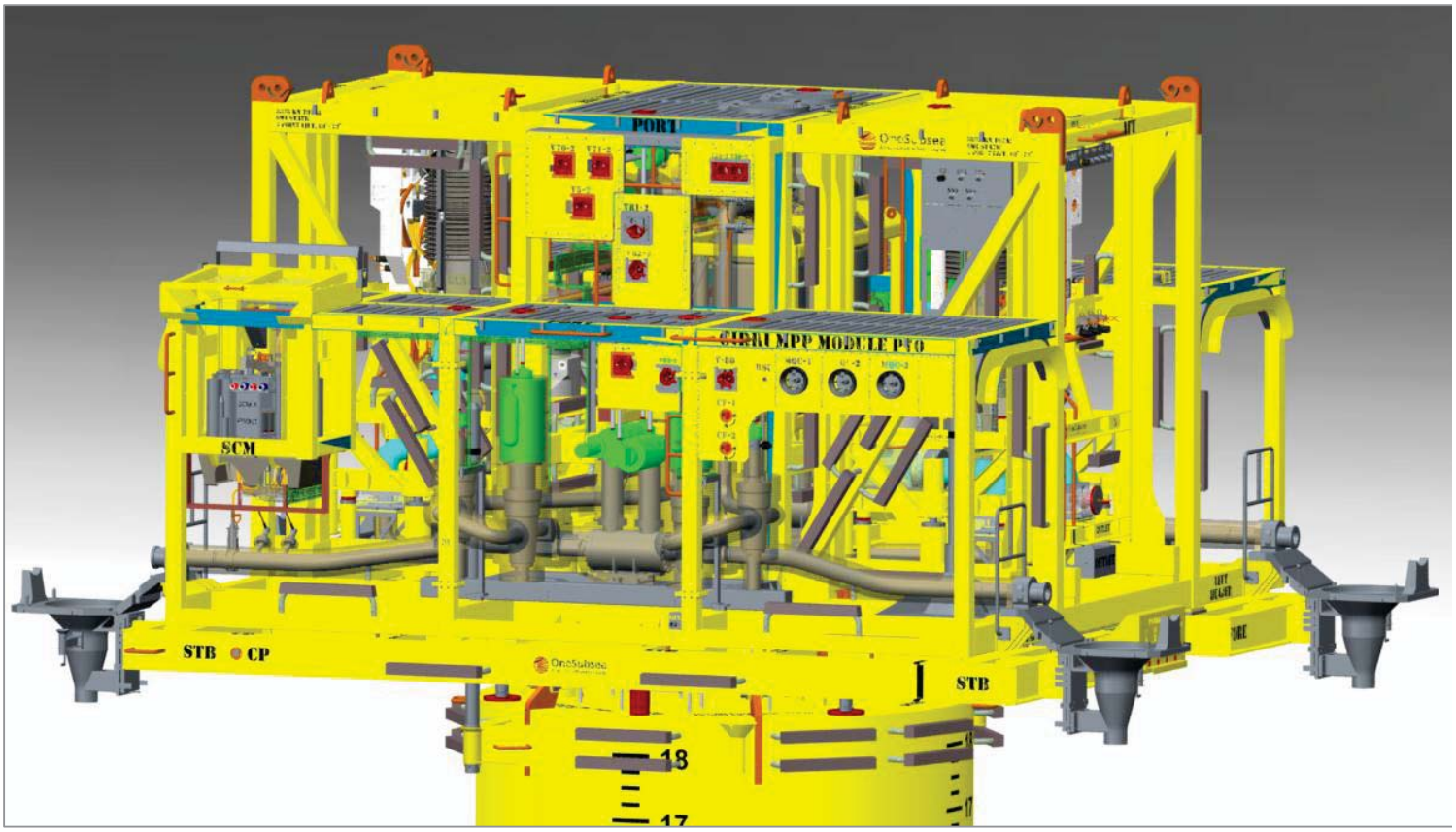
GirRI MPP - HANDBOOK

Rev.	Status	Date	Revision memo	Issued by	Checked by	Approved by
02	AFC	20/APR/2015	Approved for construction	SAA	HHA	IFA
01	AFC	03/MAR/2015	Approved for construction	MFL	HHA	IFA
00	IFR	09/JAN/2015	Issued for review	MFL	HHA	IFA

Handbook

GirRI MPP Station



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1 System information

1.1 Project data

Description	Data
Design temperature	-18 to +90 °C
Design water depth	1450 m
Actual water depth	P70 1360 m / P80 1400 m
Design life	20 years

1.2 Well data

Description	Rosa
Initial reservoir temperature	69 °C
Initial reservoir pressure	269.6 bara at -2600m TVD/MSL
Maximum WHISP	215 bara

1.3 General information

Description	Data
MPP CON Project Number	9060
MPP CON Scope of Supply	AO-050-PJG-310-000237 (MPP CON doc no: ITM-0009639)
Main Interface Drawing	AO-050-GMP-310-000380 (MPP CON doc no: ITM-0058434)
Hydraulic Schematic	AO-050-GSG-310-000102 and AO-050-GSG-310-000103 (MPP CON doc no: DRW-0001208 and DRW-0001209)
MPP CON Project Manager	Inge Fagnastøl
Client	Total E&P Angola
Client specification	According to contract: 1C200 - Out of Country 1C201 - In Country
End User	Total E&P Angola
Country	Angola
Project	GirRI

1.4 Abbreviations and nomenclature

API	American Petroleum Institute standards
BF	Barrier Fluid
BR	Barrier Return
BS	Barrier Supply
CCR	Central Control Room
CCV	Chemical Control Valve
CF	Control Fluid
CI	Company Items
CIV	Chemical Injection Valve
COMPANY	Total E&P Angola
CR	Conductor Resistance
CTV	Chemical Throttle Valve
CV	Choke Valve
Cv	Coefficient of flow
DCV	Directional Control Valve
DMPP	Dummy MPP
DNV	Det Norske Veritas
E&P	Exploration and Production
FO	Fibre Optical
FLDF	Flying Lead Deployment Frame
FLOT	Flying Lead Orientation Tool
FPSO	Floating, Production Storage and Offloading
GA	General Arrangement (drawing)
GVF	Gas Volume Fraction
HFL	Hydraulic Flying Lead
HPU	Hydraulic Power Unit
HV	High Voltage
HVAC	Heating, Ventilation and Air Conditioning
ISO	International Organization for Standardization

IT	Installation tool
LV	Low Voltage
MCC	Motor Control Centre
MCT	Multi Cable Transit
MeOH	Methanol
MFCV	Minimum Flow Control Valve
MPFM	Multiphase Flow Meter
MPP	Multiphase Pump
MPP RT	MPP Running Tool
MSL	Mean Sea Level
MWP	Maximum Working Pressure
NA	Not Applicable
OWS	Operator Work Station
P&ID	Piping and Instrument Diagram
PCM	Power & Control Module
PPM	Parts per million
PT	Pressure Transmitter
ROV	Remotely Operated Vehicle
SCM	Subsea Control Module
SDU	Subsea Distribution Unit
SEM	Subsea Electronic Module
SLS	Support and Levelling Structure
SPCU	Subsea Power and Control Unit
TS	Transport Skid
TT	Temperature Transmitter
TVD	True Vertical Depth
UPS	Uninterruptible Power Supply
URT	Universal Running Tool
VSD	Variable Speed Drive
WHISP	Wellhead Shut in Pressure
WI	Water Injection

1.5 Equipment list

Level	BOM Line
1	**ITM-0020168/I;1-9060 GirRI SCOPE OF SUPPLY (View)**
2	**ITM-0020169/A;4-Power and Control Module (View) x 1**
3	***ITM-0090477/B;3-PCM Steel Structure Assembly (View) x 1***
4	ITM-0020170/C;4-Power and Control Module Steel Structure (View) x 1
4	ITM-0090464/B;2-PCM Bumper part 1 x 1
4	ITM-0090465/B;2-PCM Bumper part 2 x 1
4	ITM-0090466/B;2-PCM Bumper part 3 x 1
4	ITM-0090467/B;2-PCM Bumper part 4 x 1
4	ITM-0090478/B;2-PCM Lifting Tools (View) x 1
4	ITM-0090457/B;2-PCM Lifting Tool Shackle A (View) x 8
4	ITM-0090458/B;2-PCM Lifting Tool Shackle B x 2
4	ITM-0090462/B;2-ITM-0090462/B;2-PCM Lifting Tool Spreader BarV x 1
4	ITM-0020196/B;2-9060 GirRI PCM Electrical Installation (View) x 1
3	***ITM-0020172/C;3-BF-HPU Assembly P70 (View) x 1***
4	ITM-0020173/B;3-Barrier Fluid HPU P70 (View) x 1
4	ITM-0038126/C;2-BF HPU Tubing Assembly (View) x 1
4	ITM-0027621/A;2-CONNECTOR MALE SWAGELOK 1610-1-16 x 3
4	ITM-0085146/A;2-Alco Valves - 3/4" Ball Valve - PB6LM x 1
4	ITM-0085147/A;2-Alco Valves - 1" Ball Valve - PB8LM x 1
4	ITM-0085154/A;1-Fluid Control - 3/4" Clamps - 5555-319 x 10
4	ITM-0085155/A;1-Fluid Control - 1" Clamps - 5555-325 x 10
4	ITM-0085151/A;2-Fluid Control - Stacking Bolt - AFN-3 x 20
4	ITM-0020173/B;3-Barrier Fluid HPU P70 (View) x 1
4	ITM-0065532/B;3-BF HPU OIL PURIFIER x 1
3	***ITM-0038127/C;3-BF-HPU Assembly P80 (View) x 1***
4	ITM-0038129/B;2-Barrier Fluid HPU P80 x 1
4	ITM-0038126/C;2-BF HPU Tubing Assembly (View) x 1
4	ITM-0027621/A;2-CONNECTOR MALE SWAGELOK 1610-1-16 x 3
4	ITM-0085146/A;2-Alco Valves - 3/4" Ball Valve - PB6LM x 1
4	ITM-0085147/A;2-Alco Valves - 1" Ball Valve - PB8LM x 1
4	ITM-0085154/A;1-Fluid Control - 3/4" Clamps - 5555-319 x 10
4	ITM-0085155/A;1-Fluid Control - 1" Clamps - 5555-325 x 10
4	ITM-0085151/A;2-Fluid Control - Stacking Bolt - AFN-3 x 20
4	ITM-0020173/B;3-Barrier Fluid HPU P70 (View) x 1
4	ITM-0089604/C;3-Nitrogen Booster Pump (View) x 1
3	***ITM-0043938/D;2-CF-HPU Assembly P70 (View) x 1***
4	ITM-0020174/B;2-Control Fluid HPU P70 x 1
4	ITM-0085160/B;1-CF HPU Tubing Assembly (View) x 1
4	ITM-0027621/A;2-CONNECTOR MALE SWAGELOK 1610-1-16 x 2
4	ITM-0085146/A;2-Alco Valves - 3/4" Ball Valve - PB6LM x 1
4	ITM-0085147/A;2-Alco Valves - 1" Ball Valve - PB8LM x 1
4	ITM-0085154/A;1-Fluid Control - 3/4" Clamps - 5555-319 x 10

Level	BOM Line
4	ITM-0085155/A;1-Fluid Control - 1" Clamps - 5555-325 x 10
4	ITM-0085151/A;2-Fluid Control - Stacking Bolt - AFN-3 x 20
4	ITM-0090373/A;3-CF HPU Shims package x 1
3	***ITM-0043940/D;3-CF-HPU Assembly P80 (View) x 1***
4	ITM-0038128/B;2-Control Fluid HPU P80 x 1
4	ITM-0085160/B;1-CF HPU Tubing Assembly (View) x 1
4	ITM-0027621/A;2-CONNECTOR MALE SWAGELOK 1610-1-16 x 2
4	ITM-0084307/A;1-Swagelok - 1"Male Tube Adaptor - SS-1610-TA-1-16 x 2
4	ITM-0085146/A;2-Alco Valves - 3/4" Ball Valve - PB6LM x 1
4	ITM-0085147/A;2-Alco Valves - 1" Ball Valve - PB8LM x 1
4	ITM-0085154/A;1-Fluid Control - 3/4" Clamps - 5555-319 x 10
4	ITM-0085155/A;1-Fluid Control - 1" Clamps - 5555-325 x 10
4	ITM-0085151/A;2-Fluid Control - Stacking Bolt - AFN-3 x 20
4	ITM-0090373/A;3-CF HPU Shims package x 1
3	***ITM-0020189/C;3-Power Drive System Assembly P70 (View) x 1***
4	ITM-0020191/C;3-Input Transformer P70R x 1
4	ITM-0043594/C;3-Input Transformer P70L x 1
4	ITM-0043612/C;2-VSD P70R x 1
4	ITM-0043613/C;2-VSD P70L x 1
4	ITM-0089813/B;3-PCM P70 VSD Maintenance Platform x 1
4	ITM-0089822/B;2-VSD P70 Maintenance Tools x 1
3	***ITM-0043595/C;3-Power Drive System Assembly P80 (View) x 1***
4	ITM-0089815/A;4-PCM P80 VSD Maintenance Platform x 1
4	ITM-0089823/B;2-VSD P80 Maintenance Tools x 1
4	ITM-0020193/C;5-Output Transformer P80L - Located P70 x 1
4	ITM-0020194/C;2-Output Transformer P80R x 1
4	ITM-0043597/C;3-Input Transformer P80R x 1
4	ITM-0043598/C;3-Input Transformer P80L x 1
4	ITM-0043615/C;2-VSD P80R x 1
4	ITM-0043616/C;2-VSD P80L x 1
3	***ITM-0020183/C;2-LV Distribution Board Assembly P70 (View) x 1***
4	ITM-0020184/B;3-P70 LV Distribution Board x 1
3	***ITM-0056767/C;3-LV Distribution Board Assembly P80 (View) x 1***
4	ITM-0056776/B;2-P80 LV Distribution Board Cabinet (View) x 1
3	***ITM-0020179/C;4-MCC Assembly P70 (View) x 1***
4	ITM-0020180/B;2-P70 MCC x 1
3	***ITM-0056768/C;4-MCC Assembly P80 (View) x 1***
4	ITM-0056775/B;3-P80 MCC Cabinet x 1
3	***ITM-0020181/D;4-SPCU Assembly P70 (View) x 1***
4	ITM-0020182/C;2-P70 SPCU Cabinet (View) x 1
4	ITM-0065849/A;6-Topside Fiber Optical Modem - Focal 922 Assembly (View) x 2
4	ITM-0091645/A;2-Hard Disk x 3
4	ITM-0032875/C;3-Server SuperMicro CSE-825 Short (View) x 2
4	ITM-0083848/A;1-Supermicro Front Bezel Cover x 2

Level	BOM Line
4	ITM-0082750/A;1-Win Server 2012 Standard x 3
4	ITM-0083852/A;1-Microsoft Windows 8 Pro x 5
4	ITM-0083853/A;1-WinPro SNGL Upgrade to virtuell x 5
4	ITM-0082749/A;1-Office Pro Plus 2013 SNGL OLP NL x 3
4	ITM-0052474/A;2-Symantec Endpoint Protection x 8
4	ITM-0006534/B;3-Acronis SW x 1
4	ITM-0009265/B;4-Microsoft Server 2008 std Edition OLP x 1
3	***ITM-0056769/D;3-SPCU Assembly P80 (View) x 1***
4	ITM-0056778/C;2-P80 SPCU Cabinet (View) x 1
4	ITM-0065849/A;6-Topside Fiber Optical Modem - Focal 922 Assembly (View) x 2
4	ITM-0032875/C;3-Server SuperMicro CSE-825 Short (View) x 2
4	ITM-0083848/A;1-Supermicro Front Bezel Cover x 2
4	ITM-0082750/A;1-Win Server 2012 Standard x 1
4	ITM-0083852/A;1-Microsoft Windows 8 Pro x 3
4	ITM-0083853/A;1-WinPro SNGL Upgrade to virtuell x 3
4	ITM-0082749/A;1-Office Pro Plus 2013 SNGL OLP NL x 4
4	ITM-0052474/A;2-Symantec Endpoint Protection x 8
4	ITM-0009265/B;4-Microsoft Server 2008 std Edition OLP x 1
4	ITM-0091645/A;2-Hard Disk x 3
3	***ITM-0020185/D;3-UCP Assembly P70 (View) x 1***
4	ITM-0020186/C;2-P70 UCP Cabinet (View) x 1
4	ITM-0052474/A;2-Symantec Endpoint Protection x 1
3	***ITM-0056773/D;2-UCP Assembly P80 (View) x 1***
4	ITM-0056774/C;2-P80 UCP Cabinet (View) x 1
4	ITM-0052474/A;2-Symantec Endpoint Protection x 1
3	***ITM-0021571/B;1-Inergen System Assembly P70 (View) x 1***
4	ITM-0021574/C;1-P70 Inergen System x 1
3	***ITM-0038072/B;1-Inergen System Assembly P80 (View) x 1***
4	ITM-0038073/C;1-Inergen system P80 x 1
3	***ITM-0021573/A;4-F&G Equipment Assembly P70 (View) x 1***
4	ITM-0056783/C;2-P70 F&G System (View) x 1
4	ITM-0080938/B;2-ORBIS IS SMOKE DETECTOR x 8
4	ITM-0080939/B;2-XTRALIS VESDA EARLY WARNING SMOKE DETECTOR x 1
4	ITM-0080940/B;2-ORBIS IS HEAT DETECTOR x 3
4	ITM-0080941/B;2-IR GAS DETECTOR x 9
4	ITM-0080942/B;2-OIL MIST MONITOR x 1
4	ITM-0080943/B;2-OIL MIST DETECTOR x 2
4	ITM-0080944/B;2-COMBINED BEACON AND SOUNDER x 10
4	ITM-0080945/B;2-INERGEN RELEASE PUSHBUTTON x 3
4	ITM-0080946/B;2-FOAM RELEASE PUSHBUTTON x 1
4	ITM-0080947/B;2-INERGEN SYSTEM STATUS PANEL x 2
4	ITM-0096295/A;3-Cooper MEDC HD1 Heat Detector x 6
3	***ITM-0056779/A;3-F&G Equipment Assembly P80 (View) x 1***
4	ITM-0056782/C;2-P80 F&G System (View) x 1

Level	BOM Line
4	ITM-0080938/B;2-ORBIS IS SMOKE DETECTOR x 8
4	ITM-0080939/B;2-XTRALIS VESDA EARLY WARNING SMOKE DETECTOR x 1
4	ITM-0080940/B;2-ORBIS IS HEAT DETECTOR x 3
4	ITM-0080941/B;2-IR GAS DETECTOR x 9
4	ITM-0080942/B;2-OIL MIST MONITOR x 1
4	ITM-0080943/B;2-OIL MIST DETECTOR x 2
4	ITM-0080944/B;2-COMBINED BEACON AND SOUNDER x 10
4	ITM-0080945/B;2-INERGEN RELEASE PUSHBUTTON x 3
4	ITM-0080946/B;2-FOAM RELEASE PUSHBUTTON x 1
4	ITM-0080947/B;2-INERGEN SYSTEM STATUS PANEL x 2
4	ITM-0096295/A;3-Cooper MEDC HD1 Heat Detector x 6
3	***ITM-0021572/A;3-Foam System Assembly P70 (View) x 1***
4	ITM-0021575/B;2-P70 Foam System x 1
3	***ITM-0056780/A;2-Foam System Assembly P80 (View) x 1***
4	ITM-0056781/B;2-P80 Foam System x 1
3	***ITM-0056647/A;3-HVAC System (View) x 1***
4	ITM-0038079/C;3-HVAC Air Cooling Units Assembly (View) x 1
4	ITM-0056532/B;2-P70 Filter Box for ACU A/B x 1
4	ITM-0056533/B;2-P80 Filter Box for ACU C/D x 1
4	ITM-0056726/C;2-P70 ACU A Shut-off Damper Inlet x 1
4	ITM-0056734/C;2-P70 ACU B Shut-off Damper Inlet x 1
4	ITM-0067558/C;2-P80 ACU C Shut-off Damper Inlet x 1
4	ITM-0067559/C;2-P80 ACU D Shut-off Damper Inlet x 1
4	ITM-0038080/B;3-HVAC Control Panels Assembly (View) x 1
4	ITM-0070935/B;3-P70 HVAC UCP x 1
4	ITM-0070936/B;2-P80 HVAC UCP x 1
4	ITM-0020187/C;3-HVAC Ducting Assembly (View) x 1
4	ITM-0056421/B;2-P70 HPU FAN 1 x 1
4	ITM-0056422/B;2-P70 HPU FAN 2 x 1
4	ITM-0056423/B;2-P80 HPU FAN 3 x 1
4	ITM-0056424/B;2-P80 HPU FAN 4 x 1
4	ITM-0056429/A;2-P70 Fire Damper Inlet Air x 1
4	ITM-0056430/A;2-P80 Fire Damper Inlet Air x 1
4	ITM-0056431/A;2-P70 Fire Damper Outlet Air HPU Room x 1
4	ITM-0056432/A;2-P80 Fire Damper Outlet Air HPU Room x 1
4	ITM-0056433/A;2-P70 Fire Damper Outlet Air Air Lock x 1
4	ITM-0056434/A;3-P80 Fire Damper Outlet Air Air Lock x 1
4	ITM-0056498/A;3-P70 Fire Damper Control room/HPU room x 1
4	ITM-0056499/A;2-P80 Fire Damper Control room/HPU room x 1
4	ITM-0056500/B;2-P70 Balancing Damper Fresh Air VSD Room x 1
4	ITM-0056501/B;2-P80 Balancing Damper Fresh Air VSD Room x 1
4	ITM-0056502/B;2-P70 Balancing Damper Fresh Air Air Lock x 1
4	ITM-0056503/B;2-P80 Balancing Damper Fresh Air Air Lock x 1
4	ITM-0056504/A;2-P70 Duct Heater Air Lock x 1

Level	BOM Line
4	ITM-0056505/A;2-P80 Duct Heater Air Lock x 1
4	ITM-0056506/A;2-P70 Pressure Relief Damper Air Lock x 1
4	ITM-0056507/A;2-P80 Pressure Relief Damper Air Lock x 1
4	ITM-0056508/A;2-P70 Pressure Relief Damper HPU Room x 1
4	ITM-0056509/A;2-P80 Pressure Relief Damper HPU Room x 1
4	ITM-0056510/A;2-P70 Balancing Damper HPU Room x 1
4	ITM-0056511/A;2-P80 Balancing Damper HPU Room x 1
4	ITM-0063660/A;3-P70 Fire Damper Inergen Release VSD/Control Room x 1
4	ITM-0063661/A;2-P80 Fire Damper Inergen Release VSD/Control Room x 1
4	ITM-0063662/A;2-P70 Fire Damper Inergen Release HPU Room x 1
4	ITM-0063663/A;2-P80 Fire Damper Inergen Release HPU Room x 1
4	ITM-0070014/A;3-P70 Fire Damper Outlet Air VSD/Elec. Room x 1
4	ITM-0070015/A;2-P80 Fire Damper Outlet Air VSD/Elec. Room x 1
4	ITM-0070017/A;3-P70 HPU Room Air Inlet Balancing Damper x 1
4	ITM-0070018/A;3-P80 HPU Room Air Inlet Balancing Damper x 1
4	ITM-0075860/A;2-P70 ACU A/B Return Air Balancing Damper A x 1
4	ITM-0075861/A;2-P70 ACU A/B Return Air Balancing Damper B x 1
4	ITM-0075862/A;2-P70 ACU A/B Return Air Balancing Damper C x 1
4	ITM-0075863/A;2-P70 ACU A/B Return Air Balancing Damper D x 1
4	ITM-0075864/A;2-P80 ACU A/B Return Air Balancing Damper A x 1
4	ITM-0075865/A;2-P80 ACU A/B Return Air Balancing Damper B x 1
4	ITM-0075866/A;2-P80 ACU A/B Return Air Balancing Damper C x 1
4	ITM-0075867/A;2-P80 ACU A/B Return Air Balancing Damper D x 1
4	ITM-0094132/A;5-P70 HPU FAN 1 Shut Off Damper x 1
4	ITM-0094133/A;4-P70 HPU FAN 2 Shut Off Damper x 1
4	ITM-0094134/A;5-P80 HPU FAN 3 Shut Off Damper x 1
4	ITM-0094135/A;5-P80 HPU FAN 4 Shut Off Damper x 1
4	ITM-0040023/C;4-HVAC Piping and Tubing Assembly (View) x 1
4	ITM-0056727/A;1-P70 Balancing Valve PCM Water Outlet x 1
4	ITM-0056736/A;1-P80 Balancing Valve Water Outlet x 1
4	ITM-0067507/A;3-P70 Isolating Valve Water Inlet x 1
4	ITM-0067508/A;2-P70 Isolating Valve Water Outlet x 1
4	ITM-0067509/A;2-P80 Isolating Valve Water Inlet x 1
4	ITM-0067510/A;2-P80 Isolating Valve Water Outlet x 1
4	ITM-0067512/A;2-P70 VSD 1 Isolating Valve Water Inlet x 1
4	ITM-0067513/A;2-P70 VSD 1 Isolating Valve Water Outlet x 1
4	ITM-0067514/A;2-P70 VSD 2 Isolating Valve Water Inlet x 1
4	ITM-0067515/A;3-P70 VSD 2 Isolating Valve Water Outlet x 1
4	ITM-0067516/A;3-P80 VSD 3 Isolating Valve Water Inlet x 1
4	ITM-0067517/A;2-P80 VSD 3 Isolating Valve Water Outlet x 1
4	ITM-0067518/A;2-P80 VSD 4 Isolating Valve Water Inlet x 1
4	ITM-0067519/A;2-P80 VSD 4 Isolating Valve Water Outlet x 1
4	ITM-0083609/A;2-PCM P70 Pressure Regulator for Air to Fire Dampers x 1
4	ITM-0083610/A;2-PCM P70 Hand Operated Valve for Air to Fire Dampers x 1

Level	BOM Line
4	ITM-0083611/A;2-PCM P80 Pressure Regulator for Air to Fire Dampers x 1
4	ITM-0083612/A;2-PCM P80 Hand Operated Valve for Air to Fire Dampers x 1
4	ITM-0056723/A;1-P70 Balancing Valve VSD 1 x 1
4	ITM-0056724/A;1-P70 Balancing Valve VSD 2 x 1
4	ITM-0056732/A;1-P80 Balancing Valve VSD 3 x 1
4	ITM-0056733/A;1-P80 Balancing Valve VSD 4 x 1
4	ITM-0056526/C;4-P70 Air Indicators and Sensors Assembly (View) x 1
4	ITM-0056520/B;3-P70 ACU A Return Air Temperature Transmitter x 1
4	ITM-0056719/B;3-P70 ACU B Return Air Temperature Transmitter x 1
4	ITM-0083631/A;2-HPU Fan 1 Flow Switch x 1
4	ITM-0083632/A;2-HPU Fan 2 Flow Switch x 1
4	ITM-0083635/A;2-P70 HPU Room Temperature Transmitter x 1
4	ITM-0083637/A;2-P70 VSD Room Temperature Transmitter x 1
4	ITM-0083639/A;3-P70 VSD Room dP Transmitter x 1
4	ITM-0083641/A;2-P70 Air Lock Room dP Transmitter x 1
4	ITM-0083645/A;2-P70 Air Filter dP Indicator & Transmitter x 1
4	ITM-0083647/A;2-P70 VSD Room Pressure Gauge x 1
4	ITM-0083649/A;2-P70 VSD Room Temperature Gauge x 1
4	ITM-0083653/A;2-P70 Air Lock Room Pressure Gauge x 1
4	ITM-0083655/A;2-P70 Air Lock Room Temperature Gauge x 1
4	ITM-0056721/B;5-P70 Air Lock Room Temperature Switch For Duct Heater x 1
4	ITM-0083627/A;2-HPU Fan 1 Local Emergency Stop x 1
4	ITM-0083628/A;2-HPU Fan 2 Local Emergency Stop x 1
4	ITM-0056527/C;6-P80 Air Indicators and Sensors Assembly (View) x 1
4	ITM-0056522/B;3-P80 ACU C Return Air Temperature Transmitter (View) x 1
4	ITM-0056728/B;3-P80 ACU D Return Air Temperature Transmitter x 1
4	ITM-0083633/A;2-HPU Fan 3 Flow Switch x 1
4	ITM-0083634/A;2-HPU Fan 4 Flow Switch x 1
4	ITM-0083636/A;2-P80 HPU Room Temperature Transmitter x 1
4	ITM-0083638/A;2-P80 VSD Room Temperature Transmitter x 1
4	ITM-0083640/A;3-P80 VSD Room dP Transmitter x 1
4	ITM-0083642/A;2-P80 Air Lock Room dP Transmitter x 1
4	ITM-0083646/A;2-P80 Air Filter dP Indicator & Transmitter x 1
4	ITM-0083648/A;2-P80 VSD Room Pressure Gauge x 1
4	ITM-0083650/A;2-P80 VSD Room Temperature Gauge x 1
4	ITM-0083654/A;2-P80 Air Lock Room Pressure Gauge x 1
4	ITM-0083656/A;2-P80 Air Lock Room Temperature Gauge x 1
4	ITM-0056722/B;4-P80 Air Lock Room Temperature Switch For Duct Heater x 1
4	ITM-0083629/A;2-HPU Fan 3 Local Emergency Stop x 1
4	ITM-0083630/A;3-HPU Fan 4 Local Emergency Stop x 1
4	ITM-0056528/C;3-P70 Water Indicators and Sensors Assembly (View) x 1
4	ITM-0070937/A;2-P70 ACU A Water Detector x 1
4	ITM-0070938/A;2-P70 ACU B Water Detector x 1
4	ITM-0070941/A;2-P70 Piping Water Detector x 1

Level	BOM Line
4	ITM-0083657/A;2-P70 Water Inlet Temperature Gauge x 1
4	ITM-0083659/A;2-P70 Water Outlet Temperature Gauge x 1
4	ITM-0083661/A;2-P70 Water Inlet Pressure Gauge x 1
4	ITM-0083663/A;2-P70 Water Outlet Pressure Gauge x 1
4	ITM-0056529/C;3-P80 Water Indicators and Sensors Assembly (View) x 1
4	ITM-0070939/A;2-P80 ACU C Water Detector x 1
4	ITM-0070940/A;3-P80 ACU D Water Detector x 1
4	ITM-0070942/A;3-P80 Piping Water Detector x 1
3	***ITM-0095968/A;3-SEC Assembly P70 (View) x 1***
4	ITM-0089584/A;2-Safety Equipment Cabinet P70 x 1
3	***ITM-0095969/A;4-SEC Assembly P80 (View) x 1***
4	ITM-0089585/A;2-Safety Equipment Cabinet P80 x 1
3	***ITM-0020500/A;3-BF outboard PCM connectors x 1***
3	***ITM-0038655/A;4-CF outboard PCM connectors x 1***
2	**ITM-0025365/B;3-Infield Jumpers (View) x 1**
3	***ITM-0020502/B;2-HV Electrical Flying Lead (View) x 12***
4	ITM-0029849/B;3-HV WM FLYING LEAD PLUG TO PLUG R/A CONNECTORS
3	***ITM-0020506/B;7-BF - Flying Lead (View) x 4***
4	ITM-0055851/C;2-Hose Barrier Fluid
4	ITM-0094266/A;4-Walther Female Connector (R1) with Autoclave MP w/fishtail (View) x 2
4	ITM-0005923/B;2-ROV female connector stab R1 with Autoclave
3	***ITM-0089693/B;2-Hydraulic Flying Lead P70/P80-CF-PU (View) x 4***
4	ITM-0005924/B;2-ROV female connector stab R2 with Autoclave x 2
4	ITM-0077698/B;2-Control Fluid Hose
3	***ITM-0052298/C;2-H#9 ETHERNET EFL x 8***
3	***ITM-0054652/C;2-H#10 SIGNAL EFL x 8***
3	***ITM-0052295/C;2-H#3 LV EFL x 4***
3	***ITM-0058985/D;1-H#4 OFL (View) x 4***
4	ITM-0053563/D;1-FO TOPSIDE PROTECTIVE CAP FOR PLUG x 2
3	***ITM-0056054/E;2-Type 1 HFL with Outboard MQC head x 2***
3	***ITM-0056055/E;2-Type 2 HFL with MQC head x 2***
3	***ITM-0056057/E;2-Type 3 HFL with MQC head***
3	***ITM-0087644/B;4-Stab Hot 43mm 1 port CV Super Duplex x 2***
3	***ITM-0093501/C;1-ROV Earth plug to plug jumper x 2***
2	**ITM-0025586/G;1-Tools and Skids (View) x 1**
3	***ITM-0020521/C;1-Dummy MPP Module (View) x 1***
4	ITM-0081765/C;2-PRIMARY STEEL (View)
4	ITM-0099480/A;6-SOFT LANDING CYLINDER TF SL100/70-200 x 4
3	***ITM-0020522/C;1-DUMMY PUMP UNIT ASSY (View) x 4***
4	ITM-0093789/C;1-SECONDARY STRUCTURE DUMMY PUMP UNIT (View)
4	ITM-0057751/E;4-Destec female hub G8SBN-HD190 8" SCH 160 BW x 2
4	ITM-0094701/A;2-DIGITRON ROV RECEPTACLE CONNECTOR
4	ITM-0094839/A;2-WEPS-100 PT/TT SENSOR

Level	BOM Line
4	ITM-0117907/A;6-Harness #23 Cable 1.5m
4	ITM-0069944/C;1-H#23 DUMMY PUMP - JUMPER HARNESS W/SENSOR
4	ITM-0096152/C;1-Soft landing system SL100x270x300 x 2
4	ITM-0060930/B;3-destec clamp G8SB left handed
4	ITM-0060931/B;3-destec clamp G8SB right hand
3	***ITM-0020525/B;1-ROV Subsea Storage Basket x 1***
3	***ITM-0020526/D;1-PUMP UNIT INSTALLATION TOOL (View) x 2***
4	ITM-0068160/A;4-ACCUMULATOR ASSEMBLY 9060 (View) x 1
3	***ITM-0020536/B;1-TEST AND TRANSPORT SKID SCM (View) x 1***
3	***ITM-0020538/A;7-Test SPCU Cabinet (View)***
4	ITM-0065849/A;6-Topside Fiber Optical Modem - Focal 922 Assembly (View) x 2
4	ITM-0056151/A;7-Topside Fiber Optical Modem - Focal 922
4	ITM-0069149/A;7-CONNECTOR HARNESS, 37-PIN MICRO D, MALE MIN-E-CON 72.0 INCH, FOCAL 922 MODEM
3	***ITM-0020542/D;1-FL DEPLOYMENT FRAMES FOR P70/P80 (View) x 1***
4	ITM-0108001/C;1-1- FL Deployment Frame
4	ITM-0108002/C;1-2- FL Deployment Frame
4	ITM-0108003/C;1-3- FL Deployment Frame
4	ITM-0108004/C;1-4- FL Deployment Frame
4	ITM-0108005/C;1-5- FL Deployment Frame
4	ITM-0108006/C;1-6- FL Deployment Frame
4	ITM-0108007/C;1-7- FL Deployment Frame
3	***ITM-0081689/C;2-Flying Lead Orientation Tool x 2***
3	***ITM-0064253/D;2-Choke Insert Running Tool (View) x 2***
3	***ITM-0064280/D;2-Choke Insert Running Tool Shipping Skid x 2***
3	***ITM-0064254/D;3-Choke Insert Transport and Workover Skid x 1***
3	***ITM-0097496/A;5-Laptop for HVAC UCP***
3	***ITM-0096345/A;3-SCM Transport skid final assembly (View) x 2***
3	***ITM-0081096/B;1-SCM INSTALLATION TOOL (View)***
4	ITM-0082534/A;2-SOFT LANDING CYLINDER 60-200 x 2
3	***ITM-0112816/D;1-PU IT SIMLIFIED (View) x 2***
2	**ITM-0020516/K;1-SUPPORT AND LEVELING STRUCTURE P80 - ASSEMBLY DRAWING (View) x 1**
3	***ITM-0057752/I;1-SUPPORT AND LEVELING STRUCTURE - WELDING DRAWING SECONDARY STEEL (View)***
4	ITM-0057753/J;1-SUPPORT AND LEVELING STRUCTURE - WELDING DRAWING PRIMARY STEEL (View)
3	***ITM-0113295/B;1-MPP MODULE GUIDE POST (LONG) - ROV BOTTOM RELEASABLE***
3	***ITM-0113296/C;1-MPP MODULE GUIDE POST (SHORT) - ROV BOTTOM RELEASABLE***
3	***ITM-0083506/A;4-HANGOFF PLATE x 4***
3	***ITM-0042712/C;8-STAB RECEPTACLE (View) x 4***
3	***ITM-0076174/B;2-STABCON MOUNTING PLATE (View) x 4***
2	**ITM-0020515/C;1-FOUNDATION - ASSEMBLY DRAWING (View) x 2**
3	***ITM-0057803/H;1-FOUNDATION - WELDING DRAWING SECONDARY STEEL (View) x 1***
4	ITM-0057804/J;1-FOUNDATION - WELDING DRAWING PRIMARY STEEL (View)

Level	BOM Line
4	ITM-0058609/D;2-RETAINMENT BOLT FIXED
4	ITM-0058608/D;2-REATAINMENT BOLT FREE
4	ITM-0075633/F;1-IMENCO GUIDE PIN RECEPTACLE - SUPPORT (View) x 2
4	ITM-0059403/E;1-FOUNDATION VENTING HATCH (View) x 2
4	ITM-0059404/D;1-ASSEMBLY DRAWING - FOUNDATION VENTING HATCH (View)
3	***ITM-0081134/E;2-SUPPORT AND LEVELING STRUCTURE GUIDE POST (LONG) - ROV TOP RELEASABLE (View)***
3	***ITM-0081136/E;1-SUPPORT AND LEVELING STRUCTURE GUIDE POST (SHORT) - ROV TOP RELEASABLE***
3	***ITM-0087120/B;2-ONSHORE LIFTING SLINGS - FOUNDATION (View)***
4	ITM-0077692/A;2-SLING LOW x 4
4	ITM-0011962/A;2-LIFT RING x 3
4	ITM-0081507/A;5-CROSBY WIDE BODY SHACKLE - 125T (View) x 4
4	ITM-0116523/A;3-ROV SHACKLE
4	ITM-0085698/B;1-BULL`S EYE PROTECTION (View)
2	**ITM-0020501/A;3-Operator Training Station (View) x 1**
3	***ITM-0090961/A;14-OTS - Operator Station x 2***
3	***ITM-0090962/A;4-OTS - Instructor Station x 1***
2	**ITM-0048178/B;2-SDU Connectors, parkings, caps (View) x 1**
3	***ITM-0056060/D;2-Parking receptacle x 4***
3	***ITM-0056053/D;2-Inboard MQC Head with 2 Male Couplers (SDU 80) (View) x 2***
3	***ITM-0056059/D;2-Long Term Protection for Male 2 Ports Plate x 2***
3	***ITM-0056058/D;2-Long Term Protection Caps for Male 4 Ports Plate x 2***
3	***ITM-0056051/D;2-Inboard MQC Head with 4 Male Couplers (SDU 70) (View) x 2***
3	***ITM-0056643/D;2-Outboard Test Plate x 4***
3	***ITM-0003702/A;5-ROV male connector receptacle R1 with weld tail (S Duplex) (View) x 4***
3	***ITM-0003687/B;2-ROV connector parking receptacle R0 x 4***
3	***ITM-0056825/C;3-H#18 ROV PARKING DUMMY PLUG x 6***
3	***ITM-0052277/C;3-H#1 LV UMBILICAL TERMINATION ROV PLUG x 6***
3	***ITM-0073920/C;1-H#27 FO ROV PARKING DUMMY RECEPTACLE x 12***
3	***ITM-0073362/B;2-H#19 ROV FLYING DUMMY RECEPTACLE x 6***
3	***ITM-0058984/D;1-H#2 FO UMBILICAL TERMINATION JUMPER HARNESS x 6***
3	***ITM-0058987/C;2-H#25 FO ROV FLYING DUMMY PLUG - LOOPED LTPC x 14***
3	***ITM-0009574/C;6-Parking connector HV x 16***
3	***ITM-0060317/A;4-ROV RECEPTACLE CONNECTOR x 2***
3	***ITM-0060349/B;3-ROV TEST DUMMY PLUG FOR SWIMMER SYSTEM x 3***
3	***ITM-0060360/B;2-ROV TOPSIDE TEST PLUG***
3	***ITM-0060361/A;6-ROV PARKING RECEPTACLE CONNECTOR x 2***
3	***ITM-0093500/D;1- Earth receptacle connector x 2***
3	***ITM-0084256/B;1-SDU Power Jumper 3 Slot Receptacle Assembly Drawing (View) x 4***
3	***ITM-0093722/A;2-4 Slot Power Jumper Parking Receptacle Assembly Drawing (View) x 4***
3	***ITM-0006373/C;2-ROV connector plug R0 with fishtail (View) x 4***
3	***ITM-0003693/C;3-ROV connector plug R0 dummy female***

Level	BOM Line
3	ITM-0003694/C;2-ROV connector plug R0 releaseble x 4
3	ITM-0029851/C;2-HV WM PLUG TYPE TEST CONNECTOR (View) x 7
3	ITM-0013094/C;2-TEST - ROV TEST RECEPTACLE W/PIGTAIL
3	ITM-0060291/D;2-Spectron 8 UTU - ROV RECEPTACLE x 2
3	ITM-0113422/A;5-Stab Plate - Connector Assembly (View) x 14
3	ITM-0003692/C;2-ROV female connector stab R1 with JIC x 4
3	ITM-0056061/D;3-Parking temporary protective cover x 4
3	ITM-0071787/C;1-H#28 TEST - FO ROV FLYING PLUG W/HOSE AND BOX (View) x 7
3	ITM-0053563/D;1-FO TOPSIDE PROTECTIVE CAP FOR PLUG x 1
3	ITM-0128150/A;4-Swimmer Topside Test Plug
3	ITM-0024728/C;2-TEST - ROV TEST RECEPTACLE W/PIGTAIL x 3
3	ITM-0076470/A;2-STAB PLATE ASSEMBLY (View) x 2
3	ITM-0106964/B;1-Parking Receptacle Subsea for Earth Plug Connector x 2
3	ITM-0106965/B;3-Protection Plug Subsea for Earth Receptacle Connector x 2
2	ITM-0038653/C;1-Test Equipment (View) x 1
3	ITM-0037077/B;2-Test HPU CF x 1
3	ITM-0037078/B;2-Test HPU BF x 1
3	ITM-0020530/A;1-Test Equipment
3	ITM-0020538/A;7-Test SPCU Cabinet (View)
3	ITM-0065849/A;6-Topside Fiber Optical Modem - Focal 922 Assembly (View) x 2
3	ITM-0056151/A;7-Topside Fiber Optical Modem - Focal 922
3	ITM-0069149/A;7-CONNECTOR HARNESS, 37-PIN MICRO D, MALE MIN-E-CON 72.0 INCH, FOCAL 922 MODEM
3	ITM-0016573/B;2-IXXAT CANopen Device Manager x 1
3	ITM-0069673/A;4-IXXAT USB-to-CAN II interface - Automotive Version x 1
3	ITM-0029851/C;2-HV WM PLUG TYPE TEST CONNECTOR (View)
3	ITM-0071787/C;1-H#28 TEST - FO ROV FLYING PLUG W/HOSE AND BOX (View) x 2
3	ITM-0053563/D;1-FO TOPSIDE PROTECTIVE CAP FOR PLUG x 1
3	ITM-0082750/A;1-Win Server 2012 Standard x 1
3	ITM-0083852/A;1-Microsoft Windows 8 Pro x 1
3	ITM-0083853/A;1-WinPro SNGL Upgrade to virtuell x 1
3	ITM-0082749/A;1-Office Pro Plus 2013 SNGL OLP NL x 1
3	ITM-0096285/A;2-Factory Talk Gateway 5000 Tags SW x 1
3	ITM-0011889/C;2-Factory Talk View SE Server 100 displays SW x 1
3	ITM-0011890/C;2-Factory Talk View SE Client SW x 1
3	ITM-0011891/B;3-RS Logix Service Edition SW x 1
3	ITM-0016179/A;10-Canary TLEH 1000 Historian & 2x Trendlink SW x 1
3	ITM-0096281/A;2-Canary Trend Historian 500 Tags SW x 1
3	ITM-0122981/A;2-O-Ring Back Seal 234ID*3.5Dia x 50
3	ITM-0073919/C;1-H#29 TEST - FO ROV BULKHEAD RECEPTACLE W/HOSE AND BOX (View) x 2
3	ITM-0071816/C;1-FO TOPSIDE PROTECTIVE CAP FOR RECEPTACLE x 1
3	ITM-0056794/C;3-H#36 TEST - ROV PLUG W/HOSE & PIGTAIL x 2
3	ITM-0024930/C;2-TEST - ROV TEST PLUG W/PIGTAIL x 2

Level	BOM Line
3	*ITM-0013094/C;2-TEST - ROV TEST RECEPTACLE W/PIGTAIL x 2*
3	*ITM-0024728/C;2-TEST - ROV TEST RECEPTACLE W/PIGTAIL x 2*
3	*ITM-0052748/D;1-TEST - EROV TEST PLUG W/PIGTAIL x 2*
3	*ITM-0052740/D;1-TEST - EROV TEST RECEPTACLE W/PIGTAIL*
3	*ITM-0056642/D;3-Inboard Test Plate x 2*
3	*ITM-0056643/D;2-Outboard Test Plate x 2*
3	*ITM-0094256/B;1-Walter Female Connector (R1) with JIC w/fishtail (View) x 2*
3	*ITM-0003692/C;2-ROV female connector stab R1 with JIC*
3	*ITM-0094273/A;3-Walther Female Connector (R2) with JIC w/fishtail (View) x 2*
3	*ITM-0003695/B;2-ROV female connector stab R2 with JIC*
3	*ITM-0003696/B;3-ROV male connector receptacle R2 with JIC x 2*
3	*ITM-0003691/C;2-ROV male connector receptacle R1 with JIC x 2*
2	ITM-0074472/A;8-Flow Line Equipment (View) x 1
3	*ITM-0052308/B;2-M801 Outboard hub. Transportation frame. (View)*
3	*ITM-0049341/C;1-Term.Head KC4-10, ID6+2+8HL, S1*
3	*ITM-0042436/C;5-CAP INBOARD LPE, KC4-10, ID8 x 12*
3	*ITM-0049325/C;2-Belly Clamp x 10*
3	*ITM-0042709/C;3-Outboard Hub Prot. Cap, KC4-10 x 10*
3	*ITM-0049319/B;9- Termination Head KC4.2-10, ID8, Stabcon MK1 x 8*
3	*ITM-0042708/C;6-Termination Head KC4-10, ID8, Stabcon MK1 x 2*
3	*ITM-0049329/B;8-Lifting Frame for 21 hour Insulation Cap (View) x 4*
3	*ITM-0049321/B;5-Transportation frames for termination heads (View) x 10*
3	*ITM-0049346/B;7-Stab adjustment jig Receptacle adjustment jig in FE specification).*
3	*ITM-0049328/B;3-Transportation frame for Belly Clamps (View) x 5*
3	*ITM-0042710/C;5-Test Cap Outb. (HP), KC4-10, ID6/8 x 10*
3	*ITM-0042711/D;2-CAP, INSULATION, REINST., KC4.2-10, LARGE TYPE, MANIFOLD SIDE, GA x 10*
3	*ITM-0049331/B;3-Seals and gaskets; Installation seals (View) x 13*
3	*ITM-0042713/C;2-Seals and gaskets; Test seals x 56*
3	*ITM-0052309/B;2-Dummy frame for CAT Interface test.*
3	*ITM-0042438/C;18-Cap Inboard Test & Flushing (HP), KC4-10, ID8 x 8*
3	*ITM-0042707/C;10- Flowing Test Cap, KC4-10, ID8 x 4*
3	*ITM-0049327/B;7-Basket, Insert F/ Insulation Cap (View) x 10*
3	*ITM-0096126/B;2-Lifting Yoke x 4*
3	*ITM-0105602/A;2-LP CAP MeOH Termination Head*
3	*ITM-0114583/B;1-Outboard HP Cap*
3	*ITM-0112477/B;2-ROV Tool, Torque, clutch*
3	*ITM-0110628/A;2-Insulation, split seal*
2	ITM-0089583/A;4-PCM Foam Deluge Skid x 1
2	ITM-0080221/D;1-SUPPORT AND LEVELING STRUCTURE P70 – ASSEMBLY DRAWING (View) x 1
3	*ITM-0057753/J;1-SUPPORT AND LEVELING STRUCTURE - WELDING DRAWING PRIMARY STEEL (View)*
3	*ITM-0057752/I;1-SUPPORT AND LEVELING STRUCTURE - WELDING DRAWING SECONDARY STEEL (View)*

Level	BOM Line
4	ITM-0057753/J;1-SUPPORT AND LEVELING STRUCTURE - WELDING DRAWING PRIMARY STEEL (View)
3	***ITM-0113295/B;1-MPP MODULE GUIDE POST (LONG) - ROV BOTTOM RELEASABLE***
3	***ITM-0113296/C;1-MPP MODULE GUIDE POST (SHORT) - ROV BOTTOM RELEASABLE***
3	***ITM-0083506/A;4-HANGOFF PLATE x 4***
3	***ITM-0042712/C;8-STAB RECEPTACLE (View) x 4***
3	***ITM-0076174/B;2-STABCON MOUNTING PLATE (View) x 4***
2	**ITM-0038654/A;9-Operator Work Station (OWS) (View) x 1**
3	***ITM-0032875/D;3-Server SuperMicro CSE-825 Short (View) x 1***
3	***ITM-0046529/A;3-Optical Mouse x 1***
3	***ITM-0046533/A;5-Keyboard x 1***
3	***ITM-0052474/A;2-Symantec Endpoint Protection x 1***
3	***ITM-0080228/A;1-Monitor Fujitsu 19" 1280x1024 x 2***
3	***ITM-0082751/A;1-Windows 7 Ultimate x 1***
3	***ITM-0082752/A;1-Chief dual vertical monitor table stand x 1***
3	***ITM-0083848/A;1-Supermicro Front Bezel Cover x 1***
3	***ITM-0082641/A;1-KVM unit_cl5708 x 2***
3	***ITM-0082806/A;1-KVM Cable USB x 2***
3	***ITM-0080234/A;1-Media Converter, Black Box x 2***
3	***ITM-0084641/A;2-Patch Cable x 2***
3	***ITM-0084640/A;1-RJ45 Cable x 4***
3	***ITM-0084644/A;1-VGA Cable x 2***
3	***ITM-0084642/A;2-Patch Panel x 1***
3	***ITM-0084645/A;2-Powerbar x 1***
3	***ITM-0084639/A;1-Graphic Card, dual screen x 1***
3	***ITM-0084651/A;1-Shelf x 1***
3	***ITM-0038134/A;11-Fiber Optic Cable x 1***
3	***ITM-0096143/A;2-KVM Extender x 1***
2	**ITM-0020519/C;2-MPP MODULE P70 w/retrievable (View) x 1**
3	***ITM-0057559/E;3-MPP MODULE (P70) ASSEMBLY (View)***
4	ITM-0057039/F;2-MPP MODULE - WELDING DRAWING SECONDARY STEEL (View)
4	ITM-0057041/F;2-MPP MODULE - PRIMARY STEEL WELDING DRAWING (View)
4	ITM-0060304/A;2-SCM Mounting Base Assembly (View)
4	ITM-0052300/D;2-H#12 ETHERNET JUMPER (View) x 2
4	ITM-0034188/D;2-H#20 JUMPER HARNESS W/SENSOR (View) x 1
4	ITM-0034189/D;2-H#21 JUMPER HARNESS W/SENSOR (View) x 2
4	ITM-0052301/E;2-H#22 JUMPER W/ODI CONNECTOR (View) x 2
4	ITM-0081753/B;2-H#32 ETHERNET JUMPER (View) x 2
4	ITM-0081757/B;5-H#33 JUMPER HARNESS W/SENSOR (View) x 1
4	ITM-0056826/D;2-H#16 ROV PARKING RECEPTACLE x 8
4	ITM-0077951/A;2-BRACKET FOR JUNCTION BOX (View) x 8
4	ITM-0081756/A;2-H#12 ETHERNET JUMPER - PHANTOM (View)
4	ITM-0081758/A;2-H#21 JUMPER HARNESS W/SENSOR - PHANTOM (View)
4	ITM-0083827/A;2-H#22 JUMPER W/ODI CONNECTOR - PHANTOM (View)

Level	BOM Line
4	ITM-0081754/A;2-H#32 ETHERNET JUMPER - PHANTOM (View)
4	ITM-0087014/A;3-SOFT LANDING CYLINDER x 4
3	***ITM-0025652/G;1-PUMPUNIT ASSEMBLY (View) x 2***
4	ITM-0056111/D;1-PUMPUNIT - WELDING DRAWING SECONDARY STEEL (View)
4	ITM-0071600/E;4-MPFM - GA DRAWING 9060 - GIRRI PW Vx SS TYPE 4. 88U (View)
4	ITM-0085727/B;1-PUMP UNIT ROOF STRUCTURE
4	ITM-0052299/C;2-H#11 ETHERNET JUMPER x 2
3	***ITM-0020520/E;1-GirRI SCM (View)***
4	ITM-0055657/B;1-SCM Internal assembly
3	***ITM-0073879/B;2-V81 - Chemical Throttle Valve (View) x 2***
3	***ITM-0067141/B;2-MINIMUM FLOW VALVE INSERT x 2***
2	**ITM-0051128/B;1-MPP MODULE P80 w/retrievable (View) x 1**
3	***ITM-0069112/D;1-MPP MODULE (P80) ASSEMBLY (View)***
4	ITM-0057039/F;2-MPP MODULE - WELDING DRAWING SECONDARY STEEL
4	ITM-0057041/F;2-MPP MODULE - PRIMARY STEEL WELDING DRAWING
4	ITM-0060304/A;2-SCM Mounting Base Assembly (View)
4	ITM-0052300/D;2-H#12 ETHERNET JUMPER (View) x 2
4	ITM-0034188/D;2-H#20 JUMPER HARNESS W/SENSOR (View) x 1
4	ITM-0034189/D;2-H#21 JUMPER HARNESS W/SENSOR (View) x 2
4	ITM-0052301/E;2-H#22 JUMPER W/ODI CONNECTOR (View) x 2
4	ITM-0081753/B;2-H#32 ETHERNET JUMPER (View) x 2
4	ITM-0081757/B;5-H#33 JUMPER HARNESS W/SENSOR (View) x 1
4	ITM-0056826/D;2-H#16 ROV PARKING RECEPTACLE x 8
4	ITM-0077951/A;2-BRACKET FOR JUNCTION BOX (View) x 8
4	ITM-0081756/A;2-H#12 ETHERNET JUMPER - PHANTOM (View)
4	ITM-0081758/A;2-H#21 JUMPER HARNESS W/SENSOR - PHANTOM
4	ITM-0083827/A;2-H#22 JUMPER W/ODI CONNECTOR - PHANTOM
4	ITM-0081754/A;2-H#32 ETHERNET JUMPER - PHANTOM (View)
4	ITM-0087014/A;3-SOFT LANDING CYLINDER x 4
3	***ITM-0025652/G;1-PUMP UNIT ASSEMBLY (View) x 2***
4	ITM-0056111/D;1-PUMP UNIT - WELDING DRAWING SECONDARY STEEL
5	ITM-0023221/F;1-Pump Multiphase type 5FA5GD
4	ITM-0071600/E;4-MPFM - GA DRAWING 9060 - GIRRI PW Vx SS TYPE 4. 88U
4	ITM-0085727/B;1-PUMP UNIT ROOF STRUCTURE
4	ITM-0052299/C;2-H#11 ETHERNET JUMPER x 2
3	***ITM-0020520/E;1-GirRI SCM (View)***
4	ITM-0055657/B;1-SCM Internal assembly
3	***ITM-0073879/B;2-V81 - Chemical Throttle Valve (View) x 2***
3	***ITM-0067141/B;2-MINIMUM FLOW VALVE INSERT x 2***

1.6 Subsea MPP system

CENTRIFUGAL PUMP
API 610 10TH EDITION / ISO 13709
PROCESS DATA SHEET
SI UNITS

PAGE 2 OF 6

JOB NO. _____ ITEM NO.(S) _____
REQ. / SPEC. NO. _____ /
PURCH. ORDER NO. TEPA-GIR-2011-C200 DATE 04-Nov-2014
INQUIRY NO. _____ BY _____

APPLICABLE TO: ○ PROPOSALS ○ PURCHASE ● AS BUILT
FOR TOTAL UNIT ITM-0023221
SITE GirRI SERVICE Multiphase Flow

NOTES: INFORMATION BELOW TO BE COMPLETED: ○ BY PURCHASER ☐ BY MANUFACTURER ◯ BY MANUFACTURER OR PURCHASER

○ DATA SHEETS

	ITEM NO.	ATTACHED	ITEM NO.	ATTACHED	ITEM NO.	ATTACHED
PUMP		○		○		○
MOTOR		○		○		○
GEAR		○		○		○
TURBINE		○		○		○

APPLICABLE OVERLAY STANDARD(S):

REVISIONS

NO.	DATE	BY
1		
2		
3		
4		
5		

○ OPERATING CONDITIONS (5.1.3)

FLOW, NORMAL _____ (m^3/h) RATED 453 (m^3/h)
OTHER @ GVF = 53% (Note 1)

SUCTION PRESSURE MAX./RATED 9.4 / 4.7 (MPa)
DISCHARGE PRESSURE 13.5 (Note 1) (MPa)
DIFFERENTIAL PRESSURE 8.8 (Note 1) (MPa)
DIFF. HEAD _____ (m) NPSHA _____ (m)
PROCESS VARIATIONS (5.1.4) _____
STARTING CONDITIONS (5.1.4) _____
SERVICE: ● CONT. ○ INTERMITTENT (STARTS/DAY) _____
○ PARALLEL OPERATION REQ'D (5.1.13)

○ SITE DATA (5.1.3)

LOCATION: (5.1.30)
○ INDOOR ○ HEATED ○ OUTDOOR ○ UNHEATED
○ ELECTRICAL AREA CLASSIFICATION (5.1.24 / 6.1.4)
CL _____ GR _____ DIV _____
○ WINTERIZATION REQ'D ○ TROPICALIZATION REQ'D.

SITE DATA (5.1.30)
○ ALTITUDE -1450 (m) BAROMETER NA (MPa)
○ RANGE OF AMBIENT TEMPS: MIN./MAX. 3.8 / 4.4 (°C)

○ RELATIVE HUMIDITY: MIN. / MAX. NA / NA (%)
UNUSUAL CONDITIONS: (5.1.30) ○ DUST ○ FUMES
● OTHER SUBSEA APPLICATION

○ DRIVER TYPE

● INDUCTION MOTOR ○ STEAM TURBINE ○ GEAR
○ OTHER _____

○ MOTOR DRIVER (6.1.1 / 6.1.4)

◯ MANUFACTURER FRAMO / LOHER (Note 2 and Note 12)
☐ 2900 (kW) ☐ 4252 (r/min)
☐ FRAME FR355 ◯ ENCLOSURE 346 bar dp
◯ HORIZONTAL ◯ VERTICAL ◯ SERVICE FACTOR S9
◯ VOLTS/PHASE/HERTZ 6000/6600 / 3 / 71.5
○ TYPE Two pole induction motor
○ MINIMUM STARTING VOLTAGE (6.1.5) _____
◯ INSULATION 11 kV ○ TEMP. RISE B
◯ FULL LOAD AMPS 340 A
◯ LOCKED ROTOR AMPS NA
◯ STARTING METHOD Frequency drive
◯ LUBE Barrier oil (Note 7)

BEARINGS (TYPE/NUMBER):
☐ RADIAL Waukesha Tilt pad / 2
☐ THRUST Waukesha Tilt pad / 1
☐ VERTICAL THRUST CAPACITY
UP 0 (N) DOWN 45000 (N)

○ LIQUID (5.1.3)

LIQUID TYPE OR NAME OIL, GAS AND WATER
● HAZARDOUS ● FLAMMABLE ○ _____ (5.1.5)

	MIN.	NORMAL	MAX.
PUMPING TEMP (°C)	4	61.7 - 67.4	93 (Note 1)
VAPOUR PRESS. (MPa)			
RELATIVE DENSITY (SG):	0.46	0.46 - 0.92	1.0 (Note 1 and 8)
VISCOSITY (mPa·s)	0.8	0.8 - 2.6	2.6 (Note 1)

SPECIFIC HEAT, Cp _____ (kJ/kg·K)
○ CHLORIDE CONCENTRATION (6.5.2.4) _____ (mg/kg)
○ H_2S CONCENTRATION _____ (mol fraction) WET (5.12.1.12c)
CORROSIVE / EROSIVE AGENT _____ (5.12.1.9)

MATERIALS (5.12.1.1)

○ ANNEX H CLASS (5.12.1.1) _____
○ MIN DESIGN METAL TEMP (5.12.4.1) _____ (°C)
○ REDUCED-HARDNESS MATERIALS REQ'D. (5.12.1.12)
☐ BARREL/CASE 22% Cr Duplex IMPELLER 22% Cr Duplex +TC coating
☐ CASE/IMPELLER WEAR RINGS TC coating (Note 3)
☐ SHAFT 34 Cr Ni Mo6
☐ DIFFUSERS 22% Cr Duplex

◯ PERFORMANCE:

PROPOSAL CURVE NO. Note 9 ☐ max. 4600 r/min
☐ IMPELLER DIA. RATED 320 MAX. _____ MIN. _____ (mm)
☐ IMPELLER TYPE Helico-Axial - 10 stages
☐ RATED POWER 2500 kW (kW) EFFICIENCY _____ (%)
☐ MINIMUM CONTINUOUS FLOW:
THERMAL _____ (m^3/h) STABLE 120 at 1500 RPM (m^3/h)
☐ PREFERRED OPER. REGION _____ TO _____ (m^3/h)
☐ ALLOWABLE OPER. REGION _____ TO _____ (m^3/h)
☐ MAX. HEAD @ RATED IMPELLER _____ (m)
☐ MAX. POWER @ RATED IMPELLER _____ (kW)
☐ NPSHR AT RATED FLOW _____ (m) (5.1.10)
◯ MAX. SUCTION SPECIFIC SPEED: _____ (5.1.11)
◯ MAX. SOUND PRESS. LEVEL REQ'D NA (dBA) (5.1.16)
◯ EST. MAX. SOUND PRESS. LEVEL NA (dBA) (5.1.16)
◯ EST. MAX. SOUND POWER LEVEL NA (dBA) (5.1.16)

○ UTILITY CONDITIONS (5.1.3)

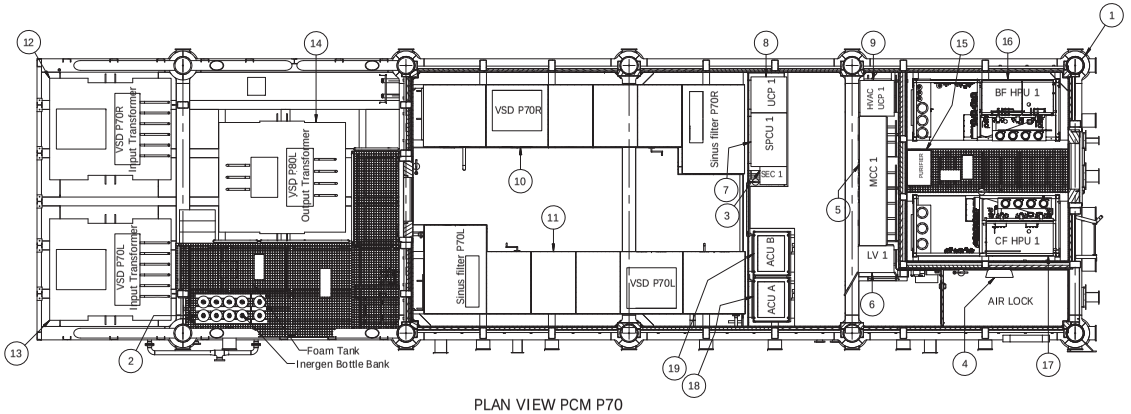
ELECTRICITY	VOLTAGE	PHASE		HERTZ
DRIVERS				
HEATING				

SYSTEM VOLTAGE DIP ○ 80% ○ OTHER _____ (6.1.5)

STEAM	MAX. PRESS.	MAX. TEMP.	MIN. PRESS.	MIN. TEMP.
DRIVERS				
HEATING				

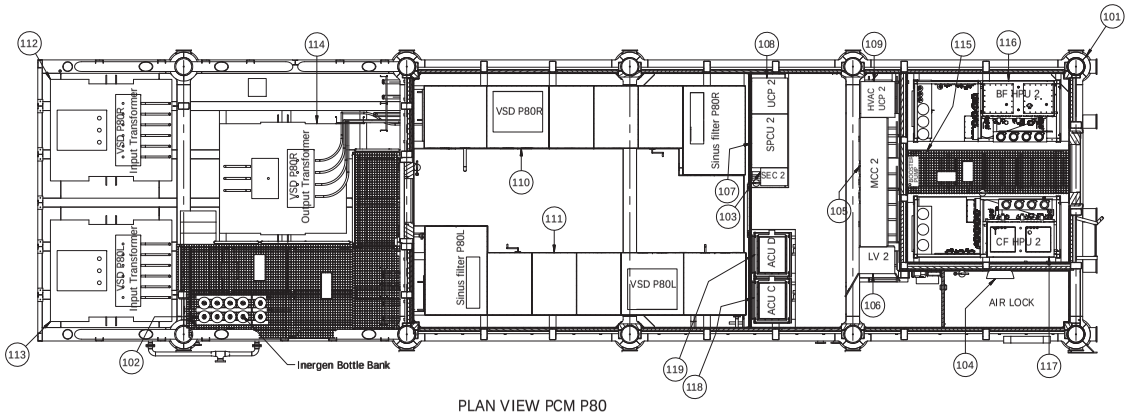
COOLING WATER: (5.1.19) SOURCE Sea
SUPPLY TEMP. 4 (°C) MAX. RETURN TEMP. _____ (°C)
NORM. PRESS. _____ (MPa) DESIGN PRESS. _____ (MPa)
MIN. RET. PRESS. _____ (MPa) MAX. ALLOW. D.P. _____ (MPa)
CHLORIDE CONCENTRATION: _____ (mg/kg)

1.7 Scope of supply



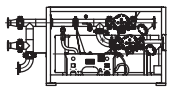
PLAN VIEW PCM P70

P70 PCM Equipment	
Item	Service Description
1	PCM P70
2	Inergen Bottlebank
3	Safety Equipment Cabinet
4	Stretcher
5	MCC 1
6	LV 1
7	SPCU 1
8	UCP 1
9	HVAC UCP 1
10	VSD P70R
11	VSD P70L
12	VSD P70R Input Transformer
13	VSD P70L Input Transformer
14	VSD P80L Output Transformer
15	Barrier Fluid Purifier
16	Barrier Fluid HPU
17	Control Fluid HPU
18	ACU A
19	ACU B

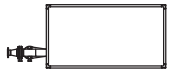


PLAN VIEW PCM P80

P80 PCM Equipment	
Item	Service Description
101	PCM P80
102	Inergen Bottlebank
103	Safety Equipment Cabinet
104	Stretcher
105	MCC 2
106	LV 2
107	SPCU 2
108	UCP 2
109	HVAC UCP 2
110	VSD P80R
111	VSD P80L
112	VSD P80R Input Transformer
113	VSD P80L Input Transformer
114	VSD P80L Output Transformer
115	Barrier Fluid Nitrogen Booster Pump
116	Barrier Fluid HPU
117	Control Fluid HPU
118	ACU C
119	ACU D



PCM FOAM SKID SIDE VIEW



PCM FOAM SKID TOP VIEW

Tooling:

- Trolleys for Inergen bottles
- Trolleys for HPU accumulators
- VSD: maintenance platform and trolley for handling VSD cells
- Flexible hoses for HPU maintenance
- Tooling for HVAC balancing valve adjustment
- SPCU
- OTS

General Equipment:

- Inergen Equipment panels
- Vesda System
- Engineering Work Stations
- Operator Training Station
- Operator Work Stations
- Emergency Lighting
- UPS PCM
- AUX PCM
- PAGA-SYSTEM A
- PAGA-SYSTEM B
- TELEPHONE
- Auxiliary Equipment
- Topside Tests Equipments
- PCM Load out rigging and Spreader Bar
- Lighting and small power PCM
- F&G Detection Equipment

NOTES:

NOTE 1: For External JB, Ducting and Dampers equipment, please see specific drawings given under references.

REFERENCE:

AO-050-GTO-311-000180 PCM P70/P80. GA EXTERNAL
AO-050-GTO-311-000185 PCM P70/P80. LIFT. ARR. AND COG
AO-050-GTO-332-000064 PCM - HVAC D&ID
AO-050-GTO-310-000006 PCM - SAFETY PLOT PLAN

ABBREVIATIONS

FLOT - Flying Lead Orientation Tool
MFCV - Minimum Flow Control Valve
FL - Flying Lead
LV - Low Voltage
HV - High Voltage
SCM - Subsea Control Module
OTS - Operational Training Station
PDS - Power Distribution System
MCC - Motor Control Center
HPU - Hydraulic Power Unit
CF - Control Fluid
BF - Barrier Fluid
MQC - Multi Quick Connector
MQC-P - Multi Quick Connector Parking
L - HV Connector
FO - Fiber Optic
EL - Small Power

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TOTAL E&P ANGOLA | OneSubsea

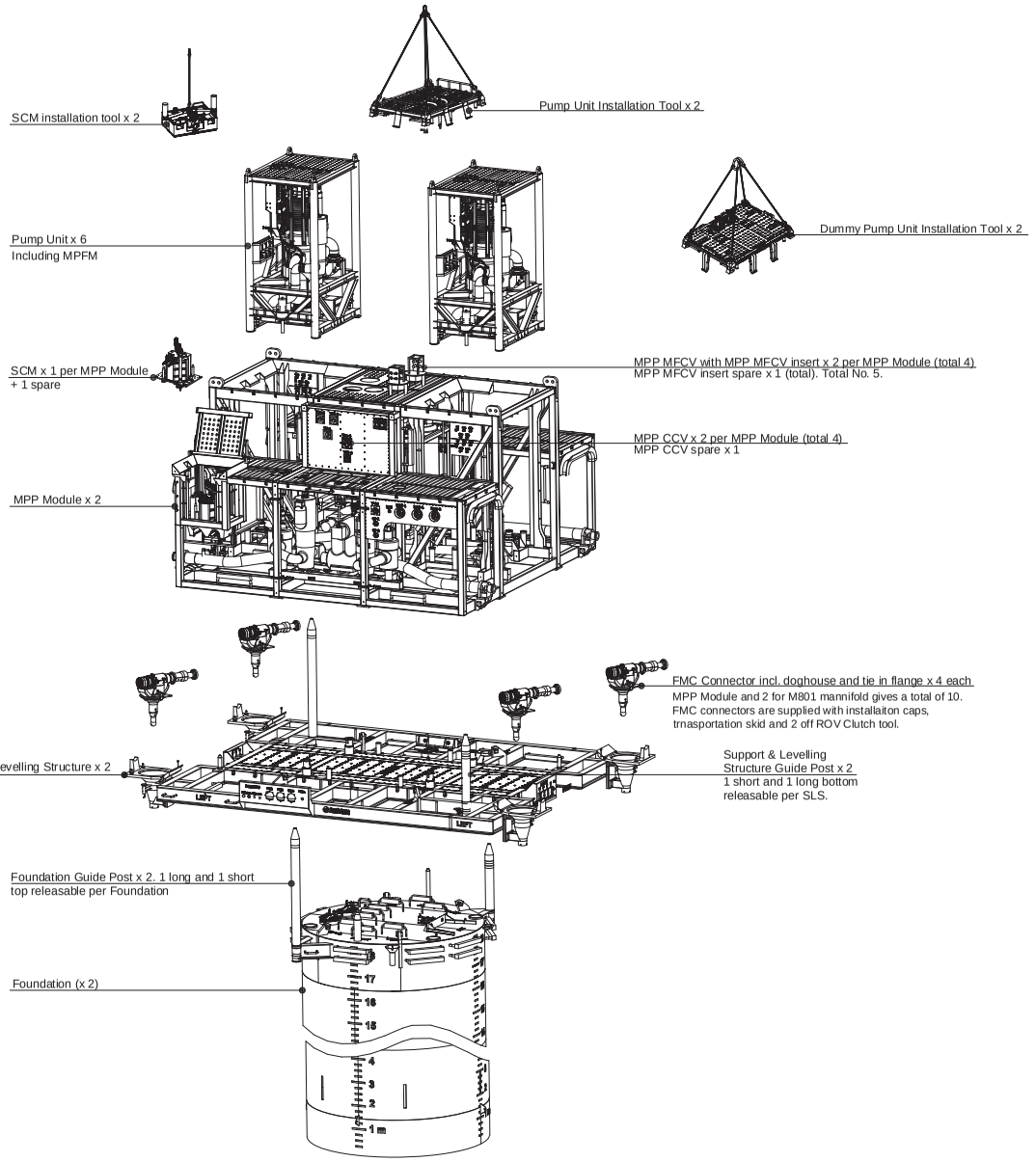
Scope of Supply, CPY
GirRi

Doc Type : DRW	System/Unit: 04	Discipline : SPS	Electronic Filename: AO-050-PJG-310-000237-REV04
COMPANY Document N°	AO-050-PJG-310-000237	REV: 04	Scale : N/A / Phase : DE
CONTRACTOR/Original Document N°	ITM-0009639	Format : A1	Folio : 1 of 5 / Class : 1

TOTAL E&P ANGOLA _ GIRRI PROJECT _ AO-050-GMP-310-000324 _ REV 02 - AFC - 20 - APR - 2015

PCM - See Sheet 1

Topside
Subsea



NOTES:

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AO-050-GSG-310-000405 GirRI SCM - GA and Interface
AO-050-GMP-310-000454 PUMP UNIT - GA DRAWING
AO-050-GSG-310-000347 SLS - GA DRAWING
AO-050-GSG-310-000358 FOUNDATION - GA DRAWING

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TOTAL E&P ANGOLA
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Scope of Supply, CPY
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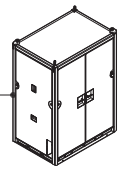
Doc Type : DRW	System/Unit: 04	Discipline : SPS	Electronic Filename: AO-050-PJG-310-000237-REV04
COMPANY Document N°	AO-050-PJG-310-000237	REV : 04	Scale : N/A / Phase : DE
CONTRACTOR/Original Document N°	ITM-0009639	Format : A1	Folio : 2 of 5 / Class : 1

TOTAL E&P ANGOLA _ GIRRI PROJECT _ AO-050-GMP-310-000324 _ REV 02 - AFC - 20 - APR - 2015

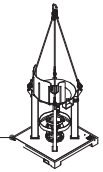
CAPITAL SPARES, TOOLS & SKIDS

CF TEST HPU

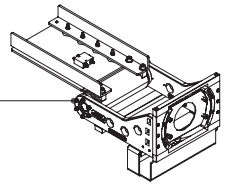


BF TEST HPU

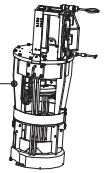
Transport skid for MFCF-RT x 2



FLOT x 2

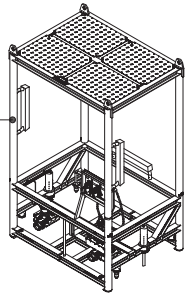


MFCV Running Tool x 2



MFCV - RT and Insert transport and workover skid

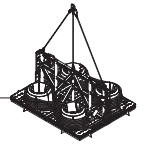
Dummy Pump Unit x 4



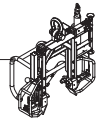
Test and Transport skid for SCM x 1

Transport skid for SCM x 2

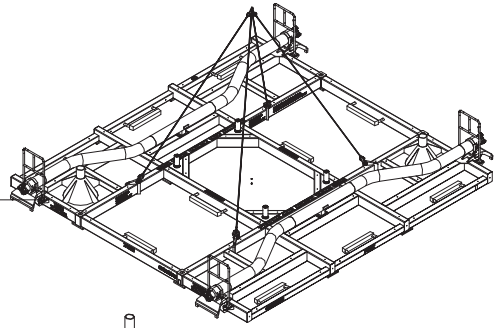
FL Deployment frame, incl MEOH x 7



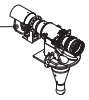
FMC Connector Lift Yoke x 4



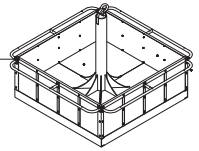
Dummy MPP Module x 1



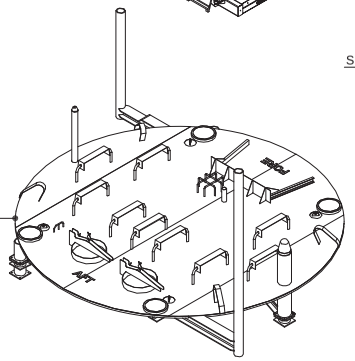
MeOH FMC Term Head x 1



Subsea Storage Basket x 1



Dummy Foundation x 1



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AO-050-GSG-310-000347 SLS - GA DRAWING
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TOTAL E&P ANGOLA

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Scope of Supply, CPY
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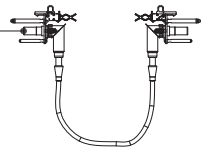
Doc. Type :	System/Unit:	Discipline :	Electronic Filename :
DRW	04	SPS	AO-050-PJG-310-000237-REV04

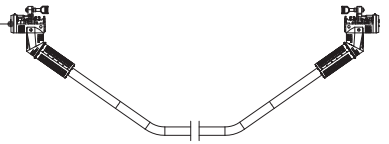
COMPANY Document N°	AO-050-PJG-310-000237	REV.: 04	Scale : N/A	Phase :	DE
CONTRACTOR/Original Document N°	ITM-0009639	Format : A1	Folio : 3 of 5	Class :	1

TOTAL E&P ANGOLA – GIRRI PROJECT – AO-050-GMP-310-000324 REV.02 - AFC - 20 - APR - 2015

H#2 HIGH VOLTAGE ELECTRICAL FLYING LEAD
Installed:12 Spare:6 Total:18

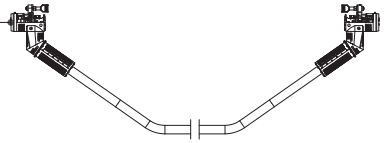


Hydraulic Flying Lead P70 - HFL bundle type 1
Installed:2 Spare:1 Total:3



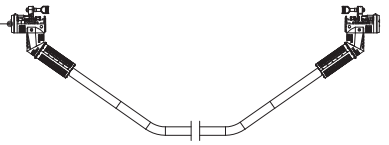
Hydraulic Flying Lead P70/P80 - HFL BF
Installed:4 Spare:2 Total:6

Hydraulic Flying Lead P80 - HFL bundle type 2
Installed:2 Spare:1 Total:3



Hydraulic Flying Lead P70/P80 - CF - PU
Installed:4 Spare:0 Total:4

Hydraulic Flying Lead P80 - HFL bundle type 3
Installed:1 Spare:1 Total:2



LV - PU Signal Electrical Flying Lead P70/P80
Installed:8 Spare:0 Total:8

LV - SCM Low Voltage Electrical Flying Lead P70/P80
Installed:4 Spare:1 Total:5

- FO Fiber Optical Flying Lead P70/P80
Installed:4 Spare:1 Total:5

Earthing cables
Installed:2 Spare:0 Total:2

H#9 Flying Lead P70/P80 - NTC - MPFM
Installed:8 Spare:0 Total:8

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00	09/JAN/2012	IFR	Issued for review	RGU	IFA	IFA

TOTAL E&P ANGOLA

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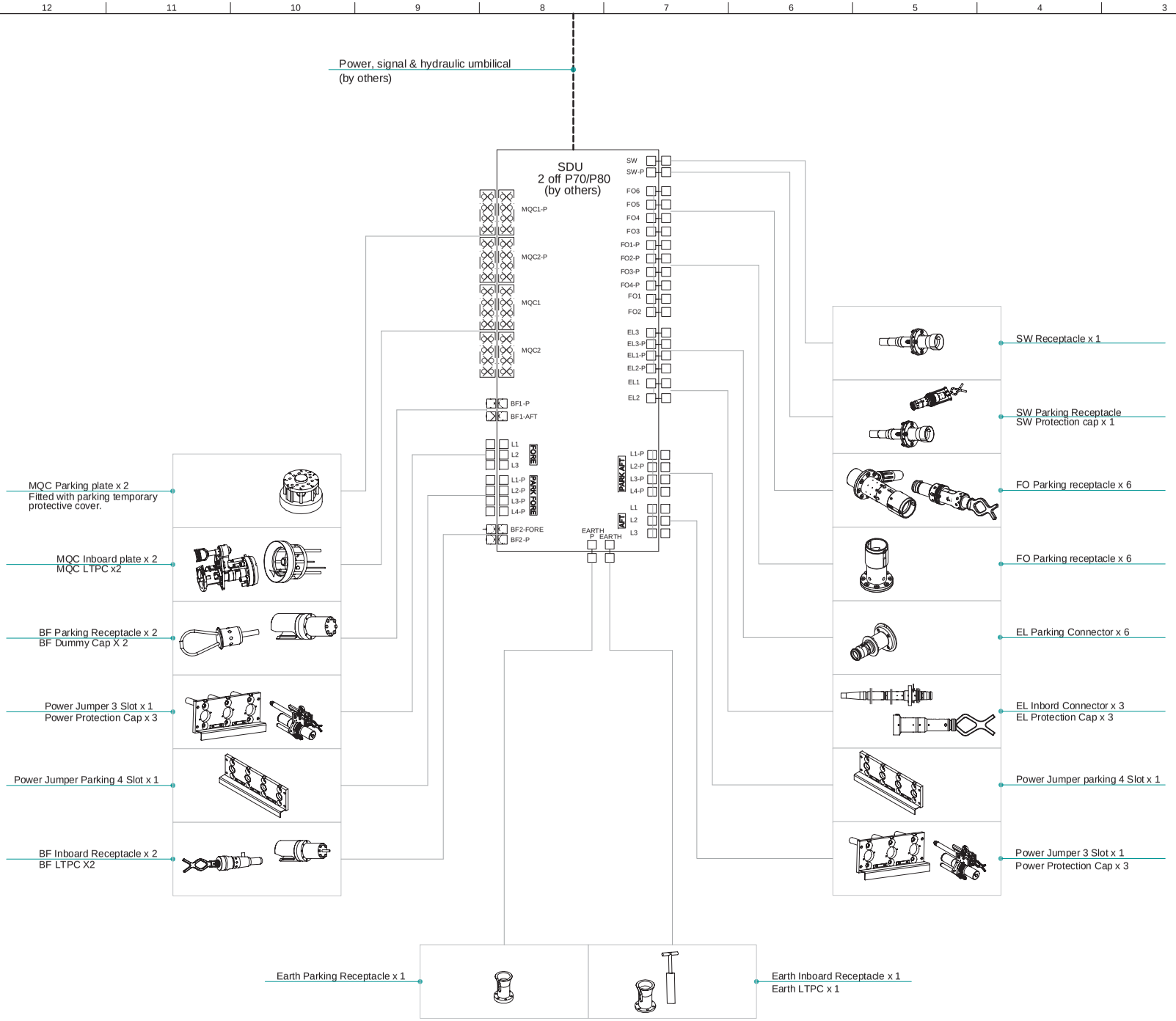
A Cameron & Schlumberger Company

Scope of Supply, CPY
GirRi

Doc Type :	System/Unit:	Discipline :	Electronic Filename :
DRW	04	SPS	AO-050-PJG-310-000237-REV04

COMPANY Document N°		REV :	Scale :	Phase :
	AO-050-PJG-310-000237	04	N/A	DE
CONTRACTOR/Original Document N°		Format :	Folio :	Class :
	ITM-0009639	A1	4 of 5	1

TOTAL E&P ANGOLA - GIRRI PROJECT - AO-050-GMP-310-000324 REV.02 - AFC - 20 - APR - 2015



NOTES:

NOTE 1: ONSHORE LIFTING RIGGING TO BE SUPPLIED BY CON ACCORDING TO CONTRACT.

