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TOTAL E&P ANGOLA BLOCK 32		
	<b>KAOMBO Project</b>	

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### BLOCK 32 - KAOMBO SPS

**10002504361-PDC-000**

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# 1 SYSTEM INFORMATION

## 1.1 Reference List

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## 1.2 Introduction

### 1.2.1 KAOMBO general description

This document covers the Outline Installation Procedure (OIP) for all the Manifolds (4-slot and 2-slot) in the Kaombo Subsea Production System (SPS). The OIP defines the requirements and establishes a guideline for installation. OIP for Manifold Support Structure's (MSS's) and the Closed Can Foundation's (CCF's) for the Kaombo (SPS) is given in separate report [14].

Aker Solution will supply the following structures in Kaombo SPS project:

- 19 off Manifolds of 7 different configurations:
  - 5 off 4-slot single header inline 12" production Manifold, daisy chained.
  - 5 off 2-slot single header inline 12" production Manifold, daisy chained.
  - 1 off 2-slot single header 12" end production Manifold.
  - 3 off 4-slot single header 12" end production Manifold.
  - 2 off 4-slot single header inline 10" production Manifold, daisy chained.
  - 1 off 2-slot single header inline 10" production Manifold, daisy chained.
  - 2 off 2-slot single header 10" end production Manifold.
- 2 off Subsea Safety Isolation Valve's (SSIV's) + 1 spare retrievable module.
- 21 Subsea Distribution Unit's (SDU's) + 1 spare.
- 35 Production Vertical Christmas Trees (PVXT) + 1 spare.
- 29 Water Injection Christmas Trees (WIVXT).

The KAOMBO project is a development in Block 32 offshore Angola, located at about 150km offshore Angola. The development will include six fields, Caril, Gindungo, Gengibre, Canela, Louro and Mostarda west, which will be tied back to two FPSO's.

All six fields are similar in layout, and are operated in a similar way. Each Field will be developed using a dedicated hybrid loop production system. Each hybrid loop comprises one insulated production line and one non-insulated service line. Water injection is required on all fields.

On each field, manifolds are tied into the production line. Production wells are clustered at the manifolds and connected to them by multi-bore jumpers.

Gas is exported to GEP Network. This can take the gas to the onshore LNG plant or inject it offshore.

Kaombo development covers 1090 km<sup>2</sup>, with water depths in the area from 1417m (Gindungo) to 1926m (Louro). The production network is composed of 33 production wells connected to in-line single header manifolds through well jumpers. There are three off contingency production wells.

The water injection network is composed of 29 water injection (WI) wells (26 WI wells + 3 contingency WI wells) connected to in-line tees through well jumpers.

System design basis	10002192731	AO-100-40-S001-000007	
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**TYPE 3 Use as is (if possible)**

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## 1.2.2 Aker Solution Support & Office Contact

Aker Solutions - Service Base	Aker Solutions AS - Headquarters
<p><b>Aker Solutions Angola</b></p> <p><b>Visting address:</b> Sonils Base, Rua 6 I.L. Boavista, Luanda</p> <p><b>Telephone:</b> <a href="tel:+244226426000">+244 226 426 000</a></p> <p><a href="http://www.akersolutions.com">www.akersolutions.com</a></p>	<p><b>Aker Solutions AS</b></p> <p><b>Visting address:</b> Oksenøyveien 8 NO-1366 Lysaker, Norway</p> <p><b>PO address:</b> PO Box 169 NO-1325 Lysaker, Norway</p> <p><b>Telephone:</b> During office hours. <a href="tel:+4767513000">+47 6751 3000</a></p> <p>Global SLS operation support (24/7) <a href="tel:+4797471634">+47 9747 1634</a></p> <p><b>Telefax:</b> During office hours. <a href="tel:+4767513010">+47 6751 3010</a></p> <p><a href="http://www.akersolutions.com">www.akersolutions.com</a></p>

## 1.3 Abbreviations

AAAT	Annulus Access Adaptor Tool
AC	Air Conditioning
AIV	Annulus Isolation Valve
AKSO	Aker Solutions (SPS Contractor)
AMV	Annulus Master Valve
APD	Acoustic Pig Detector
ASD	Acoustic Sand Detector
AWV	Annulus Wing Valve
BOP	Blow Out Preventer
CCF	Closed Can Foundation
CIV	Chemical Injection Valve
CITV	Chemical Injection Throttle Valve
CH	Circulation Head
CHA	Cobra Head Assembly
CTLF	Coiled Tubing Lifting Frame
CWJ	Cased Wear Joint
DHLP	Down Hole Low Pressure
DIU	Downhole Interface Unit
EDP	Emergency Disconnect Package
EFL	Electrical Flying Lead
EFTS	Electrical Feed Through System
EPU	Electrical Power Unit
EQD	Emergency Quick Disconnect
ESD	Emergency Shut Down
FCM	Flow Control Module
FLDF	Flying Lead Deployment Frame
FPSO	Floating Production Storage and Offloading unit
GA	General Arrangement
GEP	Gas Export Pipeline
HART	Hydraulic Activated Running Tool
HCS-R	Horizontal Connection System – Rigid
HCS-U	Horizontal Connection System – Umbilical
HFL	Hydraulic Flying Lead
HP	High Pressure
HPU	Hydraulic Power Unit
IMV	Injection Master Valve
ISO	Isometric
IWV	Injection Wing Valve
LLS	Lower Landing String
LNG	Liquid Natural Gas
LP	Low Pressure
LRP	Lower Riser Package
LTPC	Long Term Protective Cover
LV	Low Voltage
LVDT	Linear Variable Differential Transformer
LWRP	Lower Workover Riser Package
MCM	Manifold Control Module
MCS	Master Control Station
MIV	Methanol Injection Valve
MSS	Manifold Support Structure
MPFM	Multi-Phase Flow Meter
MQC	Multi-Quick Connector / Coupling
OB	Outboard
OCWR	Overall Control of Well and Risers
OIP	Outline Installation Procedure
OMM	Operation and Maintenance Manual
PGB	Production Guide Base
PLC	Programmable Logic Controller
RRRT	Running, Retrieving & Re-Orientation Tool
PMV	Production Master Valve
PSD	Production Shut Down
PT	Pressure Transmitter
PWJ	Production Well Jumper
PWV	Production Wing Valve
PVXT	Production Vertical X-mas Tree
P&ID	Piping and Instrumentation Diagram
RAM	Reliability Availability and Maintainability
RIMS	Retrievable Integrated Modular Stabplate
ROV	Remotely Operated Vehicle
RT	Running Tool
SCM	Subsea Control Module
SDU	Subsea Distribution Unit
SERS	Subsea Emergency Response System
SLS	Simplified Landing String
SLV	Service Line Valve
SFT	Surface Flow Tree
SoS	Scope of Supply
SPS	Subsea Production System
SPWV	Surface Production Wing Valve
SRM	Subsea Router Module
SRLD	Slimline Rigid Lock Down
SSIV	Subsea Isolation Valve
STMP	Single Trip Multi-Purpose Tool
SWL	Safe Working Load
TH	Tubing Hanger
THHTT	Tubing Hanger Handling & Test Tool
THOECT	Tubing Hanger Orientation and Elevation Check Tool
THOJ	Tubing Hanger Orientation Joint
THRT	Tubing Hanger Running Tool
TRT	Tree Running Tool
TT	Temperature Transmitter
UTA	Umbilical Termination Assembly
UTH	Umbilical Termination Head
VMC	Vertical Module Connection
WH	Wellhead
WI	Water Injection

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WIVXT	Water Injection Vertical X-mas Tree
WO	Workover
WOCs	Workover Control System
WOS	Workover System
XOV	X (Cross)-Over Valve
XT	X-mas Tree
XTICT	X-mas Tree Installation and Commissioning Tool

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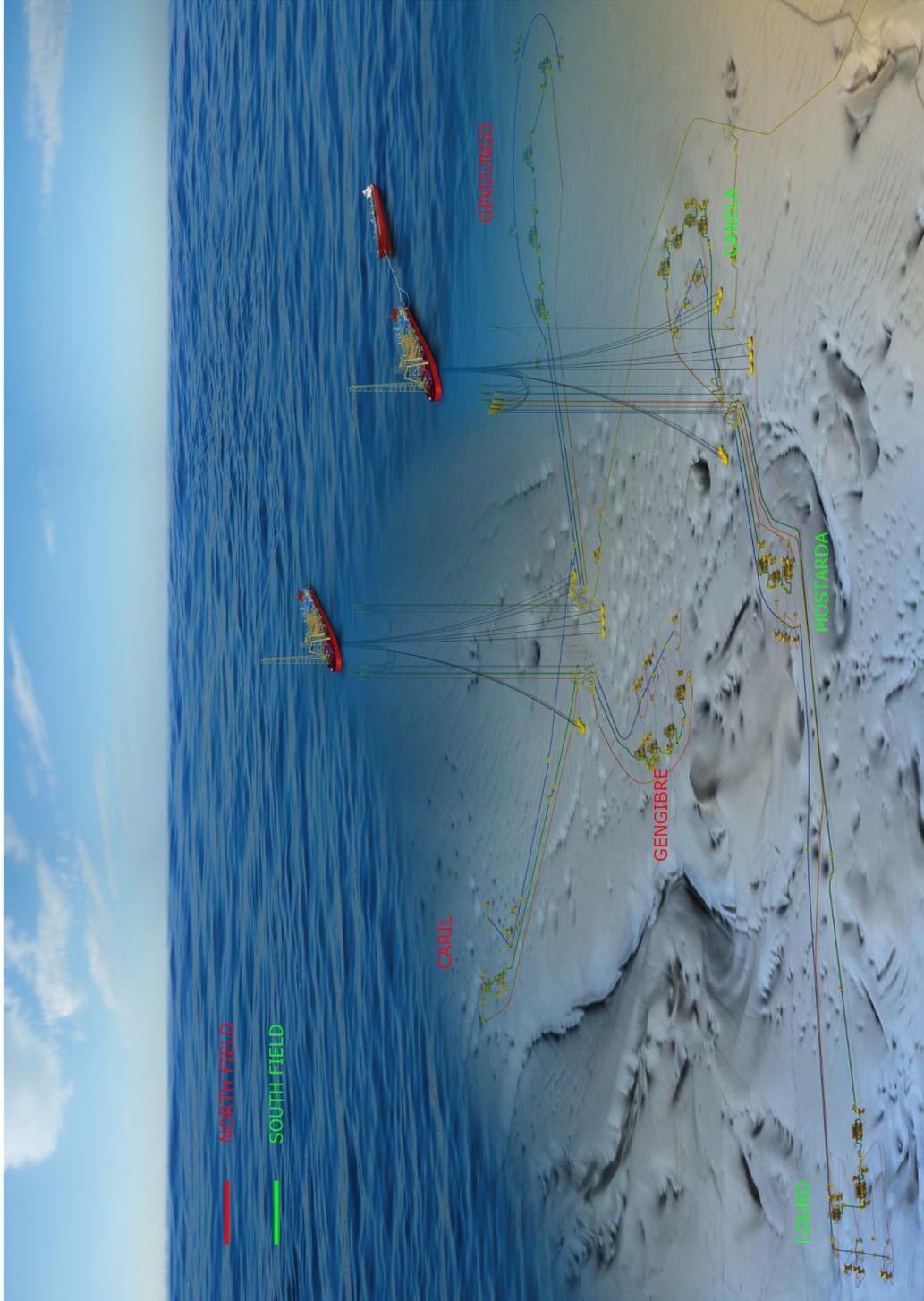
BLOCK 32 - KAOMBO SPS

## 1.4 Main Deliverables

	AKSO Work-package	Top Assembly Reference	Components	Quantity
Subsea Structures	WP03	AO-100-41-S001-000013 / 10002197511	Manifolds	19 off
			SSIV	3 off
			SDU	22 off
			Foundation Structures	41 off
	WP04	AO-100-43-S001-000008 / 10002262031	Wellhead System	65 off
	WP05	AO-100-43-S001-000004 / 10002310273	PVXT	36 off
			WIVXT	29 off
Prod. PGB			36 off	
WI PGB			29 off	
Flying Leads (across subsea structures)	WP06	AO-100-44-S001-000014 / 10002217926	Electrical Flying Leads (EFLs)	
			Hydraulic Flying Leads (HFLs)	
Misc. Subsea Instruments and Control Modules			Subsea Instruments; Control Modules; Electrical, Hydraulic and FO Flying Leads and Connectors	
Topside Control System			Subsea Control Unit	4 off
			Master Control Station	2 off
			Electrical Power unit	2 off
			Hydraulic Power Unit	2 off
Work Over System	WP07	AO-100-45-S001-000001 / 10002176858	EDP	1 off
			LRP	1 off
			WO Umbilicals	
			multiWOCS	1 off
ROV Tooling	WP08	AO-100-46-S001-000006 / 10002484290	Flying Lead Deployment Frames	5 off
			Running Tools	
			Valve Manipulation Tools	
			Production Jumper between Manifold and PXT	Production Well Jumper
Tie-In Tooling	WP10	AO-100-42-S001-000003 / 10002442979		
		AO-100-46-S001-000003 / 10002419156	Cleaning Tools, Installation Tools etc.	

Example

## 1.5 Overall Field Layout Kaombo



**TYPE 3 Use as is (if possible)**

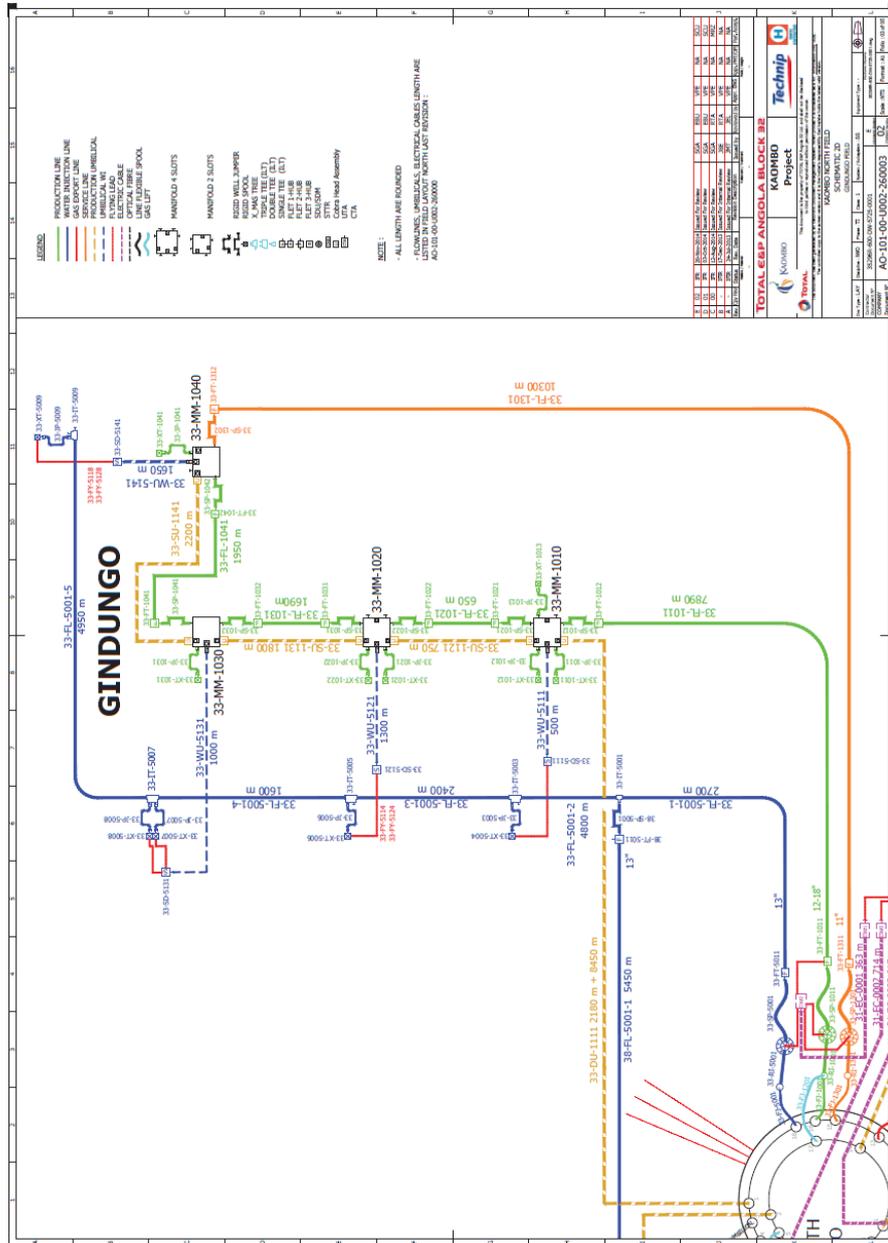


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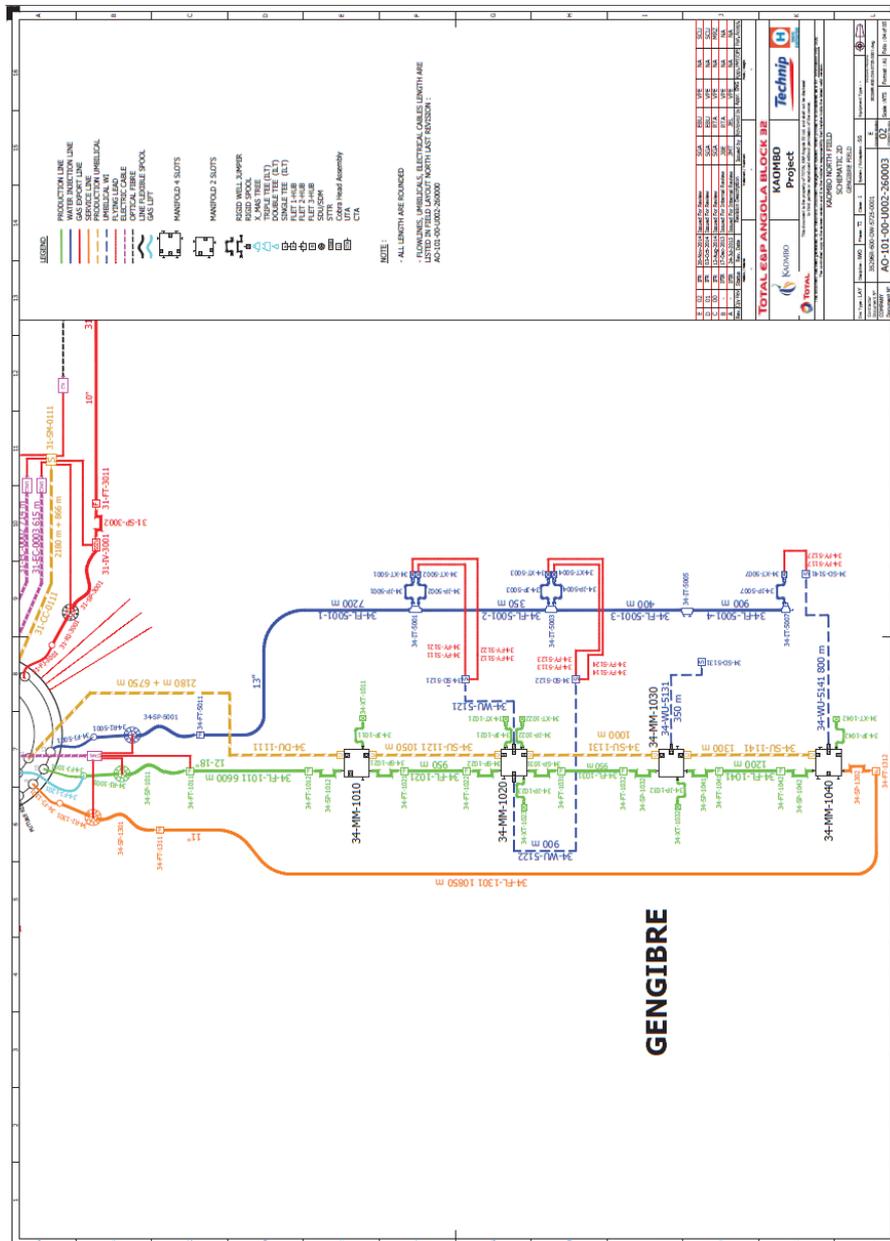
BLOCK 32 - KAOMBO SPS

1.5.2 Field schematic GINDUNGO



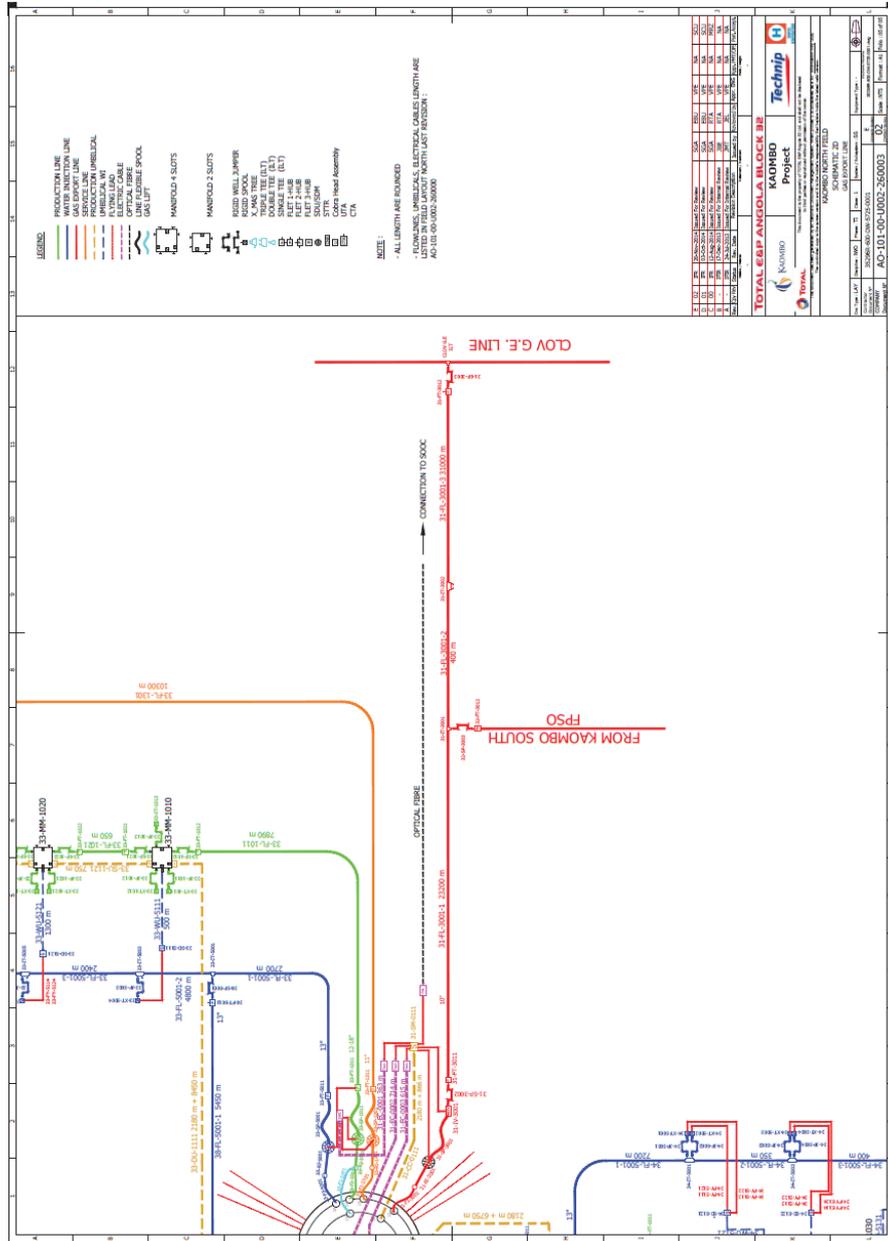
TYPE 3 Use as is (if possible)

### 1.5.3 Field schematic GENGIBRE



TYPE 3 Use as is (if possible)

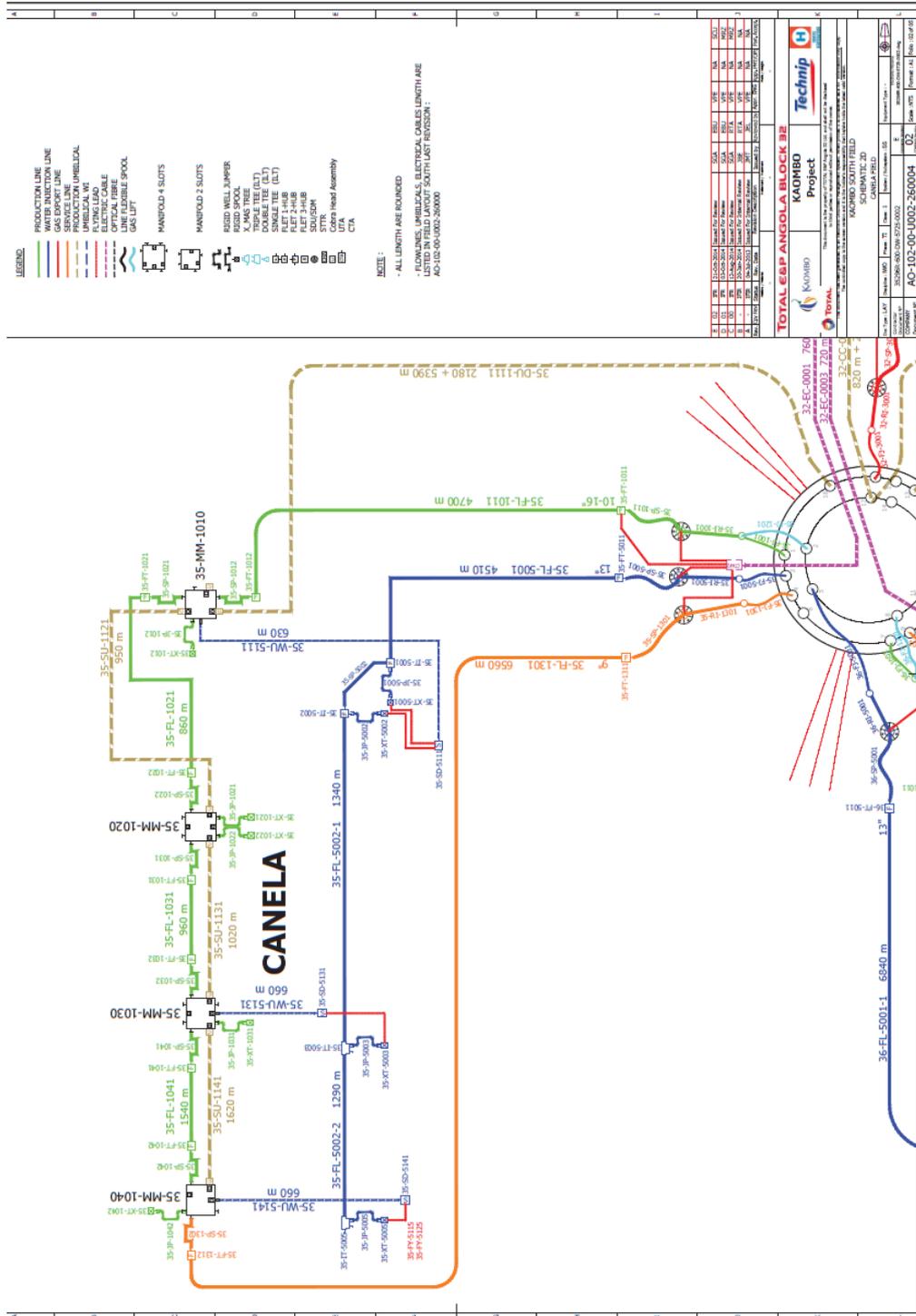
### 1.5.4 Field schematic GAS EXPORT LINE



TYPE 3 Use as is (if possible)

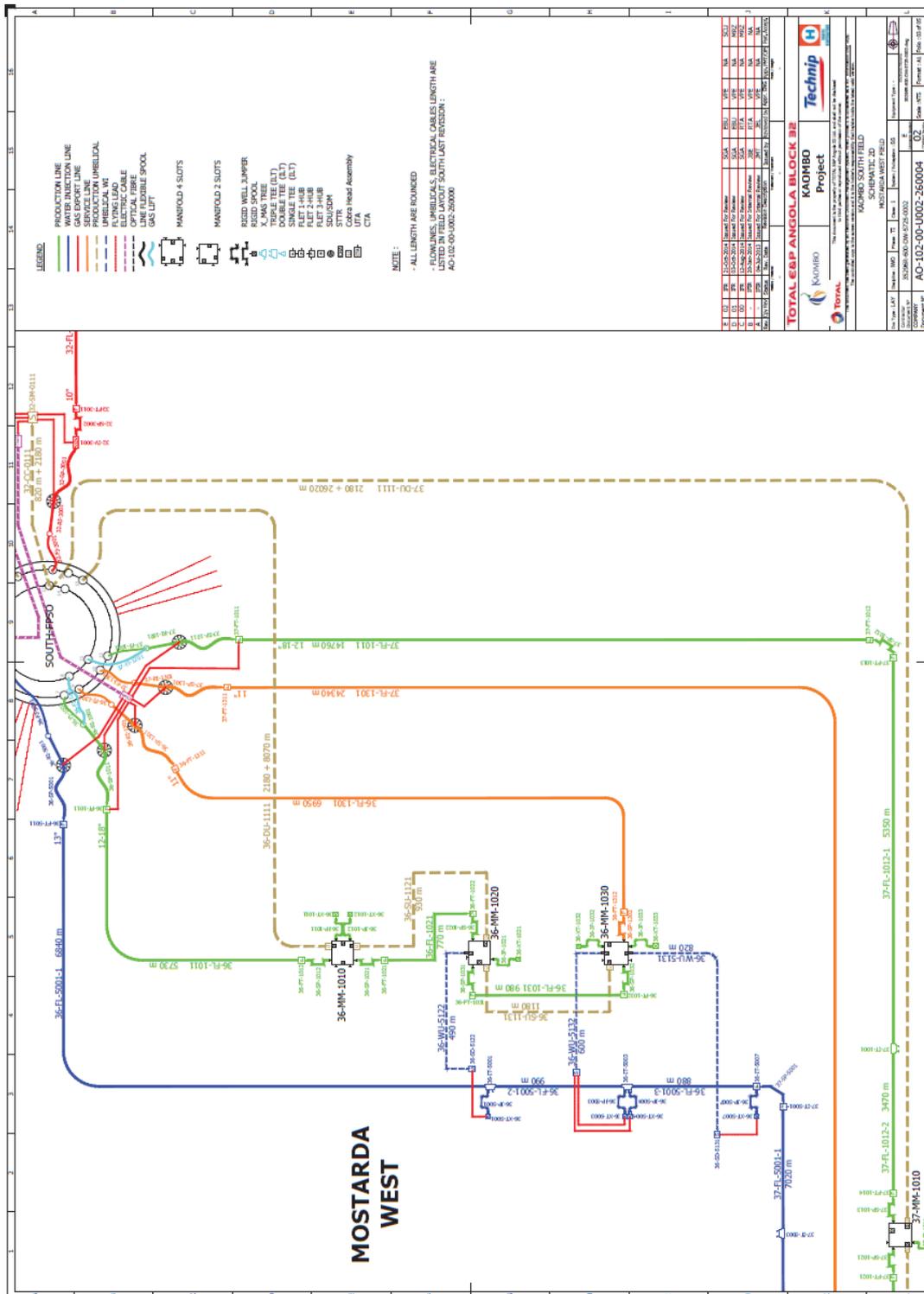
INCLUDE LEGENDS ON FIRST/LAST PAGE

### 1.5.5 Field schematic CANELA



TYPE 3 Use as is (if possible)

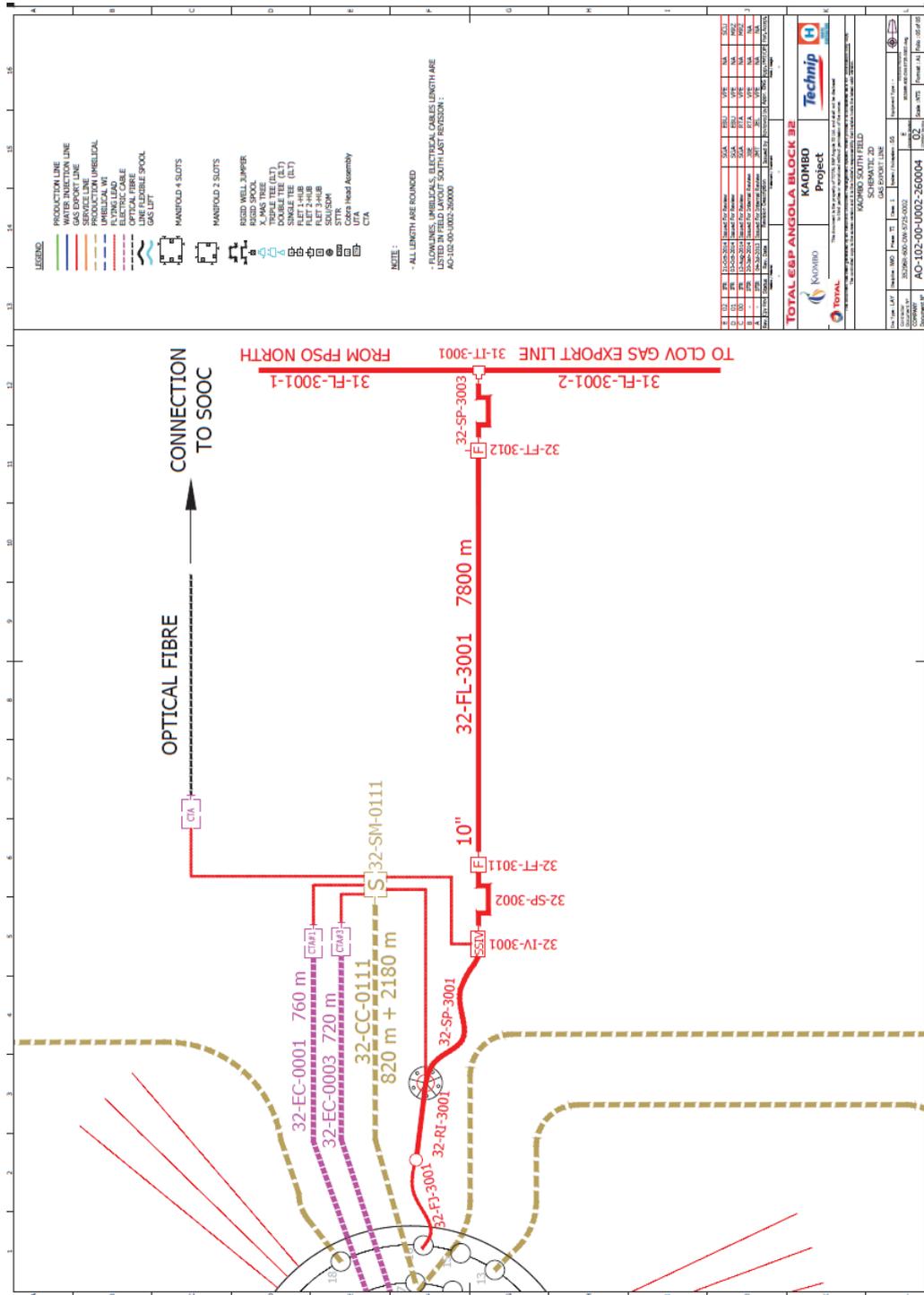
### 1.5.6 Field schematic MOSTARDA WEST



TYPE 3 Use as is (if possible)



### 1.5.8 Field schematic GAS EXPORT LINE

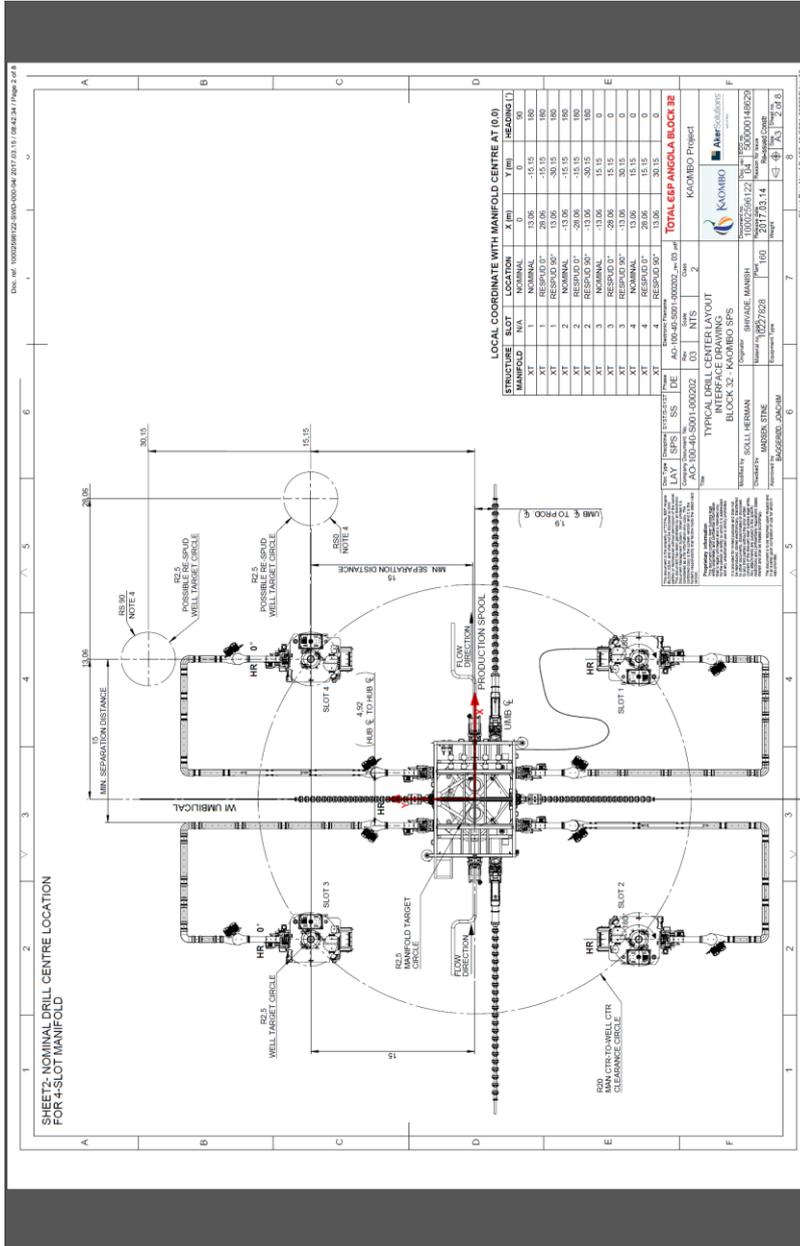


TYPE 3 Use as is (if possible)

INCLUDE LEGENDS ON FIRST/LAST PAGE

## 1.6 Production drill center layout

### 1.6.1 Typical Drill center layout Interface drawing 4-Slot manifold



**TYPE 3 Use as is (if possible)**

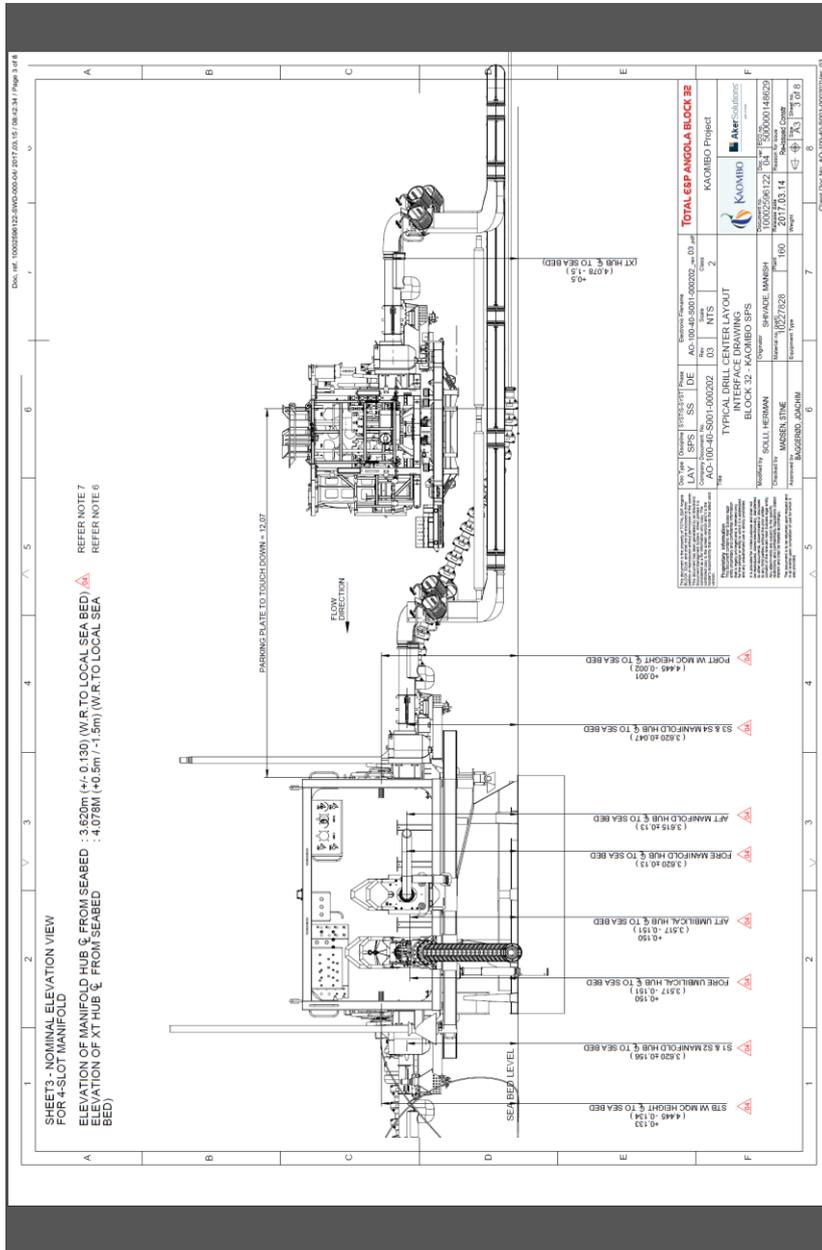
Typical drill centre layout	10002596122	AO-100-40-S001-000202	10227828
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1.6.2 Typical Drill centre layout elevation view