REFERENCE:

AO-050-GMP-310-000379 MPP MODULE - GA DRAWING
AO-050-GSG-310-000405 GirRI SCM - GA and Interface
AO-050-GMP-310-000454 PUMP UNIT - GA DRAWING
AO-050-GSG-310-000347 SLS - GA DRAWING
AO-050-GSG-310-000358 FOUNDATION - GA DRAWING

ABBREVIATIONS:

Rev	Date	Status	Revision Memo	Issued by	Checked by	Approved by
04	23/Apr/2015	ASB	As Built	ATR	SAA	HHA
03	15/JAN/2015	AFC	Accepted for Construction	ATR	HHA	TNO
02	18/MAR/2014	AFC	Accepted for Construction	HHA	TNO	HHA
01	29/OCT/2013	IFA	Issued for Acceptance	HHA	TNO	HHA
00	09/JAN/2012	IFR	Issued for review	RGU	IFA	IFA

TOTAL E&P ANGOLA

OneSubsea
A Cameron & Schlumberger Company

Scope of Supply, CPY
GirRi

Doc Type :	System/Unit:	Discipline :	Electronic Filename:
DRW	04	SPS	AO-050-PJG-310-000237-REV04

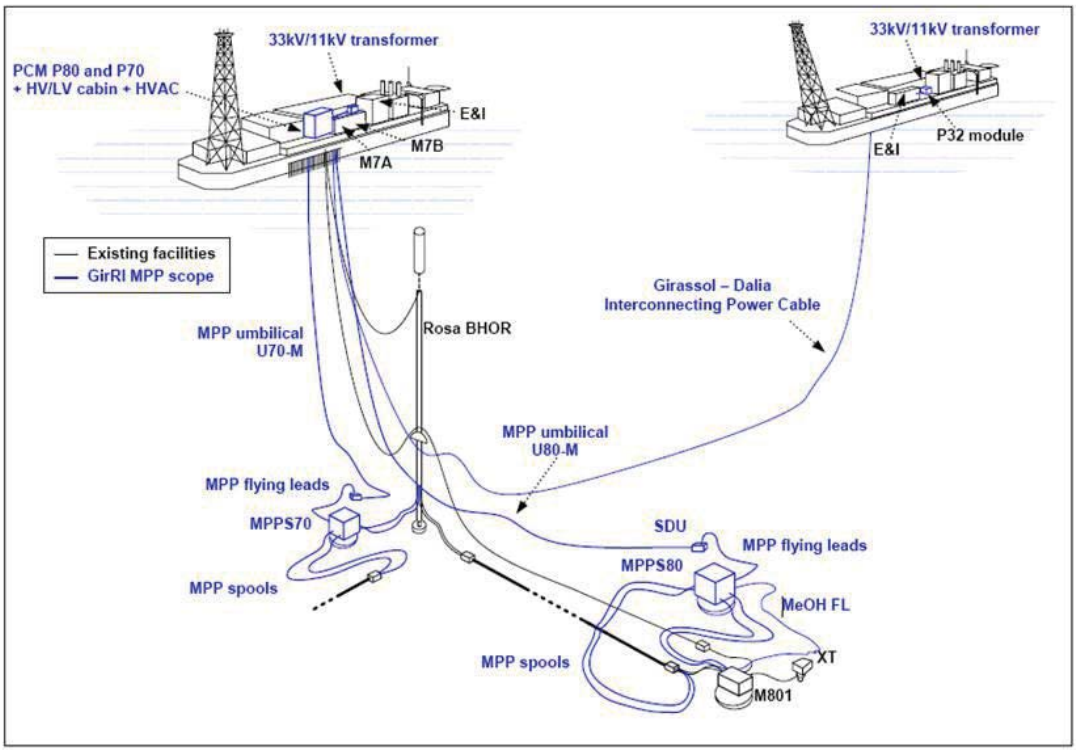
COMPANY Document N°		REV :	Scale :	Phase :
	AO-050-PJG-310-000237	04	N/A	DE
CONTRACTOR/Original Document N°		Format :	Folio :	Class :
	ITM-0009639	A1	5 of 5	1

TOTAL E&P ANGOLA - GIRRI PROJECT - AO-050-GMP-310-000324 REV.02 - AFC - 20 - APR - 2015

1.8 MPP Station assembly

MPP Station as installed on sea bed.

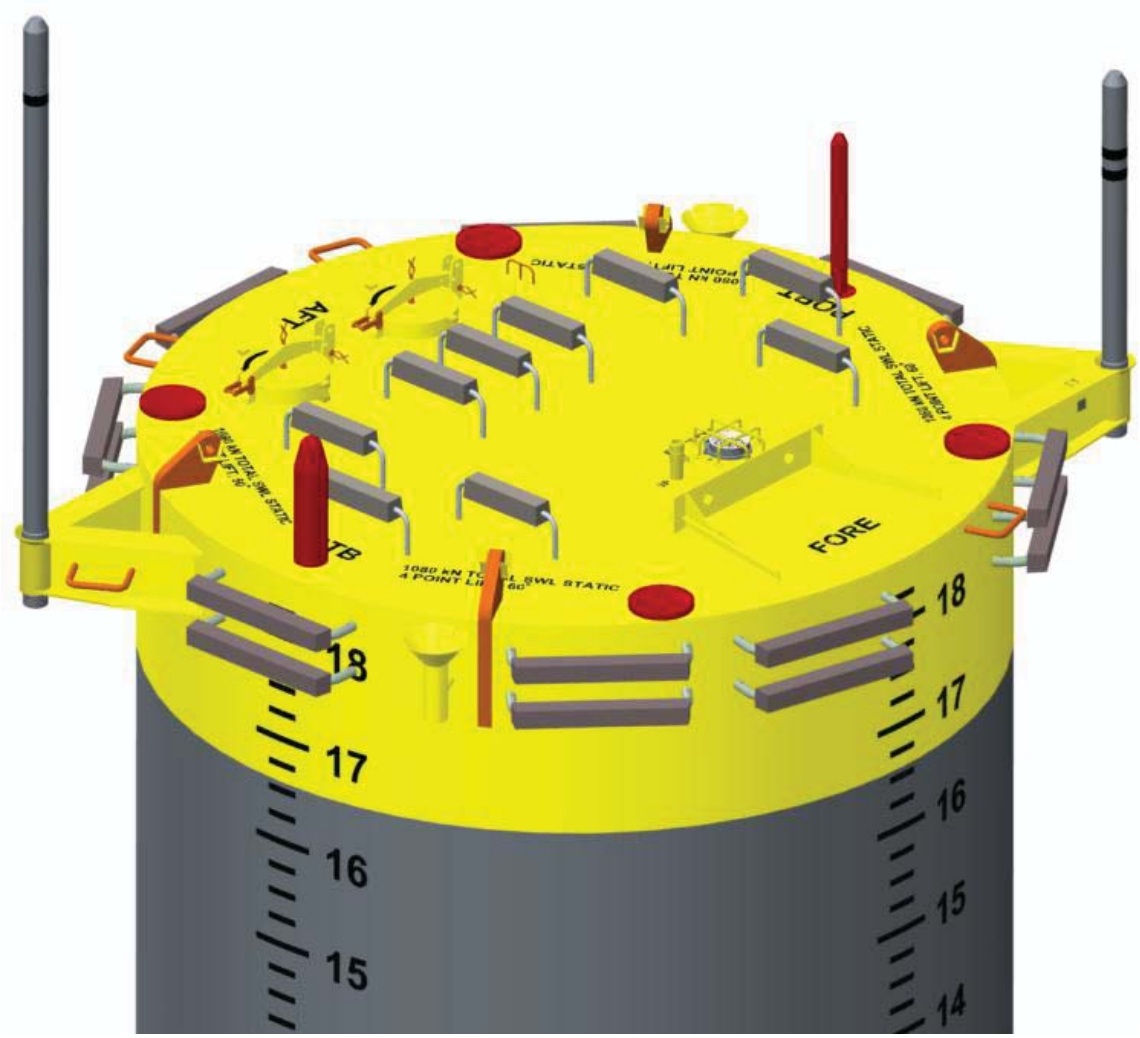
1.9 Overview GirRI



1.10 Reference list

Ref	Document title	COMPANY Doc. No	MPP CON Doc. No
/1/	Flow assurance specification	AO-050-GSG-310-000120	DOC-0007898
/2/	MPP Module - data sheet	AO-050-GMP-310-000188	DOC-0010202
/3/	Pump Unit - data sheet	AO-050-GMP-310-000186	DOC-0010201
/4/	Foundation - data sheet	AO-050-GMP-310-000191	DOC-0010204
/5/	Support And Leveling Structure - data sheet	AO-050-GMP-310-000189	DOC-0010203
/6/	MPP system Scope of supply drawing	AO-050-PJG-310-000237	ITM-0009639
/7/	Control system design specification	AO-050-SSS-900-074451	DOC-0008350
/8/	Control fluid system design specification	AO-050-GSG-310-000025	DOC-0007895
/9/	Process flow diagram	AO-050-RMP-900-071923 AO-050-RMP-900-071924	DOC-0008510 DOC-0008511
/10/	Barrier fluid design specification	AO-050-GMP-310-000007	DOC-0007881
/11/	Monthly Weight Report	AO-050-PJG-310-002487	DOC-0074119
/12/	PCM - MPP Station HV, LV & FO Block Diagram	A0-050-PJG-310-000455	DRW-0004178
/13/	PCM - MPP Station BF & CF Block Diagram	AO-050-PJG-310-000597	DRW-0004287

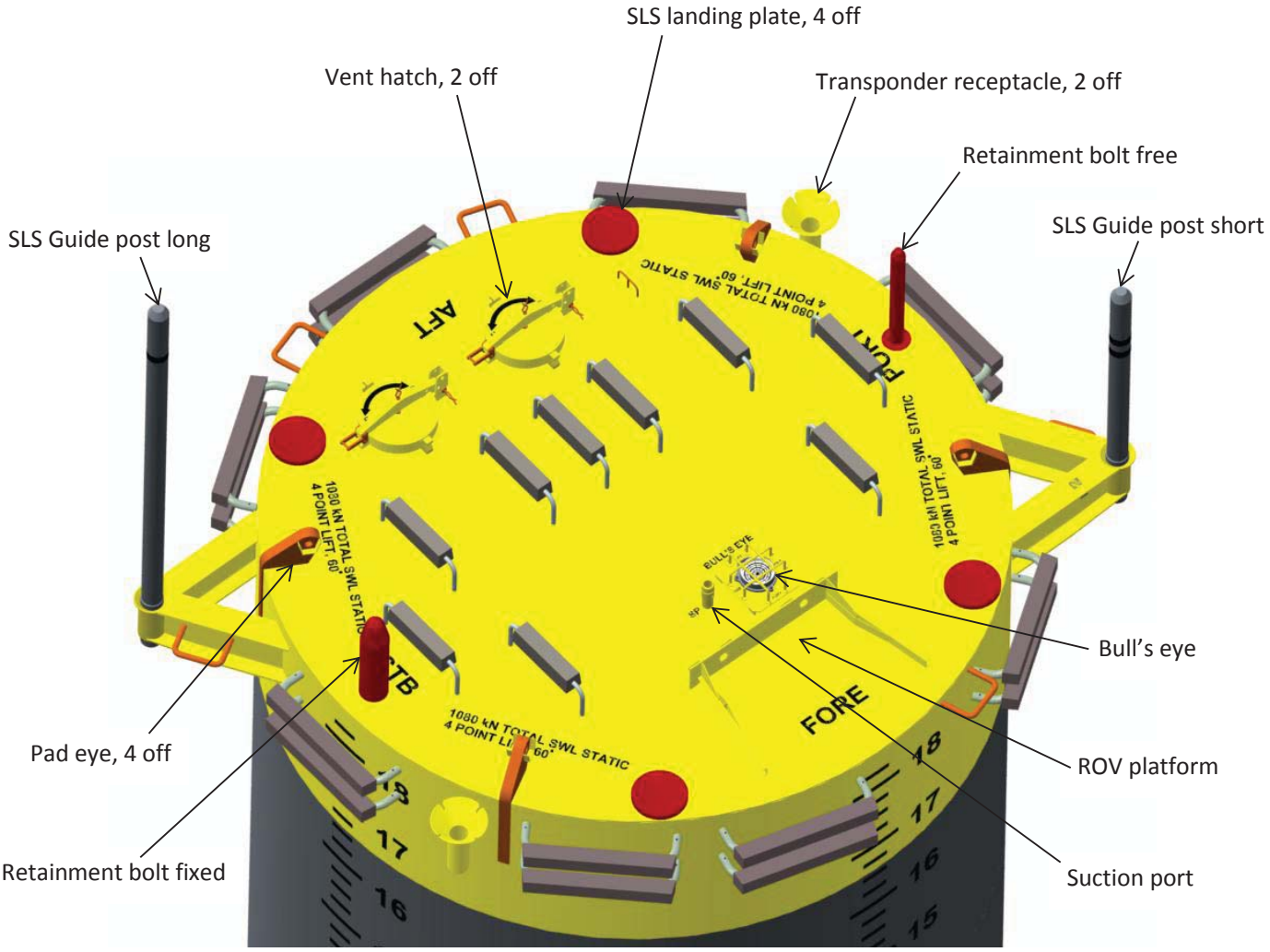
2 Foundation



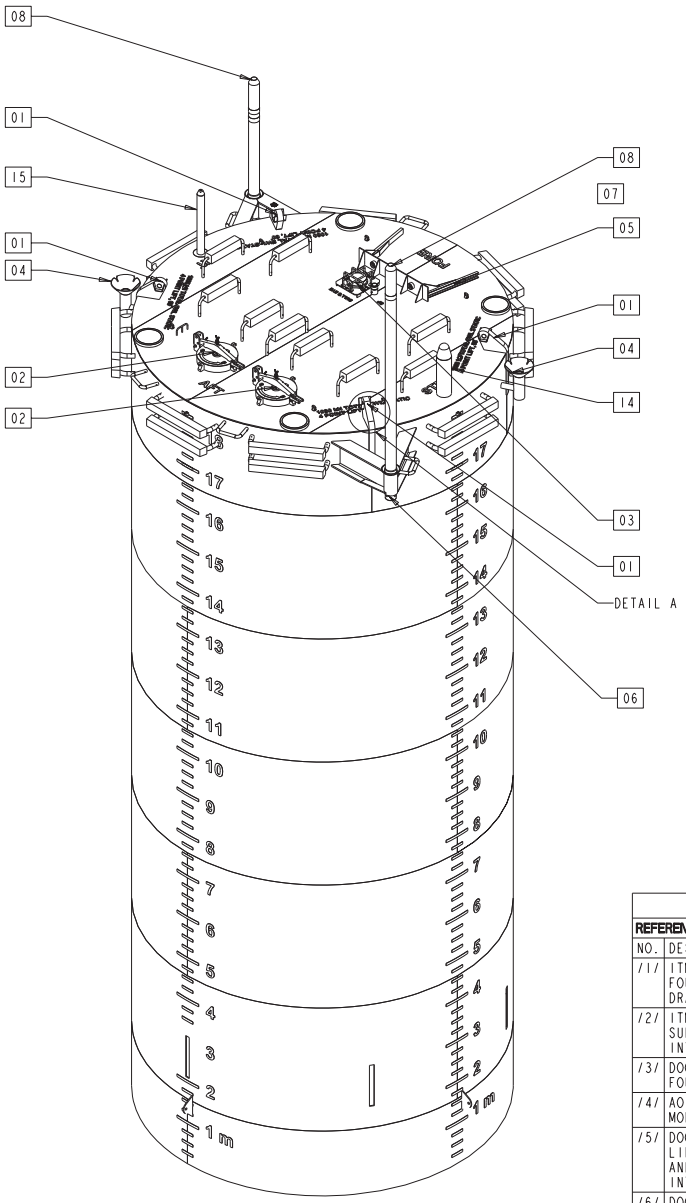
2.1 Foundation reference list

Ref	Document title	COMPANY Doc. No	MPP CON Doc. No
/14/	Foundation Data sheet	AO-050-GMP-310-000191	DOC-0010204
/15/	Foundation Interface Drawing	AO-050-GSG-310-000359	ITM-0058373
/16/	Foundation General Arrangement Drawing	AO-050-GSG-310-000358	ITM-0058358

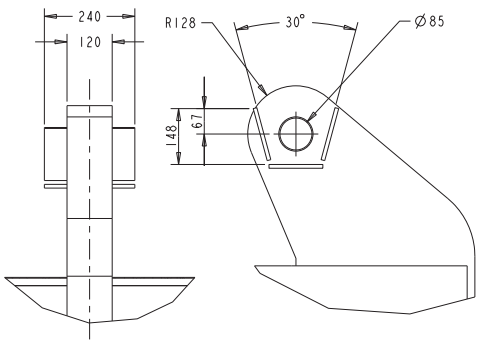
2.1 Foundation features



2.1 Foundation Interface drawing



DETAIL A - 4 POSN
SCALE 3:20



INTERFACES:

NO.	TO	DESCRIPTION
01	ROV	FOUNDATION PAD EYES SEE DETAIL A FITS WLL 125T CROSBY WIDE BODY ROV SHACKLE
02	ROV	VENTILATION HATCHES TO CLOSE: REMOVE LOCKING PIN, AND HATCH WILL FALL DOWN, TURN HANDLE APPROX. 6,5-7,5 TURNS OPERATIONAL TORQUE: 90 Nm DAMAGE TORQUE: 610 Nm WEIGHT: IN AIR: 206 KG IN WATER: 180 KG ROV OPERATING: 90 KG
03	ROV	BULL`S EYE FOR MONITORING INCLINATION, RANGE 5°. SEE DETAIL D
04	ROV	TRANSPONDER RECEPTACLE. INTERFACE FOR FPSO2 CON SUPPLIED TRANSPONDER (REF. ITS 090102)
05	ROV	ROV PLATFORM. PLATFORM FOR ROV TO DOCK ONTO. SEE DETAIL C (REF. ITS 0090100)
06		RECEPTACLE FOR TOP RELEASABLE GUIDEPOST
07	ROV	SUCTION PORT FOR SUCTION STAB. CP1 FROM FPSO2 CON. REQUIRED SUCTION FOR INSTALLATION 0.45 BAR REQUIRED PRESSURE FOR IMMEDIATE RETRIVAL IN CASE OF INSTALLATION FAILURE: 0.67 BAR REQUIRED PRESSURE FOR RETRIEVAL WITHIN 7 DAYS: 1.15 BAR REQUIRED PRESSURE FOR END-OF-LIFETIME RETRIVAL: 3.19 BAR
08	ROV	GUIDEPOST HANDLING / LIFTING INTERFACE. INTERFACE ON TOP OF GUIDEPOST FIT IMENCO TYPE GUIDE WIRE ANCHOR, REF. /5/, /8/ AND /9/.
14	SLS	RETAINMENT BOLT FIXED
15	SLS	RETAINMENT BOLT FREE

NOTES:

1. COG REF. /1/

REFERENCES:

NO.	DESCRIPTION
/1/	ITM-0058358 / AO-050-GSG-310-000358 FOUNDATION - GENERAL ARRANGEMENT DRAWING
/2/	ITM-0058372 / AO-050-GSG-310-000348 SUPPORT AND LEVELING STRUCTURE - INTERFACE DRAWING
/3/	DOC-0021787 / AO-050-GSG-310-000365 FOUNDATION - INSTALLATION GUIDELINES
/4/	AO-050-PJG-310-3130XX MONTHLY WEIGHT REPORT
/5/	DOC-0042221 / AO-050-GMP-367-001708 LIFTING ANCHORE WITH LIFTING TOP AND SAFETY CLIP ASSEMBLY AND INTERFACE DRAWING
/6/	DOC-0041977 / AO-050-GMP-367-001710 SLS GUIDE POST (LONG) ASSEMBLY AND INTERFACE DRAWING
/7/	<TBD> / <TBD> SLS GUIDE POST (SHORT) ASSEMBLY AND INTERFACE DRAWING
/8/	DOC-0042526 / AO-050-GMP-367-001711 TOP RELASABLE GUIDEPOST - OPERATION AND MAINTENANCE MANUAL
/9/	DOC-0038151 / AO-050-GMP-367-001712 LIFTING ANCHORE - OPERATION AND MAINTENANCE MANUAL

Rev	Date	Status	Revision Memo	Issued by	Checked by	Approved by
03	10/NOV/2014	ASB	As built	SIH	SAA	HHA
02	28/Mar/2014	AFC	Approved for Construction	ATR	SAA	HHA
01	11/Nov/2013	AFC	Approved for Construction	SAA	SIH	HHA
00	02-May/2013	IFR	Issued for review	RGU	MFL	HHA

FOUNDATION -
INTERFACE DRAWING

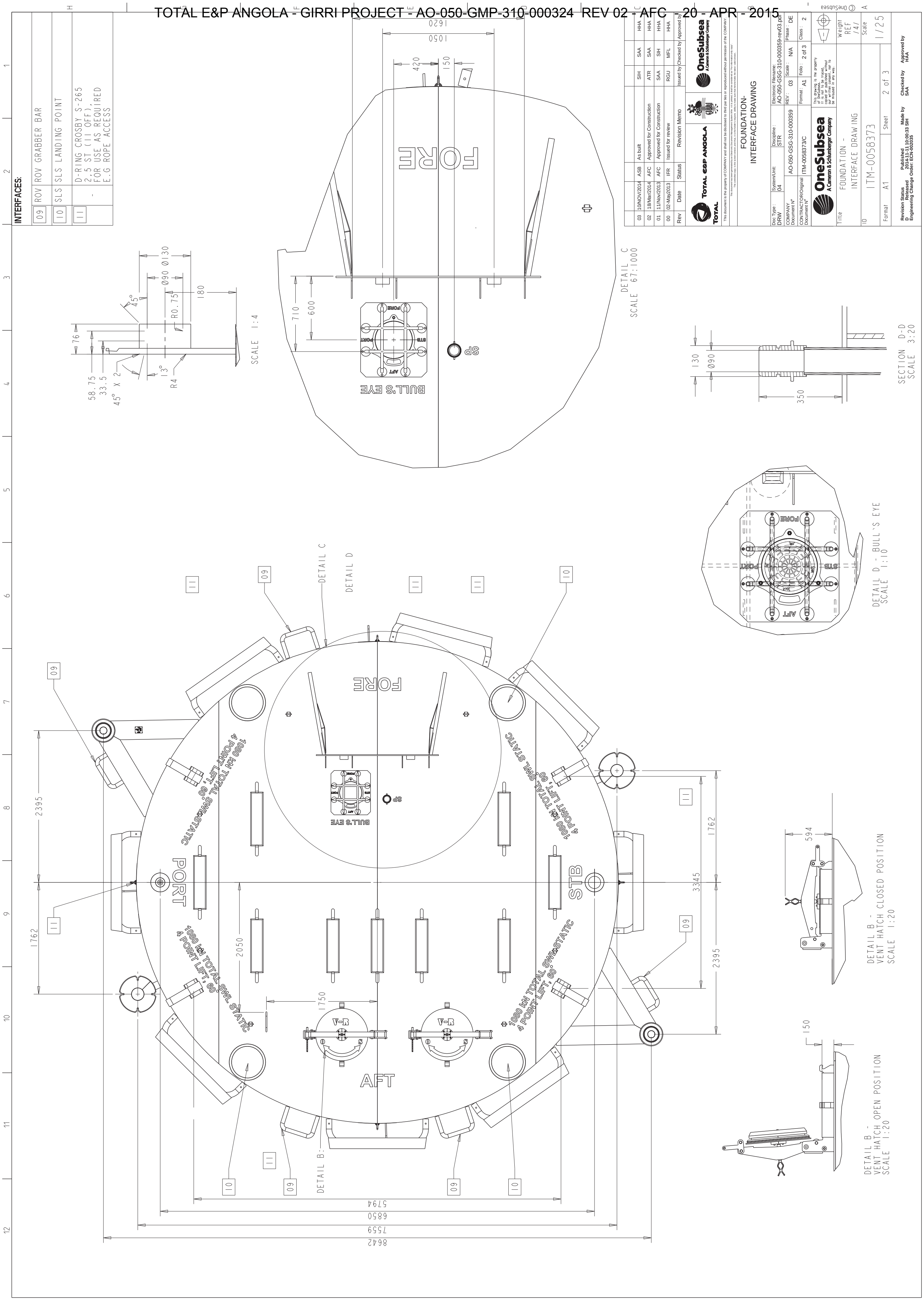
Doc.Type : DRW	System/Unit: 04	Discipline : STR	Electronic Filename: AO-050-GSG-310-000359-rev03.pdf
COMPANY Document N°	AO-050-GSG-310-000359	REV : 03	Scale : N/A	Phase : DE
CONTRACTOR/Original Document N°	ITM-0058737/C	Format : A1	Folio : 1 of 3	Class : 2

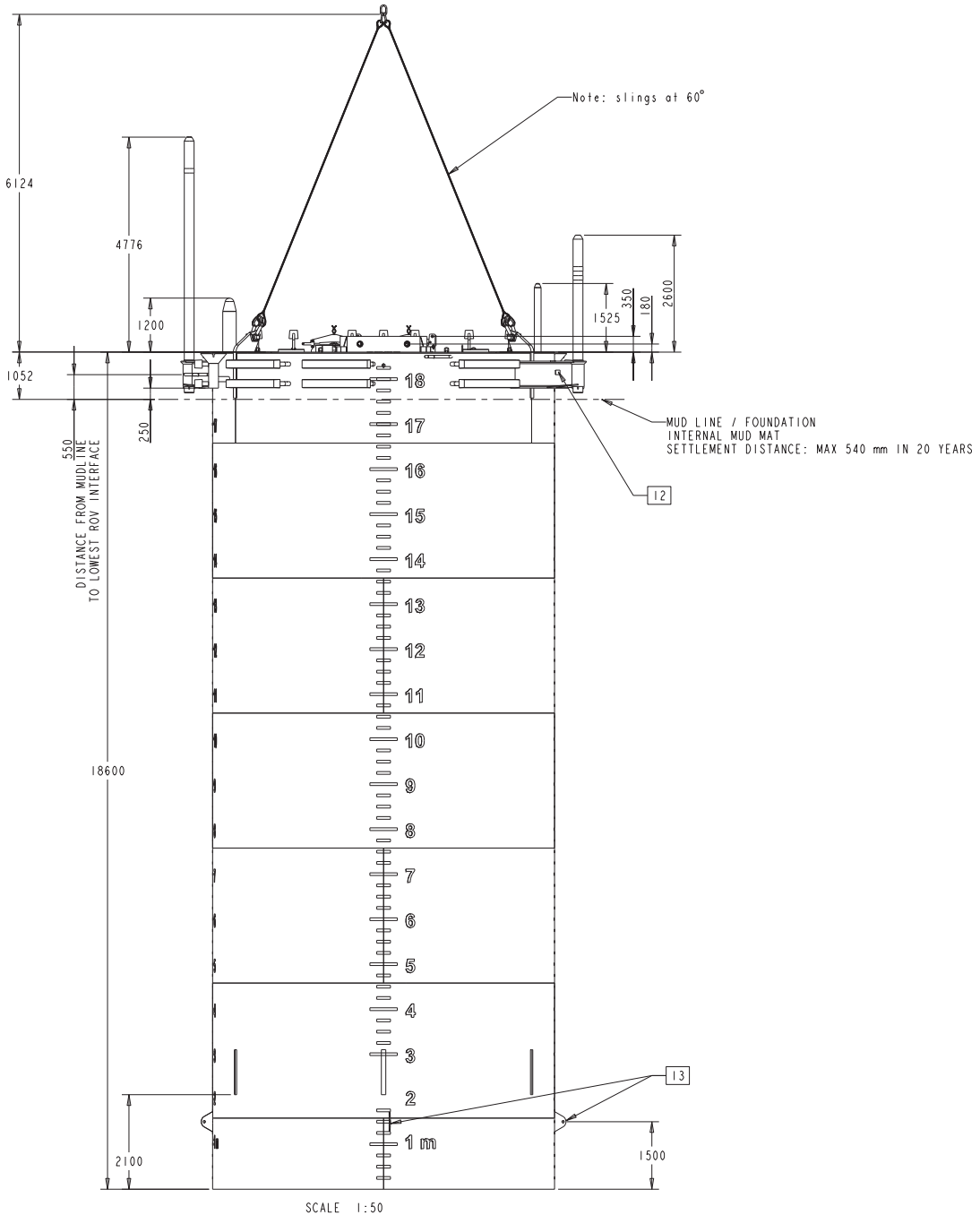
Title	FOUNDATION - INTERFACE DRAWING
ID	ITM-0058373
Format	A1
Sheet	1 of 3
Weight	REF /4/
Scale	1/50

Revision Status: D Released | Published: 2014-11-11 10:00:33 | Made by: SIH | Checked by: SAA | Approved by: HHA
Engineering Change Order: ECN-002085

TOTAL E&P ANGOLA - GIRRI PROJECT - AO-050-GMP-310-000324 - REV 02 - AFC - 20 - APR - 2015

DO NOT SCALE


INTERFACES:
09 ROV GRABBER BAR
10 SLS LANDING POINT
11 D-RING CROSBY S-265 2.5 ST (11 OFF), FOR USE AS REQUIRED E.G ROPE ACCESS
FORE
BULL'S EYE
SP
PORT
STB
AFT
DETAIL C SCALE 67:1000
SCALE 1:4
SECTION D-D SCALE 3:20
DETAIL D - BULL'S EYE SCALE 1:10
DETAIL B - VENT HATCH CLOSED POSITION SCALE 1:20
DETAIL B - VENT HATCH OPEN POSITION SCALE 1:20
1080 kN TOTAL SWL STATIC 4 POINT LIFT, 60°
5794
6850
7559
8642
03 10NOV/2014 ASB As built SIH SAA HHA
02 18/Mar/2014 AFC Approved for Construction ATR SAA HHA
01 11/Nov/2013 AFC Approved for Construction SAA SIH HHA
00 02-May/2013 IFR Issued for review RGU MFL HHA
FOUNDATION-INTERFACE DRAWING
AO-050-GSG-310-000359
ITM-0058373
OneSubsea
FOUNDATION - INTERFACE DRAWING
Sheet 2 of 3
Scale 1/25
Format A1



SCALE 1:50

INTERFACES:

NO.	TO	DESCRIPTION:
12	ROV	CP MEASUREMENT POINT (10x10 cm)
13	-	PAD EYES FOR TUGGER LINES (4 OFF)

Rev	Date	Status	Revision Memo	Issued by	Checked by	Approved by
03	10/NOV/2014	ASB	As built	SIH	SAA	HHA
02	18/mai/2014	AFC	Approved for Construction	ATR	SAA	HHA
01	11/Nov/2013	AFC	Approved for Construction	SAA	SIH	HHA
00	02-May-2013	IFR	Issued for review	RGU	MFL	HHA

TOTAL E&P ANGOLA

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FOUNDATION - INTERFACE DRAWING

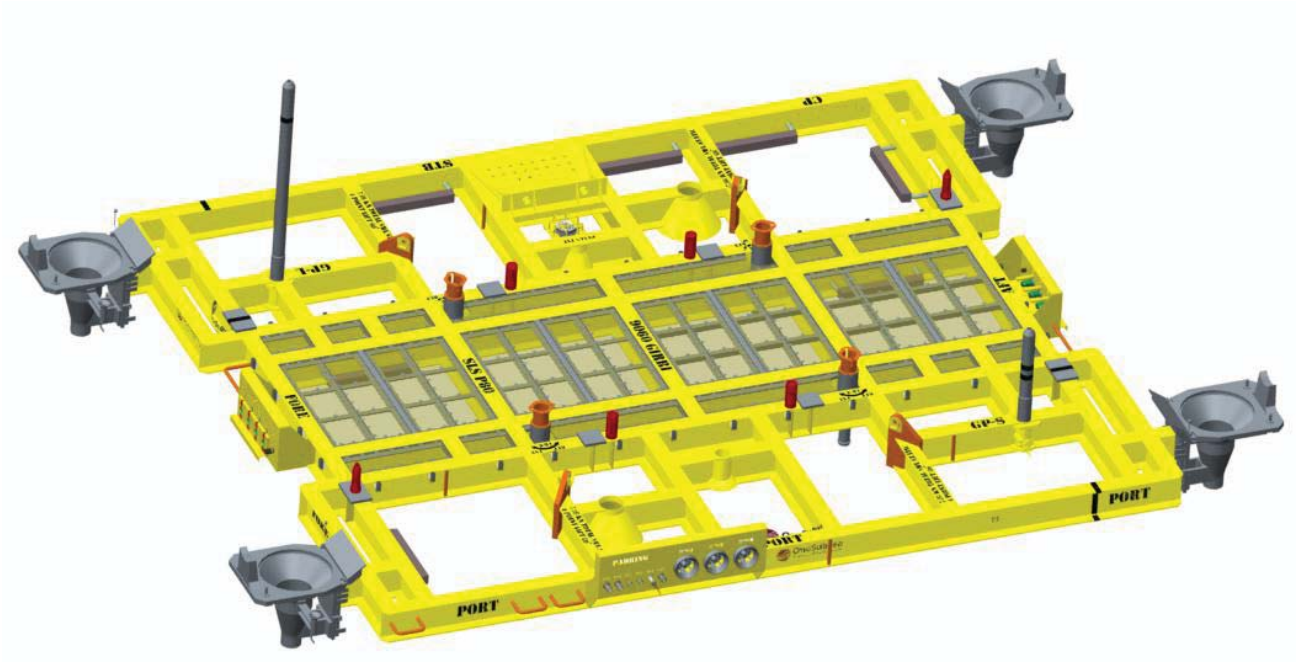
Doc. Type: DRW	System/Unit: 04	Discipline: STR	Electronic File name: AO-050-GSG-310-000359-rev03.pdf
COMPANY Document N°	AO-050-GSG-310-000359	REV: 03	Scale: N/A	Phase: DE
CONTRACTOR/Original Document N°	ITM-0058373/C	Format: A1	Folio: 3 of 3	Class: 2

Title	FOUNDATION - INTERFACE DRAWING
Weight	REF /4/
ID	ITM-0058373
Scale	1/50
Format	A1
Sheet	3 of 3

Revision Status D Released | Published 2014-11-11 10:00:33 | Made by SIH | Checked by SAA | Approved by HAA

Engineering Change Order: ECN-002085

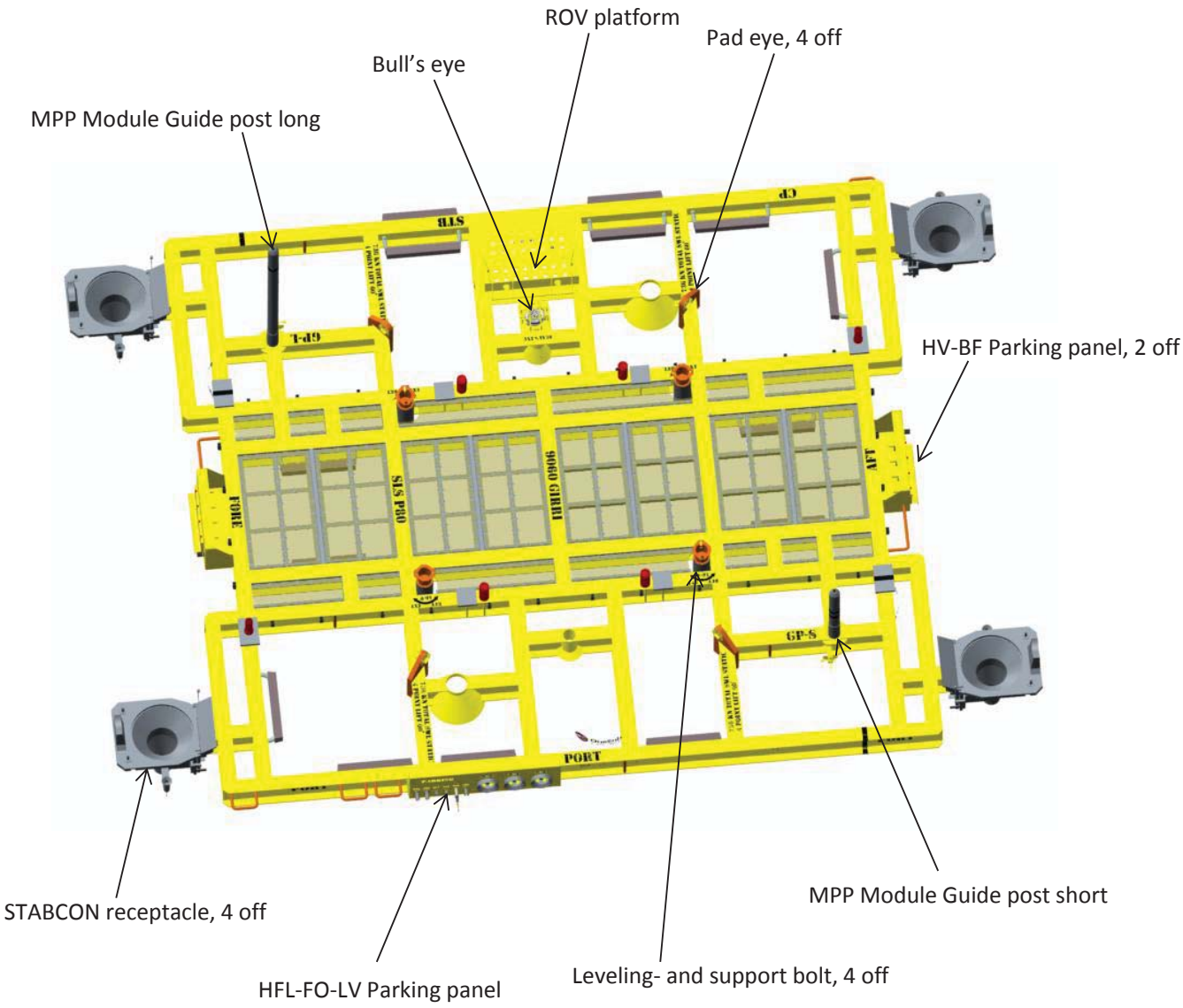
3 SLS



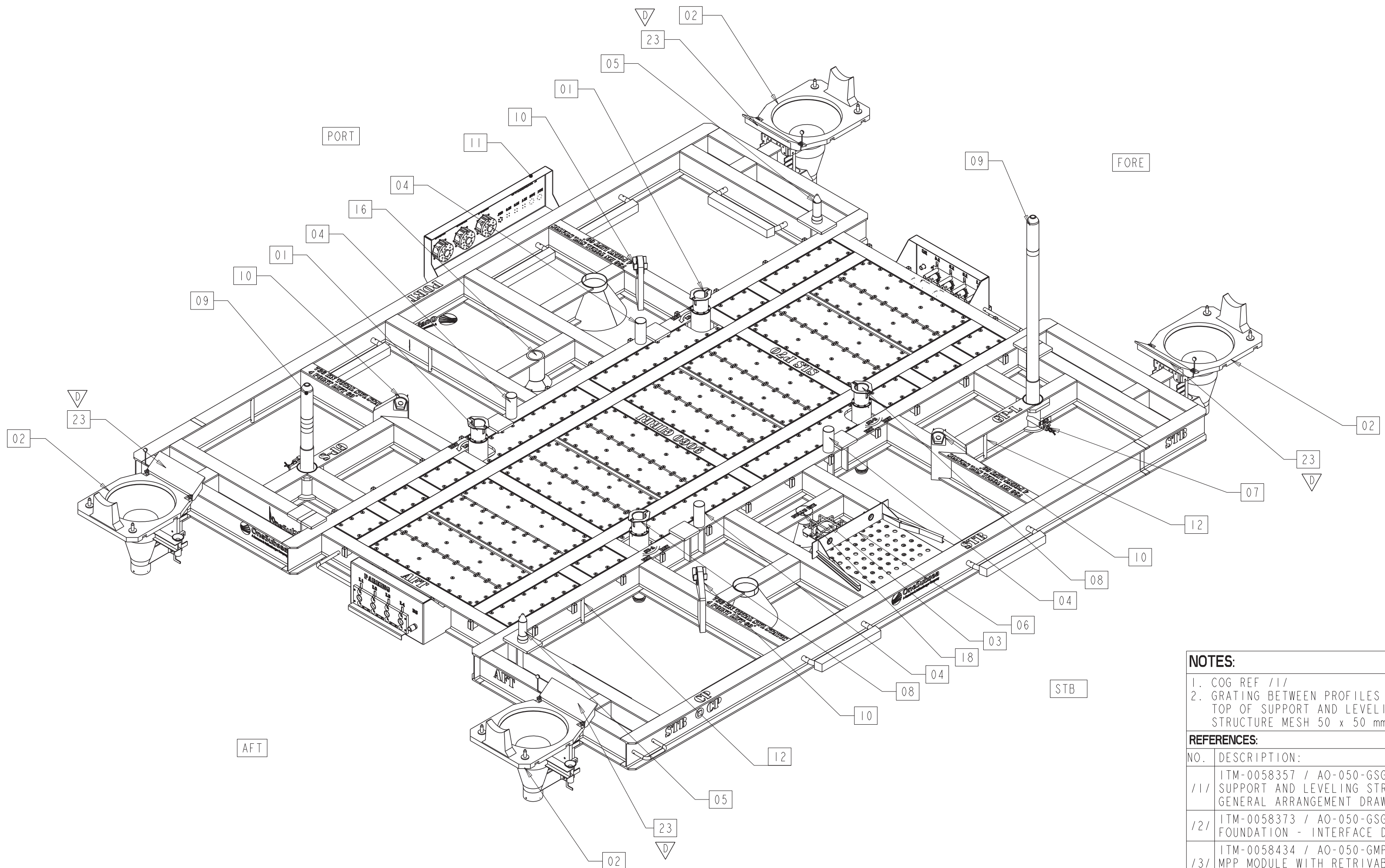
3.1 SLS reference list

Ref	Document title	COMPANY Doc. No	MPP CON Doc. No
/17/	SLS Data sheet	AO-050-GMP-310-000189	DOC-0010203
/18/	SLS Interface Drawing	AO-050-GSG-310-000348	ITM-0058372
/19/	SLS General Arrangement Drawing	AO-050-GSG-310-000347	ITM-0058357

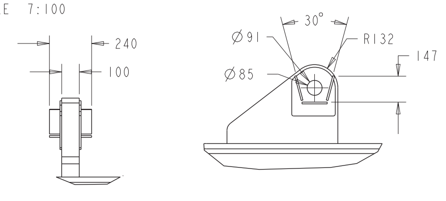
3.1 SLS features



3.2 SLS interface drawing



DETAIL B
SLING ANGLE 60°
SCALE 7:100



NOTES:

1. COG REF /1/
2. GRATING BETWEEN PROFILES ON TOP OF SUPPORT AND LEVELING STRUCTURE MESH 50 x 50 mm

REFERENCES:

NO.	DESCRIPTION:
/1/	ITM-0058357 / AO-050-GSG-310-000347 SUPPORT AND LEVELING STRUCTURE - GENERAL ARRANGEMENT DRAWING
/2/	ITM-0058373 / AO-050-GSG-310-000359 FOUNDATION - INTERFACE DRAWING
/3/	ITM-0058434 / AO-050-GMP-310-000380 MPP MODULE WITH RETRIVABLE ITEMS - INTERFACE DRAWING
/4/	DOC-0021778 / AO-050-GMP-310-000355 SUPPORT AND LEVELING STRUCTURE - INSTALLATION GUIDELINES
/5/	AO-050-PJG-310-3130XX MONTHLY WEIGHT REPORT
/6/	ITM-0081133/ TBD MPP MOODULE GUIDEPOST (SHORT)- ASSEMBLY AND INTERFACE DRAWING
/7/	DOC-0042220/AO-050-GMP-367-001709 MPP MOODULE GUIDEPOST (LONG) -ASSEMBLY AND INTERFACE DRAWING
/8/	ITM-0113295 LIFTING ANCHORE WITH LIFTING TOP AND SAFETY CLIP
/9/	DOC-0026680 / AO-050-GSG-325-000782 TERM.HEAD KC4-2.10, SI, RECEPTACLE, w/INSULATION PLATE f/RIGID SPOOL GA DRAWING
/10/	DOC-0021777 SUPPORT AND LEVELING STRUCTURE - PACKING, PRECERVATION, HANDLING, TRANSPORT AND STORAGE PROCEDURE

D

INTERFACES:

NO.	TO	DESCRIPTION
01	ROV	LEVELING BOLTS INTERFACE ISO 13628-8 CLASS 6 INTERFACE RUNNING TORQUE: 7000Nm DAMAGE TORQUE: 9000 Nm REF. OPERATING TABLE , SEE /4/ SEE DETAIL H (D)
02	MPP Mod.	STABCON STAB RECEPTACLE INTERFACE TO FLOWLINE CONNECTOR/ INBOARDHUB ON MPP MODULE. STAB RECEPTACLE FITTED WITH HELIX INSERT.
03	ROV	BULL'S EYE FOR MONITORING 5° INCLINATION. SEE DETAILE E
04	MPP Mod.	LANDING INTERFACE FOR MPP MODULE SOFT LANDING CYLINDER
05	MPP Mod.	MINI GUIDEPOST GUIDEPOST FOR FINAL GUIDING OF MPP MODULE (Ø150mm)
06	ROV	ROV PLATFORM PLATFORM FOR ROV TO DOCK ONTO
07	MPP mod/ ROV	GUIDEPOST RECEPTACLE W/ GUIDEPOST TO UNLOCK : LIFT HINGED SAFETY LOCK (UPPER HANDLE), TO UPPER POSITION. ROTATE LOCK BOLT (LOWER HANDLE) 150 °CCW. PUT HINGED SAFETY LOCK INTO LOWER POSITION. SEE DETAIL F
08	ROV	SUPPORT BOLTS: EXTEND BOLTS TO STABILIZE STRUCTURE. ISO 13628-8 CLASS 6 INTERFACE RUNNING TORQUE: 250 Nm (D) MAX TORQUE: 1000 Nm DAMAGE TORQUE: 9000 Nm REF. OPERATING TABLE SEE /4/ SEE DETAIL C
09		GUIDEPOST HANDLING / LIFTING INTERFACE INTERFACE ON TOP OF GUIDEPOST REF /6/, /7/ and /8/ FITS IMENCO GUIDE WIRE ANCHOR
10	ROV	SUPPORT AND LEVELING STRUCTURE PAD EYES
11	ROV	PARKING PANELS FOR FLYING LEADS MQC, LV, OFL AND GROUNDING
12	ROV	ROV GRABBER BAR

Rev	Date	Status	Revision Memo	Issued by	Checked by	Approved by
03	06/NOV/2014	ASB	As built	SIH	SAA	HHA
02	02/April2014	AFC	Approved for Construction	ATR	SAA	HHA
01	14-Jan-2014	AFC	Approved for Construction	SAA	SIH	HHA
00	03-May2013	IFR	Issued for review	RGU	MFL	HHA

TOTAL E&P ANGOLA — OneSubsea A Cameron & Schlumberger Company

SUPPORT AND LEVELING STRUCTURE - INTERFACE DRAWING

Doc Type : DRW	System/Unit: 04	Discipline : STR	Electronic Filename: AO-050-GSG-310-000348-rev03.pdf
COMPANY Document N°	AO-050-GSG-310-000348	REV : 03 Scale : 1/40	Phase : DE
CONTRACTOR/Original Document N°	ITM-0058372/C	Format : A1 Folio : 1 of 3	Class : 2

OneSubsea A Cameron & Schlumberger Company

Title: SUPPORT AND LEVELING STRUCTURE - INTERFACE DRAWING

Weight REF /5/

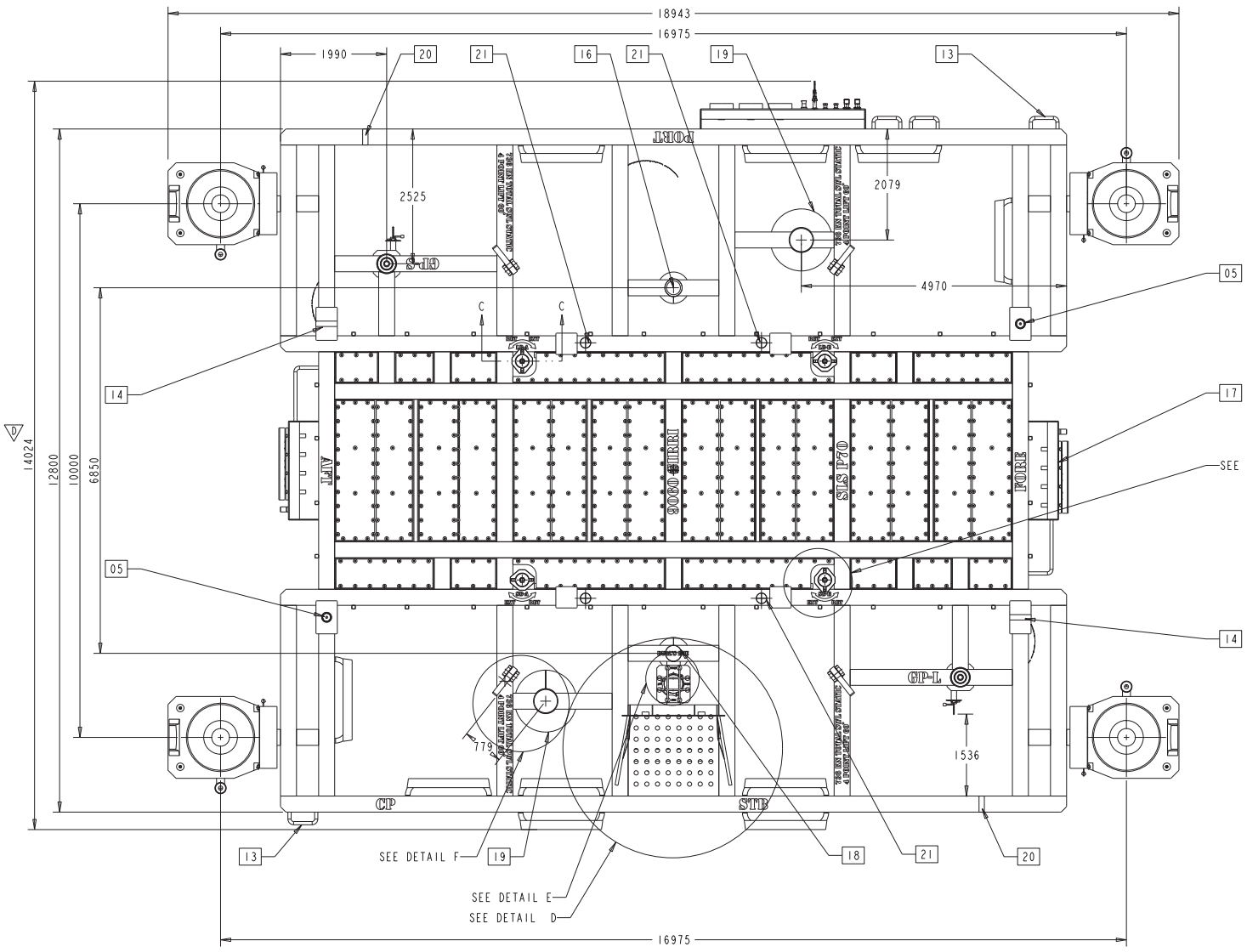
ID: ITM-0058372

Scale 1:50

Format A1 Sheet 1 of 3

Revision Status	Published	Made by	Checked by	Approved by
D Released	2014-11-06 11:10:32	SIH	SAA	HAA

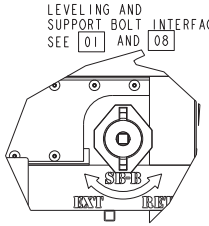
Engineering Change Order: ECN-002035



DETAIL D
SCALE 1:20

INTERFACES:

NO.	TO	DESCRIPTION
13	ROV	ROV GRABBER BAR
14	MPP Mod	MPP MODULE LANDING POINT
16	CCP	FUNNEL RETAINMENT BOLT FREE
17	ROV	PARKING PANELS FOR HV AND BF FLYING LEADS
18	CCP	FUNNEL RETAINMENT BOLT FIXED
19	CCP	FUNNEL FOR FOUNDAITION GUIDE POST
20	MPP MOD	ALIGNMENT MARKING
21	MPP MOD	LANDING POINTS FOR MPP MODULE SOFT LANDING CYLINDERS



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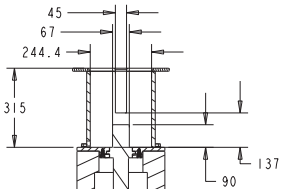

SECTION C-C
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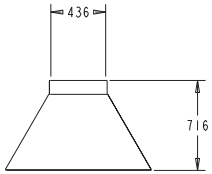
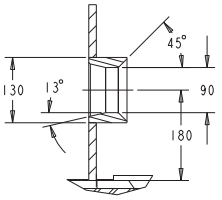


DETAIL F
SCALE 1:20



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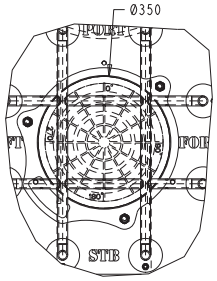
SCALE 1:5



DETAIL E
SCALE 3:20

Rev	Date	Status	Revision Memo	Issued by	Checked by	Approved by
03	03/NOV/2014	AFC	Approved for construction	SIH	SAA	HAA
02	02/April/2014	AFC	Approved for Construction	ATR	SAA	HHA
01	14-Jan-2014	AFC	Approved for Construction	SAA	SIH	HHA
00	03-May2013	IFR	Issued for review	RGU	MFL	HHA

TOTAL E&P ANGOLA

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SUPPORT AND LEVELING STRUCTURE - INTERFACE DRAWING

Doc. Type : DRW	System/Unit: 04	Discipline : STR	Electronic Filename: AO-050-GSG-310-000348-rev03.pdf
COMPANY Document N°	AO-050-GSG-310-000348	REV : 03	Scale : 1:50
CONTRACTOR/Original Document N°	ITM-005B372/C	Format : A1	Folio : 2 of 3

Phase : DE
Class : 2

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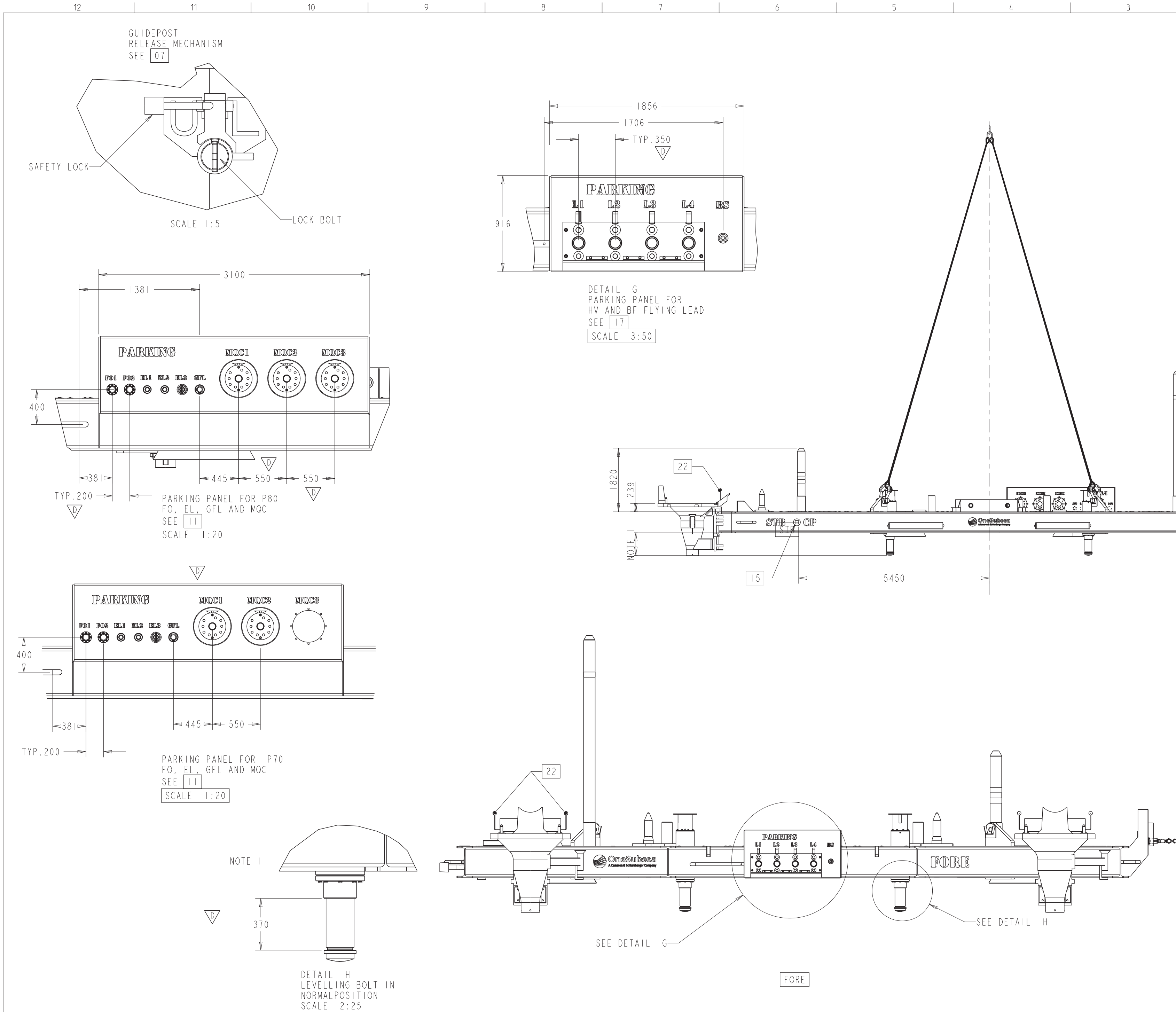
Title	SUPPORT AND LEVELING STRUCTURE - INTERFACE DRAWING
ID	ITM-0058372
Format	A1
Sheet	2 of 3
Weight	REF /5/
Scale	1:50

Revision Status	Published	Made by	Checked by	Approved by
D Released	2014-11-06 11:10:32	SIH	SAA	HAA

Engineering Change Order: ECN-002085

TOTAL E&P ANGOLA - GIRRI PROJECT - AO-050-GMP-310-000324 - REV 02 - AFC - 20 - APR - 2015



INTERFACES:

NO.	TO	DESCRIPTION:
15	ROV	CP MEASUREMENT POINT 10X10 CM
22	ROV	MONKEY FIST FOR ROV HANDLING OF HINGE PLATE ON STABCON RECEPTACLE
23	ROV	HINGE PLATE

NOTES:

1. ITEM 01 AND 08

MAX RETRACTED POSITION: 275
NOMINAL POSITION: 645
MAX EXTENDED POSITION: 1025

Rev	Date	Status	Revision Memo	Issued by	Checked by	Approved by
03	03/NOV/2014	AFC	Approved for construction	SIH	SAA	HHA
02	02/April/2014	AFC	Approved for Construction	ATR	SAA	HHA
01	14-Jan-2013	AFC	Approved for Construction	SAA	SIH	HHA
00	03-May2013	IFR	Issued for review	RGU	MFL	HHA

TOTAL E&P ANGOLA — OneSubsea A Cameron & Schlumberger Company

SUPPORT AND LEVELING STRUCTURE - INTERFACE DRAWING

Doc Type: DRW	System/Unit: 04	Discipline: STR	Electronic Filename: AO-050-GSG-310-000348-rev03.pdf
COMPANY Document N°	AO-050-GSG-310-000348	REV: 03	Scale: 1:50 — Phase: DE
CONTRACTOR/Original Document N°	ITM-0058372/C	Format: A1 — Folio: 3 of 3	Class: 2

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Title: SUPPORT AND LEVELING STRUCTURE - INTERFACE DRAWING

Weight: REF /5/

ID: ITM-0058372

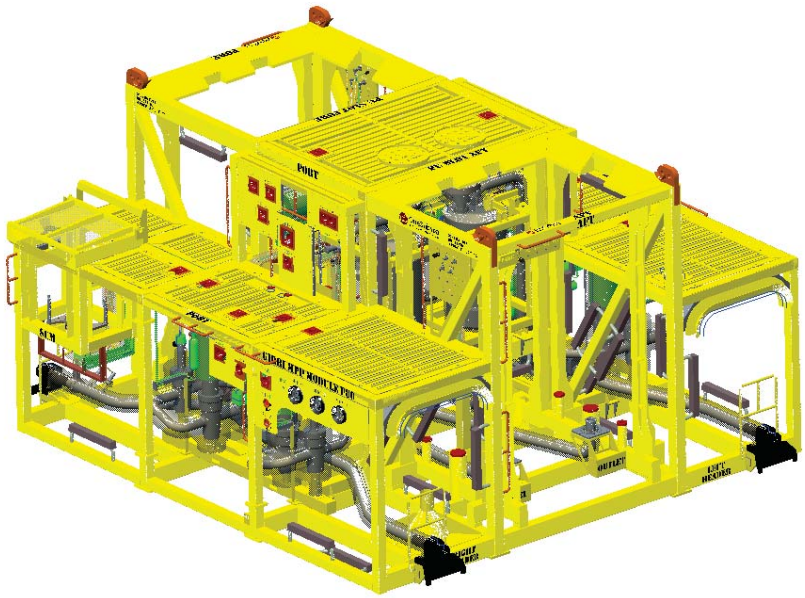
Scale: 1:50

Format: A1 — Sheet: 3 of 3

Revision Status: D Released — Published: 2014-11-06 11:10:32 — Made by: SIH — Checked by: SAA — Approved by: HAA

Engineering Change Order: ECN-002035

4 MPP Module

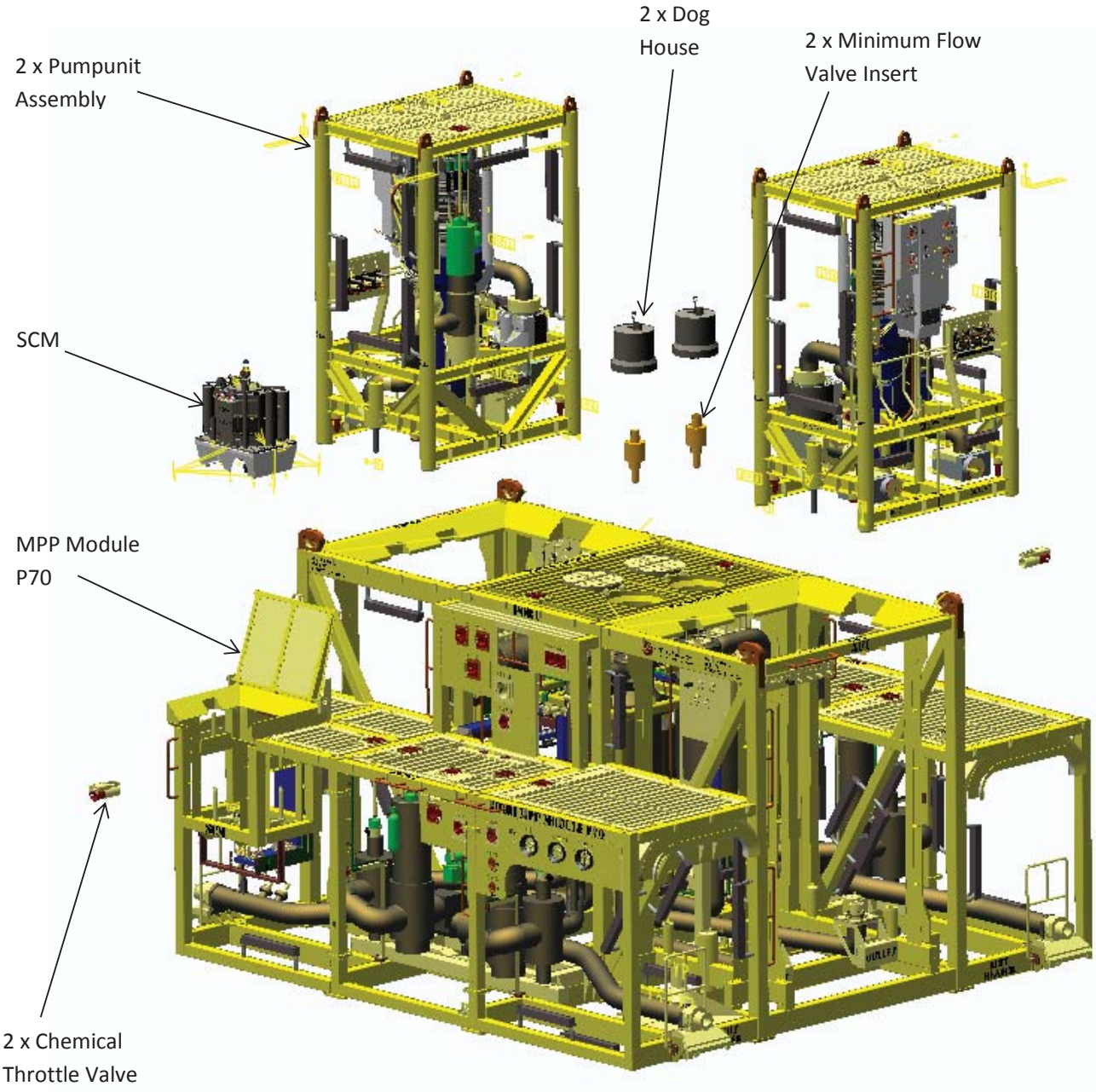


4.1 MPP Module reference list

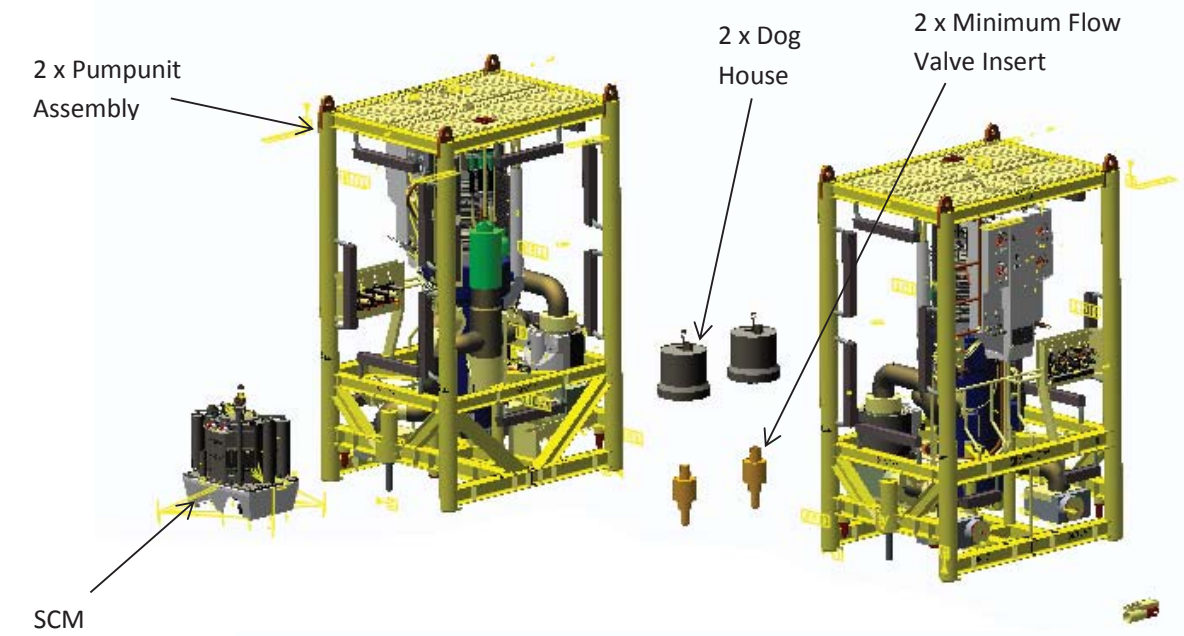
Ref	Document title	COMPANY Doc. No	MPP CON Doc. No
/20/	MPP Module P70 and P80 – Interface Drawing	AO-050-GMP-310-000380	ITM-0058434
/21/	MPP System – P&ID – MPP Station P70	AO-050-GSG-310-000102	DRW-0001208
/22/	MPP System – P&ID – MPP Station P80	AO-050-GSG-310-000103	DRW-0001209
/23/	MPP Module – General Arrangement Drawing	AO-050-GMP-310-000379	ITM-0058433
/24/	MPP Module – Data Sheet	AO-050-GMP-310-000188	DOC-0010202