TYPE 3 Use as is (if possible)

Production drill centre layout	10002596122	AO-100-40-S001-000202	10227828
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## 1.7 General Design Parameters

Design Life	20years
Design Water depth	2000m

### Design Pressure

	Item	Design Pressure (bara)	Internal / Differential pressure in design
<b>Production System (including Service Line)</b>	WH	690	Internal
	PVXT	690	Internal
	Manifold piping	517	Internal
	Valve body	517	Internal
	Jumper	450	Internal
	HCS	444-690	Differential
<b>Water Injection System</b>	WH	690	Internal
	WIVXT	690	Internal
	HCS	453-690	Differential
<b>Gas Export System</b>	SSIV piping	517	Internal
	Valve body	517-690	Internal
	HCS	404-517	Differential
<b>DHLP system from HPU to PVXT</b>	SCM	759	Differential
	HPU	380	Differential
	WO HPU	380	Differential
	UTA pipe	690	Differential
	Manifold pipe	690	Differential
	Valve body	690	Internal
	Jumper	690	Differential
	PVXT small bore pipe	759	Internal
	HCS	690	Differential
<b>DHLP system from Manifold to WIVXT</b>	SCM	759	Differential
	WO HPU	380	Differential
	Manifold pipe	690	Differential
	Valve body	690	Internal

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	CHA pipe	690	N/A
	SDU pipe	690	Differential
	HFL	690	Differential
	WIVXT small bore pipe	759	Internal
LP system from HPU to PVXT	SCM	380	
	HPU	380	
	PVXT valve actuator	380	
	PVXT valve body	380	
	PVXT pipe	380	
	Jumper	380	
	Valve body	380	
	Valve actuator	380	
	Manifold Pipe	380	
	UTA pipe	690	
LP system from Manifold to WIXT	SCM	380	
	WO HPU	380	
	WIVXT valve actuator	380	
	WIVXT small bore pipe	380	
	HFL	690	
	SDU pipe	690	
	CHA pipe	690	
	Valve body	380	
	Valve actuator	380	
	Manifold Pipe	380	
Chemicals from Topside to Manifold	UTA pipe	345-690	
	Manifold Pipe	517-690	
	Valve body	690	
Chemicals from Manifold to PXT	HCS	690	
	Jumper	690	
	VXT pipe	690	
	VXT valve body	690	

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**Note: See CTR SYSTEM DESIGN BASIS for updated and more detailed pressure values.**

**Temperature**

Components	Min temp	Max temp
Manifolds	-18	121
Production XT	-18	121
Water injection XT	-18	82
Production Well Jumper	-18	121
Water injection Well Jumper*	4	60
SSIV module	-10	60

**Chemical injection & corresponding injection points**

	Injection point location	Flow regulation	Fluid to treat
<b>Demulsifier</b>	Manifold	Subsea CITV	Produced oil + water
<b>Scale inhibitor</b>	Downhole for Gindungo Deep/ Caril wells Manifolds for other	Subsea CITV	Produced water
<b>Corrosion inhibitor</b>	Production XT	Subsea CITV Downstream PWV	Produced water
<b>Asphaltene inhibitor</b>	Downhole	Subsea CITV	Produced oil
<b>Biocide</b>	Furthest Operating Manifold from FPSO	Topside	Produced water
<b>Spare 1</b>	Production XT	Subsea CITV Downstream PWV	TBD
<b>Spare 2</b>	Manifold		TBD

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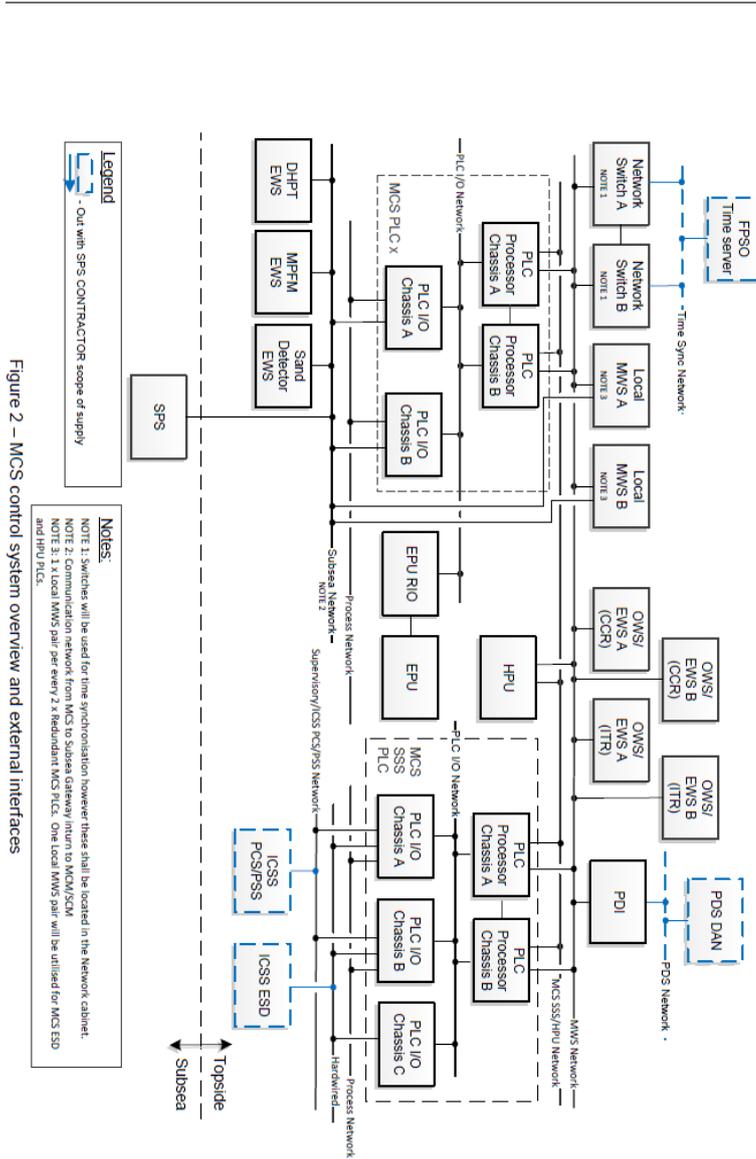
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## **2 PRODUCTION CONTROL SYSTEM**

### **2.1 Reference List**

## 2.2 Topside Architecture North & South



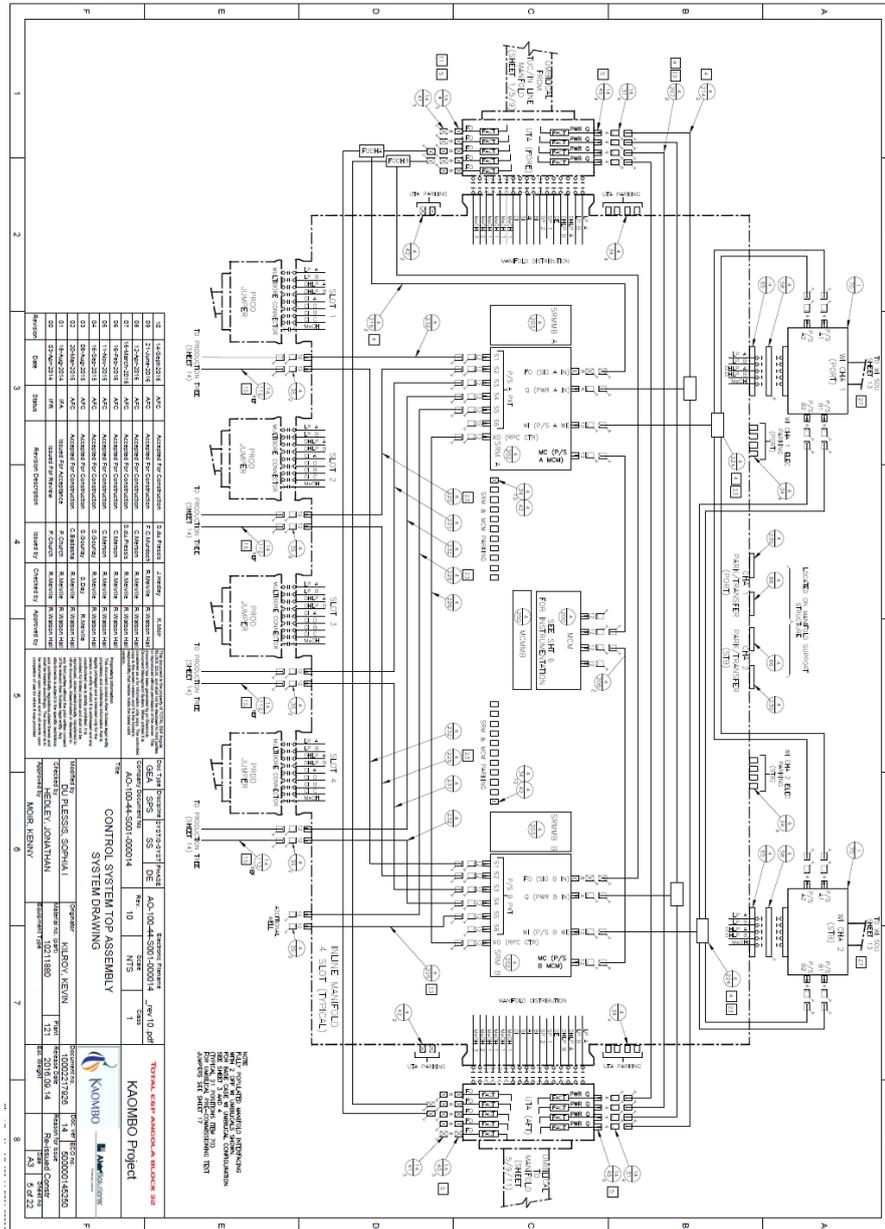
The following diagram shows an MCS control system overview.

Topside Architecture Specification	10002217936	AO-100-44-S001-000001	10211880
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**TYPE 3 Use as is (if possible)**

## 2.3 Control System Top Assembly drawing

### 2.3.1 Inline 4slot Manifold



Control System Top assembly 4 Slot inline manifold	10002217926	AO-100-44-S001-000014	10211880
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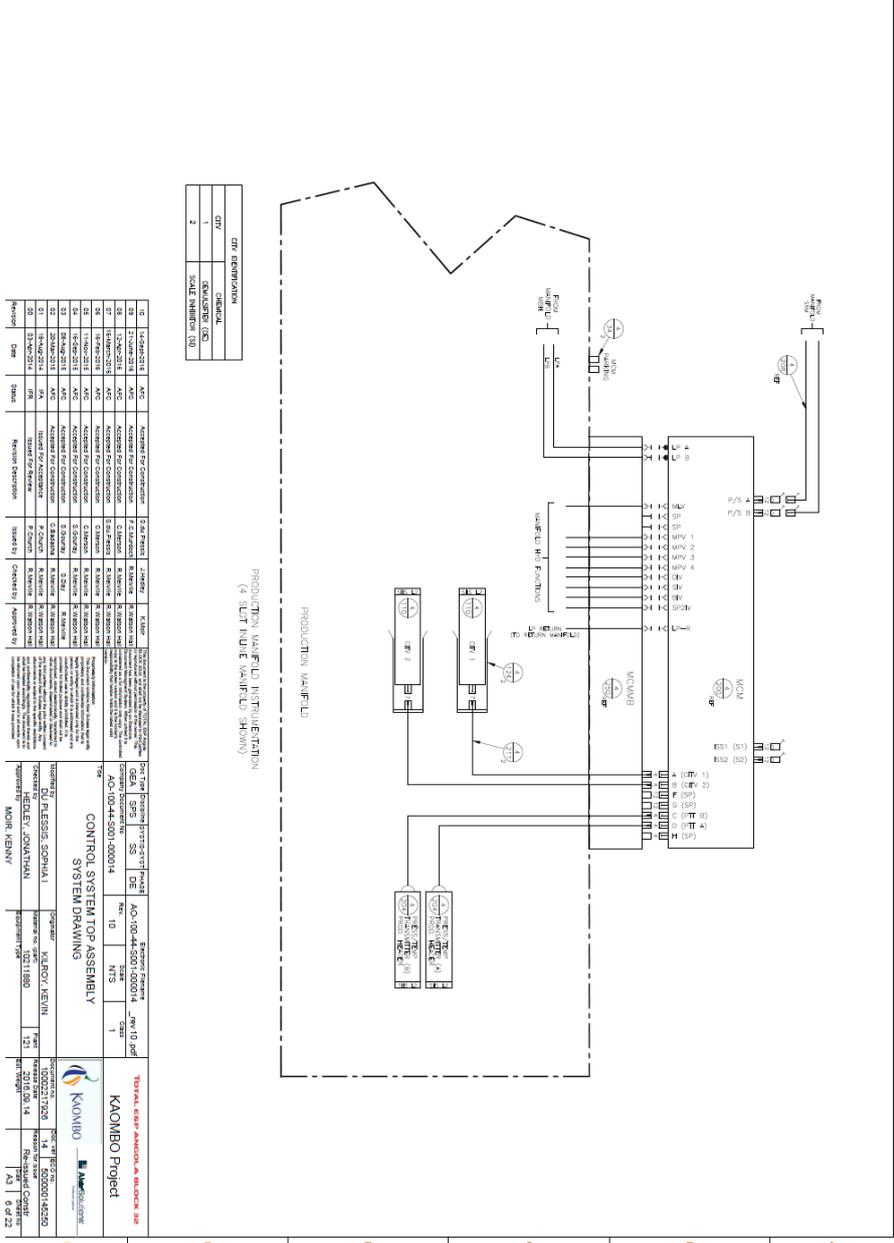
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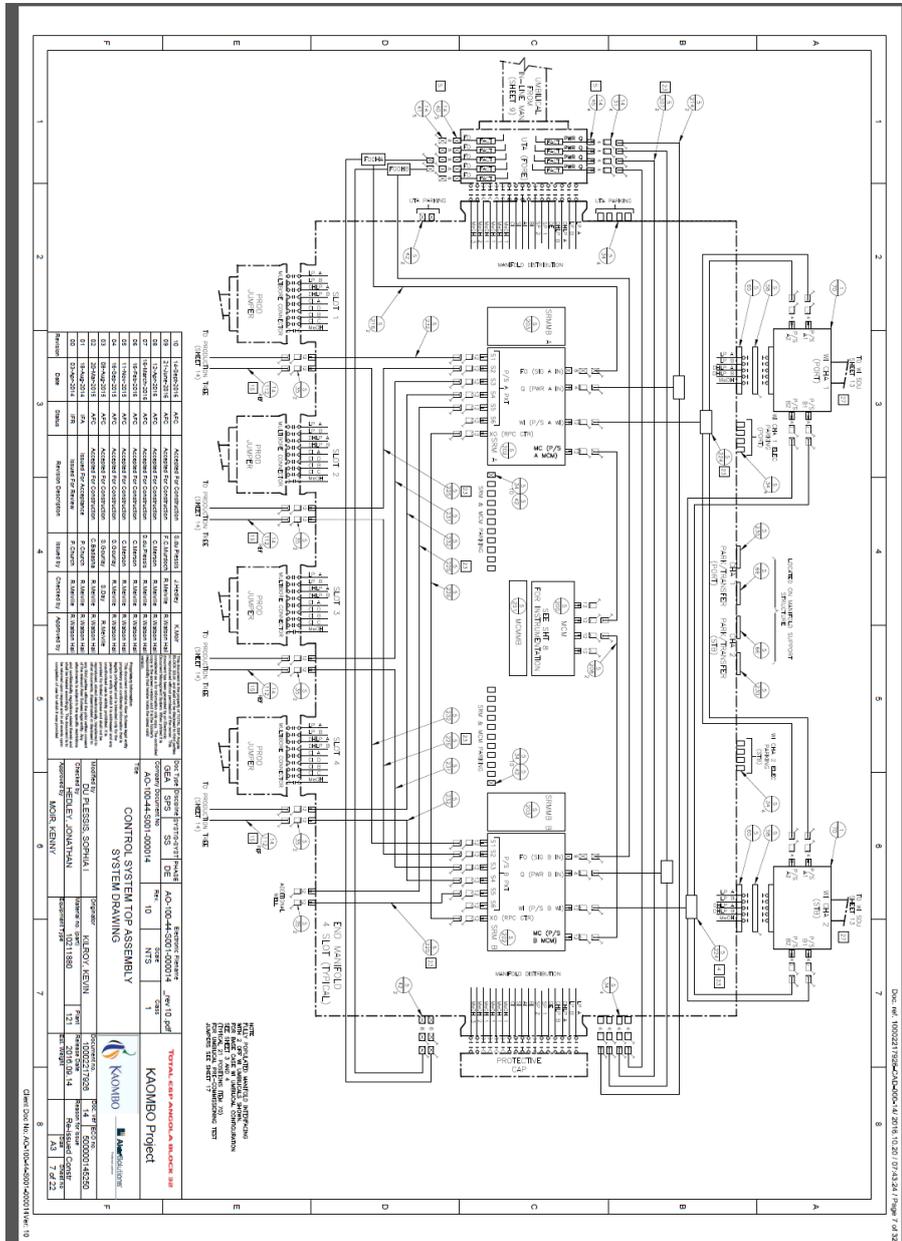
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### 2.3.2 Inline 4slot Manifold Instrumentation



### 2.3.3 End 4slot Manifold

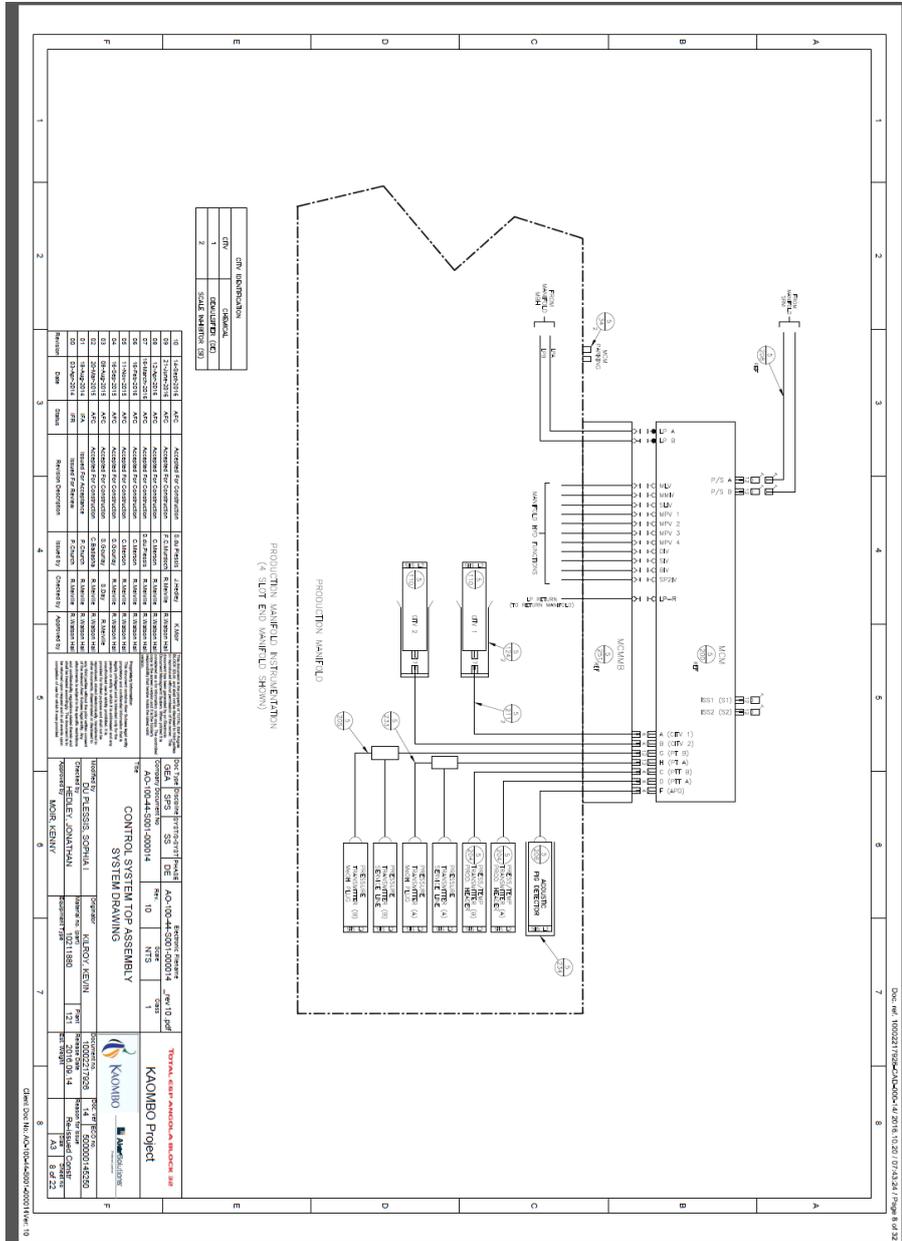


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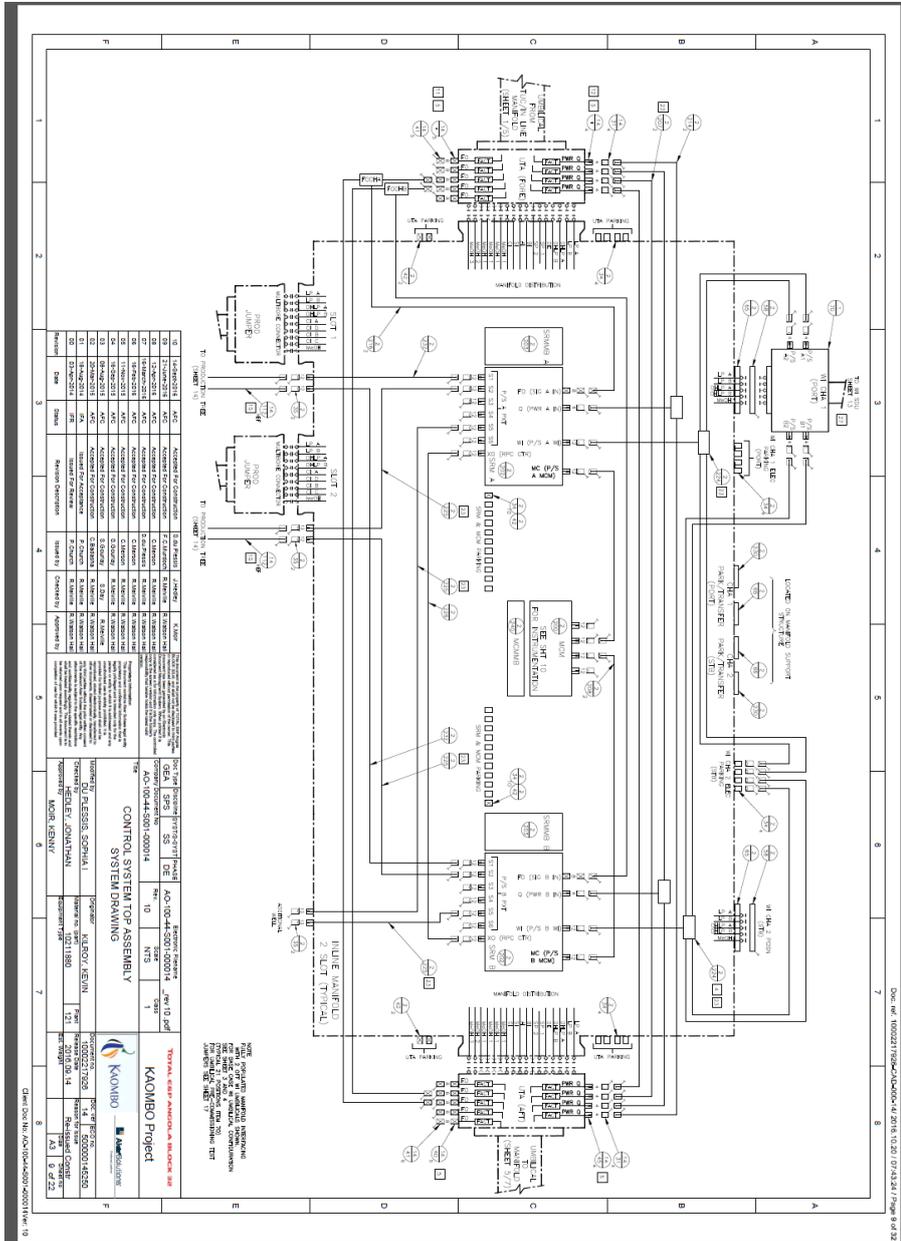
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2.3.4 End 4slot Manifold Instrumentation



### 2.3.5 Inline 2slot Manifold

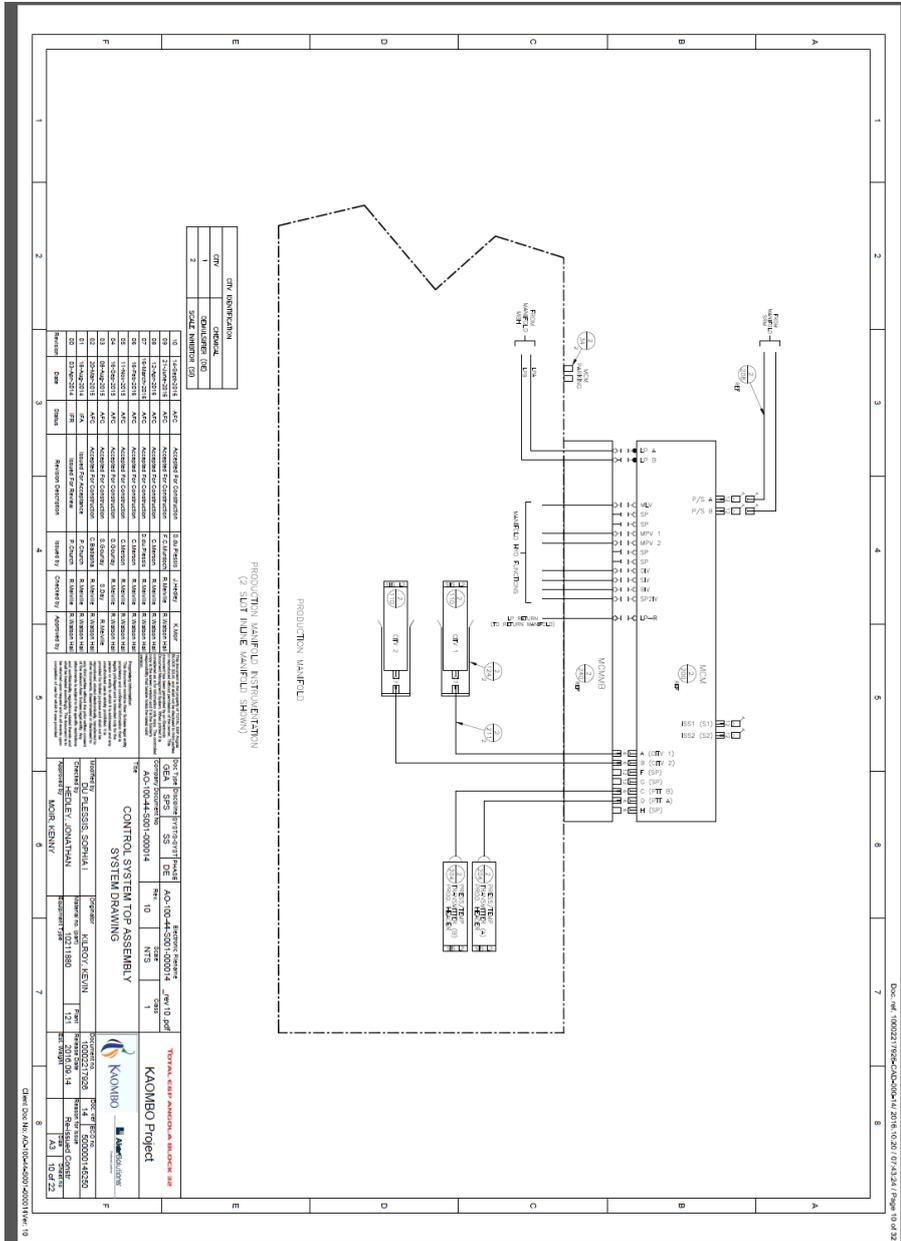


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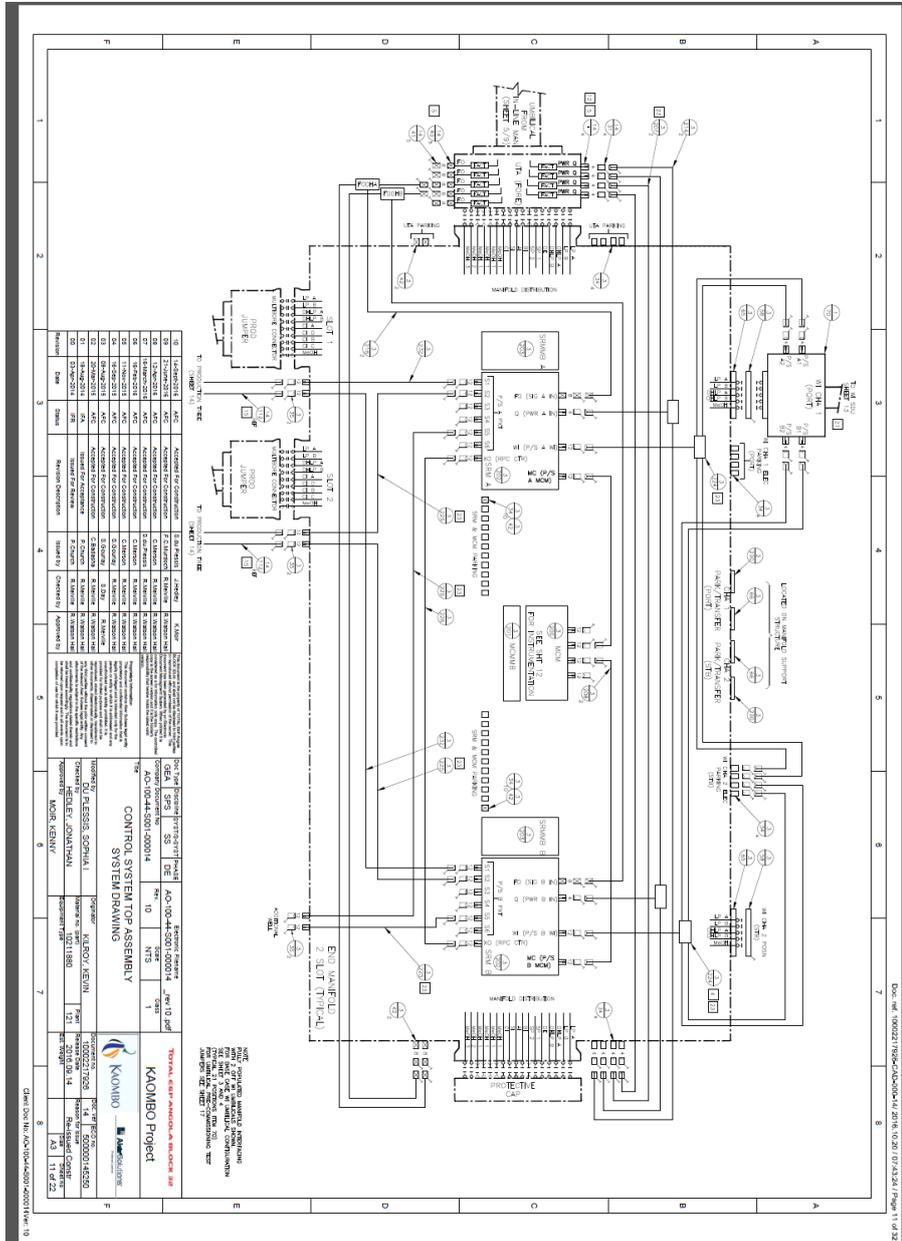
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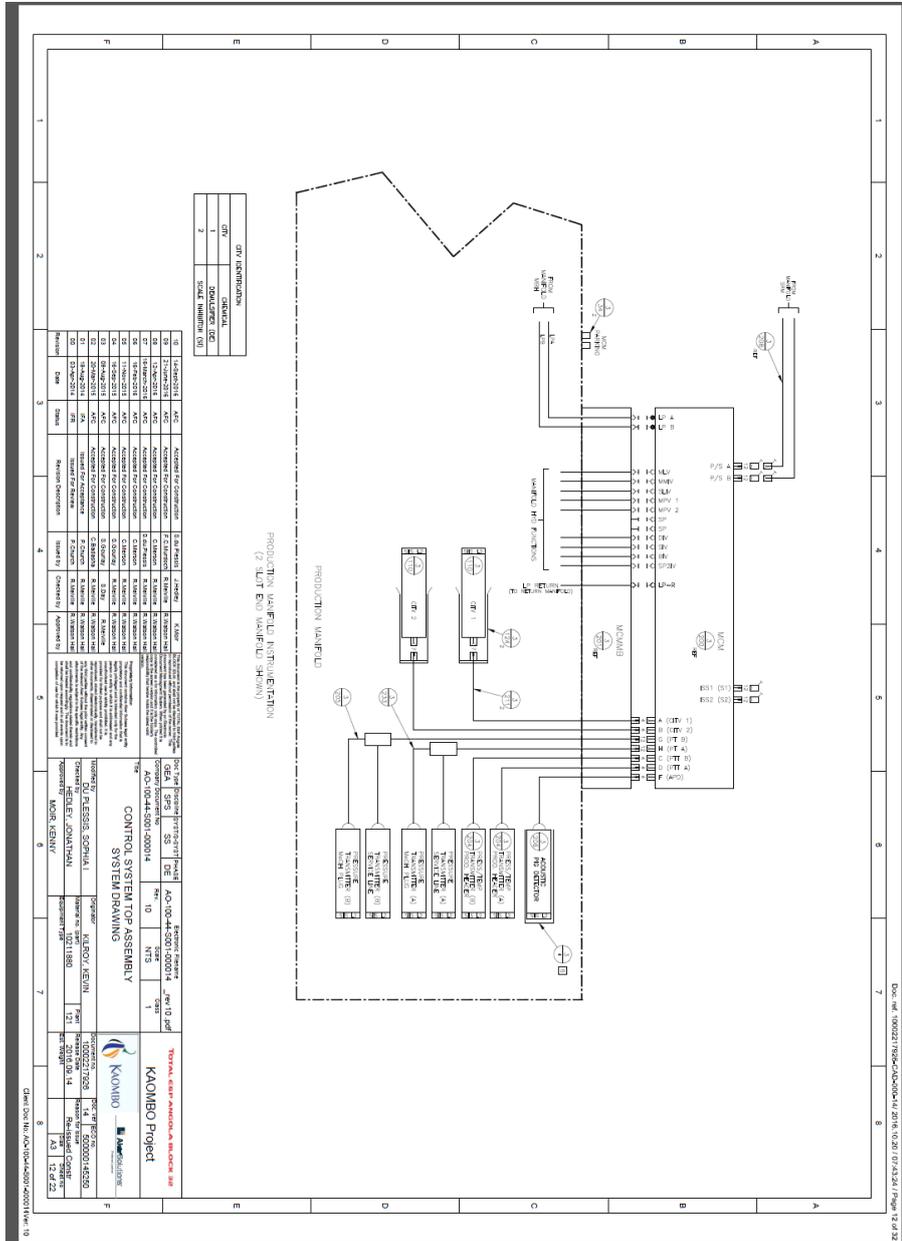
2.3.6 Inline 2slot Manifold Instrumentation



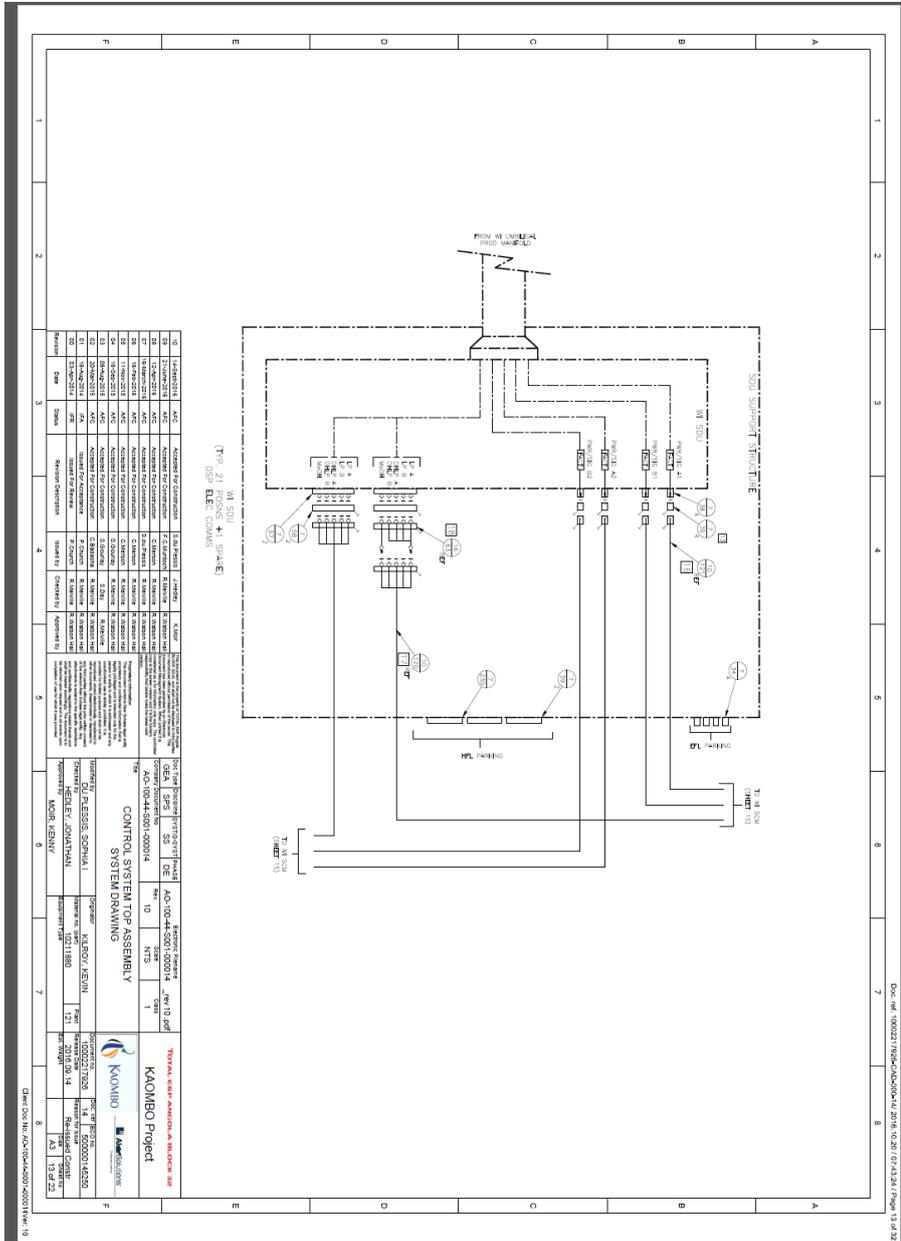
### 2.3.7 End 2slot Manifold



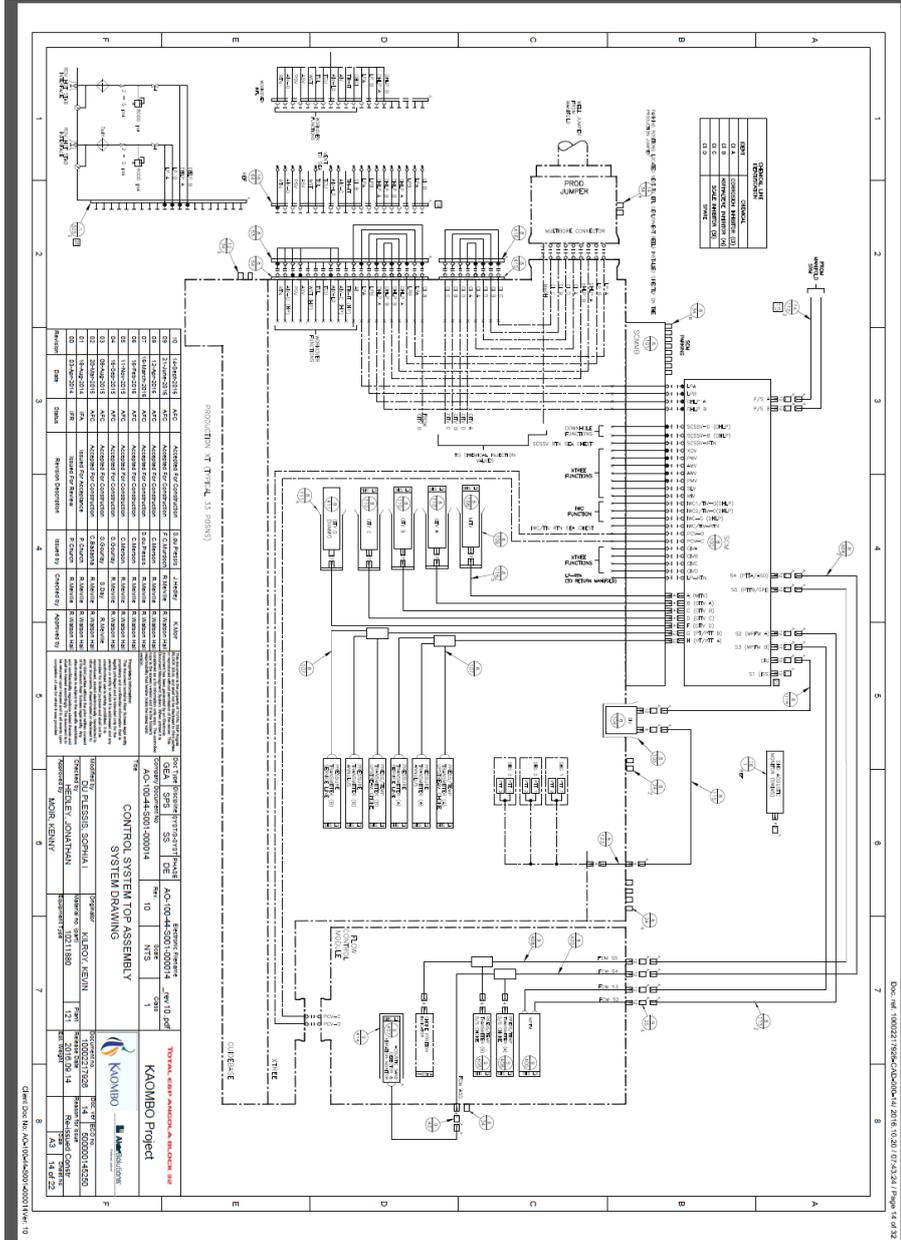
### 2.3.8 End 2slot Manifold Instrumentation



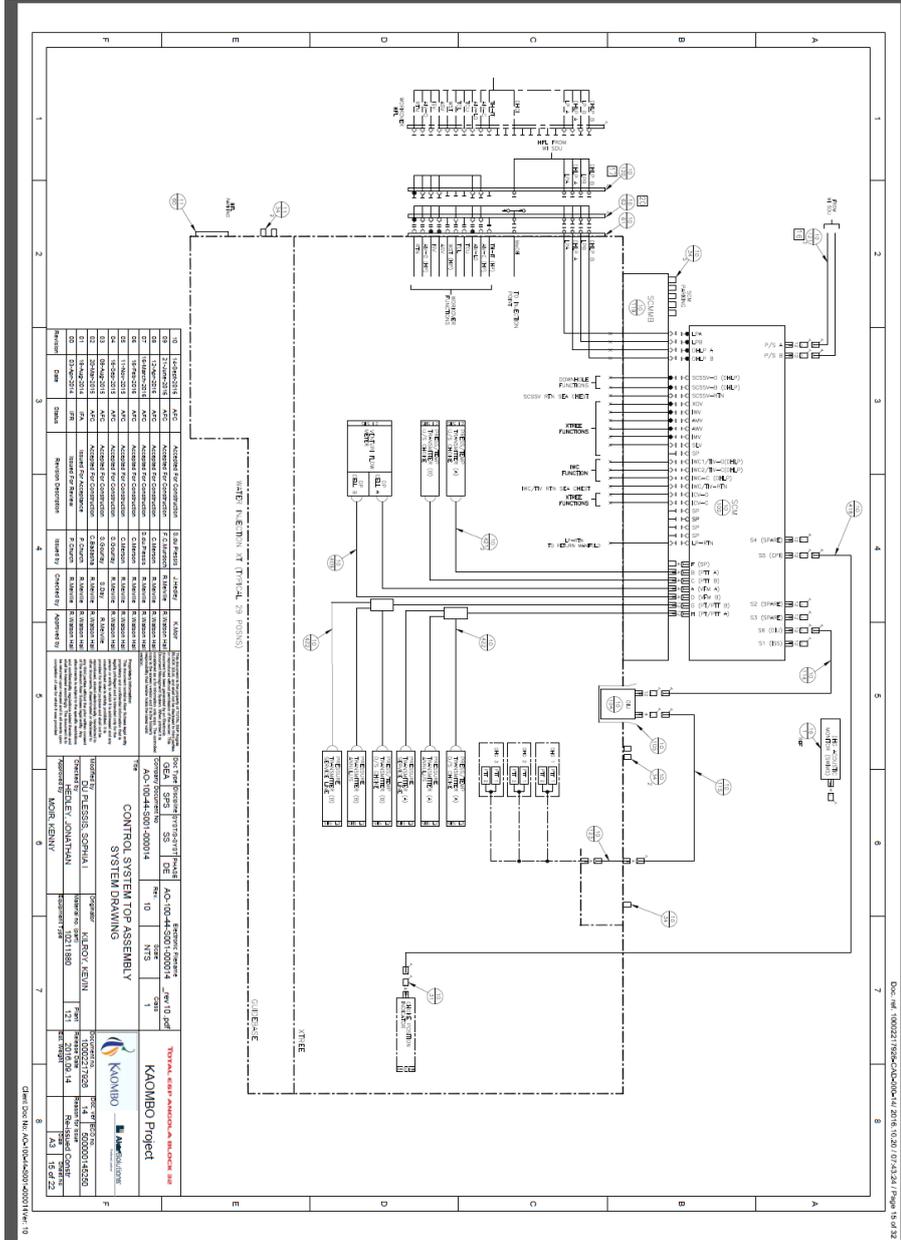
### 2.3.9 Water Injection Subsea Distribution Unit (WI SDU)



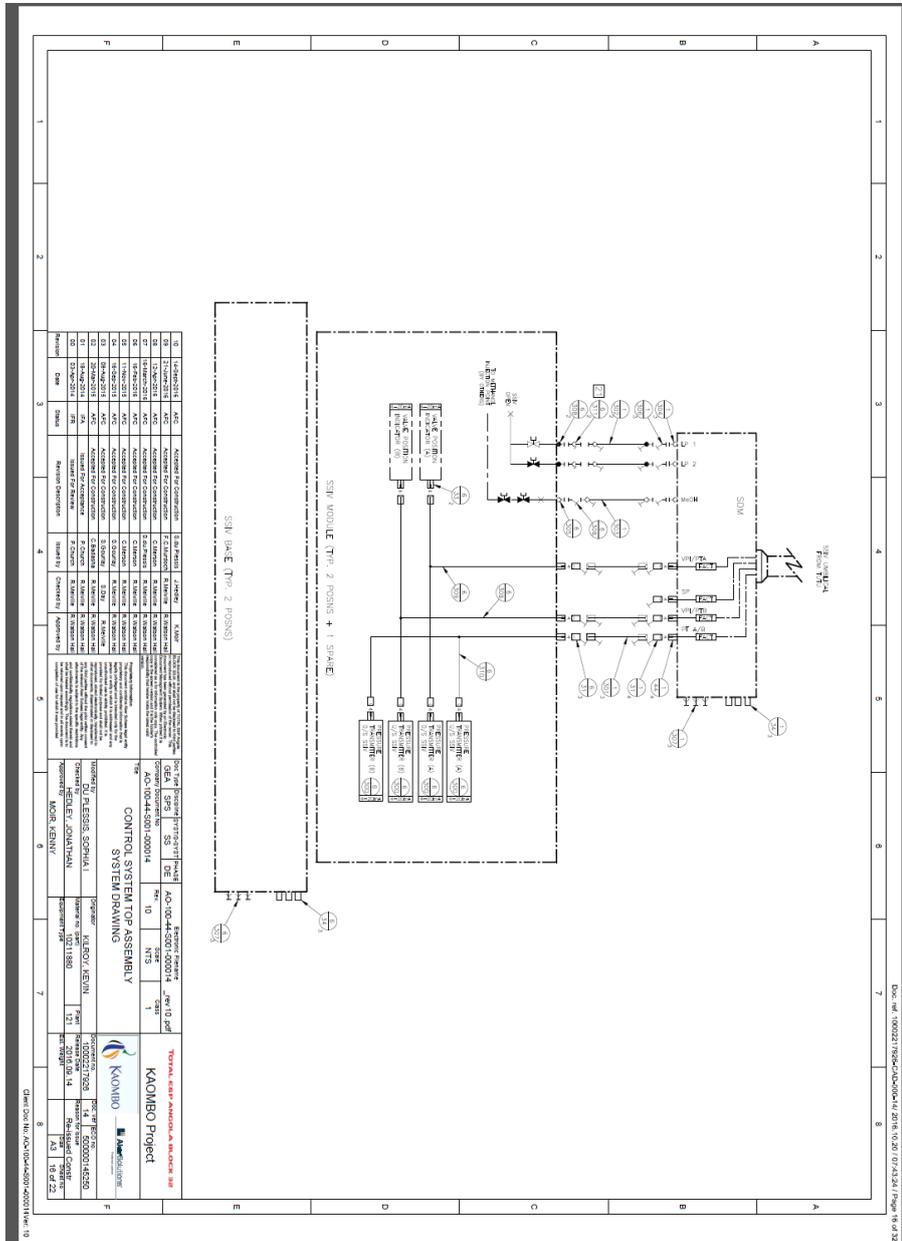
2.3.10 Production XT



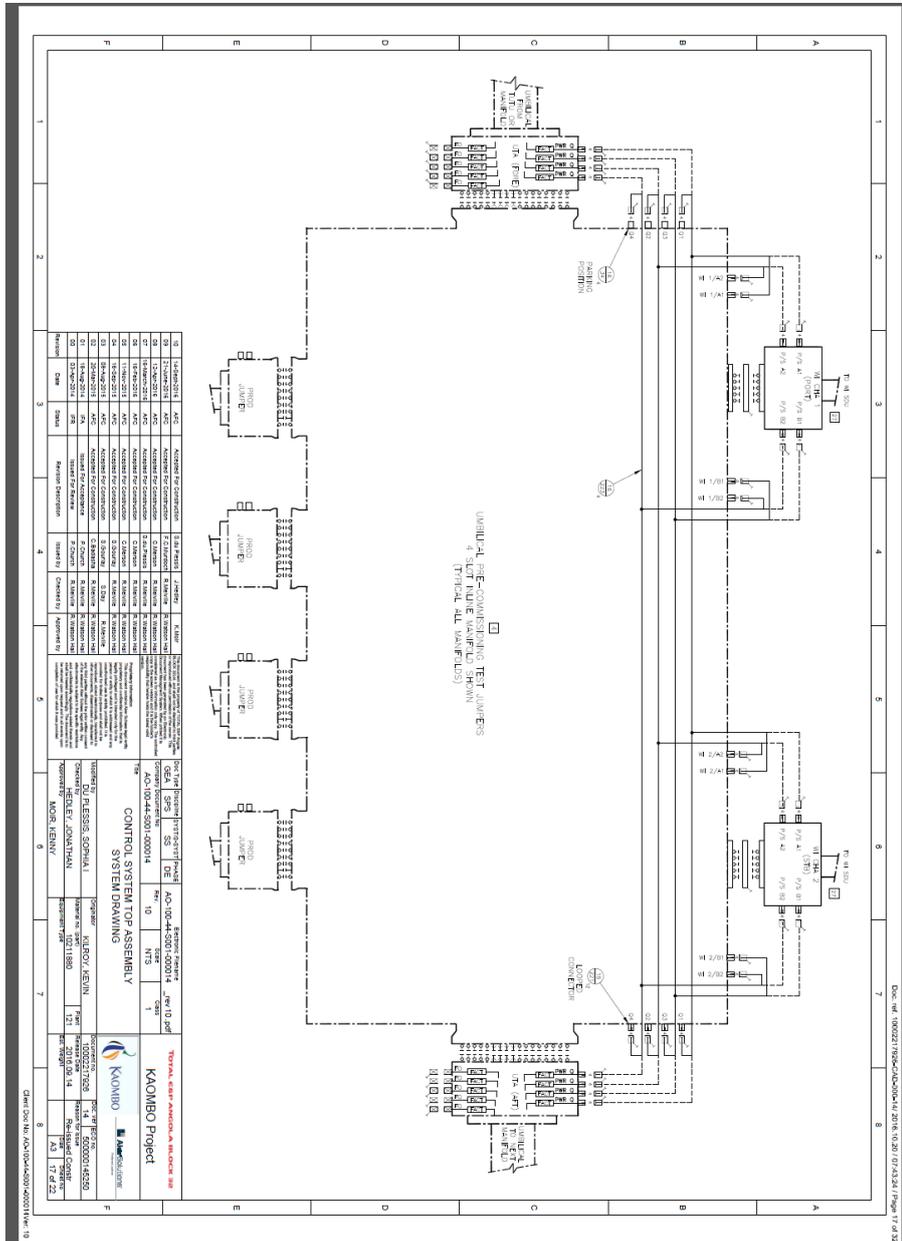
### 2.3.11 Water Injection XT



### 2.3.12 Subsea Safety Isolation Valve (SSIV) Module



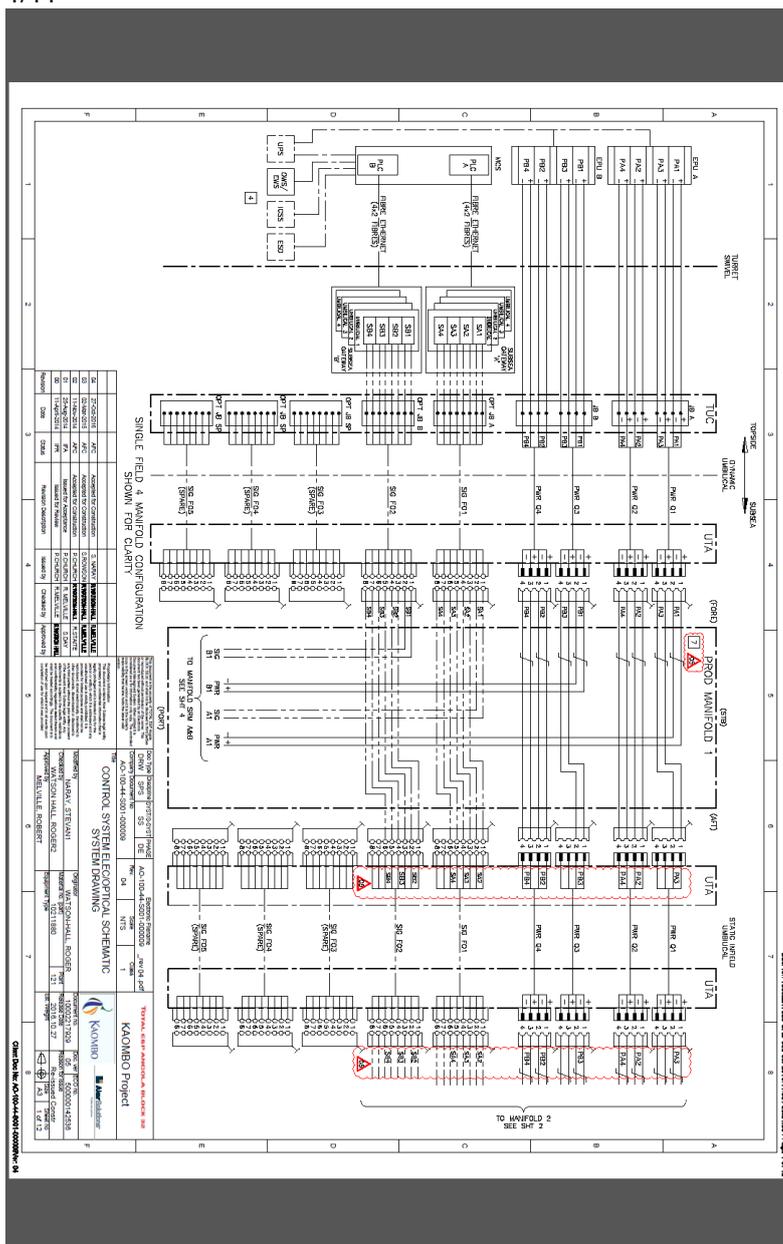
### 2.3.13 Umbilical pre-commissioning test jumpers (4slot inline Manifold shown)



## 2.4 Control System Elec/Optical Schematic System Drawing

**HOLD; feasibility of inclusion in handbook pending draft example from sub-supplier**

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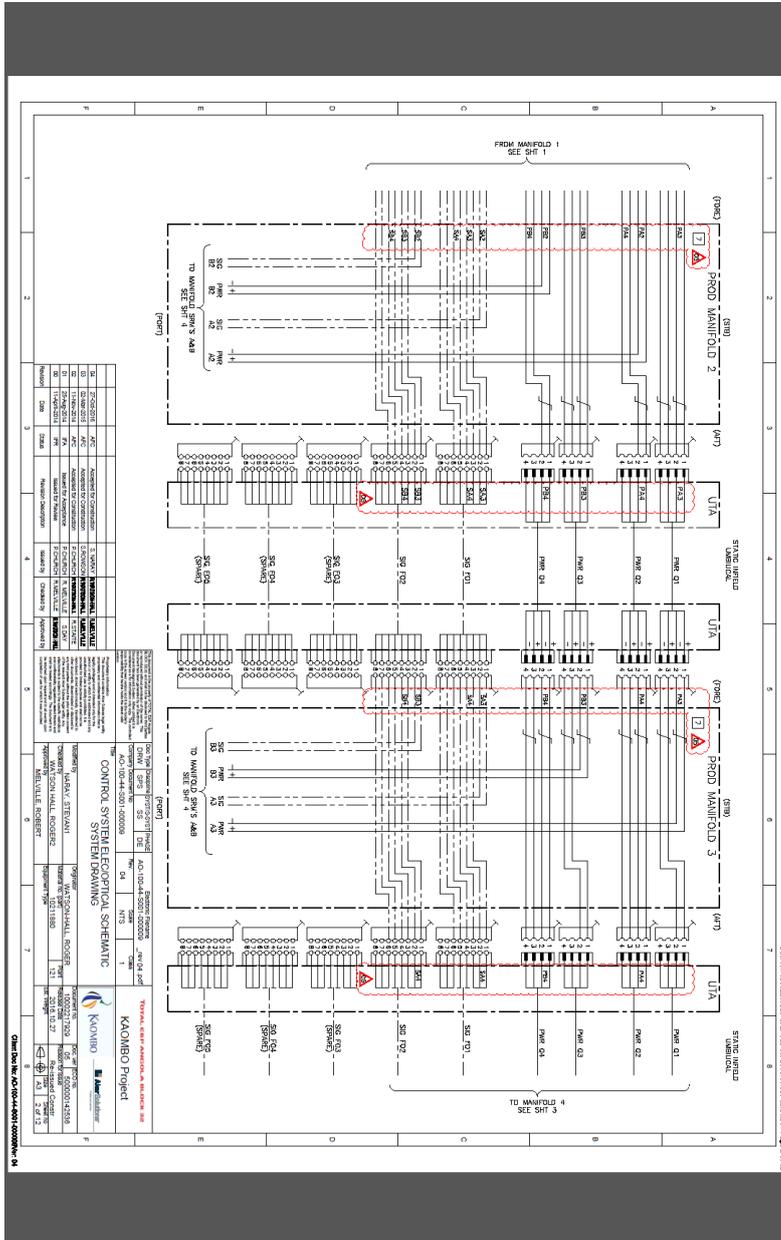


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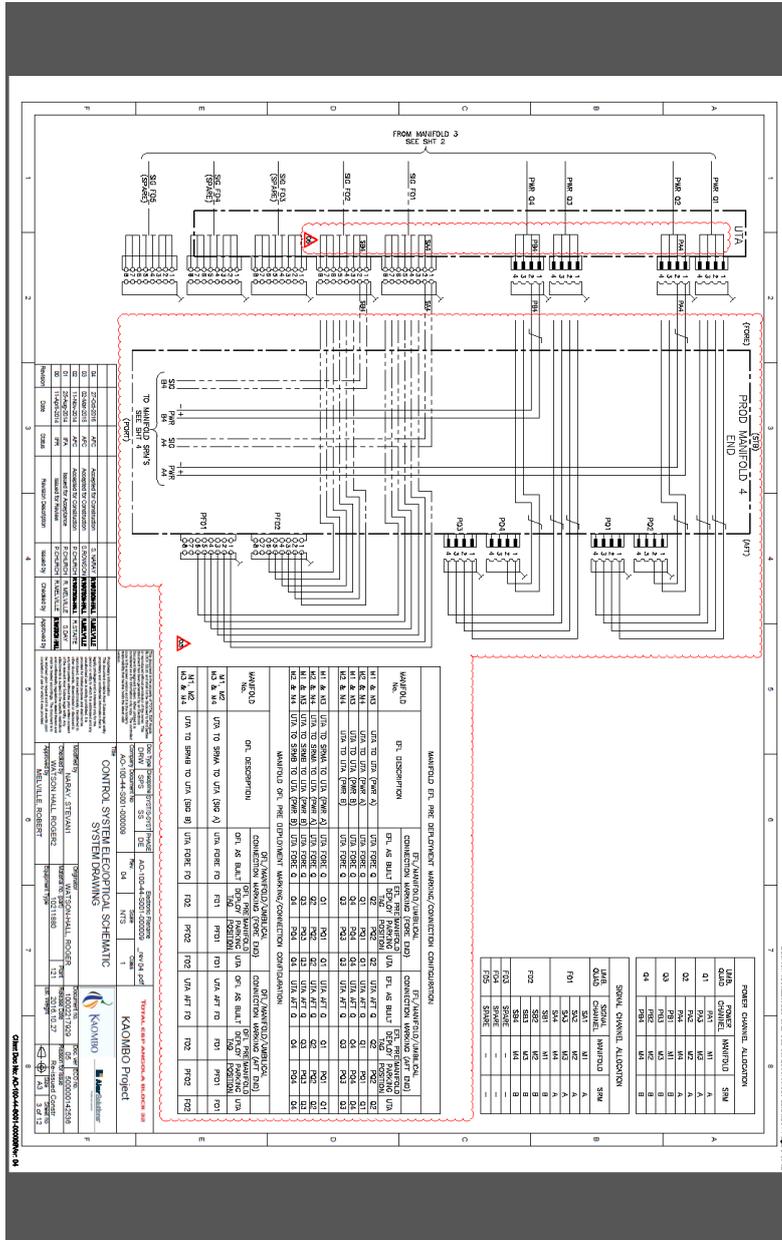


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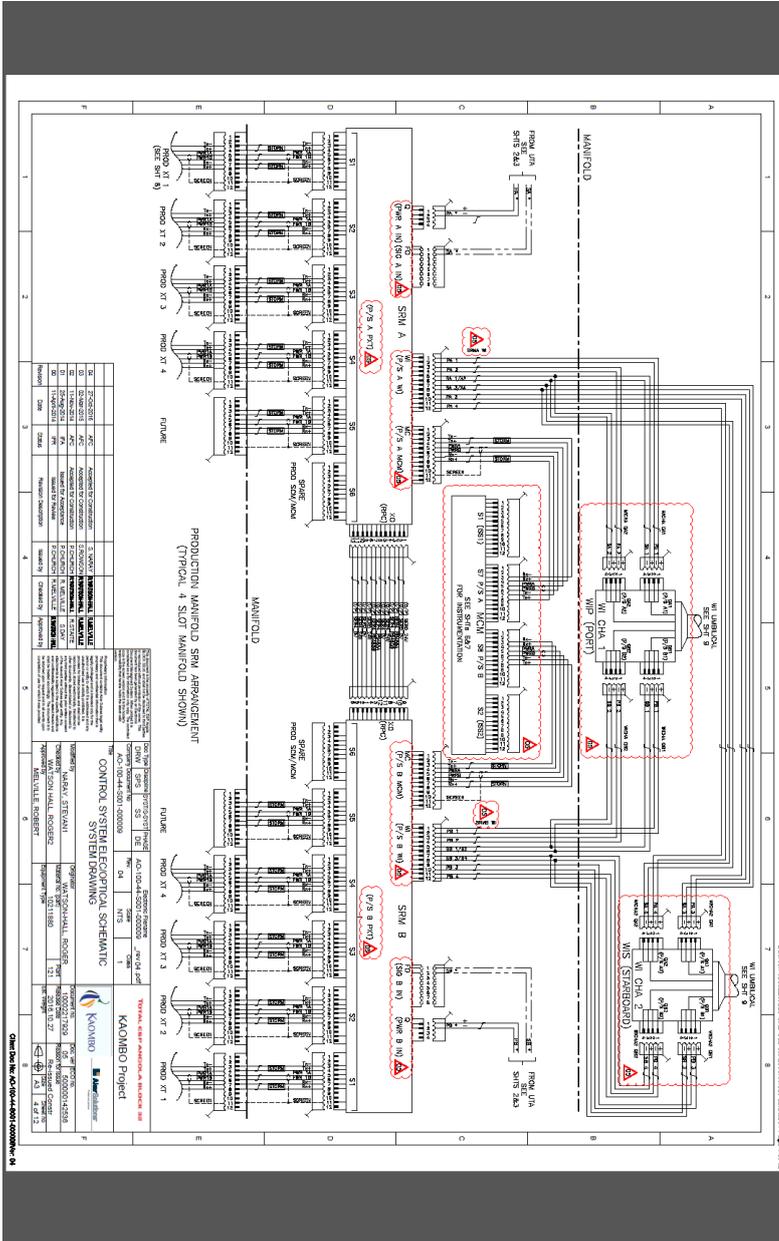


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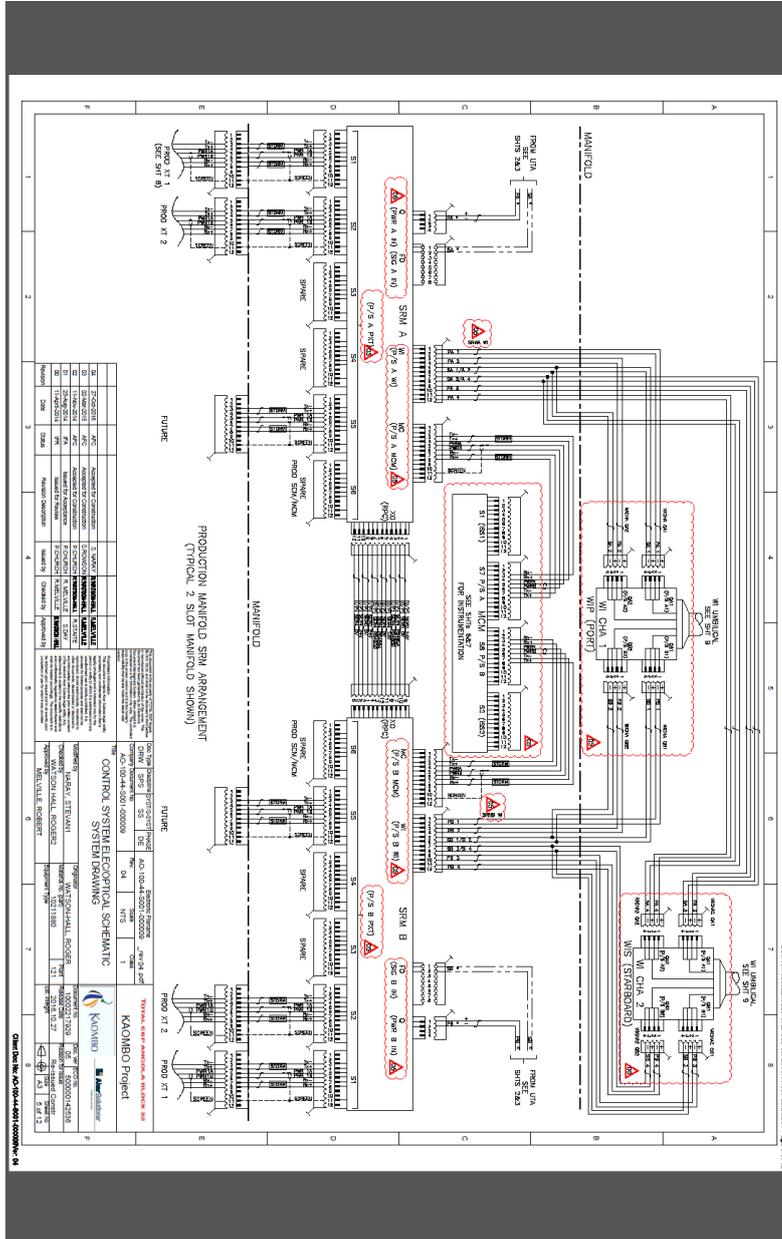


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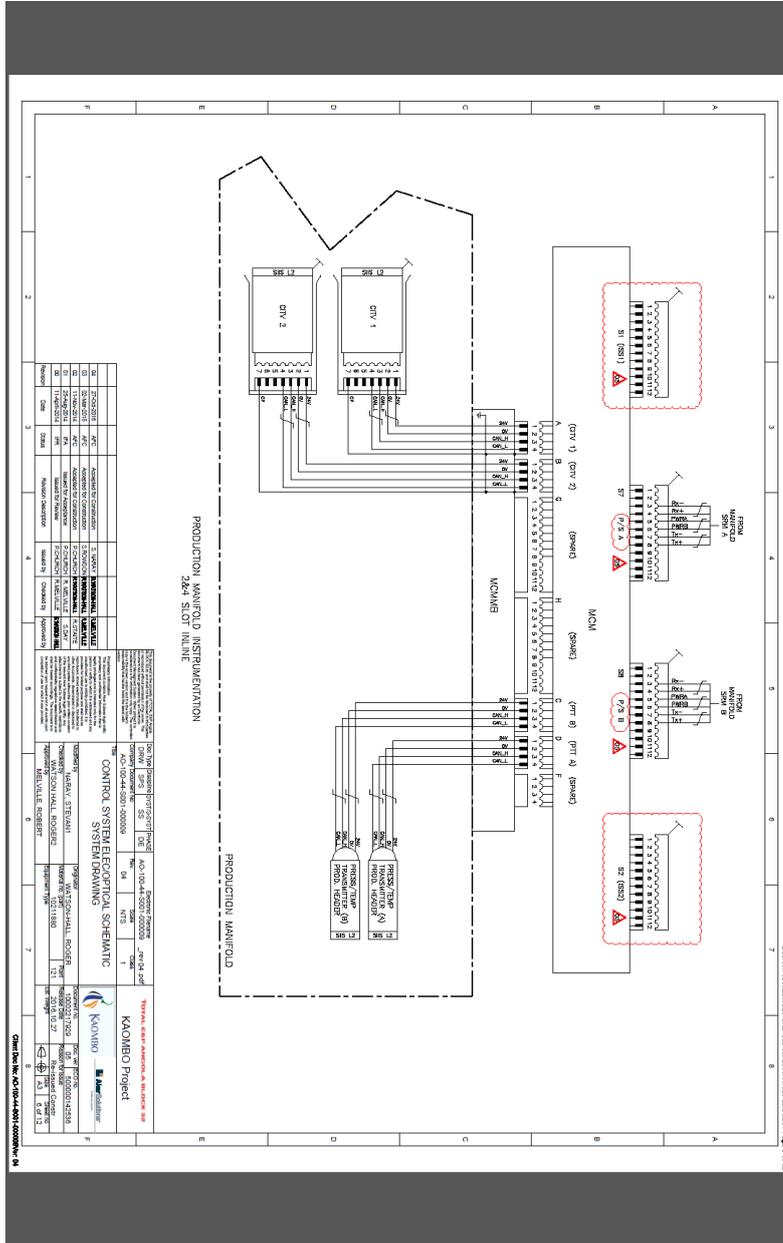


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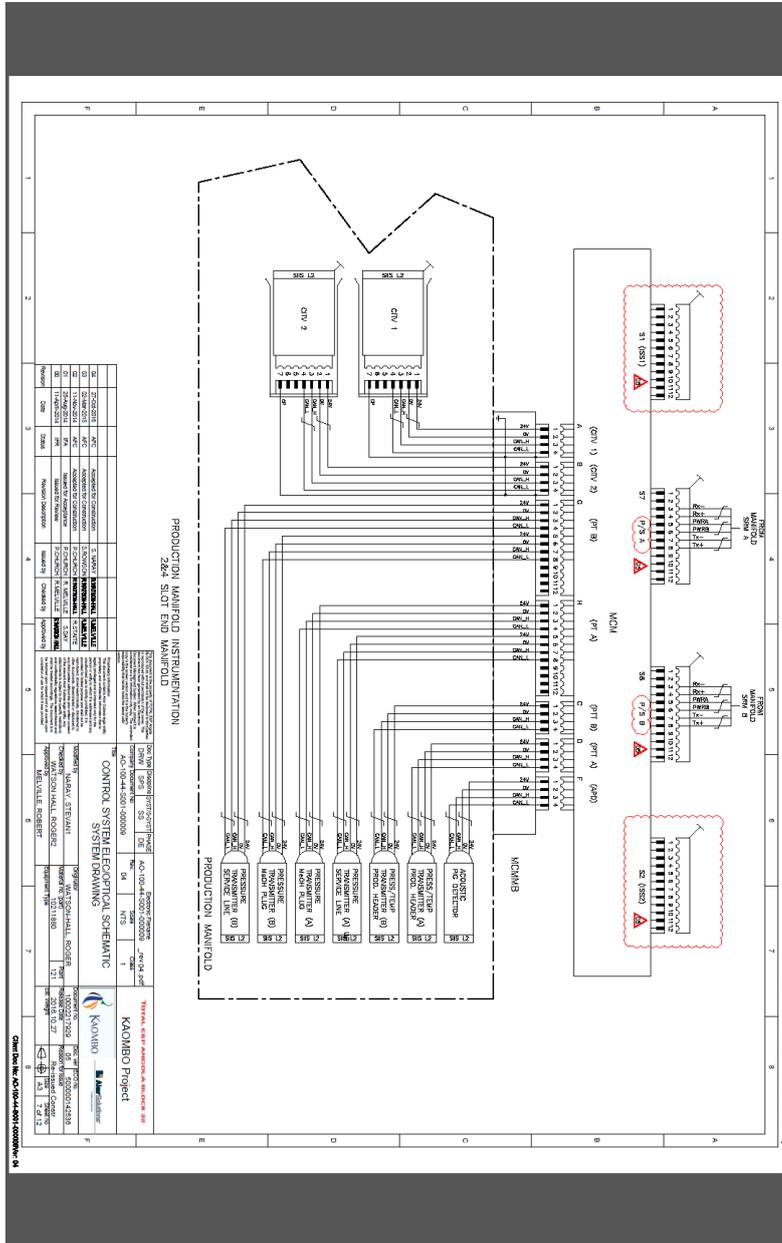


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01	ISSUED FOR CONSTRUCTION	2017.11.17	...	1
02	...	...	...	2
03	...	...	...	3
04	...	...	...	4
05	...	...	...	5
06	...	...	...	6
07	...	...	...	7

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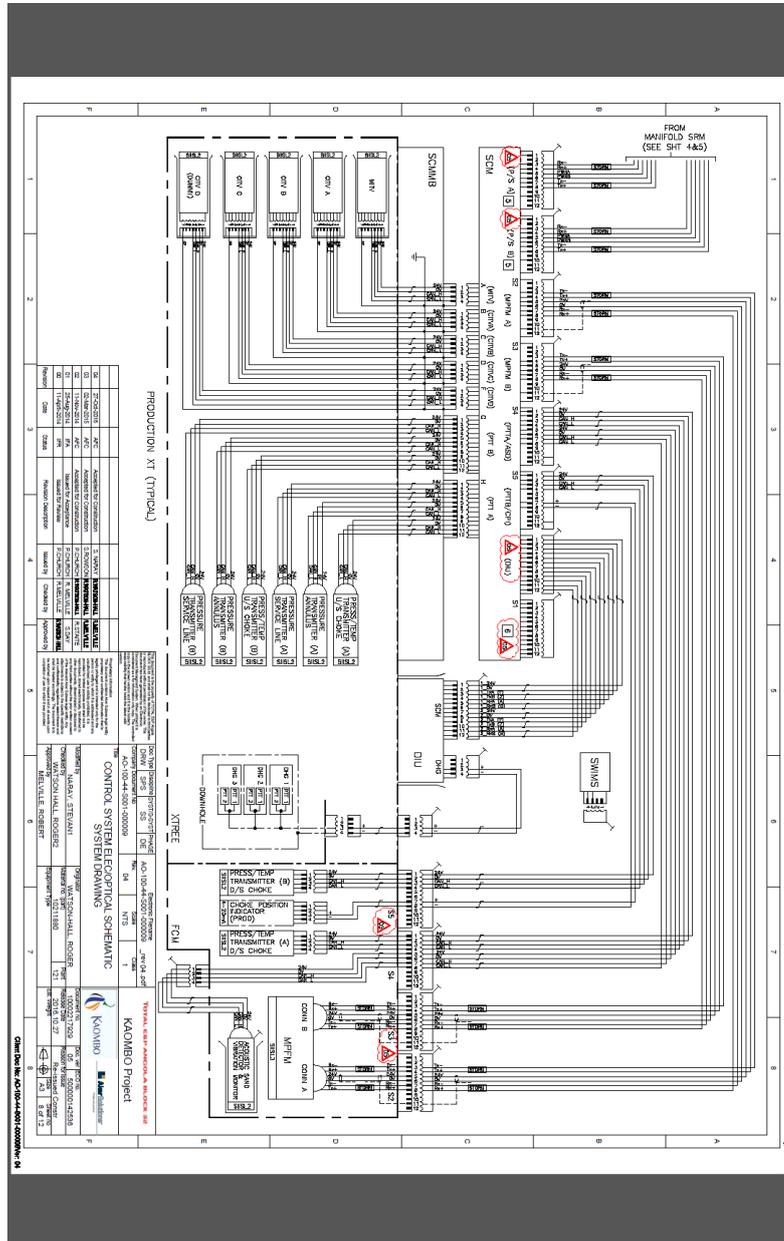
**KAOMBO PROJECT**  
 KAOMBO  
 TOTAL E&P SERVICES & SOLUTIONS

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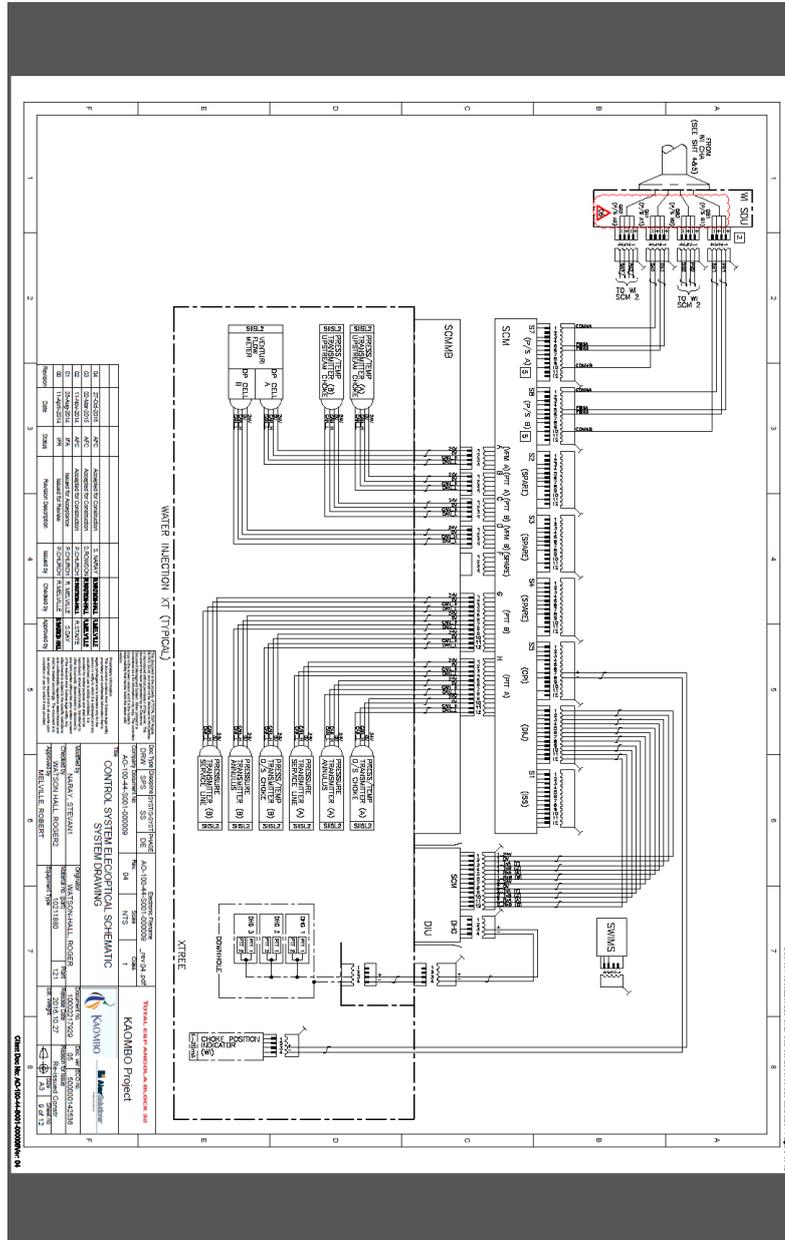