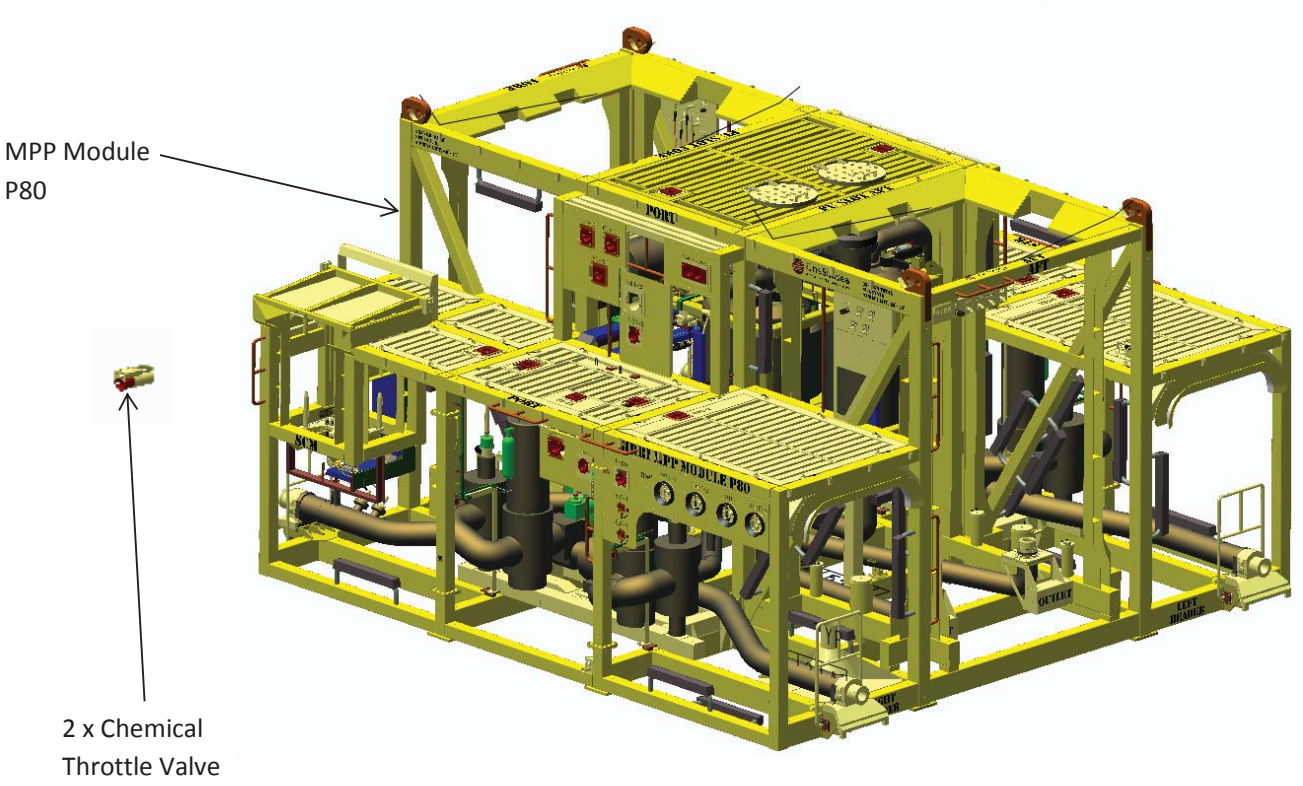
4.2 MPP Module scope of supply

4.2.1 MPP Module P70 w/retrievable items

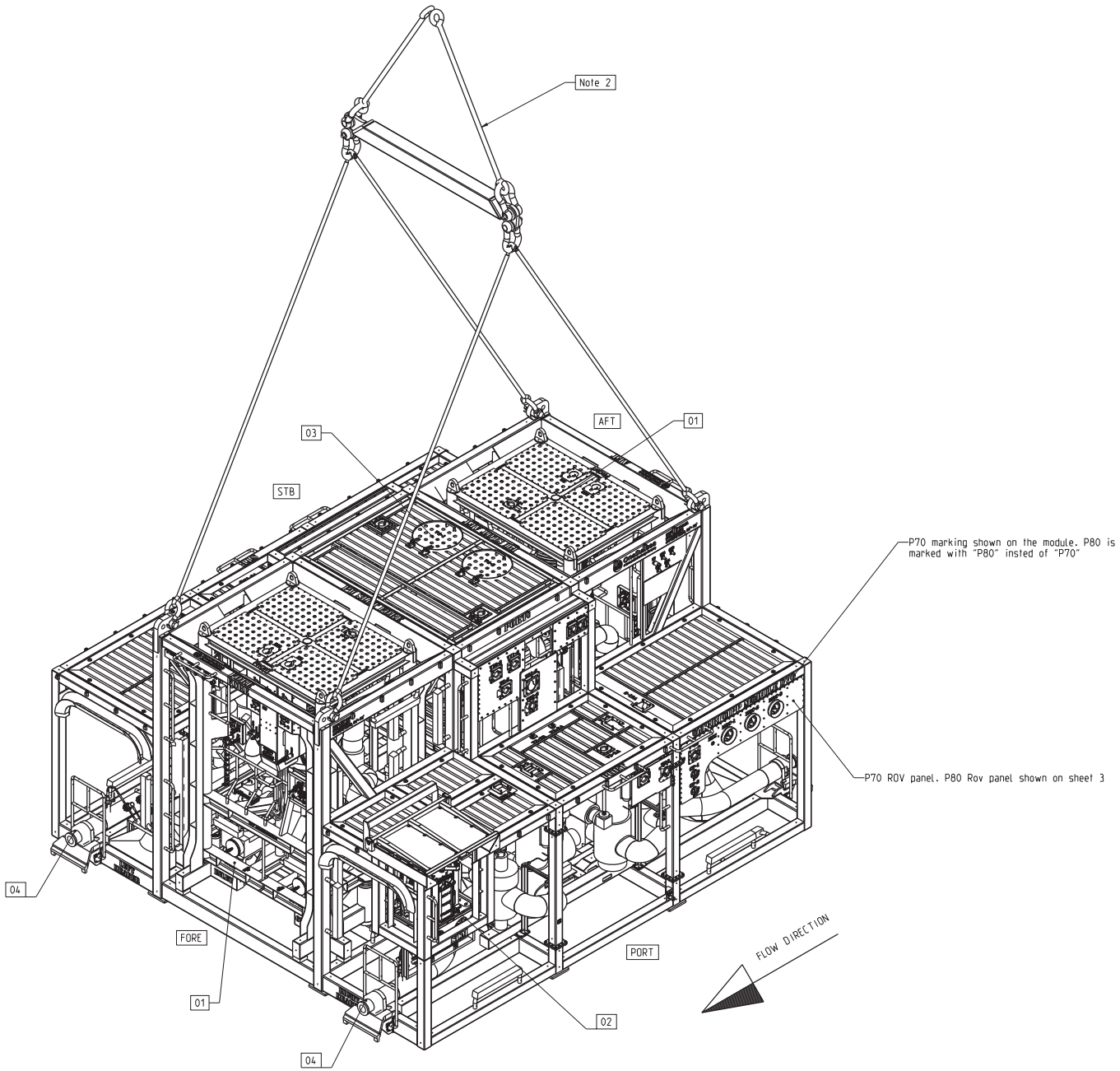


4.2.2 MPP Module P80 w/retrievable items





4.3 MPP Module interface drawing



INTERFACES		
NO.	TO	DESCRIPTION
01	PU-IT	PUMP UNIT (2 OFF) REF /4/
02	SCM-IT	SCM REF /2/
03	MFCV-RT	MFCV (2 OFF) REF /3/
04	TIE-IN	FMC STABCON SYSTEM

REFERENCES	
/1/	ITM-0058433 AO-050-GMP-310-000379 MPP MODULE GENERAL ARRANGEMENT DRAWING
/2/	ITM-0059363 AO-050-GSG-310-000405 SUBSEA CONTROL MODULE - GA & INTERFACE DRAWING
/3/	DOC-0039547 / AO-050-PSG-327-001415 GENERAL ARRANGEMENT DRAWING WITH PART LI
/4/	ITM-0077876 AO-050-GMP-310-000015 PUMP UNIT - INTERFACE DRAWING
/5/	ITM-0058373 AO-050-GSG-310-000359 FOUNDATION - INTERFACE DRAWING
/6/	ITM-0058372 AO-050-GSG-310-000348 SUPPORT AND LEVELING STRUCTURE INTERFACE DRAWING

NOTES

1. MPP MODULE SHOWN WITH RETRIVABLE ITEMS.
2. LIFTING RIGGING FOR ONSHORE USE. 350 mT WLL

ABBREVIATIONS:

PU - PUMP UNIT
PU-IT - PUMP UNIT INSTALLATION TOOL
SCM - SUBSEA CONTROL MODULE
SCM-IT - SUBSEA CONTROL MODULE INSTALLATION TOOL
MFCV - MINIMUM FLOW CONTROL VALVE

Rev	Date	Status	Revision Memo	Issued by	Checked by	Approved by
03	18-dec-2014	ABB	As-built	VES	SAA	AMI
02	05-nov-2014	AFC	Accepted for construction	VES	SAA	AMI
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TOTAL E&P ANGOLA

OneSubsea
A Cameron & Schlumberger Company

MPP Module P70 and P80
-
Interface Drawing

Doc Type : GEA	System/Unit: 04	Discipline : MPP	Electronic Filename: AO-050-GMP-310-000360-REV03
COMPANY Document N°	AO-050-GMP-310-000360	REV : 03	Scale : 1/50
CONTRACTOR/Original Document N°	ITM-0058434	Format : A1	Folio : 1 of 6

Class : 1

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Title: MPP MODULE P70 AND P80 INTERFACE DRAWING

Weight: -

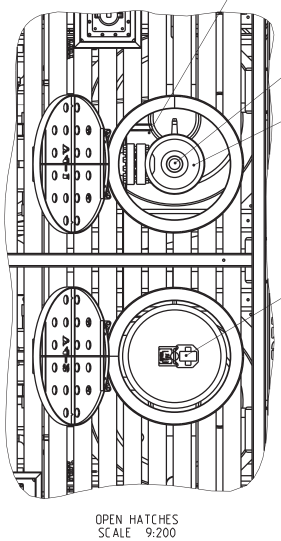
ID: ITM-0058434

Scale: 1:50

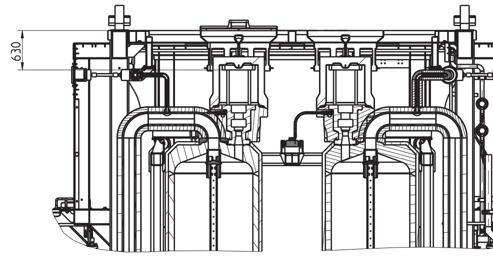
Format: A1 | Sheet: 1 of 6

Revision	Status	Published	Made by	Checked by	Approved by
D	Released	2014-12-19 10:40:35	VES	SAA	AMI

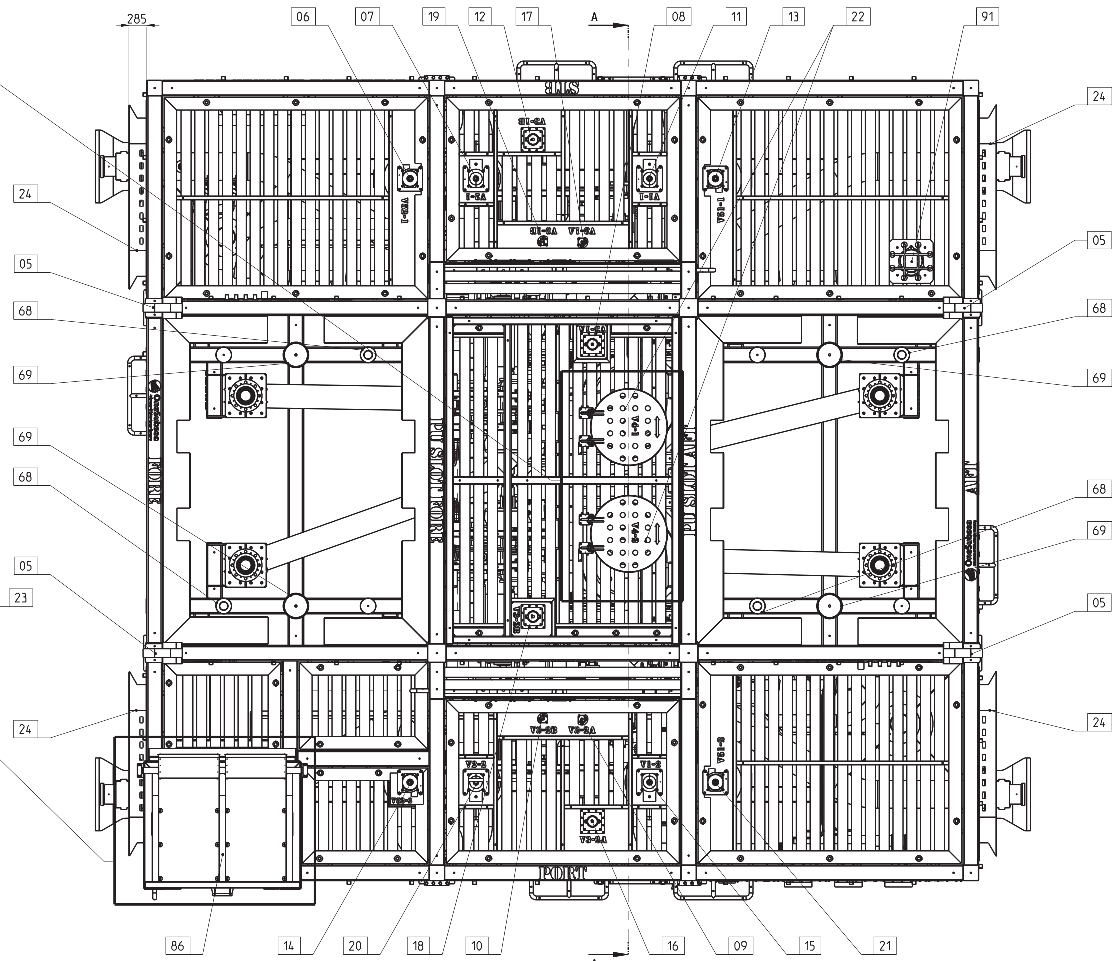
Engineering Change Order: ECN-002532

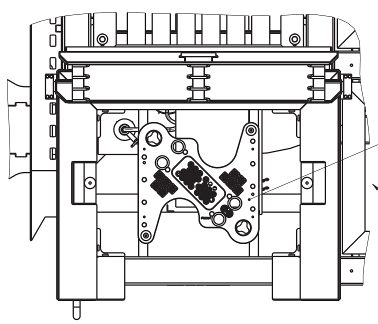


OPEN HATCHES
SCALE 9:200



DISTANCE FROM CHOKE
SECTION A-A





OPEN HATCH
SCALE 9:200

INTERFACES:

NO.	TO	DESCRIPTION
68	PU	FUNNEL FOR PU MINIGUIDE POST
69	PU	INTERFACE TOWARDS PU SOFT LANDING CYLINDERS
86		SCM HATCH WET WEIGHT: 194 kg PULL FORCE TO OPEN: 826 N
88		OVERRIDE TORQUE RECEPTACLE CLASS 4 MAX RPM: 20 OPERATING TORQUE: 272 Nm MAXIMUM TORQUE: 339 Nm DAMAGE TORQUE: 407 Nm NO. OF TURNS 8.5
89		CAMERON ROV TORQUE TOOL T-BAR HANDLE MIN SETTING TORQUE: 81 Nm MAX SETTING TORQUE: 122 Nm MAX BREAKOUT TORQUE: 108 Nm MIN BREAKOUT TORQUE: 27 Nm DAMAGE BREAKOUT TORQUE: 203 Nm NO OF TURNS 12 ±1.5
90		DOGHOUSE FOR CHOKE WITH D-HANDLE STRAIGHT PULL TO REMOVE. WET WEIGHT: 72.5 kg
91		BULLS EYE. 0-2 DEGREES

INTERFACES:

NO.	TO	DESCRIPTION
05		MPP MODULE MAIN LIFTING PAD EYES FITS 200MT CROSBY ROV SHACKLE
06 13 21 14	ROV	V52-1 V51-1 V51-2 V52-2 ROV OPERATED GATE VALVE ISO 13628-8 CLASS 4 TORQUE INTERFACE NOMINAL INPUT TORQUE: 1900 Nm MAX ALLOWABLE TORQUE: 2700 Nm DAMAGE INPUT TORQUE: 3000 Nm NO OF TURNS 33.90 CLOCKWISE TO CLOSE. AT END OF STROKE, APPLY 0.25 TURNS IN REVERSE ROTATION.
20 07		V2-2 V2-1 ISO 13628-8 CLASS 4 TORQUE INTERFACES HYDRAULIC OPERATED GATE VALVE (FSO) NOMINAL INPUT TORQUE: 1900 Nm MAX ALLOWABLE TORQUE: 2700 Nm DAMAGE INPUT TORQUE: 3000 Nm NO OF TURNS 95.70 CLOCKWISE TO CLOSE. AT END OF STROKE, APPLY 0.25 TURNS IN REVERSE ROTATION.
15 11		V1-2 V1-1 ISO 13628-8 CLASS 4 TORQUE INTERFACES HYDRAULIC OPERATED GATE VALVE (FSC) NOMINAL INPUT TORQUE: 1900 Nm MAX ALLOWABLE TORQUE: 2700 Nm DAMAGE INPUT TORQUE: 3000 Nm NO OF TURNS 95.70 CLOCKWISE TO CLOSE. AT END OF STROKE, APPLY 0.25 TURNS IN REVERSE ROTATION.
09 10 17 19		V3-2A POSITION INDICATOR V3-2B POSITION INDICATOR V3-1A POSITION INDICATOR V3-1B POSITION INDICATOR
08 12 16 18		V3-1A V3-1B V3-2A V3-2B HYDRAULIC OPERATED BALL VALVE (FSO) ISO 13628-8 CLASS 4 TORQUE INTERFACE NOMINAL INPUT TORQUE: 1900 Nm MAX ALLOWABLE TORQUE: 2700 Nm DAMAGE INPUT TORQUE: 3000 Nm NO OF TURNS 14.10 CLOCKWISE TO CLOSE
22		FLIPOVER HATCH TO ACCESS DOGHOUSE. WET WEIGHT: 103.5 kg PULL FORCE TO OPEN: 569 N
23	SCM	SCM BASE PLATE
24		JUMPER GATE

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MPP Module P70 and P80
-
Interface Drawing

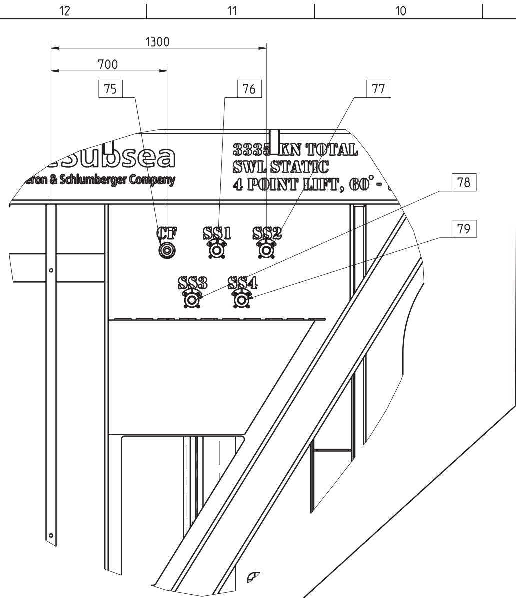
Doc Type: GEA	System/Unit: 04	Discipline: MPP	Electronic Filename: AO-050-GMP-310-000380-REV03
COMPANY Document N°	AO-050-GMP-310-000380	REV: 03	Scale: 1/40 · Phase: DE
CONTRACTOR/Original Document N°	ITM-0058434	Format: A1	Folio: 2 of 6 · Class: 1

OneSubsea — A Cameron & Schlumberger Company

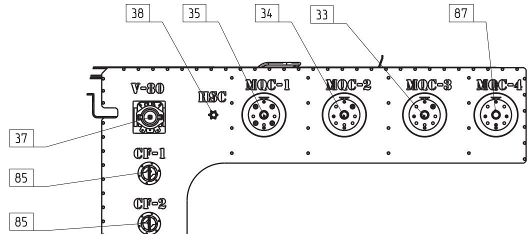
Title	MPP MODULE P70 AND P80 INTERFACE DRAWING	Weight	-
ID	ITM-0058434	Scale	1:40
Format	A1	Sheet	2 of 6

Revision Status	Published	Made by	Checked by	Approved by
D Released	2014-12-19 10:40:35	VES	SAA	AMI

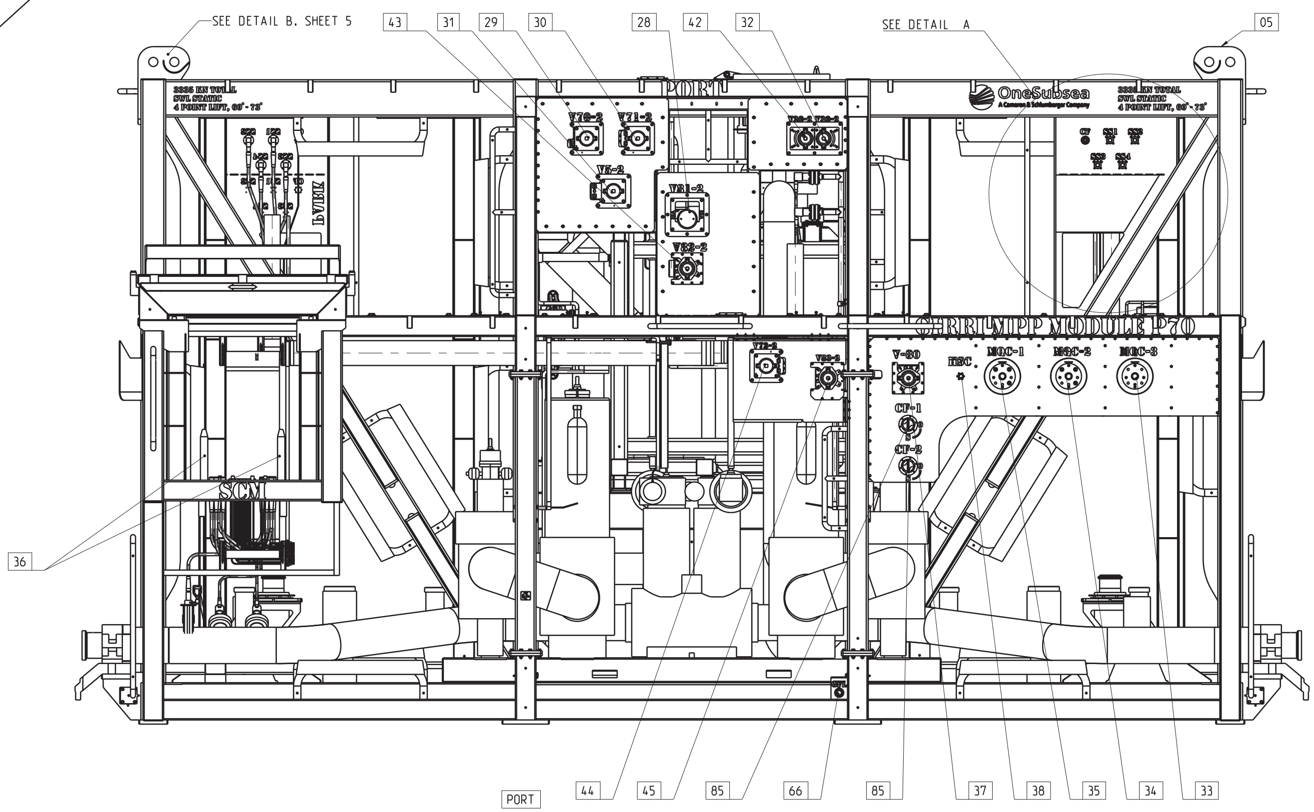
Engineering Change Order: ECN-002532



DETAIL A
MORE INFO SEE SHEET 5
SCALE 33:500



P80 ROV PANEL
SCALE 1:25



INTERFACES

NO.	TO	DESCRIPTION
43	ROV	V82-2 LB BENTLEY HYDRAULIC OPERATED VALVE (FSC) ISO 13628-8 CLASS 4 TORQUE INTERFACE NOMINAL TORQUE: 150 Nm MAX ALLOWABLE TORQUE: 340 Nm DAMAGE TORQUE: 542 Nm BREAKOUT TORQUE: 150 Nm RUNNING TORQUE: 68 Nm NO OF TURNS 12 CLOCKWISE TO CLOSE AT END OF STROKE. APPLY 0.25 TURNS IN REVERSE ROTATION.
45	ROV	V83-2 LB BEANTLEY ROV OPERATED GATE VALVE ISO 16328-8 CLASS 4 INTERFACE NOMINAL TORQUE: 129 Nm MAX ALLOWABLE TORQUE: 339 Nm DAMAGE TORQUE: 542 Nm BREAKOUT TORQUE: 150 Nm RUNNING TORQUE: 68 Nm NO OF TURNS 12 CLOCKWISE TO CLOSE AT END OF STROKE. APPLY 0.25 TURNS IN REVERSE ROTATION.
85	ROV	BALL VALVE 2-WAY-90DEG TURN 6500PSI PADDEL INTERFACE NOMINAL TORQUE: 50 Nm MAX TORQUE: 100 Nm 0.25 TURNS. CW TO CLOSE. DAMAGE TORQUE: 160 Nm
36	SCM	SCM GUIDE POSTS
37	ROV	V-80 LB BENTLEY ROV OPERATED VALVE ISO 13628-8 CLASS 4 TORQUE INTERFACE NOMINAL TORQUE: 129 Nm MAX ALLOWABLE TORQUE: 339 Nm DAMAGE TORQUE: 542 Nm BREAKOUT TORQUE: 150 Nm RUNNING TORQUE: 68 Nm NO OF TURNS 12 CLOCKWISE TO CLOSE AT END OF STROKE. APPLY 0.25 TURNS IN REVERSE ROTATION.
38		HOT STAB RECEPTABLE ISO 13628-8 TYPE B. FISHTAIL INTERFACE ON PLUG. FOR BLEED OFF LINE

INTERFACES

NO.	TO	DECRIPTION
28	ROV	V81-2 CHEMICAL CONTROL VALVE INSTALLATION: ISO 16328-8 CLASS 4 INTERFACE NOMINAL TORQUE:100 Nm MAX ALLOWABLE TORQUE: 200 Nm DAMAGE TORQUE: 400 Nm NO OF TURNS TO OPEN 4.5 NO OF TURNS TO CLOSE 5.5 CLOCKWISE TO CLOSE FLOW ADJUSTMENT: PADDEL INTERFACE ISO-13628-8 TYPE A. RECOMMENDED USE OF 3-FINGER CLAW OF PARALLEL JAW WITH MAX OF 75mm NOMINAL TORQUE @ 100 BAR DP: 20 Nm MAX TORQUE: 50 Nm DAMAGE TORQUE: 55 Nm NO OF TURNS FROM 0%-100%: APPROX 30
32 42	ROV	V30-2 V20-2 LB BENTLY DUAL MANUAL GATE VALVE ISO 16328-8 CLASS 4 INTERFACE NOMINAL TORQUE: 176 Nm MAX ALLOWABLE TORQUE: 407 Nm DAMAGE TORQUE: 610 Nm NO OF TURNS 1/4 CLOCKWISE TO CLOSE
29	ROV	V70-2 ATV GATE VALVE ROV ISO 13628-8 CLASS 4 TORQUE INTERFACE NOMINAL INPUT TORQUE: 1990 Nm MAX. INPUT TORQUE: 2700 Nm DAMAGE INPUT TORQUE: 3000 Nm NO OF TURNS: 5 CLOCKWISE TO CLOSE AT END OF STROKE. APPLY 0.25 TURNS IN REVERSE ROTATION.
31	ROV	V5-2 ATV HYDRAULIC OPERATED GATE VALVE (FSO) ISO 13628-8 CLASS 4 TORQUE INTERFACE NOMINAL INPUT TORQUE: 1900 Nm MAX ALLOWABLE TORQUE: 2700 Nm DAMAGE INPUT TORQUE: 3000 Nm NO OF TURNS 68.10 CLOCKWISE TO CLOSE AT END OF STROKE. APPLY 0.25 TURNS IN REVERSE ROTATION.
30 44	ROV	V71-2 V72-2 ATV HYDRAULIC GATE VALVE (FSC) ISO 13628-8 CLASS 4 TORQUE INTERFACE NOMINAL INPUT TORQUE: 1900 Nm MAX ALLOWABLE TORQUE: 2700 Nm DAMAGE INPUT TORQUE: 3000 Nm NO OF TURNS 5 CLOCKWISE TO CLOSE AT END OF STROKE. APPLY 0.25 TURNS IN REVERSE ROTATION.
87 33 34 35		P70 MQC1-HFL1 (1xDem. 1xCF. 2xMeOH) MQC2-HFL1 (1xDem/Spare. 1xCF. 2xMeOH) MQC3-Looped Plate P80 MQC1 - HFL2 (1xCF. 1xDem) MQC2 - HFL2 (1xCF. 1xDem/Spare) MQC3 - HFL3 (4xMeOH) MQC4 - Looped Plate MSCM.LTD MQC RECEPTACLE
66	ROV	GROUNDING FLYING LEAD FISHTAIL HANDLE INTERFACE MAKE-UP TORQUE: 80 Nm BREAK-OUT TORQUE: 80 Nm DAMAGE TORQUE: 400 Nm NO OF TURNS: 5.5

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TOTAL E&P ANGOLA — OneSubsea, A Cameron & Schlumberger Company

MPP Module P70 and P80

-

Interface Drawing

Doc Type:	System/Unit:	Discipline:	Electronic Filename:
GEA	04	MPP	AO-050-GMP-310-000380-REV03

COMPANY Document N°	AO-050-GMP-310-000380	REV: 03	Scale: 33/1000	Phase: DE	
CONTRACTOR/Original Document N°	ITM-0058434	Format: A1	Folio: 3 of 6	Class: 1	

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Format	A1	Sheet	3 of 6

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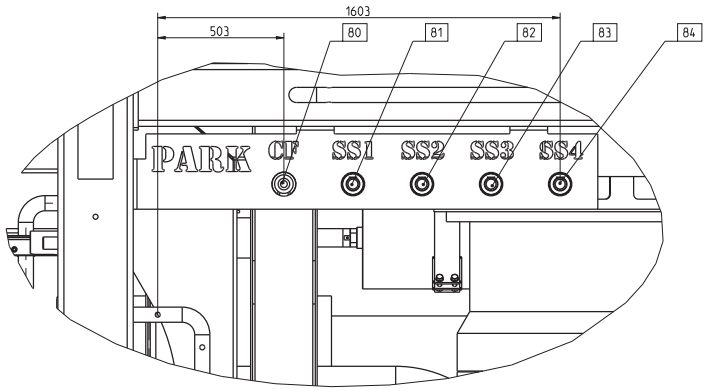
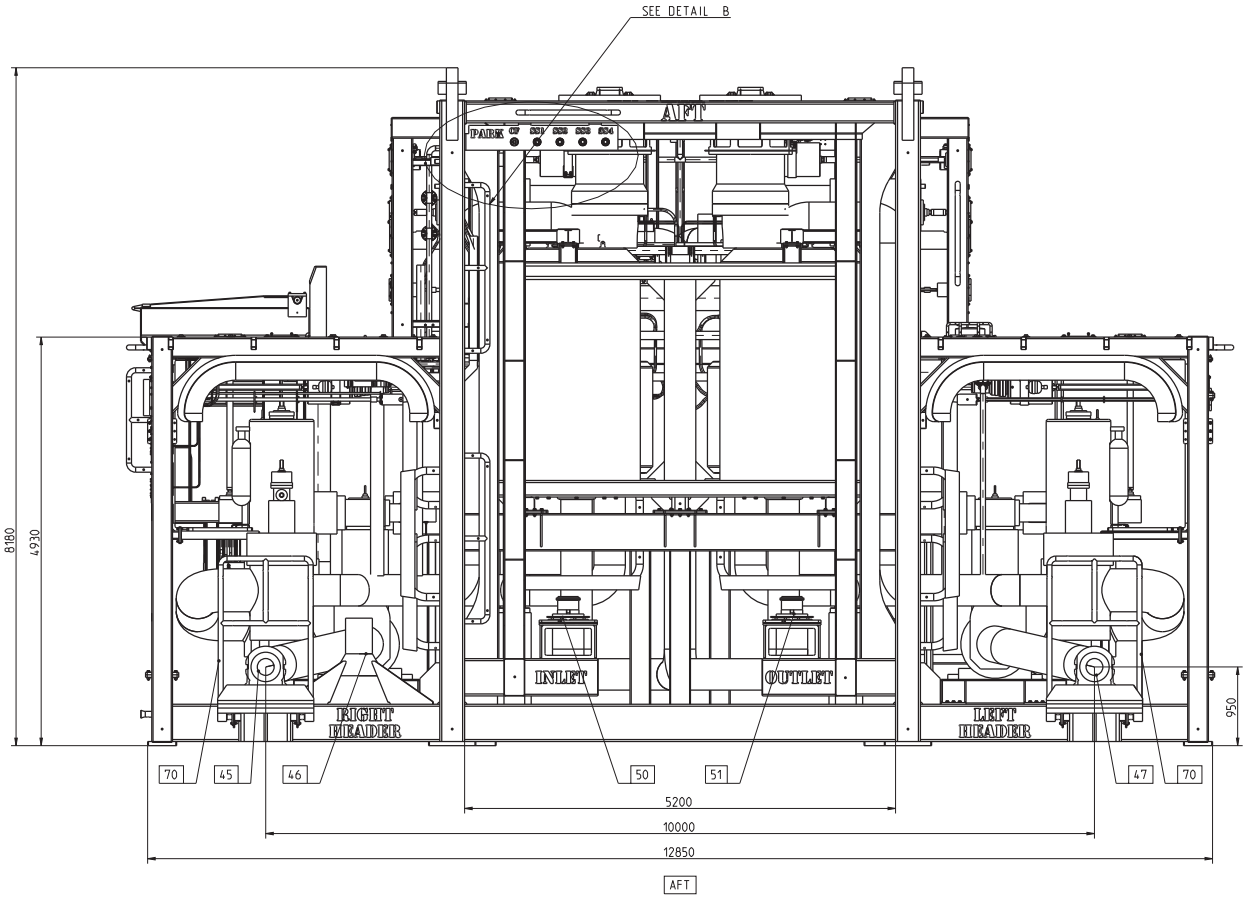


DETAIL B
SCALE 1:10



INTERFACES		
NO.	TO	DESCRIPTION
50 51	ROV	DESTEC INLET PROCESS HUB DESTEC OUTLET PROCESS HUB ISO 13628-8 CLASS 4 INTERFACE
70		BUMPER FOR 21Hr DOGHOUSE
45		RIGHT BRANCH FROM MANIFOLD CONNECTED TO AFT PU
46		GUIDE FUNNEL FOR SLS GUIDE POST
47		LEFT BRANCH FROM MANIFOLD CONNECTED TO FORE PU
80		CF ROV CONNECTOR PARKING RECEPTACLE RO CONTROL FLUID SUPPLY RECEPTACLE FOR MALE HYDRAULIC CONNECTOR TYPE WALTHER. R2 RUNNING TORQUE: 40Nm DAMAGE TORQUE: 160Nm TURN CW (11.5 TURNS) TO CONNECT
81 82 83 84		SS1-SS4 PARKING DigiTRON+ TRONIC, FISHTAIL HANDLE INTERFACE PUSH TO MATE MAX: 490N PULL TO DEMATE: 472-787N MAX RADIAL MISALIGNMENT ±20mm MAX ANGULAR MISALIGNMENT ±20° MAX ROTATIONAL MISALIGNMENT ±15°

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MPP Module P70 and P80
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COMPANY Document N°	AO-050-GMP-310-000380	REV : 03	Scale : 33/1000	Phase : DE
CONTRACTOR/Original Document N°	ITM-0058434	Format : A1	Folio : 4 of 6	Class : 1

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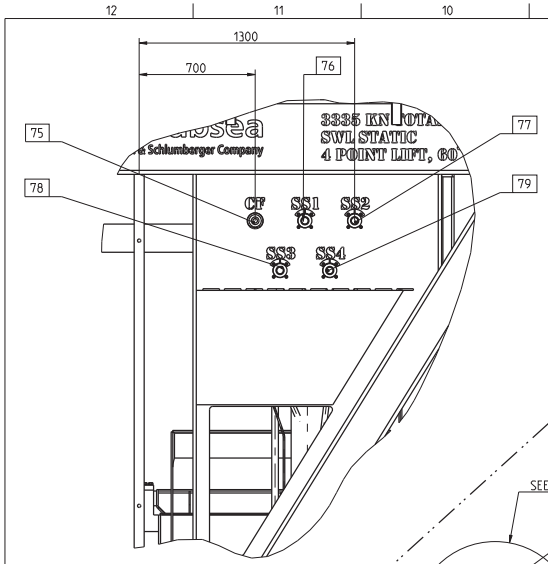

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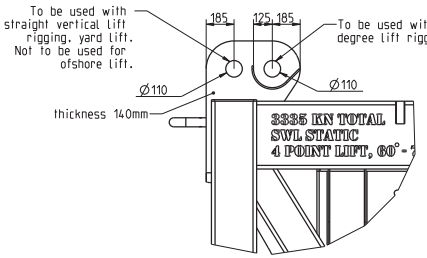
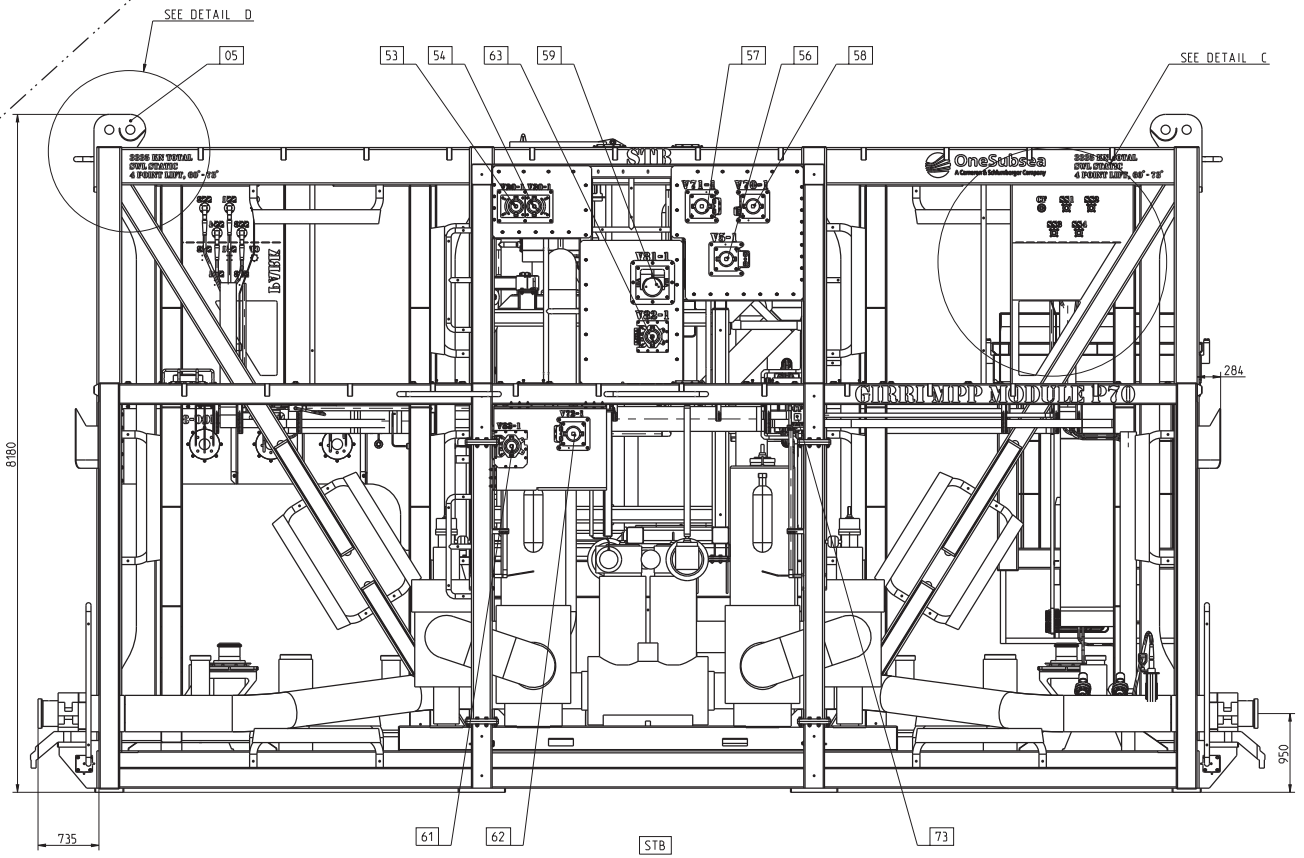
SCALE 33:500



DETAIL D
SCALE 3:50

INTERFACES		
61		V83-1 LB BEANTLEY ROV OPERATED GATE VALVE ISO 16328-8 CLASS 4 INTERFACE NOMINAL TORQUE: 129Nm MAX ALLOWABLE TORQUE: 339Nm DAMAGE TORQUE: 542Nm BREAKOUT TORQUE: 150Nm RUNNING TORQUE: 68Nm NO OF TURNS 12 CLOCKWISE TO CLOSE AT END OF STROKE, APPLY 0.25 TURNS IN REVERSE ROTATION.
75		CF ROV MALE CONNECTOR RECEPTACLE R2 CONTROL FLUID SUPPLY RECEPTACLE FOR MALE HYDRAULIC CONNECTOR TYPE WALTHER. R2 RUNNING TORQUE: 40Nm DAMAGE TORQUE: 160Nm TURN C.W (11.5 TURNS) TO CONNECT
76 77 78 79		SS1-SS4 DigiTRON+ TRONIC. FISHTAIL HANDLE INTERFACE PUSH TO MATE MAX: 490N PULL TO DEMATE: 472-787N MAX RADIAL MISALIGNMENT ±20mm MAX ANGULAR MISALIGNMENT ±20° MAX ROTATIONAL MIASALIGNMENT ±15°
73		CP MEASUREMENT. 100x100mm

INTERFACES		
NO.	TO	DESCRIPTION
53 54		V20-1 V30-1 LB BENTLY DUAL MANUAL GATE VALVE ISO 16328-8 CLASS 4 INTERFACE NOMINAL TORQUE: 176Nm MAX ALLOWABLE TORQUE: 1900 Nm MAX ALLOWABLE TORQUE: 407Nm DAMAGE TORQUE: 610Nm NO OF TURNS 1/4 CLOCKWISE TO CLOSE
56		V5-1 ATV HYDRAULIC OPERATED GATE VALVE (FSO) ISO 13628-8 CLASS 4 TORQUE INTERFACE NOMINAL INPUT TORQUE: 1900 Nm MAX. INPUT TORQUE: 2700 Nm DAMAGE INPUT TORQUE: 3000 Nm NO OF TURNS: 68.10 CLOCKWISE TO CLOSE AT END OF STROKE, APPLY 0.25 TURNS IN REVERSE ROTATION.
57 62		V71-1 V72-1 ATV HYDRAULIC GATE VALVE (FSC) ISO 13628-8 CLASS 4 TORQUE INTERFACE NOMINAL INPUT TORQUE: 1900 Nm MAX. INPUT TORQUE: 2700 Nm DAMAGE INPUT TORQUE: 3000 Nm NO OF TURNS: 5 CLOCKWISE TO CLOSE AT END OF STROKE, APPLY 0.25 TURNS IN REVERSE ROTATION.
58		V70-1 ATV GATE VALVE ROV ISO 13628-8 CLASS 4 TORQUE INTERFACE NOMINAL INPUT TORQUE: 1900 Nm MAX. INPUT TORQUE: 2700 Nm DAMAGE INPUT TORQUE: 3000 Nm NO OF TURNS: 5 CLOCKWISE TO CLOSE AT END OF STROKE, APPLY 0.25 TURNS IN REVERSE ROTATION.
59		V81-1 CHEMICAL CONTROL VALVE INSTALLATION: ISO 16328-8 CLASS 4 INTERFACE NOMINAL TORQUE:100Nm MAX ALLOWABLE TORQUE: 200Nm DAMAGE TORQUE: 400Nm NO OF TURNS TO OPEN 4.5 NO OF TURNS TO CLOSE 5.5 CLOCKWISE TO CLOSE FLOW ADJUSTMENT: NOMINAL TORQUE @ 100 BAR DP: 20Nm MAX TORQUE: 50Nm DAMAGE TORQUE: 55Nm NO OF TURNS FROM 0%-100%: APPROX 30
63		V82-1 LB BENTLEY HYDRAULIC OPERATED VALVE (FSC) ISO 13628-8 CLASS 4 TORQUE INTERFACE NOMINAL TORQUE: 150Nm MAX ALLOWABLE TORQUE: 340Nm DAMAGE TORQUE: 542Nm BREAKOUT TORQUE: 150Nm RUNNING TORQUE: 68Nm NO OF TURNS 12 CLOCKWISE TO CLOSE AT END OF STROKE, APPLY 0.25 TURNS IN REVERSE ROTATION.



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TOTAL E&P ANGOLA

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MPP Module P70 and P80
-
Interface Drawing

Doc Type : GEA	System/Unit: 04	Discipline : MPP	Electronic Filename: AO-050-GMP-310-000380-REV03
COMPANY Document N°	AO-050-GMP-310-000380	REV : 03	Scale : 33/1000 Phase : DE
CONTRACTOR/Original Document N°	ITM-0058434	Format : A1	Folio : 6 of 6 Class : 1

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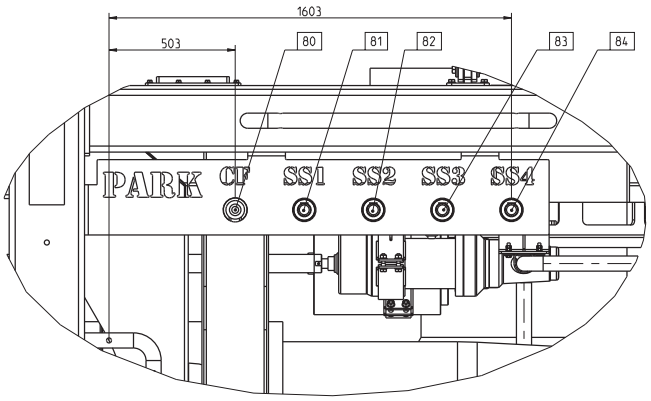
Title	MPP MODULE P70 AND P80 INTERFACE DRAWING
Weight	-
ID	ITM-0058434
Scale	33:1000
Format	A1
Sheet	5 of 6

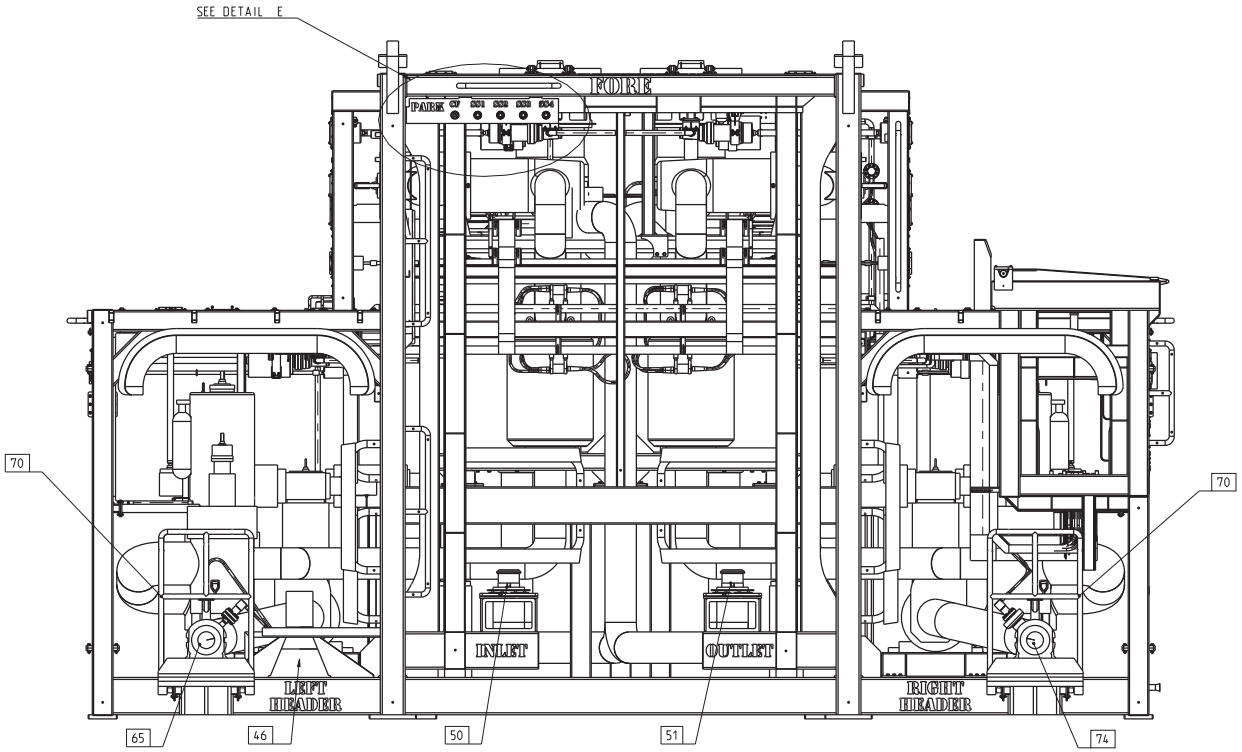
Revision Status: D Released
Published: 2014-12-19 10:40:35
Made by: VES
Checked by: SAA
Approved by: AMI
Engineering Change Order: ECN-002532

TOTAL E&P ANGOLA - GIRRI PROJECT - AO-050-GMP-310-000324 REV 02 - AFC - 20 - APR - 2015

INTERFACES		
NO.	TO	DESCRIPTION
65		LEFT BRANCH - OUTLET FROM FORE PU
74		RIGHT BRANCH - OUTLET FROM AFT PU



DETAIL E
SCALE 1:10



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TOTAL E&P ANGOLA - GIRRI PROJECT - AO-050-GMP-310-000324 REV 02 - AFC - 20 - APR - 2015

Rev	Date	Status	Revision Memo	Issued by	Checked by	Approved by
03	16-dec-2014	ASB	As-built	VES	SAA	AMI
02	05-nov-2014	AFC	Accepted for construction	VES	SAA	AMI
01	27-oct-2014	IFA	Issued for approval	VES	SAA	AMI
00	30-apr-2014	IFR	Issued for review	ATR	SHH	HHA

TOTAL E&P ANGOLA
TOTAL

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MPP Module P70 and P80
-
Interface Drawing

Doc Type: GEA	System/Unit: 04	Discipline: MPP	Electronic Filename: AO-050-GMP-310-000360-REV03
COMPANY Document N°	AO-050-GMP-310-000360	REV: 03	Scale: 33/1000
CONTRACTOR/Original Document N°	ITM-0058434	Format: A1	Folio: 6 of 6
			Phase: DE
			Class: 1

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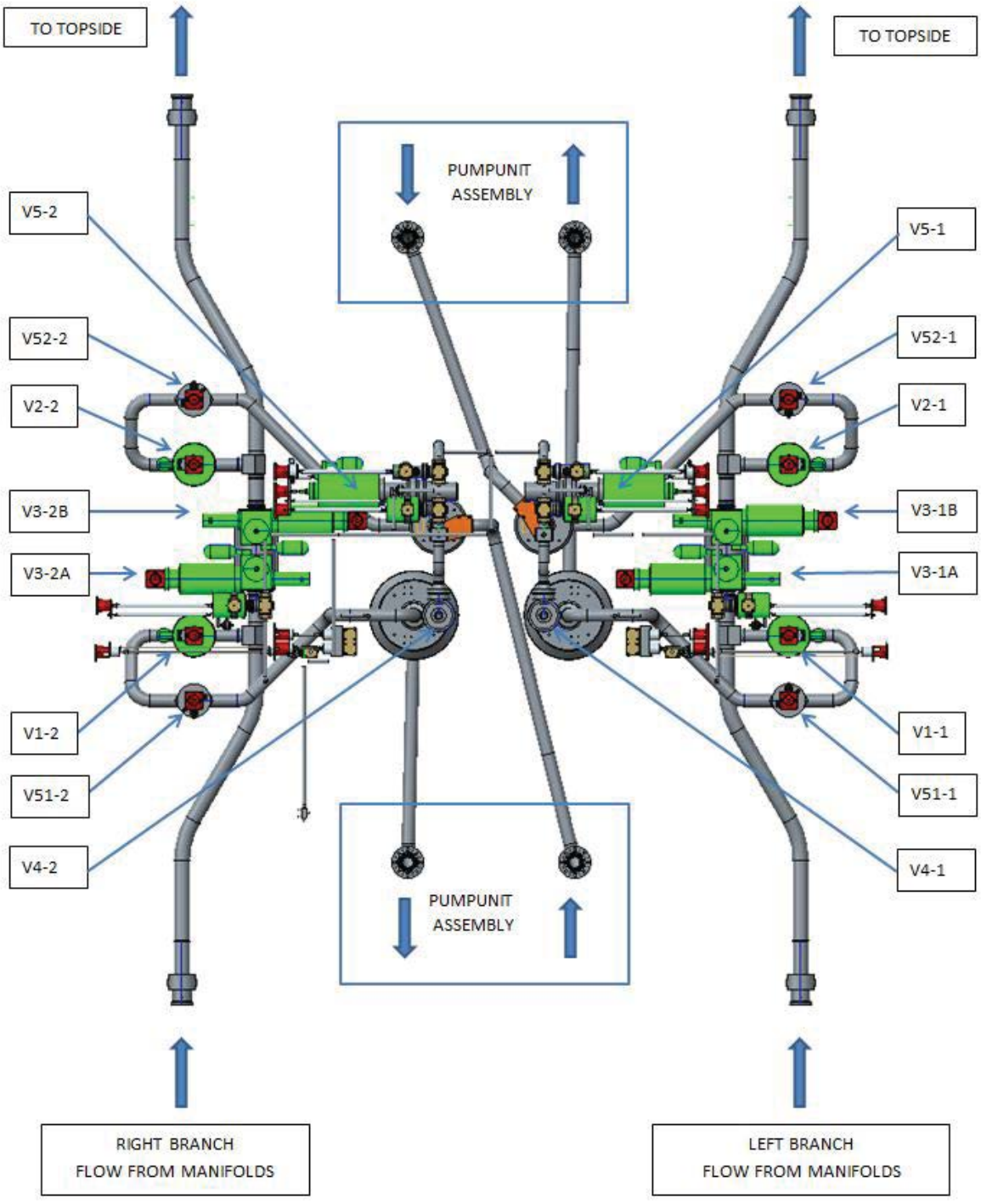
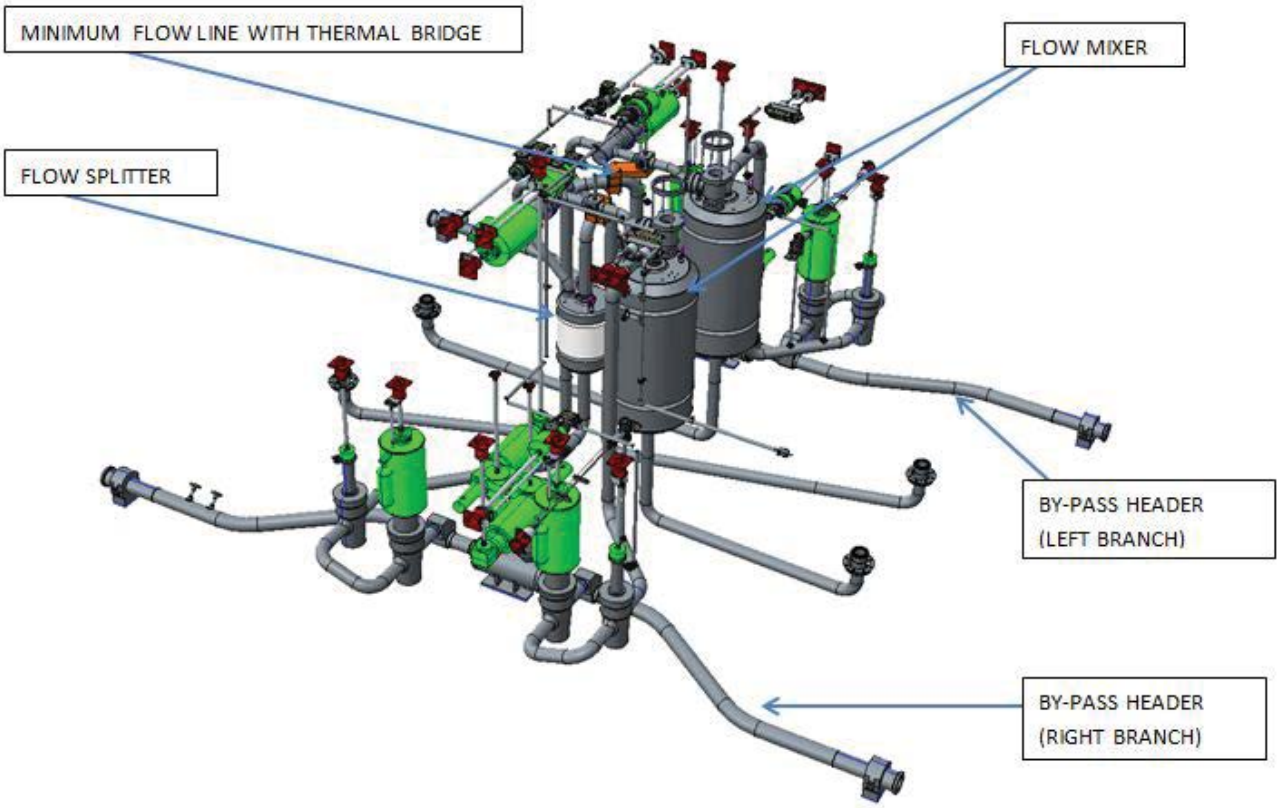
Title	MPP MODULE P70 AND P80 INTERFACE DRAWING
Weight	-
ID	ITM-0058434
Scale	33:1000
Format	A1
Sheet	6 of 6

Revision Status	Published	Made by	Checked by	Approved by
D Released	2014-12-19 10:40:35	VES	SAA	AMI

Engineering Change Order: ECN-002532

5 Process flow




MINIMUM FLOW LINE WITH THERMAL BRIDGE
FLOW MIXER
FLOW SPLITTER
BY-PASS HEADER
(LEFT BRANCH)
BY-PASS HEADER
(RIGHT BRANCH)

5.1 Valve data

5.1.1 V2-1, V2-2

ATV 8” Hydr. Op. Slab Gate Valve, FSO, With ROV Override - operating information	
Nominal Input Torque	1900 Nm
Max allowable	2700 Nm
Damage	3000 Nm
No. of turns to open/close	92.3
Interface	ISO 13628-8, Class 4
Hydraulic fluid	Oceanic HW-443
Max Hydraulic supply pressure	345 Bar (5000 Psi)

5.1.2 V51-1, V51-2, V52-1, V52-2

ATV 8” ROV Op. Slab Gate Valve - operating information	
Nominal Input Torque	1900 Nm
Max allowable	2700 Nm
Damage	3000 Nm
No. of turns to open/close	33.9
Interface	ISO 13628-8, Class 4

5.1.3 V3-1A, V3-1B, V3-2A, V3-2B

8” Hydr. Op. Ball Valve, FSO, With ROV Override - operating information	
Nominal Input Torque	1900 Nm
Max allowable	2700 Nm
Damage	3000 Nm
No. of turns to open/close	14.1
Interface	ISO 13628-8, Class 4
Hydraulic fluid	Oceanic HW-443
Max Hydraulic supply pressure	345 Bar (5000 Psi)

5.1.4 V5-1, V5-2

ATV 6" Hydr. Op. Slab Gate Valve, FSO, With ROV Override - operating information	
Nominal Input Torque	1900 Nm
Max allowable	2700 Nm
Damage	3000 Nm
No. of turns to open/close	68.1
Interface	ISO 13628-8, Class 4
Hydraulic fluid	Oceanic HW-443
Max Hydraulic supply pressure	345 Bar (5000 Psi)

5.1.5 V70-1, V70-2

ATV 2" ROV Op. Slab Gate Valve - operating information	
Nominal Input Torque	1900 Nm
Max recommended	2700 Nm
Damage	3000 Nm
No. of turns to open/close	5
Interface	ISO 13628-8, Class 4

5.1.6 V71-1, V71-2, V72-1, V72-2

ATV 2" Hydr. Op. Gate Valve, FSC, With ROV Override - operating information	
Nominal Input Torque	1900 Nm
Max recommended	2700 Nm
Damage	3000 Nm
No. of turns to open/close	5
Interface	ISO 13628-8, Class 4
Hydraulic fluid	Oceanic HW-443
Max Hydraulic supply pressure	345 Bar (5000 Psi)

5.1.7 V82-1, V82-2

LB Bentley 1" Hydr. Op. Gate Valve, FSC, With ROV Override - operating information	
Running Torque	150 Nm
Max allowable	250 Nm
Damage	542 Nm
No. of turns to open/close	12 (+/- 0,5)
Interface	ISO 13628-8, Class 4
Hydraulic fluid	Oceanic HW-443
Max Hydraulic supply pressure	345 Bar (5000 Psi)

5.1.8 V80, V83-1, V83-2

LB Bentley 1" ROV Op. Gate Valve - operating information	
Running Torque	150 Nm
Max allowable	250 Nm
Damage	542 Nm
No. of turns to open/close	12 (+/- 0,5)
Interface	ISO 13628-8, Class 4

5.1.9 V20-1, V20-2, V30-1, V30-2

LB Bentley 3/4" ROV Op. Rotary Gate Valve - operating information	
Running Torque	176 Nm
Max allowable	407 Nm
Damage	610 Nm
No. of turns to open/close	1/4 (90 Deg)
Interface	ISO 13628-8, Class 4

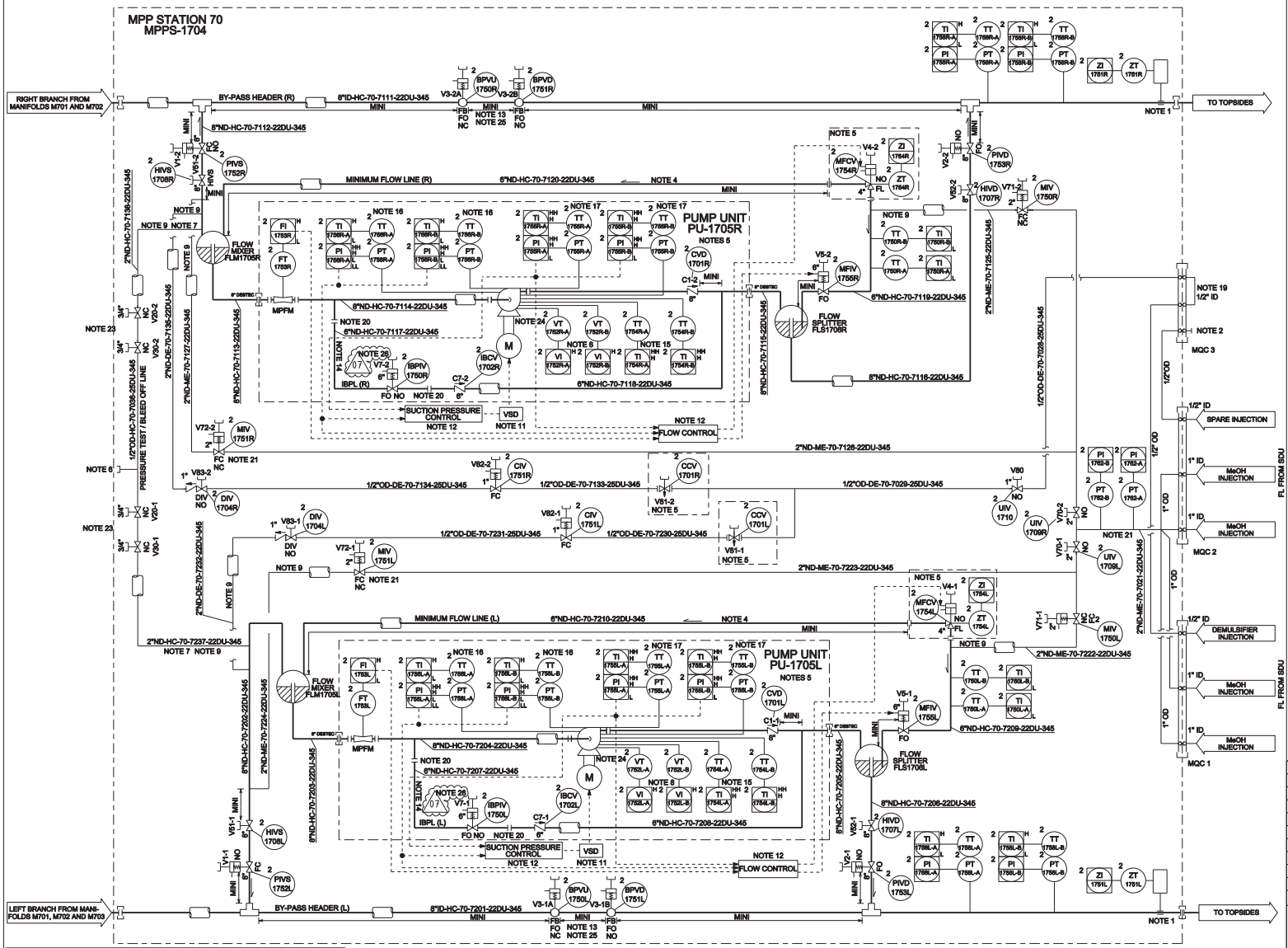
5.1.10 V4-1, V4-2

Cameron 4" Compact Choke – operating information	
Max Running Torque	474.5 Nm
Damage	779 Nm
No. of Hyd. Pulses close/open	102
No. of turns to open/close	42
Interface	ISO 13628-8, Class 4
Hydraulic fluid	Oceanic HW-443
Max Hydraulic supply pressure	345 bar (5000 Psi)

5.1.11 CF1, CF2

Butech 2-way/90° Turn ROV Op. Ball Valve – operating information	
Max Running Torque	50 Nm
Max allowable	100 Nm
Damage	160 Nm
No. of turns to open/close	1/4 (90 Deg)
Interface	ISO 13628-8, paddle

5.2 MPP System – P&ID – MPP Station P70



PUMP

ITEM NUMBER	MPP70L OR MPP70R	
SERVICE	PRODUCTION	
TYPE	HELICOAXIAL PUMP	
PRESSURE (bara)	DESIGN	345
	MAX WORKING SUCT./DISCH.	94/151
TEMPERATURE °C	DESIGN MIN/MAX. NOTE 18.	-18/93
	OPERATING MIN	50
	OPERATING MAX - BALANCE PISTON	83
	OPERATING MAX - MPP DISCHARGE	77
MAX DIFFERENTIAL PRESSURE (bar)		130
SHAFT POWER kW		2500

GENERAL NOTES :

A - All remotely actuated valves are with ROV override and ROV open/close indicator.
B - Normal valve position (N.O. or N.C) applies for MPP normal operation.
C - Thermal insulation to be provided for all process piping (by-pass header, MFL, IBPL, Flow Mixer, Flow Splitter, PumpUnit and connectors) and on length of small bore piping (MeOH, Demulsifier, Bleed off) from tie-in point to first isolation barrier (included).
D - Schedule 160 applies for all piping (where ND is stated).
E - Pump Units are interchangeable.

NOTES :

1 - Non-Intrusive pig detector.
2 - Demulsifier Spare.
3 - Deleted.
4 - Minimum Flow Line overall lenght will be minimized for thermal performances. MFL will be connected to top of flow Mixer.
5 - MPP Station independently retrievable components: Choke insert and actuator, Chemical Control valve and Pump Unit including MPFM, discharge check valve and IBPL.
6 - Hot stab connection.
7 - Bleed-off line tie-in on top of process piping (to be placed at highest point).
8 - Vibration monitoring: 2 off accelerometers (X/Y) Pump Casing Position.
9 - Insulated and/or self-drained section from valve to connection point. 2: Valve located away from the connection point.
10 - Deleted.
11 - VSD (Variable Speed Drive) is located topside.
12 - Pump Control System is located topside.
13 - The upstream integrated double valve on the by-pass header is normally closed. The downstream integrated double valve is normally open.
14 - Integrated By-pass Line overall length will be minimized. Distance between each component of the IBPL will be minimized.
15 - Balance piston temperature sensors.
16 - MPP suction side pressure and temperature sensors.
17 - MPP discharge side pressure and temperature sensors.
18 - Maximum design temperature is only applicable for MPP internals.
19 - MQC-logicap.
20 - Compact flange.
21 - Methanol Isolation Valve (MIV) shall only open if methanol supply pressure is above MPP station process pressure.
22 - NA
23 - Dual gate valve.
24 - Barrier fluid monitoring: temperature and pressure transmitters (Right: 2-PT-1757R-A/B and 2-TT-1757R-A/B, Left: 2-PT-1757L-A/B and 2-TT-1757L-A/B).
25 - Dual ball valve.
26 - V7-1 / V7-2 will be labelled V7-x on the pump units.

REFERENCES :

AO-050-SSS-310-000269 : MPP System - Subsea P&ID Legend Sheet

DESIGN PARAMETERS :

Design Pressure MPP Station	:	345 bara
Design Temperature MPP Station	:	-18°C / 90°C

Revision	Date	Status	Revision Memo	Issued by	Checked by	Approved by
07	11-Jul-2014	ASB	AS BUILT	AEB	GGA	HAA
06	13-Jan-2014	AFC	ACCEPTED FOR CONSTRUCTION	AEB	GGA	HAA
05	05-Nov-2013	AFC	ACCEPTED FOR CONSTRUCTION	AEB	GGA	HAA
04	01-Jul-2013	AFC	ACCEPTED FOR CONSTRUCTION	AEB	GGA	HAA
03	12-Apr-2013	AFC	ACCEPTED FOR CONSTRUCTION	AEB	KHK	HAA
02	17-Jan-2013	AFC	ACCEPTED FOR CONSTRUCTION	AEB	KHK	HAA
01	23-Jan-2012	IFA	ISSUED FOR ACCEPTANCE	CAL	KHK	KHK
00	22-Nov-2011	IFR	ISSUED FOR REVIEW	CAL	KHK	EGA

TOTAL E&P ANGOLA

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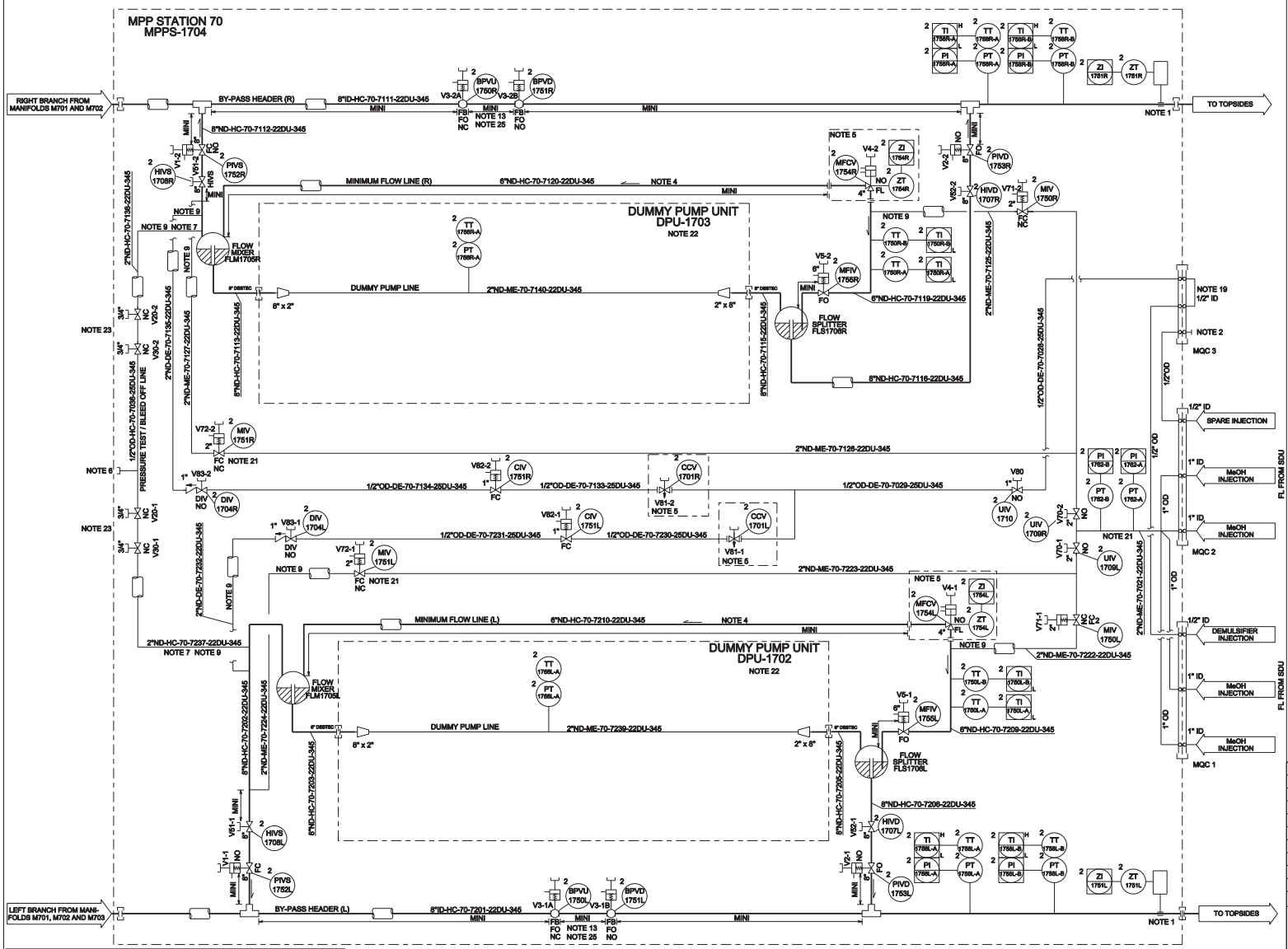
MPP SYSTEM - P&ID - MPP STATION 70

Doc Type : PID	System/Unit: 04	Discipline : PRO	Electronic Filename AO-050-GSG-310-000102_rev07.pdf		
COMPANY Document N°	AO-050-GSG-310-000102	REV : 07	Scale : NONE	Phase : DE	
CONTRACTOR/ ORIGINAL Document N°	DRW-0001208/H	Format : A1	Folio : 1 of 2	Class : 1	

Revision Status H Released | Published 2014-07-14 10:01:03 | Made by AEB | Checked by GGA | Approved by HAA
Engineering Change Order: NA

TOTAL E&P ANGOLA - GIRRI PROJECT - AO-050-GMP-310-000324 - REV-02 - AFC - 20 - APR - 2015



PUMP		
ITEM NUMBER	MPP70L OR MPP70R	
SERVICE	PRODUCTION	
TYPE	HELICOAXIAL PUMP	
PRESSURE (bara)	DESIGN	345
	MAX WORKING SUCT./DISCH.	94/151
TEMPERATURE °C	DESIGN MIN/MAX. NOTE 18.	-18/93
	OPERATING MIN	50
	OPERATING MAX - BALANCE PISTON	83
	OPERATING MAX - MPP DISCHARGE	77
MAX DIFFERENTIAL PRESSURE (bar)		130
SHAFT POWER kW		2500

GENERAL NOTES :

A - All remotely actuated valves are with ROV override and ROV open/close indicator.
B - Normal valve position (N.O. or N.C) applies for MPP normal operation.
C - Thermal insulation to be provided for all process piping (by-pass header, MFL, IBPL, Flow Mixer, Flow Splitter, PumpUnit and connectors) and on length of small bore piping (MeOH, Demulsifier, Bleed off) from tie-in point to first isolation barrier (included).
D - Schedule 160 applies for all piping (where ND is stated).
E - Dummy Pump Units are interchangeable.

NOTES :

1 - Non-intrusive pig detector.
2 - Demulsifier Spare.
3 - Deleted.
4 - Minimum Flow Line overall lenght will be minimized for thermal performances. MFL will be connected to top of flow Mixer.
5 - MPP Station independently retrievable components: Choke insert and actuator, Chemical Control valve and Pump Unit including MPFM, discharge check valve and IBPL.
6 - Hot stab connection.
7 - Bleed-off line tie-in on top of process piping (to be placed at highest point).
8 - NA.
9 - Insulated and/or self-drained section from valve to connection point. 2: Valve located away from the connection point.
10 - Deleted.
11 - NA
12 - NA
13 - The upstream integrated double valve on the by-pass header is normally closed. The downstream integrated double valve is normally open.
14 - NA
15 - NA
16 - NA
17 - NA
18 - Maximum design temperature is only applicable for MPP internals.
19 - MQC logicap.
20 - NA.
21 - Methanol Isolation Valve (MIV) shall only open if methanol supply pressure is above MPP station process pressure.
22 - Uninsulated dummy Pump Unit.
23 - Dual gate valve.
24 - NA.
25 - Dual ball valve.
26 - NA.