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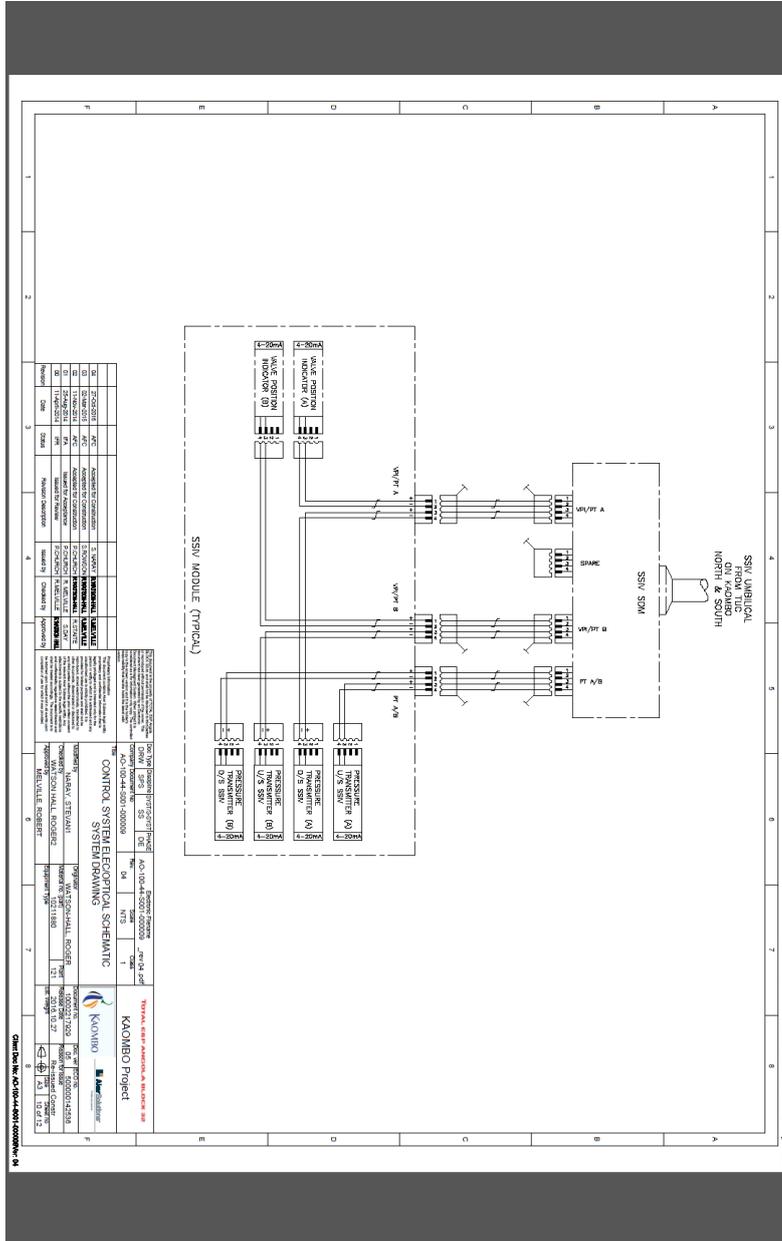


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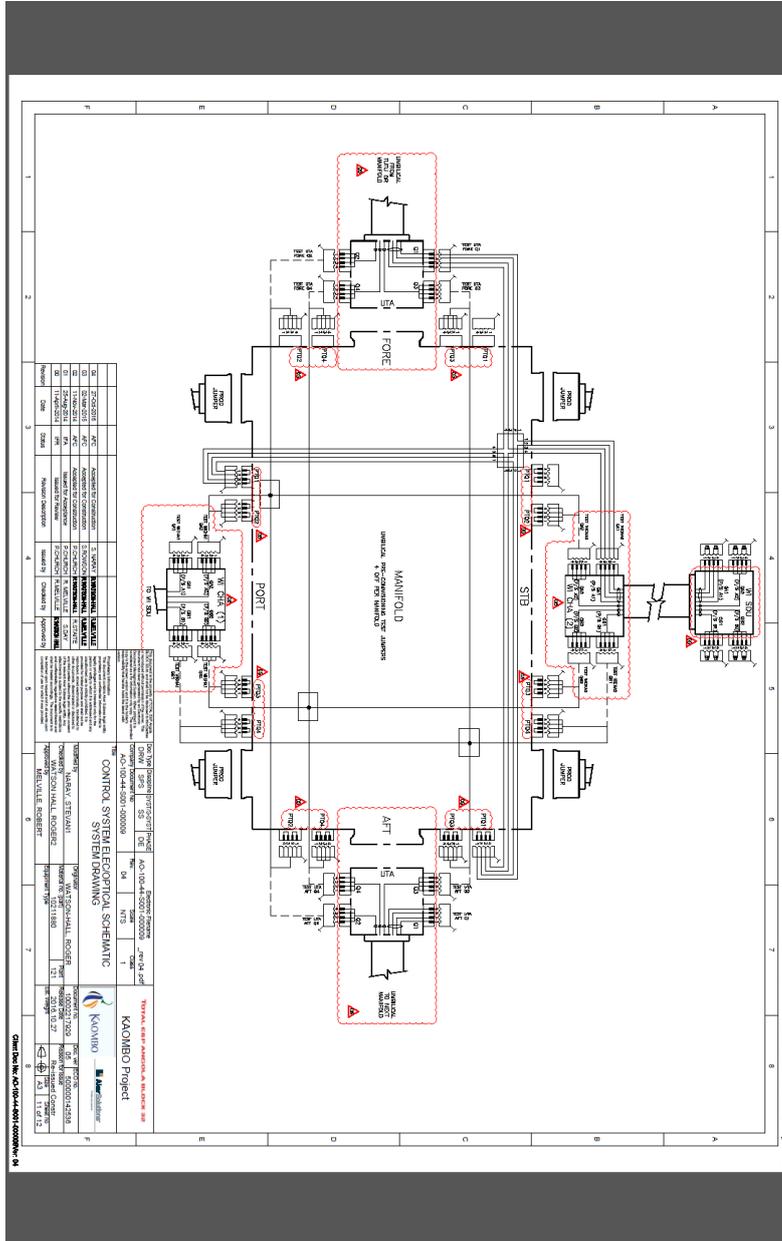


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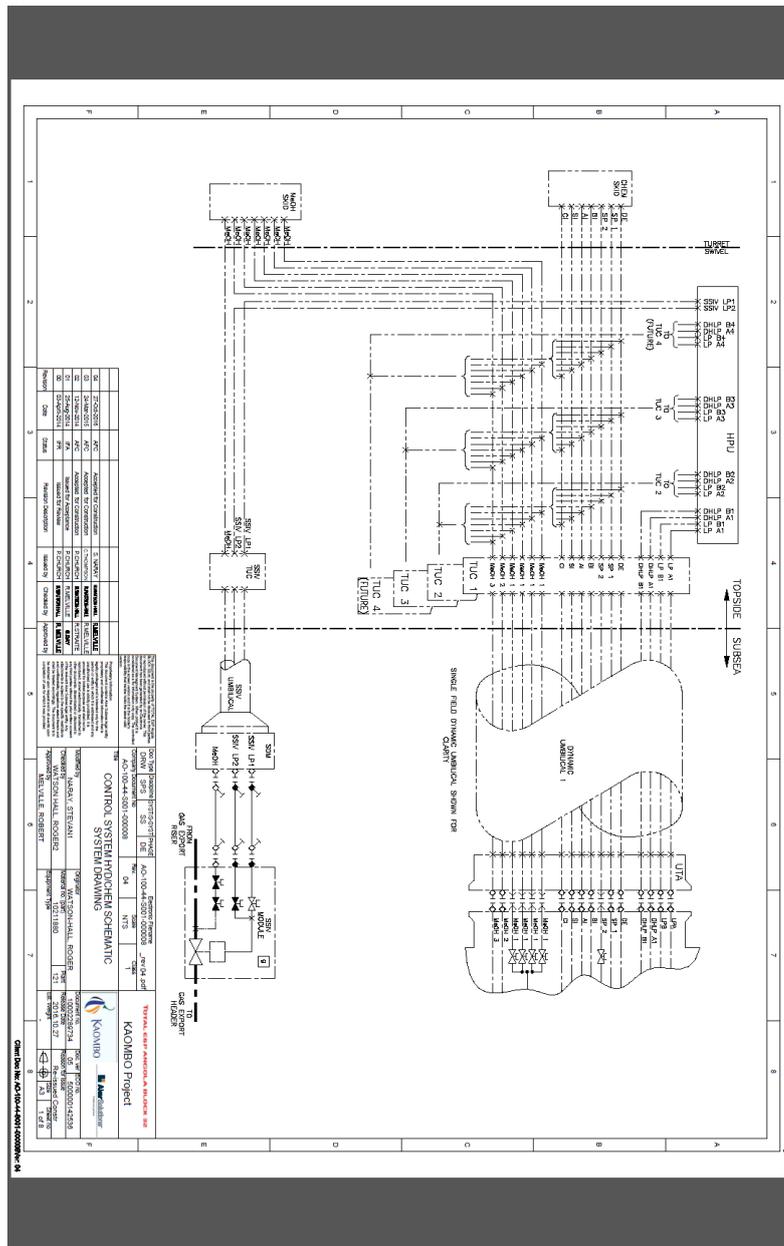
11/11



## 2.5 Control System Hyd/Chem Schematic

**HOLD; feasibility of inclusion in handbook pending draft example from sub-supplier**

1/7



Control system Electrical & optical schematic	10002289734	AO-100-44-S001-000008	10211880
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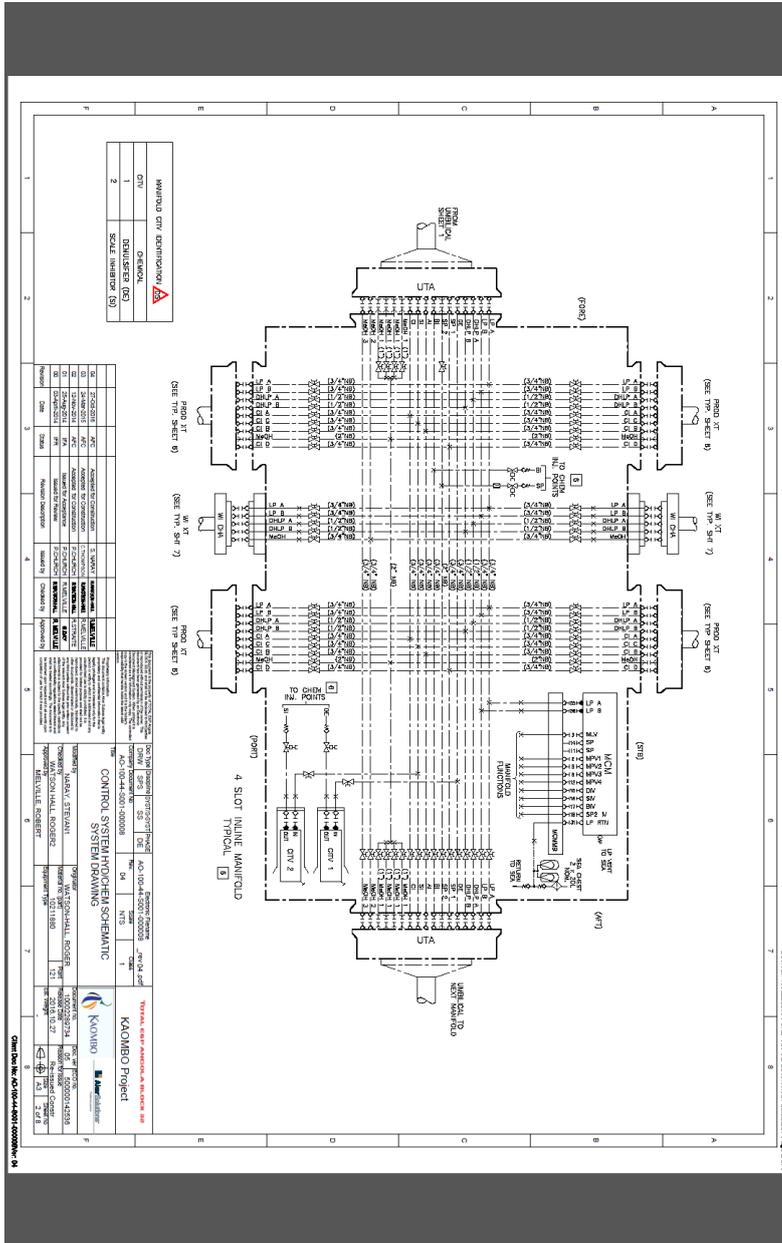
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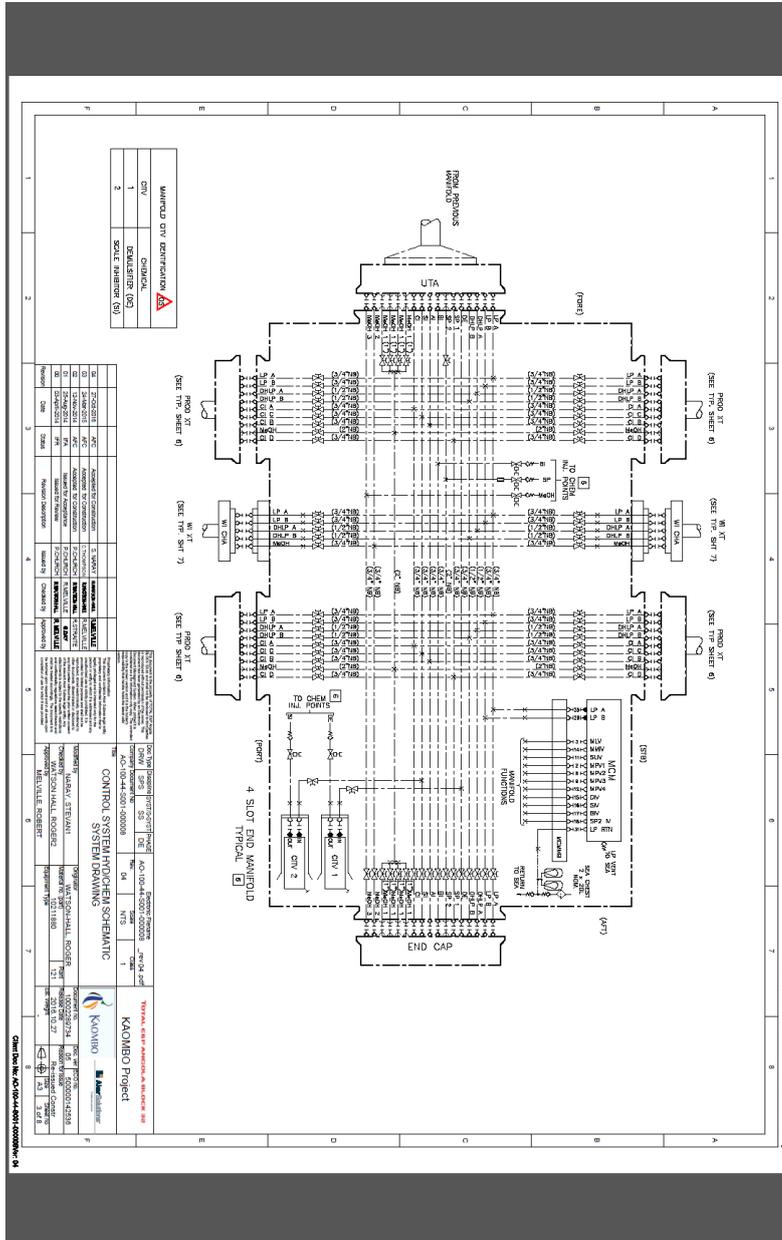


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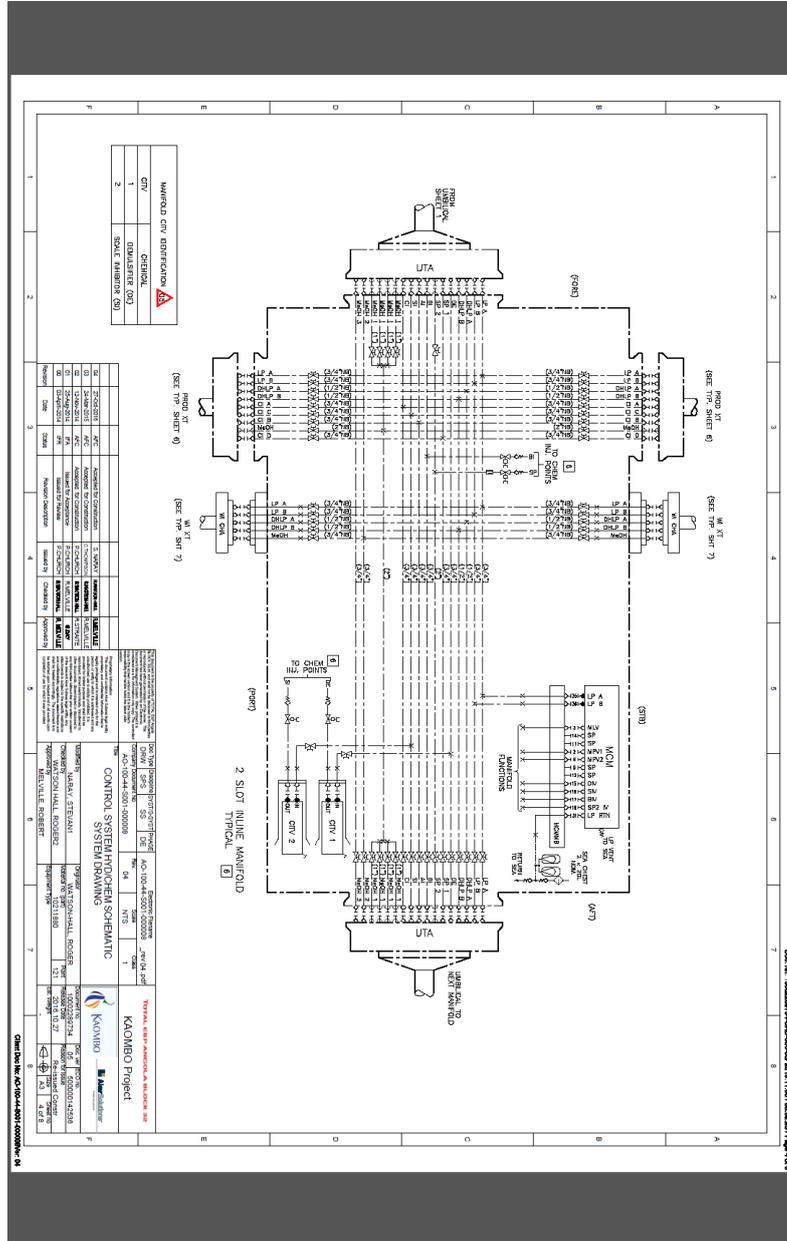
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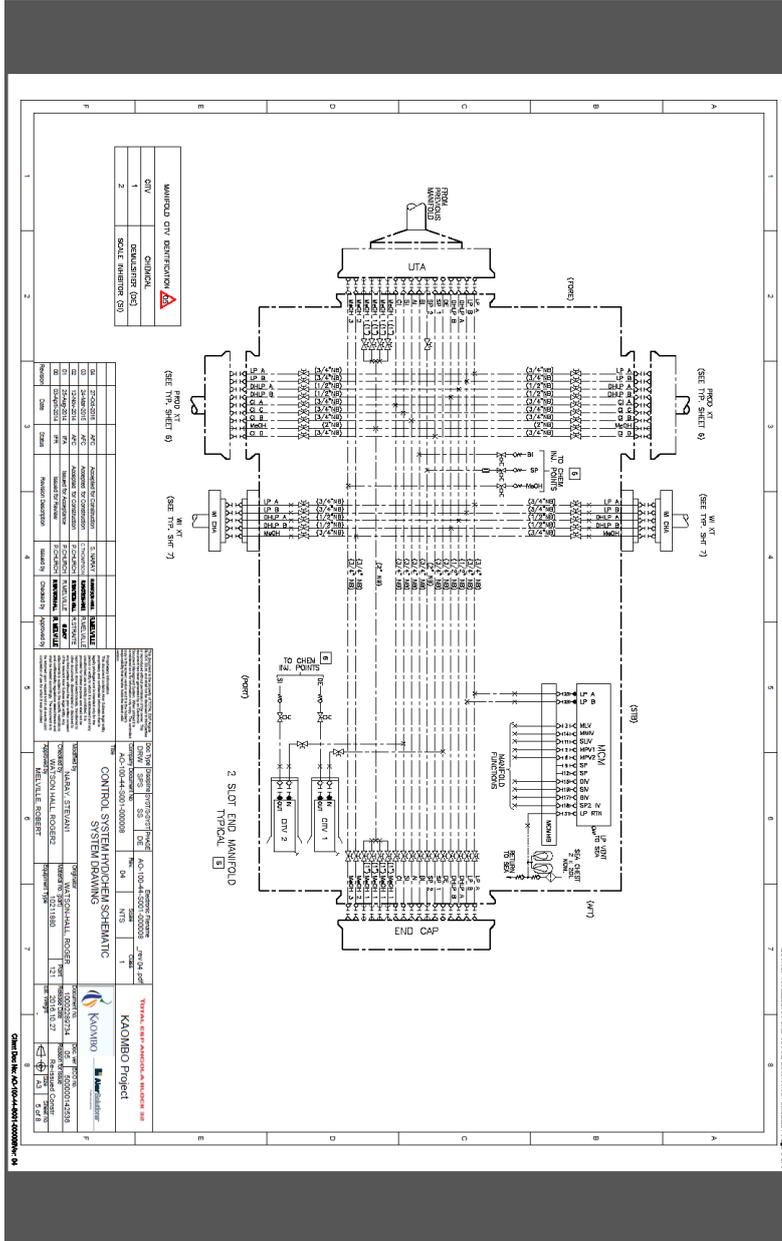


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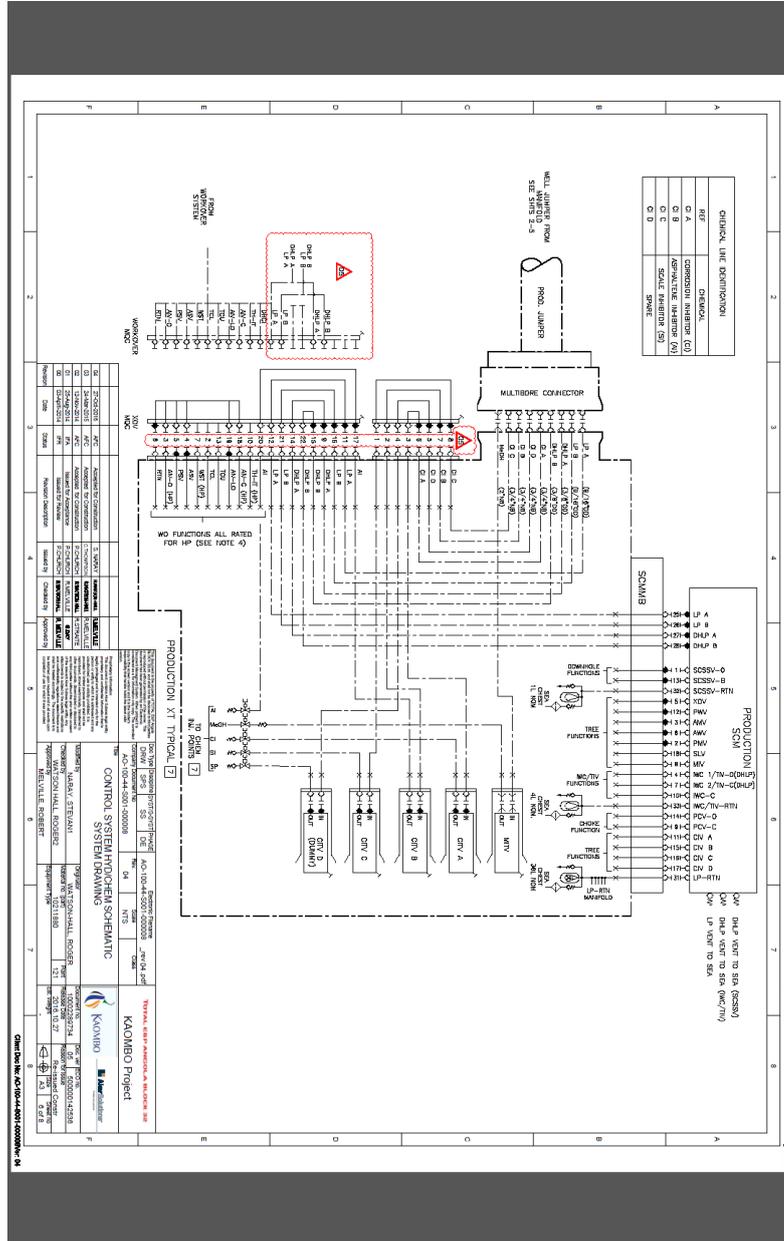


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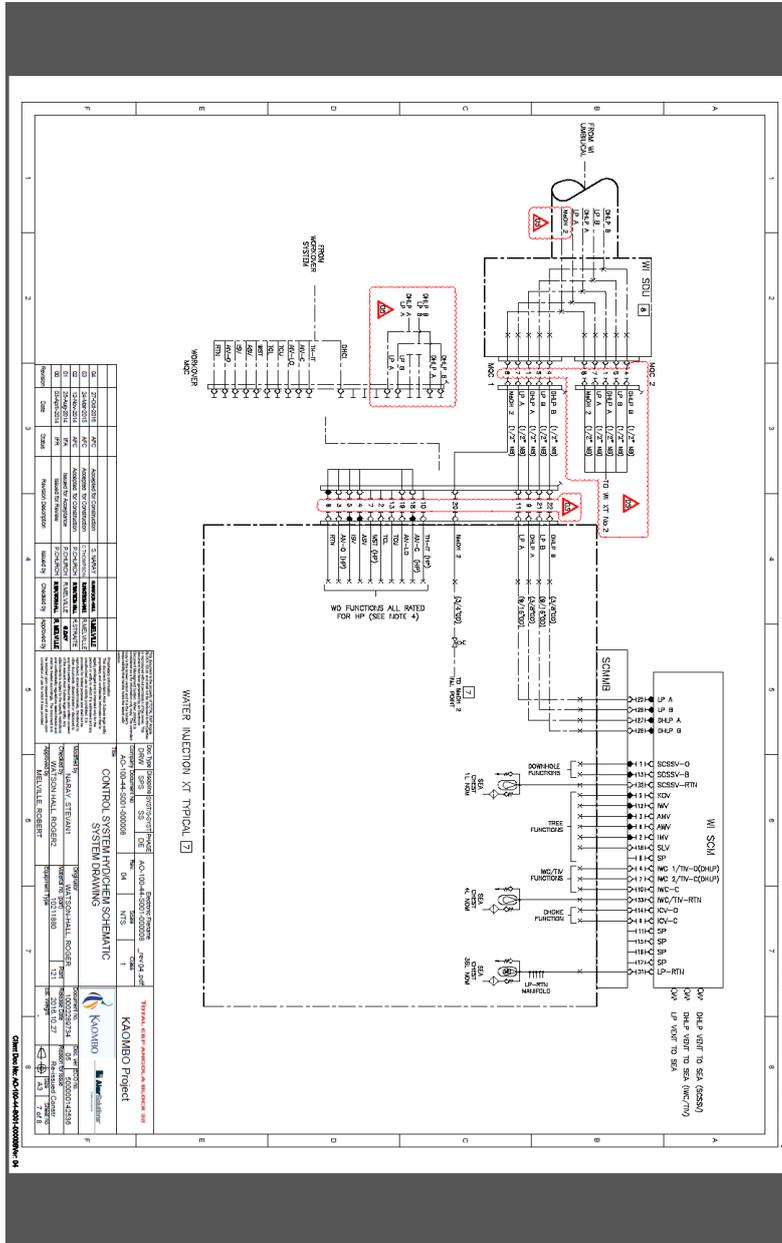


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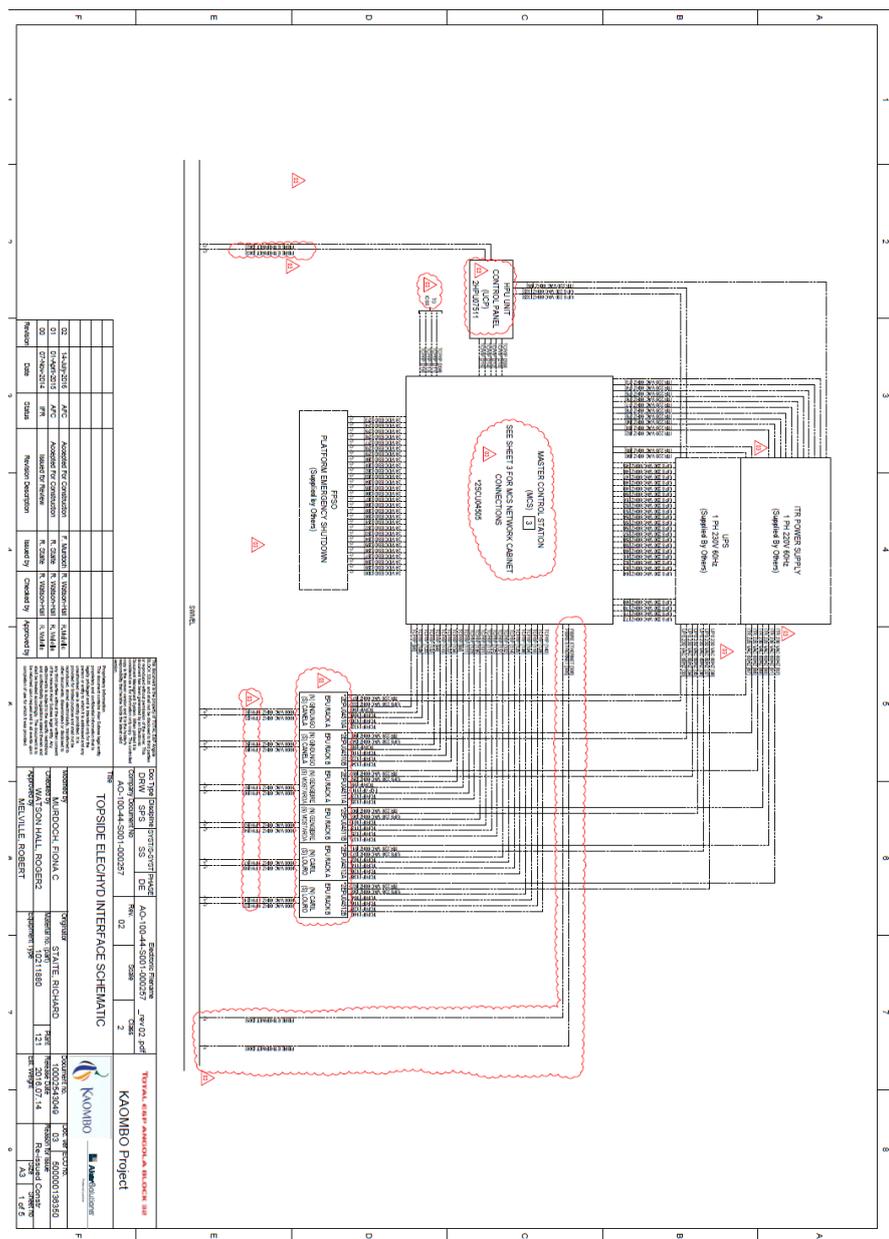
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## 2.6 Topside Elec/Hyd Interface Schematic

**HOLD; feasibility of inclusion in handbook pending draft example from sub-supplier**

1/5 Topside ELEC/HYD interface schematic



Topside electrical interface schematic	10002543049	AO-100-44-S001-000257	10211880
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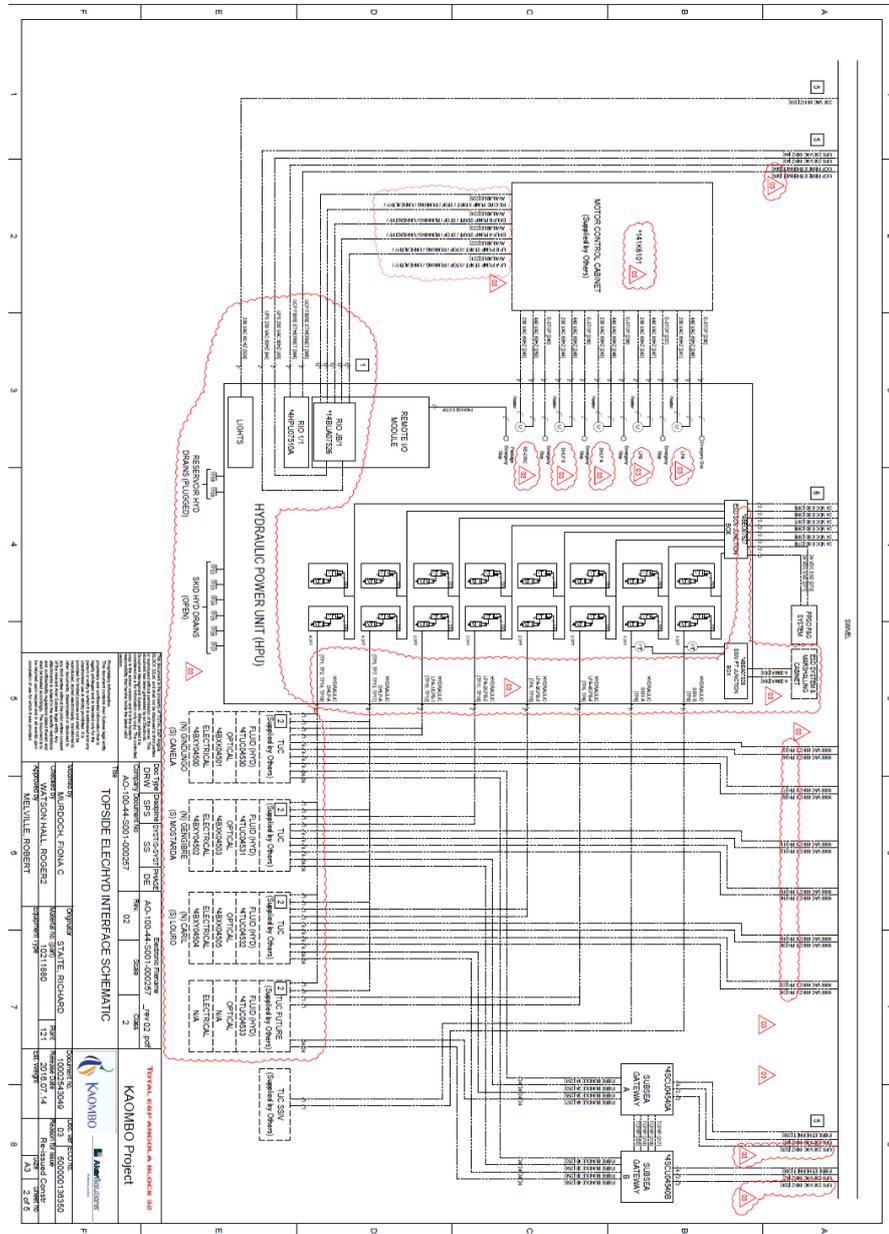
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Document: 10002504361-PDC-000  
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2/5 Topside ELEC/HYD interface schematic



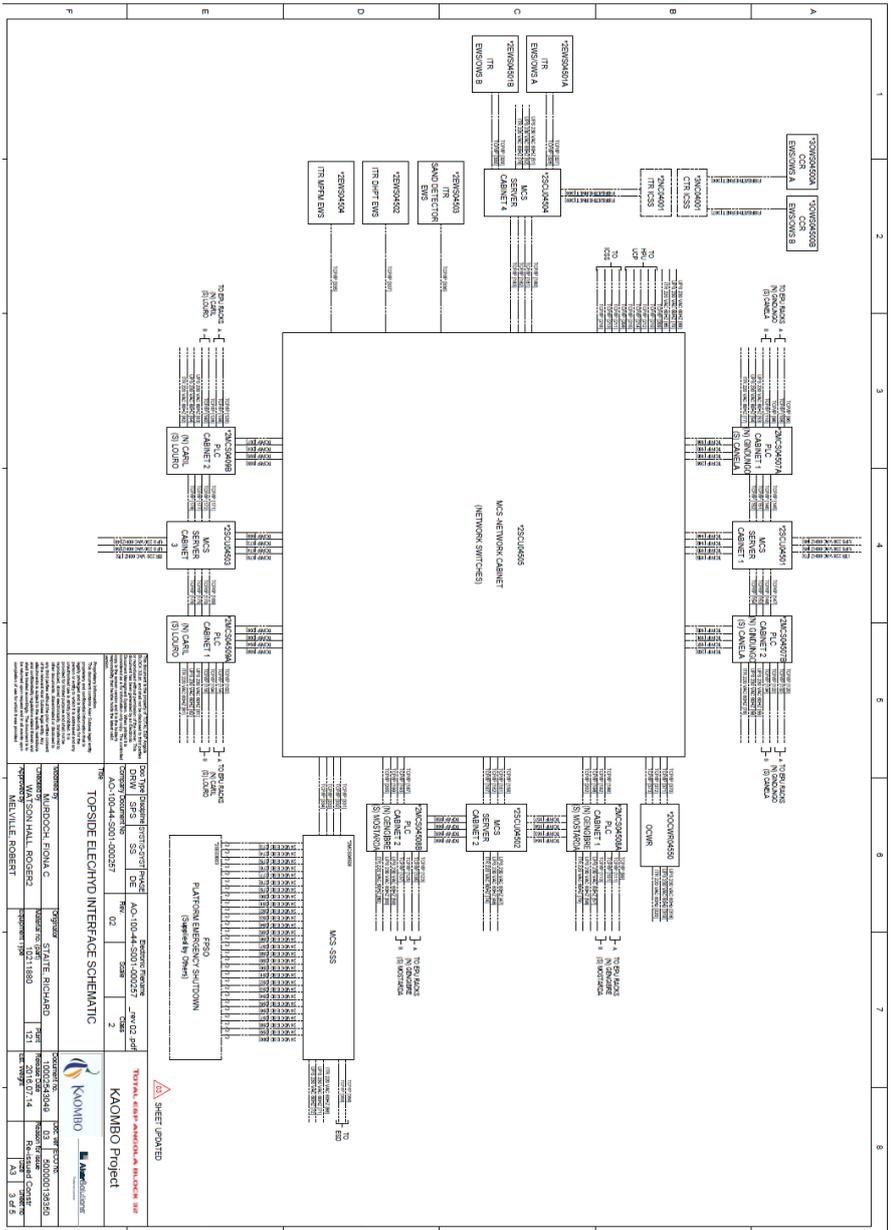
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3/5 Topside ELEC/HYD interface schematic