07

REFERENCES :

AO-050-SSS-310-000269 : MPP System - Subsea P&ID Legend Sheet

DESIGN PARAMETERS :

Design Pressure MPP Station : 345 bara
Design Temperature MPP Station : -18°C / 90°C

Revision	Date	Status	Revision Memo	Issued by	Checked by	Approved by
07	11-Jul-2014	ASB	AS BUILT	AEB	GGA	HAA
06	13-Jan-2104	AFC	ACCEPTED FOR CONSTRUCTION	AEB	GGA	HAA
05	05-Nov-2013	AFC	ACCEPTED FOR CONSTRUCTION	AEB	GGA	HAA
04	01-Jul-2013	AFC	ACCEPTED FOR CONSTRUCTION	AEB	GGA	HAA
03	12-Apr-2013	AFC	ACCEPTED FOR CONSTRUCTION	AEB	KHK	HAA
02	17-Jan-2013	AFC	ACCEPTED FOR CONSTRUCTION	AEB	KHK	HAA
01	23-Jan-2012	IFA	ISSUED FOR ACCEPTANCE	CAL	KHK	KHK
00	22-Nov-2011	IFR	ISSUED FOR REVIEW	CAL	KHK	EGA

TOTAL E&P ANGOLA

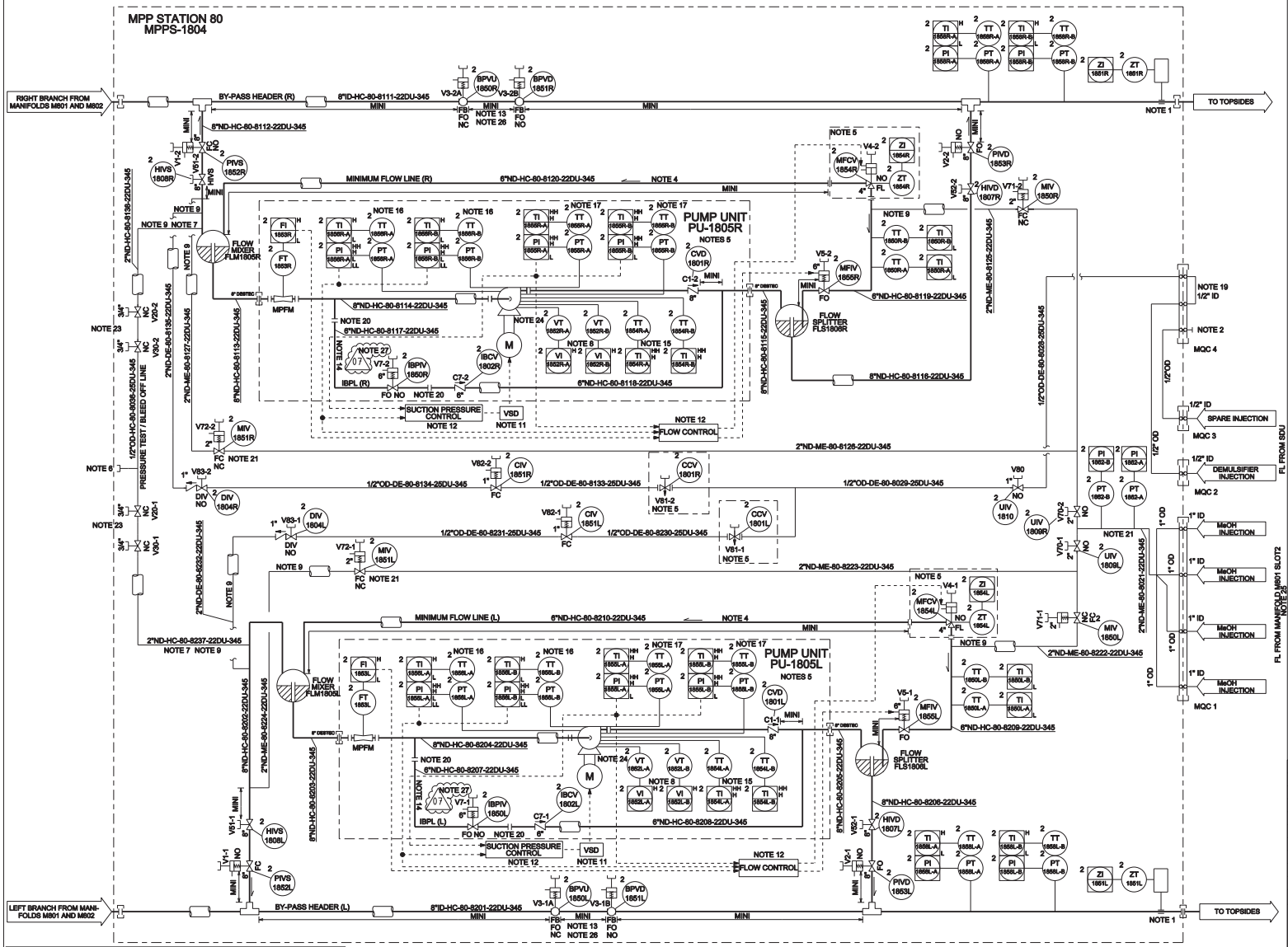
MPP SYSTEM - P&ID - MPP STATION 70

Doc Type : PID	System/Unit: 04	Discipline : PRO	Electronic Filename AO-050-GSG-310-000102_rev07.pdf
COMPANY Document N°	AO-050-GSG-310-000102	REV : 07	Scale : NONE	Phase : DE
CONTRACTOR/ ORIGINAL Document N°	DRW-0001208/H	Format : A1	Folio : 2 of 2	Class : 1

Revision Status H Released | Published 2014-07-14 10:01:03 | Made by AEB | Checked by GGA | Approved by HAA
Engineering Change Order: NA

TOTAL E&P ANGOLA - GIRRI PROJECT - AO-050-GMP-310-000324 - REV-02 - AFC - 20 - APR - 2015

5.3 MPP System – P&ID – MPP Station P80



GENERAL NOTES :

A - All remotely actuated valves are with ROV override and ROV open/close indicator.
B - Normal valve position (N.O. or N.C) applies for MPP normal operation.
C - Thermal insulation to be provided for all process piping (by-pass header, MFL, IBPL, Flow Mixer, Flow Splitter, PumpUnit and connectors) and on length of small bore piping (MeOH, Demulsifier, Bleed off) from tie-in point to first isolation barrier (Included).
D - Schedule 160 applies for all piping (where ND is stated).
E - Pump Units are interchangeable.

NOTES :

1 - Non-intrusive pig detector.
2 - Demulsifier Spare.
3 - Deleted.
4 - Minimum Flow Line overall lenght will be minimized for thermal performances. MFL will be connected to top of flow Mixer.
5 - MPP Station independently retrievable components: Choke insert and actuator, Chemical Control valve and Pump Unit including MPFM, discharge check valve and IBPL.
6 - Hot stab connection.
7 - Bleed-off line tie-in on top of process piping (to be placed at highest point).
8 - Vibration monitoring: 2 off accelerometers (X/Y) Pump Casing Position.
9 - Insulated and/or self-drained section from valve to connection point. 2: Valve located away from the connection point.
10 - Deleted.
11 - VSD (Variable Speed Drive) is located topside.
12 - Pump Control System is located topside.
13 - The upstream integrated double valve on the by-pass header is normally closed. The downstream integrated double valve is normally open.
14 - Integrated By-pass Line overall length will be minimized. Distance between each component of the IBPL will be minimized.
15 - Balance piston temperature sensors.
16 - MPP suction side pressure and temperature sensors.
17 - MPP discharge side pressure and temperature sensors.
18 - Maximum design temperature is only applicable for MPP Internals.
19 - MQC logicap.
20 - Compact flange.
21 - Methanol Isolation Valve (MIV) shall only open if methanol supply pressure is above MPP station process pressure.
22 - NA
23 - Dual gate valve.
24 - Barrier fluid monitoring: temperature and pressure transmitters (Right: 2-PT-1857R-A/B and 2-TT-1857R-A/B, Left: 2-PT-1857L-A/B and 2-TT-1857L-A/B).
25 - MeOH injection from manifold M801 SLOT 2.
26 - Dual ball valve.
27 - V7-1 / V7-2 will be labelled V7-x on the pump units.

REFERENCES :

AO-050-SSS-310-000269 : MPP System - Subsea P&ID Legend Sheet

DESIGN PARAMETERS :

Design Pressure MPP Station : 345 bara
Design Temperature MPP Station : -18°C / 90°C

PUMP		
ITEM NUMBER	MPP80L OR MPP80R	
SERVICE	PRODUCTION	
TYPE	HELICOAXIAL PUMP	
PRESSURE (bara)	DESIGN	345
	MAX WORKING SUCT./DISCH.	94/151
TEMPERATURE °C	DESIGN MIN/MAX. NOTE 18.	-18/93
	OPERATING MIN	50
	OPERATING MAX - BALANCE PISTON	83
	OPERATING MAX - MPP DISCHARGE	77
MAX DIFFERENTIAL PRESSURE (bar)		130
SHAFT POWER kW		2500

Revision	Date	Status	Revision Memo	Issued by	Checked by	Approved by
07	11-Jul-2014	ASB	AS BUILT	AEB	GGA	HAA
06	13-Jan-2014	AFC	ACCEPTED FOR CONSTRUCTION	AEB	GGA	HAA
05	05-Nov-2013	AFC	ACCEPTED FOR CONSTRUCTION	AEB	GGA	HAA
04	01-Jul-2013	AFC	ACCEPTED FOR CONSTRUCTION	AEB	GGA	HAA
03	12-Apr-2013	AFC	ACCEPTED FOR CONSTRUCTION	AEB	KHK	HAA
02	17-Jan-2013	AFC	ACCEPTED FOR CONSTRUCTION	AEB	KHK	HAA
01	23-Jan-2012	IFA	ISSUED FOR ACCEPTANCE	CAL	KHK	KHK
00	22-Nov-2011	IFR	ISSUED FOR REVIEW	CAL	KHK	EGA

TOTAL E&P ANGOLA

MPP SYSTEM - P&ID - MPP STATION 80

Doc Type : PID	System/Unit: 04	Discipline : PRO	Electronic Filename AO-050-GSG-310-000103_rev07.pdf		
COMPANY Document N°	AO-050-GSG-310-000103	REV : 07	Scale : NONE	Phase : DE	
CONTRACTOR/ ORIGINAL Document N°	DRW-0001209/H	Format : A1	Folio : 1 of 2	Class : 1	

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Engineering Change Order: NA

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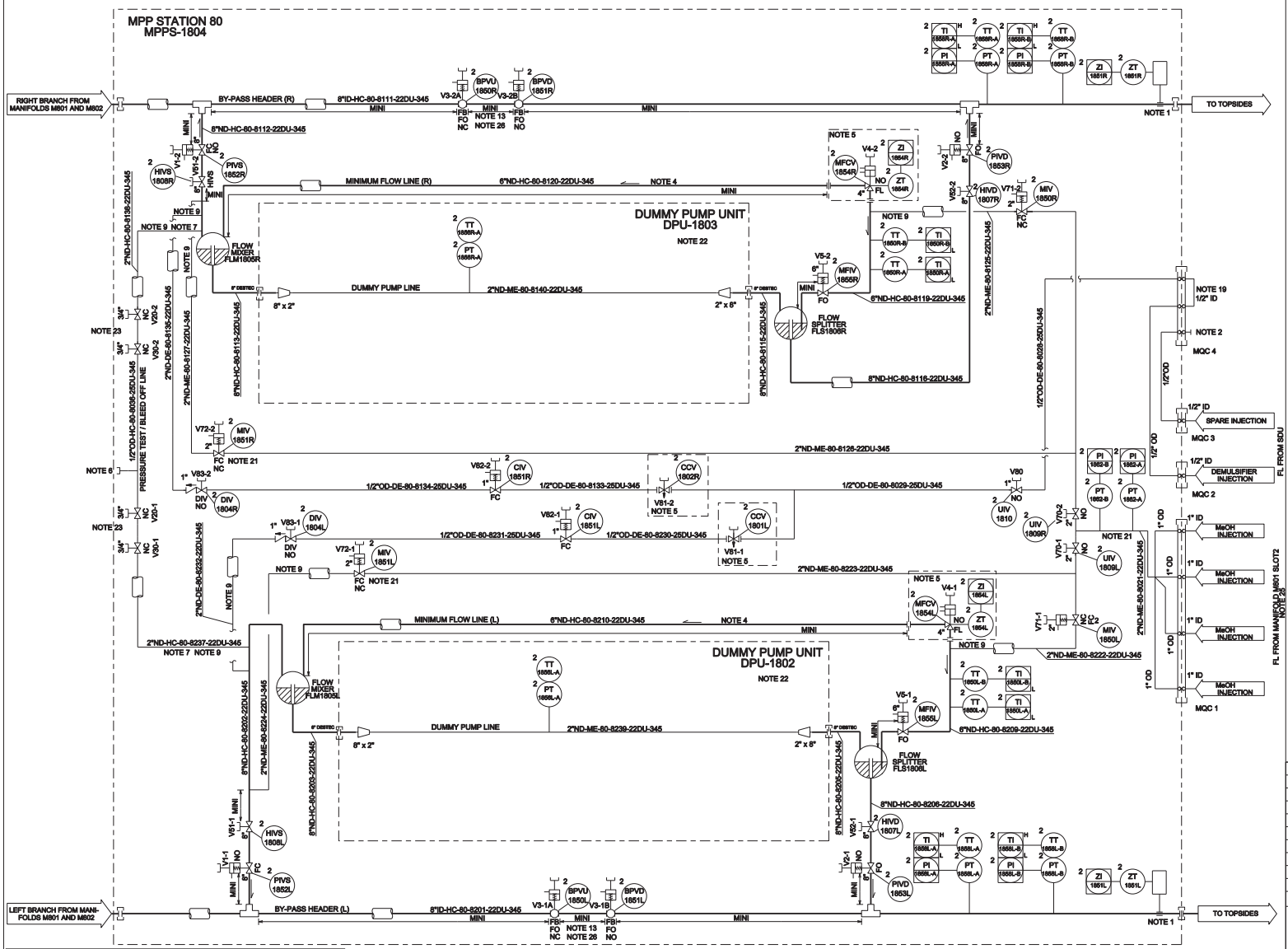


PUMP		
ITEM NUMBER	MPP80L OR MPP80R	
SERVICE	PRODUCTION	
TYPE	HELICOAXIAL PUMP	
PRESSURE (bara)	DESIGN	345
	MAX WORKING SUCT./DISCH.	94/151
TEMPERATURE °C	DESIGN MIN/MAX. NOTE 18.	-18/93
	OPERATING MIN	50
	OPERATING MAX - BALANCE PISTON	83
	OPERATING MAX - MPP DISCHARGE	77
MAX DIFFERENTIAL PRESSURE (bar)		130
SHAFT POWER kW		2500

GENERAL NOTES :

A - All remotely actuated valves are with ROV override and ROV open/close indicator.
B - Normal valve position (N.O. or N.C) applies for MPP normal operation.
C - Thermal insulation to be provided for all process piping (by-pass header, MFL, IBPL, Flow Mixer, Flow Splitter, PumpUnit and connectors) and on length of small bore piping (MeOH, Demulsifier, Bleed off) from tie-in point to first isolation barrier (included).
D - Schedule 160 applies for all piping (where ND is stated).
E - Pump Units are interchangeable.

NOTES :

1 - Non-intrusive pig detector.
2 - Demulsifier Spare.
3 - Deleted.
4 - Minimum Flow Line overall lenght will be minimized for thermal performances. MFL will be connected to top of flow Mixer.
5 - MPP Station independently retrievable components: Choke insert and actuator, Chemical Control valve and Pump Unit including MPFM, discharge check valve and IBPL.
6 - Hot stab connection.
7 - Bleed-off line tie-in on top of process piping (to be placed at higheet point).
8 - NA.
9 - Insulated and/or self-drained section from valve to connection point. 2: Valve located away from the connection point.
10 - Deleted.
11 - NA.
12 - NA.
13 - The upstream integrated double valve on the by-pass header is normally closed. The downstream integrated double valve is normally open.
14 - NA.
15 - NA.
16 - NA.
17 - NA.
18 - Maxdmum design temperature is only applicable for MPP internals.
19 - MQC logicap.
20 - NA.
21 - Methanol Isolation Valve (MIV) shall only open if methanol supply pressure is above MPP station process pressure.
22 - Uninsulated dummy Pump Unit.
23 - Dual gate valve.
24 - NA.
25 - MeOH injection from manifold M801 SLOT 2.
26 - Dual ball valve.
27 - NA.

REFERENCES :

AO-050-SSS-310-000269 : MPP System - Subsea P&ID Legend Sheet

DESIGN PARAMETERS :

Design Pressure MPP Station : 345 bara
Design Temperature MPP Station : -18°C / 90°C

Revision	Date	Status	Revision Memo	Issued by	Checked by	Approved by
07	11-Jul-2014	ASB	AS BUILT	AEB	GGA	HAA
06	13-Jan-2014	AFC	ACCEPTED FOR CONSTRUCTION	AEB	GGA	HAA
05	05-Nov-2013	AFC	ACCEPTED FOR CONSTRUCTION	AEB	GGA	HAA
04	01-Jul-2013	AFC	ACCEPTED FOR CONSTRUCTION	AEB	GGA	HAA
03	12-Apr-2013	AFC	ACCEPTED FOR CONSTRUCTION	AEB	KHK	HAA
02	17-Jan-2013	AFC	ACCEPTED FOR CONSTRUCTION	AEB	KHK	HAA
01	23-Jan-2012	IFA	ISSUED FOR ACCEPTANCE	CAL	KHK	KHK
00	22-Nov-2011	IFR	ISSUED FOR REVIEW	CAL	KHK	EGA

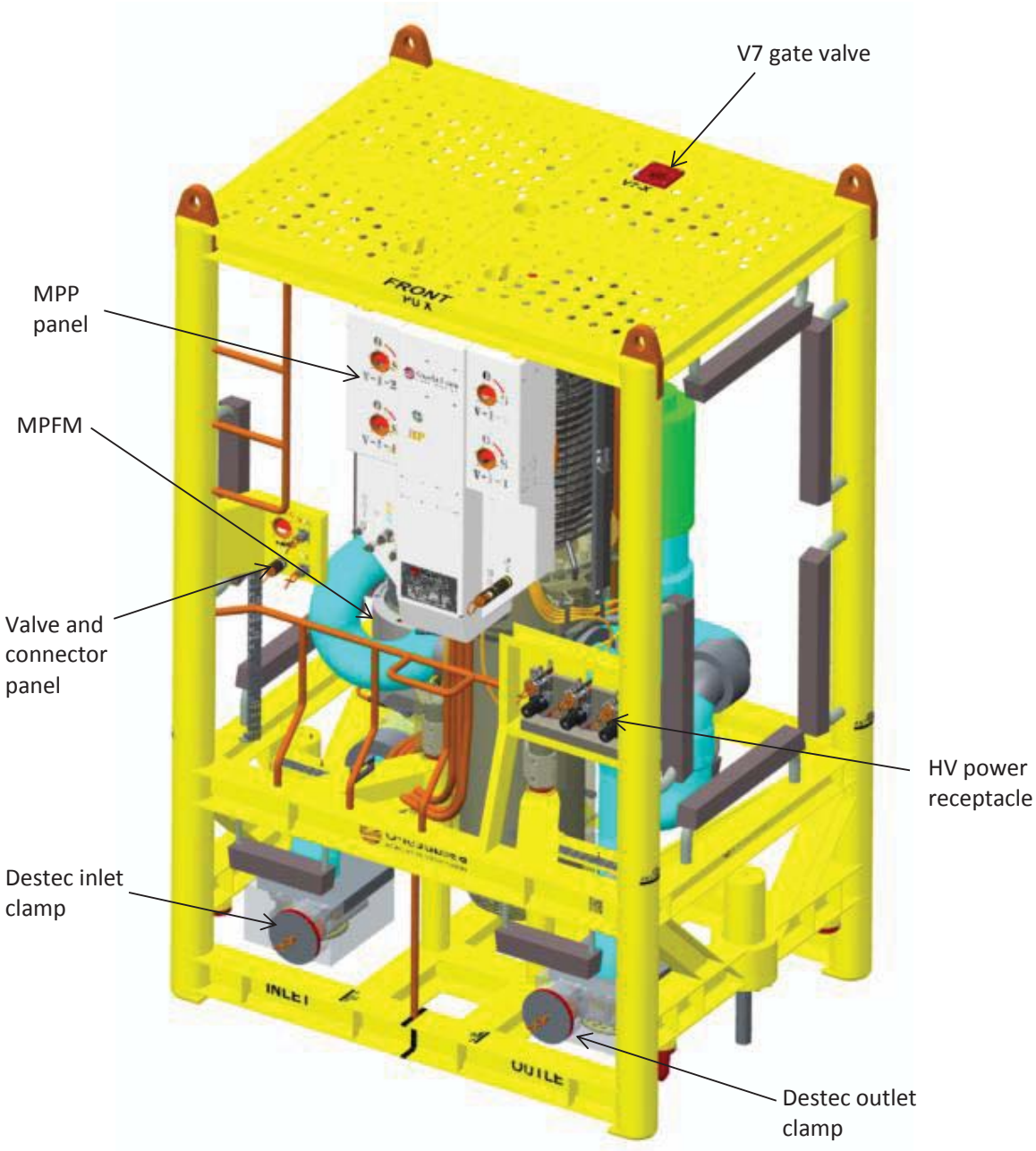
TOTAL E&P ANGOLA

MPP SYSTEM - P&ID - MPP STATION 80

Doc Type : PID	System/Unit: 04	Discipline : PRO	Electronic Filename AO-050-GSG-310-000103_rev07.pdf		
COMPANY Document N°	AO-050-GSG-310-000103	REV : 07	Scale : NONE	Phase : DE	
CONTRACTOR/ ORIGINAL Document N°	DRW-0001209/H	Format : A1	Folio : 2 of 2	Class : 1	

Revision Status H Released | Published 2014-07-14 10:01:00 | Made by AEB | Checked by GGA | Approved by HAA
Engineering Change Order: NA

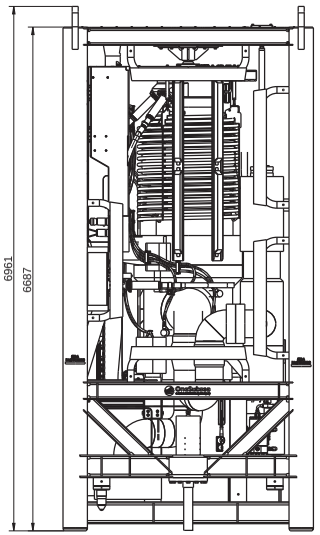
6 Pump Unit



6.1 Pump Unit reference list

Ref	Document title	COMPANY Doc. No	MPP CON Doc. No
/25/	Pump Unit GA	AO-050-GMP-310-000454	ITM-0071499
/26/	Pump Unit Interface drawing	AO-050-GMP-310-000015	ITM-0077876

6.2 Pump Unit interface drawing



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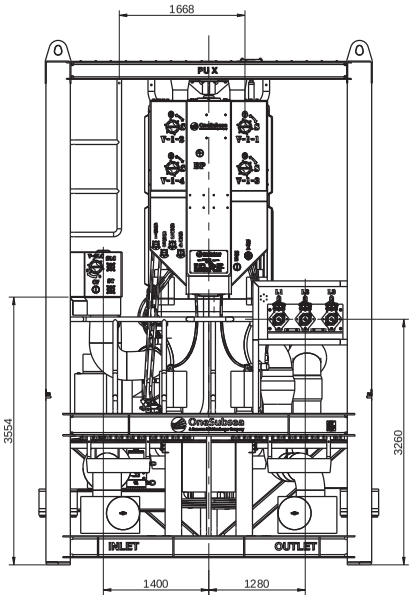

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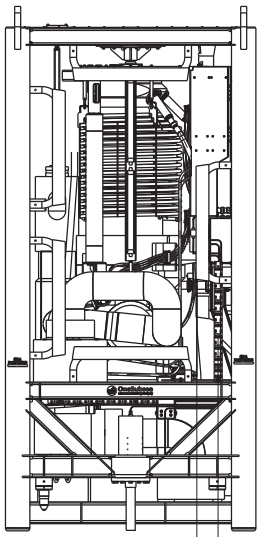
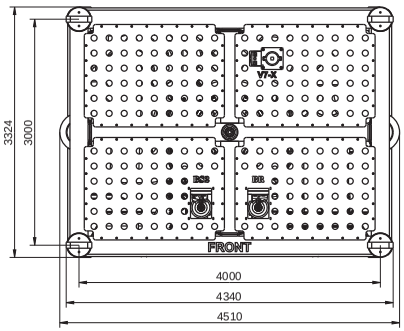
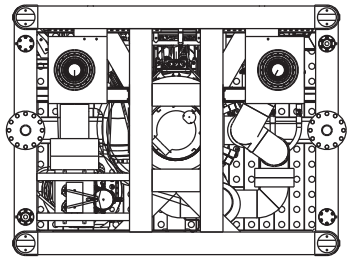


LEFT VIEW

282



TOP VIEW



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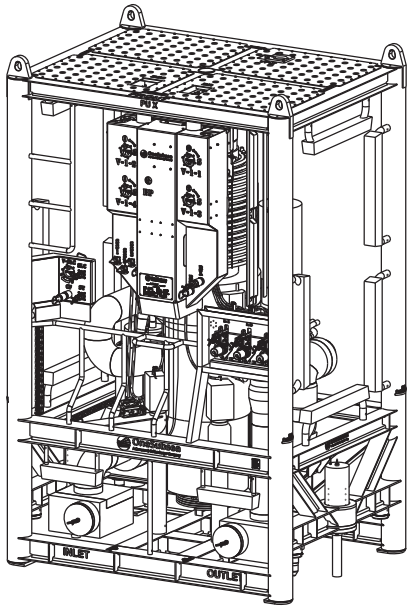


SCALE 3:100

REFERENCES:

/1/	RUNNING TOOL PUMP UNIT ITM-0081769 AO-050-GMP-310-000621
/2/	SUBSEA SIGNAL JUMPER LAYOUT DRW-0000852 AO-050-GSG-310-000045
/3/	PUMP UNIT - GENERAL ARRANGEMENT ITM-0071499 AO-050-GMP-310-000454
/4/	MPP BARRIER FLUID SYSTEM SCHEMATIC DRW-0000885 AO-050-GMP-310-000089
/5/	MPP SYSTEM - P&ID - MPP STATION 80 DRW-0001209 A0-050-GSG-310-000103
/6/	RETRIEVAL AND INSTALLATION GUIDELINE DOC-0022421 AO-050-GMP-310-000459

Note:

1: Weight pump unit:

Weighed weight:
PU #1 (SN:13459) : 51 883kg
PU #2 (SN:13460) : 51 433kg
PU #3 (SN:13461) : 51 850kg
PU #4 (SN:13462) : 52 033kg
PU #5 (SN:13463) : 52 283kg
PU #6 (SN:13464) : 51 967kg

CoG: /3/
CoG with tool: Sheet 5. Given in air.

ABBREVIATIONS:

PM	MPP Module

Rev.	Date	Status	Revision Memo	Issued by	Checked by	Approved by
04	12/FEB/2015	ASB	As Built	BEI	SAA	HAA
03	30/OCT/2014	ASB	As Built	BEI	SAA	MGI
02	26/JUN/2014	AFC	Accepted for construction	BEI	SHO	MGI
01	05/MAR/2014	IFA	Issued for acceptance	BEI	SAA	MGI
00	23/AUG/2013	IFR	Issued for review	RHO	SAA	MGI

TOTAL E&P ANGOLA

OneSubsea A Cameron & Schlumberger Company

PUMP UNIT - INTERFACE DRAWING

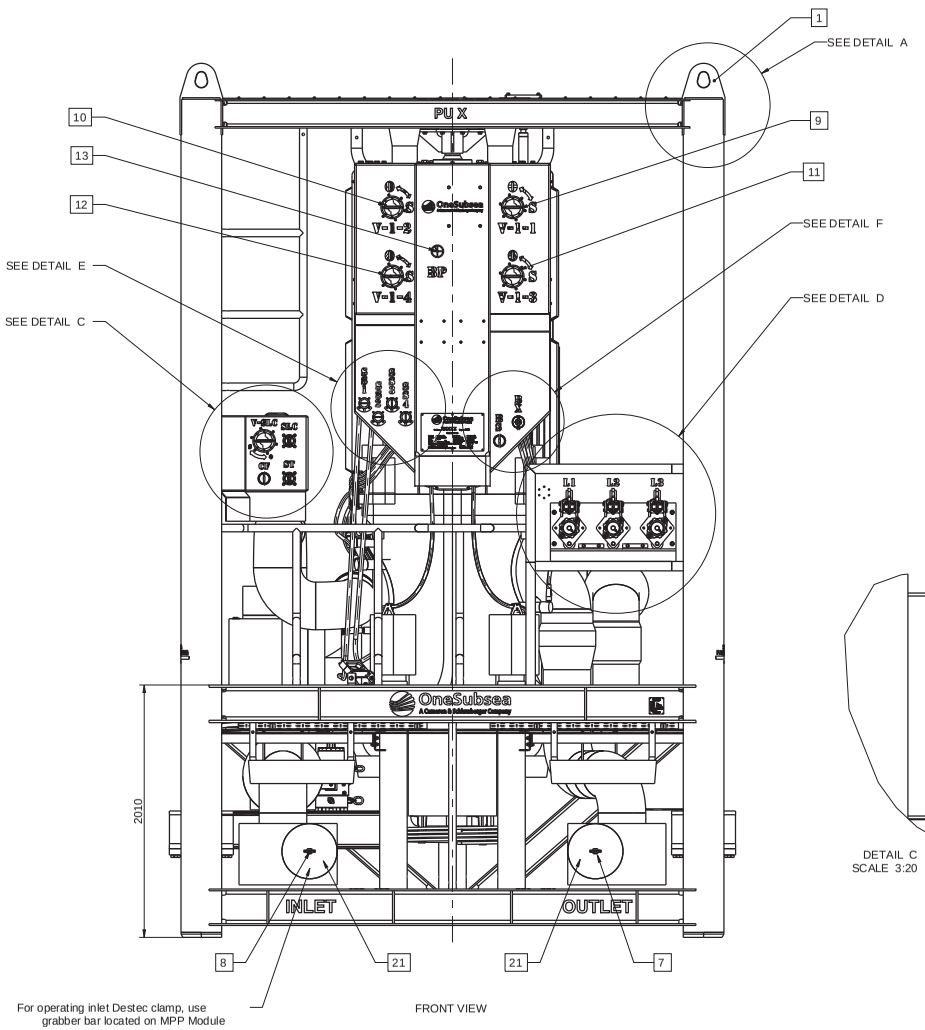
Doc Type : GEA	System/Unit: 04	Discipline : MPP	Electronic Filename : AO-050-GMP-310-00045 4-REV 04
COMPANY Document N°	AO-050-GMP-310-000015	REV : 04	Scale : 1:25
CONTRACTOR/Originator Document N°	ITM-0077876/E	Format : A1	Folio : 1 of 5
			Phase : DE
			Class : 1

OneSubsea A Cameron & Schlumberger Company

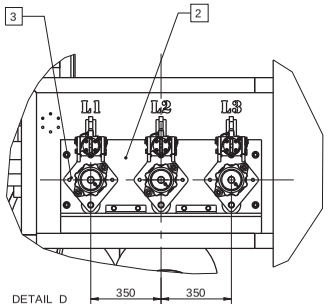
Title	PUMP UNIT - INTERFACE DRAWING
Weight	Note 1
ID	ITM-0077876
Scale	1:25
Format	A1
Sheet	1 of 5

Revision Status Published Made by Checked by Approved by
E Released 2015-02-16 08:50:42 BEI SAA HAA
Engineering Change Order: NA

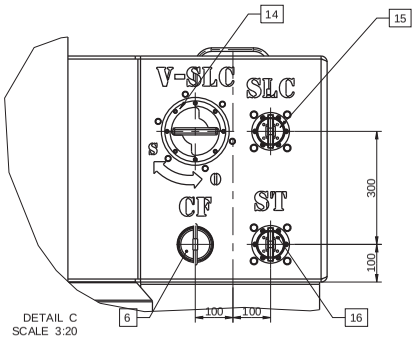
TOTAL E&P ANGOLA - GIRRI PROJECT - AO-050-GMP-310-000324 REV 02 - AFC - 20 - APR - 2015



For operating inlet Destec clamp, use grabber bar located on MPP Module



DETAIL D
SCALE 2:25

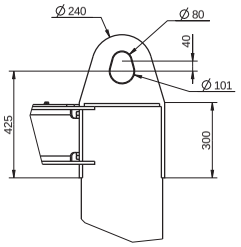


DETAIL C
SCALE 3:20

10	ROV	V-1-2 Barrier Fluid Work-over supply valve (from Installation Tool) paddle handle interface. Max operating torque:100Nm Damage torque: 160Nm Turn 90 CCW to open
11	ROV	V-1-3 Barrier Fluid supply valve Paddle handle interface. Max operating torque:100Nm Damage torque: 160Nm Turn 90 CCW to open
12	ROV	V-1-4 Barrier Fluid pressure indicator isolation valve Paddle handle interface. Max operating torque:100Nm Damage torque: 160Nm Turn 90 CCW to open
13	ROV	Barrier fluid pressure gauge. open valve V-1-4 to pressurize. Gauge is compensated to enviroment.
14	ROV	Valve for Soft Landing Cylinder Padle handle interface Max operating torque: 100Nm Damage torque: 160Nm Turn 90 CW to open
15	ROV	Receptacle for male hydraulic connector type hot stab. For Soft Landing Cylinder ISO 13628-8, Hot Stab, 43mm dual port Type B. Port 2 in use Push to mate Pull to de-mate
16	ROV	Receptacle for male hydraulic connector type hotstab. For Back Seal Test on hub ISO 13628-8, Hot Stab, 43mm dual port Type B. Push to mate Pull to de-mate
17 18 19 20	ROV	Subsea Signal 1, MPFM Subsea Signal 2, MPFM Subsea Signal 3, MPP Subsea Signal 4, MPP Tronic, Lanyard interface Push to mate max: 490N Pull to demate: 472-787N Max radial misalignment ±20mm Max angular misalignment ±20° Max rotational misalignment ±15°
21	ROV	GLOVE Pull out plug to access the rov bucket on Destec clamps Fishtail handle interface

INTERFACES:

NO.	TO	DESCRIPTION:
1	IT	Pad eyes designed only for lifting whith spreader beam or dedicated installation tool
2	ROV	In-Line Power Jumper 3 slot Receptacle
3	ROV	HV power receptacle Fish handle: Turn 180° CW to engage locking mechanism then push to connect: Nominal: 900N (X-direction) Max: 2000N X-direction) Turn 180° CCW to disengage locking mechanism, then pull to disconnect: Nominal: 30Nm (CCW) Max: 200Nm (CCW)
4	ROV	"BX" Workover Barrier oil supply Receptacle for male hydraulic connector type Walther. Running torque: 40Nm Max operational torque: 160Nm Damage torque: 240Nm Turn CW (11.5 turns) to Connect
5	ROV	"BS" Umbilical Barrier oil Supply Receptacle for male hydraulic connector type Walther. Running torque: 40Nm Max operational torque: 160Nm Damage torque: 240Nm Turn CW (11.5 turns) to Connect
6	ROV	Control fluid supply Receptacle for male hydraulic connector type Walther. Running torque: 40Nm Max operational torque: 160Nm Damage torque: 240Nm Turn CW (11.5 turns) to Connect
7	ROV	Destec outlet process clamp. ISO 13628-8 class 4 interface. Make up torque: 1381Nm Brake out torque: 1588Nm Damage torque: 2700Nm Damage torque in fully open position: 80Nm No. of turns: 26 CW to close
8	ROV	Destec Inlet process clamp. ISO 13628-8 class 4 interface. Make up torque: 1381Nm Brake out torque: 1588Nm Damage torque: 2700Nm Damage torque in fully open position: 80Nm No. of turns: 26 CW to close
9	ROV	V-1-1 Barrier Fluid Work-over return valve Paddle handle interface. Max operating torque:100Nm Damage torque: 160Nm Turn 90 CCW to open



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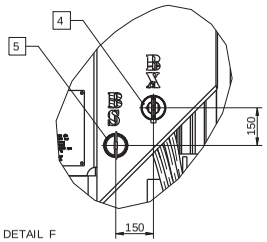
SCALE 1:10



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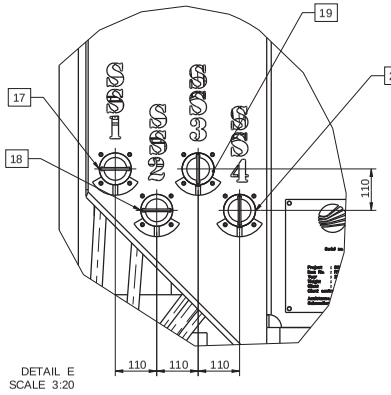

DETAIL E
SCALE 3:20

Rev.	Date	Status	Revision Memo	Issued by	Checked by	Approved by
04	12/FEB/2015	ASB	As Built	BEI	SAA	HAA
03	09/OCT/2014	ASB	As Built	BEI	SAA	MGI
02	26/JUN/2014	AFC	Accepted for construction	BEI	SHO	MGI
01	25/MAR/2014	IFA	Issued for acceptance	BEI	SAA	MGI
00	23/AUG/2013	IFR	Issued for review	RHO	SAA	MGI

TOTAL E&P ANGOLA - GIRRI PROJECT - AO-050-GMP-310-000324 - REV 02 - AFC - 20 - APR - 2015

PUMP UNIT - INTERFACE DRAWING

Doc. Type : GEA	System/Unit: 04	Discipline : MPP	Electronic Filename : AO-050-GMP-310-000454-REV04
COMPANY Document N°	AO-050-GMP-310-000015	REV : 04	Scale : 1:25 Phase : DE
CONTRACTOR/Originator Document N°	ITM-0077876/E	Format A1	Folio : 2 of 5 Class : 1

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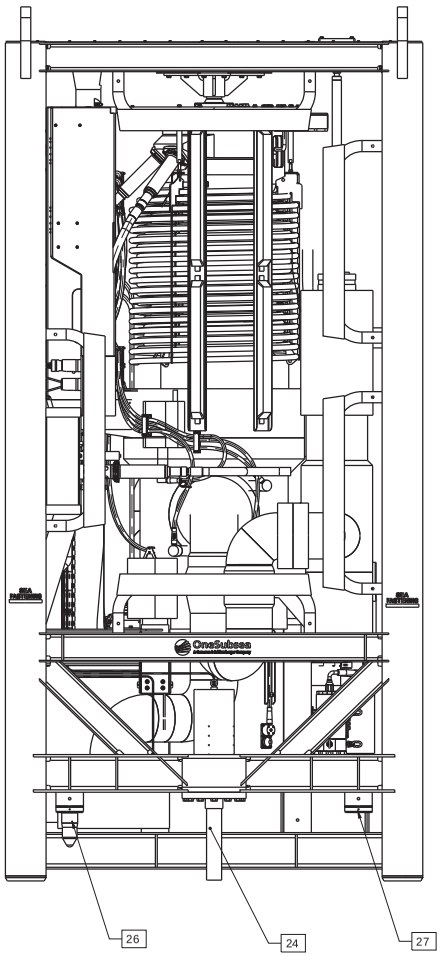
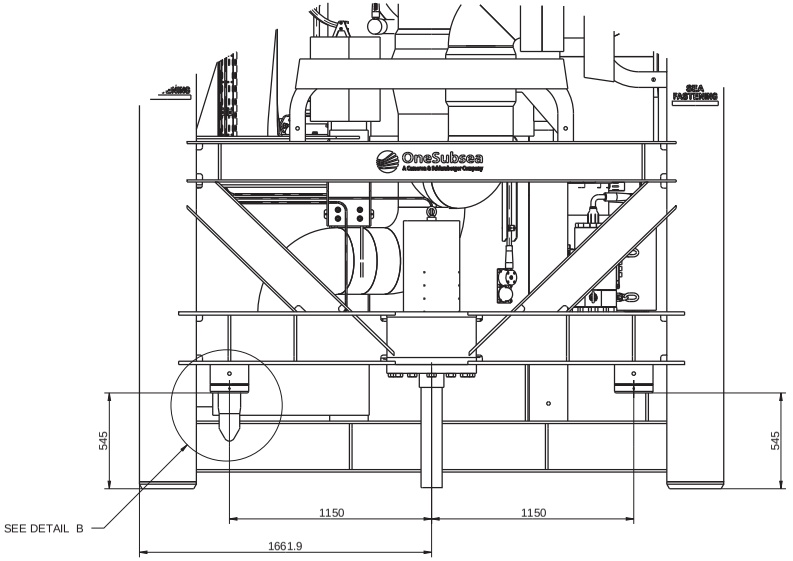
Title	PUMP UNIT - INTERFACE DRAWING
ID	ITM-0077876
Format A1	Sheet 2 of 5
Weight	
Scale	1:25

Revision Status: E Released
Published: 2015-02-16 08:50:42 BEI
Made by: SAA
Checked by: SAA
Approved by: HAA
Engineering Change Order: NA

RIGHT VIEW





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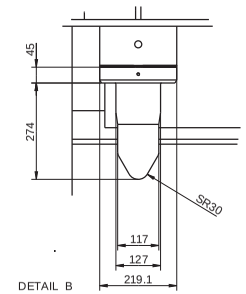

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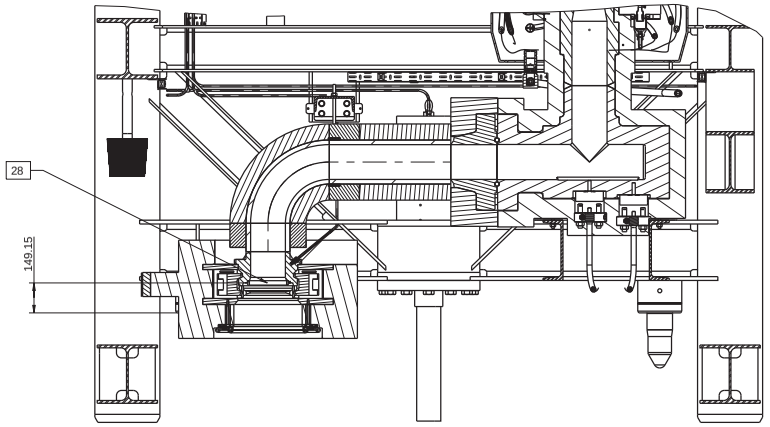

SECTION HUB-HUB
SCALE 2:25

INTERFACES:		
NO.	TO	DESCRIPTION:
24	PM	See sheet 4
26	PM	Guidepost and landing pad for PU
27	PM	Soft landing system
28	PM	Interface between male hub on PU and female hub on MPP Module

Rev.	Date	Status	Revision Memo	Issued by	Checked by	Approved by
04	12/FEB/2015	ASB	As Built	BEI	SAA	HAA
03	09/OCT/2014	ASB	As Built	BEI	SAA	MGI
02	26/JUN/2014	AFC	Accepted for construction	BEI	SHO	MGI
01	25/MAR/2014	IFA	Issued for acceptance	BEI	SAA	MGI
00	23/AUG/2013	IFR	Issued for review	RHO	SAA	MGI

TOTAL E&P ANGOLA - GIRRI PROJECT - AO-050-GMP-310-000324 REV 02 - AFC - 20 - APR - 2015

PUMP UNIT - INTERFACE DRAWING

Doc. Type :	System/Unit:	Discipline :	Electronic Filename :
GEA	04	MPP	AO-050-GMP-310-000454-REV04

COMPANY Document N°	AO-050-GMP-310-000015	REV : 04	Scale : 1:25	Phase : DE	
CONTRACTOR/Originator Document N°	ITM-0077876/E	Format A1	Folio : 3 of 5	Class : 1	

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Title	PUMP UNIT - INTERFACE DRAWING
ID	ITM-0077876
Format	A1
Sheet	3 of 5
Weight	
Scale	1:20

Revision Status	Published	Made by	Checked by	Approved by
E Released	2015-02-16 08:50:42	BEI	SAA	HAA

Engineering Change Order: NA

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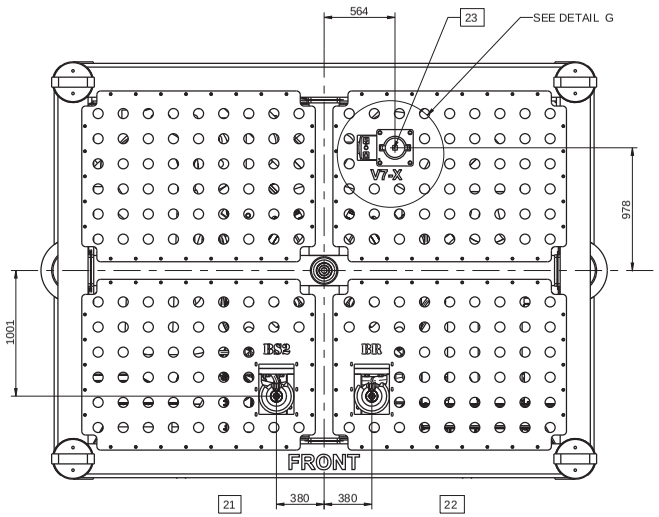
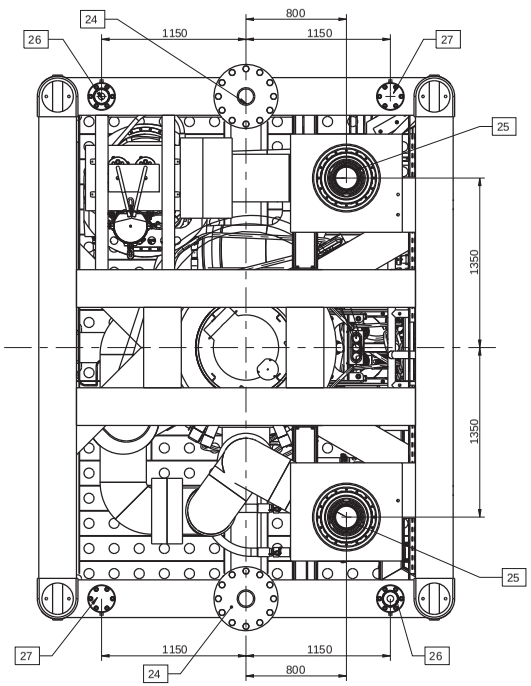
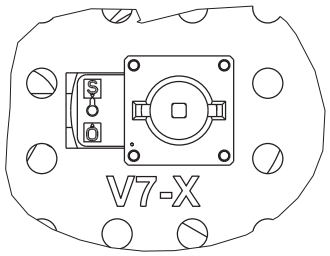


BOTTOM VIEW





DETAIL G
SCALE 3:20

INTERFACES:

21	ROV/IT	"BS2" 'interface to instalaltion tool barrier fluid accumulators. Receptacle for male hydraulic connector type Walther. Running torque: 40Nm Max operational torque: 160Nm Damage torque: 240Nm Turn CW (11.5 turns) to Connect
22	ROV/IT	"BR" Workover barrier oil return. Receptacle for male hydraulic connector type Walther. Running torque: 40Nm Max operational torque: 160Nm Damage torque: 240Nm Turn CW (11.5 turns) to Connect
23	ROV/IT	V7-1/V7-2 ISO 13628-8 Class 4 torque interface. Hydraulic operated gate valve (FSO) Valve BTO torque: 550Nm ROV nominal input torque: 1900Nm ROV maximum input torque: 2700Nm Damage torque: 3000Nm NO of Turns: 68.1 CW to close At end of stroke, apply 0.25 turns in reverse rotation
24	PM	EAB 2 stage Soft Landing System for subsea instalation tools and modules Bottom flange standard SL 180/270x300
25	PM	Inlet/outlet pipe
26	PM	Guidepost and landing pad for PU
27	PM	Landing pad for PU

Rev.	Date	Status	Revision Memo	Issued by	Checked by	Approved by
04	12/FEB/2015	ASB	As Built	BEI	SAA	HAA
03	09/OCT/2014	ASB	As Built	BEI	SAA	MGI
02	26/JUN/2014	AFC	Accepted for construction	BEI	SHO	MGI
01	25/MAR/2014	IFA	Issued for acceptance	BEI	SAA	MGI
00	23/AUG/2013	IFR	Issued for review	RHO	SAA	MGI

TOTAL E&P ANGOLA

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PUMP UNIT - INTERFACE DRAWING

Doc. Type : GEA	System/Unit: 04	Discipline : MPP	Electronic Filename : AO-050-GMP-310-000454-REV04
COMPANY Document N°	AO-050-GMP-310-000015	REV : 04	Scale : 1:25
CONTRACTOR/Originator Document N°	ITM-0077876/E	Format A1	Folio 4 of 5
			Phase : DE
			Class : 1

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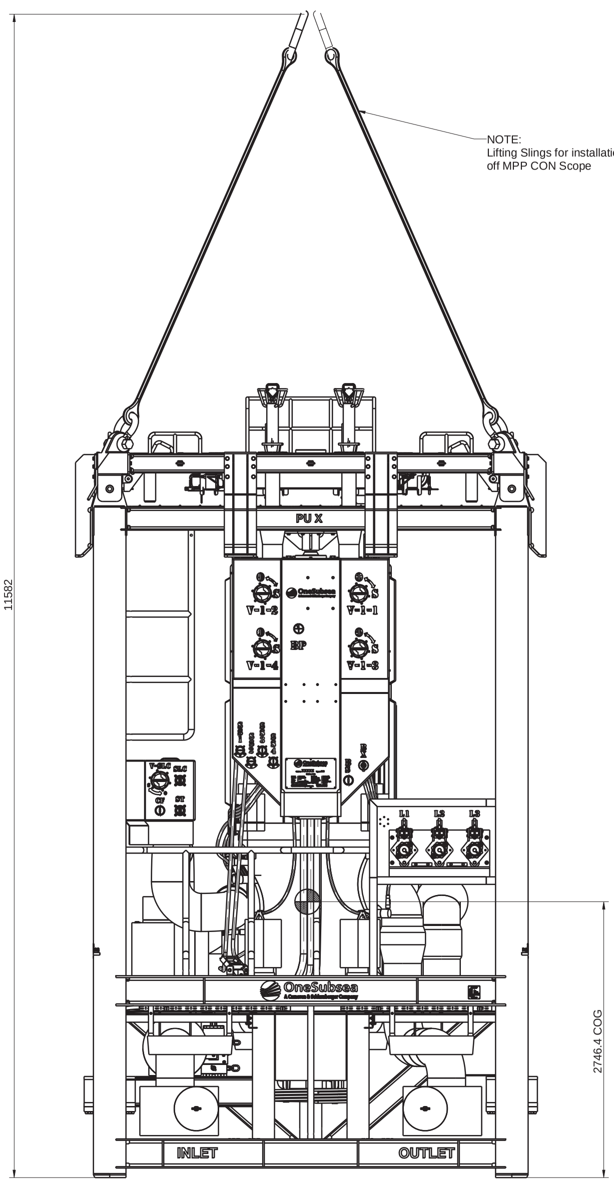
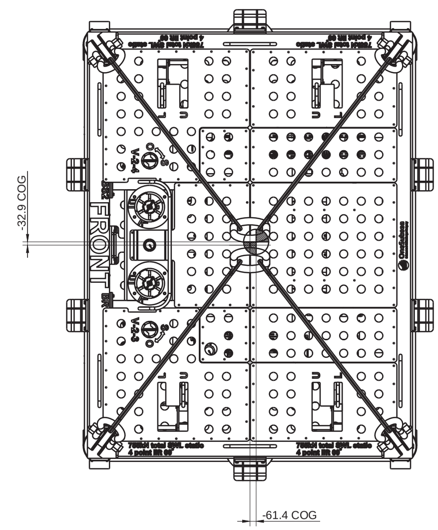
Title	PUMP UNIT - INTERFACE DRAWING
ID	ITM-0077876
Format A1	Sheet 4 of 5
Weight	
Scale	1:20

Revision Status Published Made by Checked by Approved by
E Released 2015-02-16 08:50:42 BEI SAA HAA
Engineering Change Order: NA

TOTAL E&P ANGOLA - CLIRR PROJECT - AO-050-GMP-310-000324 REV 02 - AFC - 20 - APR - 2015

WITH TOOL





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04	12/FEB/2015	ASB	As Built	BEI	SAA	HAA
03	30/OCT/2014	ASB	As Built	BEI	SAA	MGI
02	26/JUN/2014	AFC	Accepted for construction	BEI	SHO	MGI
01	25/MAR/2014	IFA	Issued for acceptance	BEI	SAA	MGI
00	23/AUG/2013	IFR	Issued for review	RHO	SAA	MGI

TOTAL E&P ANGOLA — OneSubsea, A Cameron & Schlumberger Company

PUMP UNIT - INTERFACE DRAWING

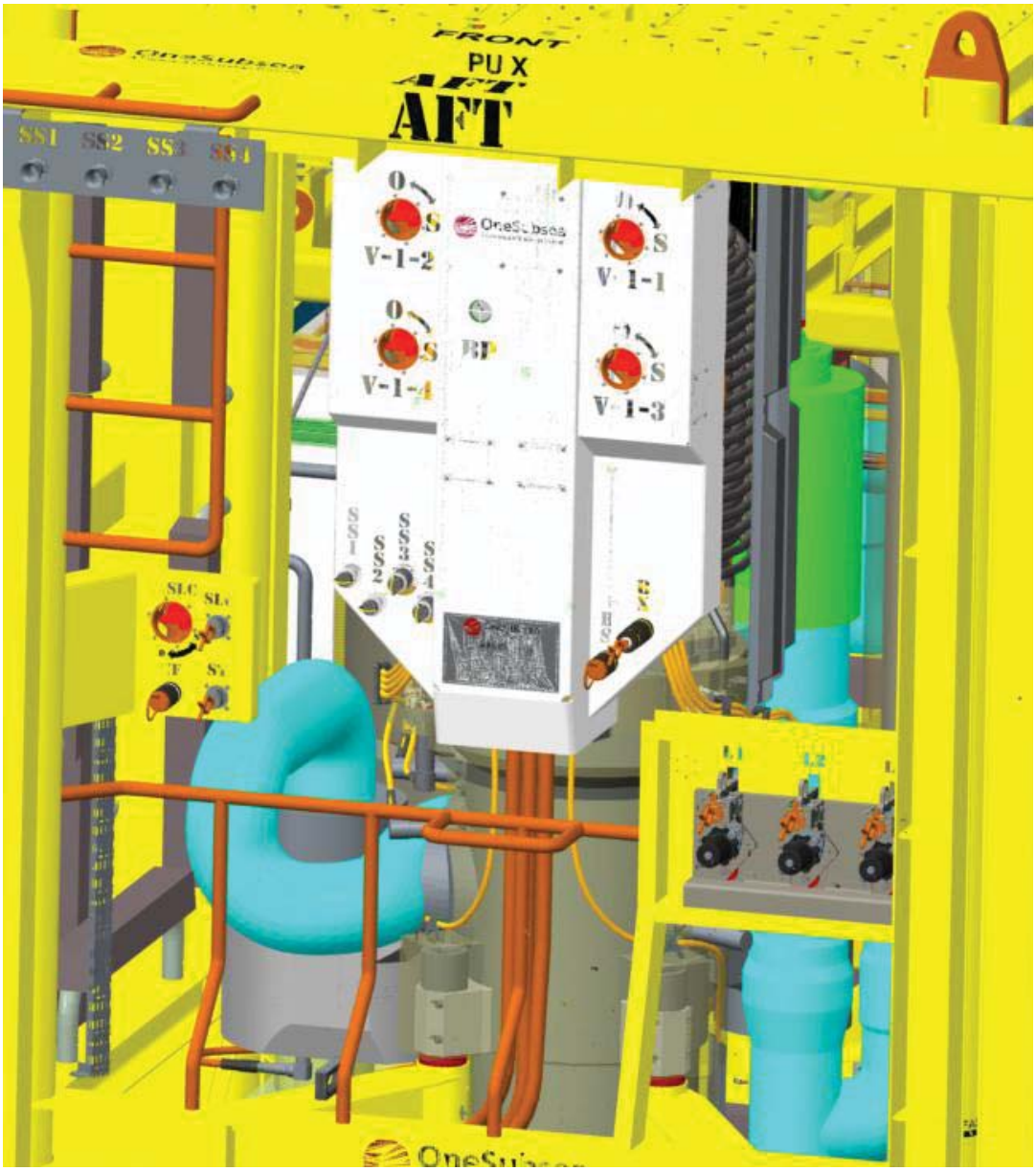
Doc Type : GEA	System/Unit: 04	Discipline : MPP	Electronic Filename: AO-050-GMP-310-000454-REV04		
COMPANY Document N°	AO-050-GMP-310-000015		REV : 04	Scale : 1:25	Phase : DE
CONTRACTOR/Original Document N°	ITM-0077876/E		Format : A1	Folio : 5 of 5	Class : 1

Title	PUMP UNIT - INTERFACE DRAWING
ID	ITM-0077876
Format	A1
Sheet	5 of 5
Scale	1:25
Weight	

Revision Status	Published	Made by	Checked by	Approved by
E Released	2015-02-16 08:50:42	BEI	SAA	HAA

Engineering Change Order: NA

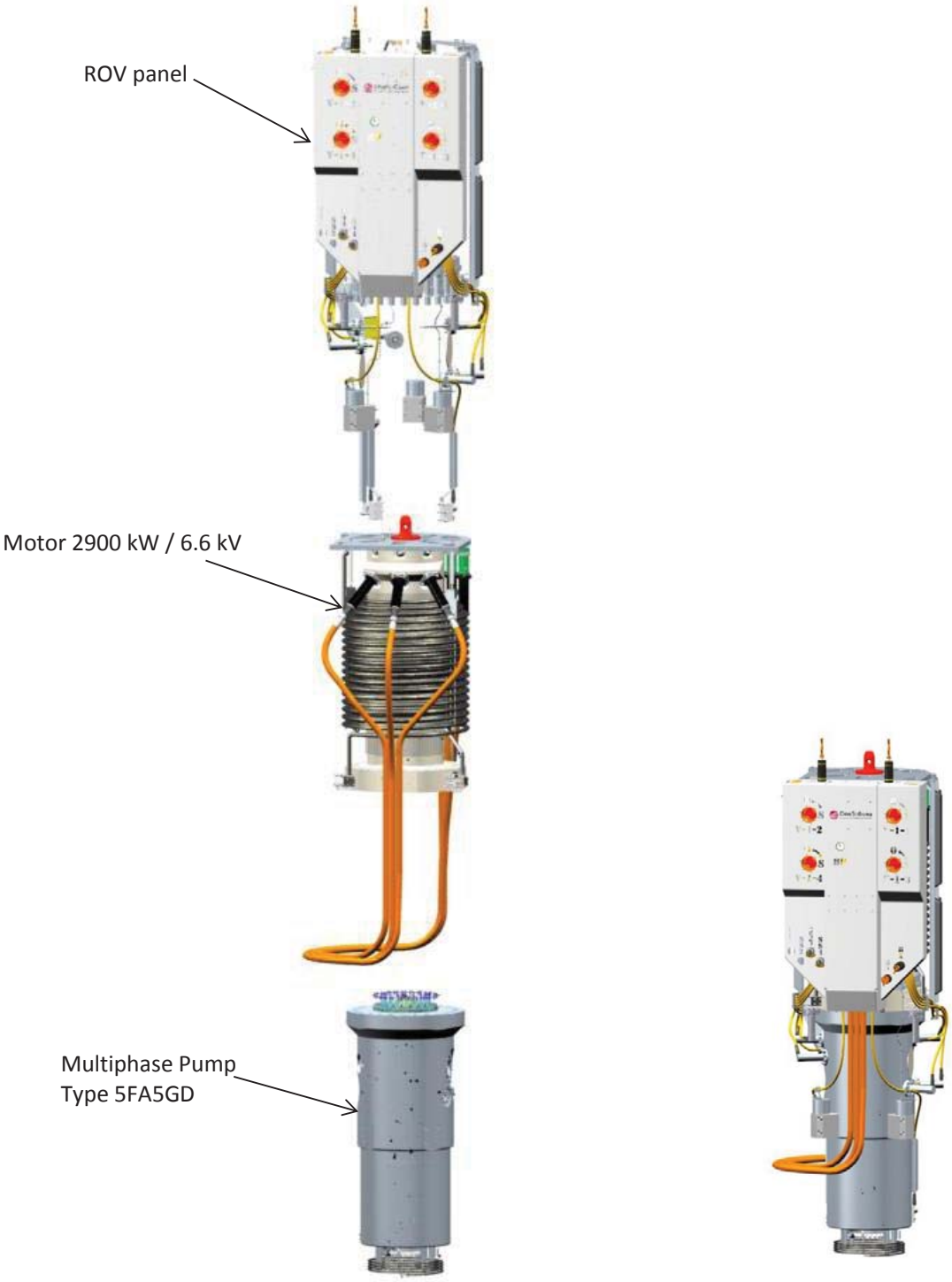
7 MPP



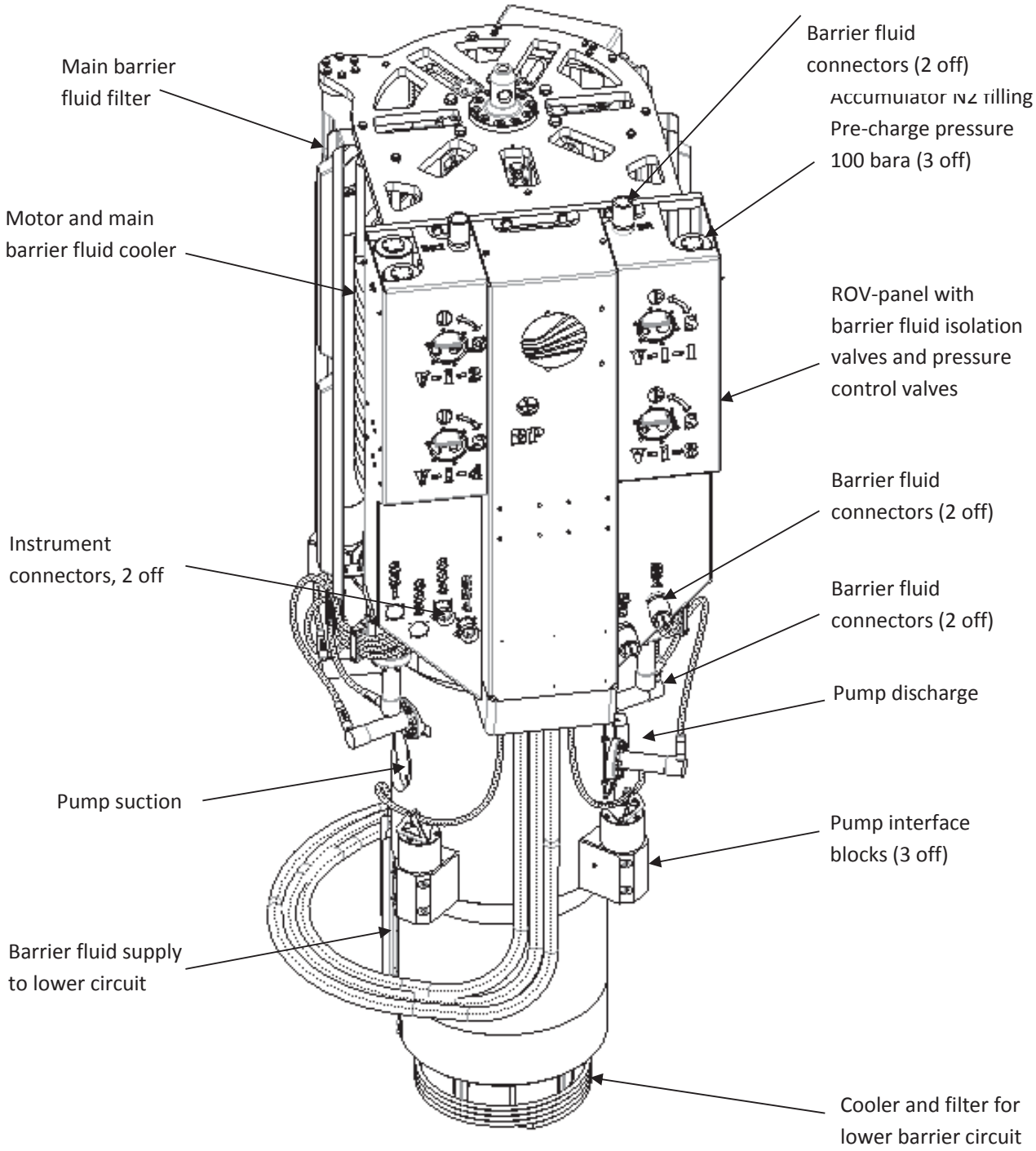
7.1 MPP reference list

Ref	Document title	COMPANY Doc. No	MPP CON Doc. No
/27/	Pump functional specification	A0-050-GMP-310-000086	DOC-0003905
/28/	Pump Performance Test Procedure	AO-050-GMP-310-000442	DOC-0022266
/29/	MPP GA	AO-050-GMP-310-000961	ITM-0070730
/30/	Pump selection	AO-050-GMP-310-000017	DOC-0003858
/31/	Basis of operation and control – Pump system	AO-050-GMP-310-000028	DOC-0007904

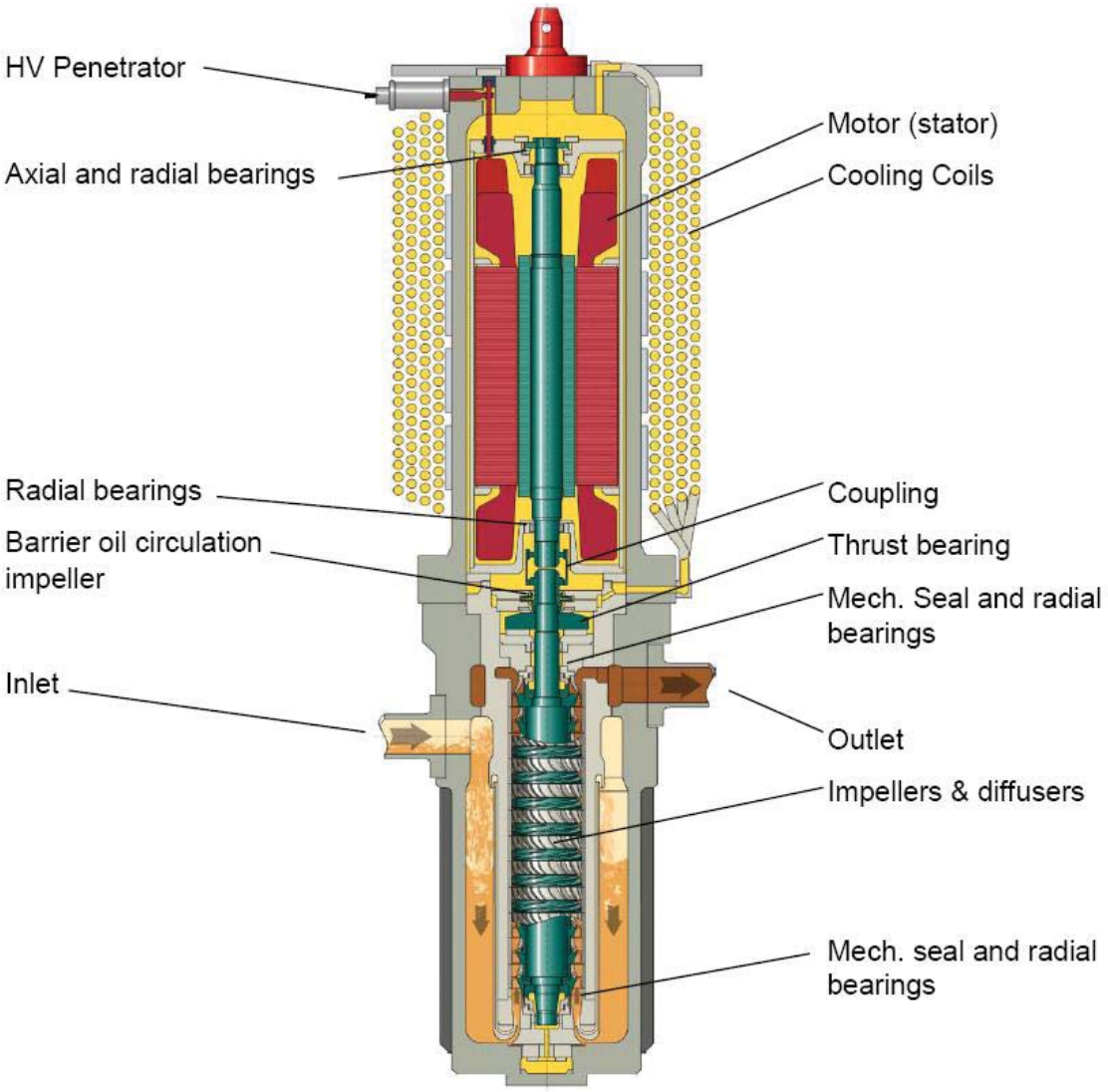
7.2 MPP overview



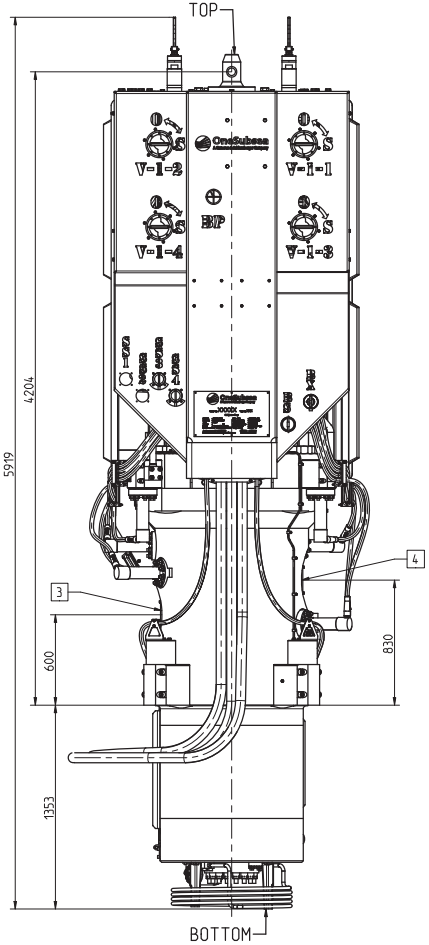
7.3 MPP details

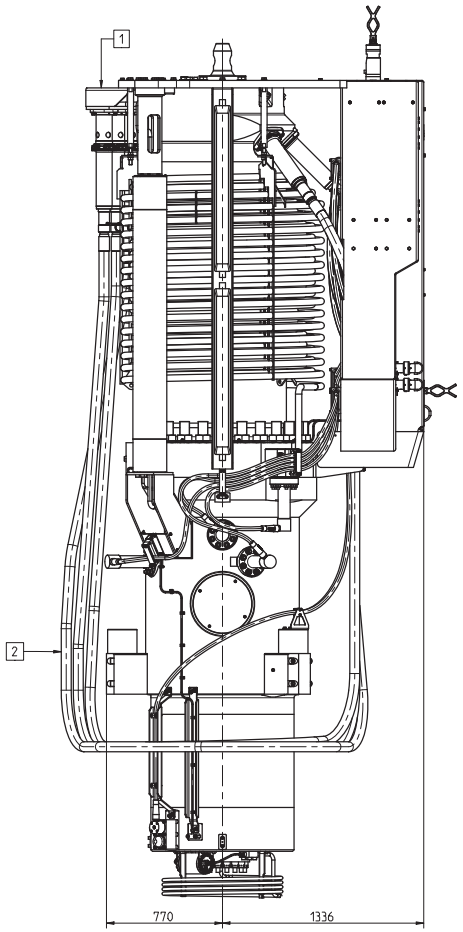


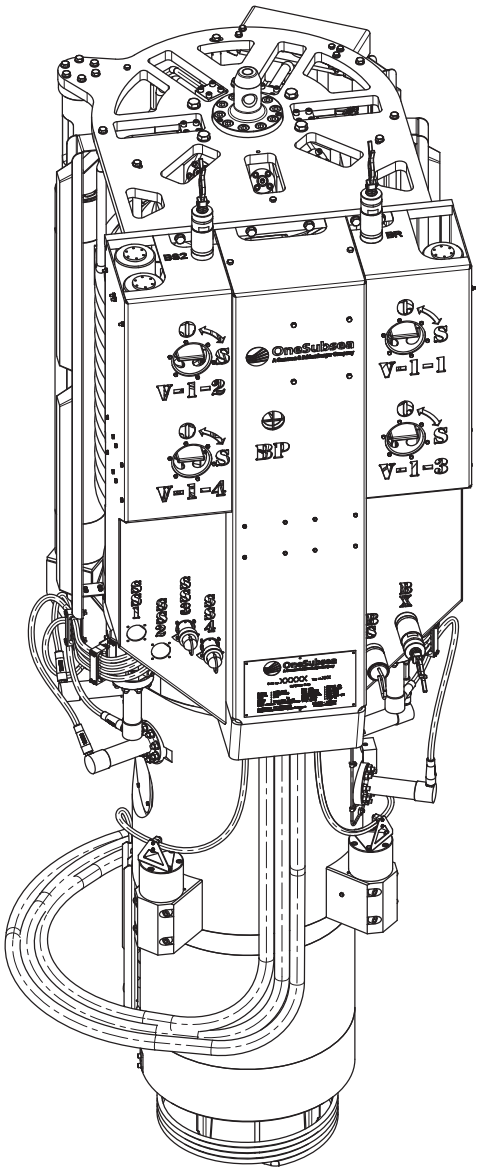
7.4 MPP cross section



7.5 MPP GA drawing







3D-VIEW
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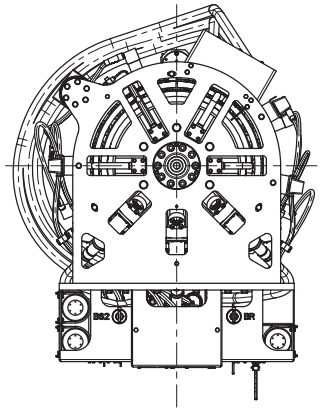

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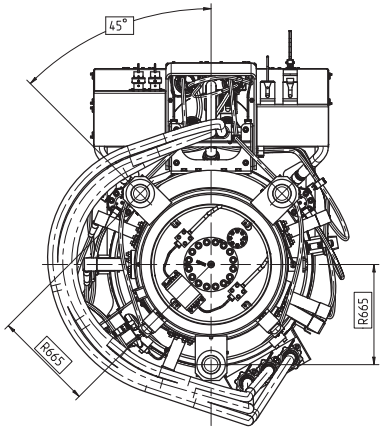

SEEN FROM BOTTOM

REFERENCE DOCUMENTS & DRAWINGS:

REF./1/
DOC-0010998 MULTIPHASE PUMP-
AO-050-GMP-310-000974 FAT PROCEDURE

REF./2/
DOC-0008496 MULTIPHASE PUMP-
AO-050-GMP-310-000109 DATA SHEET

REF./3/
DRW-0000885 MPP BARRIER FLUID-
AO-050-GMP-310-000089 SCHEMATIC

REF./4/
DRW-0000852 SUBSEA SIGNAL JUMPER
AO-050-GSG-310-000045 SYSTEM LAYOUT

REF./5/
ITM-0071499 PUMP UNIT - GA DRAWING
AO-050-GMP-310-000454

NOTES:

1. TEMPORARY PARKSTATION FOR HV POWER CABLES, INTERNAL DRY ASSEMBLING ON PUMP UNIT.
2. HV POWER CABLES 10 METER LONG.
3. INLET.
4. OUTLET.