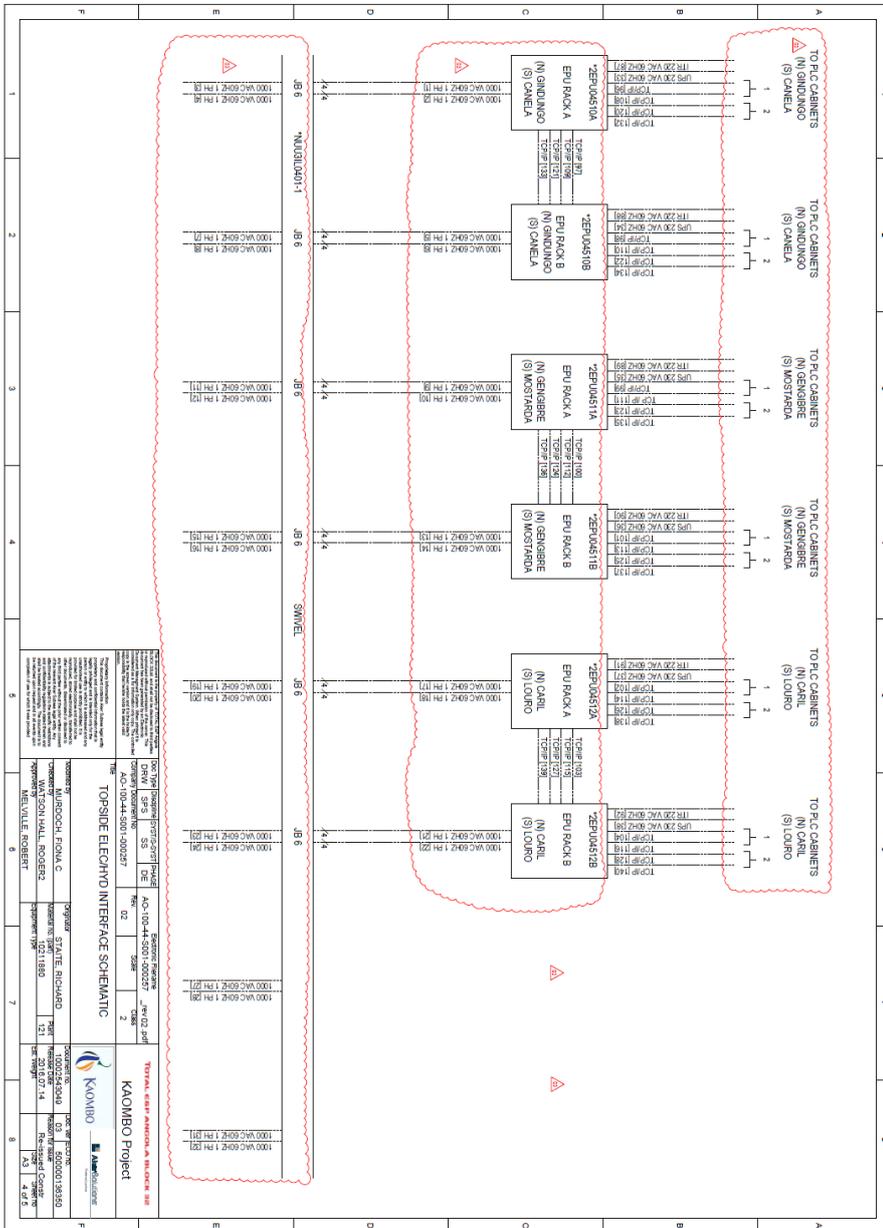
PROJECT: KAOMBO SHEET: 3 OF 5	
TITLE: TOPSIDE ELEC/HYD INTERFACE SCHEMATIC	DRAWN BY: STATE RICHARD CHECKED BY: MELVILLE ROBERT
PROJECT NO: 10002504361 SHEET NO: 3 OF 5	PROJECT NO: 10002504361 SHEET NO: 3 OF 5
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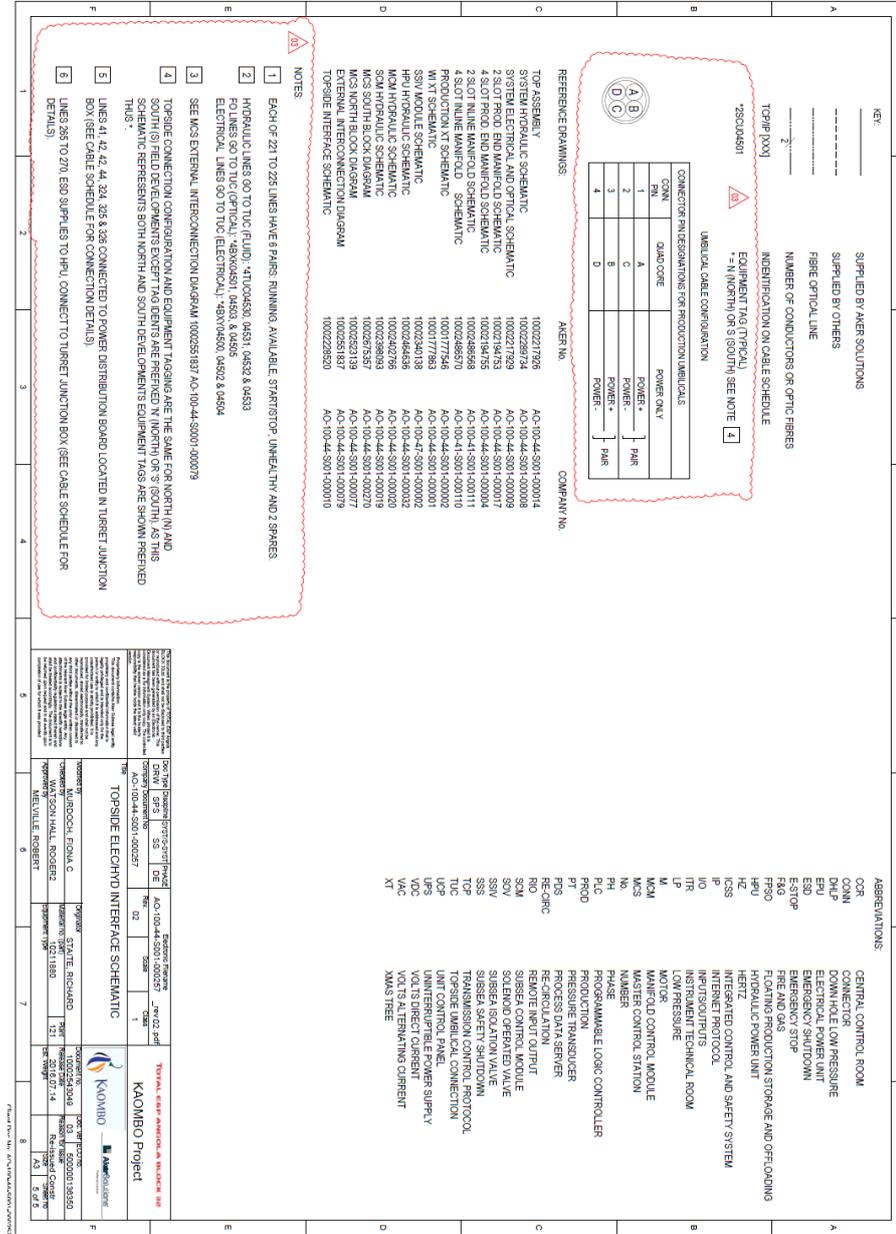
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4/5 Topside ELEC/HYD interface schematic



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5/5 Topside ELEC/HYD interface schematic

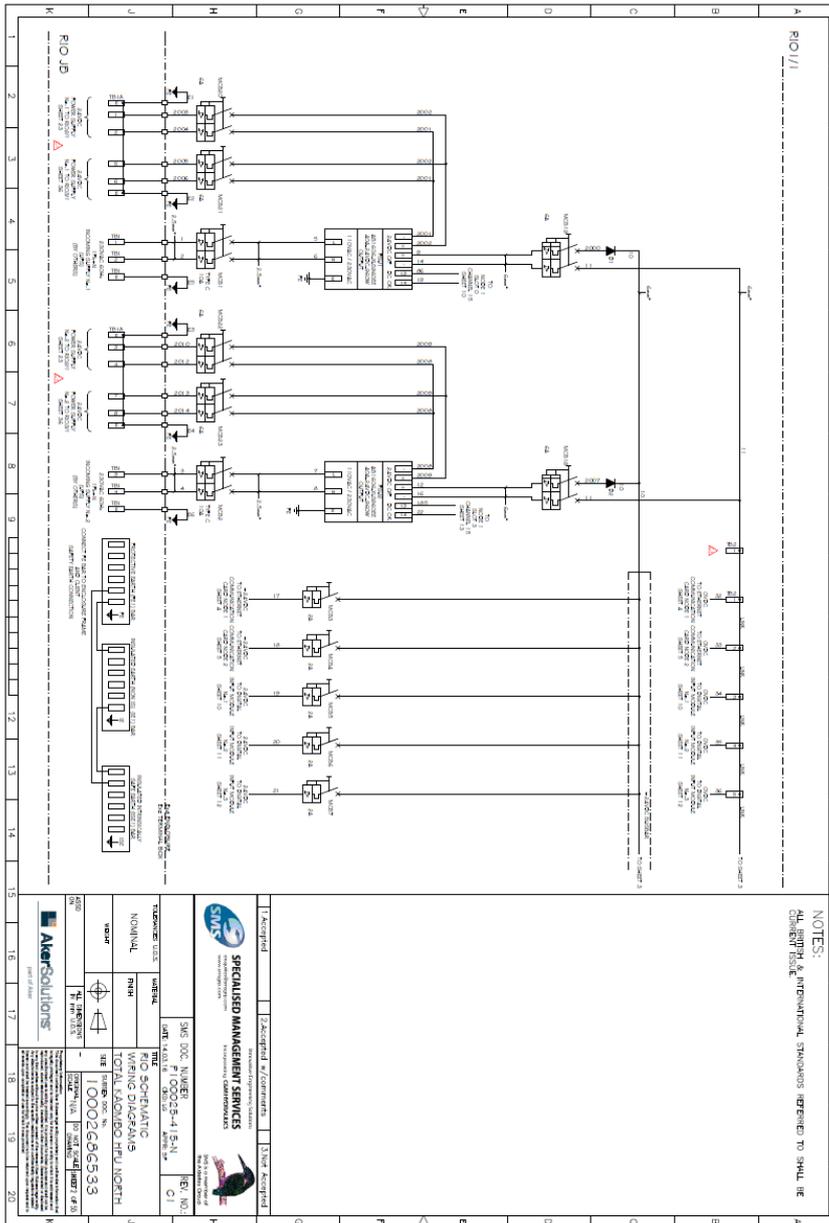


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## 2.7 Hydraulic Power Unit (HPU) Electrical Schematic

### 2.7.1 HPU Electrical Schematic Diagram North



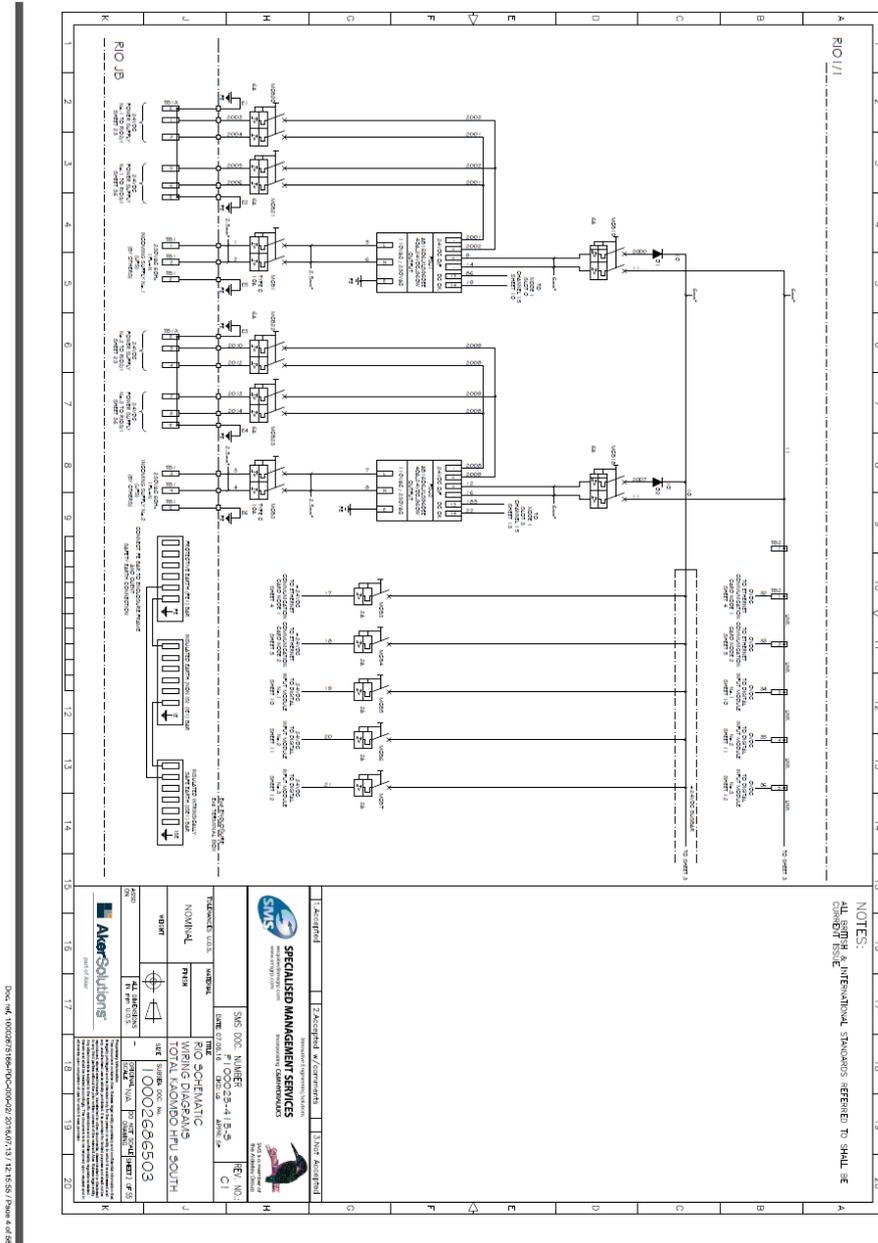
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### 2.7.2 HPU Electrical Schematic Diagram South



HPU Electrical Schematic South	10002675166	AO-100-44-S167-000051	10232645
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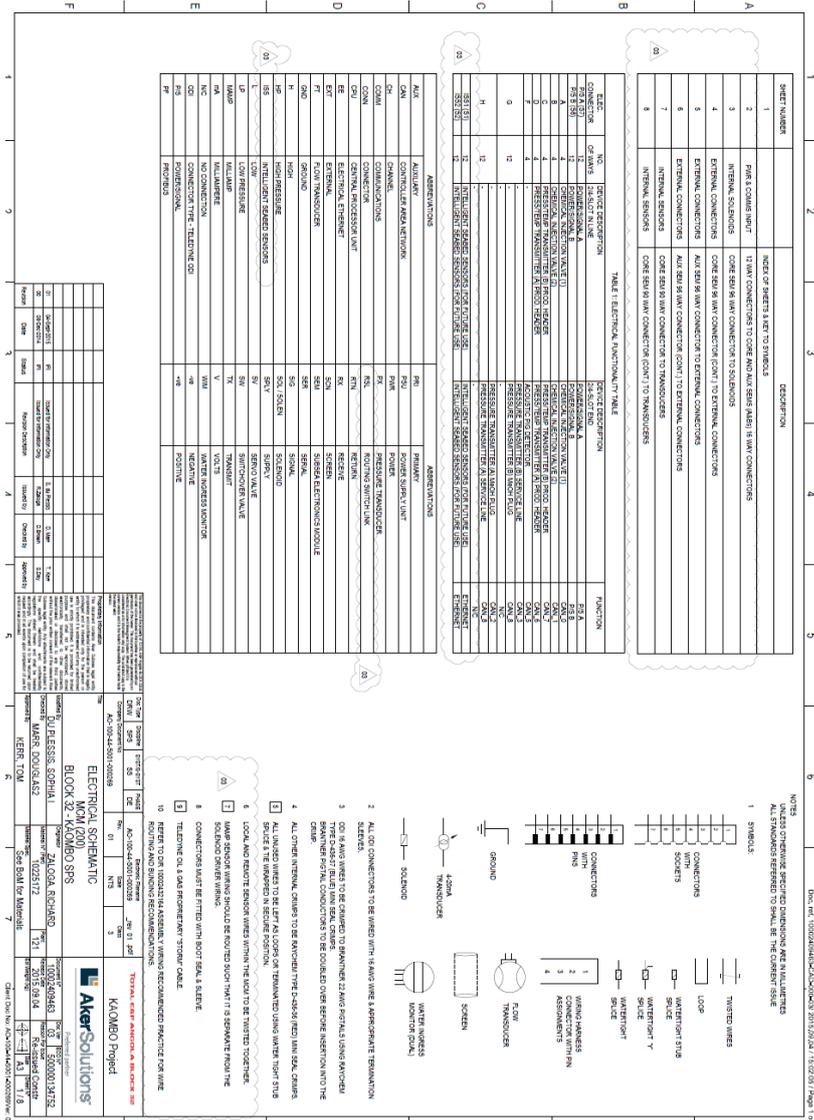
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	Version: 05 - Re-issued Constr
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## 2.8 Manifold Control Module (MCM) Electrical Schematic

**HOLD; feasibility of inclusion in handbook pending draft example from sub-supplier**

MCM 1/8 Electrical schematics



MCM Electrical Schematic	10002409463	AO-100-44-S001-000269	10225172
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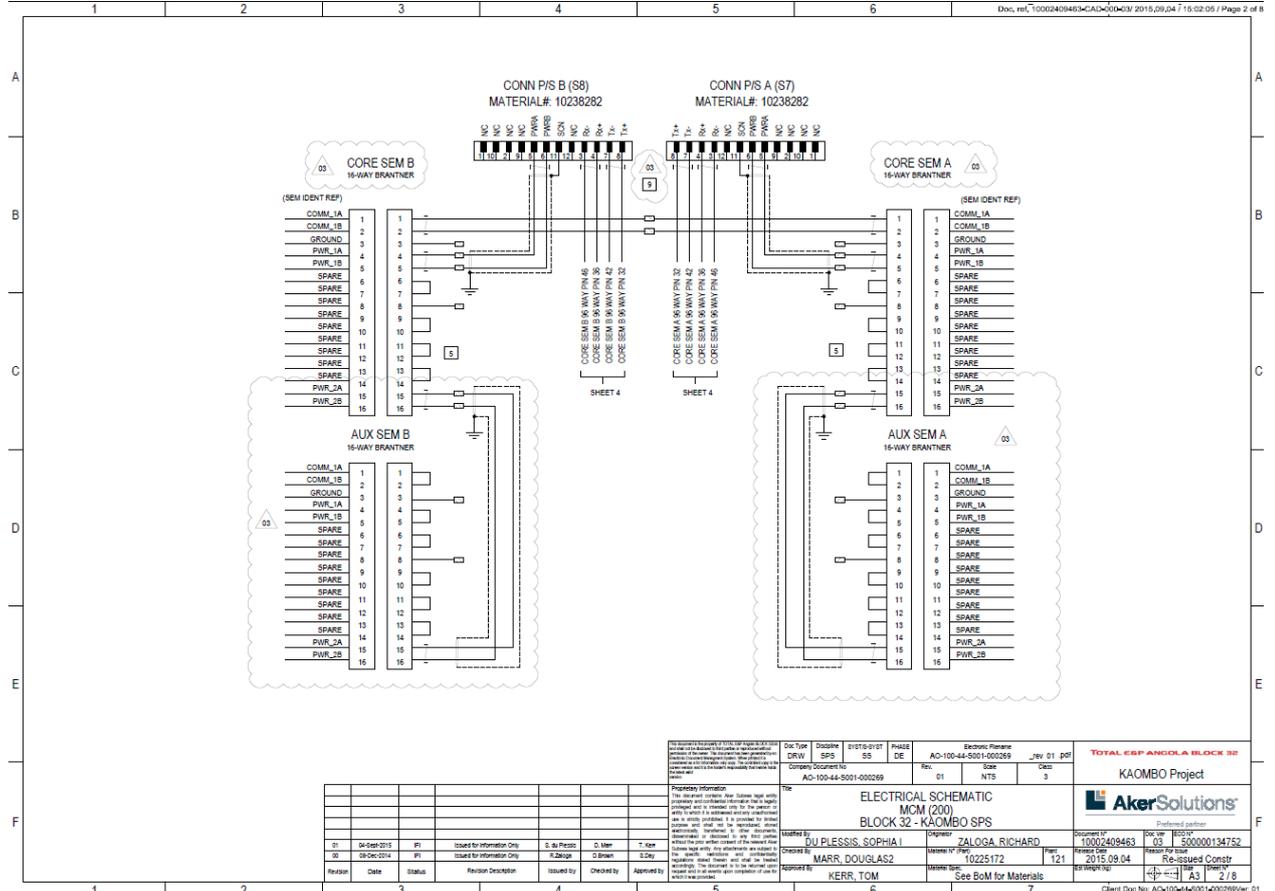
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MCM 2/8 Electrical schematics



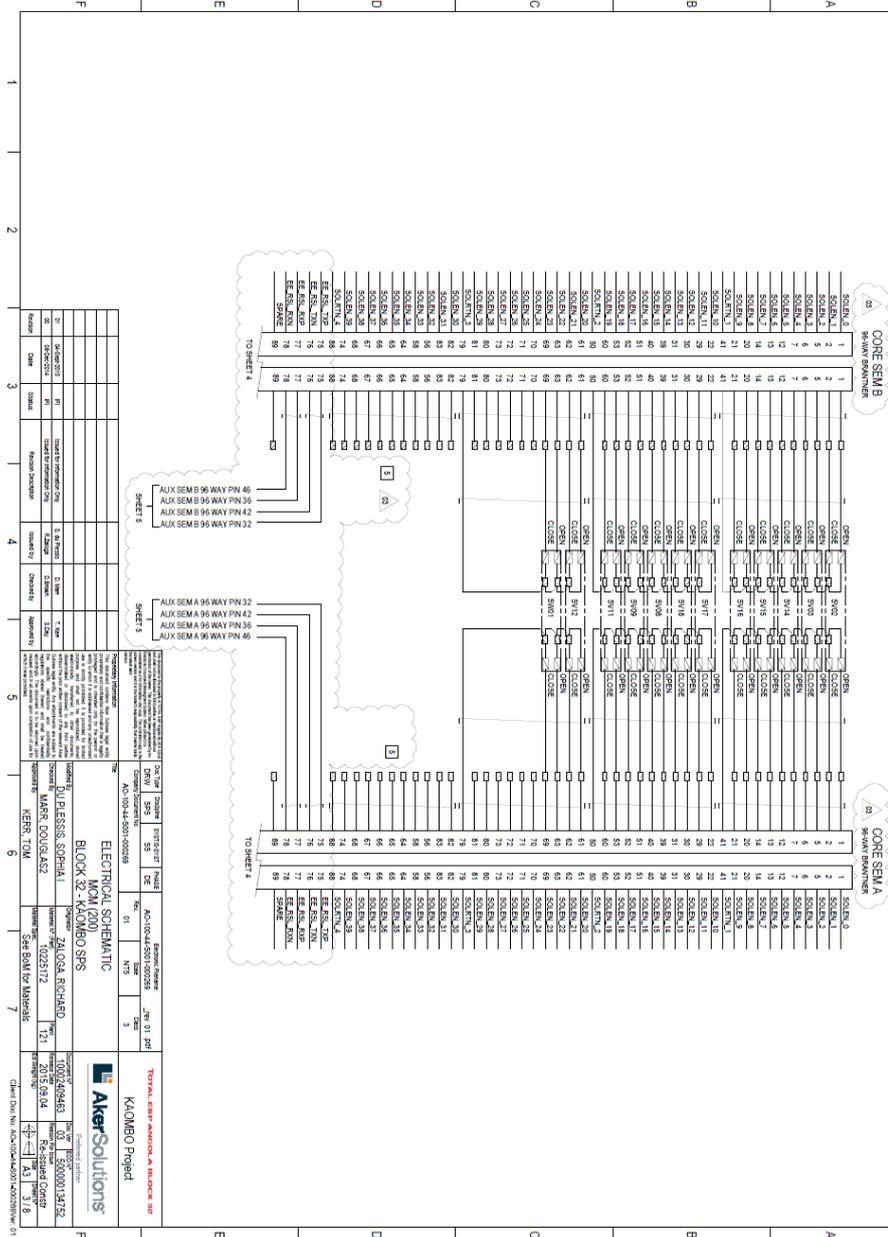
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<p><b>ELECTRICAL SCHEMATIC</b>                  MCM (200)                  BLOCK 32 - KAOMBO SPS</p>		<p>Drawn by: DU FLESSIS, SOPHIA I                  Checked by: MARR, DOUGLAS2                  Approved by: KERR, TOM</p>		
<p>Engineer: ZALOGA, RICHARD                  License No: 10225172                  Issue Date: 2015.09.04                  See BoM for Materials</p>		<p>Doc No: 10002504361-05                  Project No: 500000134752                  Issue Date: 2015.09.04                  Issue: 03                  Re-issued Constr                  Sheet: 73 of 316                  Block: A3                  Page: 2/8</p>		

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MCM 3/8 Electrical schematics



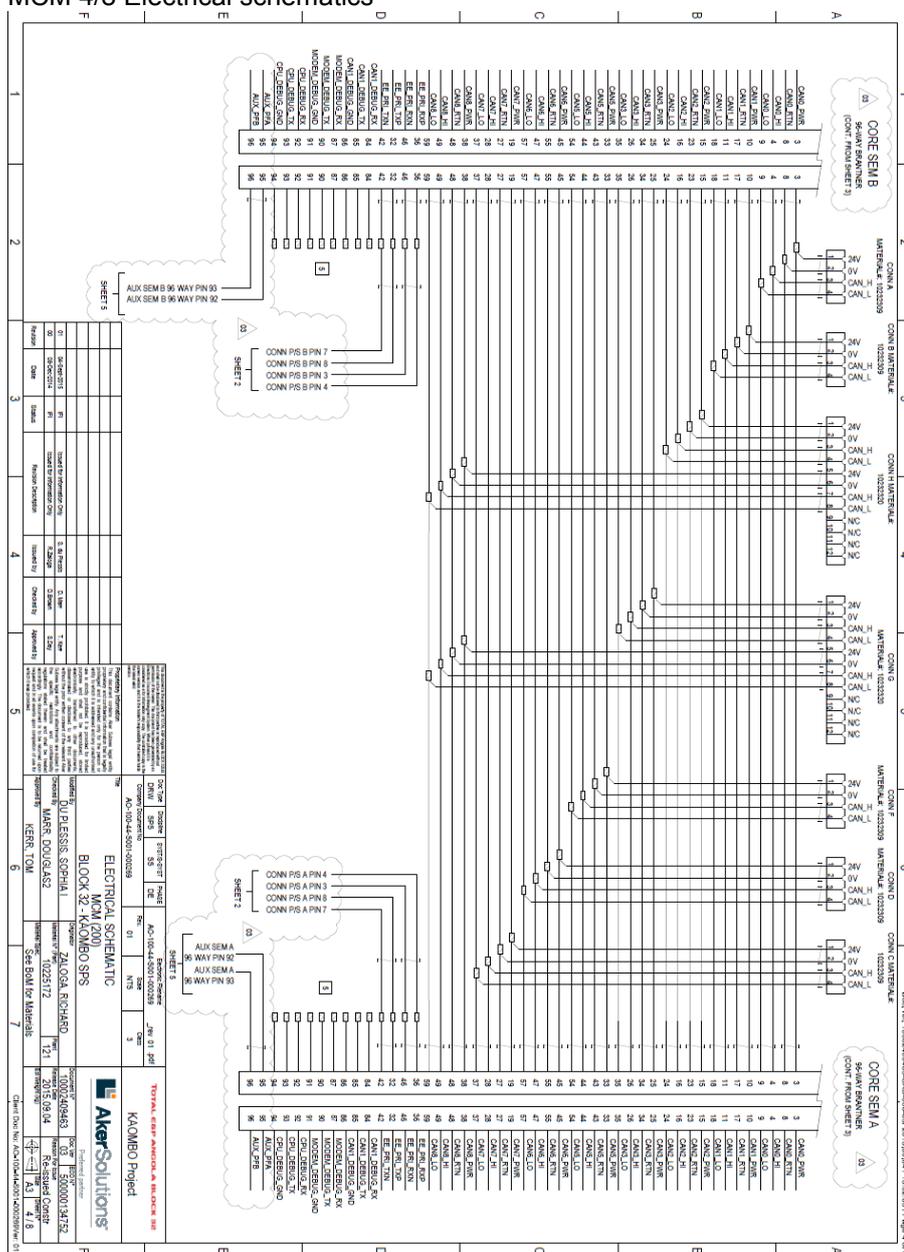
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MCM 4/8 Electrical schematics



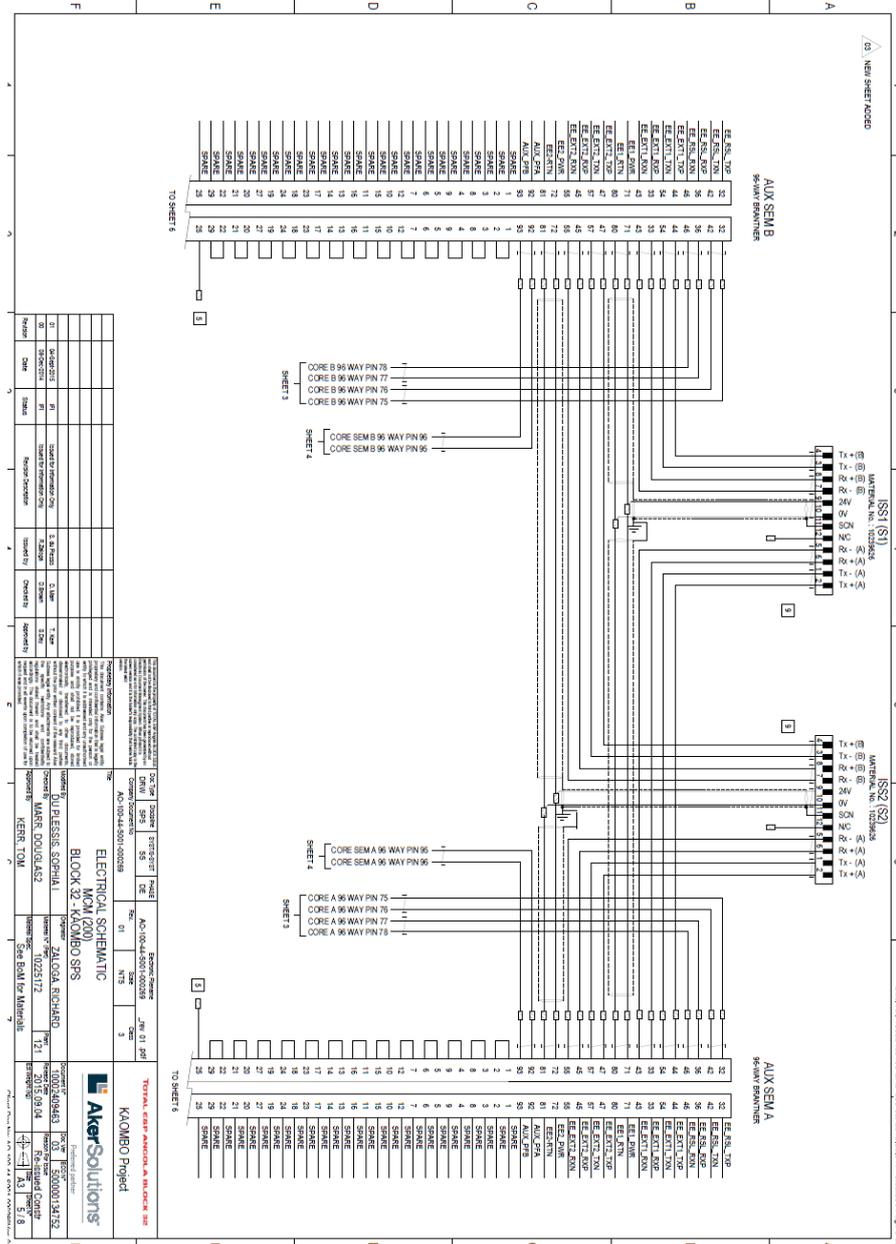
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MCM 5/8 Electrical schematics

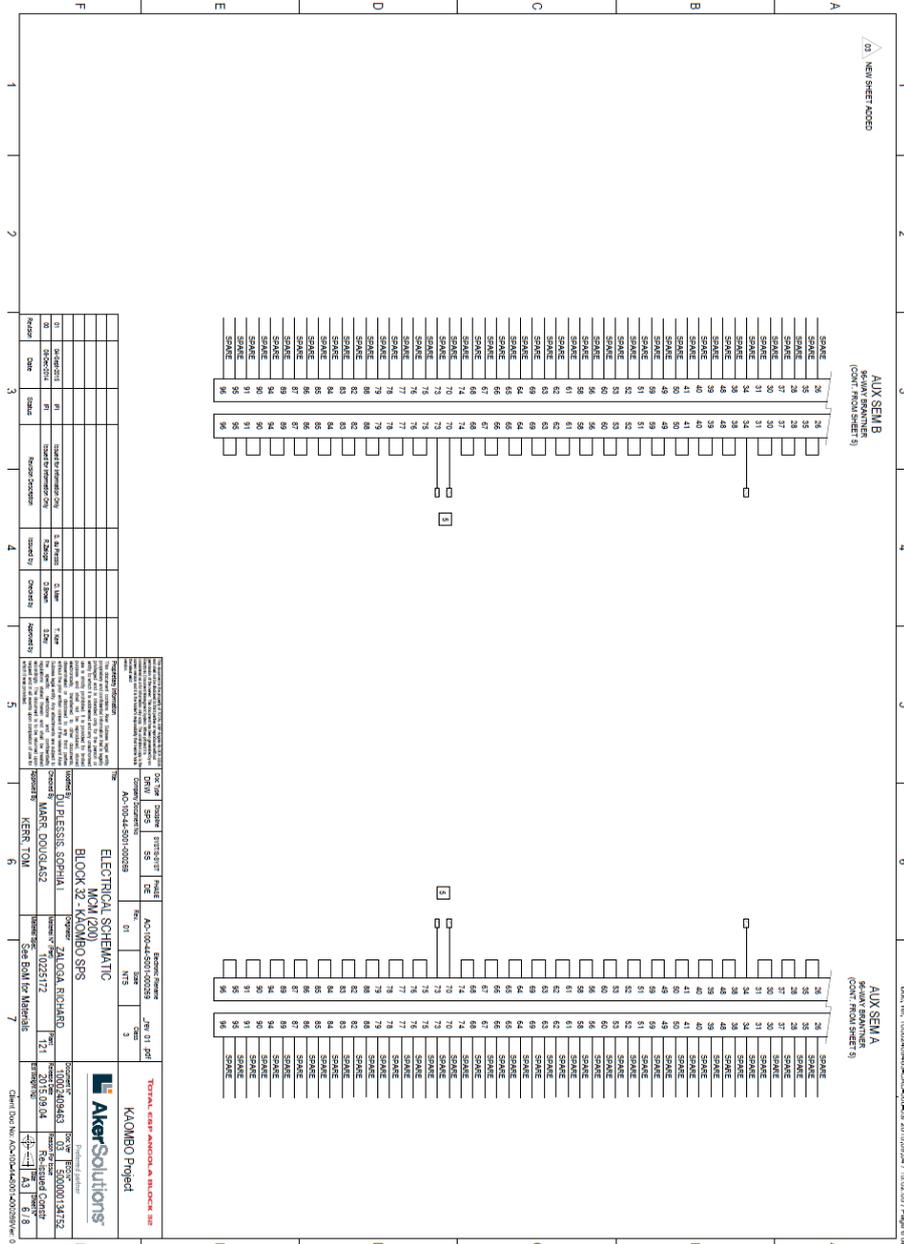


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MCM 6/8 Electrical schematics

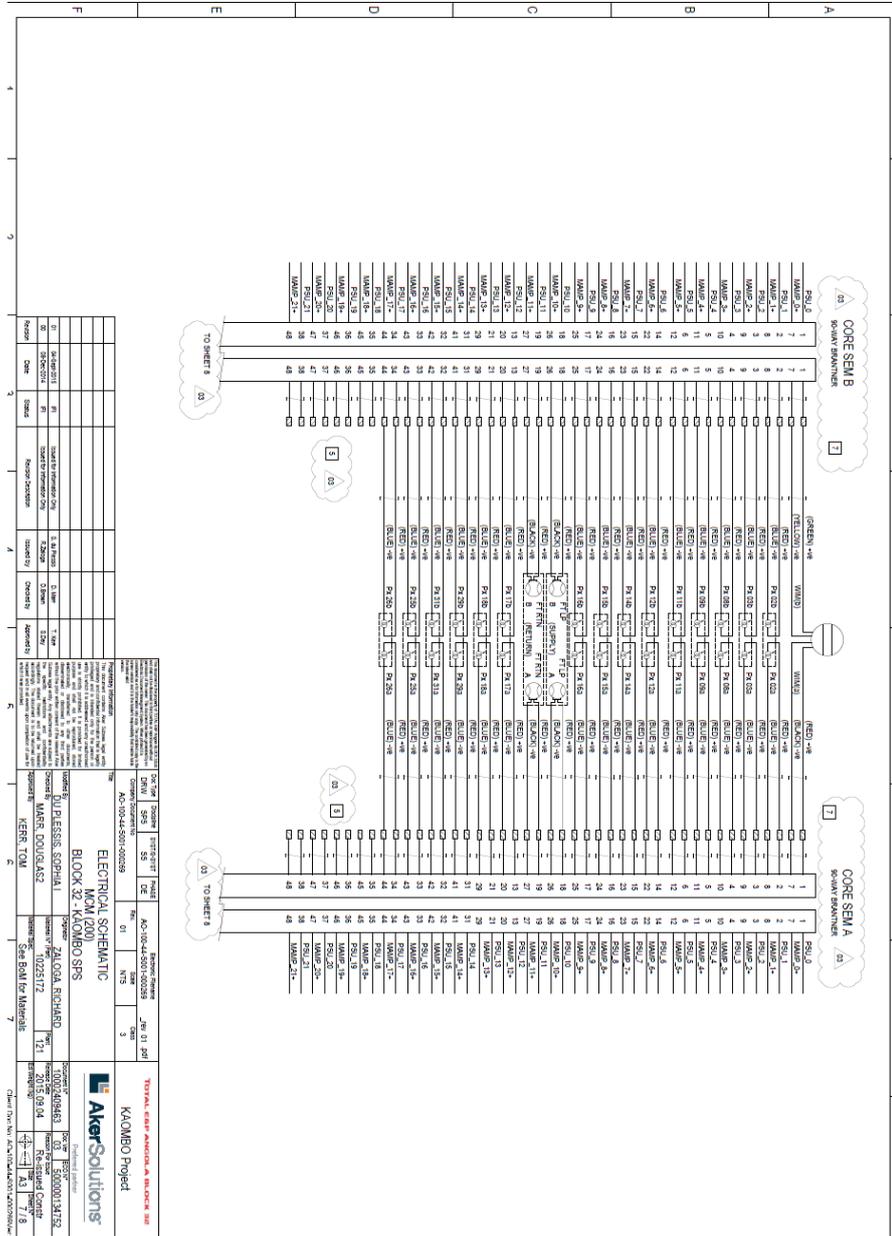


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MCM 7/8 Electrical schematics



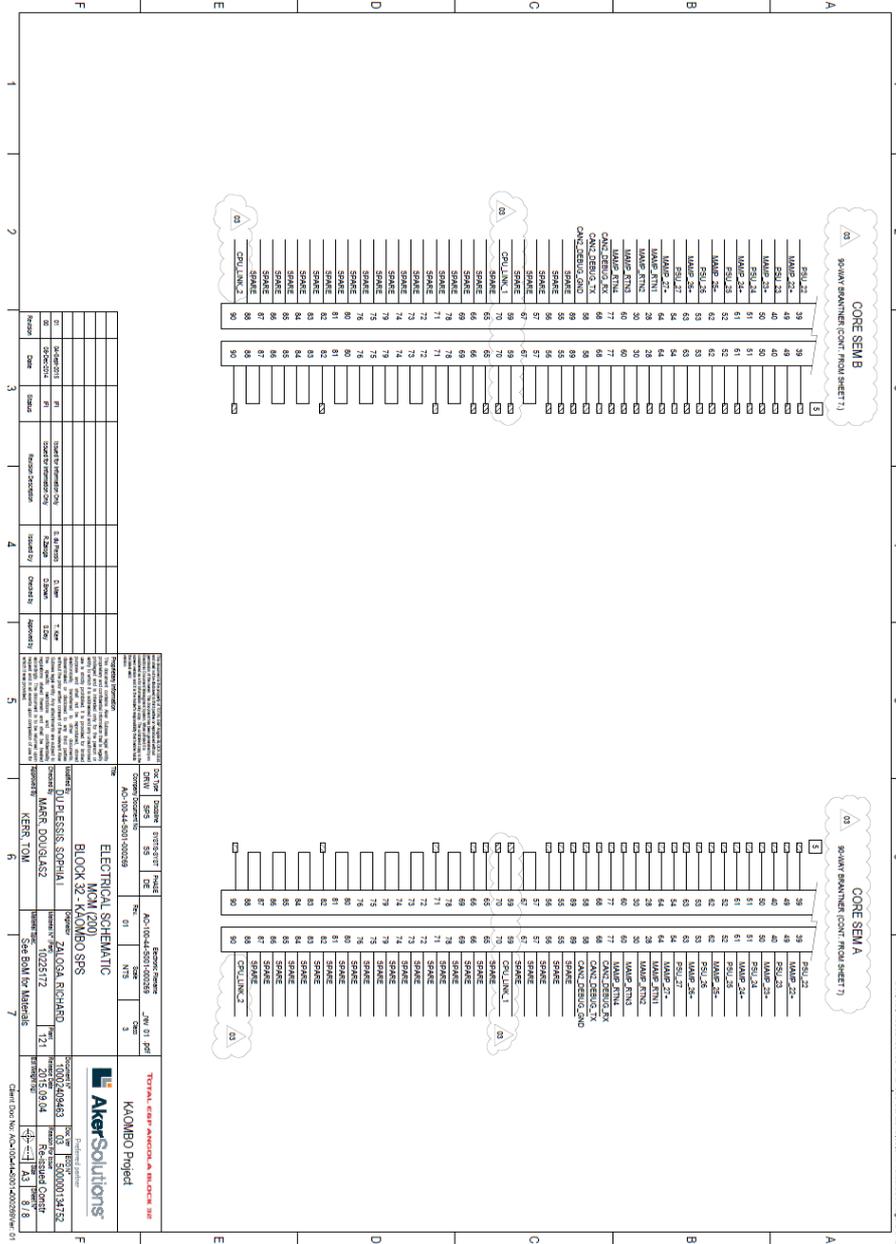
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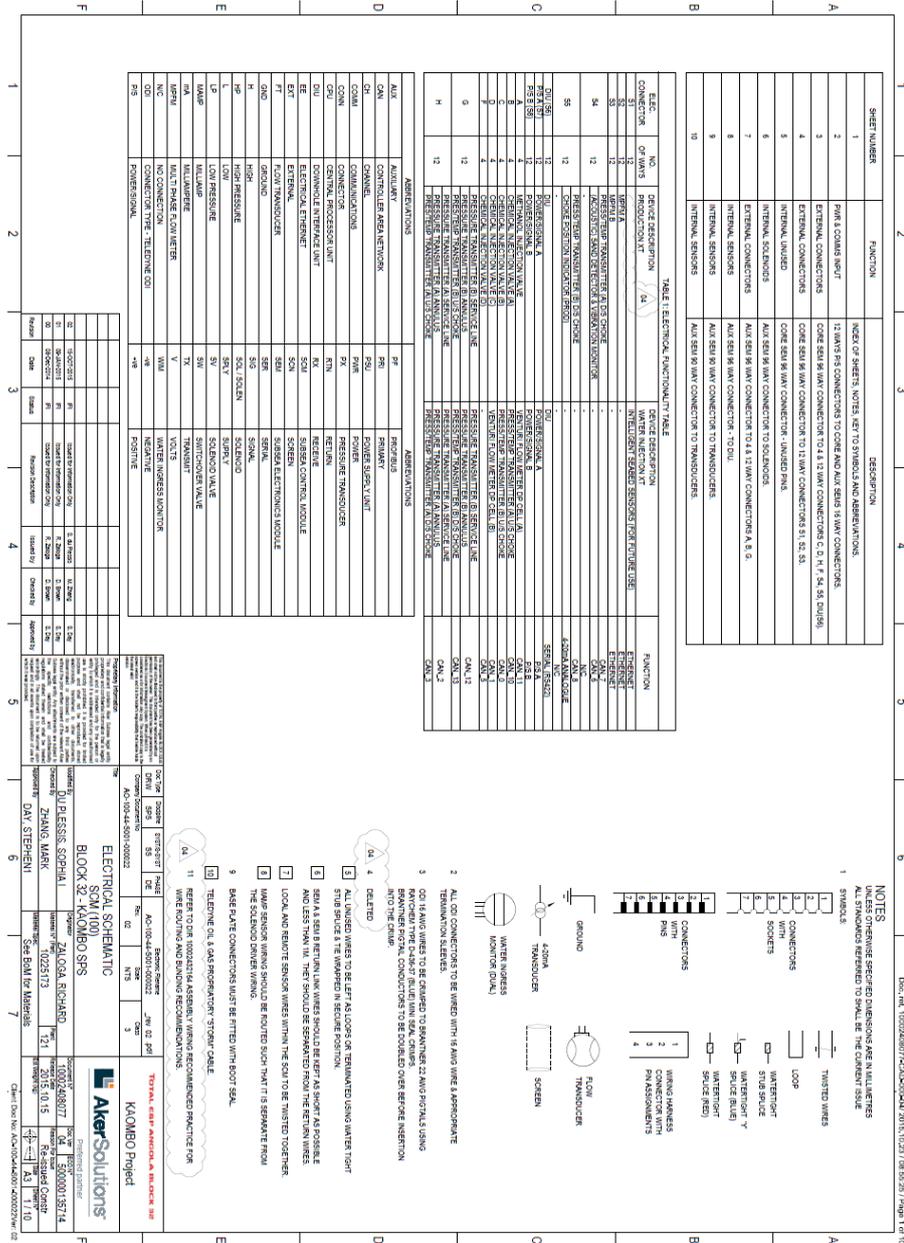
MCM 8/8 Electrical schematics



TYPE 3 Use as is (if possible)

## 2.9 Subsea Control Module (SCM) Electrical Schematic

**HOLD; feasibility of inclusion in handbook pending draft example from sub-supplier**  
 1/10 Electrical Schematic



SCM Electrical Schematic	10002408077	AO-100-44-S001-000022	10225173
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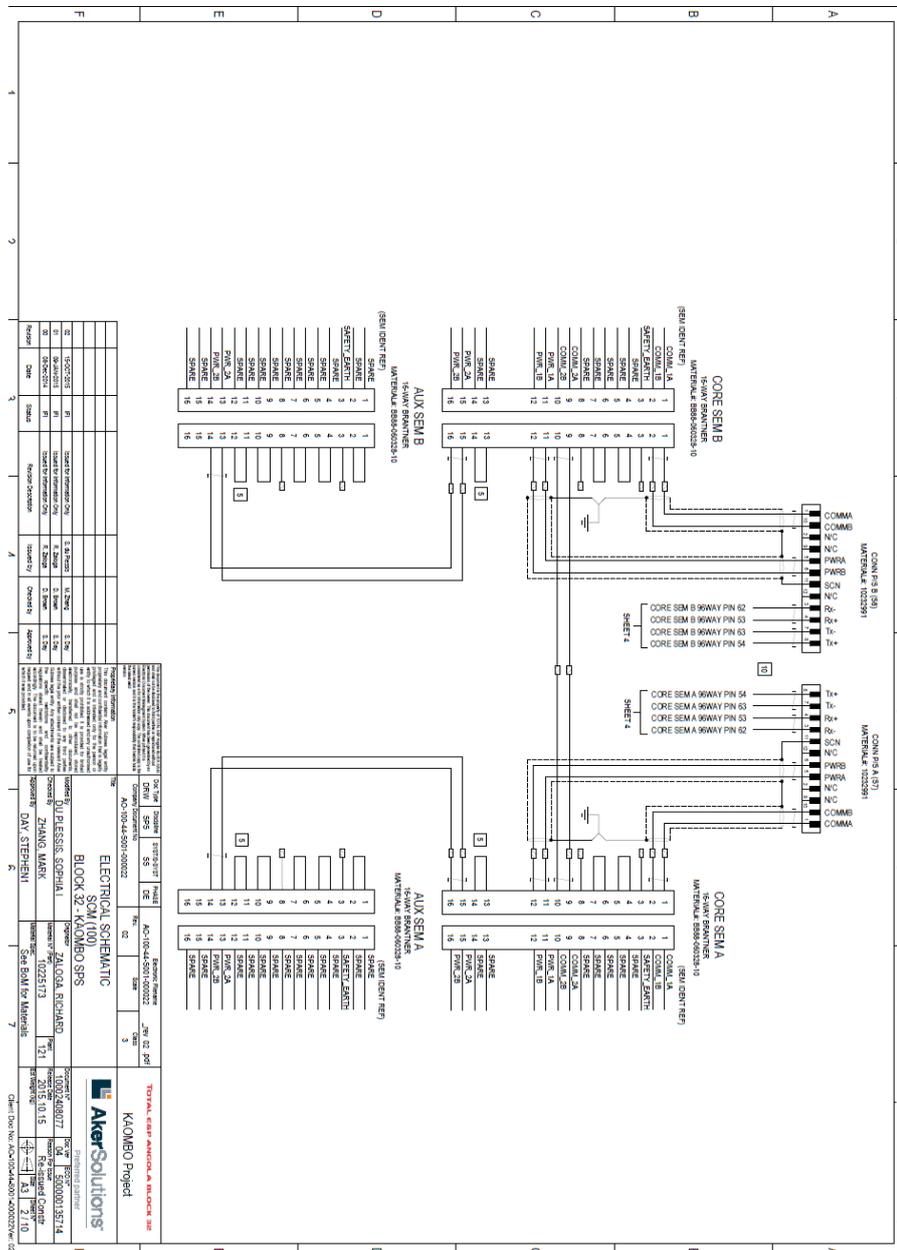
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2/10 Electrical Schematic

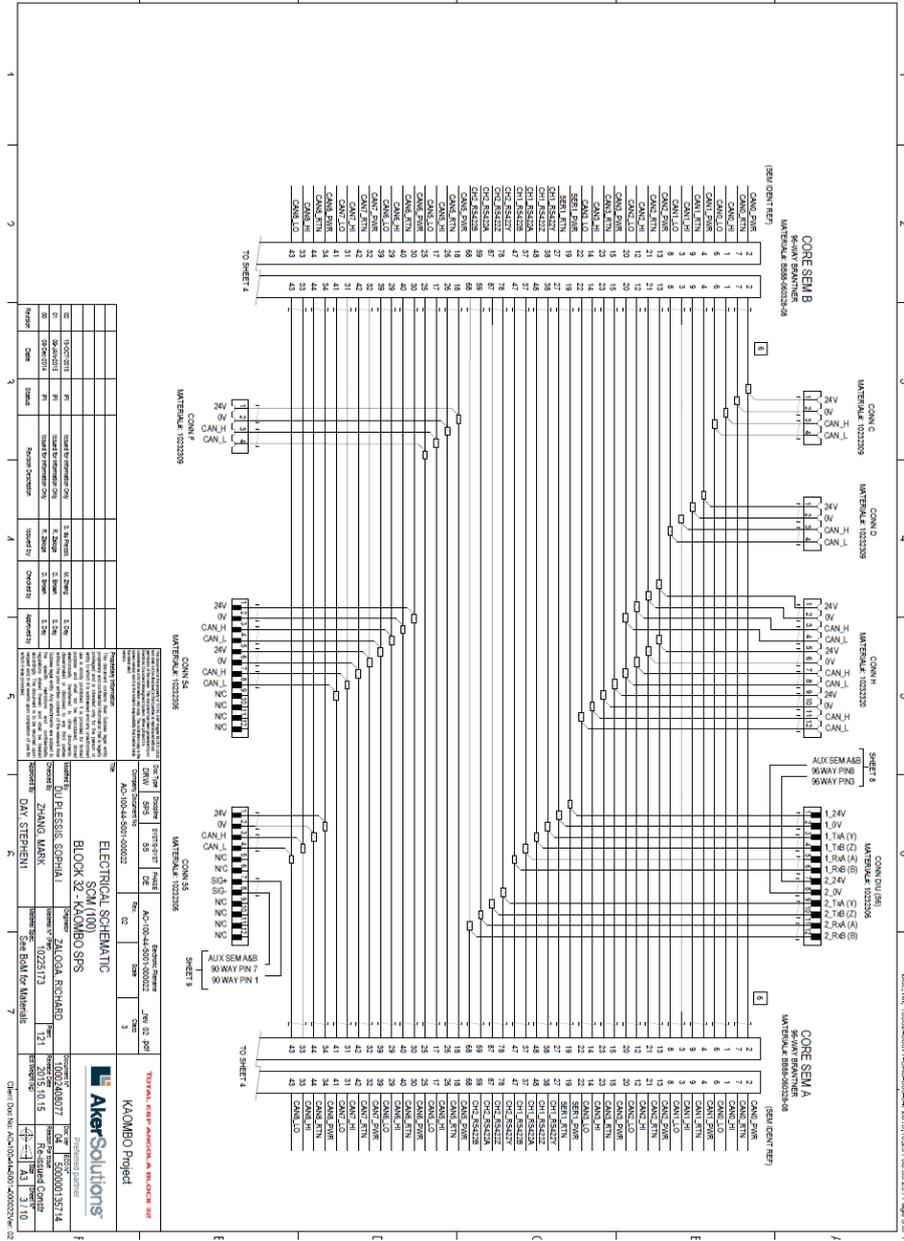


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3/10 Electrical Schematic

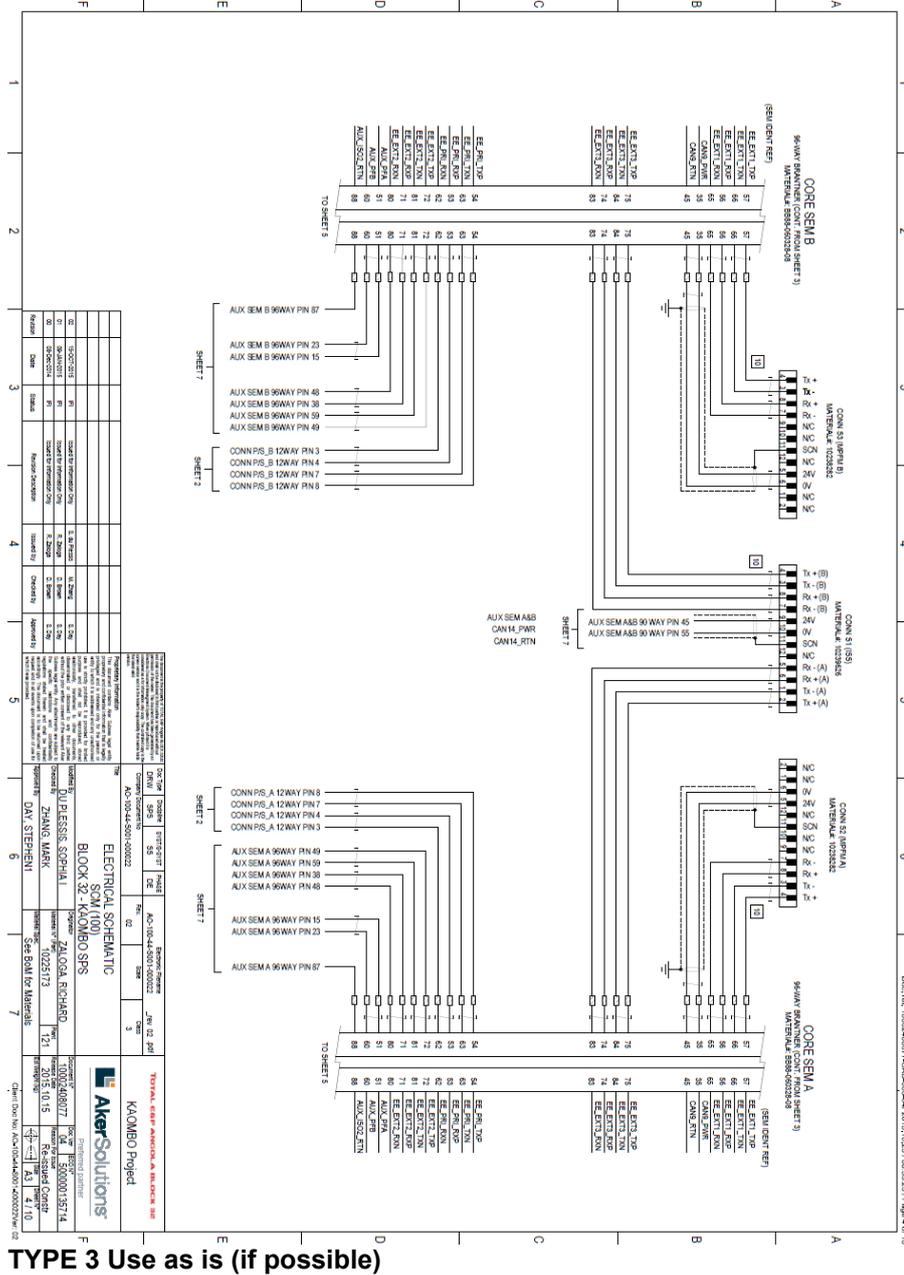


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4/10 Electrical Schematic



TYPE 3 Use as is (if possible)

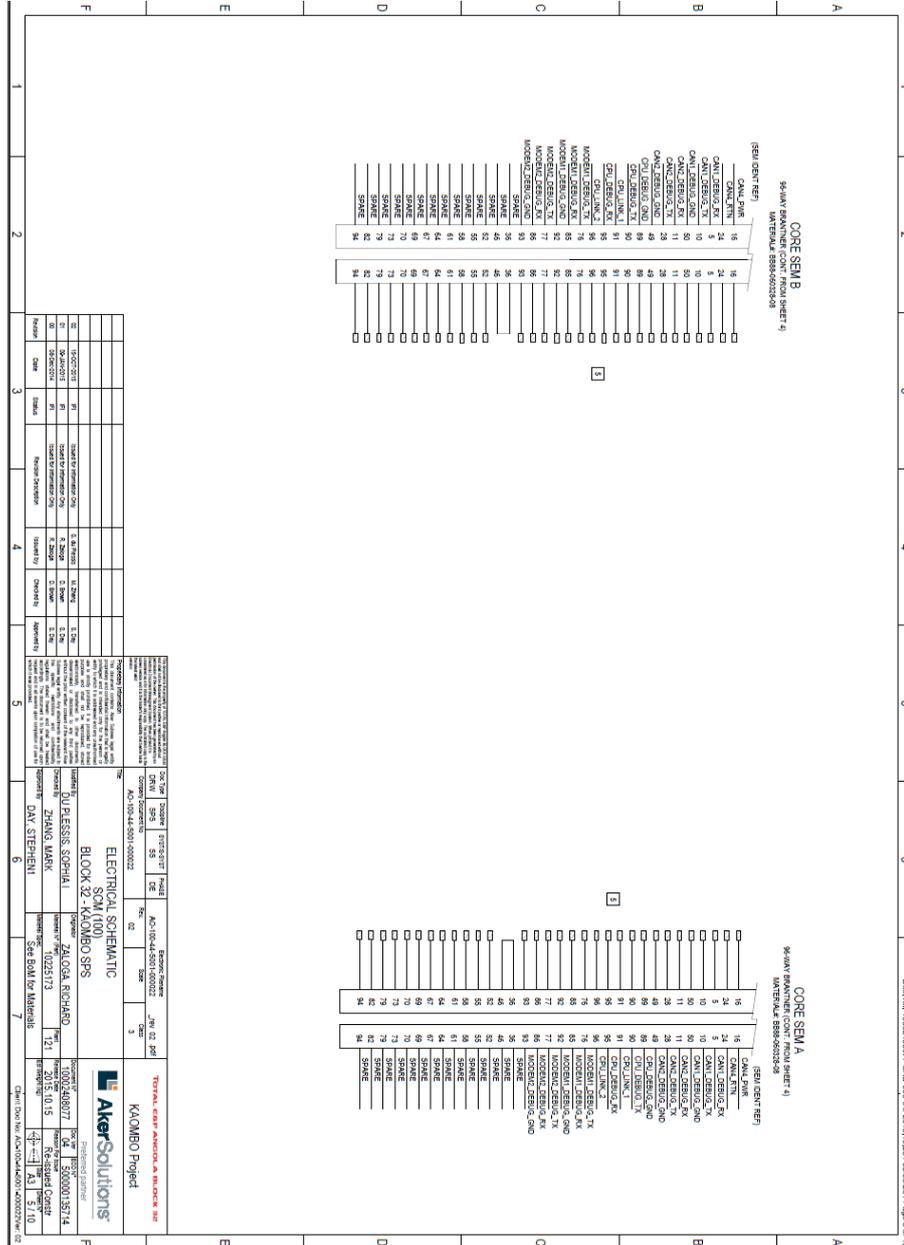
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5/10 Electrical Schematic

5/10

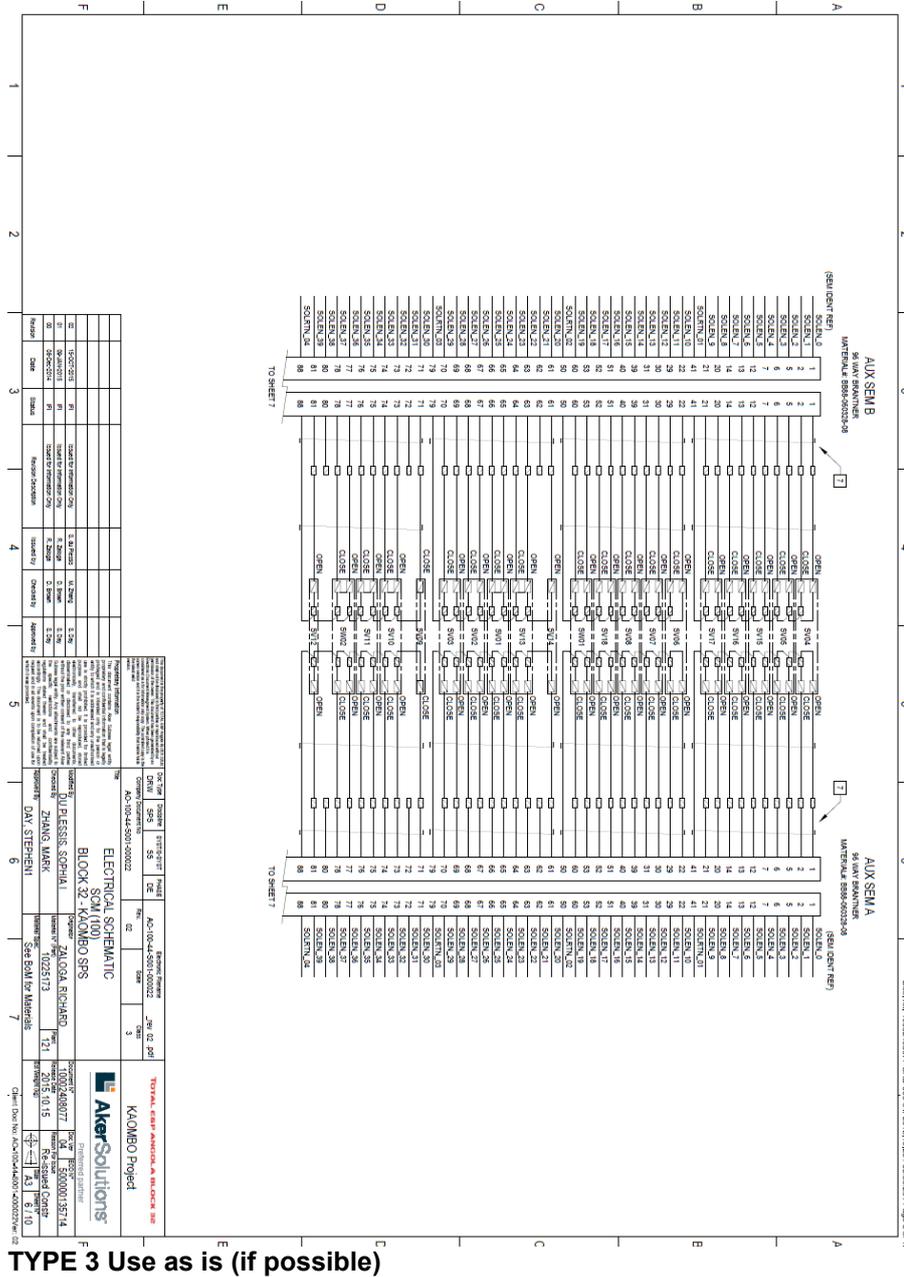


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6/10 Electrical Schematic



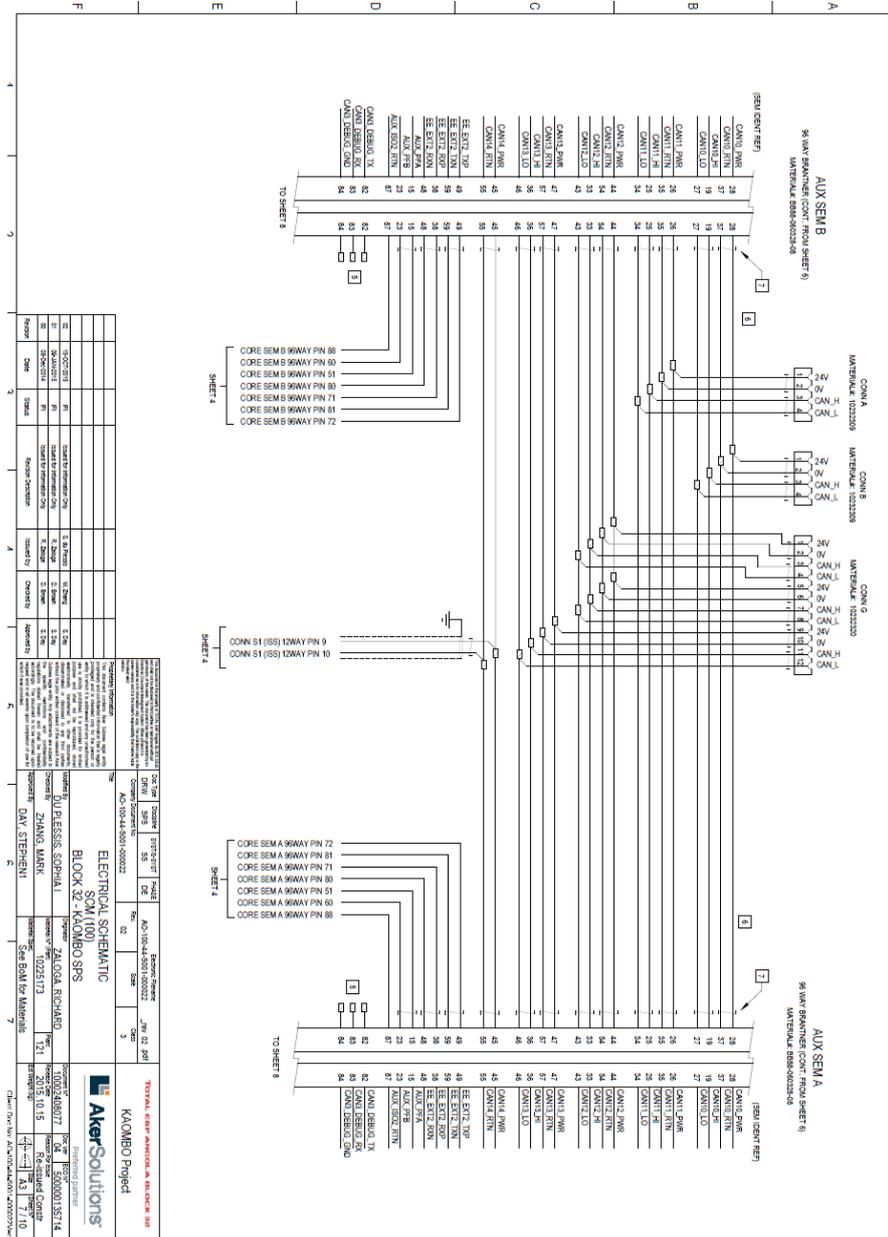
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7/10 Electrical Schematic



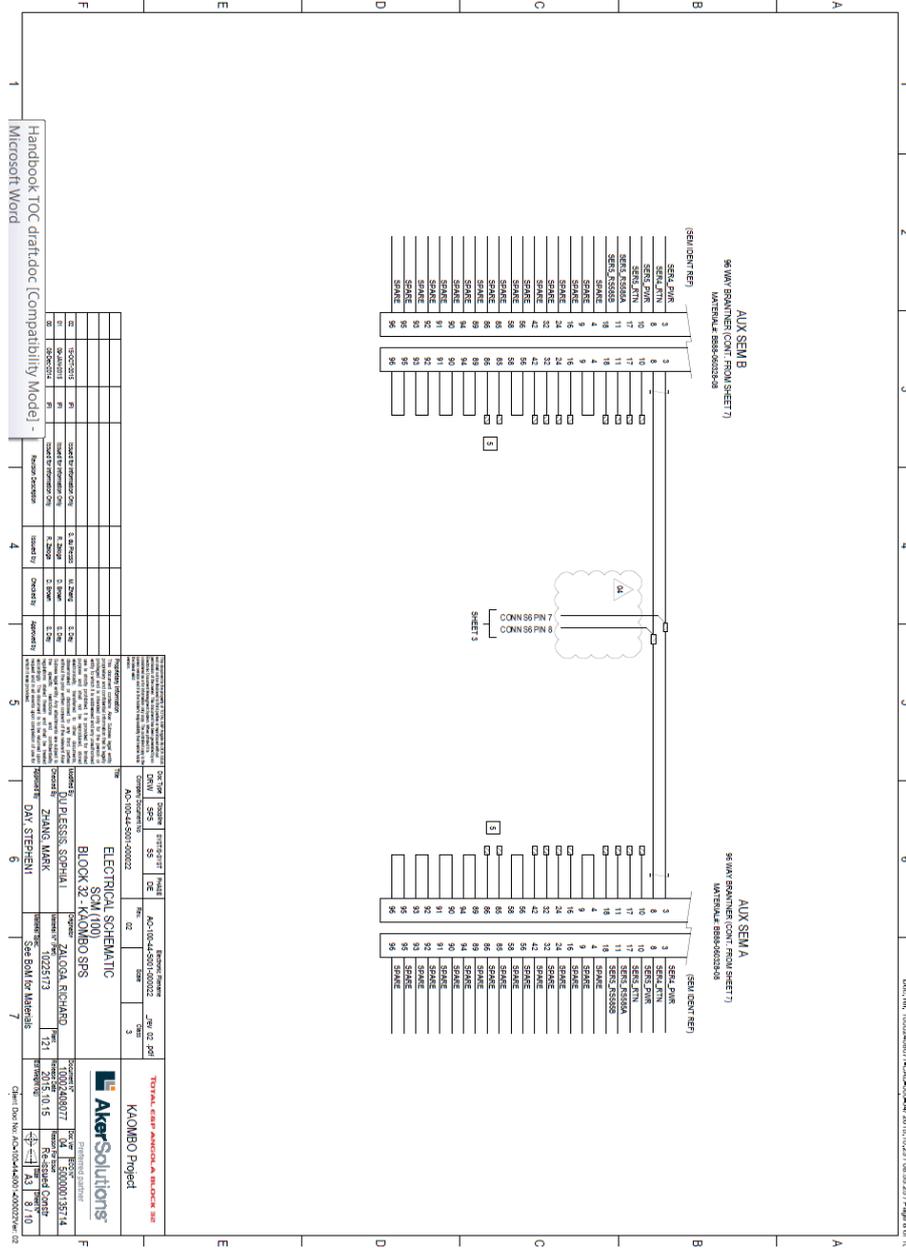
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8/10 Electrical Schematic

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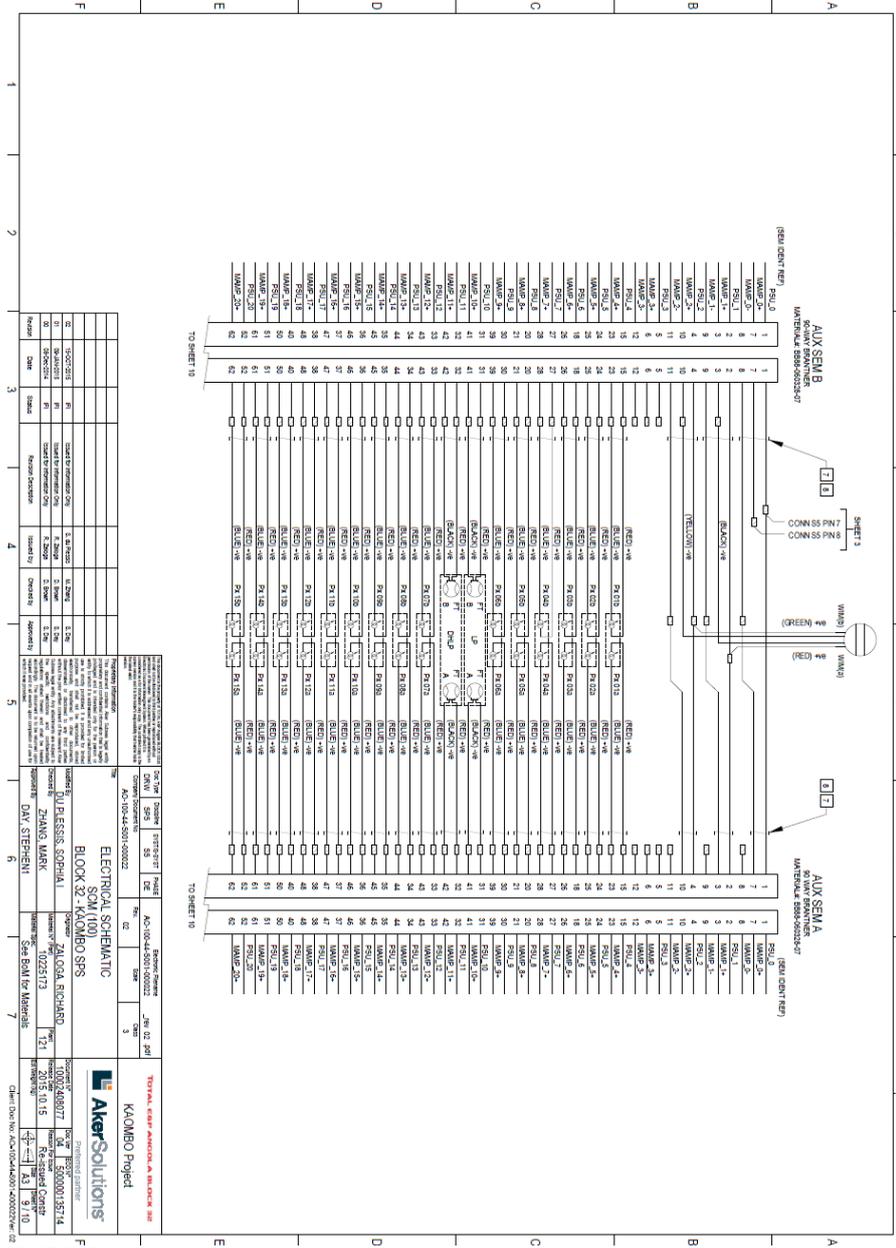


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9/10 Electrical Schematic

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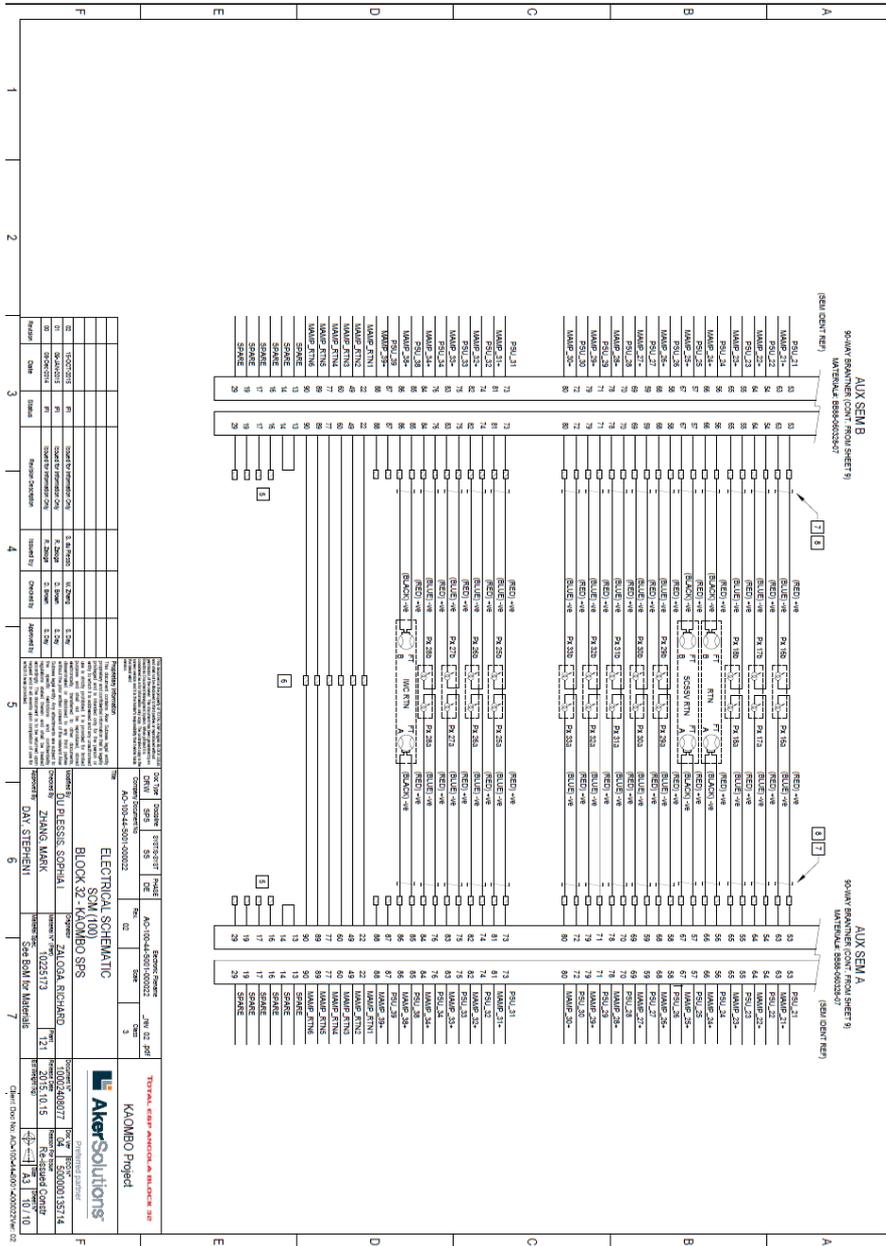
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10/10 Electrical Schematic



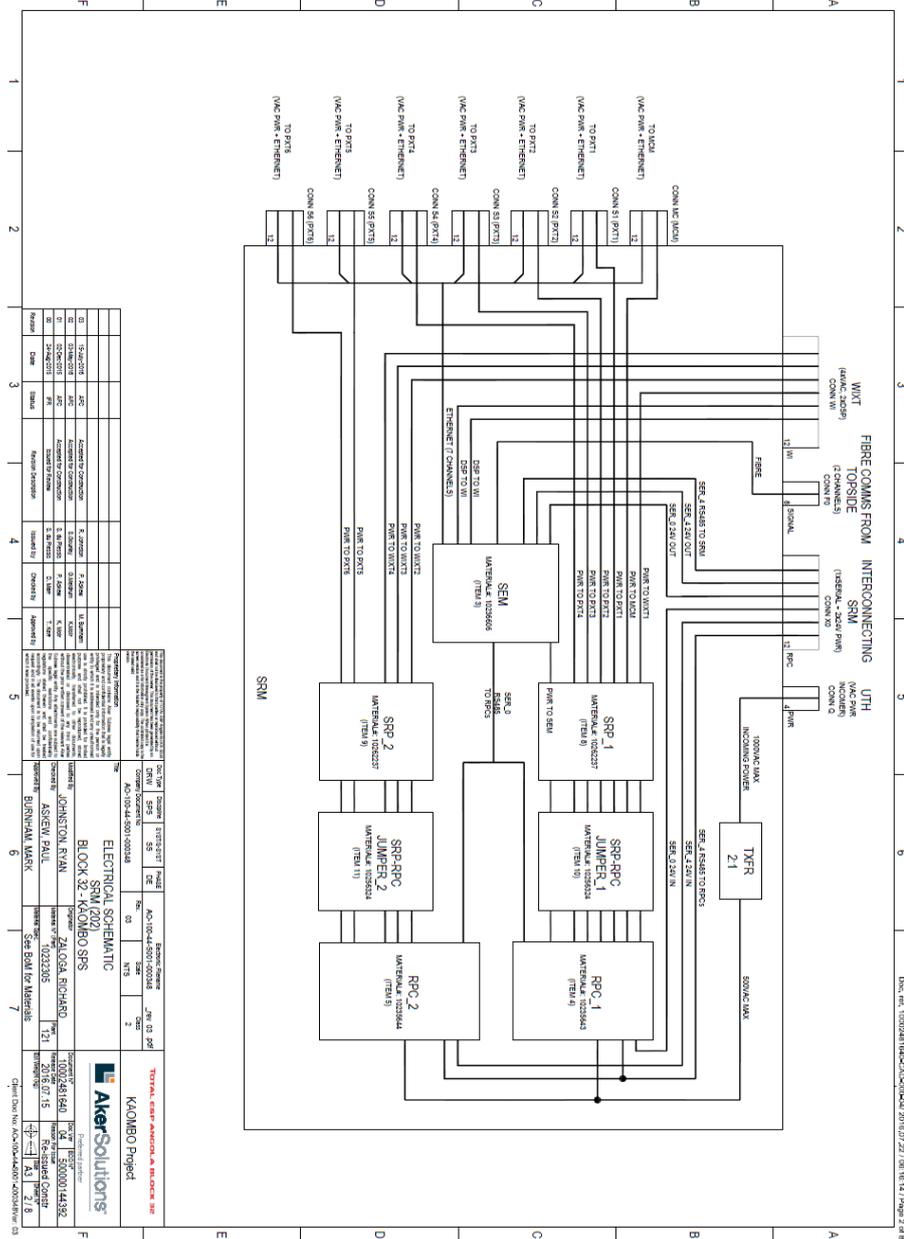
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2/8 Electrical schematics