WEIGHTS:

DRY WEIGHT, OIL FILLED	26400kg
SUBMERGED WEIGHT	20500kg

Rev	Date	Status	Revision Memo	Issued by	Checked by	Approved by
03	14-Jan-2015	ASB	As Built	KSN	VA	MGI
02	29-Nov-2013	AFC	Accepted for Construction	PST	VA	MGI
01	30-Apr-2013	AFC	Accepted for Construction	PST	VA	MGI
00	12-Feb-2013	IFR	Issued for review	PST	VA	MGI

TOTAL E&P ANGOLA - GIRRI PROJECT - AO-050-GMP-310-000324 REV 02 + AFC 20 - APR - 2015

MPP
GA

Doc Type : DRW	System/Unit: 04	Discipline : MPP	Electronic Filename: AO-050-GMP-310-000981_rev_03
COMPANY Document N°	AO-050-GMP-310-000981	REV : 03	Scale : 3/50
CONTRACTOR/Original Document N°	ITM-0070730/A	Format : A1	Folio : 1 of 1
		Phase : DE	Class : 2

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Title	MPP GA
Weight	-
ID	ITM-0070730
Scale	3:50
Format	A1
Sheet	1 of 1

Revision Status	Published	Made by	Checked by	Approved by
D Released	2015-03-23 13:20:50	KSN	VA	MGI

Engineering Change Order: ECN-002981

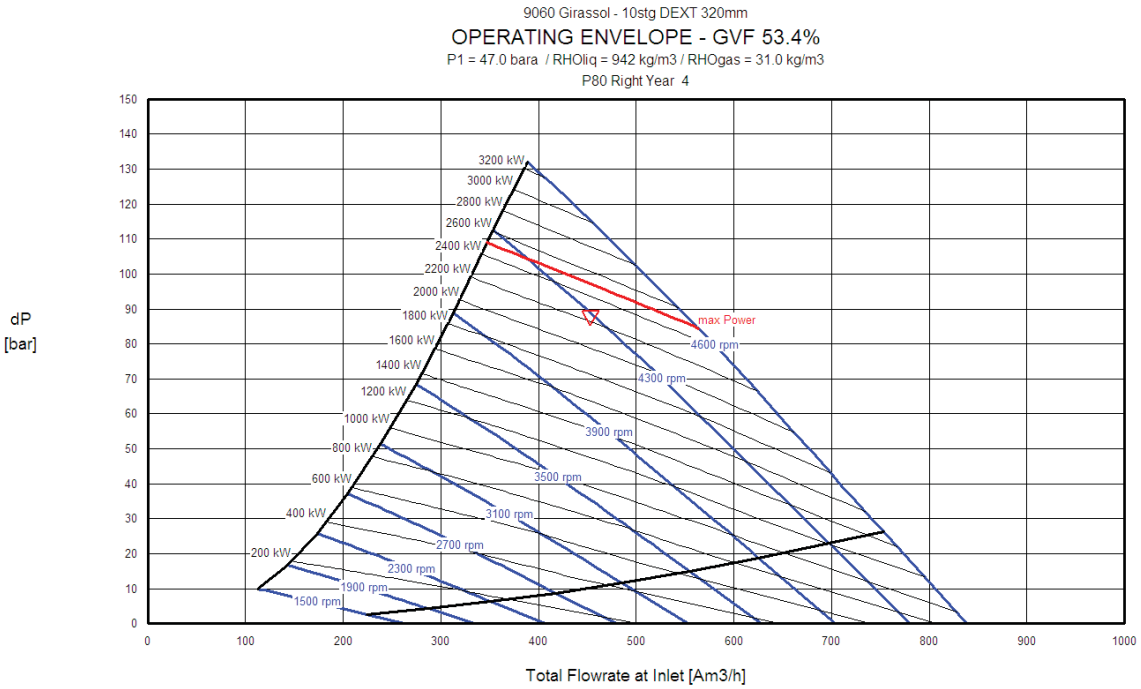
7.6 MPP technical description

MPP parameters	Description
Number of pumps	6
Operation	According to operating scenarios in A0-050-GMP-310-000086
Pump Type:	Multiphase pump w/ balance piston
Pump Inlet/Outlet size:	8”
Drive	Electric, Variable Speed (VSD)
Location of Drive System	Power and Control module on deck
Motor Voltage	6.6 kV
Rated Motor Shaft Power:	2900 kW
Rated Motor frequency:	71.5 Hz
Rated motor torque	6507 Nm
Rated Speed:	4252 rpm
Speed Range:	1500 – 4620 rpm
Number of stages:	10
Impeller diameter:	320 mm
Max differential Pressure:	110 bar
Flow capacity (operating cond.)	552 Am3/h (P70 Left year 4)
Maximum GVF (operating cond.)	53 % (P80 Right year 4)
Design pressure	346 bar (on both process and barrier fluid)
Design temperature process	93 degC
Design temperature barrier fluid	70 degC

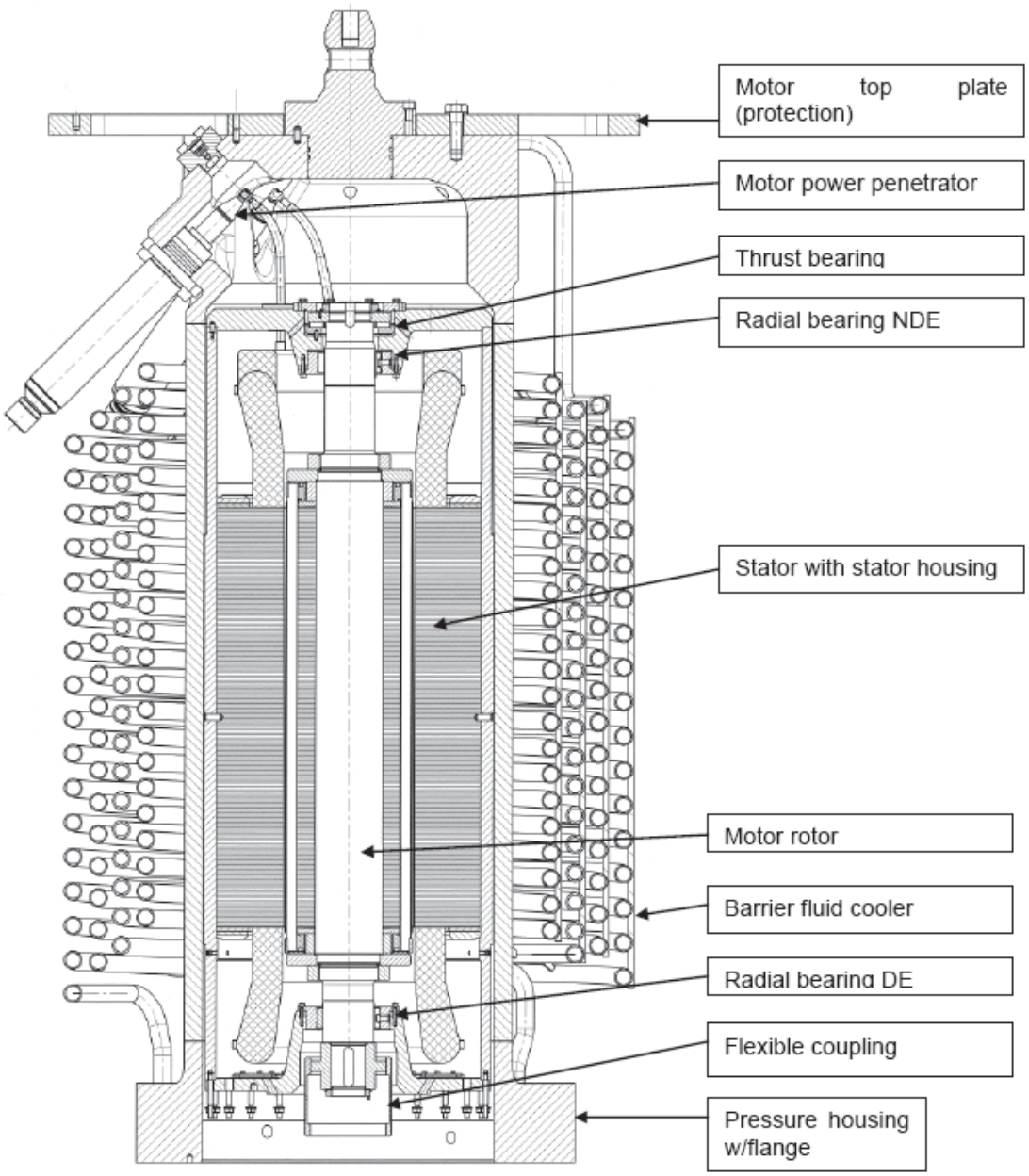
7.7 MPP working area

The figure below shows the operating envelope for P80 Right for year 4. Operating envelopes for other operating conditions are included in Pump Selection, ref. /30/.

A description of the operating envelope is included in Basis of Operation and Control – Pump System, ref. /31/.



7.8 MPP motor


Motor top plate (protection)
Motor power penetrator
Thrust bearing
Radial bearing NDE
Stator with stator housing
Motor rotor
Barrier fluid cooler
Radial bearing DE
Flexible coupling
Pressure housing w/flange

7.9 MPP general requirements

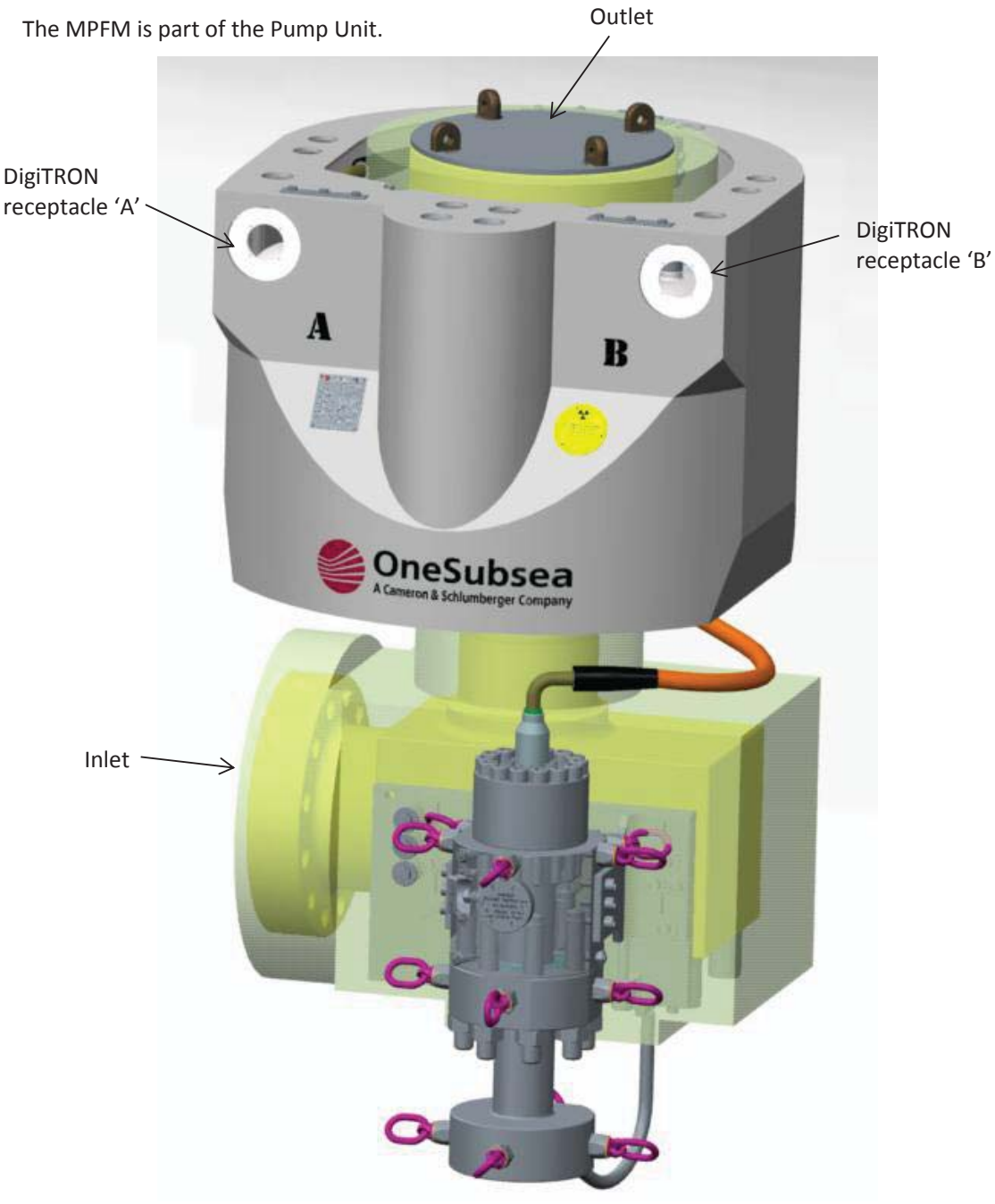
- Variable speed drive (VSD) for each MPP.
- Recycle loop per MPP.
- The MPP have dedicated upstream flowmixer and downstream flow splitter
- The MPP have a built-in check valve at the MPP outlet.
- Barrier fluid supply for the MPP motor.
- The MPP to be installed in a Pump Unit that is interchangeable and retrievable.

7.10 MPP design conditions

Design conditions	Value	Comment
Maximum Pressure Differential	110 bar	Max dP limited to thrust bearing and balance piston.
Pump Design Pressure Process	346 bara	
Pump casing design pressure (process fluid exposed parts)	346 bara	
Pump casing (mixer housing) design temperature (process fluid exposed parts)	93 °C	
Pump casing hydrostatic test pressure at workshop (process fluid exposed parts)	495 barg	According to ASME VIII div. 2
Motor casing design pressure (barrier fluid exposed parts)	346 bara	
Motor casing design temperature (barrier fluid exposed parts)	85 °C	
Motor casing hydrostatic test pressure at work shop (barrier fluid exposed parts)	495 barg	According to ASME VIII div. 2 AO-050-GMP-310-000028
Process Fluid Normal Operating Temperature Range	4 – 77 °C	Flowing Condition
Barrier fluid design temperature	3.8 - 70 °C	
Ambient Sea water temperature max/min	4.4 / 3.8 °C	
Sea water pressure at pump location	146.8 bar	Ambient pressure of 1450m
Max. Design pressure external	150 bar	
Max GVF	100%	
Motor Rated Shaft Power	2900 kW	@ 4252 rpm
Maximum continuous speed	4620 rpm	

8 MPFM

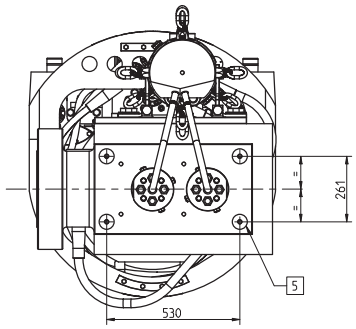
The MPFM is part of the Pump Unit.

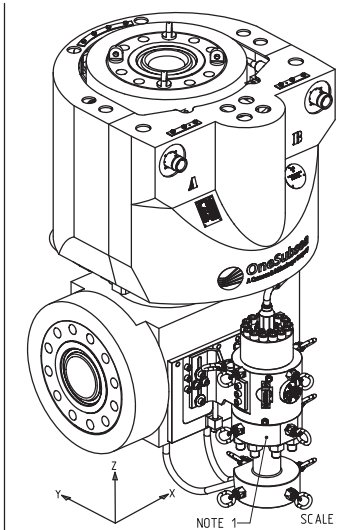


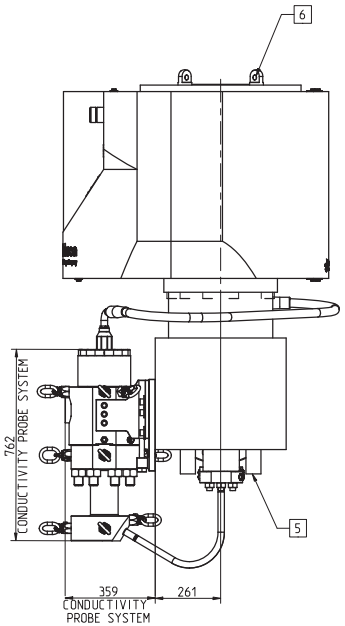
8.1 MPFM reference list

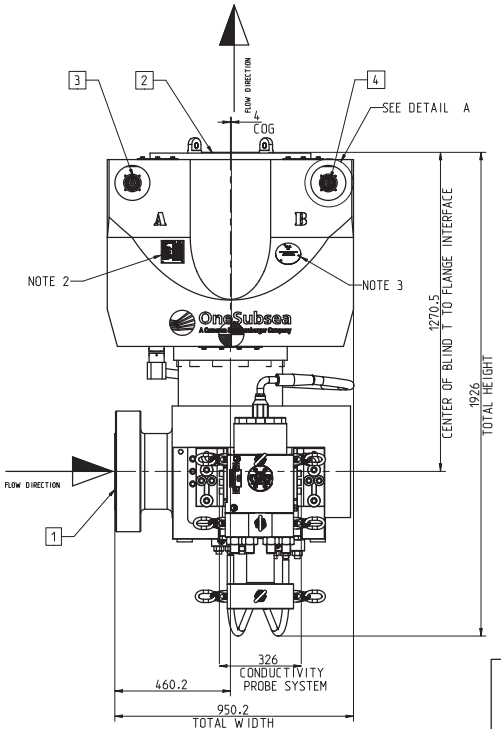
Ref	Document title	COMPANY Doc. No	MPP CON Doc. No
/32/	MPFM - GA drawing	AO-050-GMP-310-000411	ITM-0071600

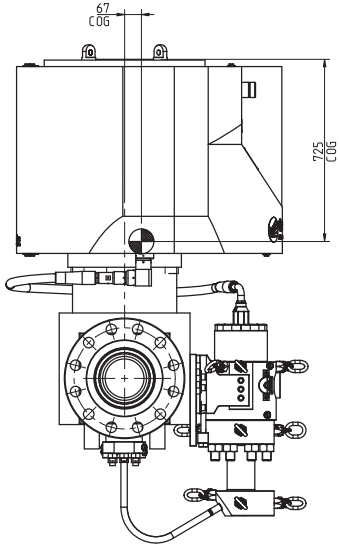
8.1 MPFM GA drawing

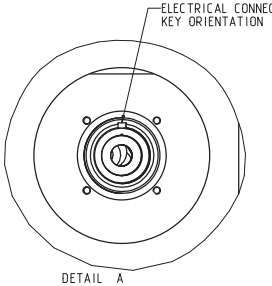


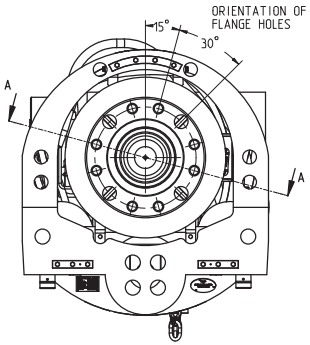


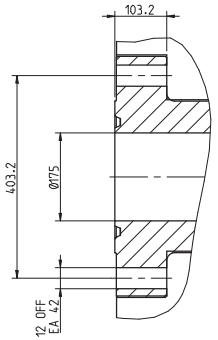


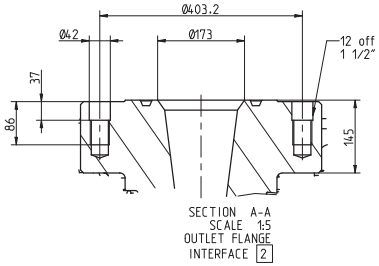












NOTES:

NOTE 1.
CONDUCTIVITY PROBE SYSTEM FINAL DIMENSIONS (E)

NOTE 2.
PW Vx SS Type F NAME PLATE: ITM-0064659

NOTE 3.
WARNING LABEL FOR RADIOACTIVITY: ITM-0031835

NOTE 4.
CATHODIC PROTECTION:
SURFACE AREA ESTIMATED 8 m2 COATED AREA.
(COVERS AND INSULATION NOT INCLUDED)
ALL METAL SURFACES ELECTRICALLY CONNECTED
TO CATHODIC PROTECTION SYSTEM ARE PAINTED.

NOTE 5.
CENTRE OF GRAVITY; SEE DRAWING (COG)

NOTE 6.
WELDING ON STRUCTURES CONNECTED TO
THE PHASEWATCHER Vx MAY ONLY BE PERFORMED IF
APPROPRIATE ACTIONS HAVE BEEN TAKEN TO ENSURE
THAT NO WELDING CURRENTS WILL FLOW THROUGH
ANY PART OF THE Vx METER.
FURTHER, THE Vx METER PARTS MUST NEVER BE
EXPOSED TO HEAT FROM THE WELDING OPERATIONS
(REF. STORAGE CONDITIONS -20 TO +50DEGC
FOR SUBSEA Vx).
FE WILL NOT ACCEPT ANY WARRANTY CLAIMS IF THESE
CONDITIONS ARE VIOLATED.

NOTE 7.
SURFACE PROTECTION, REF DATA SHEET

NOTE 8.
ESTIMATED WEIGHT IN AIR: 2600kg
ESTIMATED WEIGHT IN WATER: 2250kg (E)

#	INTERFACES:
1	INLET: API 6BX 7 1/16 FLANGE 10k SEAL: BX-156 SEE TABLE FOR ALLOWABLE NOZZLE LOADS
2	OUTLET: API 6BX 7 1/16 FLANGE 10k SEAL: BX-156 SEE TABLE FOR ALLOWABLE NOZZLE LOADS
3	ELECTRICAL CONNECTOR "A" EDIV-20-B004-AA-DC-HD12P DigiTRON, SIZE 20, WITH 12 WAY CONNECTOR (RECEPTACLE)
4	ELECTRICAL CONNECTOR "B" EDIV-20-B004-AA-DC-HD12P DigiTRON, SIZE 20, WITH 12 WAY CONNECTOR (RECEPTACLE)
5	STRUCTURAL ATTACHEMENT 4 OFF M16 SPACED AS SHOWN
6	LIFTING EYELET, 4 OFF 1.5T EA

Rev	Date	Status	Revision Memo	Issued by	Checked by	Approved by
03	13/10/2013	ASB	AS BUILT	MBA	AEF	RAN
02	09/01/2014	AFC	Accepted for Construction	MBA	STJ	RAN
01	11/11/2013	IFA	Issued for Acceptance	EAB	STJ	RAN
00	21/02/2013	IFR	Issued for review	STJ	HAR/OJR	RAN

TOTAL E&P ANGOLA

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MPFM - GA DRAWING
9060 - GIRRI
PW Vx SS TYPE F4, 88U

Doc Type: DRW	System/Unit: 04	Discipline: MPP	Electronic Filename: AO-050-GMP-310-000411-REV03
COMPANY Document N°	AO-050-GMP-310-000411	REV: 03	Scale: 1/10
CONTRACTOR/Original Document N°	ITM-0071600/E	Format: A1	Folio: 1 of 2

Phase: DE
Class: 1

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Weight: NOTE 8
Scale: 1:10

Title: 9060 GIRRI MPFM - GA DRAWING
PW Vx SS TYPE F4. 88U

ID: ITM-0071600

Format: A1 | Sheet: 1 of 2

Revision Status	Published	Made by	Checked by	Approved by
E Released	2014-10-22 17:20:28 MB A		AEF	ATJ

Engineering Change Order: ECN-002247

REFERENCES

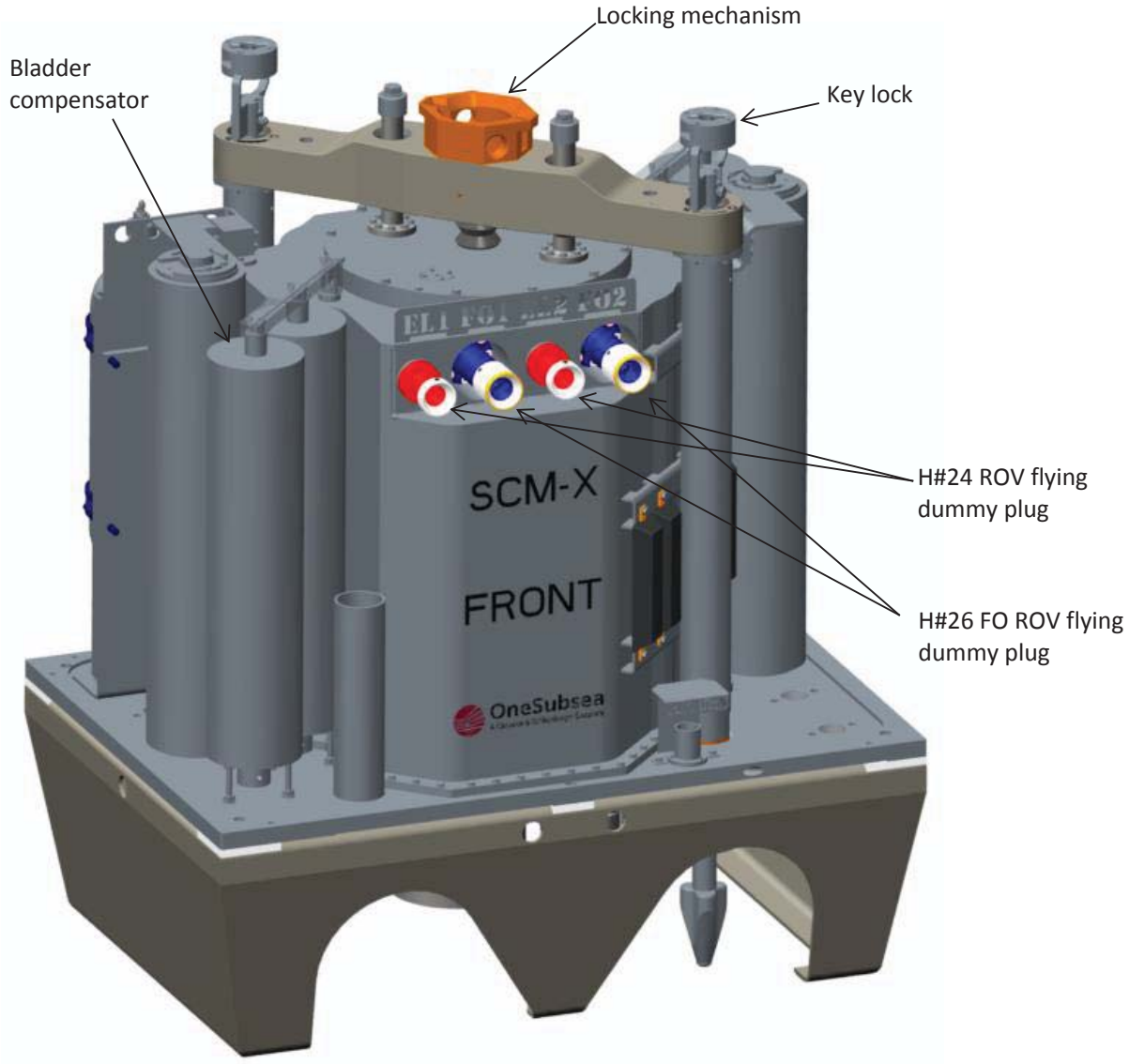
DATA SHEET	DOC-0003678	AO-050-GSG-310-000158
INETERCONNECTION DIAGRAM	DRW-0002326	
MATERIAL SELECTION	DOC-0025417	AO-050-GMP-310-000773

ALLOWABLE NOZZLE LOADS FOR PW Vx SS 88U

	Fx (kN)	Fy (kN)	Fz (kN)	Mx (kNm)	My (kNm)	Mz (kNm)
INLET	44.2	44.2	44.2	28	28	28
OUTLET	44.2	44.2	44.2	28	28	28

TOTAL E&P ANGOLA - GIRRI PROJECT - AO-050-GMP-310-000324 REV 02 - AFC - 20 - APR - 2015

9 SCM



The SCM will be utilized to monitor and control the subsea pump modules P70 and P80 for GirRI.

Each pump module will be equiped with 1 off SCM which will interface all control and monitoring functions on the MPP Module.

One common SCM design shall ensure interchangeability between SCMs for the GirRI development.

The subsea pump control system is based on a standard OneSubsea Subsea Control Module (SCM); an electro hydraulic subsea pump control system with fibre optic communication. It will be equipped with two electronic modules; SEMs for redundancy, and a dielectric oil filled, pressure compensated compartment for the instrumented hydraulic system utilizing DCVs, pressure- and flow sensors.

The SCM is designed to be installed and retrieved by the use of OneSubsea SCM Installation Tool.

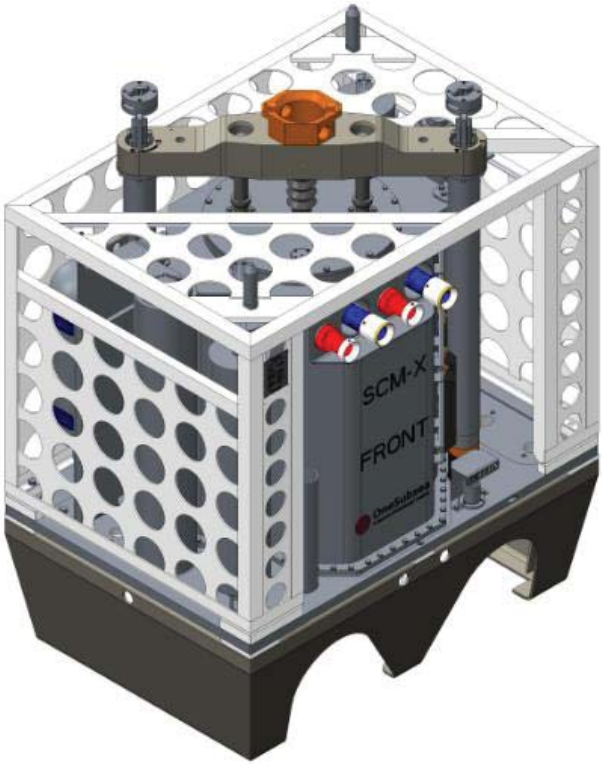
9.1 SCM reference list

Ref	Document title	COMPANY Doc. No	MPP CON Doc. No
/33/	SCM User Manual	AO-050-GSG-310-000472	DOC-0022249
/34/	SCM GA & Interface drawing	AO-050-GSG-310-000405	ITM-0059363
/35/	SCM Data Sheet	AO-050-GSG-310-000153	DOC-0003680
/36/	SCM Hydraulic Schematic	AO-050-GSG-310-000090	DRW-0001198

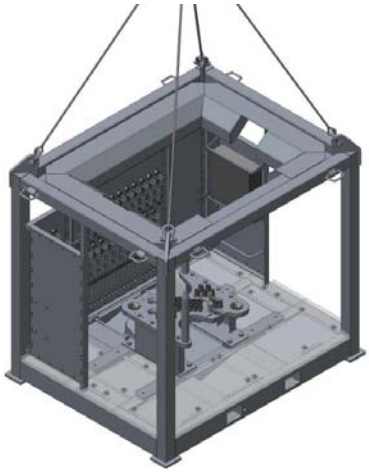
9.2 SCM scope of supply

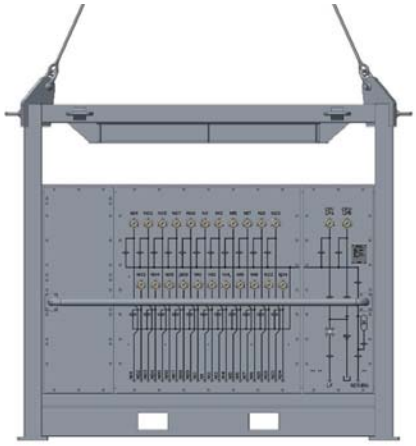
SCM x 3

- SCM P70
- SCM P80
- SCM Spare

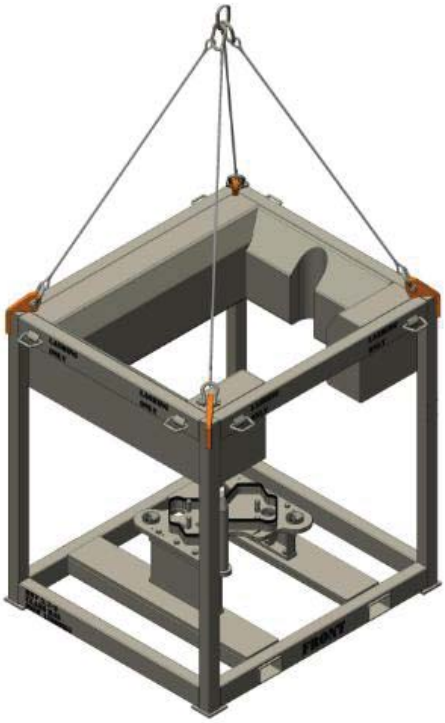


SCM Test & Transport Skid (SCM T&TS) x 1

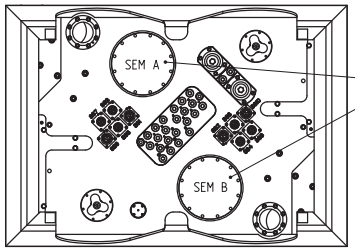


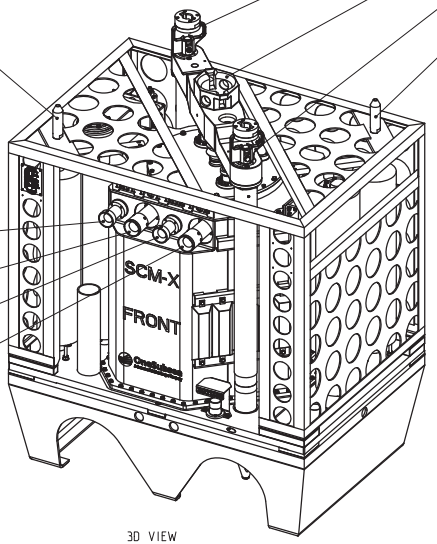


SCM Transport Skid (SCM TS) x 2

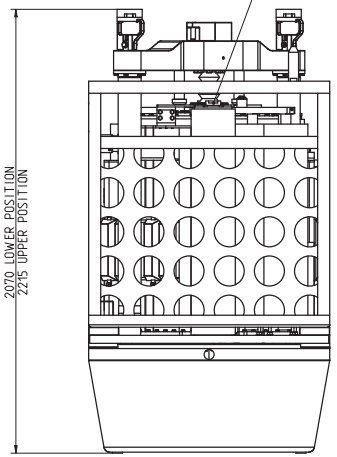


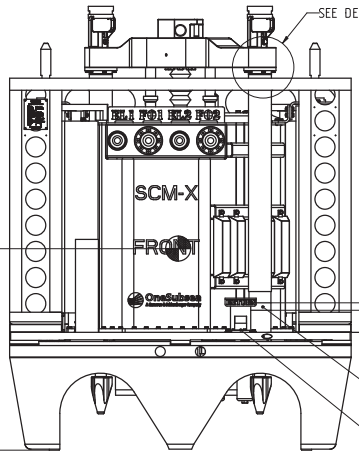
9.3 SCM interface drawing



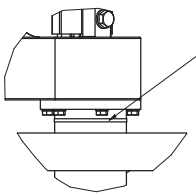


3D VIEW
FRONT

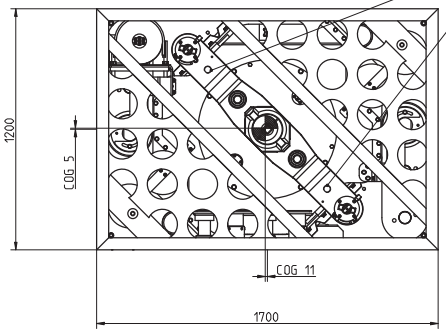


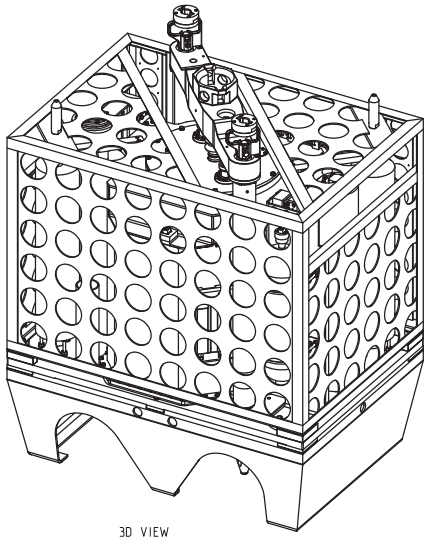


SEE DETAIL A



DETAIL A
SCALE 1:4





3D VIEW
BACK

NOTES:

WEIGHT SCM (WEIGHED):

IN AIR: 4750 KG

WEIGHT SCM (CALCULATED):

SUBMERGED: 4100 KG

NOTE 01: ROV BUCKET CLASS 4
SCM INSTALLATION TOOL AND TORQUE TOOL INTERFACE.
MAKE UP TORQUE: 800 Nm
BREAK OUT TORQUE: 1200 Nm
DAMAGE TORQUE: 2000 Nm
NO. OF TURNS FULL TRAVEL: 30 1/2
NO. OF TURNS INSTALLATION: 25 1/2
CCW TO MAKE UP
CW TO DISCONNECT / RELEASE

NOTE 02: LOCKING HANDLES
LIFT AND ROTATE 60° CW TO LOCK
LIFT AND ROTATE 60° CCW TO OPEN

NOTE 03: ROV SIGNAL/LV POWER CONNECTOR
MATING FORCE MAX 500N
DEMATE FORCE 600N
MAX RADIAL MISALIGNMENT: ±20
MAX ANGULAR MISALIGNMENT: ±20°
MAX ROTATIONAL MISALIGNMENT: ±15°

NOTE 04: ROV FO CONNECTORS
MATING FORCE MAX 36.5 KG
DEMATE FORCE 36.5 KG
MAX RADIAL MISALIGNMENT: ±6.35
MAX ANGULAR MISALIGNMENT: ±5°
MAX ROTATIONAL MISALIGNMENT: ±10°

NOTE 05: GUIDE POST FOR SCM INSTALLATION TOOL

NOTE 06: ACCUMULATOR PRE-CHARGE PORT
NITROGEN PRE-CHARGE PORT, 1 OFF ACCUMULATOR ON EACH SIDE

NOTE 07: HYDRAULIC RETURN FLUID VENT PORT

NOTE 08: SUBSEA ELECTRONIC MODULE (SEM)

NOTE 09: INSTALLATION INDICATORS
INSTALLATION MODE: UPPER ORANGE NOT VISIBLE
OPERATION MODE: LOWER ORANGE NOT VISIBLE

NOTE 10: INTERFACE FOR EYE BOLTS, M36.
FOR TOPSIDE HANDLING (EYE BOLTS NOT SHOWN).
EYE BOLTS TO BE DELIVERED WITH SCM.
EYE BOLTS TO BE REMOVED PRIOR TO INSTALLATION.

NOTE 11: MARKING FOR SECONDARY RELEASE CUT

REFERENCE DOCUMENTS:

SUBSEA CONTROL MODULE - USER MANUAL
AO-050-GSG-310-000472 (DOC-0022249)

SCM INSTALLATION TOOL GA & INTERFACE DRAWING
AO-050-GSG-310-000588 (DRW-0003536)

TAG NO:

P-70 SCM: 2-SCM-1706
P-80 SCM: 2-SCM-1806
SPARE SCM: 2-SCM-1005S

Rev	Date	Status	Revision Memo	Issued by	Checked by	Approved by
04	23/10/2014	ASB	As Built	EHA	OSI	SHJ
03	16/06/2014	AFC	Accepted for Construction	EHA	OSI	SHJ
02	31/01/2014	AFC	Accepted for Construction	EHA	OSI	TDA
01	12/09/2013	IFA	Issued for Acceptance	EHA	OSI	SHJ
00	02/07/2013	IFR	Issued for review	EHA	SHJ	TTH

TOTAL E&P ANGOLA

GirRI
Subsea Control Module
GA and Interface

Doc Type : GEA	System/Unit: 04	Discipline : SPS	Electronic Filename: AO-050-GSG-310-000405-REV04.pdf
COMPANY Document N°	AO-050-GSG-310-000405	REV : 04	Scale : 2/25
CONTRACTOR/Original Document N°	ITM-0059363/E	Format : A1	Folio : 1 of 1

Phase : DE
Class : 1

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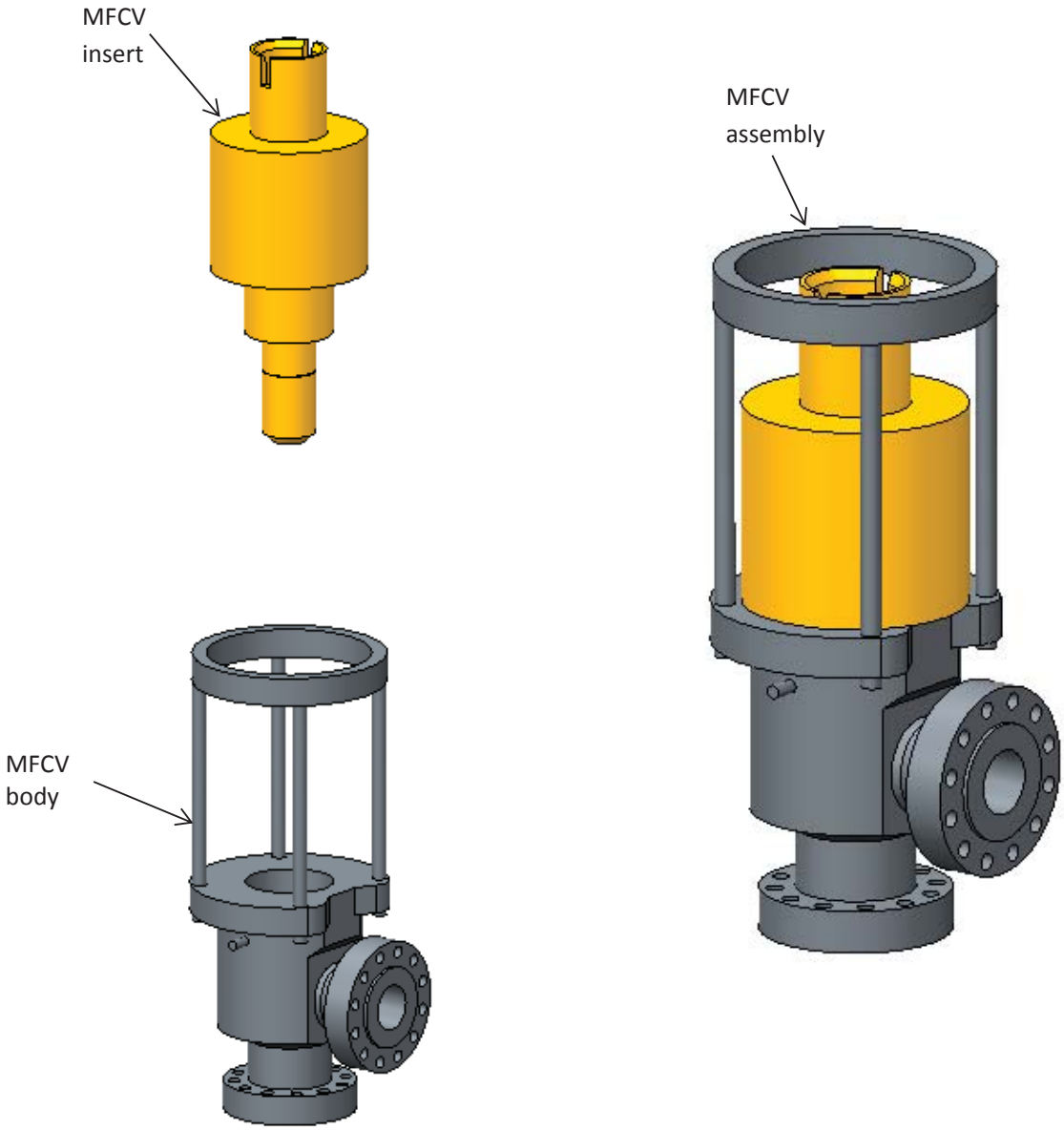
Title	GirRI Subsea Control Module GA and Interface
ID	ITM-0059363
Format	A1
Sheet	1 of 1
Weight	SEE ABOVE
Scale	2:25

Revision Status: E Released
Published: 2014-10-23 16:20:28 EHA
Made by: ØSI
Checked by: SHJ
Approved by:
Engineering Change Order: NA

TOTAL E&P ANGOLA - GIRRI PROJECT - AO-050-GMP-310-000324 REV 02 - AFC - 20 - APR - 2015

10 MFCV (V4-1 / V4-2)

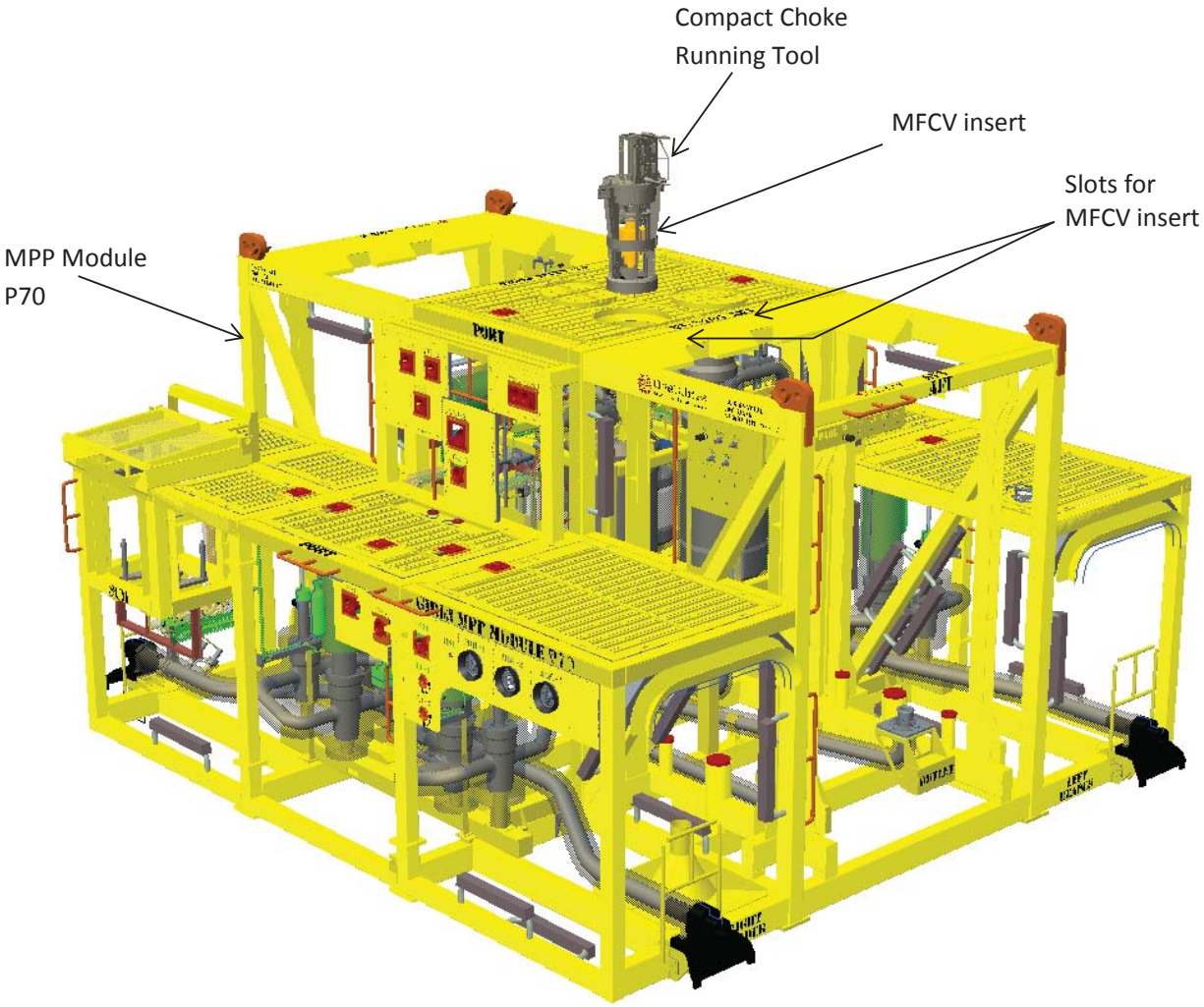


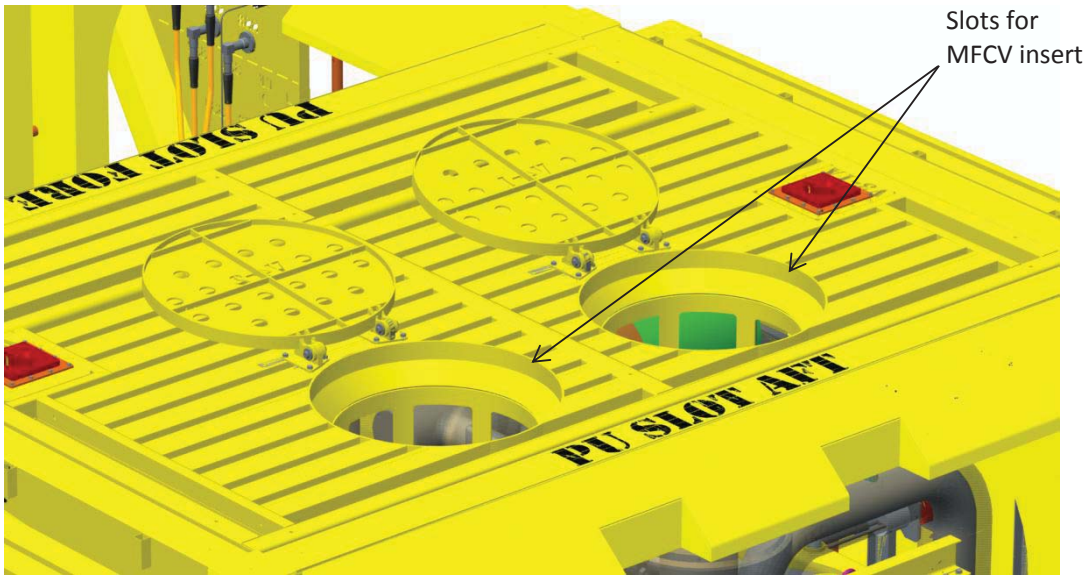
Minimum Flow Control Valve Body with Minimum Flow Valve Insert

10.1 MFCV reference list

Ref	Document title	COMPANY Doc. No	MPP CON Doc. No
/37/	General Arrangement Drawings with Parts List (Minimum Flow Valve)	AO-050- PJG-327-001415	DOC-0039547
/38/	Choke Data Sheet (Minimum Flow Valve)	AO-050-PJG-327-001408	DOC-0037949
/39/	Assembly Drawing, Assy Detail, Insert Assy	NA	DOC-0043207
/40/	MPP Module P70 and P80 – Interface Drawing	AO-050-GMP-310-000380	ITM-0058434

10.2 MFCV placement



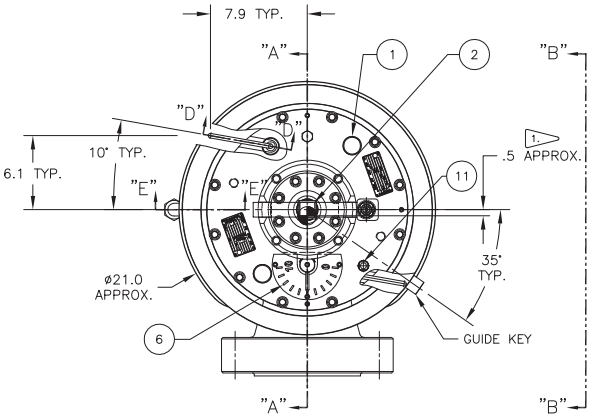


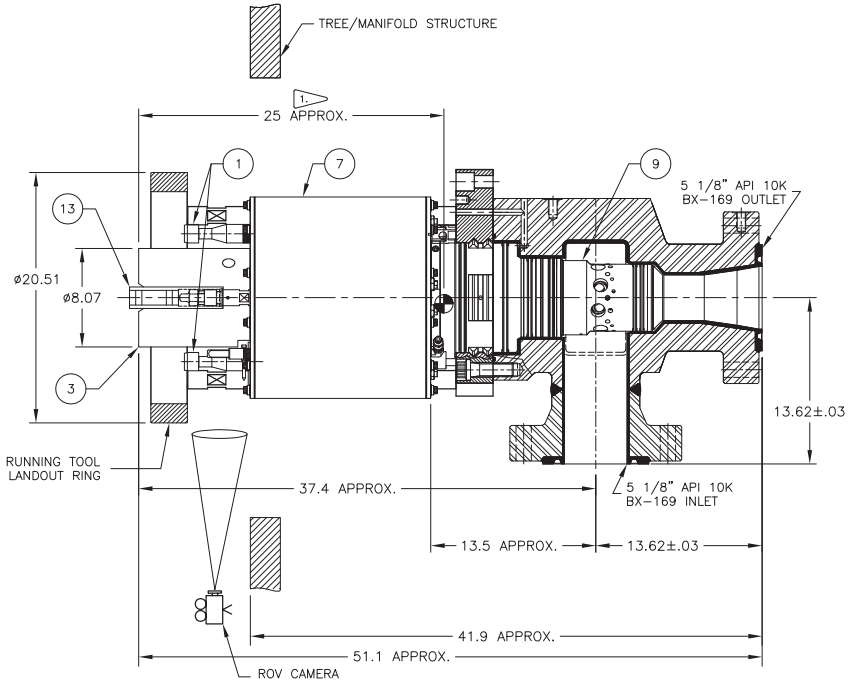
10.1 MFCV technical description

CC40 SRC Compact Choke	MFCV data
Item Details	API 6A 20th Ed. / API 17D 2nd Ed / ISO 10423 / ISO 13628-4
Design Code	See SK-079548-20
Reference Drawing:	10,000 psi MWP
Pressure Rating	10,000 feet
Depth Rating	5 1/8" API 10k, Flanged inlet & outlet
End Connections	13.62" +/- 0.03" (346mm +/-0.8mm)
Distance Choke inlet to Outlet Centerline	13.62" +/- 0.03" (346mm +/-0.8mm)
Distance Choke Outlet to Inlet Centerline	"P-U" (-20oF to 250oF, -29 oC to 121 oC)
API Temperature Rating	"HH-NL"
API Material Class	2 ¼ Cr 1Mo LAS fully Ni alloy clad on process wetted surfaces
Body	25Cr Super Duplex Stainless Steel
Bonnet Material	718 Ni Alloy / Tungsten Carbide
Trim Material	Plug and Cage Eq. % with Max. Cv = 106 (Flow tested = 134)
Trim (Forward Flow)	Dog-in-Window Self Locking Connector with Mechanical Anti
Connector Type	Vibration Lock/Unlock
Primary Bonnet Seal	718 Ni Alloy metal lip seal.
Primary / Secondary Stem Seals	VaripakTM – Spring energized PTFE / U-Packing
Quality level	Manufactured to PSL 3G
F.A.T. testing	In Accordance With API 17D, Section 7.21.4.2 + Gas Test
Qualification	API 6A 20th Ed (ISO 10423) - PR2, API 17D (ISO 13628-4)
	Hyperbaric test to 10,000 feet water depth.

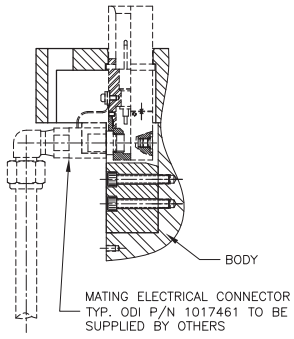
CC40 SRC Compact Choke	Actuator data
Type	Subsea Stepping Linear Choke Actuator SSLCA
Actuator Cleanliness	SAE AS4059 6B-F
Hydraulic Supply Pressure	5,000 psi
Control Fluid	Oceanic HW 443
Hydraulic Connections	2 off 3/8" x 0.065" (9.5mm x 1.7mm) Weld Tails
Hydraulic Swept Volume	0.64in3 (10.5cm3) per pulse
Temperature Rating	35 oF to 150 oF (2 oC to 66 oC)
Location Indicator	Graduated from 0 to 10. (0 closed, 10 open)
Electrical Feedback	LVDT, 4 – 20 mA Output, 10.5-28 VDC Input
Electrical Connector	4-way ODI Electrical Connector (Body half supplied by others)
No. of Hyd. Pulses to close	102 nominal. Operating times based on 3 Sec pulse time = 5.1 minutes
ROV Interface	API 17H / ISO 13628-8 Rotary interface Class 4
Operating Torque for Override	250 Ft. lbs max
Qualification	API 6A 20th Ed (ISO 10423) - PR2, API 17D (ISO 13628-4)
	Hyperbaric test to 10,000 feet water depth. & 1,000,000 pulse endurance test.

10.2 MFCV GA drawing

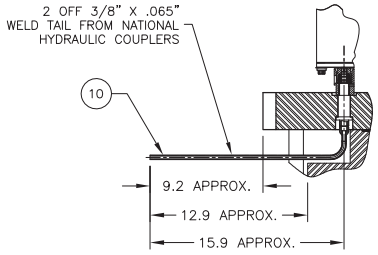




PARTIAL SECTION "A–A"
NOT TRUE VIEW



PARTIAL SECTION "E–E"

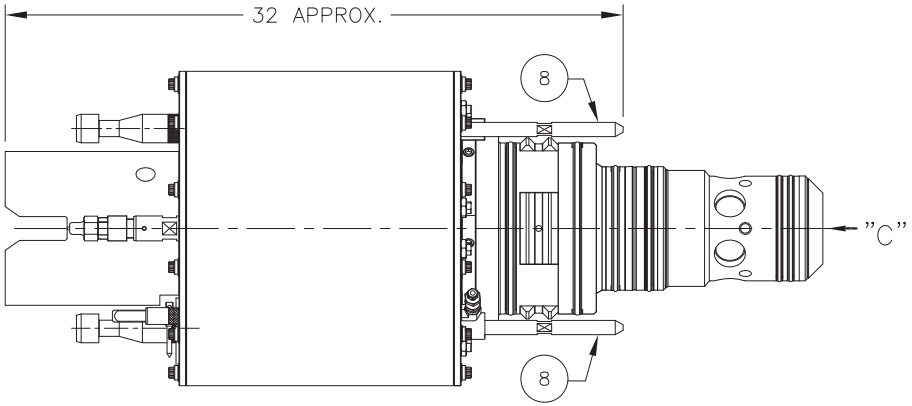


PARTIAL SECTION "D–D"
TYP. 2 PLCS.

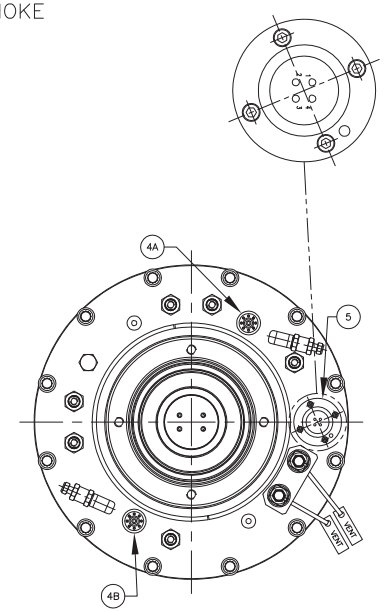
CHOKE ASSY. WEIGHT: 880Kgs (IN AIR).
BODY ASSY. WEIGHT: 540Kgs (IN AIR)
INSERT ASSY. WEIGHT: 340Kgs (IN AIR), 291Kgs (IN WATER).

1. APPROX. CENTRE OF GRAVITY INDICATED BY

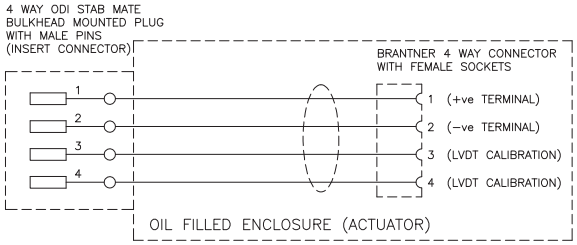
NOTE:
IF IT IS ANTICIPATED THAT MARINE GROWTH COULD OCCUR TO THE INTERFACES OF THE CHOKE (I.E. PUSH/PULL RODS, HYD OVERRIDE, LIFT BUCKET,)
CAMERON RECOMMEND THAT A MARINE GROWTH PROTECTION CAP IS PUT IN PLACE.



INSERT PARTIAL VIEW "B–B"
(WITH BODY REMOVED)

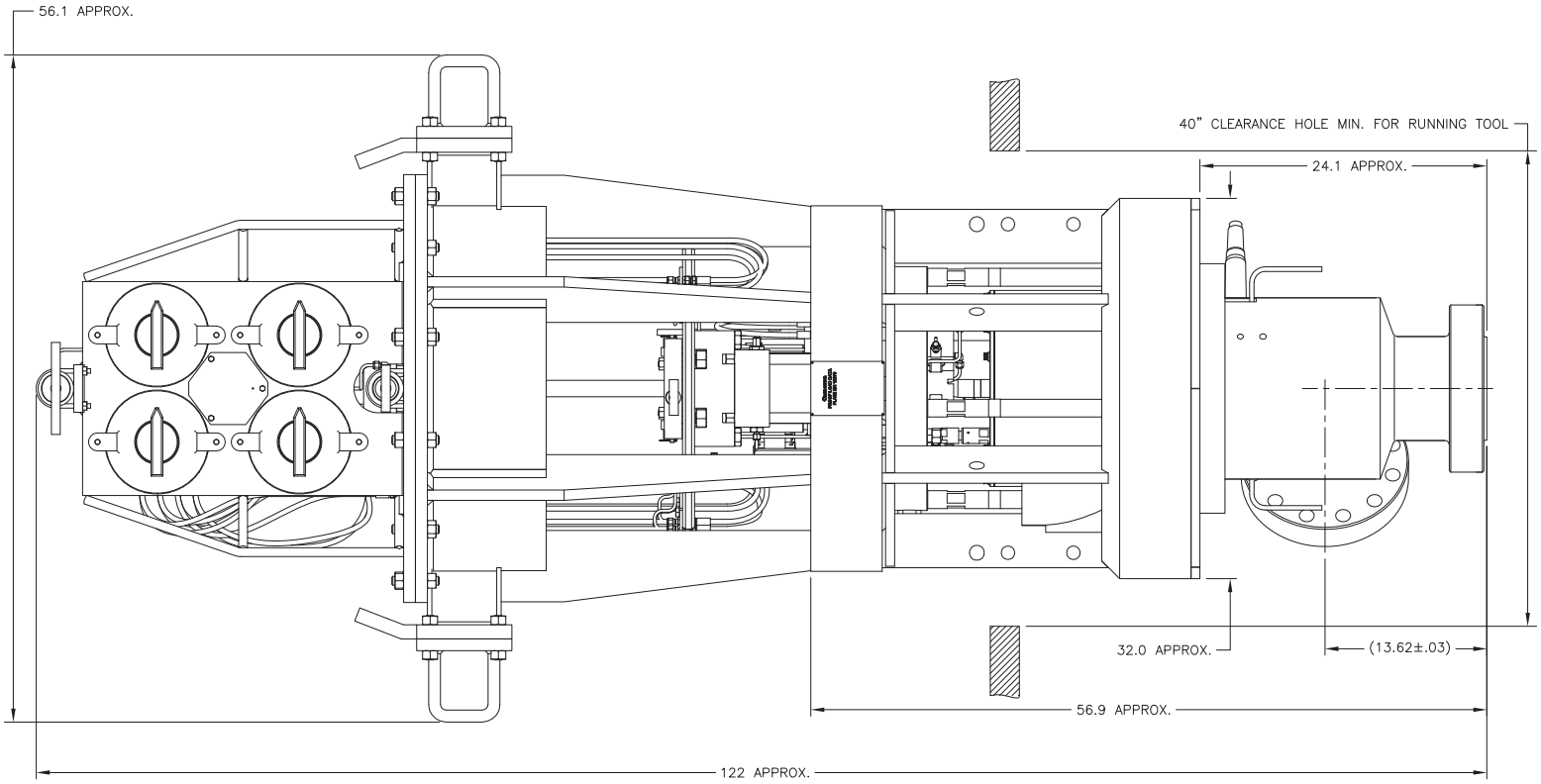


VIEW "C"



ELECTRICAL SCHEMATIC

ITEM No.	DESCRIPTION	REFERENCE DRAWING No.(s)	INTERVENTION DATA
1	PUSH–PULL RODS	---	ALL INFO PERTAINING TO FUNCTIONING OF THE PUSH PULL RODS CAN BE FOUND IN THE RUNNING TOOL OPERATION MANUAL.
2	OVERRIDE TORQUE RECEPTACLE	API 17H (ISO 13628–8) DOCKING ROTARY CLASS 4	OPERATING TORQUE = 200 Ft.Lbs. (272Nm). MAXIMUM TORQUE = 250 Ft.Lbs. (339Nm). DAMAGE TORQUE = 300 Ft.Lbs. (407Nm). No. OF TURNS OF OVERRIDE SHAFT FROM OPEN TO CLOSE = 8.5 APPROX.
3	LIFTING MANDREL	---	MAXIMUM LIFT FORCE OF 10,000 LbS (44,482N) MAY BE APPLIED.
4	NATIONAL HYDRAULIC COUPLERS (4A) HYDRAULICALLY ACTUATED TO CLOSE. (4B) HYDRAULICALLY ACTUATED TO OPEN.	---	CONNECT TO CONTROL SYSTEM VIA 3/8" x .065" BUTT WELD TAIL ON MALE COUPLER WHICH IS SITUATED ON THE CHOKE BODY. DISTANCE FROM BODY WALL TO CENTRELINE OF WELD TAIL IS 5.9". (NO BACK PRESSURE RETURN LINE) EXHAUST TO SEA 316L STAINLESS STEEL WELD TAIL
5	OCEAN DESIGN 4 WAY ELECTRICAL STAB CONNECTOR. BULKHEAD	ODI P/N: 1015710 REF. DWG: X–249463–02	ODI CONNECTOR, STAB TYPE (ON RETRIEVABLE CHOKE INSERT) 4 WAY PIN CONTACTS (MALE) PIN 1 +VE, PIN 2 –VE. PINS 3 & 4 NOT TO BE TERMINATED(USED FOR IN HOUSE CALIBRATION). TYPICAL MATING CONNECTOR ODI P/N 1017461 (FINISHED WIRE OD AND COMPENSATION FLUIDS TO BE CONFIRMED WITH ODI). (TO BE SUPPLIED BY OTHERS AS PART OF THE JUMPER FROM SCM TO CHOKE BODY.)
6	VISUAL INDICATOR	---	SCALE GRADUATED 0 TO 10, 0 = FULLY CLOSED, 10 = FULLY OPEN. SOME OVER TRAVEL IS PERMITTED.
7	SSLCA ACTUATOR WITH LVDT	---	INPUT VOLTAGE 10.5–28 VDC. OUTPUT 4–20 mA, 4mA @ FULLY CLOSED, 20mA @ FULLY OPEN. SUBSEA STEPPING LINEAR CHOKE ACTUATOR FILLED WITH CHEVRON ULTRA ISO GR68 GEAR OIL.
8	CHOKE INSERT GUIDE PINS	---	DESIGNED TO ACCOMODATE 3° MAXIMUM INSERT OFFSET IN ANY DIRECTION,
9	CC40 P & C TRIM		2.125" TRAVEL, APPROX. 102 PULSES FROM OPEN TO CLOSE.
10	HYDRAULIC SUPPLY DATA	N/A	MAXIMUM HYDRAULIC SUPPLY PRESSURE = 5,000 PSIG HYDRAULIC PULSE INTERVALS : 1 SECOND POWER, 2 SECONDS RETURN. RECOMMENDED INTERVALS TO BE VERIFIED DURING CONTROLS SYSTEM INTERFACE TESTING.
11	LOCKDOWN BAR	---	SECONDARY ANTI–VIBRATION LOCKDOWN BAR MIN. SETTING TORQUE = 60 FT LBS MAX. BREAKOUT TORQUE = 80 ft lbs MAX. SETTING TORQUE = 90 FT LBS MIN. BREAKOUT TORQUE = 20 ft lbs DAMAGE BREAKOUT TORQUE = 150 ft lbs NO OF TURNS TO LOCK AV BAR = 12+/–1.5 APPROX.
12	SECONDARY HYDRAULIC UNLOCK OVERRIDE	---	COUPLER ENGAGES WITH FEMALE HYDRAULIC COUPLER ON THE COMPACT CHOKE RUNNING TOOL. TO BE OPERATED USING WATER ONLY. EXPECTED OPERATING PRESSURE = 1,000 PSI MAXIMUM ALLOWABLE PRESSURE = 3,000 PSI
13	MARINE GROWTH COVER	---	COVER TO BE REMOVED BY ROV, PRIOR TO CHOKE INSERT INTERVENTION VIA CCRT.



CCRT SHOWN LANDED OUT ON CHOKE ASSEMBLY

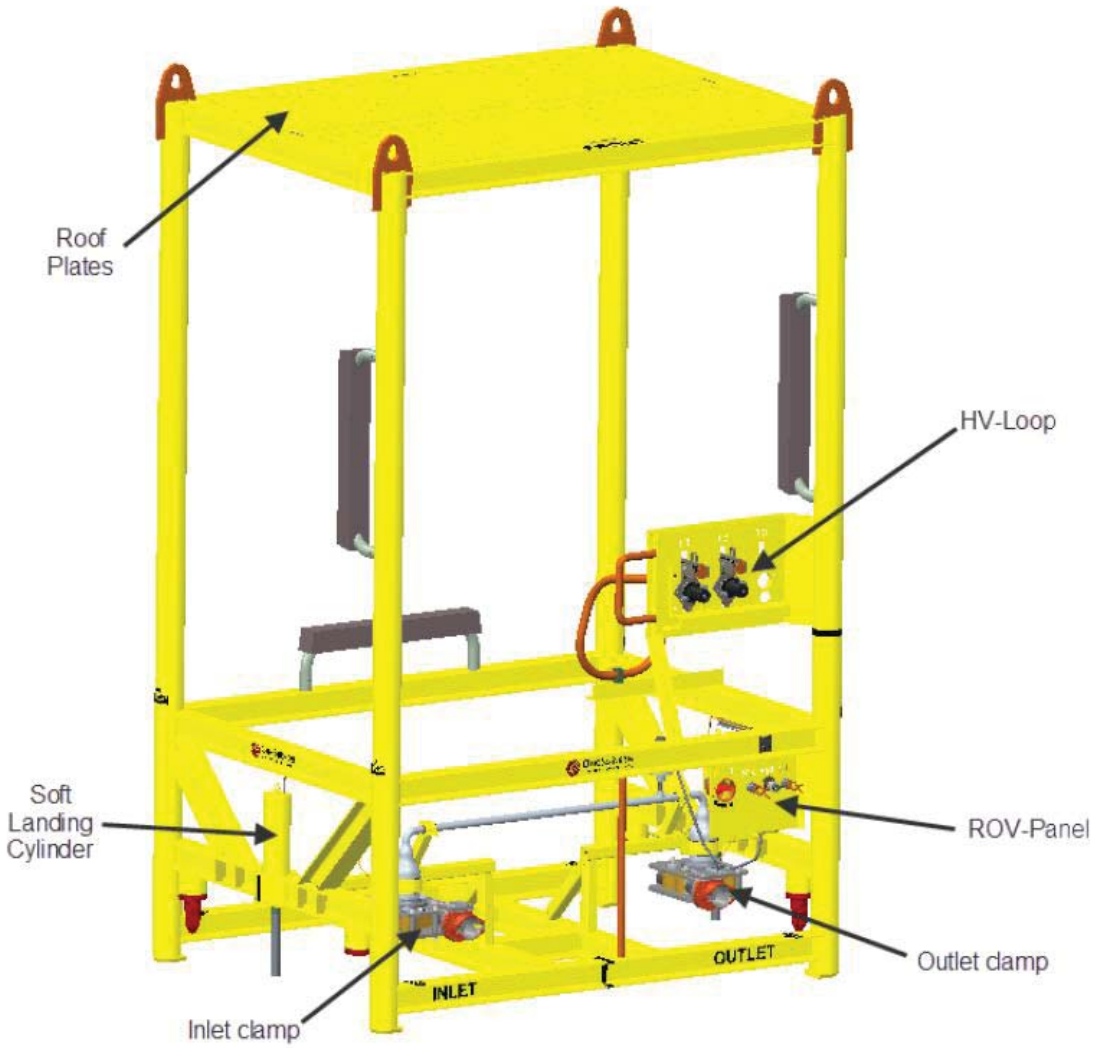
(NOT TRUE VIEW)

11 DPU

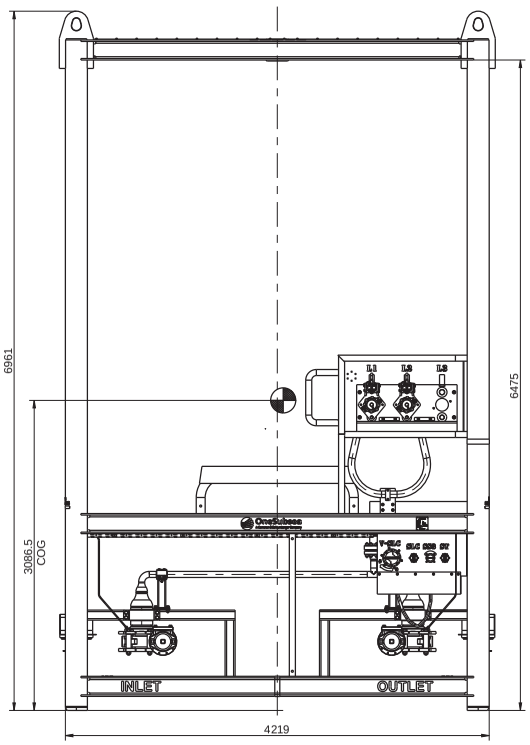
11.1 DPU reference list

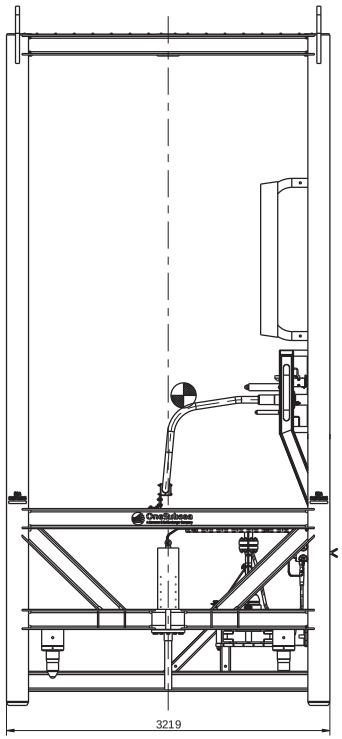
Ref	Document title	COMPANY Doc. No	MPP CON Doc. No
/41/	DPU – GA/Interface Drawing	AO-050-GMP-310-000534	ITM-0105865
/42/	DPU – Data Sheet	AO-050-GMP-310-001115	DOC-0029759

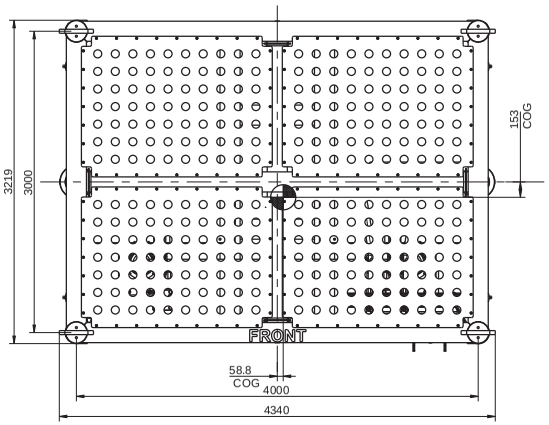
11.2 DPU scope of supply

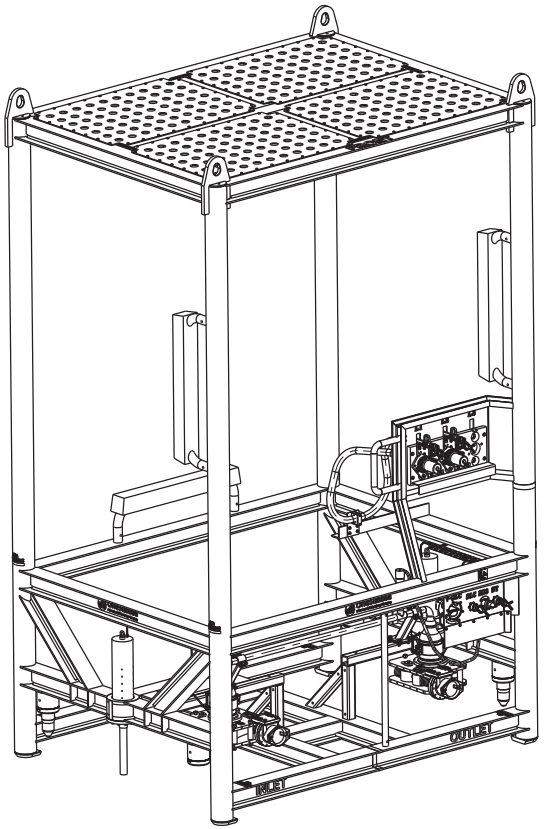


11.3 DPU GA/interface drawing









REFERENCES:

/1/	ITM-0081769 Running Tool Pump Unit
/2/	DRW-00852 Pump Unit Subsea Signal Jumper Layout
/3/	ITM-0071499 A0-050-GMP-310-000454 Pump Unit GA Drawing
/4/	DRW-0001209 A0-050-Gsg-310-000103 MPP System - P &ID - MPP Station 80
/5/	ITM-0058433 A0-050-GMP-310-000379 MPP GA Drawing

ABBREVIATIONS:

DPU	DUMMY PUMP UNIT
PM	PUMP MODULE
ROV	REMOTELY OPERATED VEHICLE
ST	SEAL TEST
SLC	SOFT LANDING CYLINDER
V-SLC	VALVE SOFT LANDING CYLINDER

NOTE:

Weighed dry weight (no fluids): 8800 KG

See Monthly weight report:
AO-050-PJG-310-314013

Rev	Date	Status	Revision Memo	Issued by	Checked by	Approved by
02	15/10/2014	ASB	As Built	BEI	MGI	HHA
01	22/05/2014	AFC	Accepted for Construction	CSS	BEI	MGI
00	17/03/2014	IFR	Issued for review	BEI	SAA	MGI

TOTAL E&P ANGOLA

DUMMY PUMP UNIT
GA/INTERFACE DRAWING

Doc Type : GEA	System/Unit: 04	Discipline : MPP	Electronic Filename: AO-050-GMP-310-000534-REV02
COMPANY Document N°	AO-050-GMP-310-000534	REV : 02	Scale : 1/25
CONTRACTOR/Original Document N°	ITM-0105865/C	Format : A1	Folio : 1 of 5

Phase : DE
Class : 2

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Title
DUMMY PUMP UNIT GA/INTERFACE DRAWING

Weight
SEE NOTE

ID
ITM-0105865

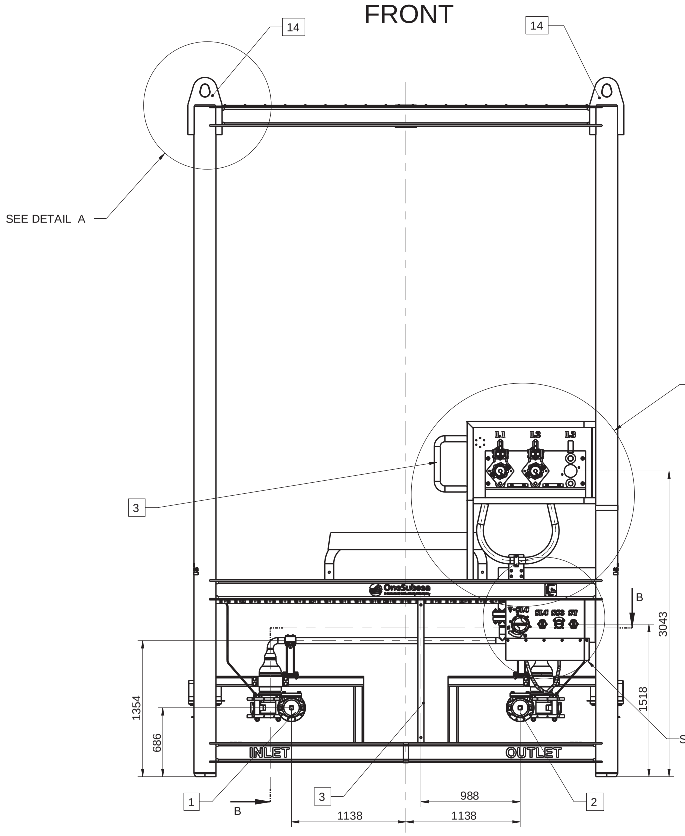
Scale
1:25

Format A1 | Sheet 1 of 5

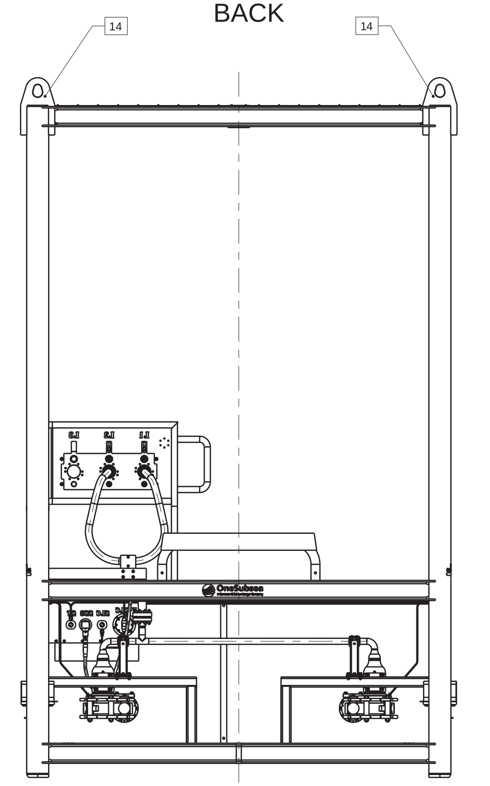
Revision Status Published Made by Checked by Approved by
C Released 2014-10-16 09:30:36 BEI MGI HA A
Engineering Change Order: NA