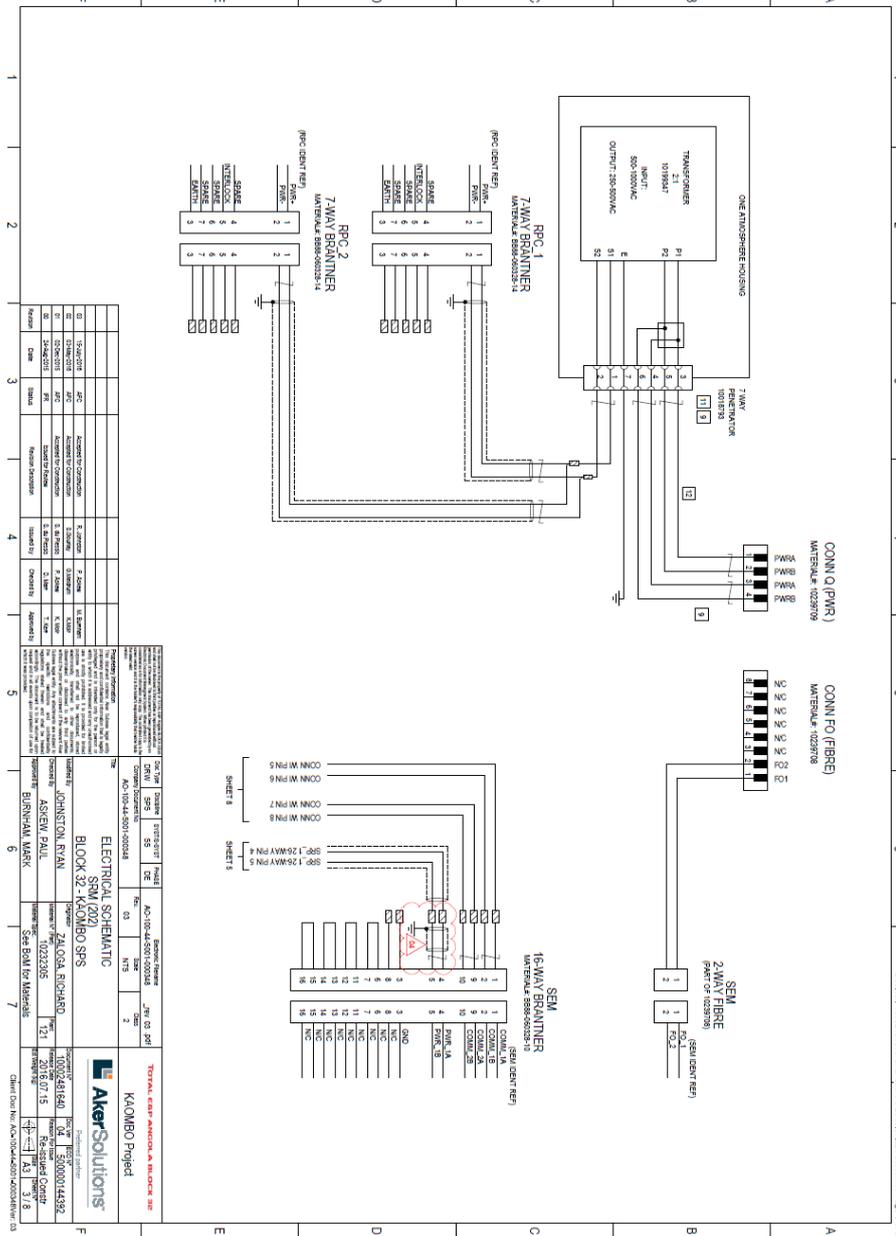
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3/8 Electrical schematics



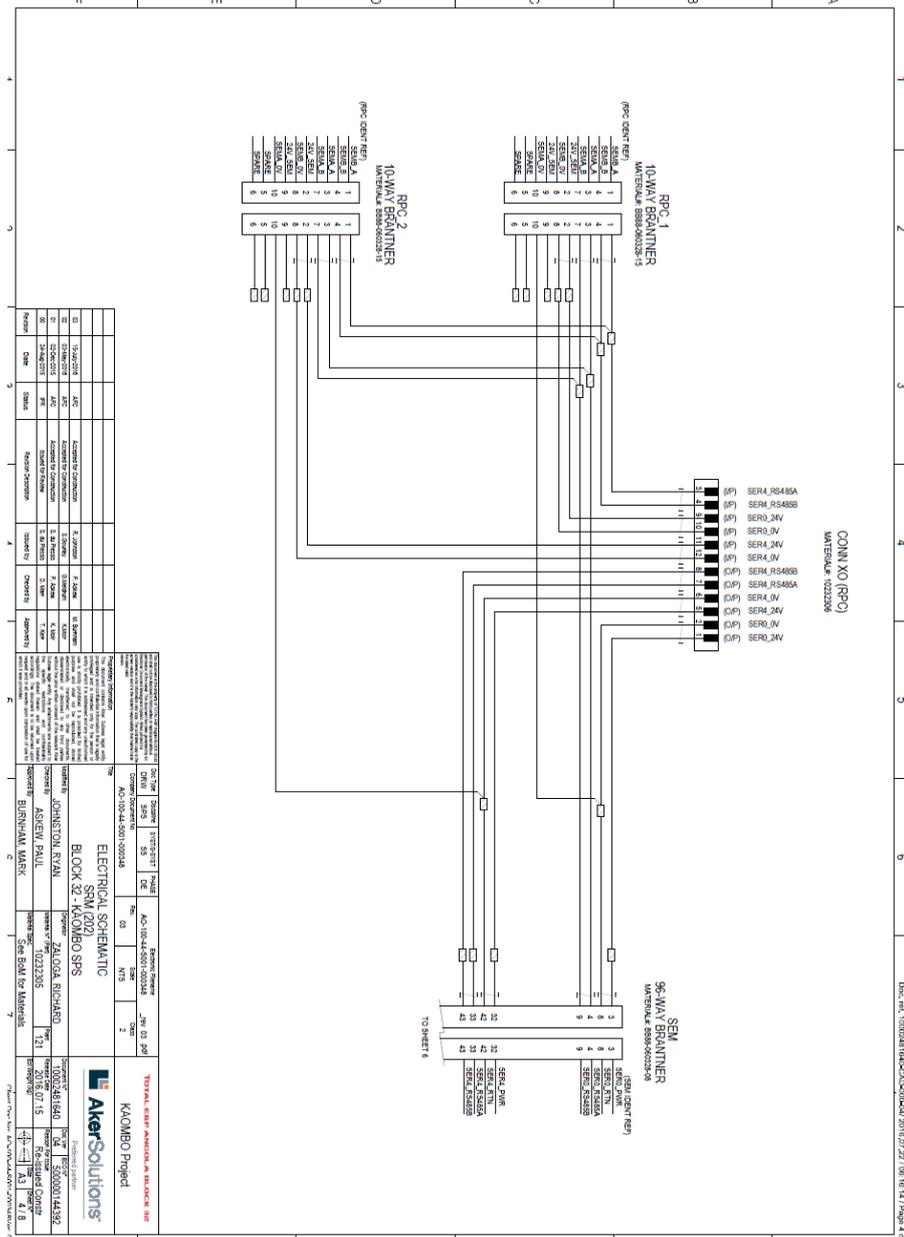
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4/8 Electrical schematics



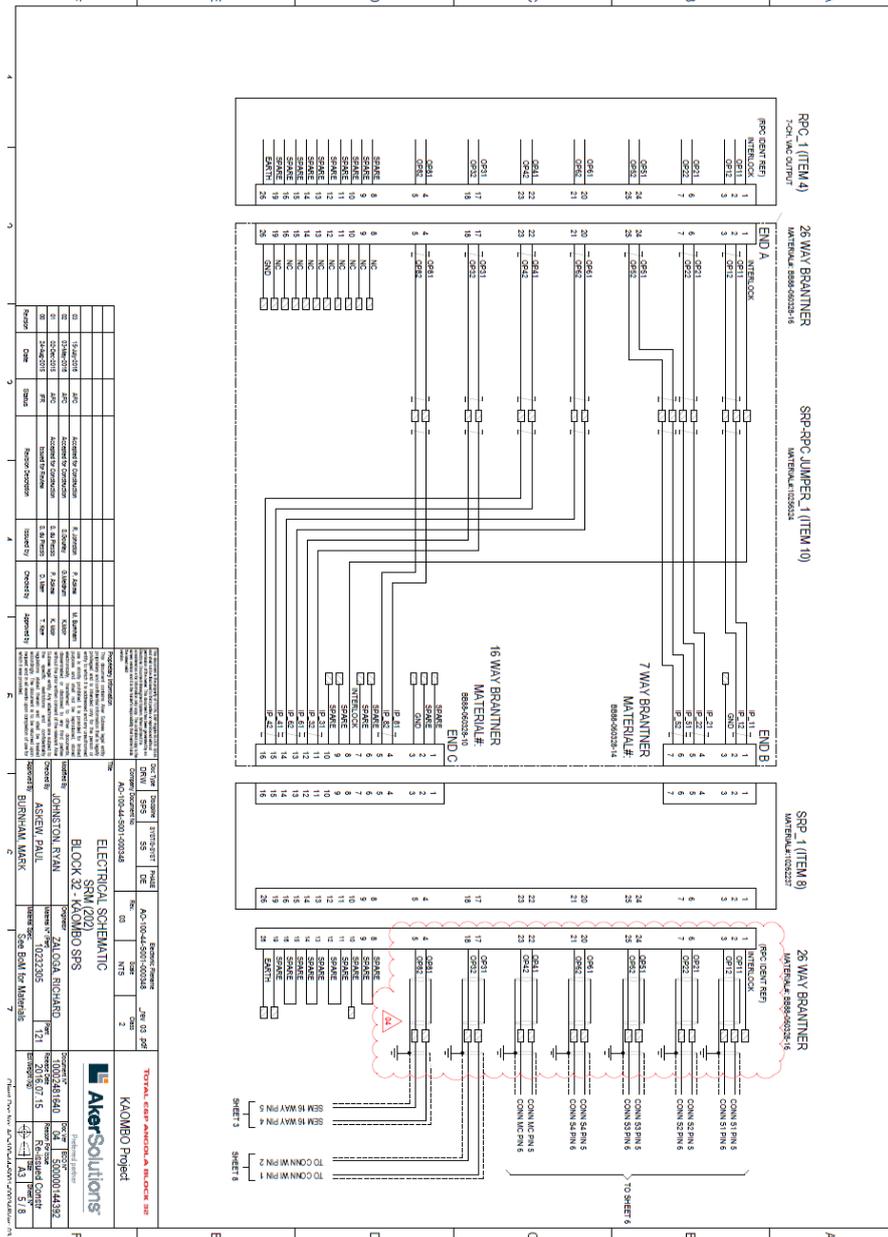
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5/8 Electrical schematics



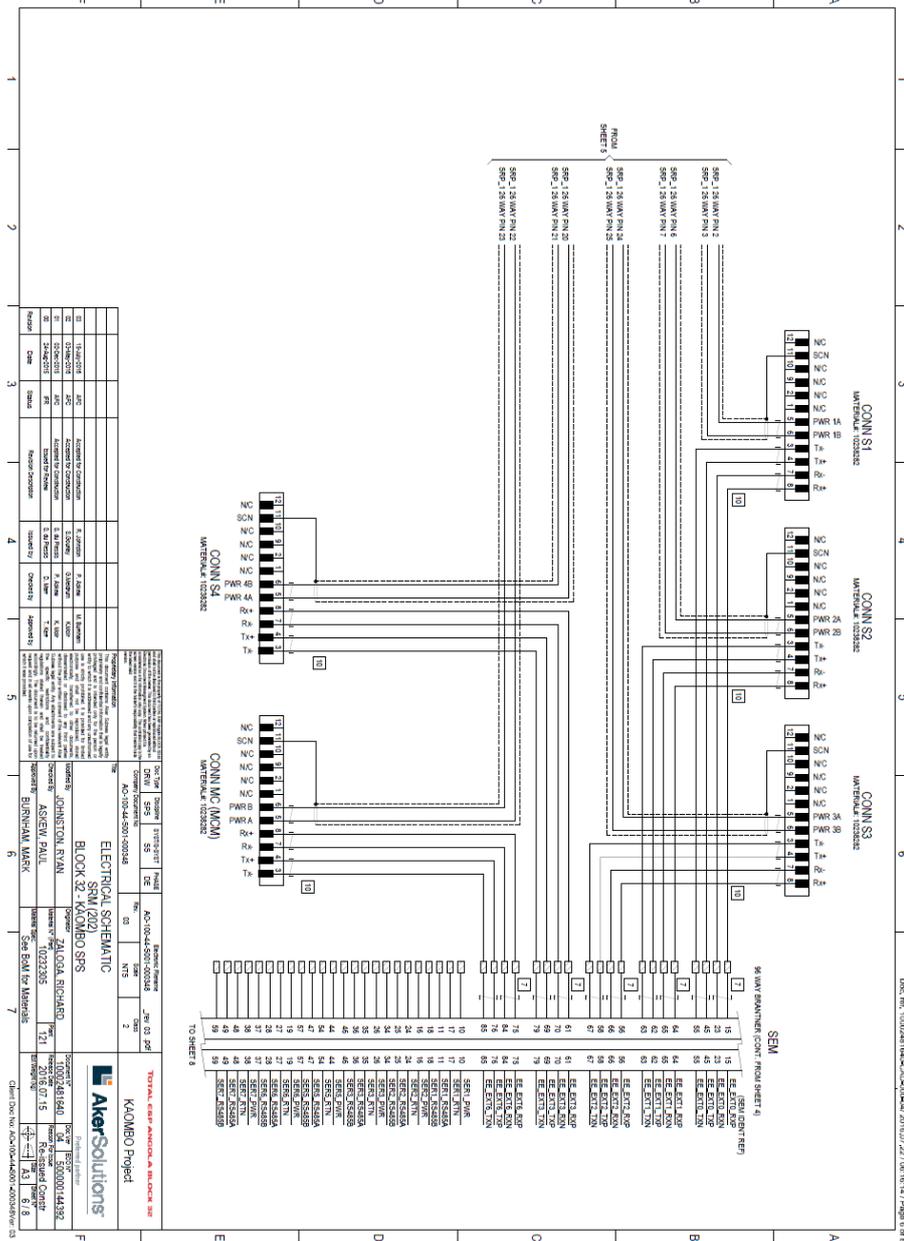
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6/8 Electrical schematics



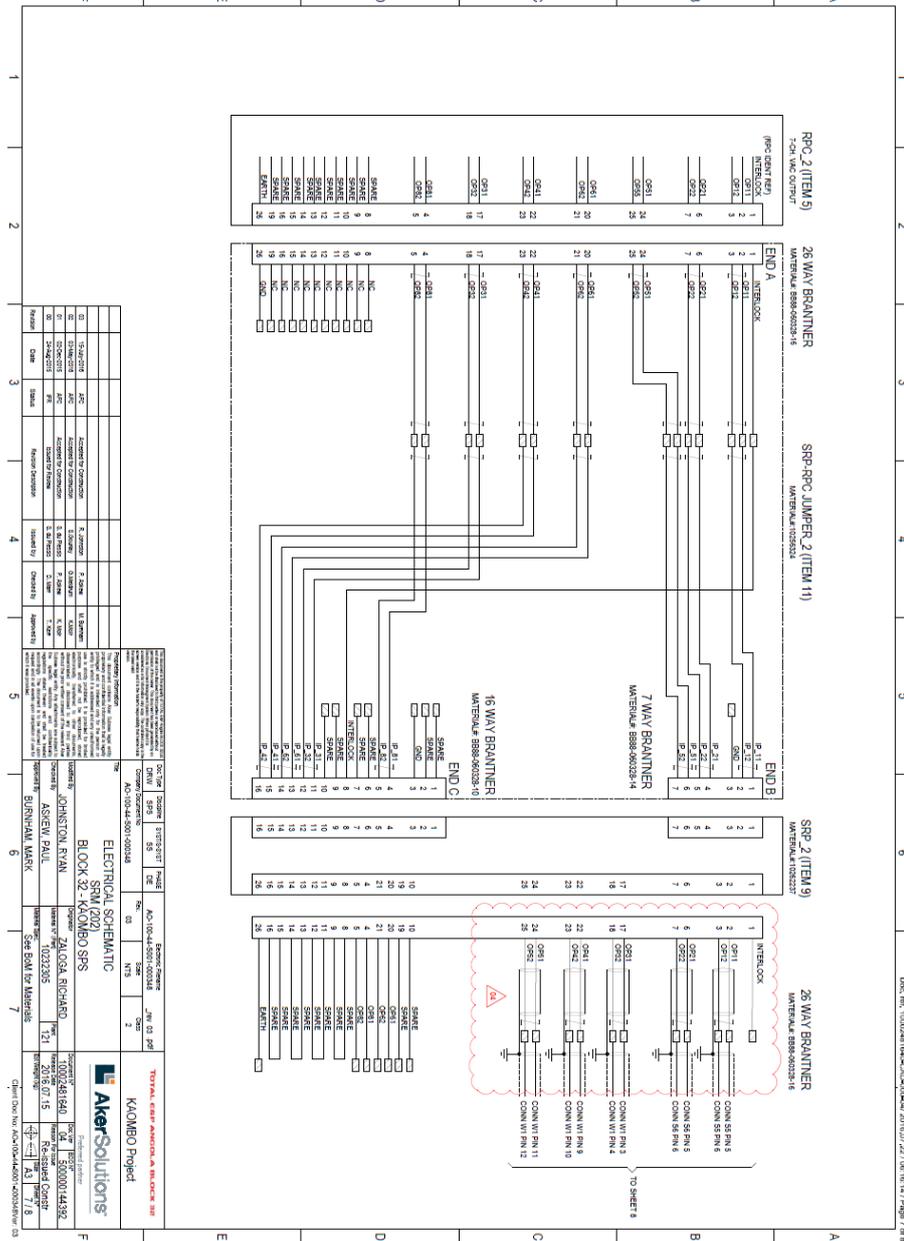
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7/8 Electrical schematics



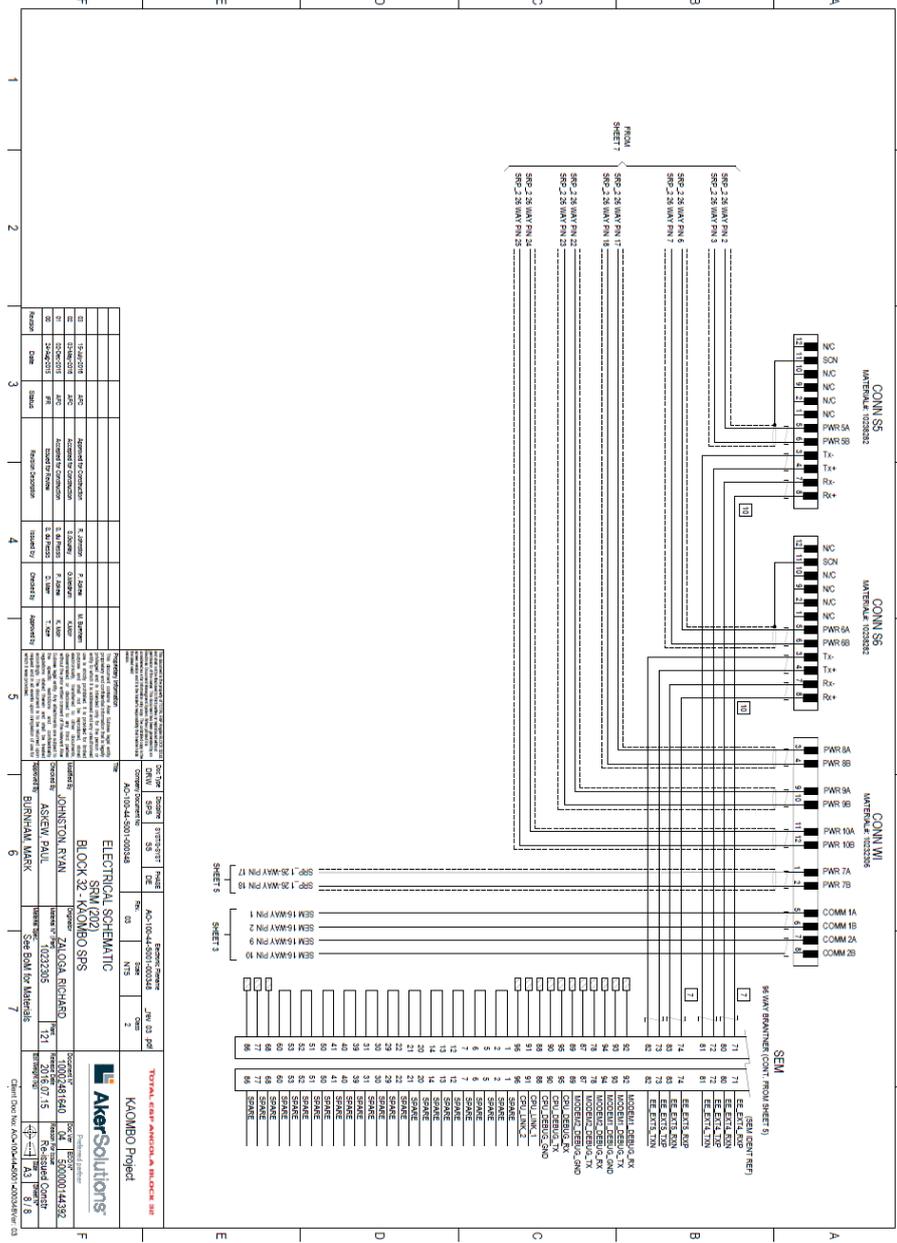
TYPE 3 Use as is (if possible)

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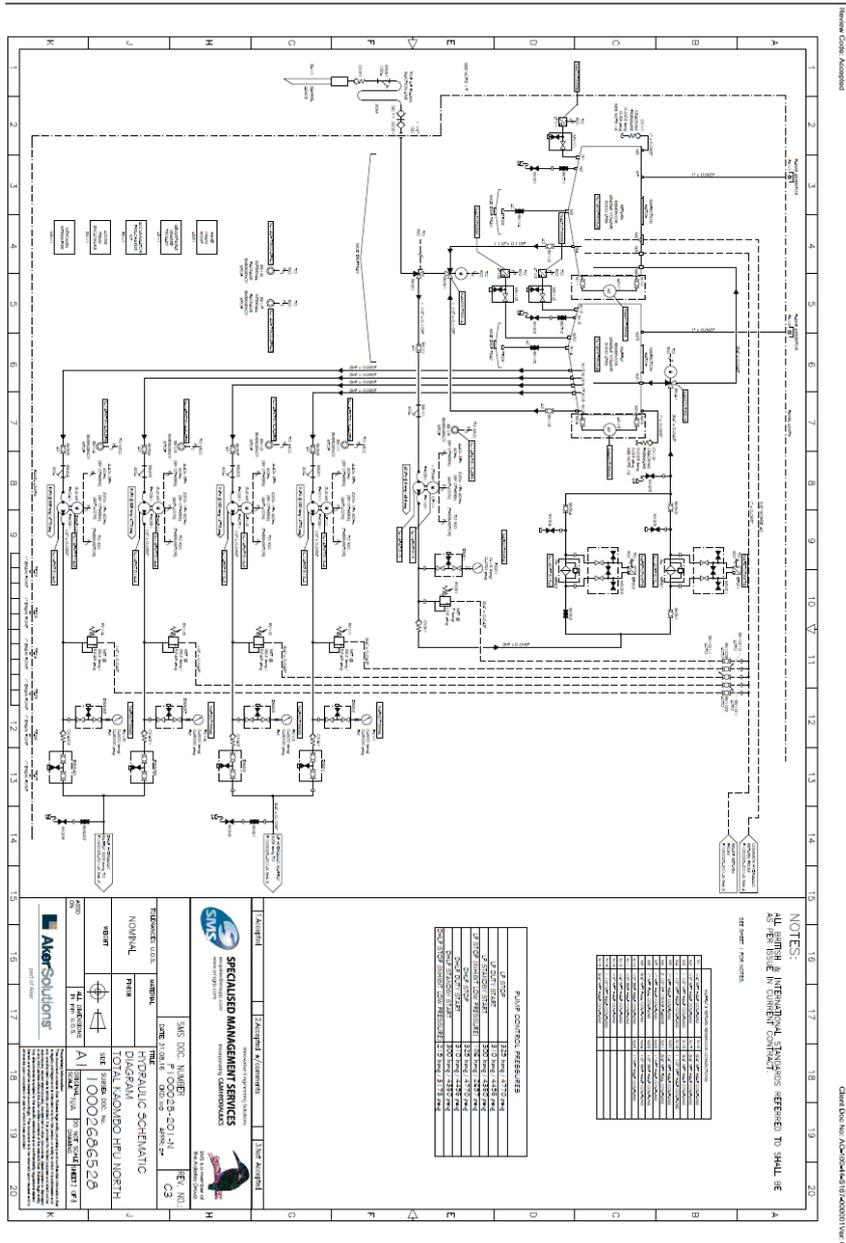
8/8 Electrical schematics



TYPE 3 Use as is (if possible)

## 2.11 HPU Hydraulic Schematic

### 2.11.1 HPU Hydraulic Schematic North



HPU Hydraulic Schematic North	10002640607	AO-100-44-S167-00001	10232644
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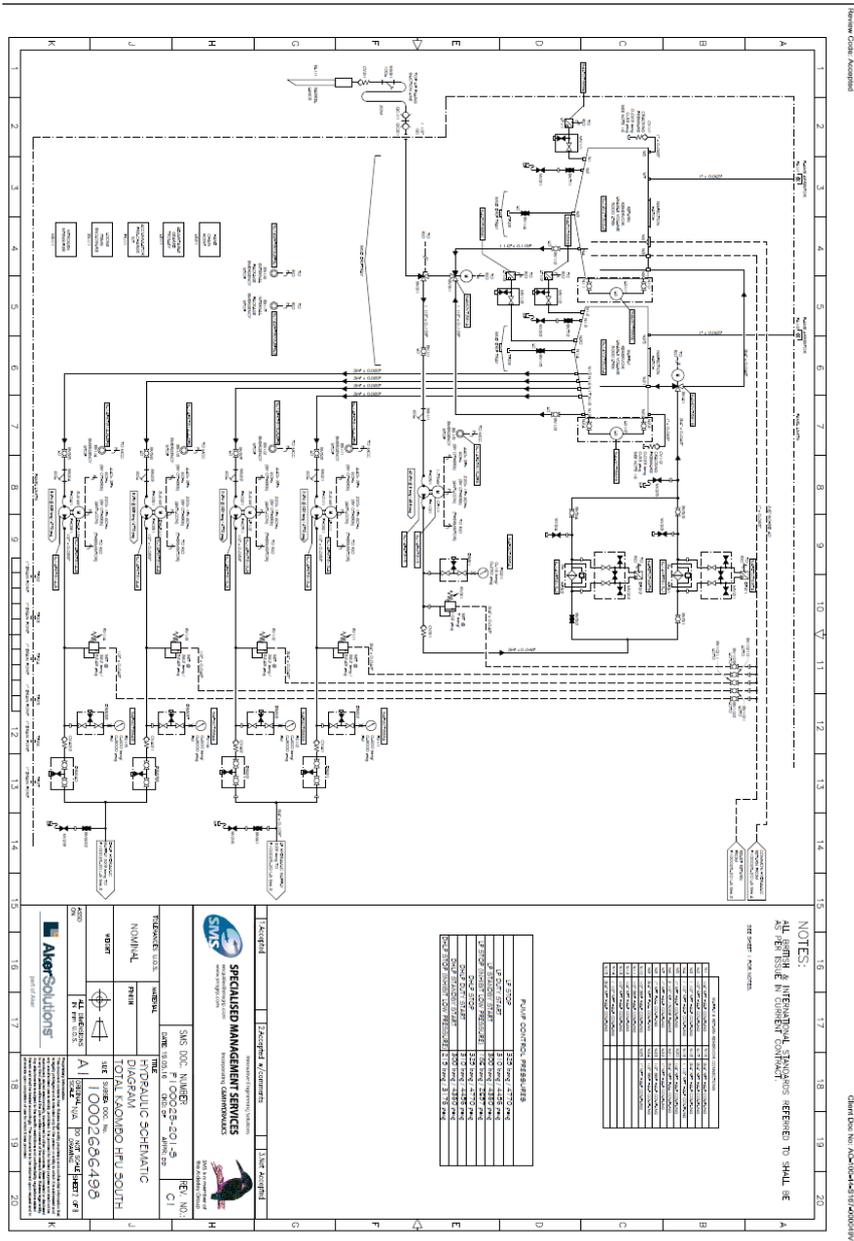
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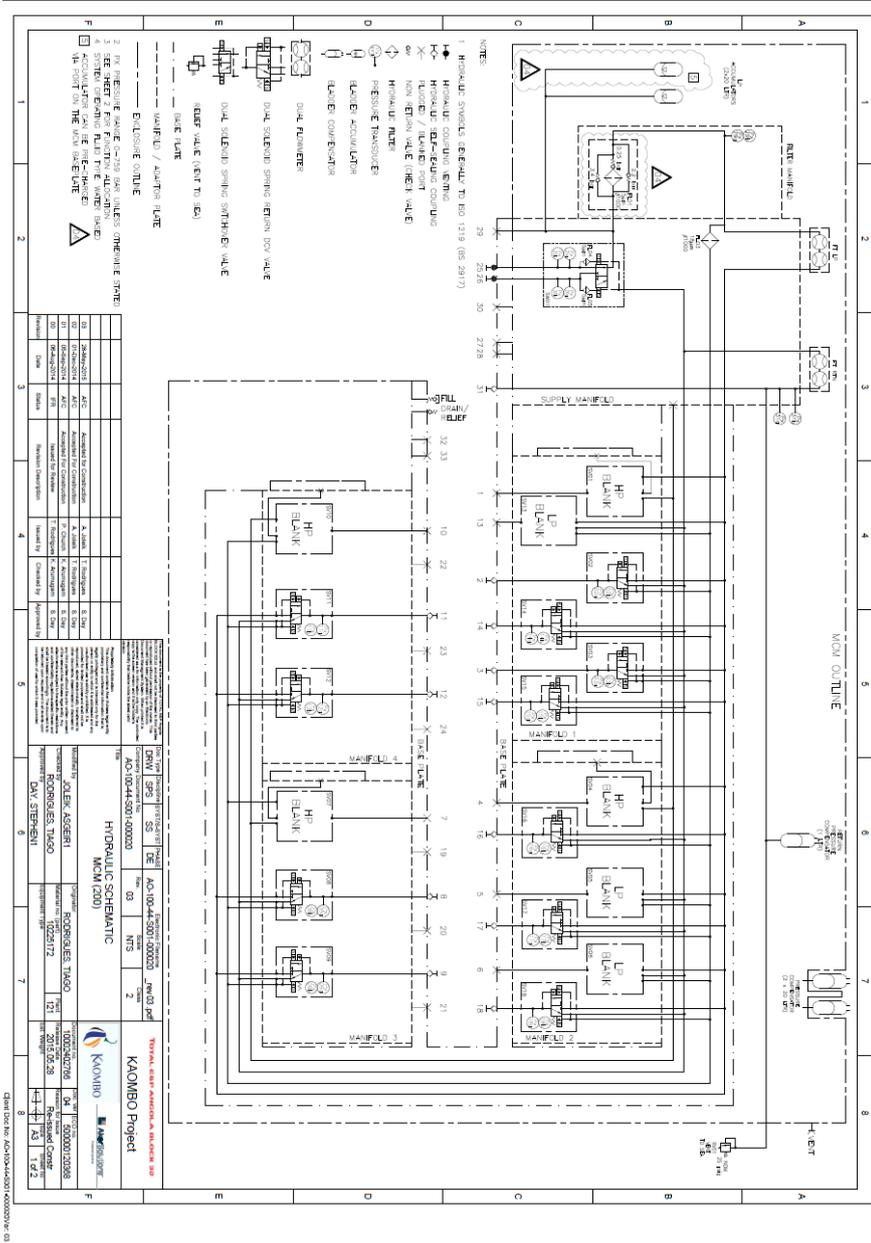
## 2.11.2 HPU hydraulic Schematic South



HPU Hydraulic Schematic South	10002674994	AO-100-44-S167-000049	10232645
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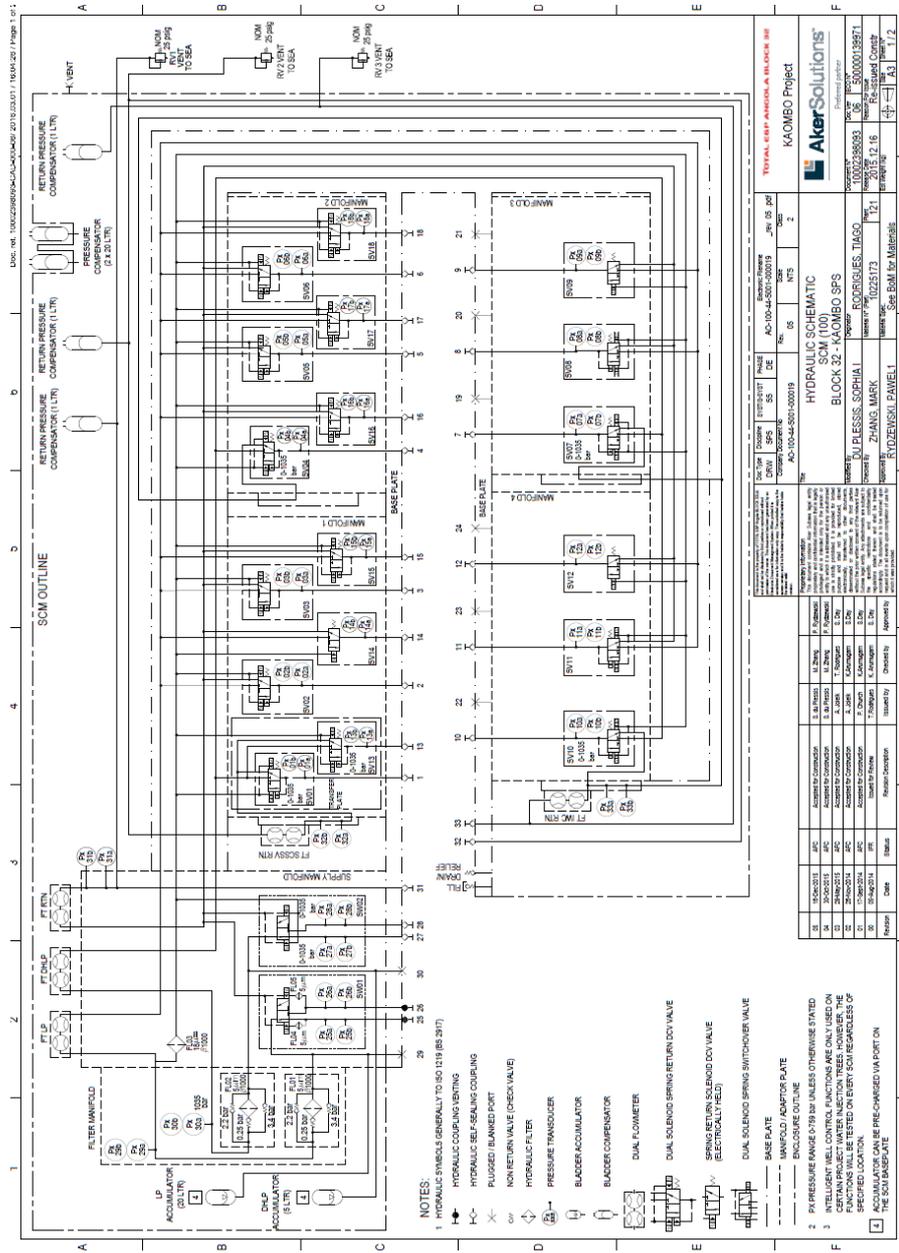
## 2.12 MCM Hydraulic schematic



MCM Hydraulic Schematic	10002402766	AO-100-44-S001-000020	10225172
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**TYPE 3 Use as is (if possible)**

## 2.13 SCM Hydraulic schematic

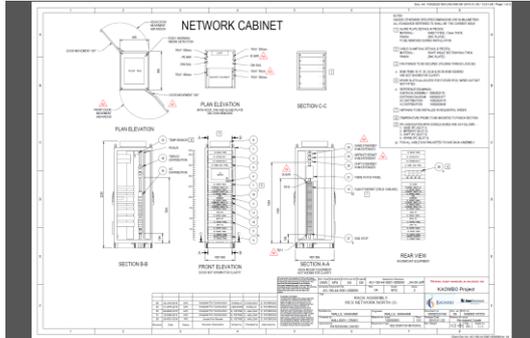


SCM Hydraulic Schematic	10002398093	AO-100-44-S001-000019	10225173
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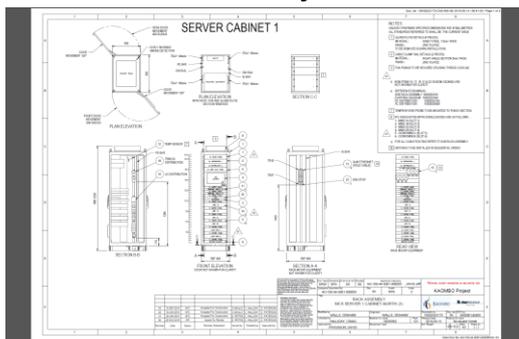
## 2.14 Rack assembly DRAWINGS

### 2.14.1 Rack assembly Master Control Station (MCS) Network Cabinet



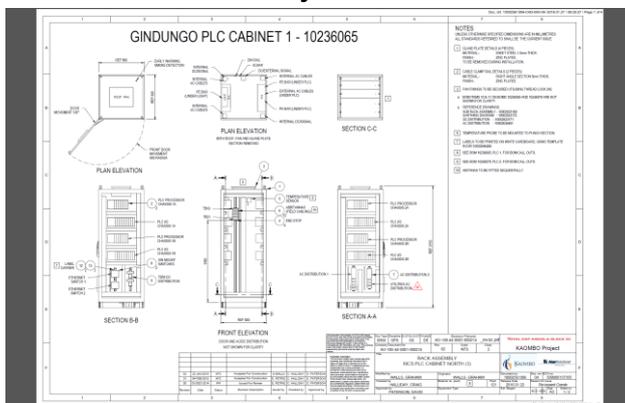
MCS Network Cabinet North	10002523160	AO-100-44-S001-000090	10236063
MCS Network Cabinet South	10002675361	AO-100-44-S001-000272	10236111

### 2.14.2 Rack assembly MCS Server 1 Cabinet



MCS Server 1 Cabinet North	10002523173	AO-100-44-S001-000095	10236062
MCS Server 1 Cabinet South	10002675363	AO-100-44-S001-000276	10236110