TOTAL E&P ANGOLA - GIRRI PROJECT - AO-050-GMP-310-000534 REV 02 - AFC - 20 - APR - 2015

FRONT



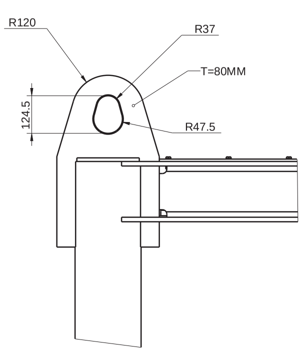
BACK



INTERFACES:

NO.	TO	DESCRIPTION
1	ROV	Destec inlet process clamp ISO 13628-8 class 4 interface Make up torque: 1381Nm Brake out torque: 1588Nm Damage torque: 2700Nm Damage torque to open: 80Nm No. of turns: 26 CW to close
2	ROV	Destec outlet process clamp ISO 13628-8 class 4 interface Make up torque: 1381Nm Brake out torque: 1588Nm Damage torque: 2700Nm Damage torque to open: 80Nm No. of turns: 26 CW to close
14	IT	Pad eyes designed only for lifting with spreader beam or dedicated installation tool
3	ROV	Grabber Bars
4	ROV	Valve for Soft Landing Sylinder Paddle handle interface Max operating torque: 100Nm Damage torque: 160Nm Turn 90 CCW to open
5	ROV	Receptacle for male hydraulic connector type hotstab, for Soft Landing Cylinder Running torque: 40Nm Damage torque: 160Nm Turn CW (11.5 turns) to Connect ISO 13628-8, Hot Stab Type B Push to mate Pull to de-mate Remove Dummy Stab before installing/ retrival from PM
6	ROV	Pressure/Temperature Transmitter
7	ROV	Receptacle for male hydraulic connector type hotstab, for Back Seal Test on hub Running torque: 40Nm Damage torque: 160Nm Turn CW (11.5 turns) to Connect ISO 13628-8, Hot Stab Type B Push to mate Pull to de-mate Remove Dummy Stab before installing/ retrival from PM
8	ROV	HV Test-Power Receptacle Turn 180° CW to engage locking mechanism, then push to connect: Nominal: 900N (X-direction) Max: 2000N (X-direction) Turn 180° CCW to disengage locking mechanism, then pull to disconnect: Nominal: 30Nm (CCW) Max: 200Nm (CCW)

PAD EYE



DETAIL A
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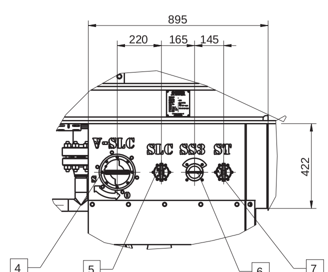
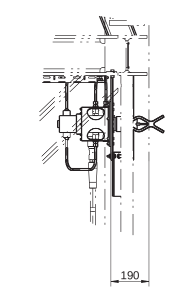
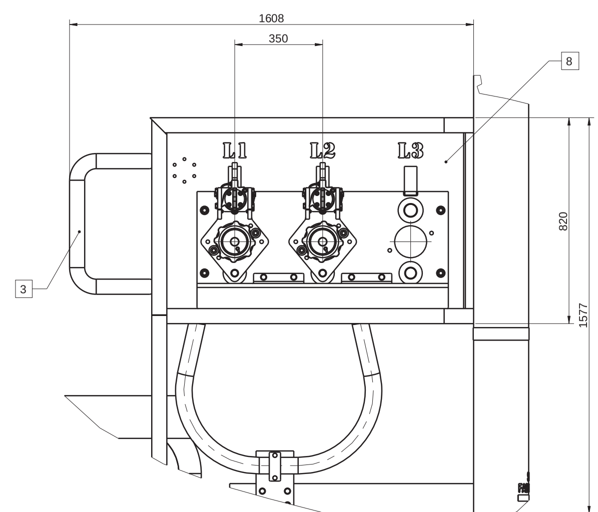


DETAIL D
SCALE 2:25





DETAIL C
SCALE 1:10

Rev	Date	Status	Revision Memo	Issued by	Checked by	Approved by
02	15/10/2014	ASB	As Built	BEI	MGI	HHA
01	22/05/2014	AFC	Accepted for Construction	CSS	BEI	MGI
00	17/03/2014	IFR	Issued for review	BEI	SAA	MGI

TOTAL E&P ANGOLA — TOTAL — OneSubsea A Cameron & Schlumberger Company

DUMMY PUMP UNIT
GA/INTERFACE DRAWING

Doc Type: GEA	System/Unit: 04	Discipline: MPP	Electronic Filename: AO-050-GMP-310-000534-REV02
COMPANY Document N°	AO-050-GMP-310-000534	REV: 02	Scale: 1/25 · Phase: DE
CONTRACTOR/Original Document N°	ITM-0105865/C	Format: A1	Folio: 1 of 5 · Class: 2

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Title: DUMMY PUMP UNIT GA/INTERFACE DRAWING — Weight: -

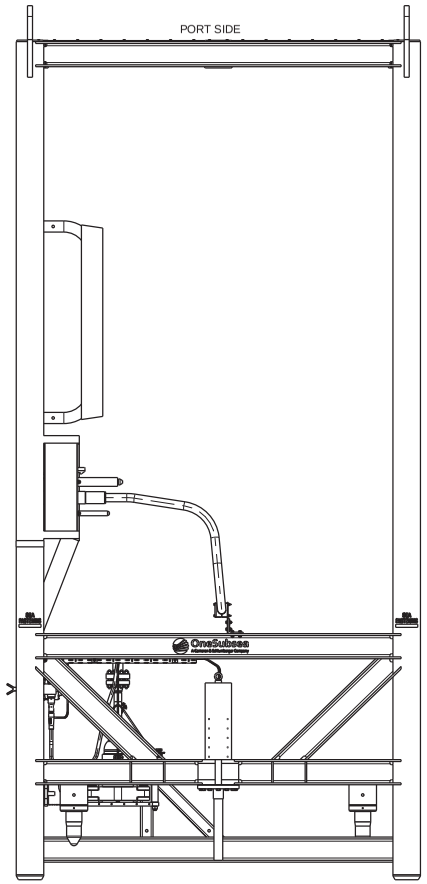
ID: ITM-0105865 — Scale: 1:25

Format: A1 — Sheet: 2 of 5

Revision Status	Published	Made by	Checked by	Approved by
C Released	2014-10-16 09:30:36	BEI	MGI	HAA

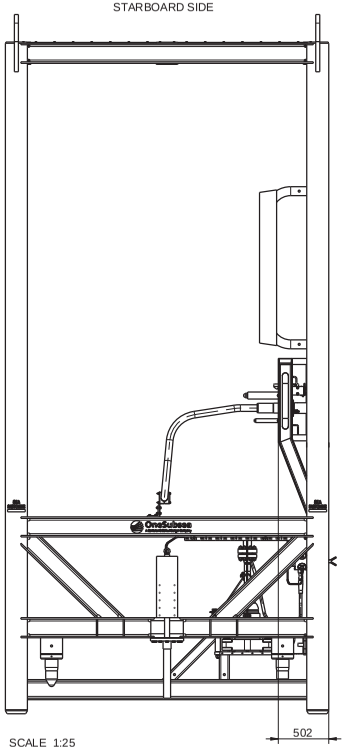
Engineering Change Order: NA

PORT SIDE



SCALE 1:20

STARBOARD SIDE



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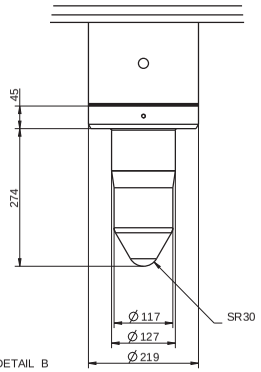
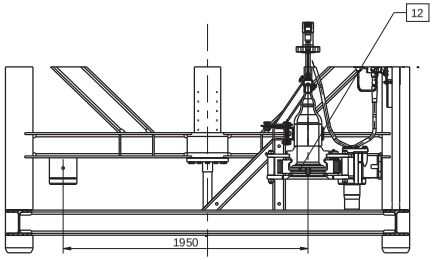
Guide Post

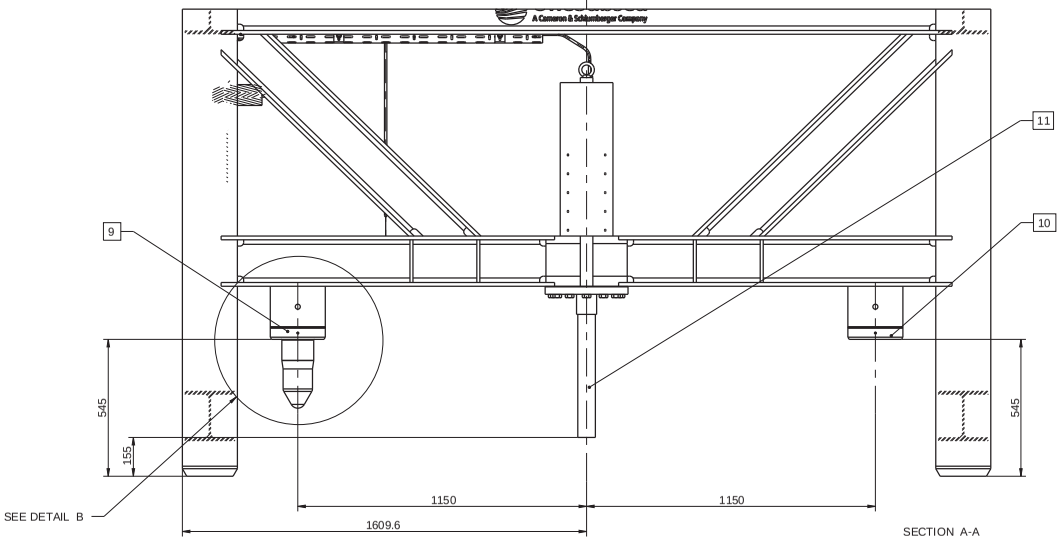


DETAIL B
SCALE 1:5



SECTION B-B
SCALE 1:20

INTERFACES:		
NO.	TO	DESCRIPTION
9	PM	Guide post and Landing pad for DPU
10	PM	Landing pad for DPU
11	PM	EAB soft landing system for subsea instalation of tools and modules. Bottom flange, standard. SL 100/270x300 Water damping: 200mm Water stroking: 70mm Hydraulic stroke: 300mm
12	PM	Inteface between male hub on DPU and female hub on PM. Nominell 2 mm clearance between hub's



SECTION A-A
SCALE 1:10

Rev	Date	Status	Revision Memo	Issued by	Checked by	Approved by
02	15/10/2014	ASB	As Built	BEI	MGI	HHA
01	22/05/2014	AFC	Accepted for Construction	CSS	BEI	MGI
00	17/03/2014	IFR	Issued for review	BEI	SAA	MGI

TOTAL E&P ANGOLA - GIRRI PROJECT - AO-050-GMP-310-000324 REV 02 - AFC - 20 - APR - 2015

DUMMY PUMP UNIT
GA/INTERFACE DRAWING

Doc Type : GEA	System/Unit: 04	Discipline : MPP	Electronic Filename : AO-050-GMP-310-000534-REV02
COMPANY Document N°	AO-050-GMP-310-000534	REV : 02	Scale : 1/25
CONTRACTOR/Original Document N°	ITM-0105865/C	Format A1	Folio : 1 of 5
			Phase : DE
			Class : 2

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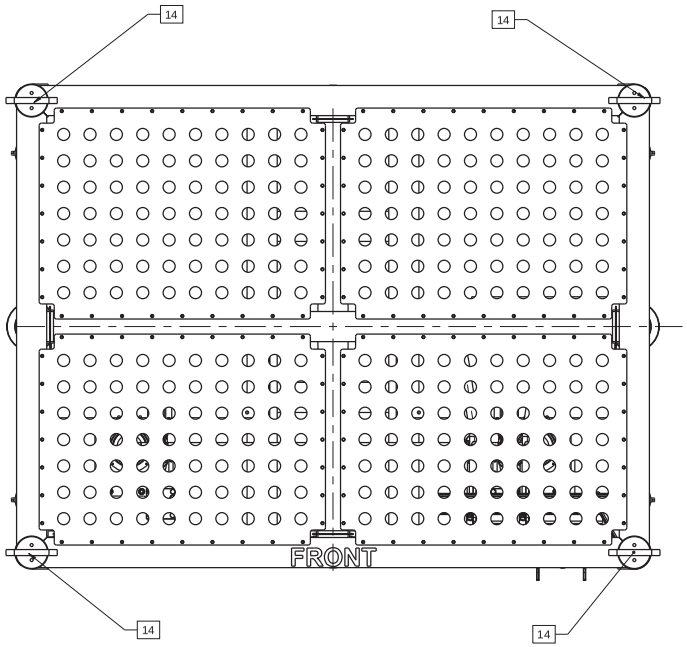
Title	DUMMY PUMP UNIT GA/INTERFACE DRAWING
ID	ITM-0105865
Format	A1
Sheet	3 of 5
Weight	-
Scale	1:25

Revision Status: C Released
Published: 2014-10-16 09:30:36 BEI
Made by: MGI
Checked by: HAA
Approved by:
Engineering Change Order: NA

INTERFACES:		
NO.	TO.	DESCRIPTION.
14	IT	See sheet 2
9	PM	See sheet 3
10	PM	See sheet 3
11	PM	See sheet 3
13	PM	Inlet/outlet pipe

TOP



SCALE 3:50

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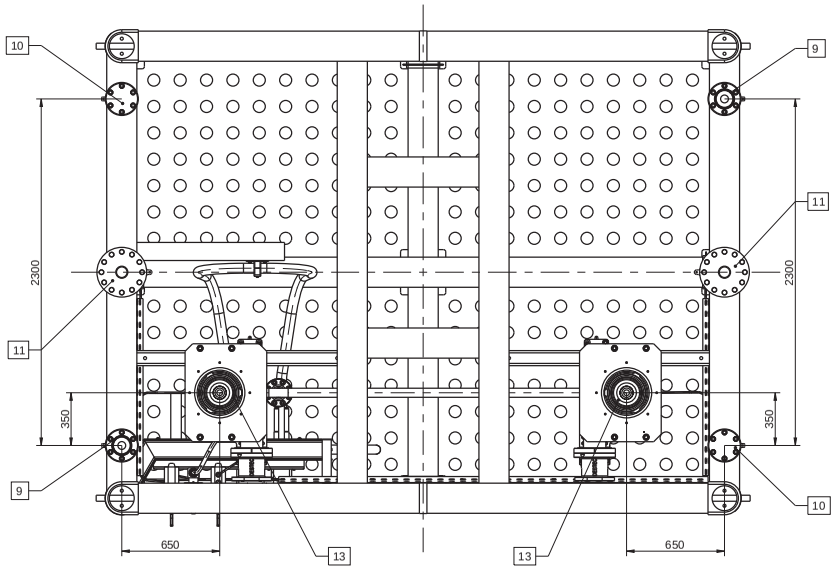

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Rev	Date	Status	Revision Memo	Issued by	Checked by	Approved by
02	15/10/2014	ASB	As Built	BEI	MGI	HHA
01	22/05/2014	AFC	Accepted for Construction	CSS	BEI	MGI
00	17/03/2014	IFR	Issued for review	BEI	SAA	MGI

TOTAL E&P ANGOLA

OneSubsea A Cameron & Schlumberger Company

DUMMY PUMP UNIT
GA/INTERFACE DRAWING

Doc Type :	System/Unit:	Discipline :	Electronic Filename :
GEA	04	MPP	AO-050-GMP-310-000534-REV02

COMPANY Document N°	AO-050-GMP-310-000534	REV : 02	Scale : 1/25	Phase : DE
CONTRACTOR/Original Document N°	ITM-0105865/C	Format : A1	Folio : 1 of 5	Class : 2

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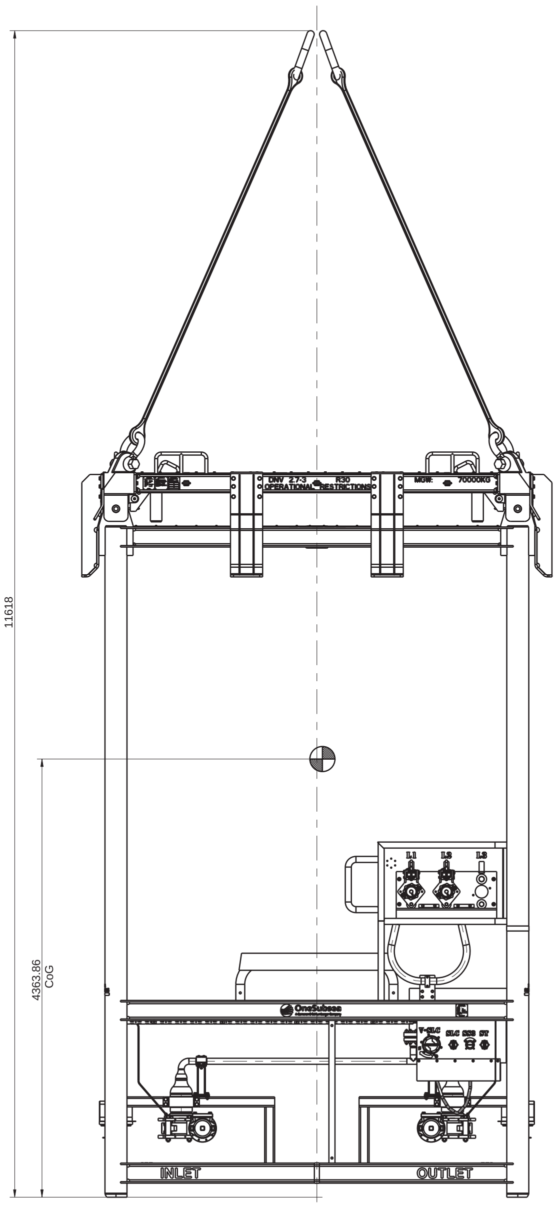
Title	Weight
DUMMY PUMP UNIT GA/INTERFACE DRAWING	-
ID: ITM-0105865	Scale: 1:25
Format: A1	Sheet: 4 of 5

Revision	Status	Published	Made by	Checked by	Approved by
C	Released	2014-10-16 09:30:36 BEI	MGI	HA A	

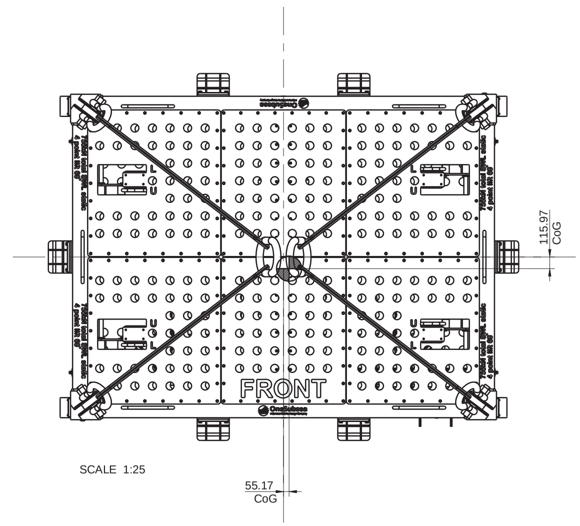
Engineering Change Order: NA

TOTAL E&P ANGOLA - GIRRI PROJECT - AO-050-GMP-310-000324 REV 02 - AFC - 20 - APR - 2015

WITH INSTALLATION TOOL



SCALE 1:25



SCALE 1:25

Rev	Date	Status	Revision Memo	Issued by	Checked by	Approved by
02	15/10/2014	ASB	As Built	BEI	MGI	HHA
01	22/05/2014	AFC	Accepted for Construction	CSS	BEI	MGI
00	17/03/2014	IFR	Issued for review	BEI	SAA	MGI

TOTAL E&P ANGOLA — OneSubsea A Cameron & Schlumberger Company

DUMMY PUMP UNIT
GA/INTERFACE DRAWING

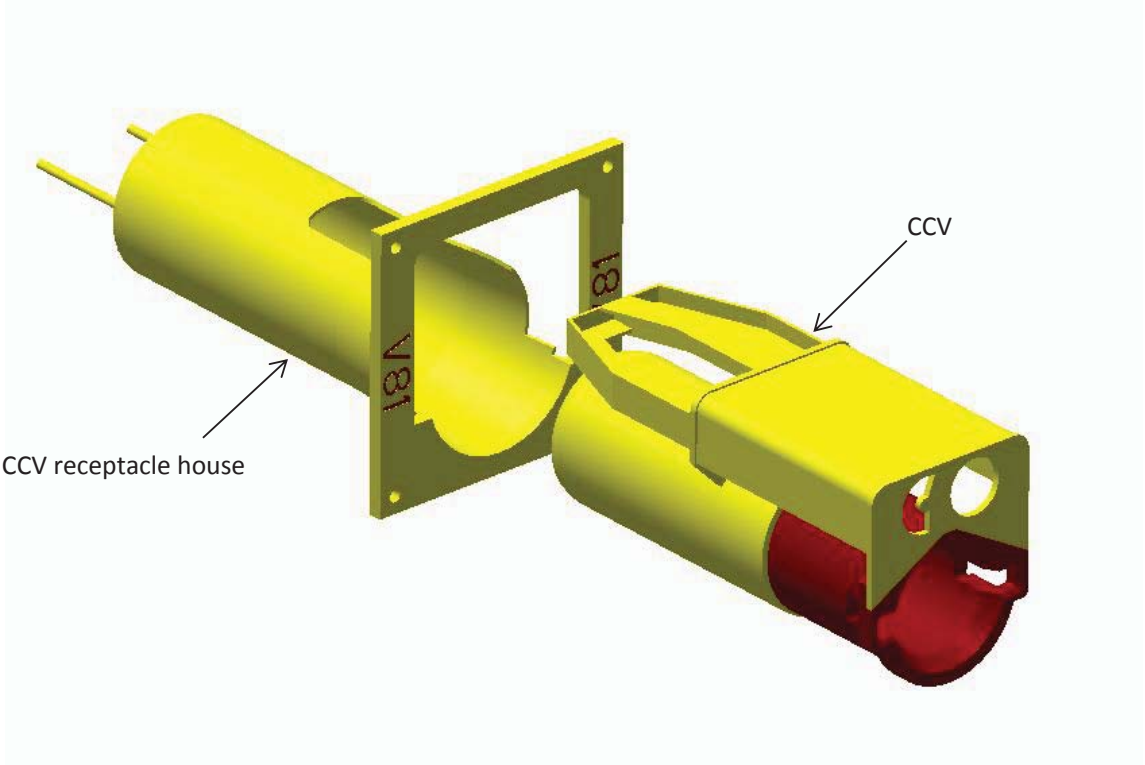
Doc Type : GEA	System/Unit: 04	Discipline : MPP	Electronic Filename: AO-050-GMP-310-000534-REV02
COMPANY Document N°	AO-050-GMP-310-000534	REV : 02	Scale : 1/25 — Phase : DE
CONTRACTOR/Original Document N°	ITM-0105865/C	Format : A1	Folio : 1 of 5 — Class : 2

OneSubsea A Cameron & Schlumberger Company

Title	DUMMY PUMP UNIT GA/INTERFACE DRAWING	Weight -
ID	ITM-0105865	Scale 1:25
Format A1	Sheet 5 of 5	

Revision Status C Released — Published 2014-10-16 09:30:36 — Made by BEI — Checked by MGI — Approved by HAA
Engineering Change Order: NA

12 CCV (V81-1 / V81-2)

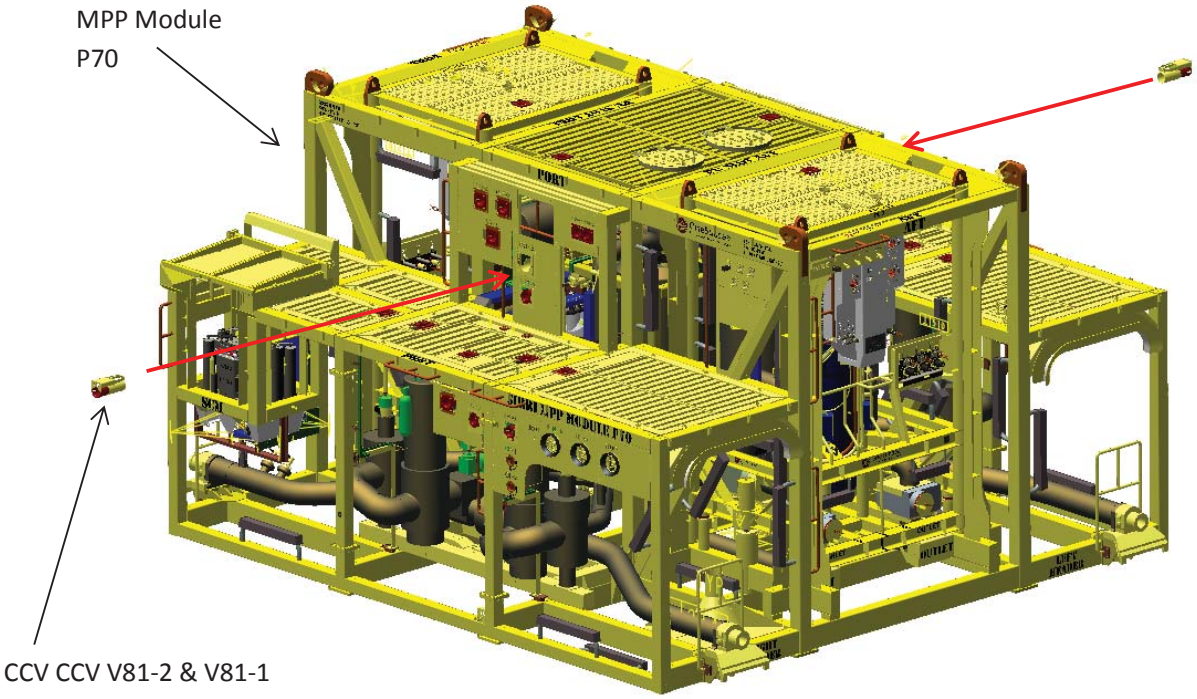


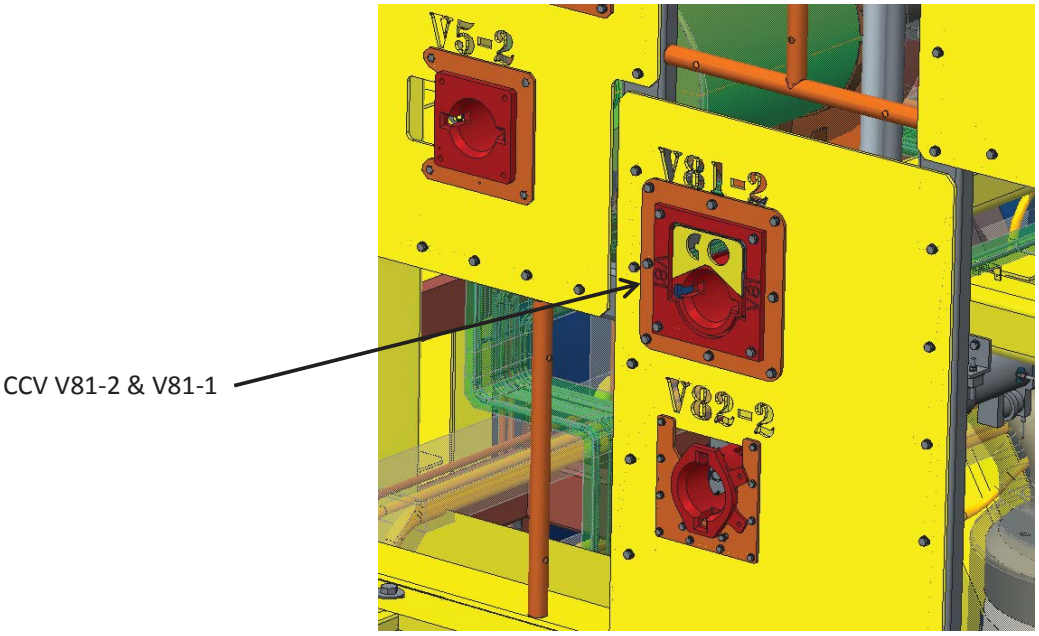
Chemical Control Valve (CCV) and Receptacle House

12.1 CCV reference list

Ref	Document title	COMPANY Doc. No	MPP CON Doc. No
/43/	CTV General Arrangement Drawing	AO-050-PJG-340-001625	DOC-0042761
/44/	MPP Module P70 and P80 – Interface Drawing	AO-050-GMP-310-000380	ITM-0058434
/45/	MPP System – Installation Guideline - Chemical Control Valve (CCV)	AO-050-GSG-310-002302	DOC-0064035
/46/	Receptacle House General Arrangement Drawing	AO-050-PJG-340-001561	DOC-0042072

12.2 CCV placement





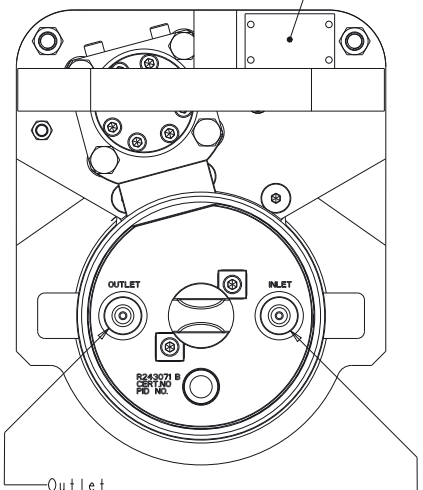
12.3 CCV GA drawing

ISSUE	DESCRIPTION	DATE	ISSUE NAME
A	UPDATED ACC. TO COMMENTS: COUPLER P/N, ROV INTERFACE SPEC. SUBMERGED WT	09.01.2014	IMA

Name plate to contain:
O/R Serial no.:
O/R Part no.:
Client Part no.:
Client Line no.: / Rev

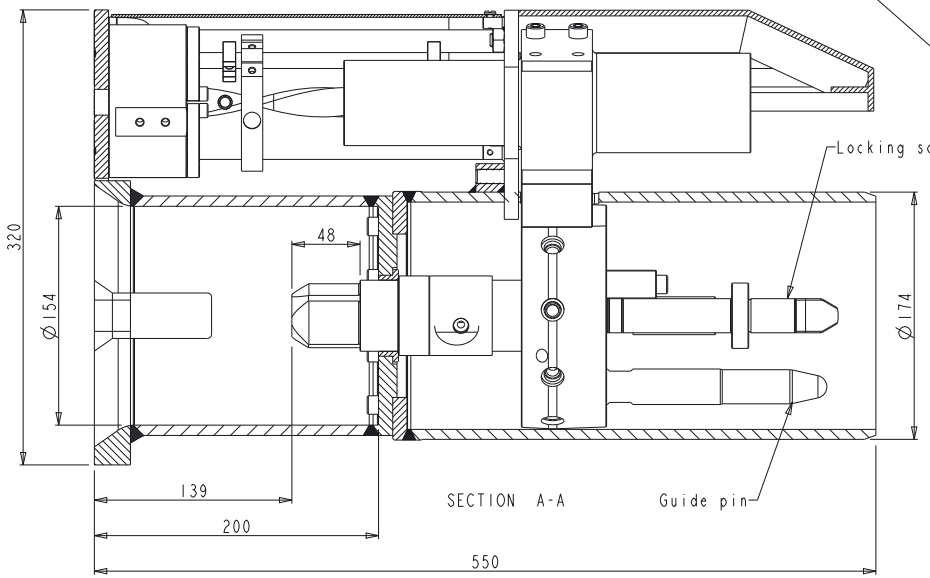
Painted acc. to:
Total Doc. No.: NG50-2-300-SPS-SPAB-30-0218, point 9.1

Low torque receptacle type A
(According to ISO 13628-8)

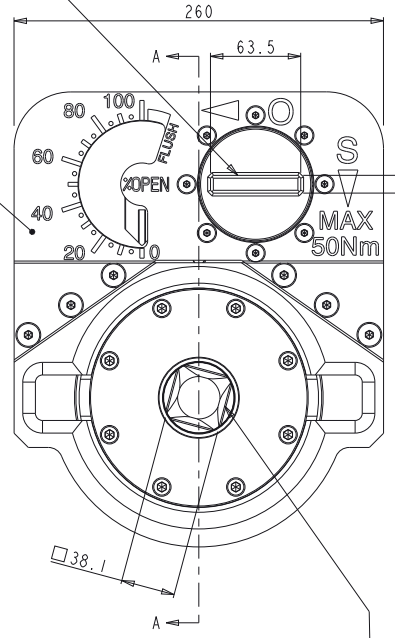


Outlet
HUNTING FEMALE COUPLING:
UO-4-B-66-PK-PK-C510

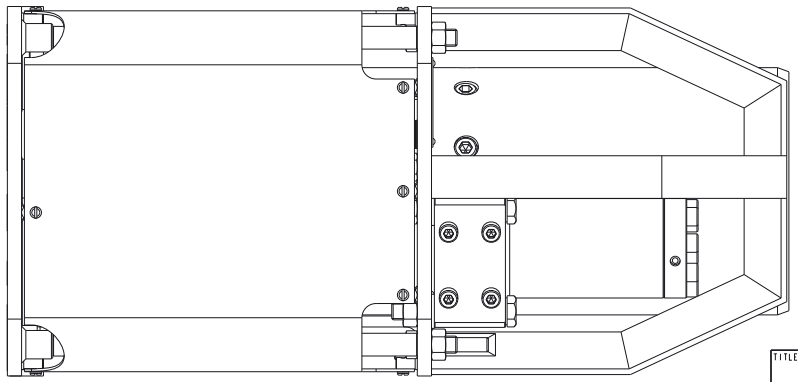
Inlet
HUNTING FEMALE COUPLING:
UO-4-B-66-PK-PK-C510

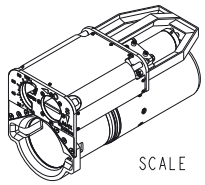


SECTION A-A



Interface for Class 4 Torque Tool
(According to ISO 13628-8)
Minimum installation torque: 100 Nm
Maximum installation torque: 200 Nm
Damage torque: 400 Nm





SCALE 1:10

ESTIMATED DRY WEIGHT: 65 KG
ESTIMATED SUBMERGED WEIGHT: 55 KG

Revision	Date	Status	Revision Memo	Issued by	Checked by	Approved by
02	02/Dec/2014	ASB	As Built	LTV	JOF	IFA
01	24/Feb/2014	AFC	Accepted for Construction	JOF	AMI	IFA
00	22/Oct/2013	IFR	Issued for Review	JOF	AMI	IFA

TOTAL E&P ANGOLA

OneSubsea
A Cameron & Schlumberger Company

CTV GENERAL ARRANGEMENT DRAWING

Doc Type: DRW	System/Unit: 04	Discipline: PVV	Electronic Filename AO-050-PJG-340-001625_rev02.pdf
COMPANY Document N°	AO-050-PJG-340-001625	REV: 02	Scale: NONE	Phase: DE
Contractor/Original Document N°	DOC-0042761	Supplier Ref. GA000148	Format: XX	Folio: 1 of 1	Class: 2

TITLE - CHEMICAL THROTTLE VALVE
-
-
-
- GENERAL ARRANGEMENT DRAWING

rotator
Oceaneering Rotator AS, 4685 Nodeland, Norway

MATR. No.	MASS kg 63.05	DER. FROM	CAD SYSTEM Creo	SCALE 2:5	DATE 14.10.2013	A2
STATE 3D MODEL Released	REPL. BY	REPLACES	TRACED IMA	CONSTR. IMA	CHECKED BY VMO	APPROVED BY OGW
STATE 2D DRAWING Released	PART No. GA000148		DRW.No. GA000148	SHEET 1	OF 1	ISSUE A

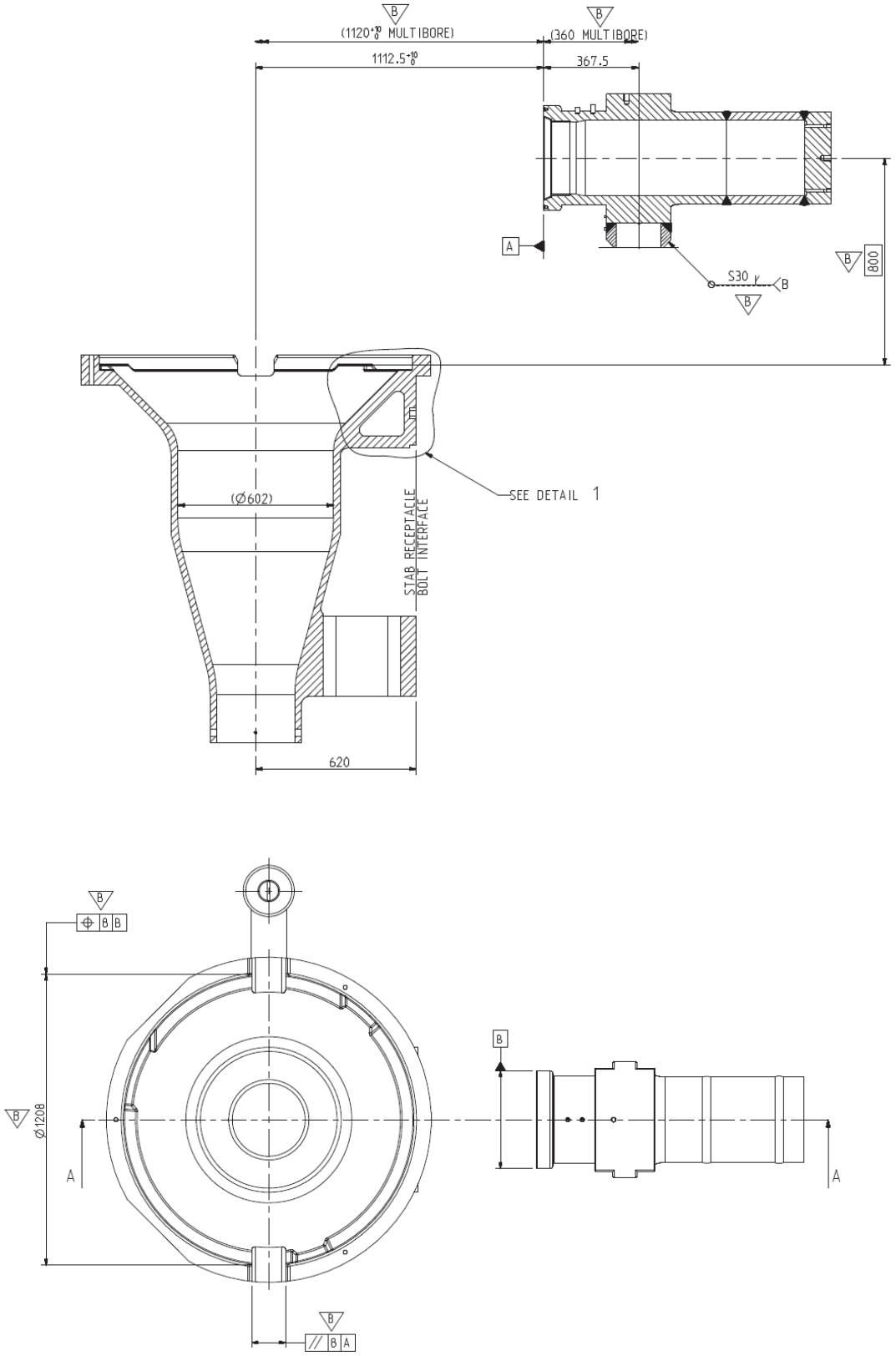
13 Tie in

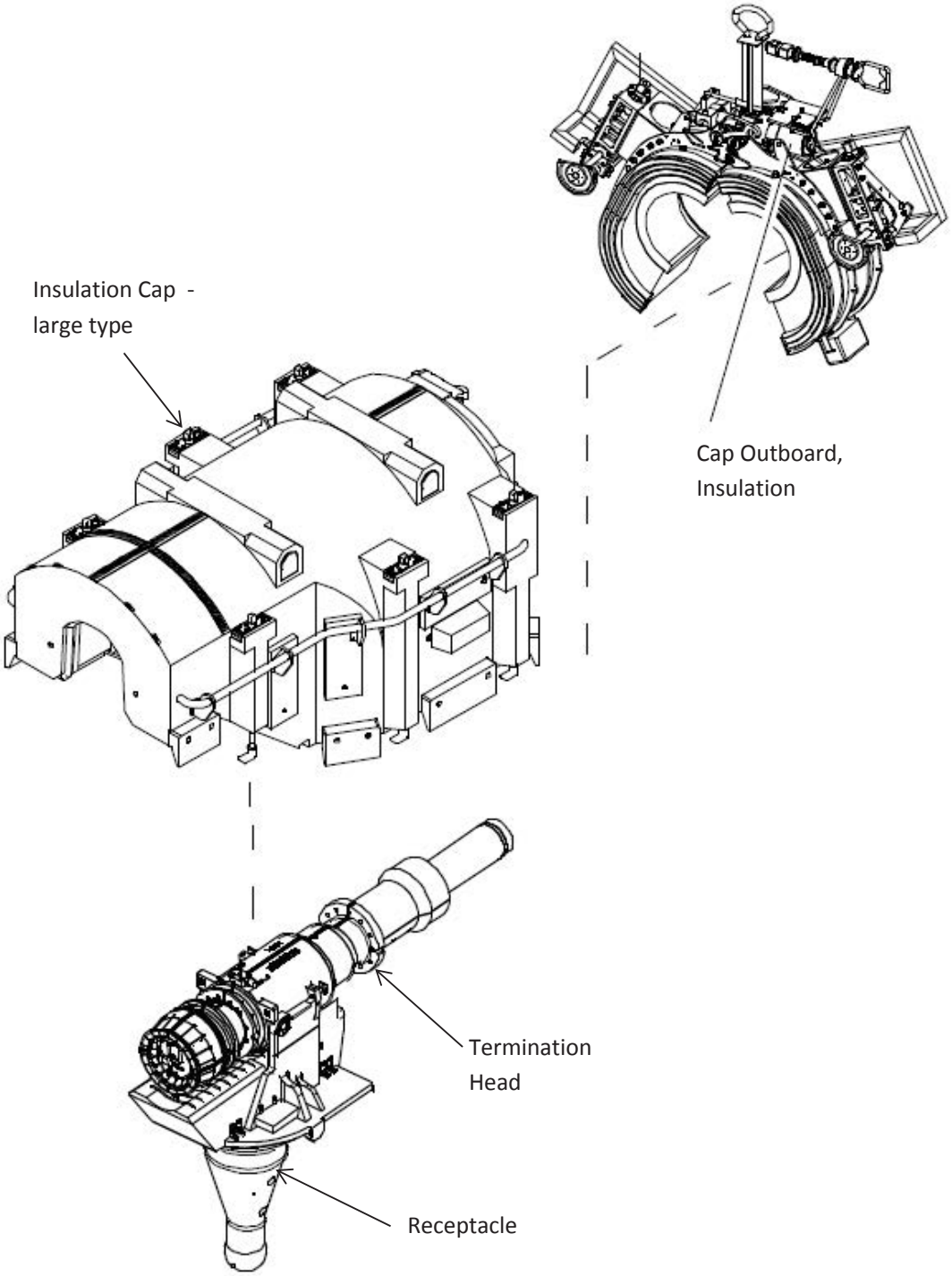
STABCON flowline connector

13.1 Tie in reference list

Ref	Document title	COMPANY Doc. No	MPP CON Doc. No
/47/	Product Data Sheet, Termination Heads and Inboard Hubs, STABCON MK1	AO-050-GSG-325-000545	DOC-0047861
/48/	Product Data Sheet, Large Insulation Cap	AO-050-GSG-325-000797	DOC-0025577
/49/	Installation/commissioning Procedure, Subsea – intervention/Tie-in, large insulation cap	AO-050-GSG-325-001019	DOC-0028278
/50/	Installation/Commissioning Procedure, Subsea – Intervention/Tie-in, Well jumper flowline spool connection and disconnection procedure.	AO-050-GSG-325-001764	DOC-0061573
/51/	Term.head KC4.2-10, ID8, SPO, S1 Swivel GA	AO-050-GSG-325-000785	DOC-0026877
/52/	Cap, Insulation, Reinst., KC4.2-10, Large Type, Manifold Side, GA	AO-050-GSG-325-000780	DOC-0026679
/53/	Cap outboard, Insulation, KC4-10, GA	AO-050-GSG-325-000778	DOC-0026667

13.2 Tie in interface drawing

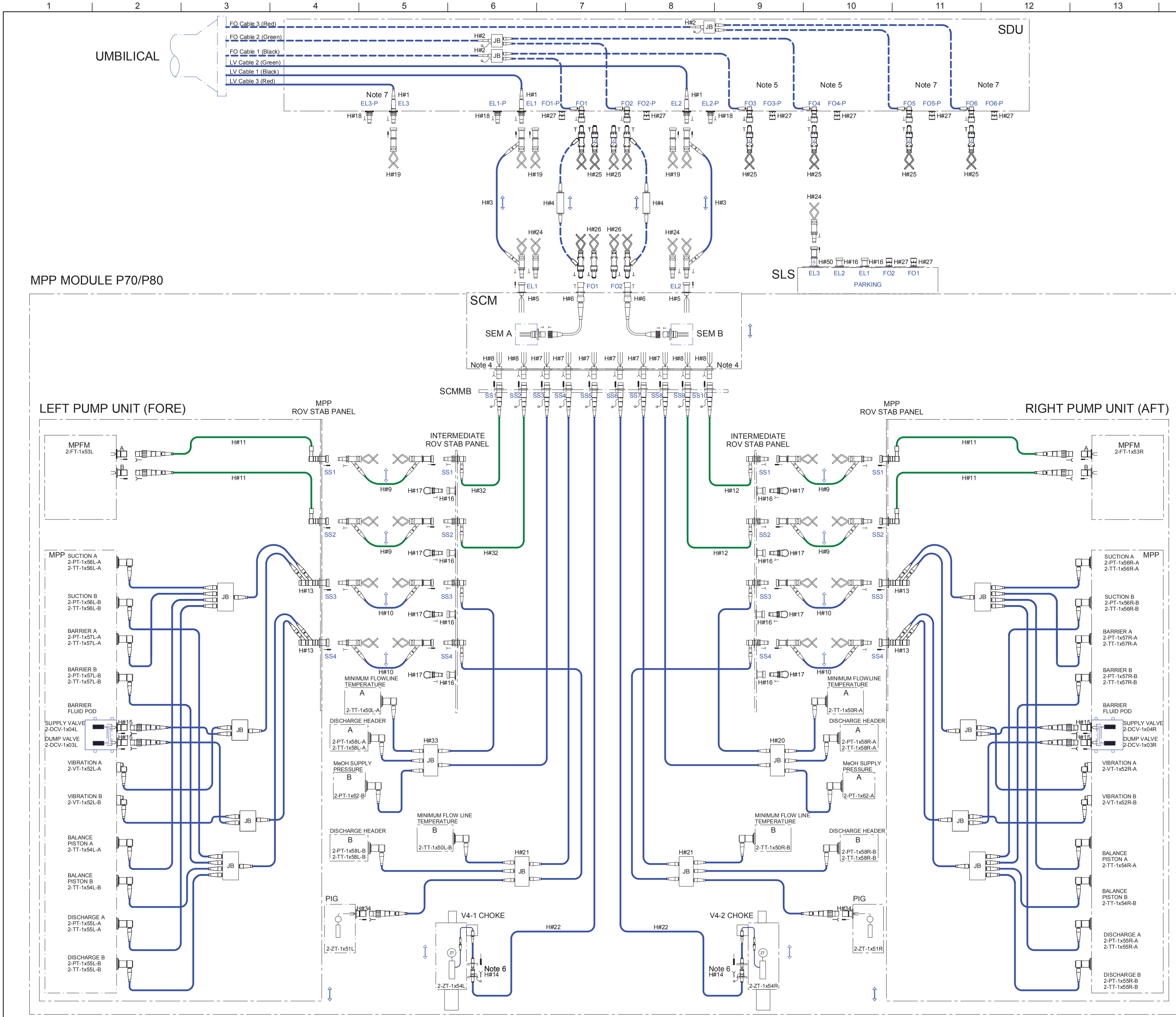



Insulation Cap - large type
Cap Outboard, Insulation
Termination Head
Receptacle

14 Jumpers and wiring

Ref	Document title	COMPANY Doc. No	MPP CON Doc. No
/54/	Subsea Jumper Layout Schematic P70	AO-050-GSG-310-001455	DRW-0002726
/55/	Subsea Jumper Layout Schematic P80	AO-050-GSG-310-001548	DRW-0002919
/56/	Ga Drawing Fiber Optical Test Connector Plug	AO-050-GSG-310-002171	DRW-0003780
/57/	Subsea Signal Jumper Layout	AO-050-GSG-310-000045	DRW-0000852
/58/	PBOF Jumper Assembly, Hydralight, 8FOSM, 45' Hose Exit, Fishtail Handle, 110m	AO-050-GSG-334-001382	DOC-0041480
/59/	SCM - SPCU FO Connection Diagram	AO-050-GSG-310-000604	DRW-0002108
/60/	SCM - SPCU LV Connection Diagram	AO-050-GSG-310-000474	DRW-0002105
/61/	General Arrangement Drawing For H#3	AO-050-GSG-331-002113	DOC-0054457
/62/	Subsea Signal Jumper Wiring Diagram	AO-050-GSG-310-000075	DRW-0001202
/63/	Hydraulic Single line Flying Leads – Interface drawing	AO-050-GSG-310-001759	DRW-0003114
/64/	GA Female Outboard Plate 7 Way (4POP) – HFL type 1	AO-050-GSG-357-000602	DOC-0034261
/65/	GA Female Outboard Plate 7 Way (4POP) – HFL type 2	AO-050-GSG-357-000603	DOC-0034262
/66/	GA Female Outboard Plate 7 Way (4POP) – HFL type 3	AO-050-GSG-357-001274	DOC-0034265
/67/	HV General Arrangement / Interface drawing	AO-050-GSG-310-001297	ITM-0084555

14.1 Signal jumper layout drawing



NOTES:

1. Number of Contacts:
   All EFL connectors are 12 ways
   All OFL connectors are 8 ways
2. All Connectors Mounted on ROV Panels are of Compliant Mount Type.
3. All Connectors Mounted on SCM and Barrier Fluid Control Pod are of Bulkhead Type.
4. Ports S1, S2 and S9, S10 are Ethernet, Cat 5e.
5. Fiber Optical Connectors for "swimmer" are of Same Type and Configuration as for MPP/SCM.
6. 4-Way ODI Nautilus Electrical Stab Connector.
7. Spare Electrical Connector/Optical Fiber for SCM.

LEGENDS:

- LV/Signal Lines
- Ethernet (Cat 5e) & Signal Lines
- FO Lines
- Mechanical Bounderies
- Receptacle - Pin / Male
- Plug - Socket / Female
- Fiber Contact
- Loop Back
- Retrivable Unit
- LV Long Term Protecion Receptacle
- LV Long Term Protection Plug
- LV Parking Receptacle
- LV Parking Plug
- FO Management / Splice box
- FO Long Term Protection Plug
- FO Parking Receptacle

ABBREVIATIONS:

DCV	- Directional Control Valve
EFL	- Electrical Flying Lead
EL	- Electrical
FO	- Fiber Optical
FT	- Flow Rate Transmitter
H#	- Connector/Jumper Reference
JB	- Junction Box
LV	- Low Voltage
MPFM	- Multiphase Flowmeter
MPP	- Multiphase Pump
OFL	- Optical Flying Lead
PT	- Pressure Transmitter
ROV	- Remotely Operated Underwater Vehicle
SCM	- Subsea Control Module
SCMMB	- Subsea Control Module Mounting Base
SDU	- Subsea Distribution Unit
SEM	- Subsea Electronic Module
SLS	- Support and Leveling Structure
TT	- Temperature Transmitter
VT	- Vibration Transmitter
ZT	- Position Transmitter

REFERENCES:

GS EP SPS 021	EN Subsea Mateable Electrical, Optical Connectors
AO-050-GSG-310-0000123	Connector Scope Low Voltage Technical Specification
AO-050-GSG-310-000050	Connector Scope Fiber Optical Technical Specification
AO-050-GSG-310-000051	Subsea Instruments Technical Specification
AO-050-SSS-900-074951	MPP-Subsea Schematic Electrical and Optical Distribution
AO-050-GSG-310-000474	SCM - SPCU LV Connection Diagram
AO-050-GSG-310-000604	SCM - SPCU FO Connection Diagram

Rev	Date	Status	Revision Memo	Issued by	Checked by	Approved by
07	14/10/2014	ASB	AS BUILT	EAD	KDY	GGA
06	27/03/2014	AFC	APPROVED FOR CONSTRUCTION	EAD	KDY	GGA
05	04/11/2013	AFC	APPROVED FOR CONSTRUCTION	EAD	KDY	GGA
04	03/06/2013	AFC	APPROVED FOR CONSTRUCTION	EAD	GGA	TME

TOTAL E&P ANGOLA — OneSubsea A Cameron & Schlumberger Company

SUBSEA SIGNAL JUMPER LAYOUT

Doc Type : LAY	System/Unit: 04	Discipline : INS	Electronic Filename: AO-050-GSG-310-000045_rev07
COMPANY Document N°	AO-050-GSG-310-000045	REV : 07	Scale : N/A	Phase : DE
CONTRACTOR/Original Document N°	DRW-0000852	Format : A1	Folio : 1 of 2	Class : 1

Title: SUBSEA SIGNAL JUMPER LAYOUT

Weight: N/A

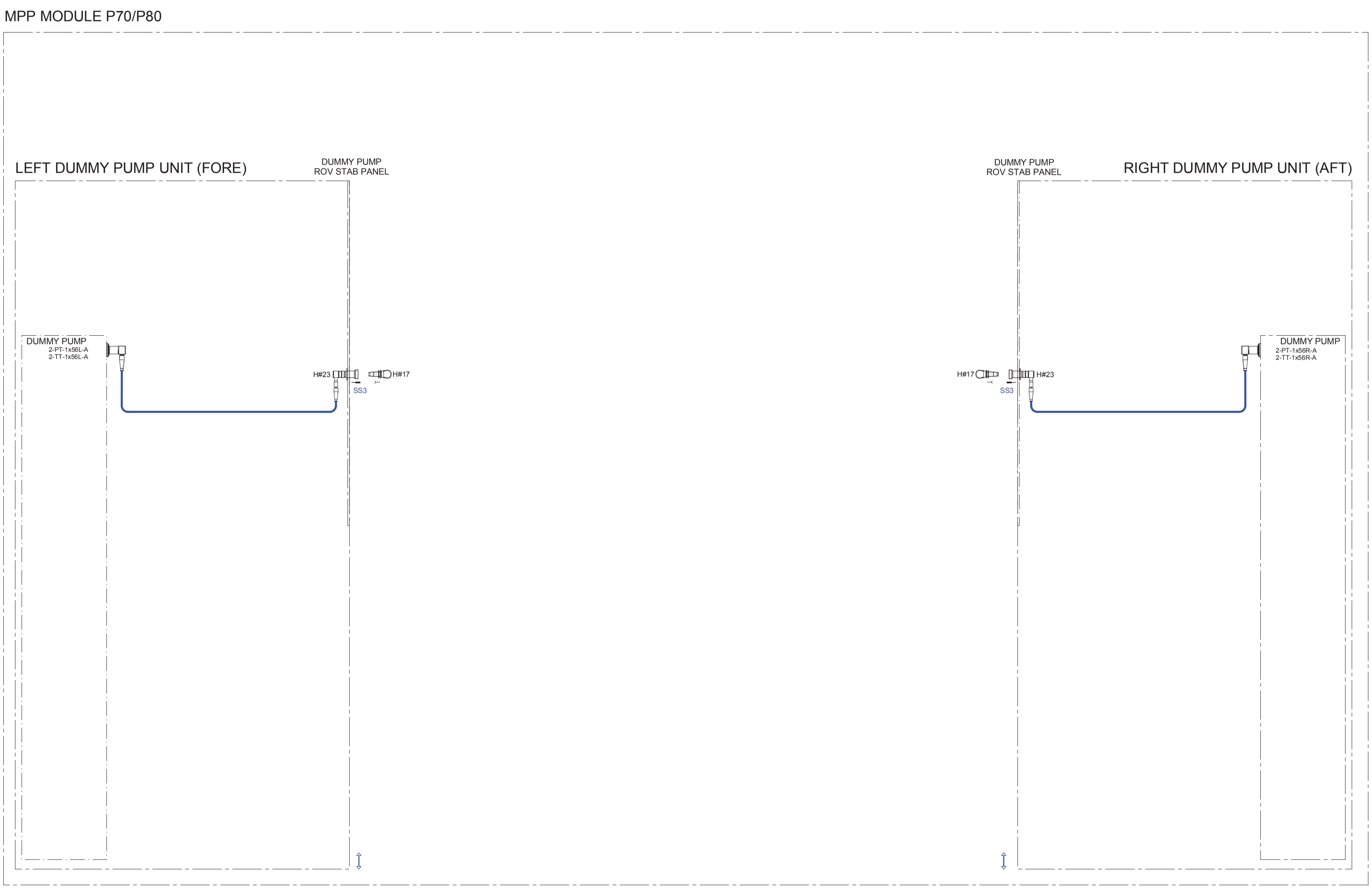
ID: DRW-0000852

Scale: NTS

Format: A1 Sheet 1 of 2

Revision Status: J Released — Published: 2014-10-15 11:40:38 EAD — Made by — Checked by: KDY — Approved by: GGA

Engineering Change Order: NA



NOTES:

1. Number of Contacts:
   All EFL connectors are 12 ways
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2. All Connectors Mounted on ROV Panels are of Compliant Mount Type.
3. All Connectors Mounted on SCM and Barrier Fluid Control Pod are of Bulkhead Type.
4. Ports S1, S2 and S9, S10 are Ethernet, Cat 5e.
5. Fiber Optical Connectors for "swimmer" are of Same Type and Configuration as for MPP/SCM.
6. 4-Way ODI Nautilus Electrical Stab Connector.
7. Spare Electrical Connector/Optical Fiber for SCM.

LEGENDS:

- LV/Signal Lines
- Ethernet (Cat 5e) & Signal Lines
- FO Lines
- Mechanical Bounderies
- Receptacle - Pin / Male
- Plug - Socket / Female
- Fiber Contact
- Loop Back
- Retrivable Unit
- LV Long Term Protecion Receptacle
- LV Long Term Protection Plug
- LV Parking Receptacle
- LV Parking Plug
- FO Management / Splice box
- FO Long Term Protection Plug
- FO Parking Receptacle

ABBREVIATIONS:

DCV	- Directional Control Valve
EFL	- Electrical Flying Lead
EL	- Electrical
FO	- Fiber Optical
FT	- Flow Rate Transmitter
H#	- Connector/Jumper Reference
JB	- Junction Box
LV	- Low Voltage
MPFM	- Multiphase Flowmeter
MPP	- Multiphase Pump
OFL	- Optical Flying Lead
PT	- Pressure Transmitter
ROV	- Remotely Operated Underwater Vehicle
SCM	- Subsea Control Module
SCMMB	- Subsea Control Module Mounting Base
SDU	- Subsea Distribution Unit
SEM	- Subsea Electronic Module
SLS	- Support and Leveling Structure
TT	- Temperature Transmitter
VT	- Vibration Transmitter
ZT	- Position Transmitter

REFERENCES:

GS EP SPS 021	EN Subsea Mateable Electrical, Optical Connectors
AO-050-GSG-310-0000123	Connector Scope Low Voltage Technical Specification
AO-050-GSG-310-000050	Connector Scope Fiber Optical Technical Specification
AO-050-GSG-310-000051	Subsea Instruments Technical Specification
AO-050-SSS-900-074951	MPP-Subsea Schematic Electrical and Optical Distribution
AO-050-GSG-310-000474	SCM - SPCU LV Connection Diagram
AO-050-GSG-310-000604	SCM - SPCU FO Connection Diagram

Rev	Date	Status	Revision Memo	Issued by	Checked by	Approved by
07	14/10/2014	ASB	AS BUILT	EAD	KDY	GGA
06	27/03/2014	AFC	APPROVED FOR CONSTRUCTION	EAD	KDY	GGA
05	04/11/2013	AFC	APPROVED FOR CONSTRUCTION	EAD	KDY	GGA
04	03/06/2013	AFC	APPROVED FOR CONSTRUCTION	EAD	GGA	TME

TOTAL E&P ANGOLA — TOTAL — OneSubsea A Cameron & Schlumberger Company

SUBSEA SIGNAL JUMPER LAYOUT

Doc Type : LAY	System/Unit: 04	Discipline : INS	Electronic Filename: AO-050-GSG-310-000045_rev07
COMPANY Document N°	AO-050-GSG-310-000045	REV : 07	Scale : N/A / Phase : DE
CONTRACTOR/Original Document N°	DRW-0000852	Format : A1	Folio : 2 of 2 / Class : 1

Title: SUBSEA SIGNAL JUMPER LAYOUT — Weight: N/A

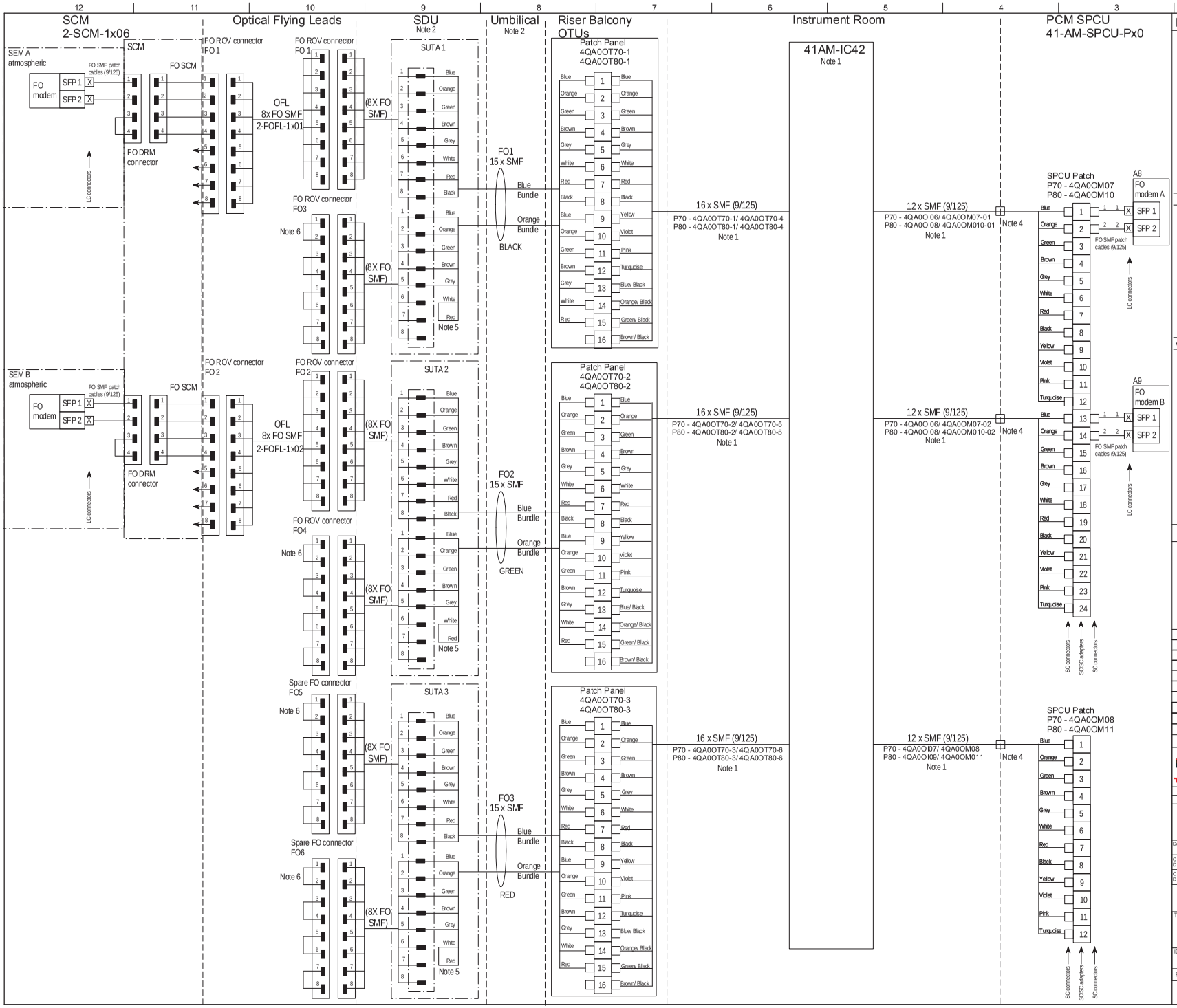
ID: DRW-0000852 — Scale: NTS

Format: A1 — Sheet: 2 of 2

Revision Status: J Released — Published: 2014-10-15 11:40:38 — Made by: EAD — Checked by: KDY — Approved by: GGA

Engineering Change Order: NA

14.2 SCM-SPCU FO connection diagram



NOTES:

1. Supplied by FPSO2
2. Supplied by SURF2
3. x is used in tags as a placeholder for 7 or 8, for P70 and P80
4. Reference is made to AO-050-GTO-310-000119 for detailed MCT information
5. Looped, used for temperature monitoring
6. Looped long term protection caps

LEGEND:

- FO fusion splice
- Subsea FO connector contact symbol
- Blinded (unused) FO
- FO connector SC
- Topsides FO connector LC
- MCT

ABBREVIATIONS:

DRM	- Dry Mate
FO	- Fiber Optical
OFL	- Optical Flying Lead
OTU	- Optical Termination Unit
LC	- Lucent Connector
LTPC	- Long Term Protection Cap
MCT	- Multi Cable Transit
PBOF	- Pressure Balanced Oil Filled
ROV	- Remote Operated Vehicle
SPCU	- Subsea Power and Control Unit
SCM	- Subsea Control Module
SDU	- Subsea Distribution Unit
SUTA	- Subsea Umbilical Termination Assembly
SEM	- Subsea Electronics Module
SFP	- Small Form Factor Pluggable
SMF	- Single Mode Fiber
TBC	- To Be Confirmed

REFERENCES:

AO-050-GSG-310-000045	Subsea Signal Jumper Layout
AO-050-GTO-310-000119	PCM P70 and P80 Cable Block Diagram
AO-050-GTO-311-000301	PCM P70 and P80 Penetration Arrangement

Rev.	Date	Status	Revision Memo	Issued by	Checked by	Approved by
09	20/AUG/2014	ASB	As Built	GGA	ANE	TM
08	19/MAR/2014	ASB	As Built	GGA	ANE	TM
07	01/OCT/2013	AFC	Approved for Construction	GGA	ANE	TM
06	03/SEP/2013	AFC	Approved for Construction	GGA	ANE	TMe
05	23/JUL/2013	AFC	Approved for Construction	GGA	ANE	TM
04	17/JUN/2013	AFC	Approved for Construction	GGA	ANE	TMe
03	19/APR/2013	AFC	Approved for Construction	GGA	TMe	KHK
02	19/MAR/2013	AFC	Approved for Construction	GGA	TMe	KHK
01	5/FEB/2013	AFC	Approved for Construction	GGA	TMe	KHK
00	21/NOV/2012	IFR	Issued for Review	GGA	TMe	KHK

SCM - SPCU FO CONNECTION DIAGRAM

Doc Type: DRW	System/Unit: 04	Discipline: INS	Electronic Filename: AO-050-GSG-310-000604_rev09
COMPANY Document N°:	AO-050-GSG-310-000604	REV: 09	Scale: N/A
CONTRACTOR/Original Document N°:	DRW-0002108/J	Format: A1	Folio: 1 of 1

OneSubsea A Cameron & Schlumberger Company

Title: SCM - SPCU FO CONNECTION DIAGRAM

Weight: -

ID: DRW-0002108

Scale:

Format: A1 Sheet: 1 of 1

Revision Status: 2 Released Published: 2014-08-21 10:51:45 GGA Made by: ANE Checked by: Approved by: TM

Engineering Change Order: NA

14.3 FO Flying Lead assembly drawing

NOTES:

1. SEE SAPL DRAWING 7741-101 FOR CONNECTOR INTERFACE DIMENSIONS.

2. SPECIFICATIONS:

CONNECTOR:

MATING STROKE LENGTH:	4.8 in (122 mm)
MAXIMUM ROTATIONAL MISALIGNMENT:	10°
MAXIMUM ANGULAR MISALIGNMENT:	5°
MAXIMUM RADIAL MISALIGNMENT:	0.25 in (6.4 mm)
MAXIMUM FORCES:	
MATE:	112.5 lbf. (500N)
DE-MATE:	50 lbf. (222N)

HOSE:

MINIMUM BENDING RADIUS(OUTSIDE):	6.0 in. (152 mm)
MINIMUM BENDING RADIUS (INSIDE):	5.0 in. (125 mm)
PRE-CHARGE PRESSURE:	102 psi (7.0 bar)

CONNECTOR TO HOSE:

PULL FORCE @ 0°:	562 lbf. (2500N)
PULL FORCE @ 90°:	281 lbf. (1250N)

3. ELECTRO-CHEMICAL ETCH SEACON PART (DRAWING) NUMBER, REVISION LEVEL, SERIAL NUMBER AND CUSTOMER PART NUMBER (IF APPLICABLE) USING 10 PT HIGH CHARACTERS, WHERE SHOWN. NUMBERS SHALL BE LABELED AS FOLLOWS:
(PART NUMBER & REVISION LEVEL) P/N XXXX - XXX REV X
(SALES ORDER - LINE ITEM - SEQUENTIAL NUMBER) S/N XXXXXXX - XX - XXX

4. ATTACH WATER PROOF LABEL AT THESE LOCATIONS WITH THE FOLLOWING INFORMATION:

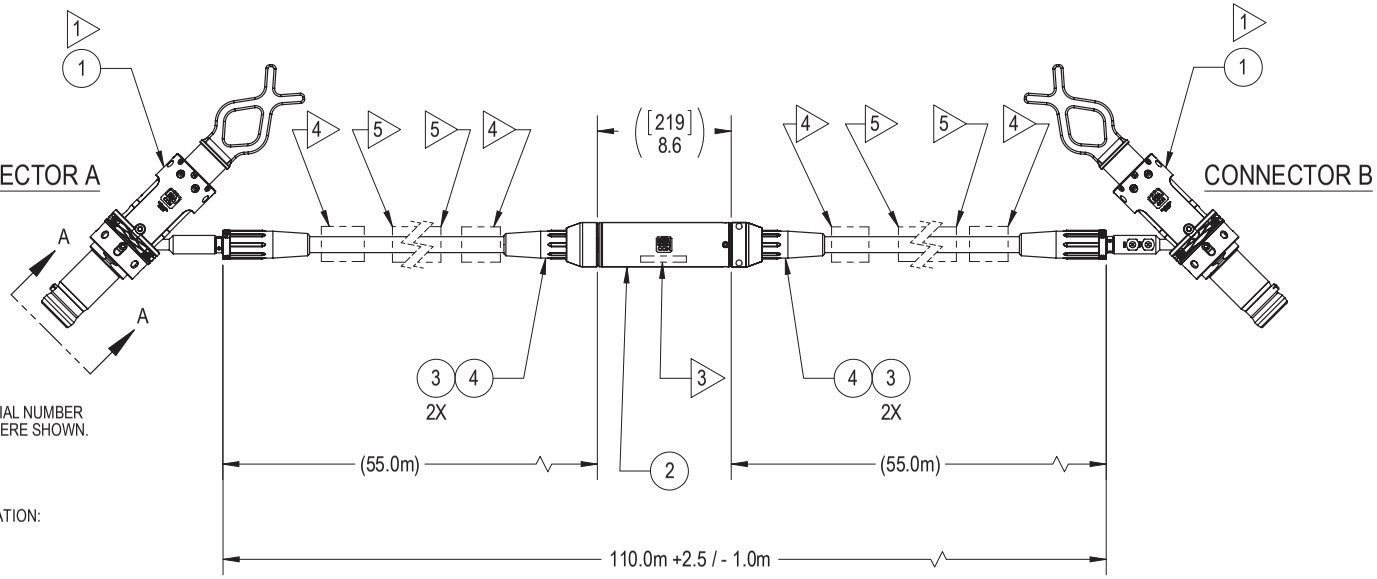
JUMPER PART (DRAWING) NUMBER AND REVISION
JUMPER SERIAL NUMBER
CUSTOMER PART NUMBER (IF APPLICABLE)

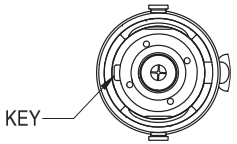
SECURE IN PLACE WITH CLEAR HEAT SHRINK SLEEVING.

5. PLACE TWO (2) PIECES OF LOOSE HEAT SHRINK TUBING ON EACH HOSE, 12 INCHES LONG, ON HOSE FOR CUSTOMER USE.

6. ESTIMATED WEIGHT (OIL FILLED):

IN AIR:	255.7 lbs. (116.0 kg)
IN WATER:	170.5 lbs. (77.3 kg)





VIEW A-A
SCALE 1 : 4
TYP BOTH ENDS

OPTICAL TERMINATION

CONNECTOR	CONNECTOR
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8

ITEM NO.	QTY.	CAGE	PART NUMBER	DESCRIPTION	MATERIAL	MATERIAL SPEC	NOTE
7	AR	5K441	M23053/5-212-C	SUMITUBE HEAT SHRINK TUBING, 2" CLEAR (NOT SHOWN)	POLYOLEFIN		
6	AR	2K588	DC200 / 100 CST	DOW CORNING COMPENSATION FLUID 100 CST (NOT SHOWN)	SILICONE	---	
5	REF	99017	SC-2 1/2	PROTECTIVE CAP (NOT SHOWN)	LDPE	---	
4	2	4EAN5	A140-111-55	13mm MK II PBOF HOSE ASSEMBLY, Ti FITTINGS, 55m LONG	---	---	
3	4	4EAN5	A066-121	FIBER MANAGEMENT SUB ASSEMBLY	---	---	
2	1	4EAN5	A066-111	IN-LINE OPTICAL SPLICE CHAMBER, NON PRESSURE COMPENSATED	(TI GR 5)	---	
1	2	4EAN5	7741-101	HYDRALIGHT, TOP ASSEMBLY, SM, FLYING LEAD, 8 - CHANNEL, FISHTAIL HANDLE	---	---	

MATERIAL INFORMATION

MATERIAL: (TI GR 5)
MATERIAL SPEC: ---

PROCESS SPECS:

- ASSEMBLE IAW SAPL-MPS-1080.
- FACTORY ACCEPTANCE TESTING: REFER TO SALES ORDER.
- OPERATION AND MAINTENANCE IAW SAPL-OMM-1013.

DO NOT SCALE DRAWING

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ARE:
FRACTIONS ±1/16 DECIMALS .X ±.05 .XX ±.01 .XXX ±.005 .XXXX ±.0005 ANGLES ±1°
BREAK ALL EDGES & CORNERS R.005. ALL DIA. TO BE CONCENTRIC WITHIN .004 TIR.
FINISH 63

THIRD ANGLE PROJECTION

TOP ASSEMBLY
NEXT ASSEMBLY

FOR REVISION DETAILS EPDM DOCUMENT RECORD

REV	DSN	DRN	CHK	APP	DATE
Ap4	JAK	GDF			

SEACON ADVANCED PRODUCTS LLC
1321 NELIUS RD. - BELLVILLE, TEXAS - 77418

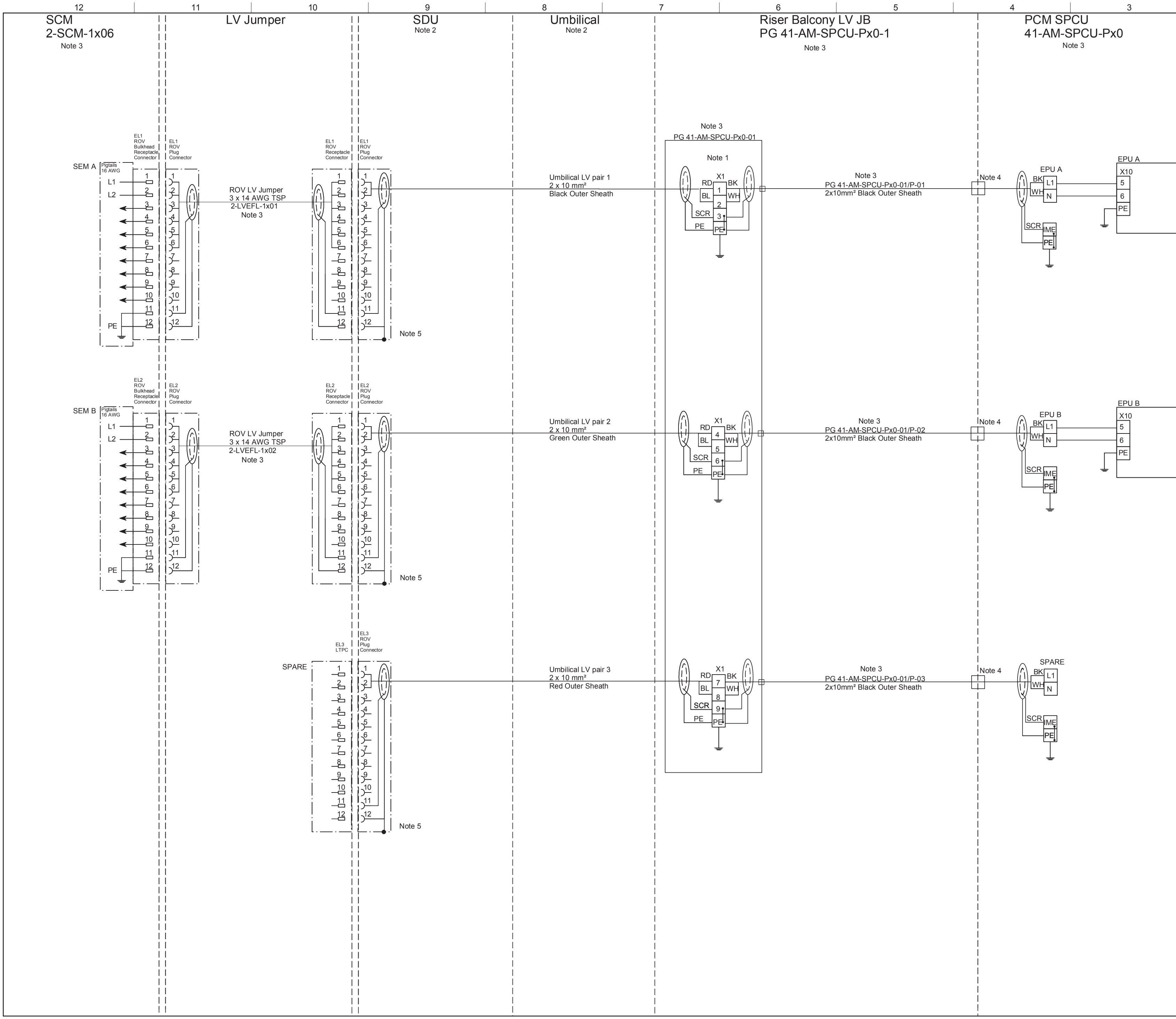
PBOF JUMPER ASSEMBLY, HYDRALIGHT, 8FOSM, 45° HOSE EXIT, FISHTAIL HANDLE, 110m

SIZE	CAGE NO.	DWG NO.	REV
B	4EAN5	A218-101	Ap4
	JOB NO. 15679		

WEIGHT: 6 | SCALE 1:24 | SOLIDWORKS | SHEET 1 OF 1

14.4 SCM-SPCU LV connection diagram

Ref. Subsea Signal Jumper Layout /57/ H#3.



NOTES:

1. Supplied by FPSO2
2. Supplied by SURF2
3. x is used in tags as a placeholder for 7 or 8, for P70 and P80
4. Reference is made to AO-050-GTO-310-000119 for detailed MCT Information
5. Armour/Electromagnetic screen in contact with cable gland/Connector Housing

LEGEND:

- Electromagnetic screen
- Electrostatic screen
- Pin connector
- Socket connector
- Blinded connector (unused terminal)
- Armour earthed in cable gland
- MCT

ABBREVIATIONS:

AWG	- American Wire Gauge
EPU	- Electric Power Unit
FPSO	- Floating Production and Offloading
JB	- Junction Box
LTPC	- Long Term Protective Cap
LV	- Low Voltage
MCT	- Multi Cable Transit
PCM	- Pump Control Module
PE	- Protective Earth
ROV	- Remote Operated Vehicle
SCM	- Subsea Control Module
SEM	- Subsea Electronics Module
SDU	- Subsea Distribution Unit
SPCU	- Subsea Power and Communication Unit
TSP	- Twisted Shielded Pair

REFERENCES:

AO-050-GSG-310-000045 Subsea Signal Jumper Layout
AO-050-GTO-310-000119 PCM P70 and P80 Cable Block Diagram
AO-050-GTO-311-000301 PCM P70 and P80 Penetration Arrangement

Rev	Date	Status	Revision Memo	Issued by	Checked by	Approved by
08	19/MAR/2014	ASB	As Built	GGA	KDY	TMe
07	29/JAN/2014	AFC	Approved for Construction	GGA	KDY	TMe
06	13/JAN/2014	AFC	Approved for Construction	GGA	KDY	TMe
05	03/DEC/2013	AFC	Approved for Construction	GGA	ANE	TMe
04	01/NOV/2013	AFC	Approved for Construction	GGA	ANE	TMe
03	02/OCT/2013	AFC	Approved for Construction	GGA	ANE	TMe
02	14/MAR/2013	AFC	Approved for Construction	GGA	TMe	KHK
01	30/JAN/2013	AFC	Approved for Construction	GGA	TMe	KHK
00	22/NOV/2012	IFR	Issued for Review	GGA	TMe	KHK

TOTAL E&P ANGOLA — TOTAL — OneSubsea A Cameron & Schlumberger Company

SCM - SPCU LV CONNECTION DIAGRAM

Doc Type: DRW	System/Unit: 04	Discipline: INS	Electronic Filename: AO-050-GSG-310-000474_rev08
COMPANY Document N°	AO-050-GSG-310-000474	REV: 08	Scale: N/A — Phase: DE
CONTRACTOR/Original Document N°	DRW-0002105/I	Format: A1	Folio: 1 of 1 — Class: 2

OneSubsea A Cameron & Schlumberger Company

Title: SCM - SPCU LV CONNECTION DIAGRAM

Weight: -

Scale

ID: DRW-0002105

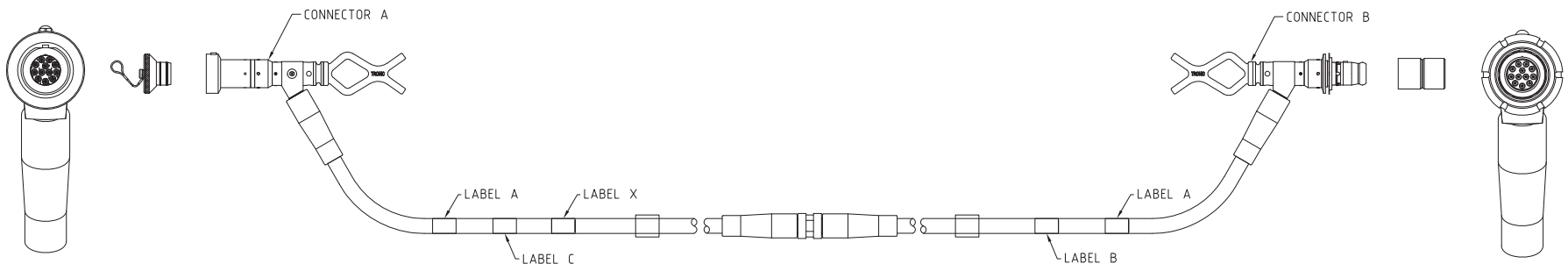
Format: A1 — Sheet: 1 of 1

Revision Status: I Released — Published: 2014-04-02 17:30:42 GGA — Made by: KDY — Checked by: TM — Approved by
Engineering Change Order: NA

14.5 LV Flying Lead assembly drawing

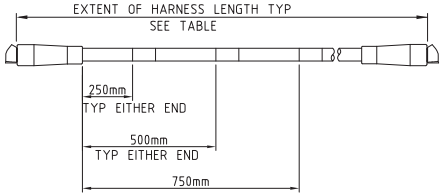
DRG No.	SHT No.	TYPE/PART No.		IF IN DOUBT ASK. DO NOT SCALE.	© THIS DRAWING AND THE INFORMATION AND DESIGNS ON IT ARE THE COPYRIGHT AND PROPERTY OF SIEMENS SUBSEA CONNECTORS, A DIVISION OF SIEMENS PLC AND MUST NOT BE COPIED IN WHOLE OR IN PART, OR CONVEYED TO ANY THIRD PARTY WITHOUT THE WRITTEN CONSENT OF SIEMENS SUBSEA CONNECTORS, A DIVISION OF SIEMENS PLC	ETCH WHERE INDICATED THUS: #	DESIGN INPUT DOCUMENT No:- DID -
T32023	1 OF 1	SEE TABLE					

TYPE/PART NUMBER	T31851-00
CONNECTOR A	BROV-20-B003-BQ-DC-HD12P-VF
CONNECTOR B	BROV-20-A003-BQ-DC-HD12S-VF
HOSE LENGTHS	110M
LABEL A	H#3 ITM-0052295
LABEL B	SCM
LABEL C	SDU
LABEL X	TRONIC PART No. & TRONIC SERIAL No.
WEIGHT IN AIR (Kg)	120.71Kg
WEIGHT IN WATER (Kg)	30.73Kg
MATERIAL	UNS S32550
REFERENCE TO ASSEMBLY DRAWING	DOC-0029429 & A0-050-GSG-331-002113
REFERENCE TO HANDLING PROCEDURES	DOC-0022937 & X-000505
REFERENCE TO WIRING SCHEMATIC	DOC-0040408 & A0-050-GSG-331-001496
OneSubsea PROJECT No. & ITM No.	9060 - ITM-0052295
INTERNAL PRESSURE	15 BAR
INTERNAL OIL TYPE	DOW CORNING 200 SILICONE OIL
HOSE BEND RADIUS	180mm
HOSE OUTSIDE DIAMETER BEFORE FILLING	32.0±0.6mm
REQUIRED MADE/DE-MATE FORCE	<50 Kgf/48-80 Kgf
GUIDE PIN LOCATION	0° POSITION
MAXIMUM RADIAL MISALIGNMENT	±20mm
MAXIMUM ANGULAR MISALIGNMENT	±20°
MAXIMUM ROTATIONAL MISALIGNMENT	±15°



END VIEW OF RECEPTACLE SCALE 2:1

END VIEW OF PLUG SCALE 2:1



Revision	Date	Status	Revision Memo	Issued by	Checked by	Approved by
02	03 Feb 2015	ASB	As Built	LTY	KDY	IFA
01	28 Oct 2014	AFC	Accepted for Construction	KDY	AMI	IFA
00	20 May 2014	IFR	Issued for Review	KDY	AMI	IFA

TOTAL E&P ANGOLA

OneSubsea
A Cameron & Schlumberger Company

General Arrangement drawing for H#3

Doc Type : DRW	System/Unit : 04	Discipline : INS	Electronic Filename A0-050-GSG-331-002113_rev02.pdf
COMPANY Document N°	A0-050-GSG-331-002113	REV : 02	Scale : NONE	Phase : DE
Contractor's Original Document N°	DOC-0054497	Supplier Ref. T32023	Format : XX	Folio : 1 of 1	Class : 2

GENERAL TOLERANCE UNLESS STATED
LINEAR ±0.25mm
ANGULAR ±0.5°
SHARP CORNER REMOVAL
BREAK CORNERS 0.25 x 45° TYP
FILLET RADII 0.50 TYP

ORIGINAL SCALE

DIMENSIONS UNLESS OTHERWISE STATED
mm

MATERIAL

GENERAL SURFACE FINISH UNLESS OTHERWISE STATED
1.6 MICRO-METRES Ra

FINISH

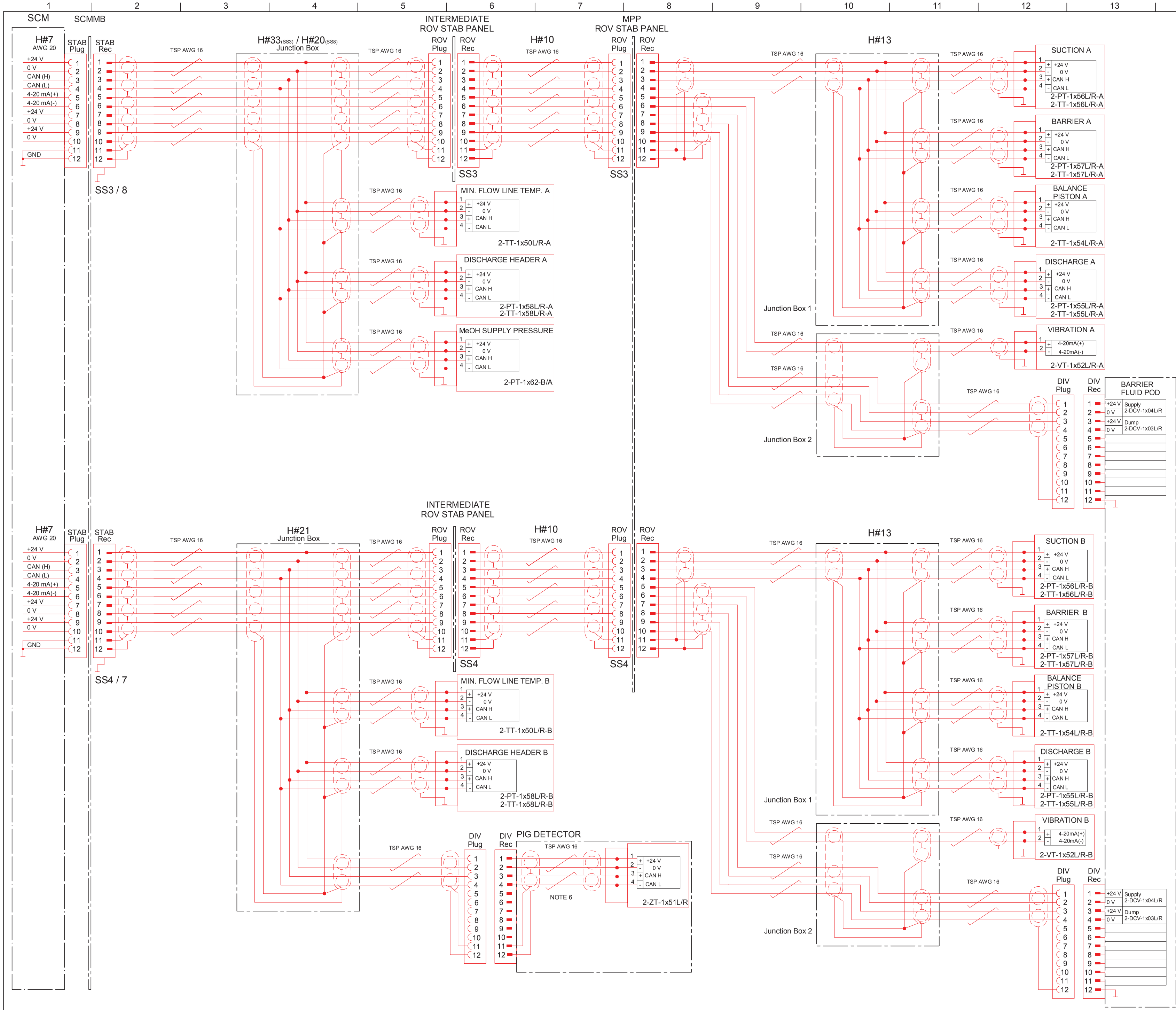
SIEMENS
SIEMENS SUBSEA
SUBSEA EXCELLENCE CENTRE
ULVERSTON, CUMBRIA, LA12 9EE
Tel:- (01229) 580500
Fax:- (01229) 586604

TITLE
OneSubsea
12-WAY ROV RECEPTACLE TO 12-WAY ROV PLUG INSTALLATION DRAWING

LB	WW	JB	-----	15/09/14	C
LB	JB	SPT	-----	31/03/14	B
LB	JB	SPT	-----	06/03/14	A
DRN	CHK	APP	REF	DATE	ISS

DRG No. T32023 | SHT No. 1 OF 1 | A1

14.6 Electrical jumper diagram



NOTES:

1. The "x" in the tags indicates the difference between MPP Station P70 and P80.
2. In order to avoid circulating currents, shall the electrostatic screen be interconnected in one end only. (for jumpers with more than 1 TSP)
3. Wiring is of Raychem Spec 44, or where stated: Industrial Ethernet Cat5e, Tronic type 75-B165.
4. Wiring for the dummy pump sensor. The grayed area is an illustration from sheet 1. This is to show where the dummy pump sensor is connected.
5. Check wiring to pin configuration. Pin 5(yellow), 6(orange), 9(white) and 10(blue) are Ethernet.
6. Oil filled hose, inside the PIG detector.

LEGENDS:

1. Electrostatic Screen
2. Electromagnetic Screen
3. Twisted Pair
4. Plug - Socket / Female
5. Receptacle - Pin / Male
6. ROV Stab Panel

ABBREVIATIONS:

AWG	- American Wire Gauge
DCV	- Directional Control Valve
DIV	- Diver Connector
DO	- Digital Output
FT	- Flow Rate Transmitter
GND	- Ground
H#	- Connector/Jumper Reference
MeOH	- Methanol
MPFM	- Multiphase Flowmeter
MPP	- Multiphase Pump
NC	- Not Connected
PT	- Pressure Transmitter
Rec	- Receptacle
ROV	- Remotely Operated Underwater Vehicle
SCM	- Subsea Control Module
SCMMB	- Subsea Control Module Mounting Base
SEM	- Subsea Electronic Module
STAB	- Stab (a type of connector)
TSP	- Twisted Shielded Pair
TT	- Temperature Transmitter
VT	- Vibration Transmitter
ZT	- Position Transmitter

REFERENCES:

AO-050-GSG-310-000123 (FE: DOC-0007914)
Technical Specifications for Electrical Connector (LV) Design and Manufacture

AO-050-GSG-310-000051 (FE: DOC-0007918)
Subsea Instrument Technical Specification

AO-050-GSG-310-000045 (FE: DRW-0000852)
Subsea Signal Jumper Layout

Rev	Date	Status	Revision Memo	Issued by	Checked by	Approved by
04	14/10/2014	ASB	As Built	EAD	KDY	GGA
03	04/11/2013	AFC	Accepted for Construction	EAD	KDY	GGA
02	03/06/2013	AFC	Accepted for Construction	EAD	GGA	TME
01	14/01/2013	IFA	Issued for Acceptance	EAD	KDY	TME

TOTAL E&P ANGOLA — TOTAL — OneSubsea A Cameron & Schlumberger Company

SUBSEA SIGNAL JUMPER WIRING DIAGRAM

Doc Type : WIR	System/Unit: 04	Discipline : INS	Electronic Filename: AO-050-GSG-310-000075-REV04
COMPANY Document N°	AO-050-GSG-310-000075	REV : 04	Scale : N/A	Phase : DE
CONTRACTOR/Original Document N°	DRW-0001202	Format : A1	Folio : 1 of 3	Class : 1

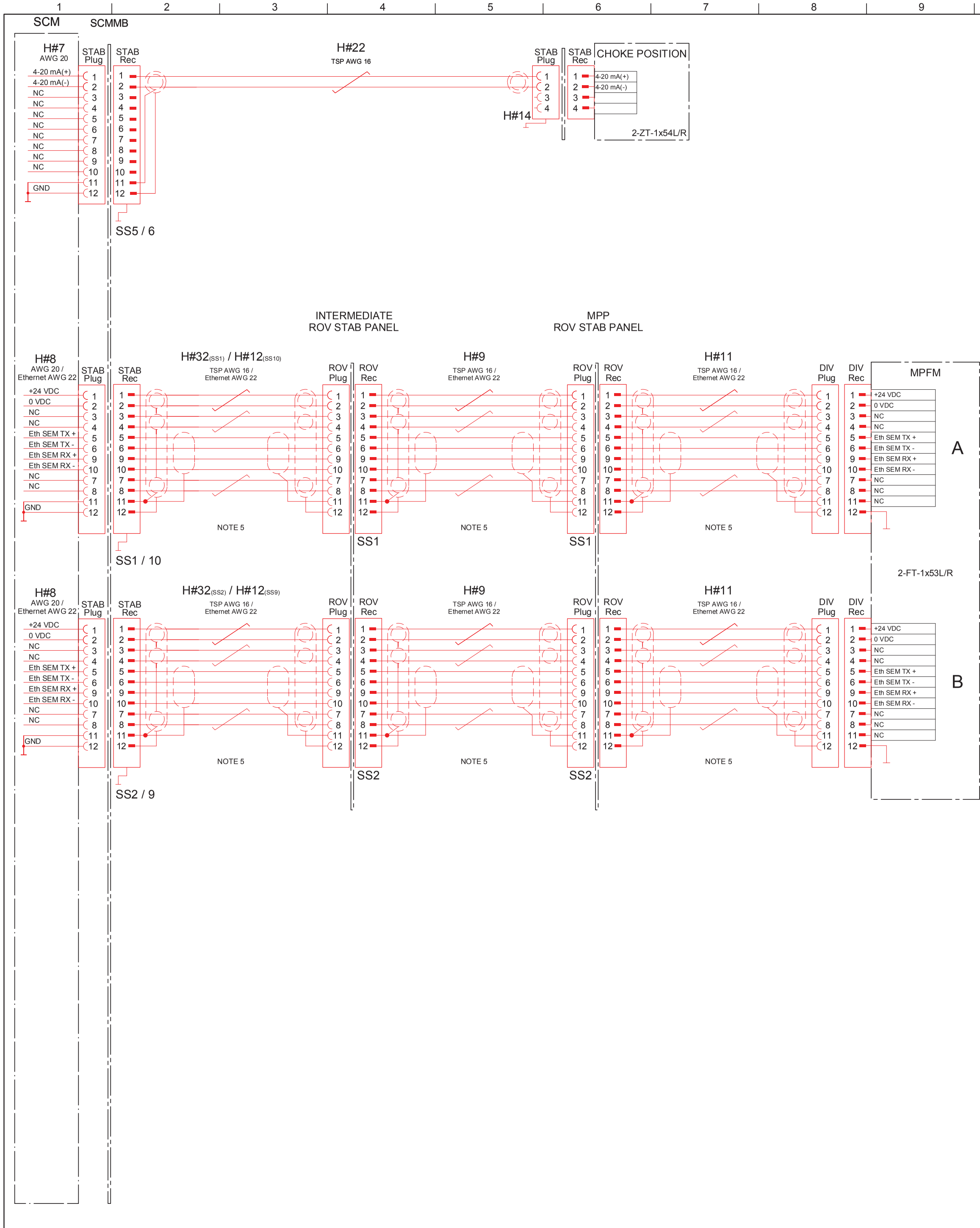
Title: SUBSEA SIGNAL JUMPER WIRING DIAGRAM — Weight: N/A

ID: DRW-0001202 — Scale: NTS

Format: A1 — Sheet: 1 of 3

Revision Status: E Released — Published: 2014-10-15 11:40:42 EAD — Made by — Checked by: KDY — Approved by: GGA

Engineering Change Order: NA



NOTES:

1. The "x" in the tags indicates the difference between MPP Station P70 and P80.
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AO-050-GSG-310-000123 (FE: DOC-0007914)
Technical Specifications for Electrical Connector (LV)
Design and Manufacture

AO-050-GSG-310-000051 (FE: DOC-0007918)
Subsea Instrument Technical Specification

AO-050-GSG-310-000045 (FE: DRW-0000852)
Subsea Signal Jumper Layout

Rev	Date	Status	Revision Memo	Issued by	Checked by	Approved by
04	14/10/2014	ASB	As Built	EAD	KDY	GGA
03	04/11/2013	AFC	Accepted for Construction	EAD	KDY	GGA
02	03/06/2013	AFC	Accepted for Construction	EAD	GGA	TME
01	14/01/2013	IFA	Issued for Acceptance	EAD	KDY	TME

TOTAL E&P ANGOLA — TOTAL — OneSubsea, A Cameron & Schlumberger Company

SUBSEA SIGNAL JUMPER WIRING DIAGRAM

Doc Type : WIR | System/Unit: 04 | Discipline : INS | Electronic Filename: AO-050-GSG-310-000075-REV04

COMPANY Document N°: AO-050-GSG-310-000075 | REV : 04 | Scale : N/A | Phase : DE

CONTRACTOR/Original Document N°: DRW-0001202 | Format : A1 | Folio : 2 of 3 | Class : 1

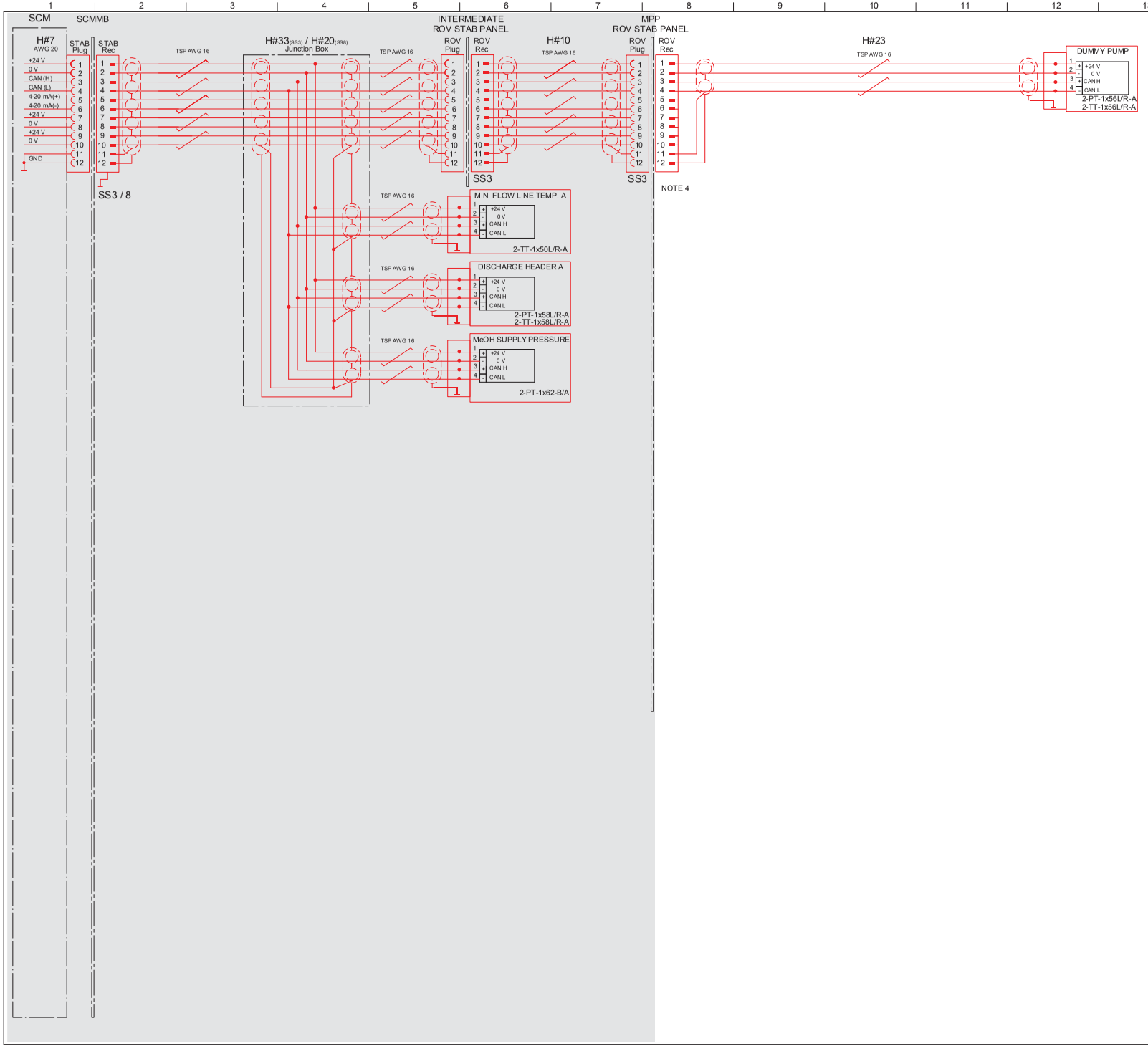
OneSubsea, A Cameron & Schlumberger Company

Title: SUBSEA SIGNAL JUMPER WIRING DIAGRAM | Weight: N/A

ID: DRW-0001202 | Scale: NTS

Format: A1 | Sheet: 2 of 3

Revision Status: E Released | Published: 2014-10-15 11:40:42 | Made by: EAD | Checked by: KDY | Approved by: GGA
Engineering Change Order: NA



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5. Receptacle - Pin / Male
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DO	- Digital Output
FT	- Flow Rate Transmitter
GND	- Ground
H#	- Connector/Jumper Reference
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MPP	- Multiphase Pump
NC	- Not Connected
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SCM	- Subsea Control Module
SCMMB	- Subsea Control Module Mounting Base
SEM	- Subsea Electronic Module
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TSP	- Twisted Shielded Pair
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REFERENCES:

AO-050-GSG-310-000123 (FE: DOC-0007914)
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Design and Manufacture

AO-050-GSG-310-000051 (FE: DOC-0007918)
Subsea Instrument Technical Specification

AO-050-GSG-310-000045 (FE: DRW-0000852)
Subsea Signal Jumper Layout

Rev	Date	Status	Revision Memo	Issued by	Checked by	Approved by
04	14/10/2014	ASB	As Built	EAD	KDY	GGA
03	04/11/2013	AFC	Accepted for Construction	EAD	KDY	GGA
02	03/06/2013	AFC	Accepted for Construction	EAD	GGA	TME
01	14/01/2013	IFA	Issued for Acceptance	EAD	KDY	TME

SUBSEA SIGNAL JUMPER WIRING DIAGRAM

Doc Type : WIR	System/Unit : 04	Discipline : INS	Electronic Filename: AO-050-GSG-310-000075-REV04
COMPANY Document N°:	AO-050-GSG-310-000075	REV : 04	Scale : N/A	Phase : DE
CONTRACTOR/Original Document N°:	DRW-0001202	Format : A1	Folio : 3 of 3	Class : 1

Title: SUBSEA SIGNAL JUMPER WIRING DIAGRAM	Weight: N/A
ID: DRW-0001202	Scale: NTS
Format: A1	Sheet: 3 of 3

Revision Status	Published	Made by	Checked by	Approved by
E Released	2014-10-15 11:40:42	EAD	KDY	GGA

Engineering Change Order: NA

TOTAL E&P ANGOLA - GIRRI PROJECT - AO-050-GMP-310-000324 - REV 02 - AFC - 29-APR-2015

15 ROV intervention/ tooling

15.1 ROV intervention / tooling reference list

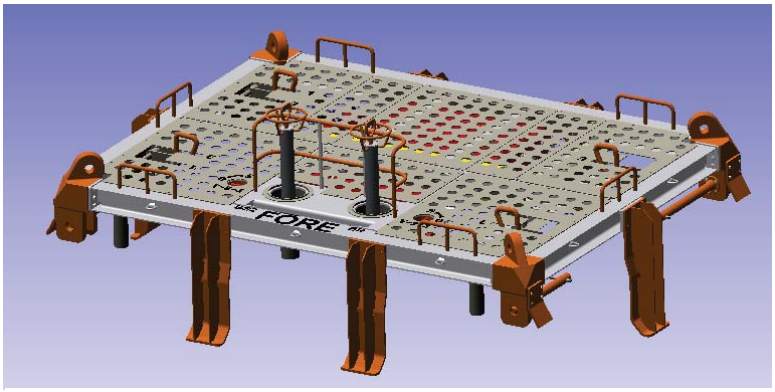
NO	To	Marking	Description
/68/	GA and Interface Drawing – SCM-IT	AO-050-GMP-310-000081	DRW-0003536
/69/	MFCV – Drawing for Running Tool	AO-050-GMP-327-001417	DOC-0039552
/70/	Running Tool Pump Unit GA/ Interface drawing	AO-050-GMP-310-000621	ITM-0081769
/71/	Pump Unit Installation Tool Simplified GA / Interface drawing	AO-0 50-GMP-310-002254	ITM-0128125
/72/	PU IT – Data Sheet	AO-050-GMP-310-000624	DOC-0022406
/73/	FLOT GA drawing	AO-050-GSG-340-001880	DOC-0048874
/74/	Lifting Anchor Assembly drawing	AO-050-GMP-367-001708	DOC-0042221
/75/	FLDF Type 1 GA drawing	AO-050-GMP-310-001516	ITM-0081459
/76/	FLDF Type 2 GA drawing	AO-050-GMP-310-001513	ITM-0091985
/77/	FLDF Type 3 GA drawing	AO-050-GMP-310-001515	ITM-0081481
/78/	Test HPU GA drawing	AO-050-GTO-370-001525	DOC-0027201

15.2 PU running tool

Running tool is used for installation of the Pump Unit.

15.3 PU installation tool

The PU-IT is designed for installation and retrieval of the PU. The tool contains a package with accumulators and compensators for barrier fluid that provide barrier fluid supply during installation, and make the PU able to remain pressurized without barrier fluid supply from umbilical for 21 days, given that process is equal to ambient pressure during subsea storage period. In addition there are accumulators for flushing and sampling of barrier fluid.



PU installation tool

The PU-IT is interfacing the 4 pad-eyes on top of the PU and mechanically locked onto the PU.

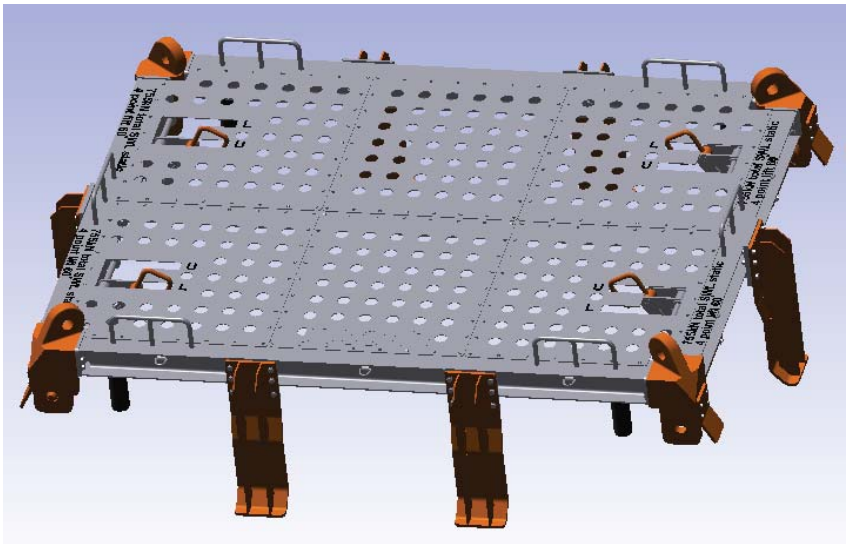
The BF jumper between the PU and PU-IT consist of a hose with Walther type 87-G08 female connectors in each end, one for BF supply and one for flushing and sampling.

Design pressure 345 bar. SWL 750 kN.

PU-IT shall not be used for installation / recovery of DPU.

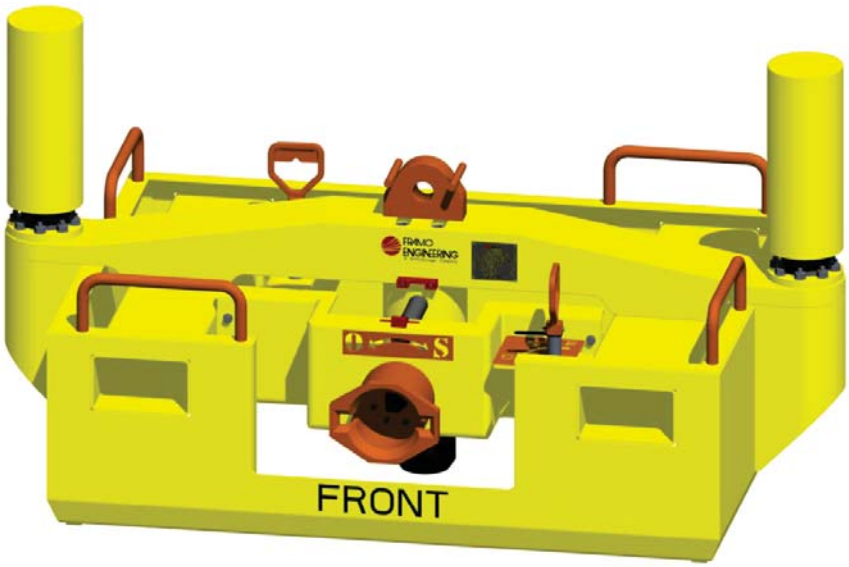
15.4 Simplified PU installation tool

The Simplified Pump Unit installation tool is designed for installation and retrieval of the DPU. DPU is equipped with 6 off guiding feet towards DPU, these are also designed for landing feet when landed on ground. The DPU-IT is interfacing the 4 pad-eyes on top of the DPU and mechanically locked onto the DPU by use of 4 off locking handles.



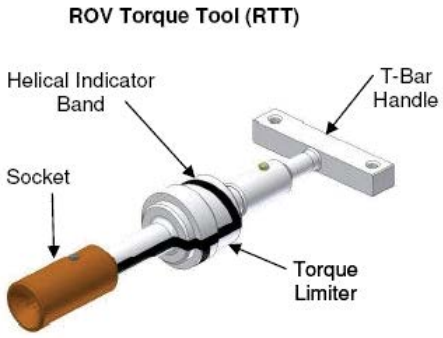
15.1 SCM installation tool

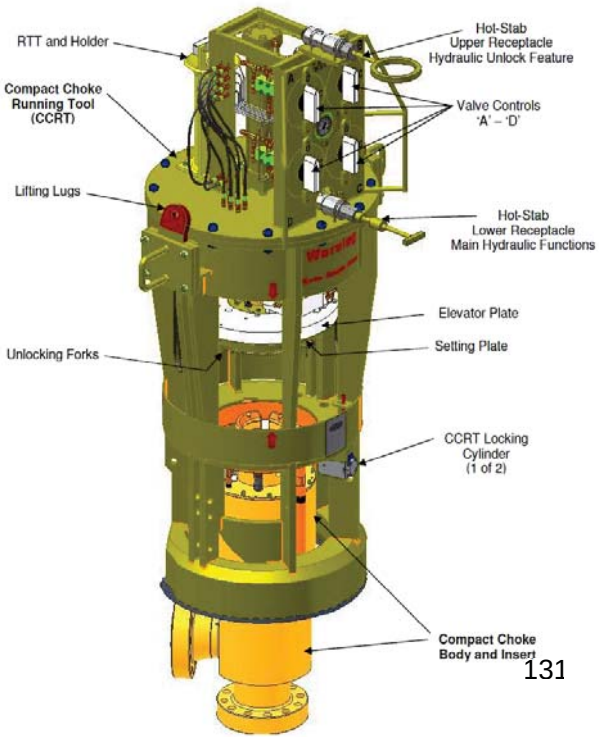
SCM-IT is designed for installation and retrieval of the SCM. The SCM-IT is mechanically locked onto the SCM by use of ISO 13628-8, Class 4 Torque tool. The locking mechanism between the SCM and mounting base can be operated by use of the SCM-IT. There are two soft landing cylinders on the SCM-IT which is interfacing the Pump Module structure during SCM installation.



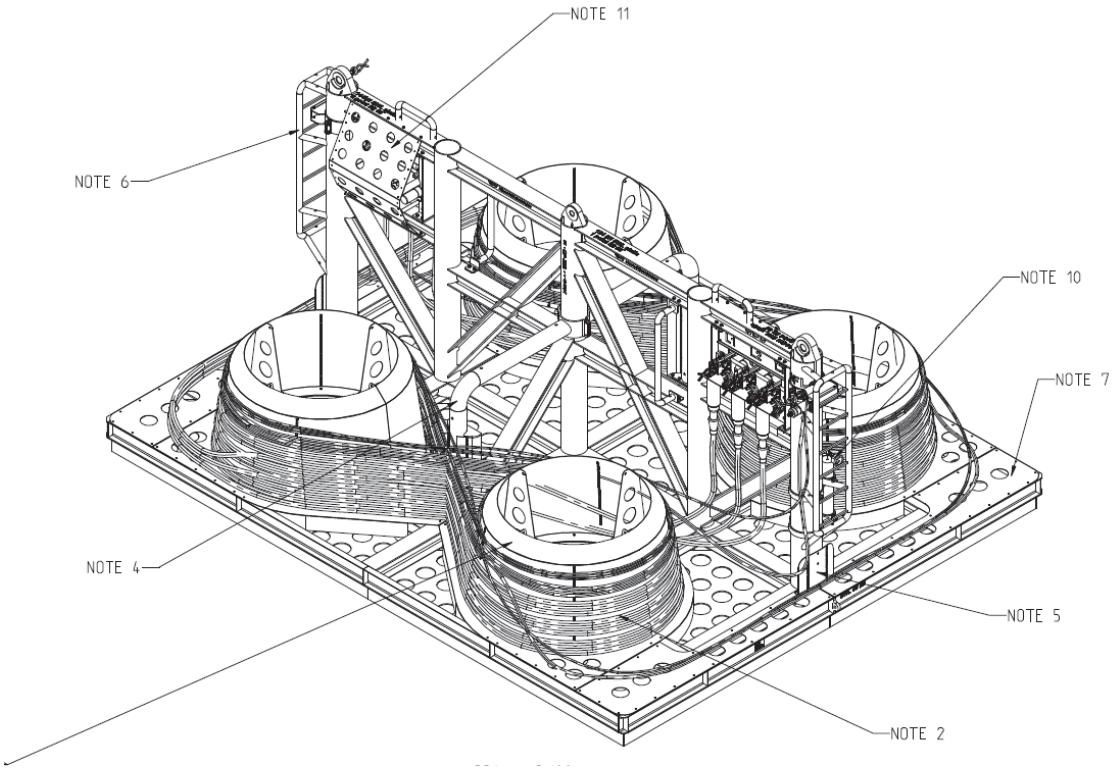
15.2 MFCV – Running tool

MFCV Insert replacement is performed by the MFCV - Running Tool (choke insert running tool). This is a purpose built deep water ROV operated Running Tool. Insert is fully vertically retrievable with no horizontal access necessary.





15.3 Flying Leads Deployment Frame



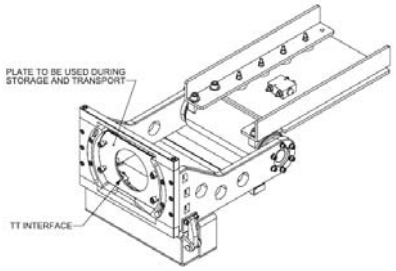
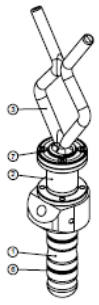
All flying leads between SDU/M801 and MPP Station are to be deployed from deployment frames.Flying leads are to be deployed from 3 different types of frames;

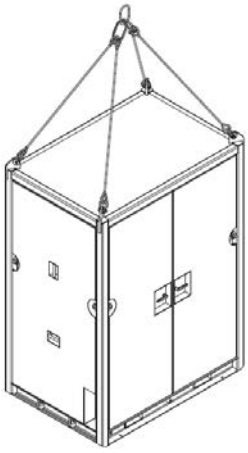
Deployment frame	Content	Lengths
Type 1 – (4 off) GA drawing, ref. /75/	3x HV Flying leads 1x Barrier fluid flying lead 1x Earth bonding flying lead	110m 110m 110m (on two of these frames)
Type 2 - (2 off) GA drawing, ref. /76/	2x Bundled Hydraulic flying leads 2x LV Flying leads 2x FO Flying leads	110m 110m 110m 110m
Type 3 - (1 off) GA drawing, ref. /77/	1x MeOH	230m
Dimensions	7.5m long, 6.0m wide and 3.4m high	

This gives a total of 7 deployment frames for MPP station P70 and P80. All frames are based on the same dimensions and design, but with different configuration of parking panels and flying leads. Each Deployment frame is lifted with a two leg lifting sling, and has a mud mat interface against seabed. Included in the design is a compensation system for the CF lines in the HFL and accumulators for the BF flying lead. Coiling of flying leads is to be equally divided on each side of the frame, which allows ROV to lift out cable in two runs.

15.4 Tooling required

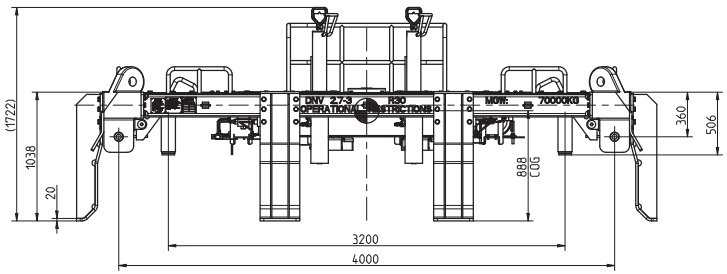
The necessary ROV tools for operations at the GirRI MPP system are listed below.

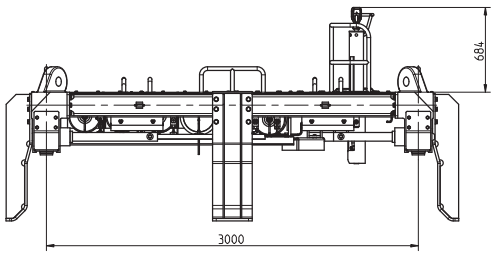
Description	Comment	Supplier
Torque tool Class 1-4	Standard ISO 13628-8 Class 1-4 torque tool.	Intervention contractor
Torque tool / Gear Class 6	For operation Support and leveling bolts at the SLS.	Intervention contractor
ROV hydraulic Oil Pack	For operating soft landing cylinders on Pump Unit and Dummy Pump Unit. Minimum pressure: 100barg Minimum volume: 50 liters Envirinmental friendly oil to be used.	Intervention contractor
FLOT: 	For installation / intervention of HFL`s and CCV. Ref. /73/.	OneSubsea
Hot Stab 43mm 1 port: 	For operating bleed off line MPP Module. Design according to ISO 13628-8 type B hotstab.	OneSubsea

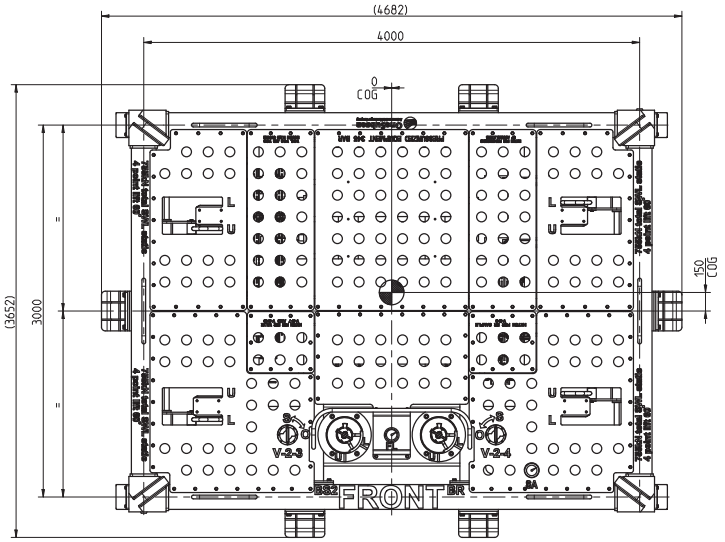
Hot Stab 43mm 2 ports 	For operating Soft landing cylinders on PU and DPU, and for performing back seal test on destec clamps placed on PU and DPU. Design according to ISO 13628-8 type B hotstab.	OneSubsea
Lifting Anchor 	For retrieval of SLS Guide post placed on Foundation.	OneSubsea
Test HPU 	HPU for testing.	OneSubsea

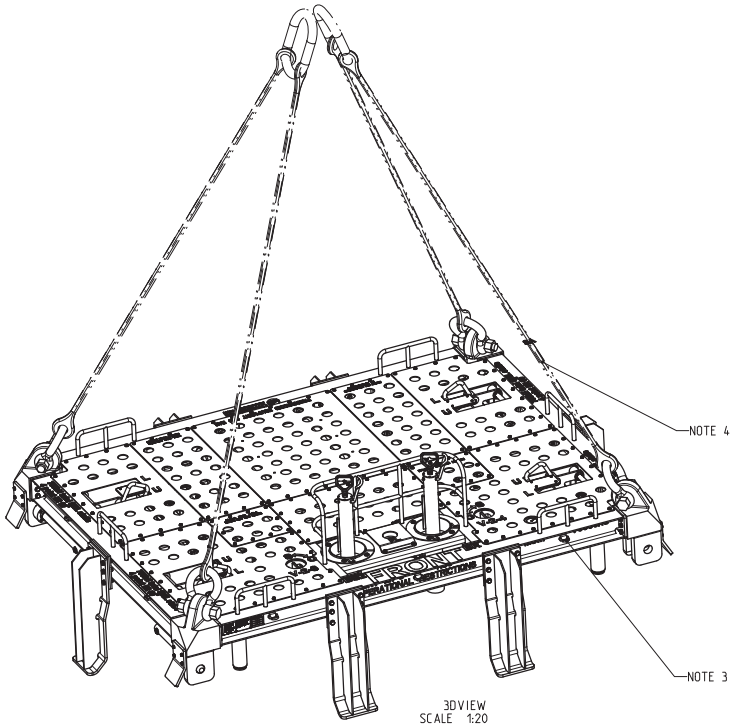
15.5 PU running tool interface drawing

RUNNING TOOL SHOWN IN TRANSPORT MODE

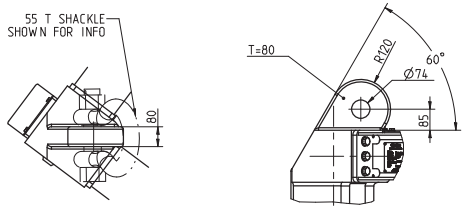








3DVIEW
SCALE 1:20



LIFTING EYE - TOP VIEW

LIFTING EYE - SIDE VIEW

DETAIL LIFTING EYES
SCALE 1:10

NOTES:

1. WEIGHT PUMP UNIT INSTALLATION TOOL
   DRY WEIGHT: 6080 KG
   COG: STATED ON VIEWS
2. INTERFACES SEE SHEET 2
3. LASHING POINTS FOR TRANSPORT 10 PCS.
4. LIFTING SLINGS SHOWN FOR INFO
5. MARKING AND COLOURS
   COLOUR STRUCTURE : YELLOW RAL 1004
   COLOUR LIFTING POINT : ORANGE RAL 2004
   COLOUR ROV INTERFACE: ORANGE RAL 2004
   COLOUR MARKING : BLACK TEXT ON YELLOW BACKGROUND
   MARKING, ROV : CUT IN PLATE OR LABELS W/MIN 50 MM HEIGHT

REFERENCES:

/1/	AO-050-GMP-310-000454 / ITM-0071499 PUMP UNIT GENERAL ASSEMBLY
/2/	AO-050-GMP-310-000015 / ITM-0077876 PUMP UNIT INTERFACE DRAWING
/3/	AO-050-GMP-310-001353 / DOC-0032854 PUMP UNIT INSTALLATION TOOL STRUCTURAL ANALYSIS REPORT
/4/	AO-050-GMP-310-002151 / DRW-0003098 PUMP UNIT INSTALLATION TOOL HYDRAULIC SCHEMATIC
/5/	ITM-0121566 NAME PLATE PU INSTALLATION TOOL
/6/	ITM-0122812 NAME PLATE INFORMATION IT
/7/	ITM-0122640 NAME PLATE INSPECTION IT
/8/	AO-050-GMP-310-002155 / DOC-0057123 PUMP UNIT INSTALLATION TOOL-PRESERVATION, PACKING AND STORAGE PROCEDURE
/9/	AO-050-GMP-310-000629 / DOC-0022413 PUMP UNIT INSTALLATION TOOL - TRANSPORT AND HANDLING PROCEDURE
/10/	AO-050-GMP-310-001694 / DOC-0021237 PUMP UNIT - INSTALLATION AND RETRIEVAL GUIDELINE

Rev	Date	Status	Revision Memo	Issued by	Checked by	Approved by
05	16/01/2015	ASB	As Built	CSS	GSa	MGI
04	14/12/2014	ASB	As Built	CSS	GSa	MGI
03	06/10/2014	ASB	As Built	CSS	GSa	MGI
02	28/08/2014	IFR	Accepted for Construction	CSS	GSa	MGI
01	25/11/2013	IFA	Issued for Acceptance	GSa	SAA	MGI
00	14/08/2013	IFR	Issued for review	GSa	SAA	MGI

TOTAL GEP ANGOLA
TOTAL
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RUNNING TOOL
PUMP UNIT
GA / INTERFACE DRAWING

Doc Type : GEA	System/Unit: 04	Discipline : MPP	Electronic Filename: AO-050-GMP-310-000821-rev05.pdf
COMPANY Document N°	AO-050-GMP-310-000821	REV : 05	Scale : NA / Phase : DE
CONTRACTOR/Original Document N°	ITM-0081769/F	Format : A1	Folio : 1 of 3 / Class : 1

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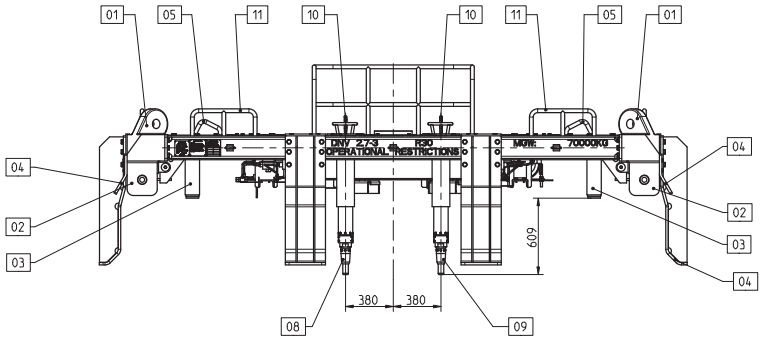
Title	RUNNING TOOL PUMP UNIT GA / INTERFACE DRAWING
Weight	SEE NOTES
ID	ITM-0081769
Scale	1:20
Format	A1
Sheet	1 of 3

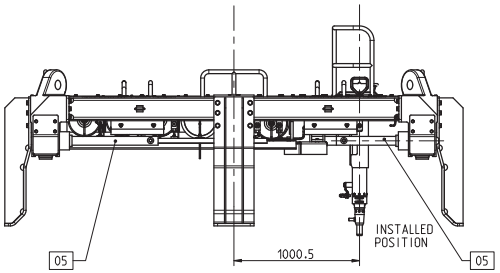
Revision Status	Published	Made by	Checked by	Approved by
F Released	2015-01-19 16:00:45 CSS		GSA	MGI

Engineering Change Order: ECN-002965

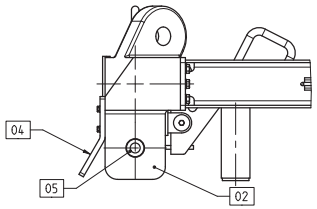
TOTAL E&P ANGOLA - GIRRI PROJECT - AO-050-GMP-310-000324 REV 02 - AFC - 20 - APR - 2015

RUNNING TOOL SHOWN IN OPERATION MODE

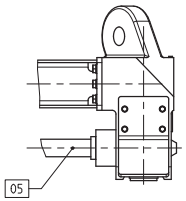




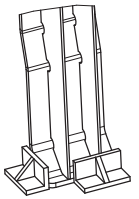
DETAIL LOCKING MECHANISM
FRONT VIEW
SCALE 1:10

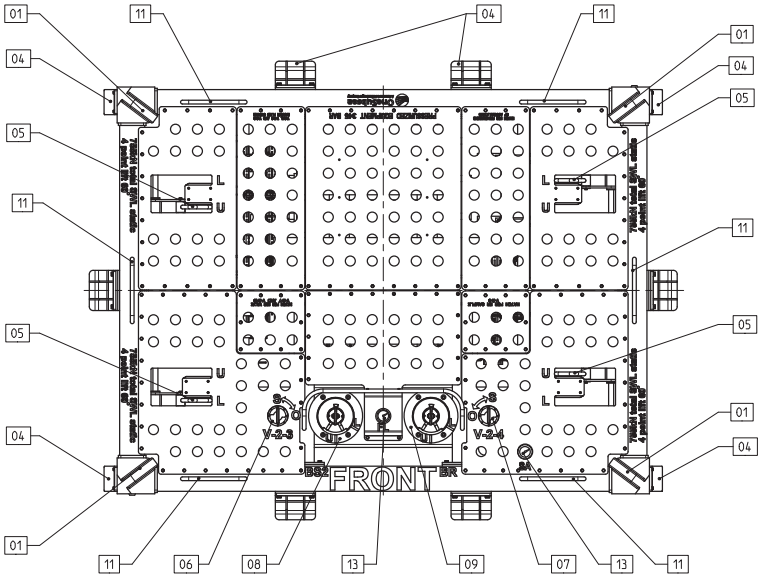


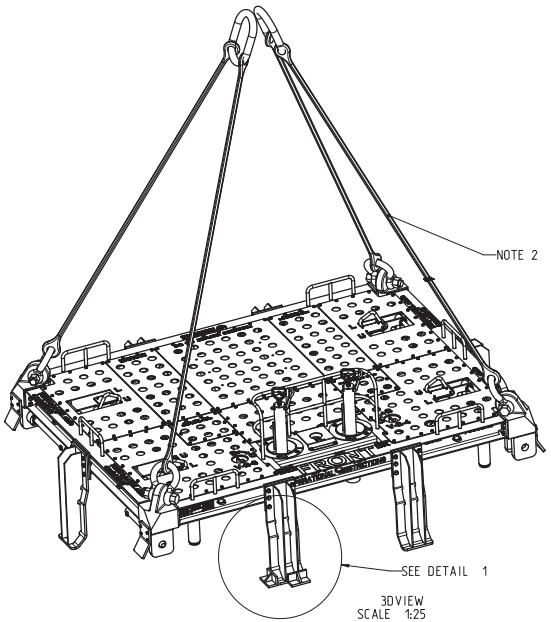
DETAIL LOCKING MECHANISM
SIDE VIEW



DETAIL 1
TYPICAL SEAFASTENING
SCALE 1:10







3DVIEW
SCALE 1:25

INTERFACES:

NO.	TO	DESCRIPTION:
01	ROV	PAD EYE FOR LIFTING SLINGS.
02	TOOL	LIFTING EYES TO FIT PAD EYES ON PUMP UNIT
03	TOOL	LANDING FEETS TOWARDS PUMP UNIT x4
04	ROV	GUIDING BRACKETS AND LANDING FEET
05	ROV	LOCKING MECHANISM FOR PUMP UNIT
06	ROV	V-2-4 BARRIER SUPPLY VALVE
		BARRIER FLUID CONTROL VALVE FLAT BAR HANDLE INTERFACE. MAX. OPERATING TORQUE = 50 Nm DAMAGE TORQUE = 400 Nm TURN 90° CW TO CLOSE.
07	ROV	V-2-3 BARRIER RETURN VALVE
		BARRIER FLUID CONTROL VALVE FLAT BAR HANDLE INTERFACE. MAX. OPERATING TORQUE = 50 Nm DAMAGE TORQUE = 400 Nm TURN 90° CCW TO CLOSE.
08	ROV	"BS2" INTERFACE TO INSTALLATION TOOL BARRIER FLUID ACCUMULATORS
09	ROV	"BR" WORKOVER BARRIER OIL RETURN.
		FOR INTERFACE NO 08 & 09: MALE HYDRAULIC CONNECTOR TYPE WALTHER. RUNNING TORQUE = 40 Nm DAMAGE TORQUE = 160 Nm TURN CW TO CONNECT. 11.5 TURNS TO FULLY ENGAGE
10	ROV	ROV HANDLE: D-HANDLE
11	ROV	GRABBER BARS
12	TOOL	HANDLE BAR FOR CONNECTOR
13	ROV	MANOMETER
		FOR INTERFACE NO 13: SA = SAMPLE FL = FLUSH

NOTES:

1. WEIGHTS AND REFERENCES SEE SHEET 1.
2. LIFTING SLINGS SHOWN FOR INFO

Rev	Date	Status	Revision Memo	Issued by	Checked by	Approved by
05	19/01/2015	ASB	As Built	CSS	GSa	MGI
04	14/12/2014	ASB	As Built	CSS	GSa	MGI
03	06/10/2014	ASB	As Built	CSS	GSa	MGI
02	28/08/2014	AFC	Accepted for Construction	CSS	GSa	MGI
01	25/11/2013	IFA	Issued for Acceptance	GSa	SAA	MGI
00	14/08/2013	IFR	Issued for review	GSa	SAA	MGI

TOTAL E&P ANGOLA

RUNNING TOOL
PUMP UNIT
GA / INTERFACE DRAWING

Doc Type : GEA	System/Unit: 04	Discipline : MPP	Electronic Filename: AO-050-GMP-310-000821-rev05.pdf
COMPANY Document N°	AO-050-GMP-310-000821	REV : 05	Scale : NA	Phase : DE
CONTRACTOR/Original Document N°	ITM-0081769/F	Format : A1	Follo : 2 of 3	Class : 1

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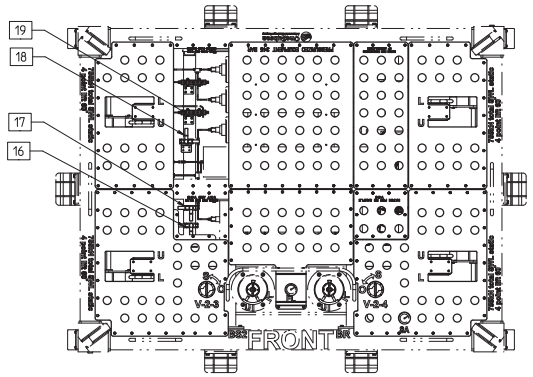
Title	RUNNING TOOL PUMP UNIT GA / INTERFACE DRAWING	Weight SEE SHEET 1
ID	ITM-0081769	Scale 1:20
Format A1	Sheet 2 of 3	

Revision Status F Released | Published 2015-01-19 16:00:45 | Made by CSS | Checked by GSA | Approved by MGI
Engineering Change Order: ECN-002965

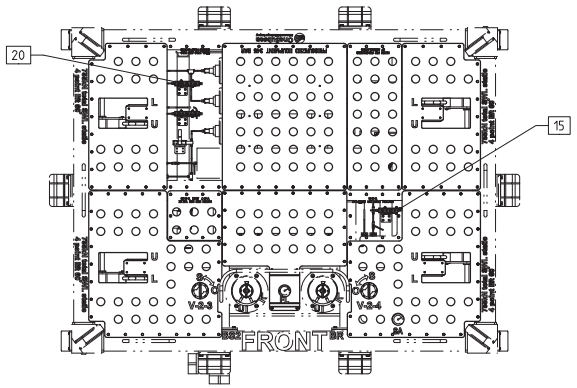
TOTAL E&P ANGOLA - GIRRI PROJECT - AO-050-GMP-310-000324 - REV 02 - AFC - 20 - APR - 2015

MANUALLY OPERATED VALVES: BS2 - BARRIER FLUID SYSTEM



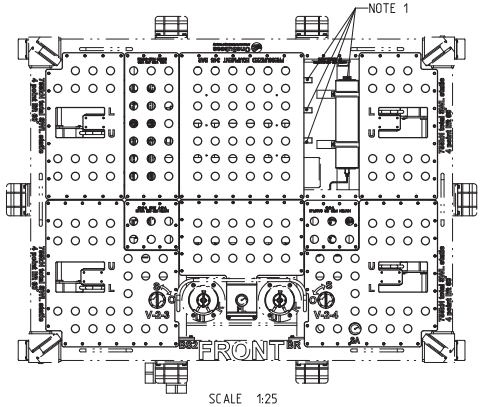
SCALE 1:25

MANUALLY OPERATED VALVES: BR - FLUSH & SAMPLING



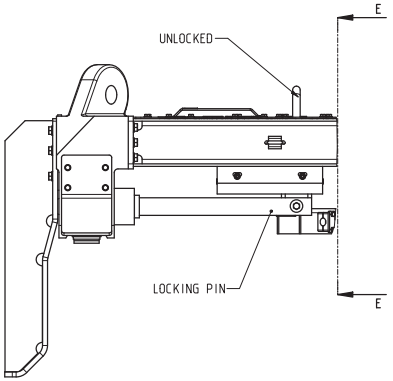
SCALE 1:25

ACCUMULATOR CHARGING POINTS

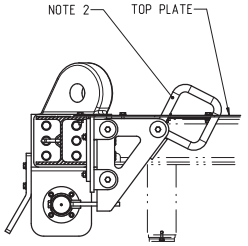


SCALE 1:25

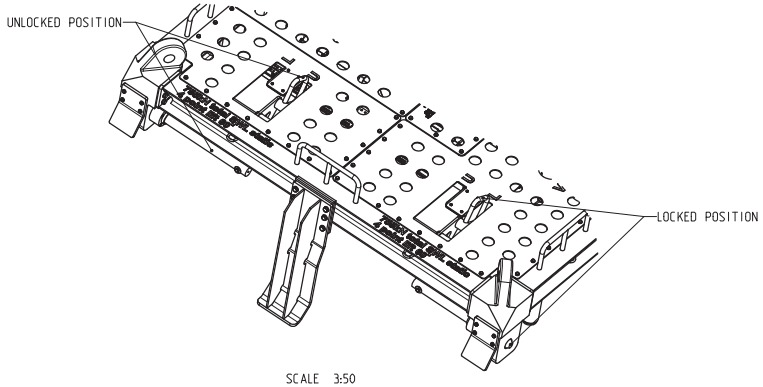
LOCKING MECHANISM



SCALE 1:10

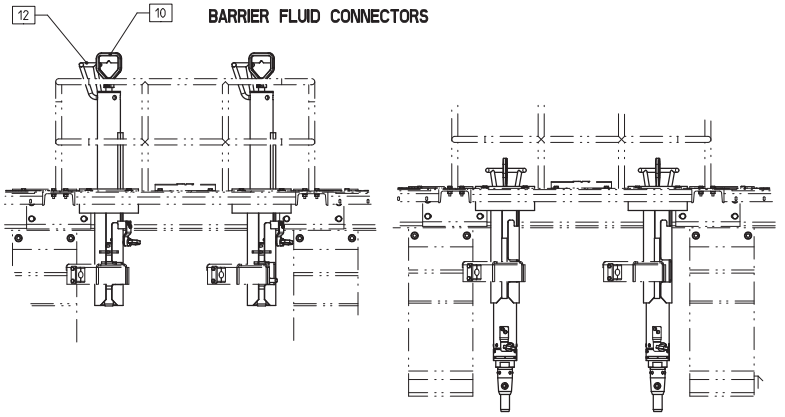


SECTION E-E
SCALE 1:10



SCALE 3:50

BARRIER FLUID CONNECTORS



TRANSPORT PHASE/UPPER POSITION
SECTION E-E
SCALE 2:25

INSTALLATION PHASE/LOWER POSITION
SECTION E-E
SCALE 2:25

INTERFACES:

NO.	TO	DESCRIPTION:
15		DBB valve: V-2-6
16		Ball valve: V-2-7
17		Ball valve: V-2-10
18		Ball valve: V-2-9
19		DBB valve: V-2-8
20		DBB valve: V-2-5

NOTES:

1. A TOPSIDE ACTIVITY FOR ACCUMULATOR MAINTENANCE AND FLUID SAMPLE COLLECTION REMOVAL OF SMALL TOP PLATE FOR QUICK AND EASY ACCESS TO VALVES AND ACCUMULATOR 4 PLACES
2. WEIGHT OF HANDLE ENSURE IT STAYS IN CHOSEN POSITION

Rev	Date	Status	Revision Memo	Issued by	Checked by	Approved by
05	19/01/2015	ASB	As Built	CSS	GSa	MGI
04	14/12/2014	ASB	As Built	CSS	GSa	MGI
03	06/10/2014	ASB	As Built	CSS	GSa	MGI
02	28/08/2014	AFC	Accepted for Construction	CSS	GSa	MGI
01	25/11/2013	IFA	Issued for Acceptance	GSa	SAA	MGI
00	14/08/2013	IFR	Issued for review	GSa	SAA	MGI

RUNNING TOOL PUMP UNIT GA / INTERFACE DRAWING

Doc Type : GEA	System/Unit: 04	Discipline : MPP	Electronic Filename: AO-050-GMP-310-000821-rev05.pdf
COMPANY Document N°	AO-050-GMP-310-000821	REV : 05	Scale : NA
CONTRACTOR/Original Document N°	ITM-0081769/F	Format : A1	Folio : 3 of 3

Phase : DE
Class : 1

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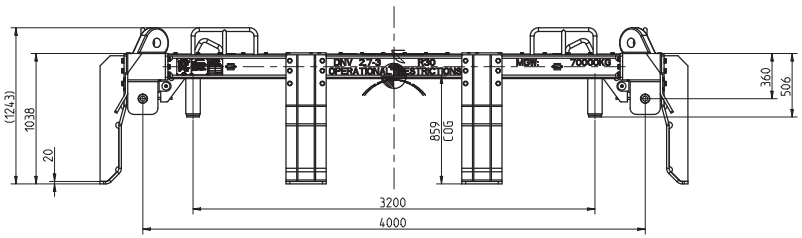
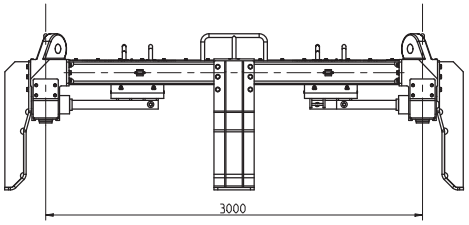
Title	RUNNING TOOL PUMP UNIT GA/INTERFACE DRAWING
ID	ITM-0081769
Format	A1
Sheet	3 of 3
Weight	SEE SHEET1
Scale	1:20

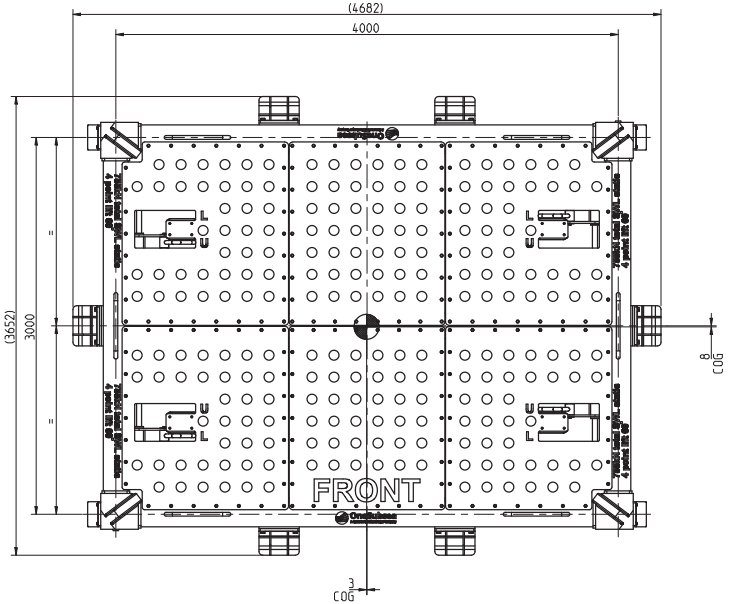
Revision Status	Published	Made by	Checked by	Approved by
F Released	2015-01-19 16:00:45	CSS	GSA	MGI

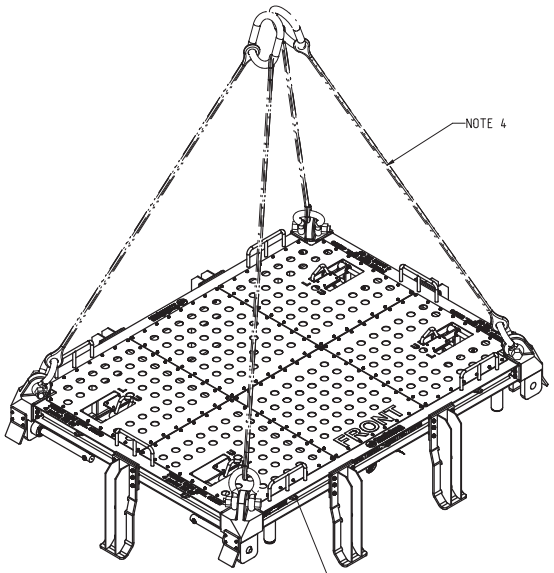
Engineering Change Order: ECN-002365

15.1 PU installation tool interface drawing

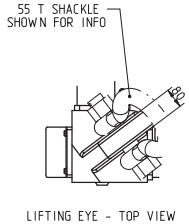




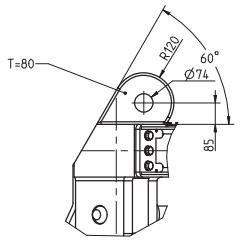




3D VIEW
SCALE 1:25



LIFTING EYE - TOP VIEW



LIFTING EYES

DETAIL LIFTING EYES
SCALE 1:10

REFERENCES:

/1/	A0-050-GMP-310-000454 / ITM-0071499 PUMP UNIT GENERAL ASSEMBLY
/2/	A0-050-GMP-310-000015 / ITM-0077876 PUMP UNIT INTERFACE DRAWING
/3/	A0-050-GMP-310-002238 / DOC-0060866 PU SIMPLIFIED INSTALLATION TOOL PRESERVATION, PACKING AND STORAGE PROCEDURE
/4/	A0-050-GMP-310-002239 / DOC-0060867 PU SIMPLIFIED INSTALLATION TOOL TRANSPORT AND HANDLING PROCEDURE
/5/	A0-050-GMP-310-001353 / DOC-0032854 PUMP UNIT INSTALLATION TOOL STRUCTURAL ANALYSIS REPORT
/6/	A0-050-GMP-310-001694 / DOC-0021237 PUMP UNIT - INSTALLATION AND RETRIEVAL GUIDELINE
/7/	ITM-0120543 NAME PLATE PU INSTALLATION TOOL
/8/	ITM-0122812 NAME PLATE INFORMATION IT
/9/	ITM-0122640 NAME PLATE INSPECTION IT

NOTES:

1. WEIGHT PUMP UNIT INSTALLATION TOOL SIMPLIFIED
   DRY WEIGHT:
   PU IT SIMP. #1 (SERIAL NUMBER. 14145): 3358.7 kg
   PU IT SIMP. #2 (SERIAL NUMBER. 14146): 3354.7 kg

   A0-050-PJG-310-31300X, MONTHLY WEIGHT REPORT.

   COG: STATED ON VIEWS

2. INTERFACES SEE SHEET 2

3. LASHING POINTS FOR TRANSPORT 10 PCS.

4. LIFTING SLINGS SHOWN FOR INFO

5. MARKING AND COLOURS
   COLOUR STRUCTURE : YELLOW RAL 1004
   COLOUR LIFTING POINT : ORANGE RAL 2004
   COLOUR ROV INTERFACE: ORANGE RAL 2004
   COLOUR MARKING : BLACK TEXT ON
   YELLOW BACKGROUND
   MARKING, ROV : CUT IN PLATE OR LABELS
   W/MIN 50 MM HEIGHT

Rev	Date	Status	Revision Memo	Issued by	Checked by	Approved by
03	22/01/2015	ABB	As Built	KJE	GSA	MGI
02	12/12/2014	AFC	Accepted for Construction	KJE	GSA	MGI
01	29/10/2014	IFA	Issued for acceptance	KJE	TTI	MGI
00	04/09/2013	IFR	Issued for review	KJE	GSA	MGI

TOTAL E&P ANGOLA

PUMP UNIT
INSTALLATION TOOL SIMPLIFIED
GA / INTERFACE DRAWING

Doc Type : GEA	System/Unit: 04	Discipline : MPP	Electronic Filename: AO-050-GMP-310-002254-rev03
COMPANY Document N°	AO-050-GMP-310-002254	REV : 03	Scale : NA / Phase : DE
CONTRACTOR/Original Document N°	ITM-0128125/D	Format : A1	Folio : 1 of 2 / Class : 1

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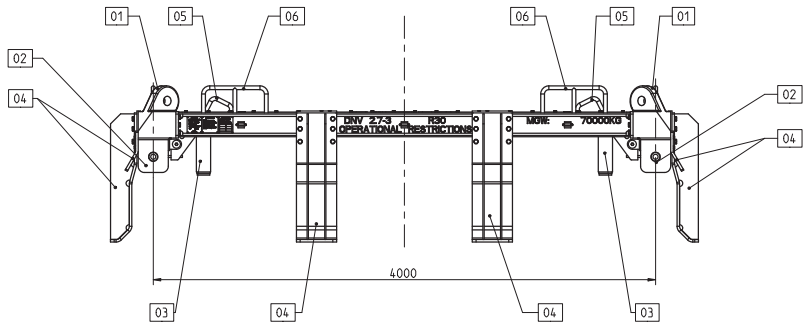
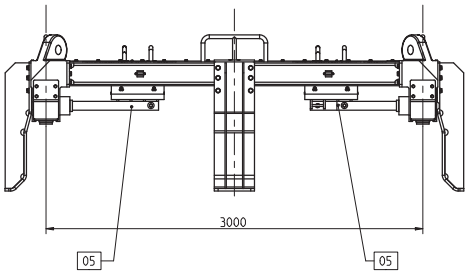
Title	PUMP UNIT INSTALLATION TOOL SIMPLIFIED-GA\INTERFACE DRAWING	Weight SEE NOTES
ID	ITM-0128125	Scale 1:20
Format	A1	Sheet 1 of 2

Revision Status	Published	Made by	Checked by	Approved by
D Released	2015-01-26 08:41:14 KJE	KJE	GSA	MGI

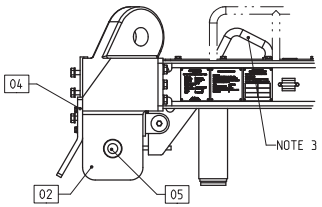
Engineering Change Order: ECN-002902

TOTAL E&P ANGOLA - CIRRI PROJECT - AO-050-GMP-310-000324 REV 02 - AFC - 20 - APR - 2015

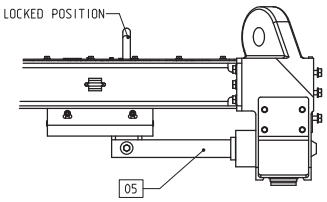




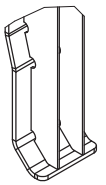
DETAIL LOCKING MECHANISM
FRONT VIEW
SCALE 1:10

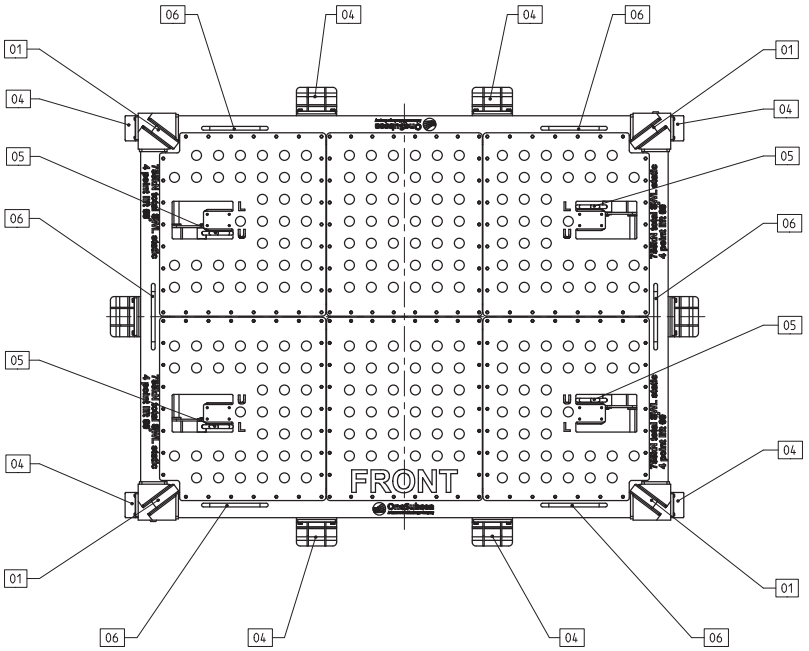


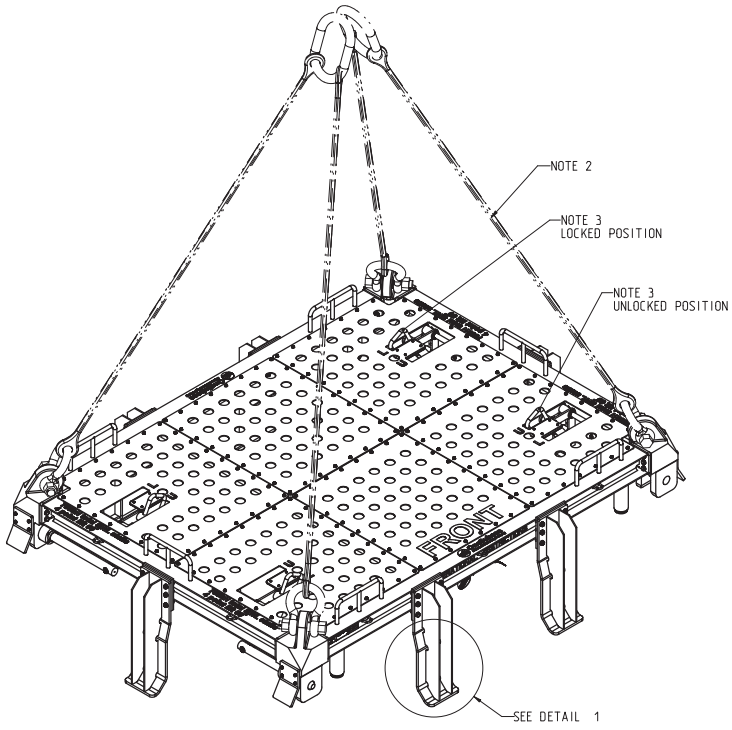
DETAIL LOCKING MECHANISM
SIDE VIEW
SCALE 1:10



DETAIL 1
TYPICAL SEAFASTENING
SCALE 1:10







3D VIEW
SCALE 1:20

INTERFACES:

NO.	TO	DESCRIPTION
01	ROV	PAD EYE FOR LIFTING SLINGS.
02	ROV	LIFTING EYES TO FIT PAD EYES ON PUMP UNIT
03	ROV	4X LANDING FEETS TOWARDS PUMP UNIT
04	ROV	GUIDING BRACKETS AND LANDING FEETS
05	ROV	LOCKING MECHANISM FOR PUMP UNIT
06	ROV	GRABBER BARS

NOTES:

1. WEIGHTS AND REFERENCES SEE SHEET 1.
2. LIFTING SLINGS SHOWN FOR INFO
3. WEIGHT ON HANDLE ENSURE IT STAYS IN CHOSEN POSITION

Rev	Date	Status	Revision Memo	Issued by	Checked by	Approved by
03	22/01/2015	ASB	As Built	KJE	GSA	MGI
02	12/12/2014	AFC	Accepted for Construction	KJE	GSA	MGI
01	29/10/2014	IFA	Issued for acceptance	KJE	TTI	MGI
00	04/09/2013	IFR	Issued for review	KJE	GSA	MGI

TOTAL E&P ANGOLA

OneSubsea
A Cameron & Schlumberger Company

PUMP UNIT
INSTALLATION TOOL SIMPLIFIED
GA / INTERFACE DRAWING

Doc Type : GEA	System/Unit: 04	Discipline : MPP	Electronic Filename: AO-050-GMP-310-002254-rev03
COMPANY Document N°	AO-050-GMP-310-002254	REV : 03	Scale : NA / Phase : DE
CONTRACTOR/Original Document N°	ITM-0128125/D	Format : A1 / Folio : 2 of 2	Class : 1

OneSubsea
A Cameron & Schlumberger Company

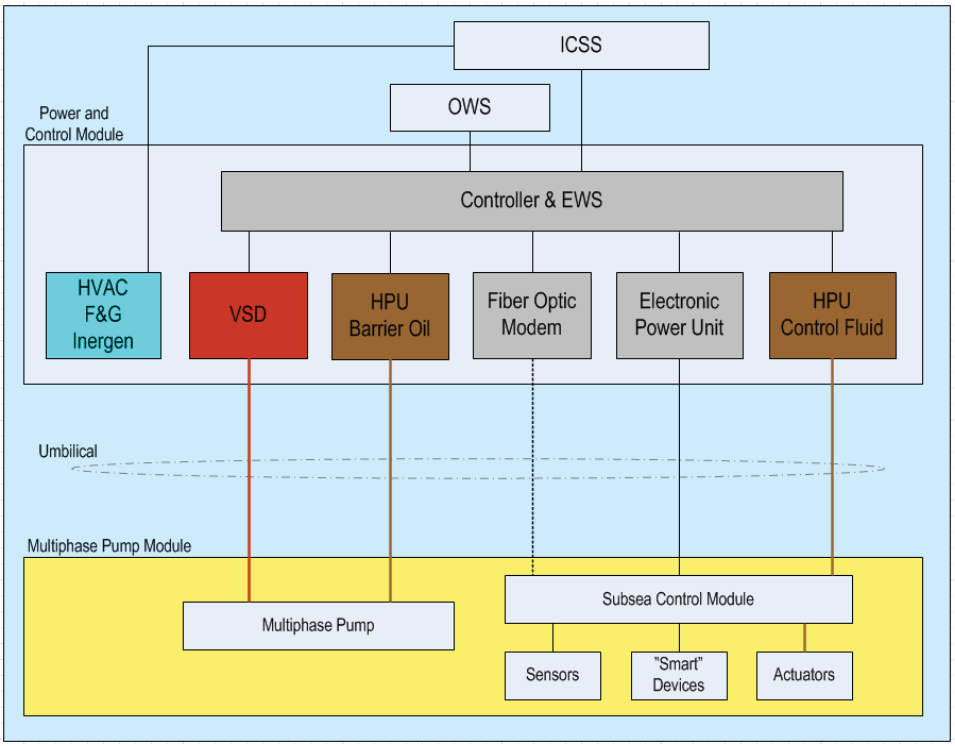
Title	PUMP UNIT INSTALLATION TOOL SIMPLIFIED-GA\INTERFACE DRAWING
Weight	SEE NOTES
ID	ITM-0128125
Scale	1:20
Format	A1
Sheet	2 of 2

Revision Status	Published	Made by	Checked by	Approved by
D Released	2015-01-26 08:41:14	KJE	GSA	MGI

Engineering Change Order: ECN-002902

TOTAL E&P ANGOLA - GIRRI PROJECT - AO-050-GMP-310-000324 REV 02 - AFC - 20 - APR - 2015

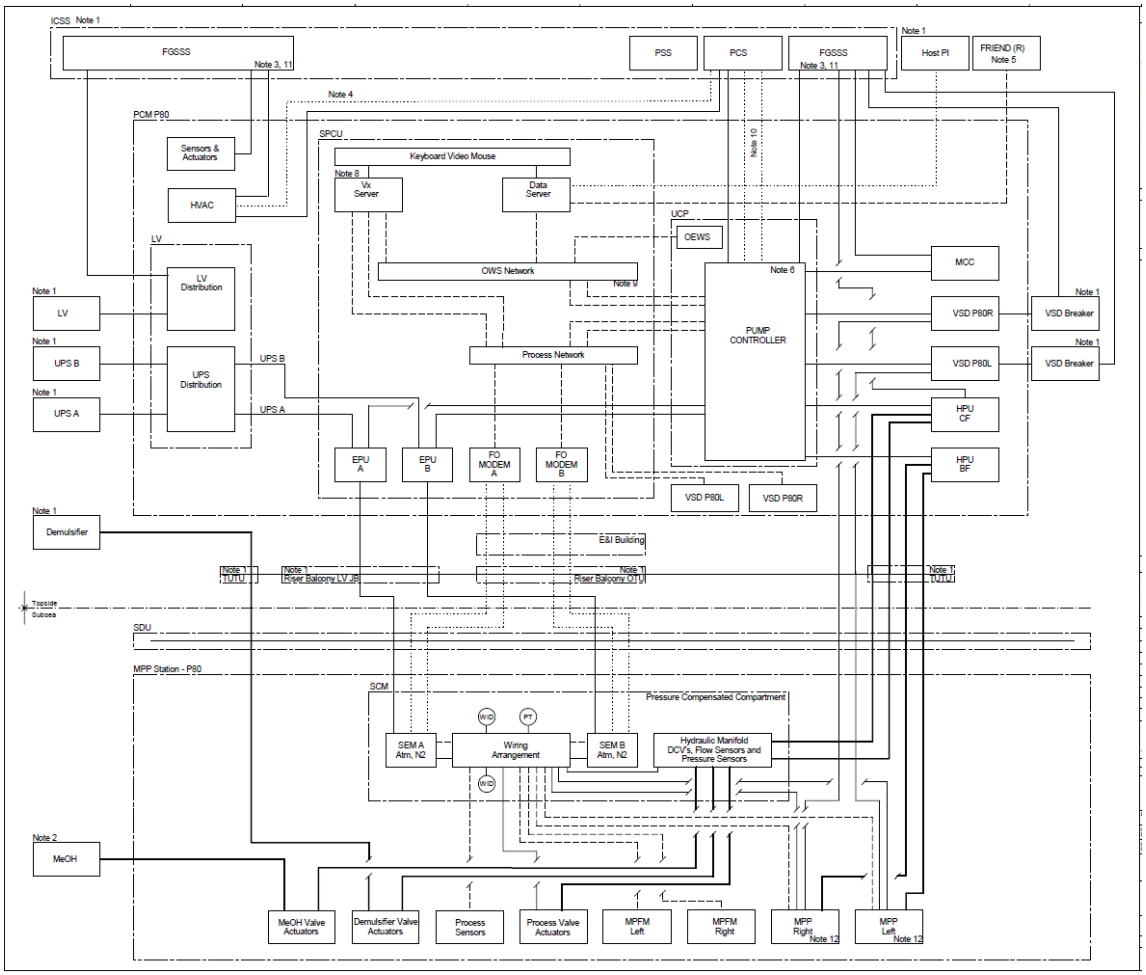
16 Control system



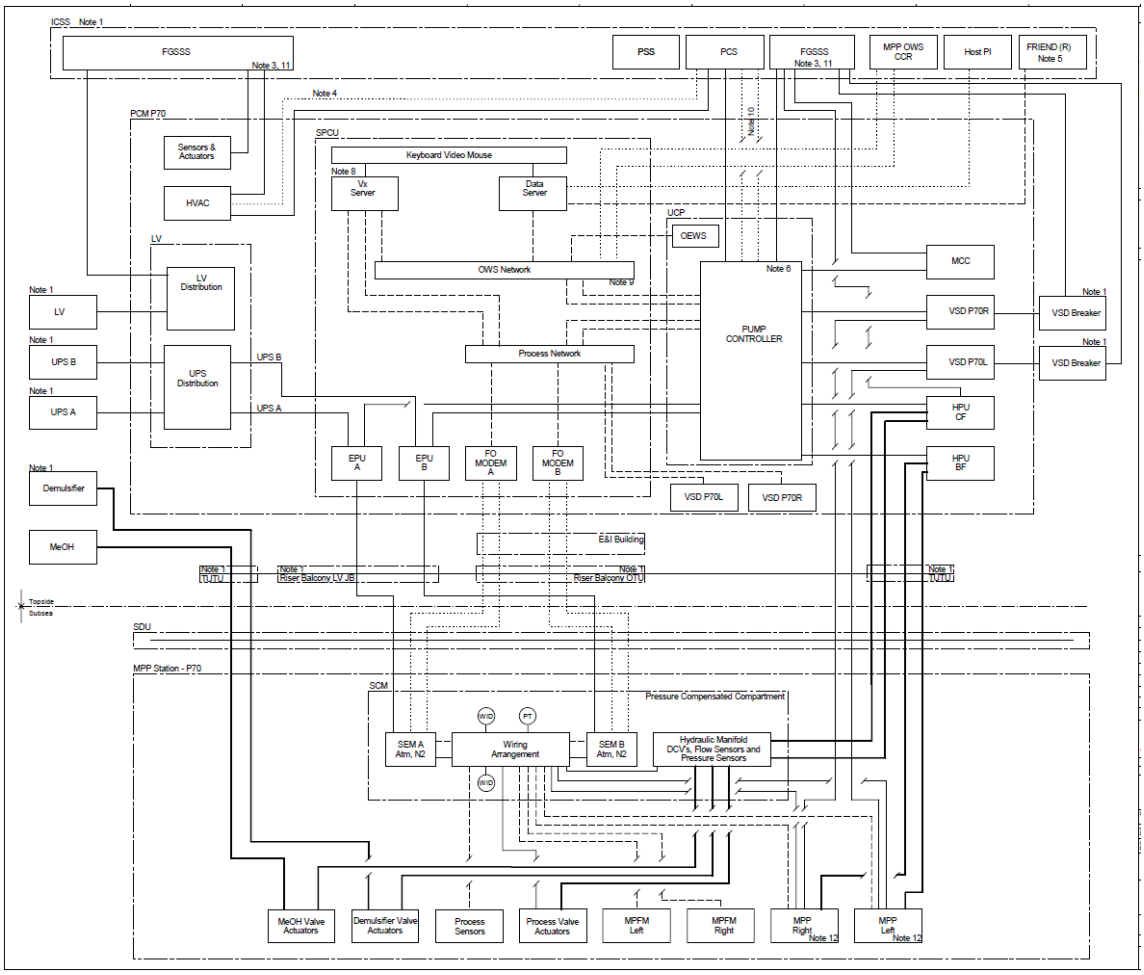
16.1 Control system reference lists

Ref	Document title	COMPANY Doc. No	MPP CON Doc. No
/79/	Control System Requirements	AO-050-GSG-310-000066	DOC-0007952
/80/	Control System Block Diagram	AO-050-GSG-310-000068	DRW-0000851
/81/	Control System Network Topology	AO-050-GSG-310-000072	DRW-0000849
/82/	Control System Operator Work Station (OWS) Network Topology	AO-050-PJG-310-001287	DRW-0002555
/83/	Subsea Control System Power Supply - Single Line Diagram	AO-050-GSG-310-000190	DRW-0001704
/84/	Subsea Control System Fiber Optic (FO) Communication Single Line Diagram	AO-050-GSG-310-000461	DRW-0002094
/85/	SCM - SPCU FO Connection Diagram	AO-050-GSG-310-000604	DRW-0002108
/86/	SCM - SPCU LV Connection Diagram	AO-050-GSG-310-000474	DRW-0002105
/87/	Cause and Effect (C&E) Diagrams	AO-050-PJG-310-000613	DOC-0023010
/88/	Control System Subsea CANBus Layout	AO-050-GSG-310-000071	DRW-0000850
/89/	Subsea Signal Jumper Layout	AO-050-GSG-310-000045	DRW-0000852
/90/	MPP Barrier Fluid Schematic	AO-050-GMP-310-000089	DRW-0000885
/91/	Control Fluid – System Schematic	AO-050-GSG-310-000092	DRW-0000884
/92/	Barrier Fluid – System Layout Schematic	AO-050-GMP-310-000093	DRW-0000883
/93/	Demulsifier and MeOH Distribution Schematic	AO-050-GSL-310-000088	DRW-0001197

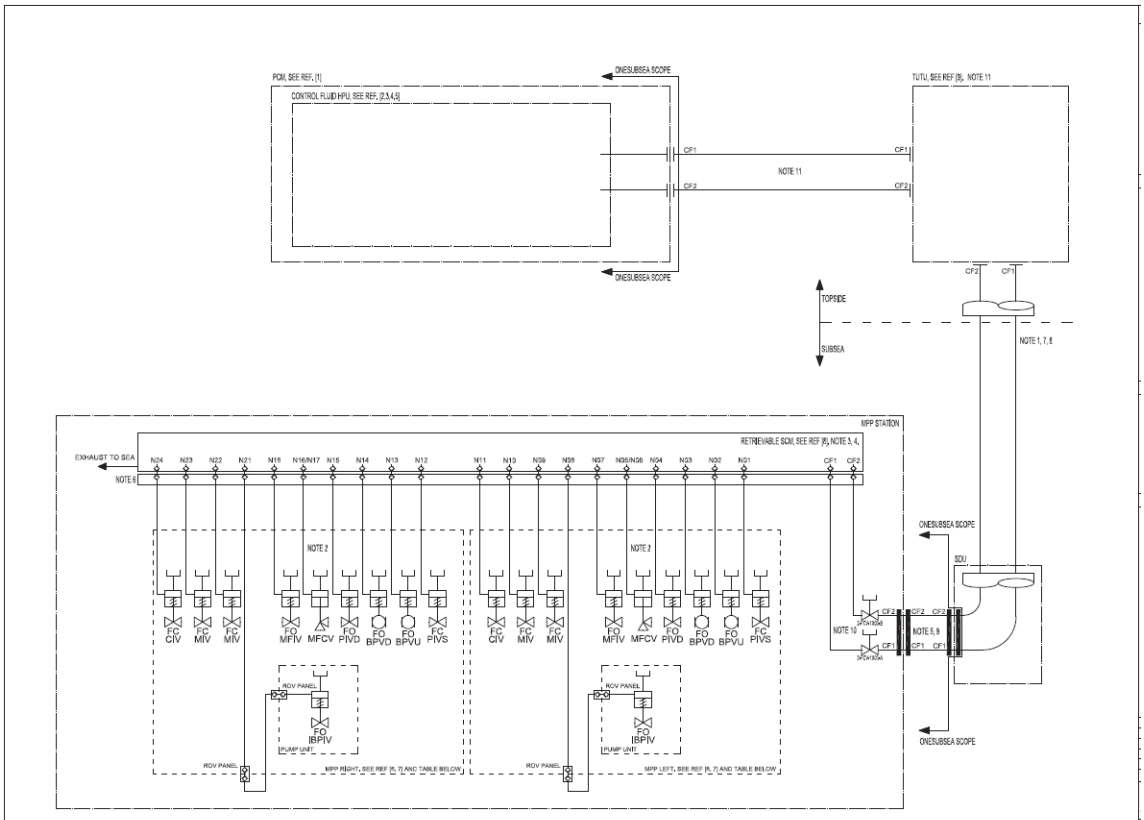
16.2 Block diagram P70



16.3 Block diagram P80



16.4 Control fluid schematic



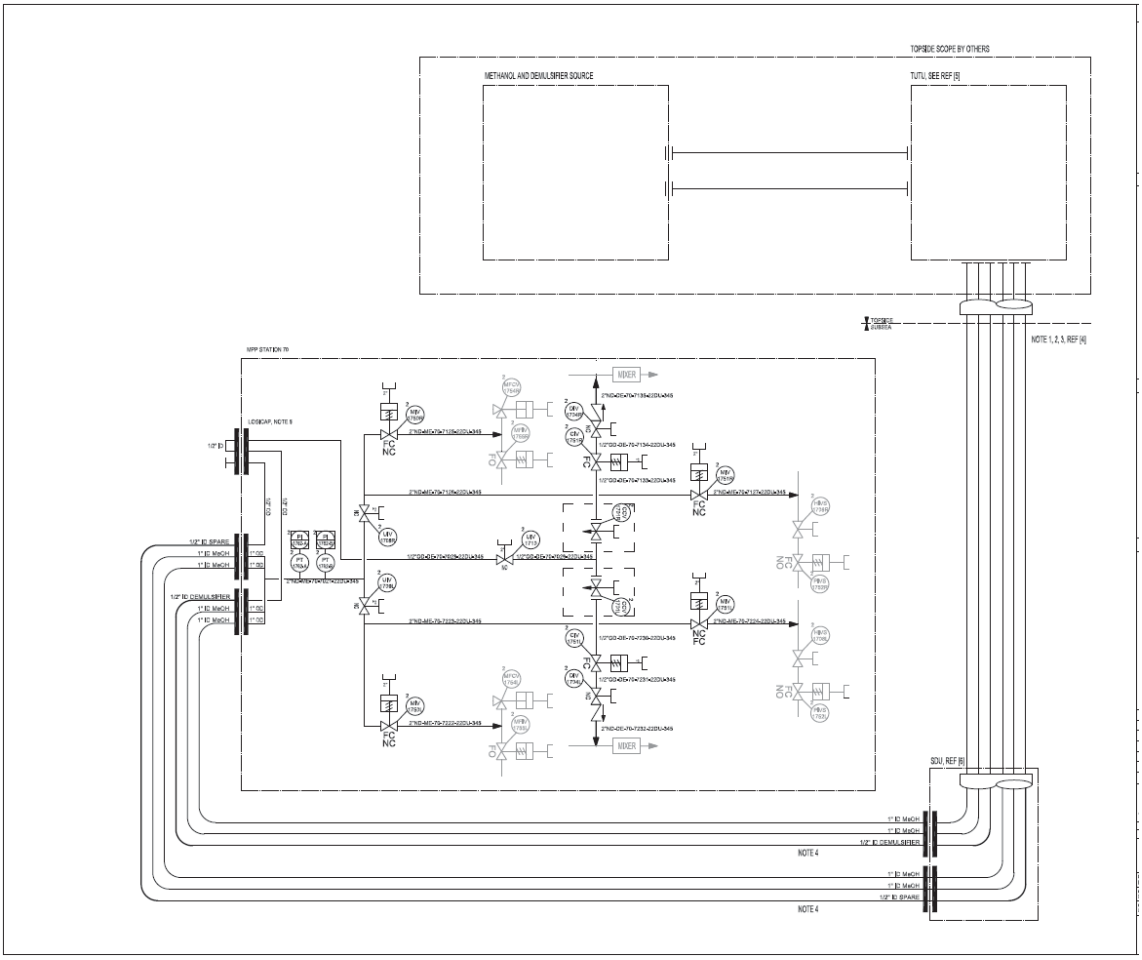
SCM NOZZLE	N01	N02	N03	N04	N05	N06	N07	N08	N09	N10	N11	N12	N13	N14	N15	N16	N17	N18	N21	N22	N23	N24	CF1	CF2
VALVE TAG	24PIVS-1X52L	24BPVU-1X53L	24BPVD-1X51L	24PIVD-1X53L	24MFCV-1X54L OPEN	24MFCV-1X54L CLOSE	24MPIV-1X55L	24BPIV-1X57L	34MIV-1X50L	34MIV-1X51L	2-CIV-1X51L	24PIVS-1X52R	24BPVU-1X55R	24BPVD-1X51R	24PIVD-1X53R	24MFCV-1X54R OPEN	24MFCV-1X54R CLOSE	24MPIV-1X55R	24BPIV-1X56R	34MIV-1X53R	34MIV-1X51R	3-CIV-1X51R		
VALVE FUNCTION	MPP INLET	MPP BYPASS	MPP BYPASS	MPP OUTLET	CHOKE OPEN	CHOKE CLOSE	MINIMUM FLOW ISOLATION VALVE	INTEGRATED BY-PASS LINE	MeOH INJECTION POINT	MeOH INJECTION POINT	DEMULSIFIER INJECTION POINT	MPP INLET	MPP BYPASS	MPP BYPASS	MPP OUTLET	CHOKE OPEN	CHOKE CLOSE	MINIMUM FLOW ISOLATION VALVE	INTEGRATED BY-PASS LINE	MeOH INJECTION POINT	MeOH INJECTION POINT	DEMULSIFIER INJECTION POINT	CONTROL FLUID SUPPLY 1	CONTROL FLUID SUPPLY 2
MWP	314 barg	314 barg	314 barg	314 barg	314 barg	314 barg	314 barg	314 barg	314 barg	314 barg	314 barg	314 barg	314 barg	314 barg	314 barg	314 barg	314 barg	314 barg	314 barg	314 barg	314 barg	314 barg	314 barg	314 barg

16.5 Control fluid data

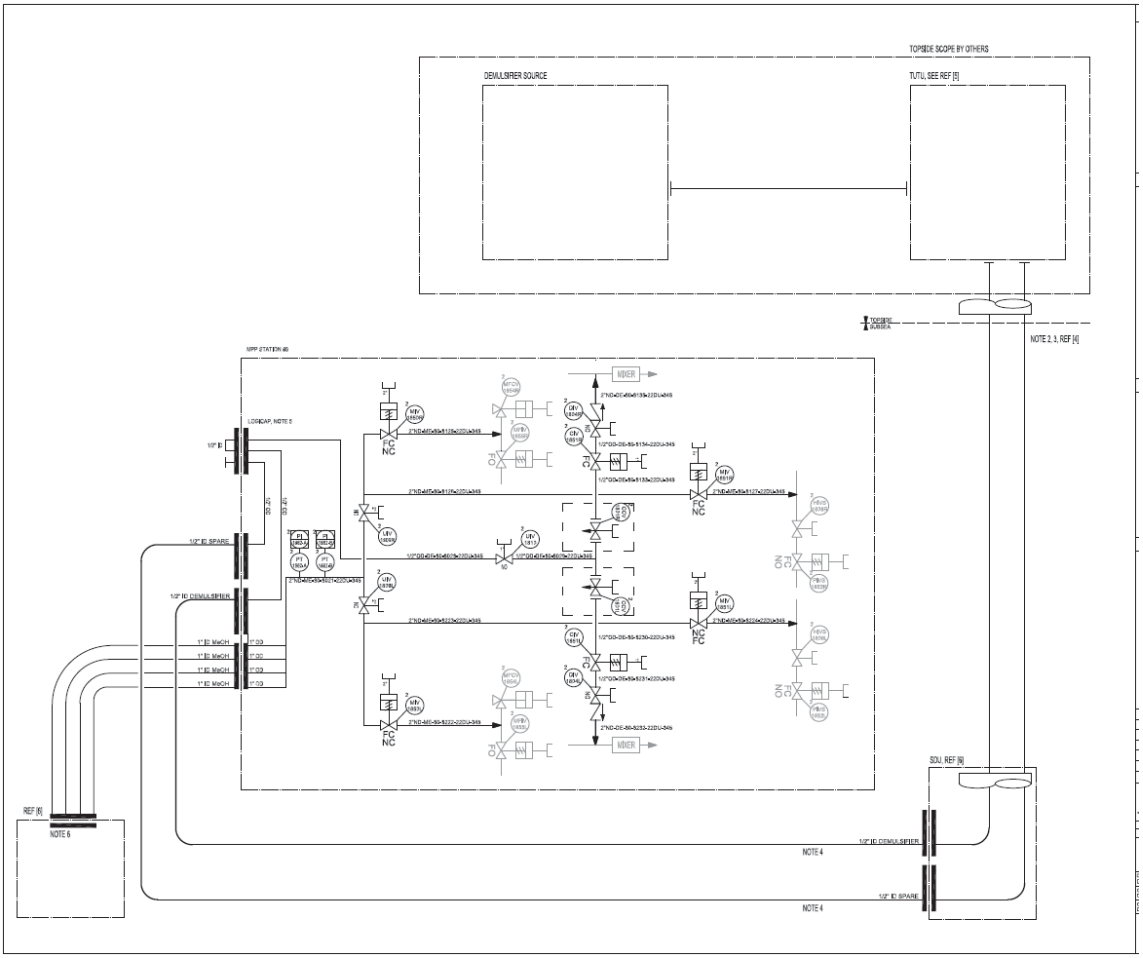
Control fluid is supplied from the PCM Control Fluid HPU, through the Topside Umbilical Termination Unit and subsea through the MPP umbilical. Further, control fluid is transferred from the subsea Umbilical Termination Assembly to the SCM mounting base located on the MPP Module. This interface is via single hydraulic jumpers and tubing. The SCM distributes the control fluid to the actuated valves and chokes on the MPP module through control fluid tubing.

Description		**MacDermid Oceanic HW443**
Appearance		Clear Fluorescent Yellow Green Fluid
pH		9.7
Specific Gravity @ 15.6°C		1.07
Kinematic viscosity at:		
	÷20°C	25.0 cSt
	0°C	9.2 cSt
	40°C	2.5 cSt
Max & min operating temperature		-25°C - +145°C
Pour Point		-25°C
SAE AS 4059		6B-F or better
Designed for use:		Open and closed loop subsea production control systems

16.6 Chemical fluid schematic P70

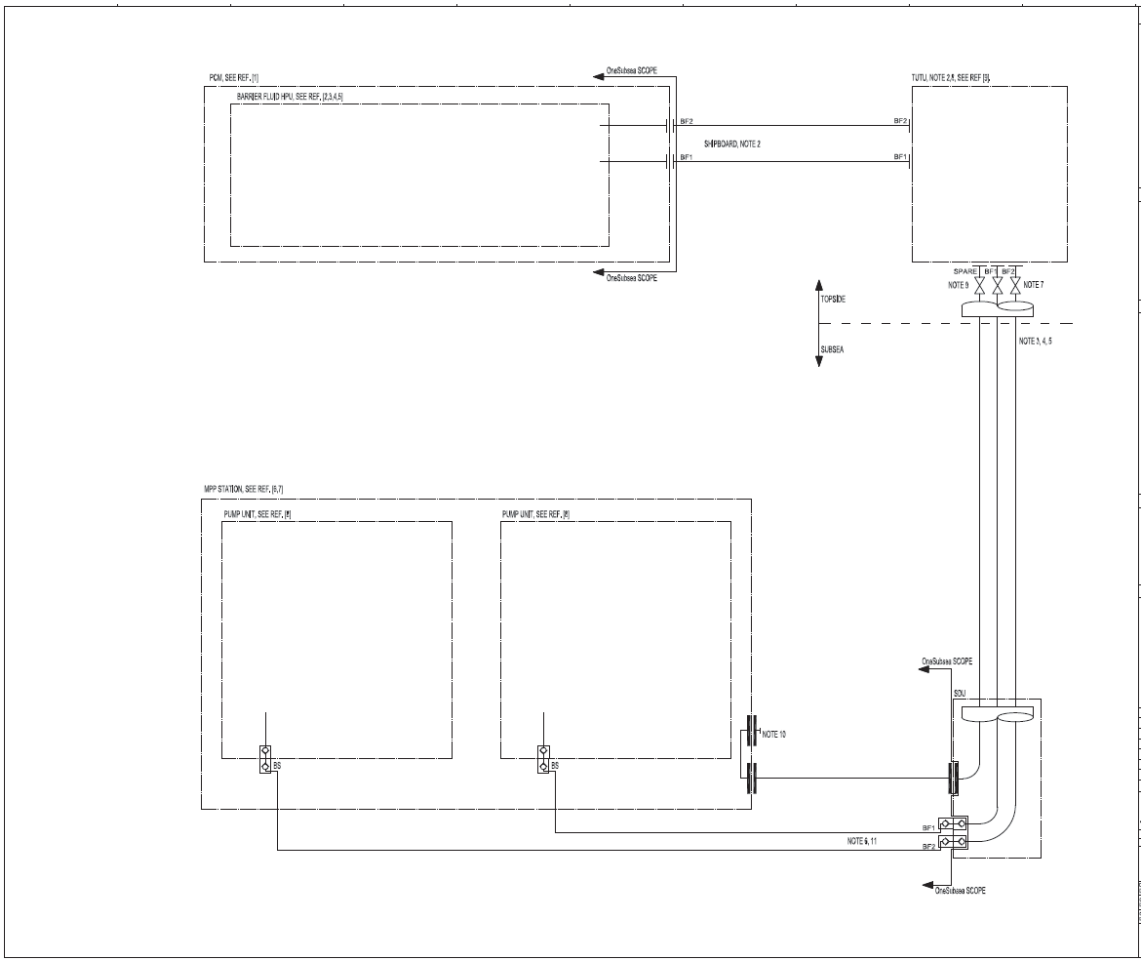


16.7 Chemical fluid schematic P80



17 Barrier system

17.1 Barrier fluid schematics

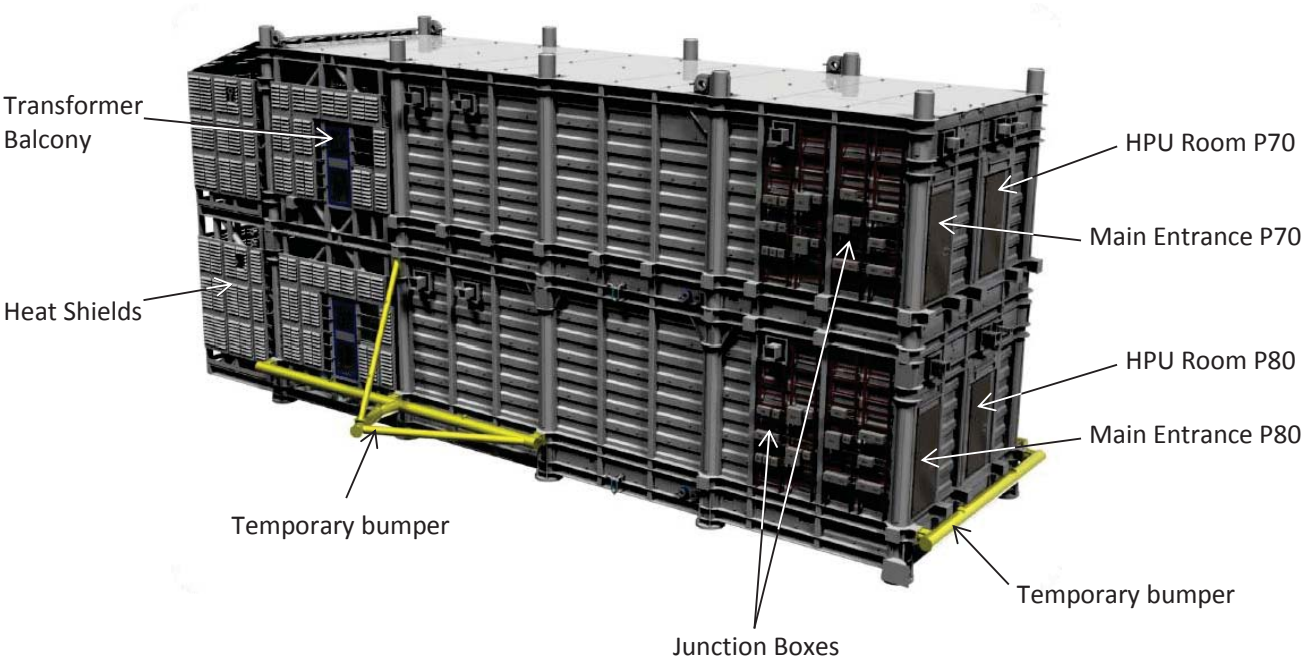


17.2 Barrier fluid data

Description		Data
Oil type		Shell Morlina S2 BL5
Bulk modulus		1.7 GPa
Thermal expansion coefficient		0.0007 1/°C
Specific Gravity @ 15.6°C		0.870
Flash point		120°C
Kinematic viscosity at:		
	4°C	17 cSt
	40°C	5 cSt
SAE AS 4059		6B-F or better
Maximum water content		Water content requirement of 50 ppm

18 PCM

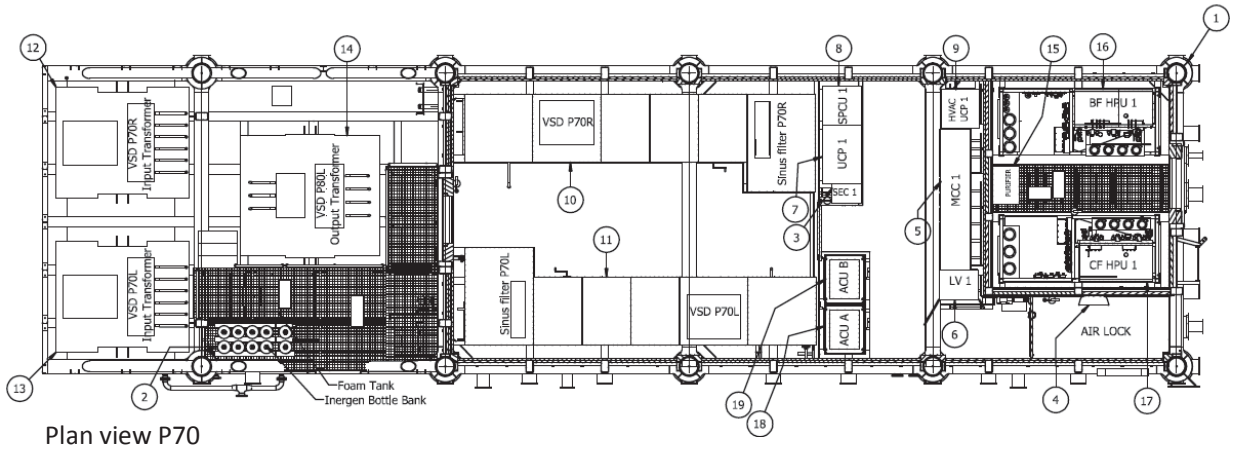
PCM details are described in PCM Equipment Manual, ref. /97/.



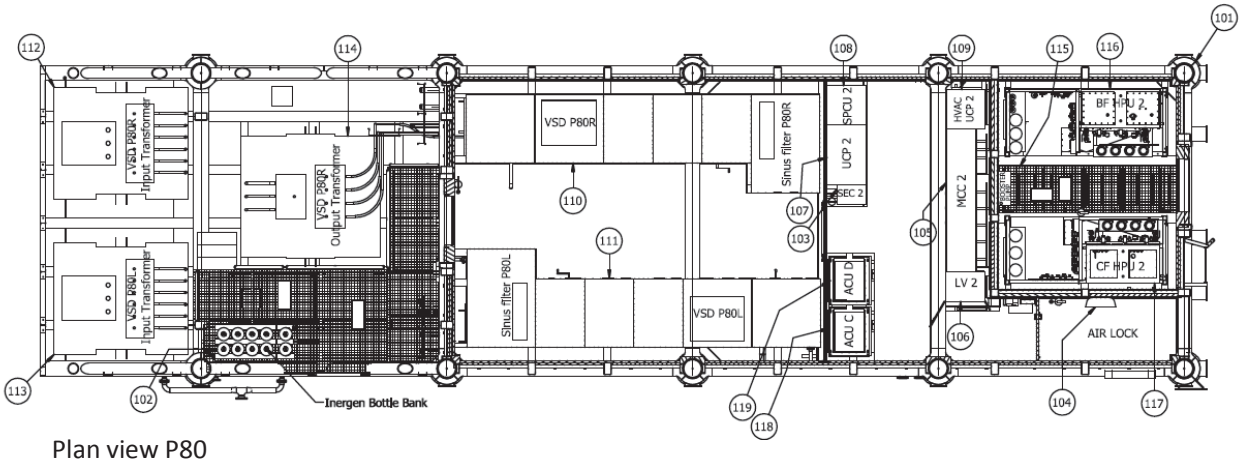
18.1 PCM reference list

Ref	Document title	COMPANY Doc. No	MPP CON Doc. No
/94/	PCM General Arrangement External Layout	AO-050-GTO-311-000180	DOC-0010194
/95/	PCM General Arrangement Internal Layout	AO-050-GTO-311-000177	DOC-0010191
/96/	PCM - Safety Plot Plan	AO-050-GTO-310-000006	DRW-0001166
/97/	PCM P70 And P80 Equipment Manual	AO-050-GTO-310-002275	DOC-0062447
/98/	PCM P70 And P80 Penetration Arrangement	AO-050-GTO-311-000301	DOC-0020853
/99/	PCM MCT Schedule	AO-050-PJG-310-001475	DOC-0040235
/100/	Topside Equipment Tag List	AO-050-GTO-310-000159	DOC-0019727

18.2 PCM internal



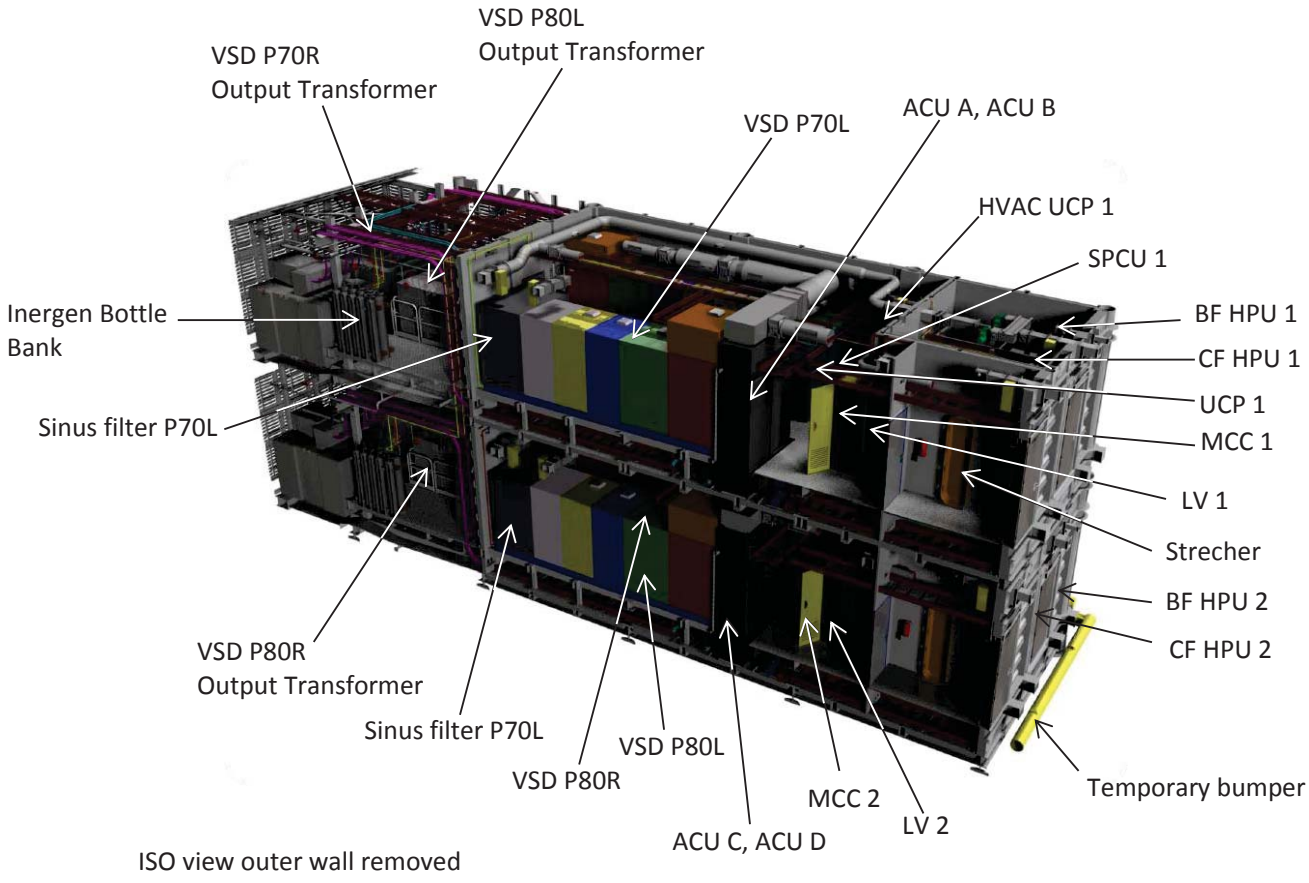
Plan view P70



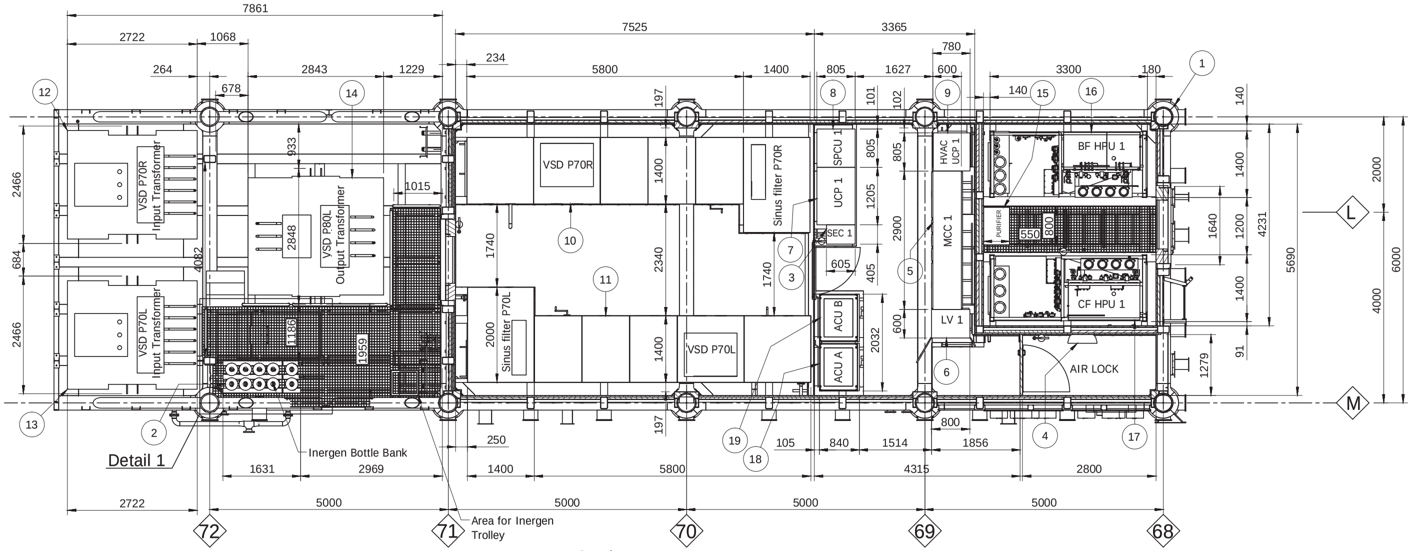
Plan view P80

P70 PCM Equipment	
Item	Service Description
1	PCM P70
2	Inergen Bottlebank
3	Safety Equipment Cabinet
4	Stretcher
5	MCC 1
6	LV 1
7	SPCU 1
8	UCP 1
9	HVAC UCP 1
10	VSD P70R
11	VSD P70L
12	VSD P70R Input Transformer
13	VSD P70L Input Transformer
14	VSD P80L Output Transformer
15	Barrier Fluid Purifier
16	Barrier Fluid HPU
17	Control Fluid HPU
18	ACU A
19	ACU B

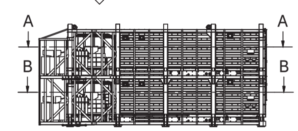
P80 PCM Equipment	
Item	Service Description
101	PCM P80
102	Inergen Bottlebank
103	Safety Equipment Cabinet
104	Stretcher
105	MCC 2
106	LV 2
107	SPCU 2
108	UCP 2
109	HVAC UCP 2
110	VSD P80R
111	VSD P80L
112	VSD P80R Input Transformer
113	VSD P80L Input Transformer
114	VSD P80R Output Transformer
115	Barrier Fluid Nitrogen Booster Pump
116	Barrier Fluid HPU
117	Control Fluid HPU
118	ACU C
119	ACU D



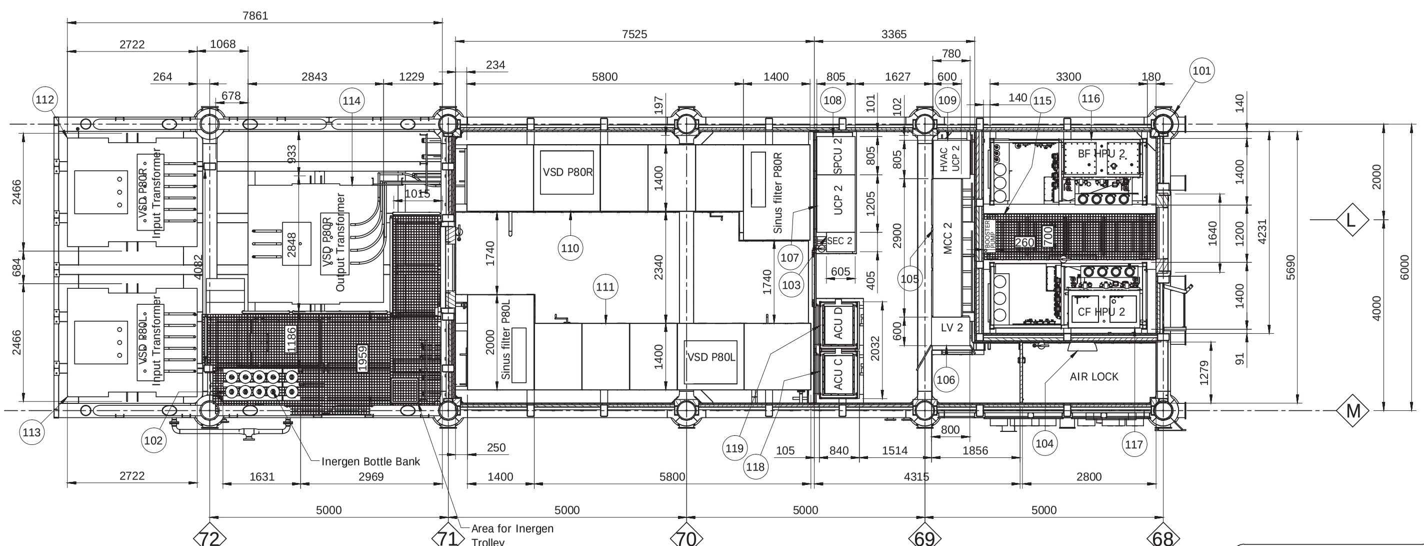
18.3 PCM internal assembly drawing



Section A-A
PLAN VIEW PCM P70



West Elevation (1: 250)



Section B-B
PLAN VIEW PCM P80

General Tolerances:
Tolerances shall be in accordance to Total spec: GS EP STR 301, Ch. 14.

NOTES:

P70 PCM Equipment

Item	Service Description	Area Code	Equipment Class	Section Code	Seq.	Equipment Tag
1	PCM P70	41	UA	0	20	41-UA0-20
2	Inergen Bottlebank	41	JF	9	701	41-JF-9701
3	Safety Equipment Cabinet	41	UB	9	701	41-UB-9701
4	Stretcher	41	UB	9	702	41-UB-9702
5	MCC 1	41	PD	9	701	41-PD-9701
6	LV 1	41	PD	9	702	41-PD-9702
7	SPCU 1	41	AM	SPCU	P70	41-AM-SPCU-P70
8	UCP 1	41	AM	UCP	P70	41-AM-UCP-P70
9	HVAC UCP 1	41	AM	HVAC	P70	41-AM-HVAC-P70
10	VSD P70R	41	ZC	9	701	41-ZC-9701
11	VSD P70L	41	ZC	9	702	41-ZC-9702
12	VSD P70R Input Transformer	41	PB	9	701	41-PB-9701
13	VSD P70L Input Transformer	41	PB	9	702	41-PB-9702
14	VSD P80L Output Transformer	41	PB	9	703	41-PB-9703
15	Barrier Fluid Purifier	41	EC	9	701	41-EC-9701
16	Barrier Fluid HPU	41	UB	9	701	41-UB-9701
17	Control Fluid HPU	41	UB	9	710	41-UB-9710
18	ACU A	41	UB	08	701	41-UB-08701
19	ACU B	41	UB	08	702	41-UB-08702

P80 PCM Equipment

Item	Service Description	Area Code	Equipment Class	Section Code	Seq.	Equipment Tag
101	PCM P80	41	UA	0	30	41-UA0-30
102	Inergen Bottlebank	41	JF	9	801	41-JF-9801
103	Safety Equipment Cabinet	41	UB	9	801	41-UB-9801
104	Stretcher	41	UB	9	802	41-UB-9802
105	MCC 2	41	PD	9	801	41-PD-9801
106	LV 2	41	PD	9	802	41-PD-9802
107	SPCU 2	41	AM	SPCU	P80	41-AM-SPCU-P80
108	UCP 2	41	AM	UCP	P80	41-AM-UCP-P80
109	HVAC UCP 2	41	AM	HVAC	P80	41-AM-HVAC-P80
110	VSD P80R	41	ZC	9	801	41-ZC-9801
111	VSD P80L	41	ZC	9	802	41-ZC-9802
112	VSD P80R Input Transformer	41	PB	9	801	41-PB-9801
113	VSD P80L Input Transformer	41	PB	9	802	41-PB-9802
114	VSD P80R Output Transformer	41	PB	9	803	41-PB-9803
115	Barrier Fluid Nitrogen Booster Pump	41	KB	9	801	41-KB-9801
116	Barrier Fluid HPU	41	UB	9	801	41-UB-9801
117	Control Fluid HPU	41	UB	9	810	41-UB-9810
118	ACU C	41	UB	08	801	41-UB-08801
119	ACU D	41	UB	08	802	41-UB-08802

Abbreviation	
ACU	- Air Conditioning Unit
BF	- Barrier Fluid
CF	- Control Fluid
HPU	- Hydraulic Power Unit
LV	- Low voltage
MCC	- Motor Control Center
HVAC UCP	- Heating, Ventilation and Air Condition Unit Control Panel
PCM	- Pump Control Module
SEC	- Safety Equipment Cabinet
SPCU	- Subsea Power and Communication Unit
UCP	- Unit Control Panel
VSD	- Variable Speed Drive

REFERENCES

DOC. NO:	-
AO-050-GTO-311-000178	PCM - P70 AND P80 INTERNAL LAYOUT SECTIONS
AO-05-GTO-311-000180	PCM - P70 AND P80 - GENERAL ARRANGEMENT EXTERNAL

Revision	Date	Status	Revision Memo	Issued by	Checked by	Approved by
05	09-JAN-2015	ASB	AS BUILT	DK	KM	JL
04	14-JUN-2013	AFC	ACCEPTED FOR CONSTRUCTION	DK	KM	JL
03	18-APR-2013	AFC	ACCEPTED FOR CONSTRUCTION	DK	KM	JL
02	31-OCT-2012	AFC	ACCEPTED FOR CONSTRUCTION	DK	KM	JL
01	29-FEB-2012	IFA	ISSUED FOR APPROVAL	DK	KM	
00	09-JAN-2012	IFR	ISSUED FOR REVIEW	KM	JL	

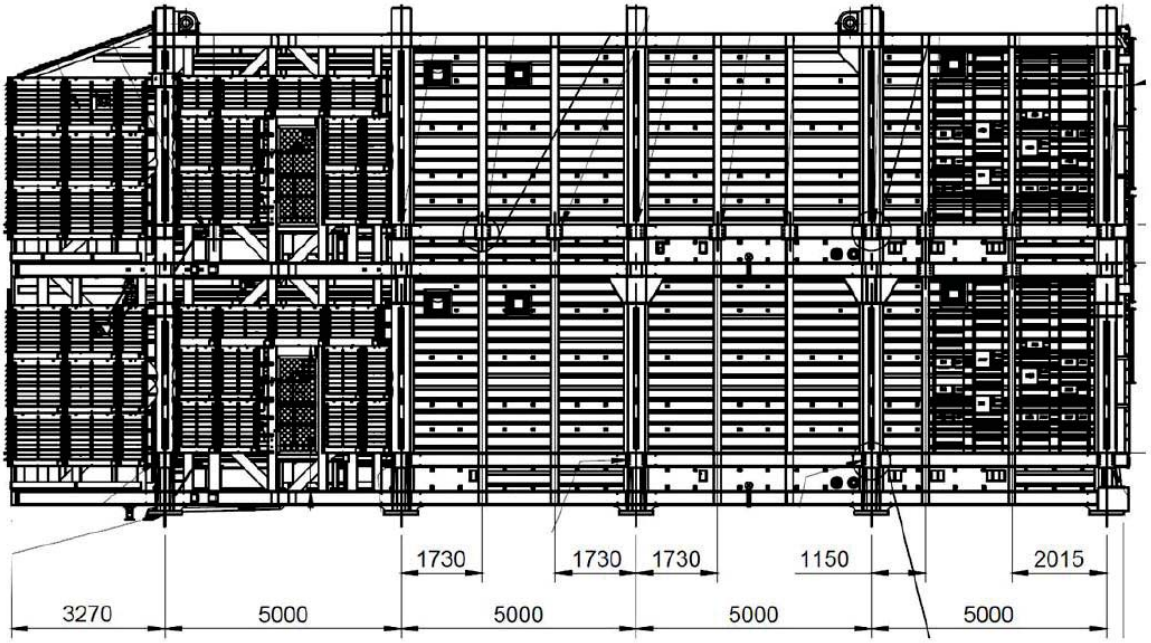
TOTAL E&P ANGOLA

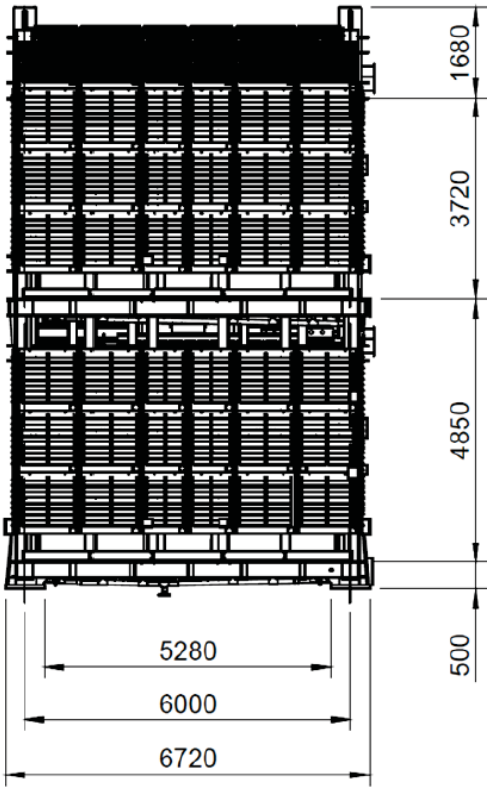
FRAMO ENGINEERING
A Schlumberger Company

PCM P70 AND P80
INTERNAL LAYOUT PLAN VIEW

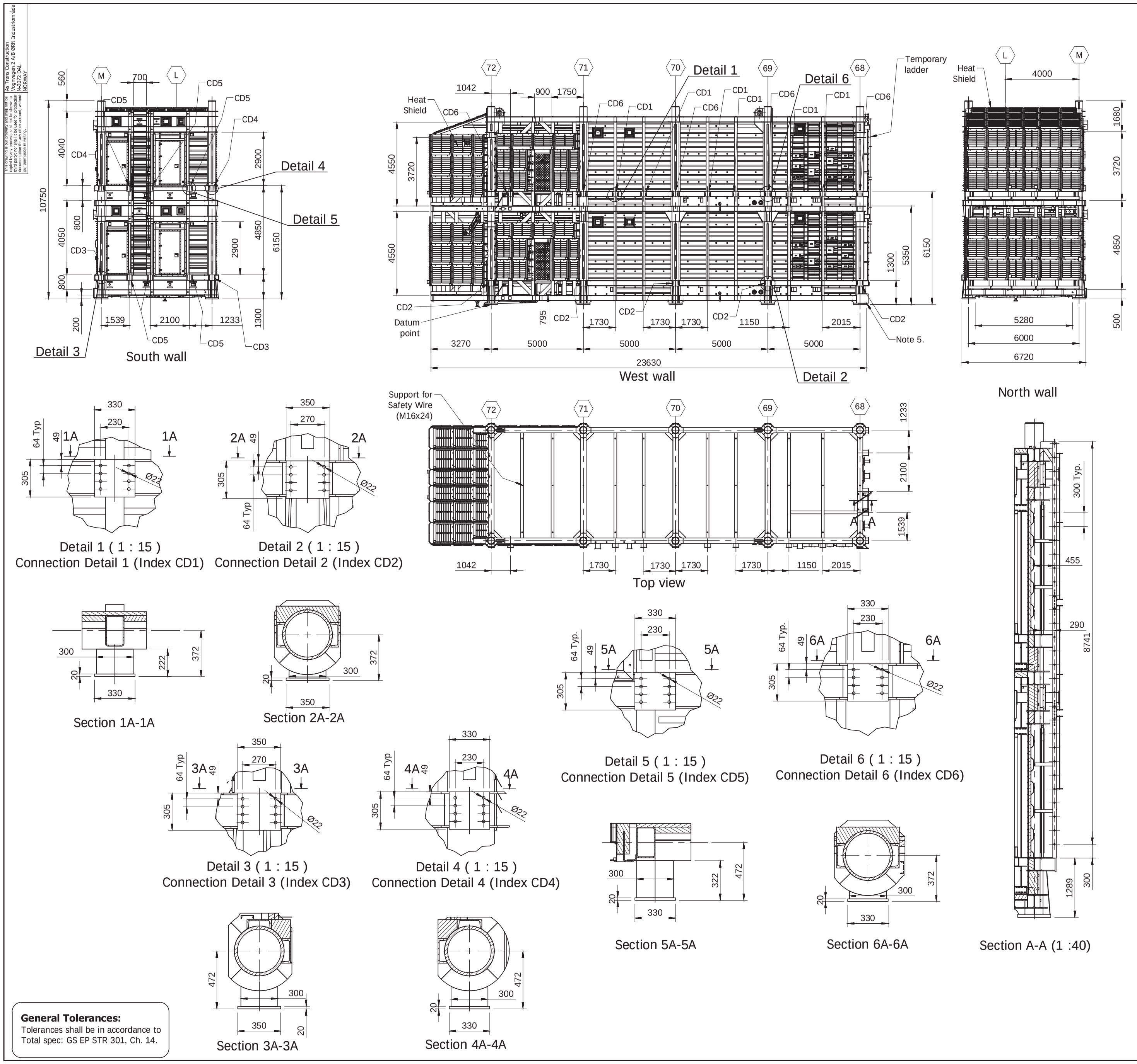
Doc Type : LAY	System/Unit: 83	Discipline : STR	Electronic Filename AO-050-GTO-311-000177_rev05.pdf	
COMPANY Document N°	AO-050-GTO-311-000177	REV : 05	Scale : 1:50	Phase : DE
Contractor/Original Document N° DOC-0010191	Supplier Ref. 2197-03-C-XE-0002-01_03F	Format : A1	Folio : 1 of 1	Class : 1

18.4 PCM external





18.5 PCM external assembly drawing



General Tolerances:
Tolerances shall be in accordance to Total spec: GS EP STR 301, Ch. 14.

NOTES:

1. The base plates are part of the PCM structure

2. For interface loads see AO-050-GTO-311-000432

3. For material grades and category see doc. no: AO-050-GTO-311-000276 PCM - P70 AND P80 MATERIAL SCHEDULE.

4. External Ducting not shown.

5. For stopper details, see Bumper Arrangement: AO-050-GTO-311-000741

REFERENCES

DOC. NO:	-
AO-050-GTO-311-000177	PCM - P70 AND P80 INTERNAL LAYOUT PLAN VIEW
AO-050-GTO-311-000178	PCM - P70 AND P80 INTERNAL LAYOUT SECTIONS
AO-050-GTO-311-000181	PCM STACK - P70 AND P80 FOOTPRINT WITH DETAILS
AO-050-GTO-311-000183	PCM - P70 AND P80 STRUCTURAL INTERFACE BETWEEN P70 AND TLM
AO-050-GTO-311-000276	PCM P70 AND P80 MATERIAL SCHEDULE REPORT
AO-050-GTO-311-000432	PCM P70 AND P80 STRUCTURAL CALCULATION REPORT IN-PLACE
AO-050-GTO-311-000741	PCM P70 AND P80 BUMPER ARRANGEMENT
AO-050-GTO-311-000308	PCM P70 AND P80 HEAT SHIELD LAYOUT AND INSTALLATION

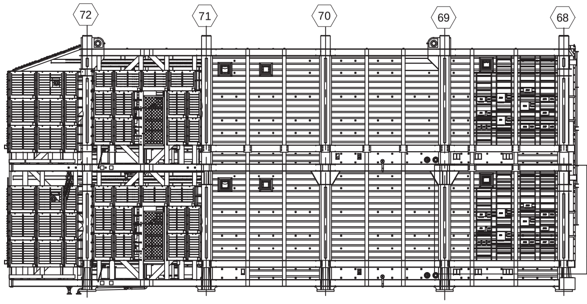
Revision	Date	Status	Revision Memo	Issued by	Checked by	Approved by
06	24-JUN-2014	ASB	AS BUILT	DK	KM	JL
05	13-DEC-2013	AFC	ACCEPTED FOR CONSTRUCTION	DK	KM	JL
04	18-APR-2013	AFC	ACCEPTED FOR CONSTRUCTION	DK	KM	JL
03	20-DEC-2012	AFC	ACCEPTED FOR CONSTRUCTION	MI	KM	JL
02	31-OCT-2012	AFC	ACCEPTED FOR CONSTRUCTION	DK	KM	JL
01	24-FEB-2012	IFA	ISSUED FOR APPROVAL	DK	KM	
00	09-JAN-2012	IFR	ISSUED FOR REVIEW	KM	JL	

TOTAL E&P ANGOLA

FRAMO ENGINEERING A Schlumberger Company

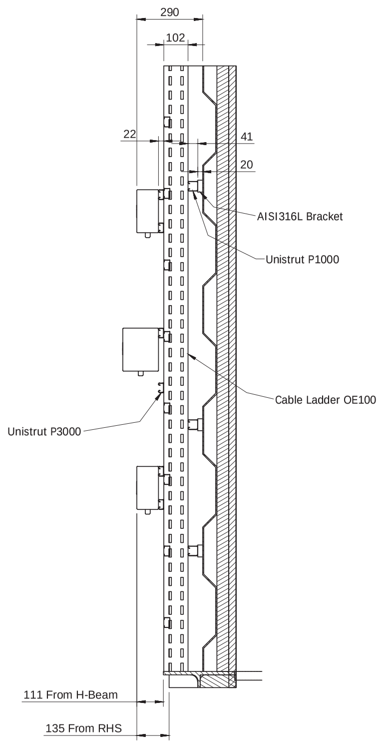
PCM P70 AND P80
GENERAL ARRANGEMENT EXTERNAL

Doc Type : GEA	System/Unit: 83	Discipline : STR	Electronic Filename AO-050-GTO-311-000180_rev06.pdf
COMPANY Document N°	AO-050-GTO-311-000180	REV : 06	Scale : 1:100 / Phase : DE
Contractor/Original Document N° DOC-0010194	Supplier Ref. 2197-03-N-XD-0002-01_05F	Format : A1	Folio : 1 of 2 / Class : 1

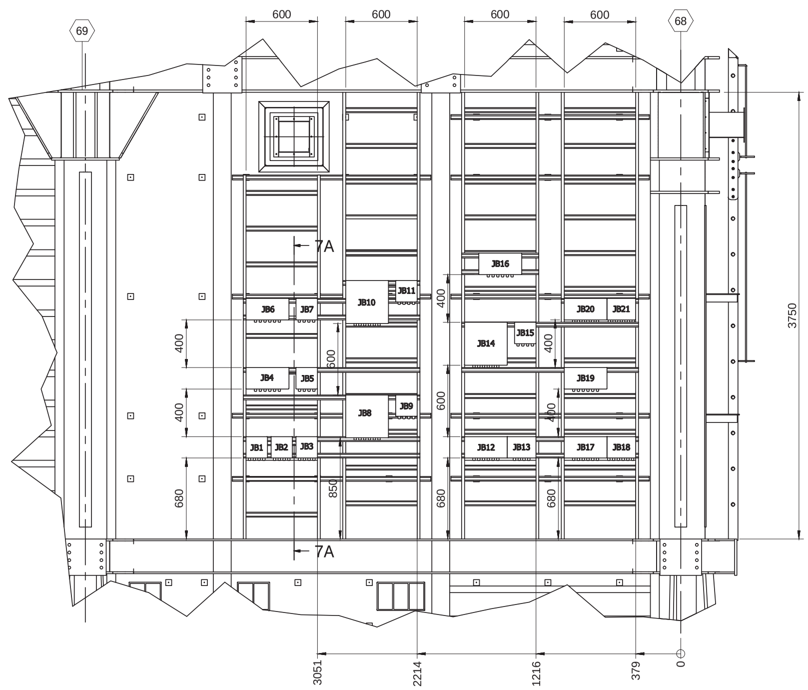


West Wall

P70 JB TABLE				P80 JB TABLE			
JUNCTION BOX ID	TYPE	DIMENSION	TAG NO.	JUNCTION BOX ID	TYPE	DIMENSION	TAG NO.
JB1	8125/.051	180x180x91	41BCO451	JB1	8125/.051	180x180x91	41BCO454
JB2	8125/.051	180x180x91	41BCO457	JB2	8125/.051	180x180x91	41BCO456
JB3	8125/.051	180x180x91	41BCO452	JB3	8125/.051	180x180x91	41BCO455
JB4	8125/.073	360x180x150	41BCI450	JB4	8125/.073	360x180x150	41BCI452
JB5	8125/.051	180x180x91	41BCI451	JB5	8125/.051	180x180x91	41BCI453
JB6	8125/.073	360x180x150	41BCO450	JB6	8125/.073	360x180x150	41BCO453
JB7	8125/.051	180x180x91	4QA0HW02	JB7	8125/.051	180x180x91	4QA0HW01
JB8	8125/.083	360x360x150	41BFAI450	JB8	8125/.083	360x360x150	41BFAI451
JB9	8125/.051	180x180x91	41BCI455	JB9	8125/.051	180x180x91	41BCI454
JB10	8125/.083	360x360x150	41BFII450	JB10	8125/.083	360x360x150	41BFII451
JB11	8125/.051	180x180x91	4QA0XC29	JB11	8125/.051	180x180x91	4QA0XC30
JB12	8125/.073	360x180x150	41BSO450	JB12	8125/.073	360x180x150	41BSO453
JB13	8125/.063	240x180x150	41BFO452	JB13	8125/.063	240x180x150	41BFO455
JB14	8125/.083	360x360x150	41BFI450	JB14	8125/.083	360x360x150	41BFI452
JB15	8125/.051	180x180x91	4QA0TW02	JB15	8125/.051	180x180x91	4QA0TW01
JB16	8125/.073	360x180x150	41BFI451	JB16	8125/.073	360x180x150	41BFI453
JB17	8125/.073	360x180x150	41BFA451	JB17	8125/.073	360x180x150	41BFA454
JB18	8125/.063	240x180x150	41BFO450	JB18	8125/.063	240x180x150	41BFO453
JB19	8125/.073	360x180x150	41BFA450	JB19	8125/.073	360x180x150	41BFA453
JB20	8125/.073	360x180x150	41BFA452	JB20	8125/.073	360x180x150	41BFA455
JB21	8125/.063	240x180x150	41BFO451	JB21	8125/.063	240x180x150	41BFO454



Section 7A-7A (1 :10)
(Typical Section of Junction Box Arrangement)



Detail 7 (1 :20)
(Junction Box Arrangement same in P70 and P80)
(Corrugated plates hidden for clarity)

General Tolerances:
Tolerances shall be in accordance to
Total spec: GS EP STR 301, Ch. 14.

NOTES:

REFERENCES

DOC. NO:	-
AO-050-GTO-311-000180	PCM P70 AND P80 GENERAL ARRANGEMENT EXTERNAL SHEET 01
AO-050-GTO-311-000177	PCM - P70 AND P80 INTERNAL LAYOUT PLAN VIEW
AO-050-GTO-311-000178	PCM - P70 AND P80 INTERNAL LAYOUT SECTIONS
AO-050-GTO-311-000181	PCM STACK - P70 AND P80 FOOTPRINT WITH DETAILS
AO-050-GTO-311-000183	PCM - P70 AND P80 STRUCTURAL INTERFACE BETWEEN P70 AND TLM
AO-050-GTO-311-000276	PCM P70 AND P80 MATERIAL SCHEDULE REPORT
AO-050-GTO-311-000432	PCM P70 AND P80 STRUCTURAL CALCULATION REPORT IN-PLACE
AO-050-GTO-311-000741	PCM P70 AND P80 BUMPER ARRANGEMENT
AO-050-GTO-311-000308	PCM P70 AND P80 HEAT SHIELD LAYOUT AND INSTALLATION

Revision	Date	Status	Revision Memo	Issued by	Checked by	Approved by
06	14-JUN-2014	ASB	AS BUILT	DK	KM	JL
05	13-DEC-2013	AFC	ACCEPTED FOR CONSTRUCTION	DK	KM	JL
04	18-APR-2013	AFC	ACCEPTED FOR CONSTRUCTION	DK	KM	JL
03	20-DEC-2012	AFC	ACCEPTED FOR CONSTRUCTION	MI	KM	JL
02	31-OCT-2012	AFC	ACCEPTED FOR CONSTRUCTION	DK	KM	JL
01	24-FEB-2012	IFA	ISSUED FOR APPROVAL	DK	KM	
00	09-JAN-2012	IFR	ISSUED FOR REVIEW	KM	JL	

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18.1 PCM equipment


Transformers

VSD Room Toward LV Room


LV Room (SPCU,MCC,LV/UPS,HVAC)

BF Oil Purifier

BF HPU – P70 and P80

CF HPU P70 and P80

Safety Systems – Detection

Safety Systems - Inergen and Foam

18.2 PCM transport and installation

Assembly in Norway

Transport to Angola

Stack up in Angola (TLM on top of PCM)

Offshore lifting to Girassol FPSO

OneSubsea
A Cameron & Schlumberger Company

PROJECT DOCUMENTS
COMMENTS TO COMMENTS

DATE: **25.03.2015**

CONTRACT: 9060 GirRI		**MULTIPHASE PUMP SYSTEM**	
CPY doc.no:	**AO-050-GMP-310-000324**	**GirRI MPP HANDBOOK**	Revision: **01**
CON doc.no:	**DOC-0067899-B**		

Ref.	Comment	Reply	Action
1.	SAL: Since this document can also be used in digital forma, please include bookmarks on pdf file	Bookmarks included.	Implemented
2.	SFR: There are 7 x FL deployment frames with ITM No. from 0108001 to 0108007. Please clarify.	ITM-number for each frame included	Implemented
3.	SMO is it really same number as for P70?	Typo, updated	Updated
4.	SFR: 4 + 0 = 6 ??? Please correct.	Comments to other documents / drawings should not be included here. Latest revision of drawing included in Handbook.	 Implemented

Revision Status Published Made by Checked by Approved by
C Released 2015-04-27 17:00:27 SAA HAA IFA
Engineering Change Order: NA