### 2.14.3 Rack assembly MCS PLC Cabinet 1



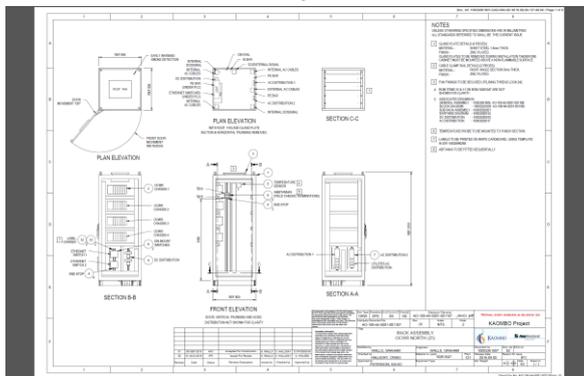
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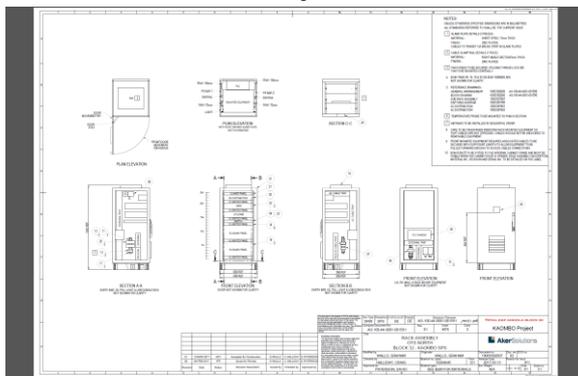
MCS PLC Cabinet 1&2 North Gindungo	10002561306	AO-100-44-S001-000214	N/A
MCS PLC Cabinet 1&2 North Gengibre	10002561309	AO-100-44-S001-000215	N/A
MCS PLC Cabinet 1&2 North Caril	10002561313	AO-100-44-S001-000216	N/A
MCS PLC Cabinet 1&2 South Louro	10002561317	AO-100-44-S001-000217	N/A
MCS PLC Cabinet 1&2 South Mostarda	10002561321	AO-100-44-S001-000218	N/A
MCS PLC Cabinet 1&2 South Canela	10002561326	AO-100-44-S001-000219	N/A

2.14.4 Rack assembly Overall Control of Wells and Risers (OCWR)



OCWR North	10003261607	AO-100-44-S001-001187	10261047
OCWR South	10003291975	AO-100-44-S001-001184	10277384

2.14.5 Rack assembly OTS



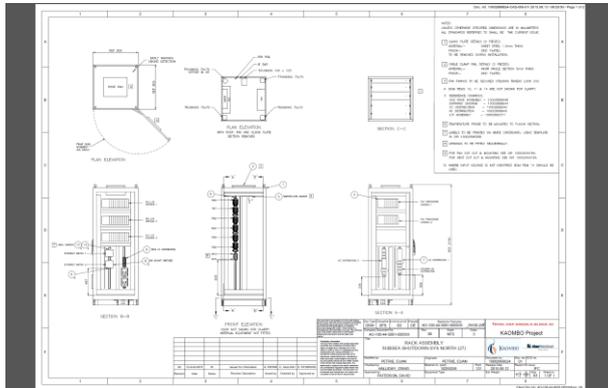
OTS North	10003392607	AO-100-44-S001-001591	10284645
OTS South	10003392614	AO-100-44-S001-001587	10284648

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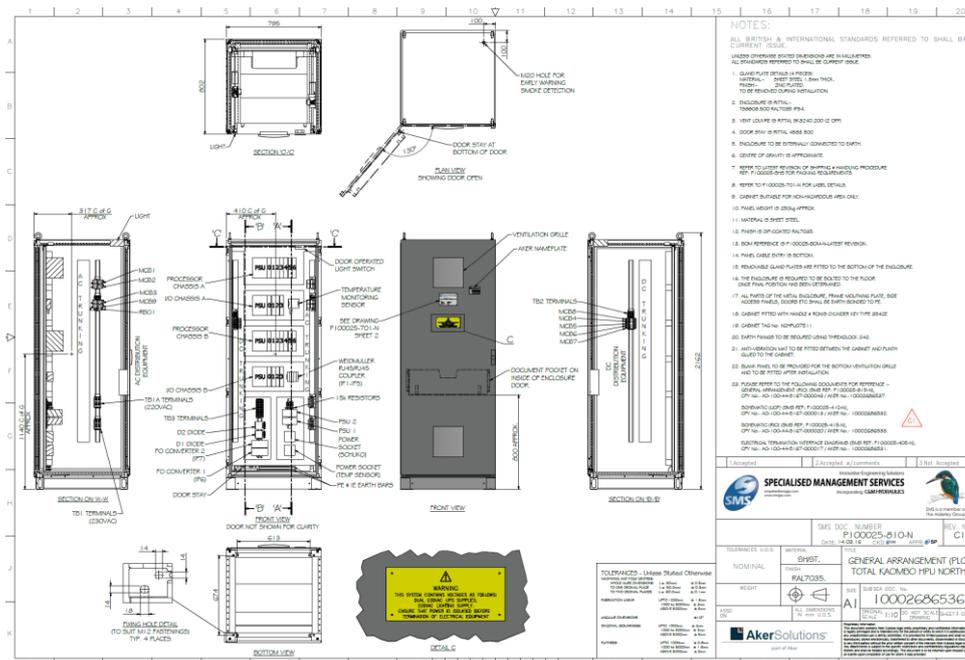
BLOCK 32 - KAOMBO SPS

2.14.6 Rack assembly Subsea Shutdown System



Subsea Shutdown System North	10002868624	AO-100-44-S001-000333	10255258
Subsea Shutdown System South	10002868636	AO-100-44-S001-000332	10256910

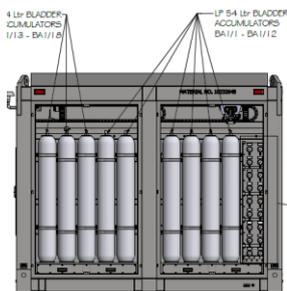
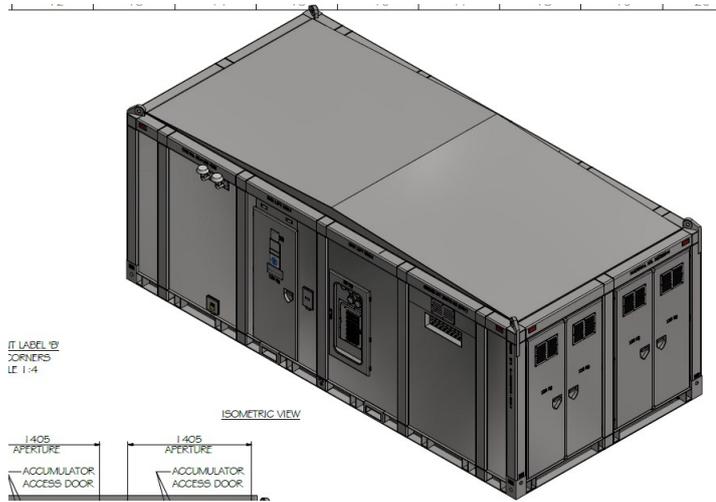
2.14.7 Rack assembly HPU UCP Cabinet



HPU UCP Cabinet North	10002674982	AO-100-44-S167-000016	
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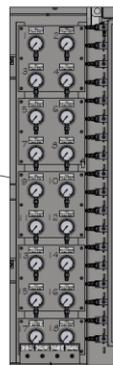
BLOCK 32 - KAOMBO SPS

2.15 HPU



1/13 ACCUMULATOR ARM AND ENCLOSURE  
 HE-12 FOR DETAILS

1 UNITS RIO/1, RIO/2  
 IO 1/3

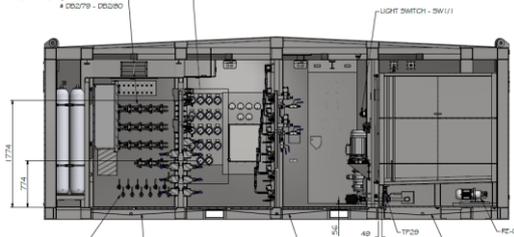


ACCUMULATOR ISOLATION  
 DOUBLE BLOCK & BLEED VALVES  
 DB3 - DB3/2, DB3/1 - DB3/6  
 # DB3/79 - DB3/20

ACCUMULATOR ARM CONNECTION PLATE  
 4x 1/4" QUICK CONNECT



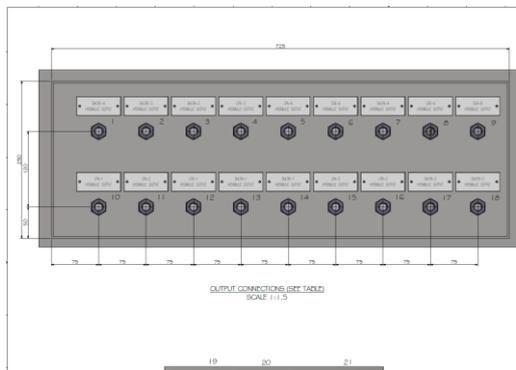
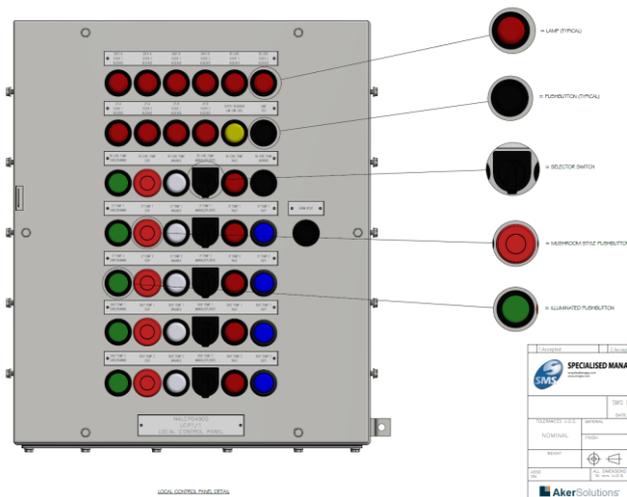
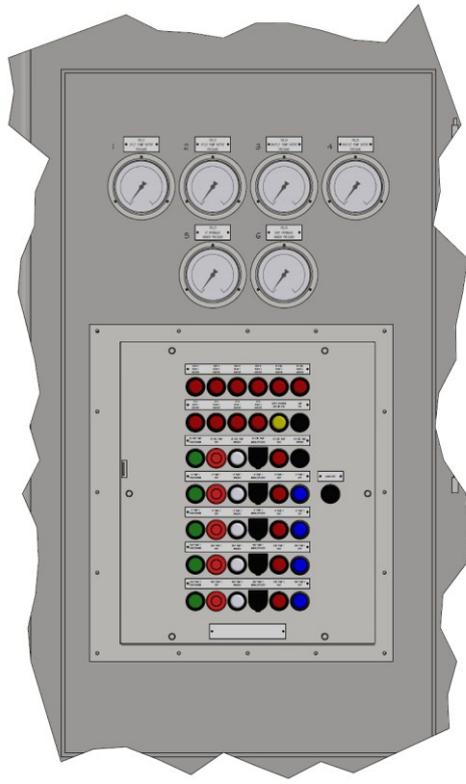
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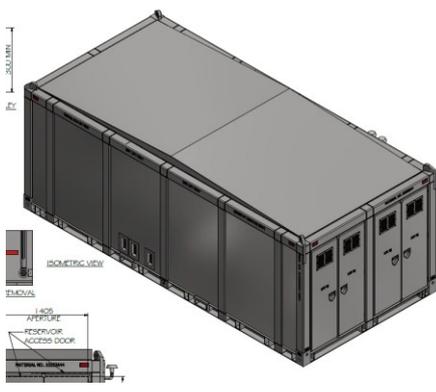
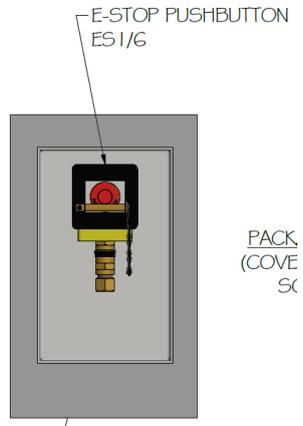
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NO	DESCRIPTION	WIRING	TERMINAL
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2	...	...	...
3	...	...	...
4	...	...	...
5	...	...	...
6	...	...	...
7	...	...	...
8	...	...	...
9	...	...	...
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11	...	...	...
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18	...	...	...

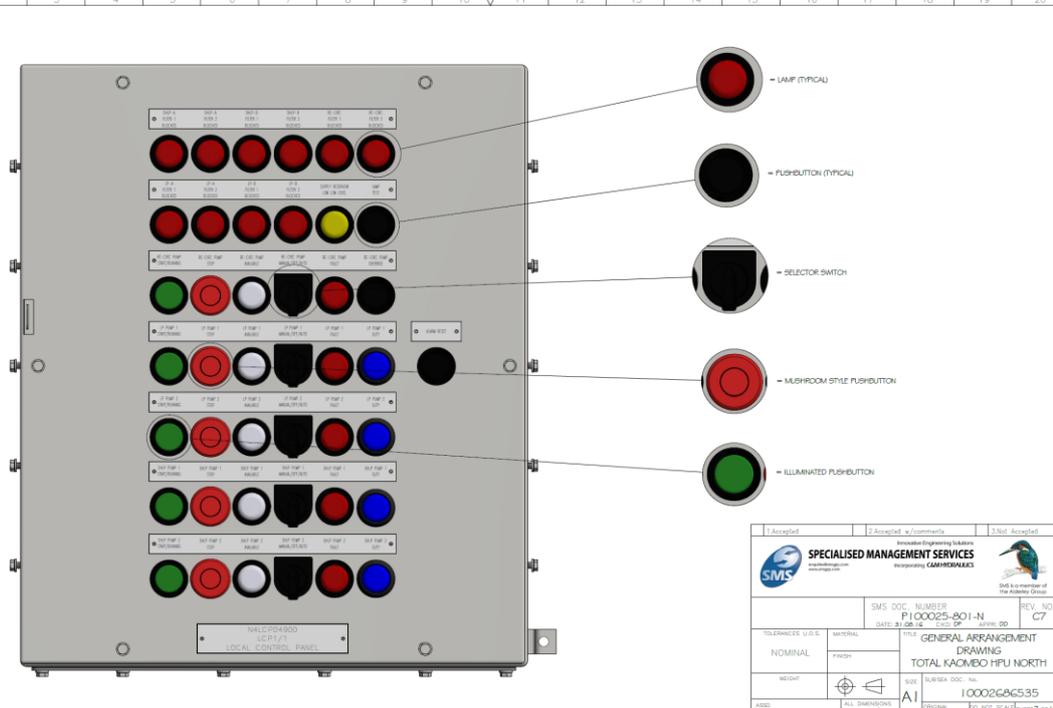


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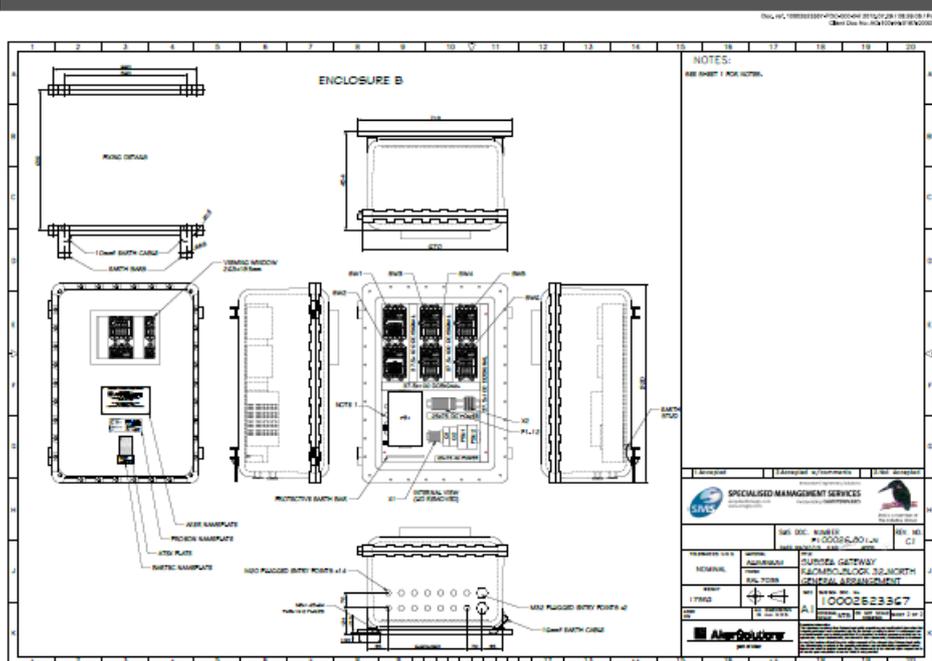
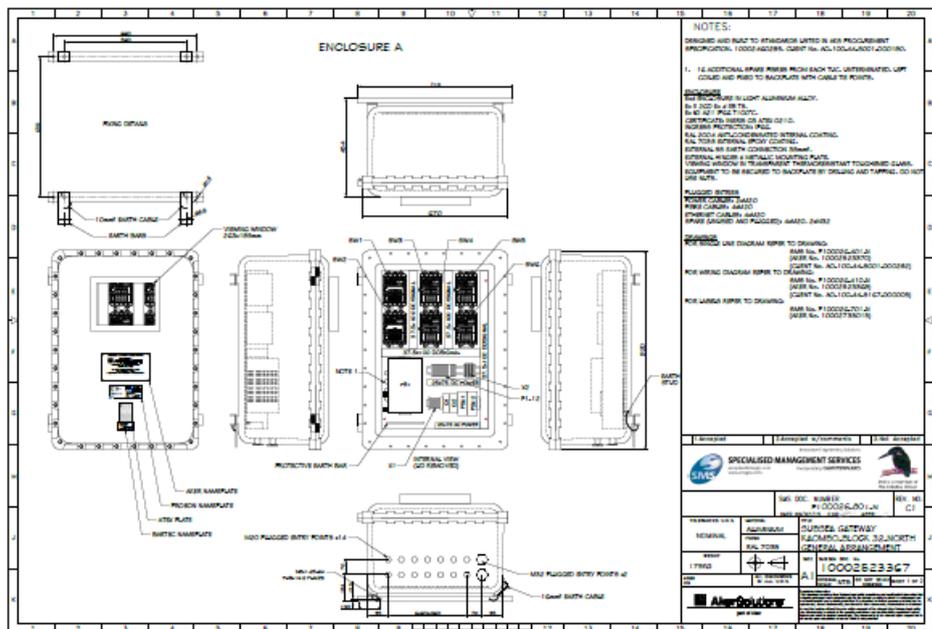
GA Local Control Panel North



HPU North GA	10002523060	AO-100-44-S167-000002	10232644
HPU South GA	10002856214	AO-100-44-S167-000052	10232645

Discuss setup with x-vision for this section.

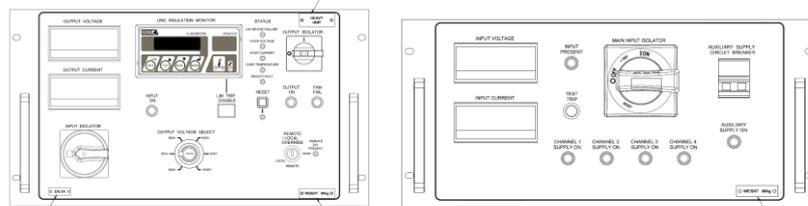
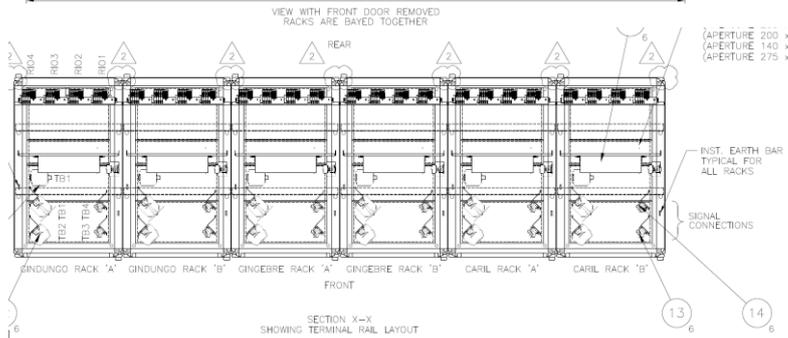
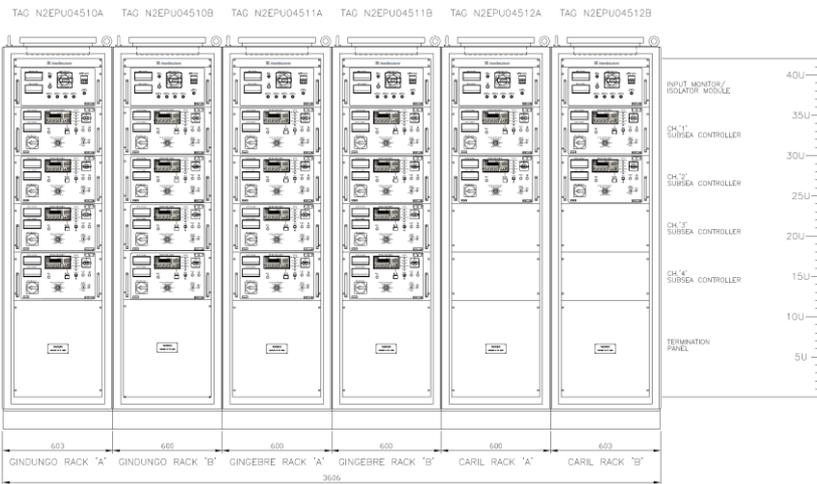
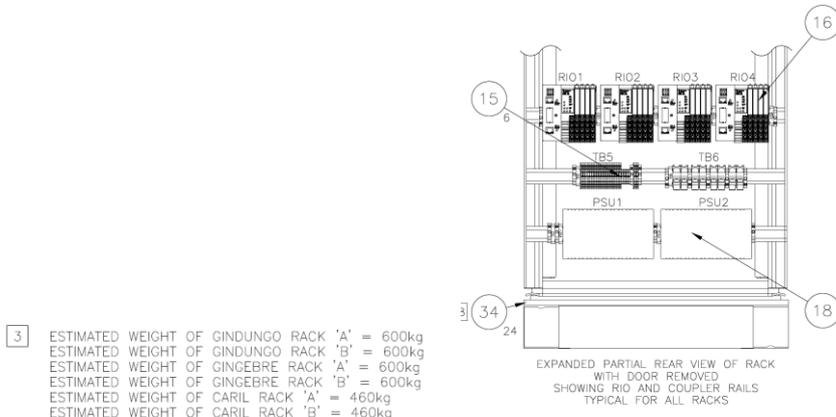
### 2.16 Subsea Gateways



Subsea Gateways GA North	10002523367	AO-100-44-S167-000003	10233086
Subsea Gateways GA South	10002735053	AO-100-44-S001-000280	10241906

**TYPE 3 Use as is (if possible)**

## 2.17 Electric Power Unit (EPU)



EPU North GA	10002523009	AO-100-44-S201-000006	10230910
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**TYPE 3 Use as is (if possible)**

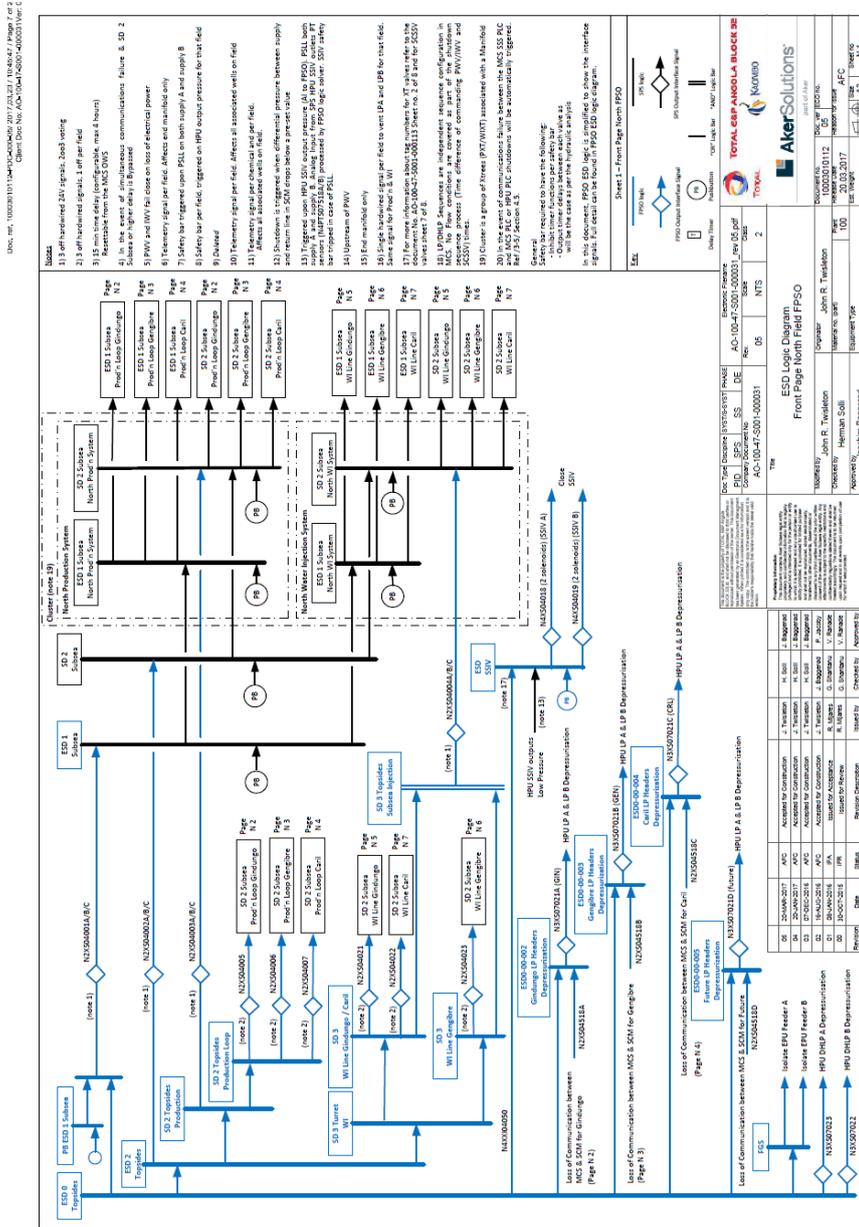
## 2.18 Emergency Shutdown Diagram (ESD)

### 2.18.1 Emergency shutdown logic diagram North

*HOLD; feasibility of inclusion in handbook pending draft example from sub-supplier*

ESD Logic Diagram	10003010112	AO-100-44-S001-000031	NA
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1/11



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## BLOCK 32 - KAOMBO SPS

2

Client Doc No: AO-100-40-S001-000185Ver: 1

Sheet 2 - Gindungo Production Well North PFD

ESD Logic Diagram  
 Gindungo Production Well North

Production Loop	Manifold	Manifold Type	Production Well
3B-MMS-1010	4 S14T In Line	3B-SCT-1011	
3B-MMS-1020	4 S14T In Line	3B-SCT-1012	
3B-MMS-1030	2 S14T In Line	3B-SCT-1013	
3B-MMS-1040	2 S14T In Line	3B-SCT-1014	

Legend:

- SS: Safety Shutdown
- PS: Production Shutdown
- CF: Communication Failure
- PLC: Programmable Logic Controller
- SIS: Safety Instrumented System
- Valves: V1, V2, V3, V4, V5, V6, V7, V8, V9, V10, V11, V12, V13, V14, V15
- Pumps: P1, P2, P3
- Control Systems: PLC, SIS

### Notes

- Soft shutdown 200 signal, load voting
- Soft shutdown signal, 1 off per field
- Soft shutdown signal, 1 off per field
- Soft shutdown signal, 1 off per field
- In the event of communication failure, S.D. 2 will be triggered in the SIS (max 4 hours)
- SS or higher delay is bypassed
- RVV and RVV this close on loss of electrical power
- Telemetry signal per field. Affect and manifold only
- Safety bar triggered upon PSL on both supply A and supply B
- Safety bar per field. triggered on HPD output pressure for that field
- Delayed
- Telemetry signal per field. Affects all associated wells on field
- Telemetry signal per chemical and per field. Affects all associated with on field.
- Shutdown: It triggers when differential pressure between two manifolds is detected.
- Telemetry (see HPD SSV) output pressure. (SI to PFD) PSL both supply A and supply B. Along input from SPS HPD SSV power. SSV safety bar triggered in case of PSL
- Upstream of RVV
- End manifold only
- Single shutdown signal per field to vent LPA, and LPS for that field. Same signal for PFD in SI
- For more information about the numbers for SI values refer to the SPS Handbook. For more information about the numbers for SSSV values refer to S.S.S.V. sheet 7. PFD
- LP DPLP sequences are independent sequencing configuration and are not dependent on the sequence of the other sequences (Time difference of commencing PFM/RVV and SSSV) times.
- Header is a group of zones (PVT/WVT) associated with a manifold.
- In the event of communication failure between the MGS SSS PLC and MGS PLC or HPV PLC shutdown will be automatically triggered for PFD, Section 4.2.
- LP DPLP sequences are independent sequencing configuration and are not dependent on the sequence of the other sequences (Time difference of commencing PFM/RVV and SSSV) times.
- For more information about the numbers for SI values refer to the SPS Handbook. For more information about the numbers for SSSV values refer to S.S.S.V. sheet 7. PFD
- LP DPLP sequences are independent sequencing configuration and are not dependent on the sequence of the other sequences (Time difference of commencing PFM/RVV and SSSV) times.
- Header is a group of zones (PVT/WVT) associated with a manifold.
- In the event of communication failure between the MGS SSS PLC and MGS PLC or HPV PLC shutdown will be automatically triggered for PFD, Section 4.2.
- LP DPLP sequences are independent sequencing configuration and are not dependent on the sequence of the other sequences (Time difference of commencing PFM/RVV and SSSV) times.

Rev. No.	01	02	03	04	05	06	07	08	09	10
Rev. Date	2017.11.17	2017.11.17	2017.11.17	2017.11.17	2017.11.17	2017.11.17	2017.11.17	2017.11.17	2017.11.17	2017.11.17
Rev. Description										

Rev. No.	Rev. Date	Rev. Description	Author	Checked	Approved
01	2017.11.17	Issue for Review	J. R. T. Trindade	J. R. T. Trindade	J. R. T. Trindade
02	2017.11.17	Issue for Review	J. R. T. Trindade	J. R. T. Trindade	J. R. T. Trindade
03	2017.11.17	Issue for Review	J. R. T. Trindade	J. R. T. Trindade	J. R. T. Trindade
04	2017.11.17	Issue for Review	J. R. T. Trindade	J. R. T. Trindade	J. R. T. Trindade
05	2017.11.17	Issue for Review	J. R. T. Trindade	J. R. T. Trindade	J. R. T. Trindade
06	2017.11.17	Issue for Review	J. R. T. Trindade	J. R. T. Trindade	J. R. T. Trindade
07	2017.11.17	Issue for Review	J. R. T. Trindade	J. R. T. Trindade	J. R. T. Trindade
08	2017.11.17	Issue for Review	J. R. T. Trindade	J. R. T. Trindade	J. R. T. Trindade
09	2017.11.17	Issue for Review	J. R. T. Trindade	J. R. T. Trindade	J. R. T. Trindade
10	2017.11.17	Issue for Review	J. R. T. Trindade	J. R. T. Trindade	J. R. T. Trindade

Rev. No.	01	02	03	04	05	06	07	08	09	10
Rev. Date	2017.11.17	2017.11.17	2017.11.17	2017.11.17	2017.11.17	2017.11.17	2017.11.17	2017.11.17	2017.11.17	2017.11.17
Rev. Description										

Approved by: *Joaquim Baga*  
 Date: 2017.11.17

Checked by: *Joaquim Baga*  
 Date: 2017.11.17

Author: *Joaquim Baga*  
 Date: 2017.11.17

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 Rev. Date 2017.11.17  
 Rev. Description Issue for Review

Rev. No. 02  
 Rev. Date 2017.11.17  
 Rev. Description Issue for Review

Rev. No. 03  
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 Rev. Description Issue for Review

Rev. No. 04  
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Rev. No. 05  
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Rev. No. 06  
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 Rev. Description Issue for Review

Rev. No. 07  
 Rev. Date 2017.11.17  
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Rev. No. 08  
 Rev. Date 2017.11.17  
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Rev. No. 09  
 Rev. Date 2017.11.17  
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Rev. No. 11  
 Rev. Date 2017.11.17  
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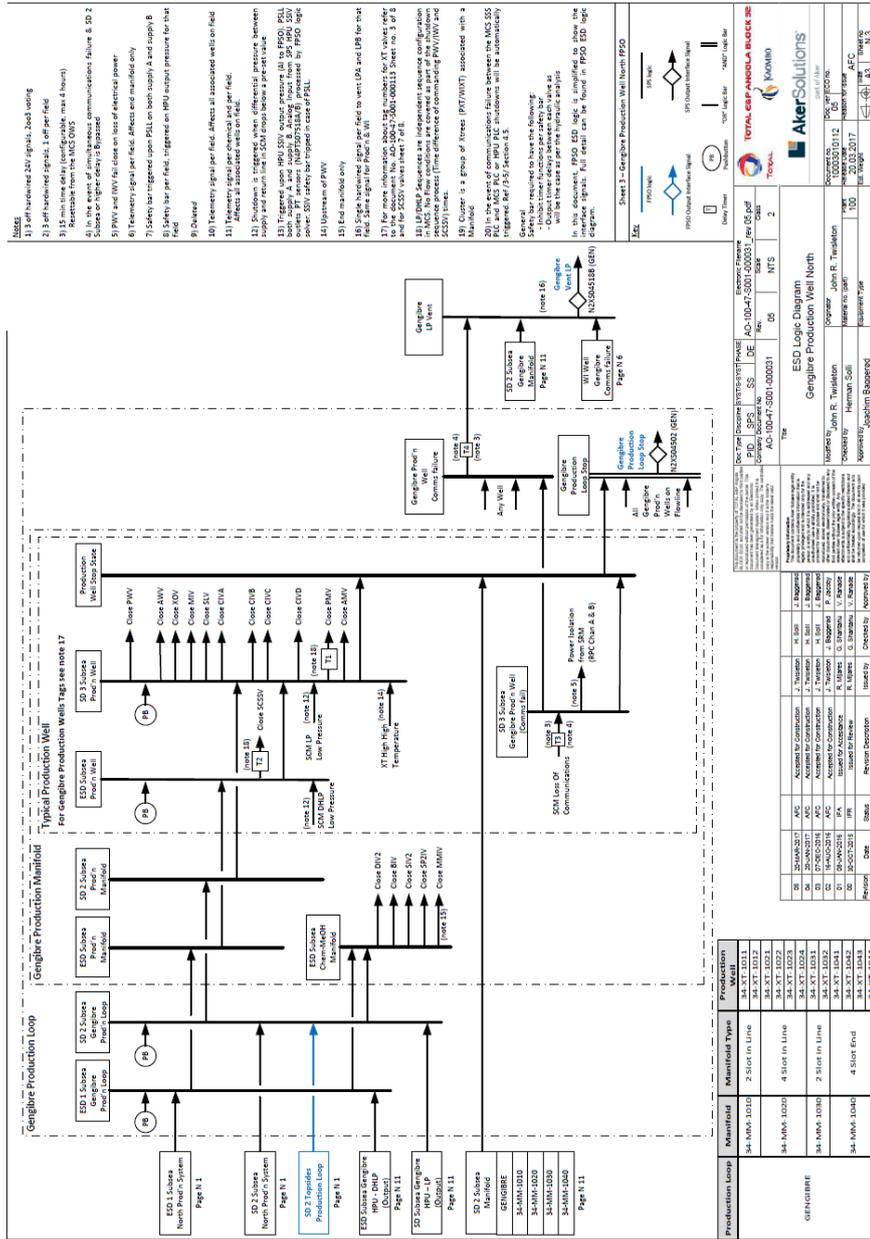


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Production Loop	Mainfield	Mainfield Type	Production Well
GENGIBRE	34-MM-1010	2 Slot in Line	34-XT-1012
	34-MM-1020	4 Slot in Line	34-XT-1022
	34-MM-1030	2 Slot in Line	34-XT-1032
	34-MM-1040	4 Slot in Line	34-XT-1042
	34-MM-1050	4 Slot in Line	34-XT-1052

Revision	Date	Status	Reason Description	Issued By	Checked By	Approved By
01	2017-11-17	Approved	Initial Release	J. Trudon	J. Trudon	J. Trudon
02	2017-11-17	Approved	Minor Corrections	J. Trudon	J. Trudon	J. Trudon
03	2017-11-17	Approved	Minor Corrections	J. Trudon	J. Trudon	J. Trudon
04	2017-11-17	Approved	Minor Corrections	J. Trudon	J. Trudon	J. Trudon
05	2017-11-17	Approved	Minor Corrections	J. Trudon	J. Trudon	J. Trudon

Doc Title	Doc Ref	Doc Rev	Doc Date
ESD Logic Diagram	AO-100-40-S001-000031	05	2017-11-17



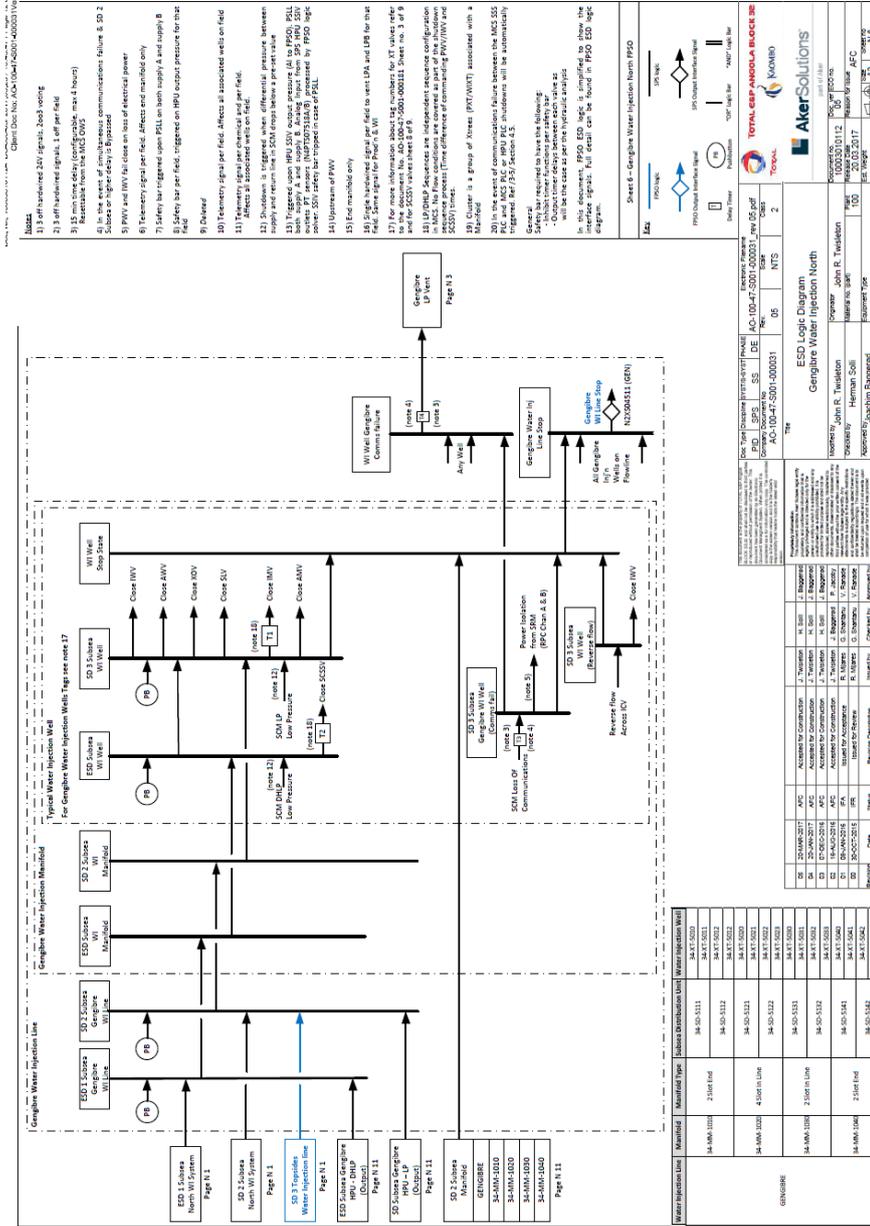


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6



- 11) Telemetry signal per field. Affects all associated wells on field
- 12) Telemetry signal per wellhead and per field.
- 13) Shutdown. Is triggered when, differently, pressure between supply and return line in SOM drops below a preset value
- 14) Triggered upon RWI SIV output pressure (AI to PSD) PLL
- 15) In the event of communications failure between the PLC and the SOM, the PLC will send a 'SOM status' signal to the SOM. The SOM will then send a 'SOM status' signal to the PLC. The SOM status signal is sent to the PLC via the PLC's SOM status input. The SOM status signal is sent to the PLC via the PLC's SOM status input.
- 16) End manifold only
- 17) Single wellhead signal per field to vent LPA and LBP for start of a wellhead signal per field. WI number for JT which refer to the document No. AO-100-47-2001-000311 Sheet no. 3 of 9 and for SOM varies sheets 3 of 9
- 18) In the event of communications failure between the PLC and the SOM, the PLC will send a 'SOM status' signal to the SOM. The SOM will then send a 'SOM status' signal to the PLC. The SOM status signal is sent to the PLC via the PLC's SOM status input. The SOM status signal is sent to the PLC via the PLC's SOM status input.
- 19) Cluster is a group of zones (PT/NOZ) associated with a Manifold
- 20) In the event of communications failure between the SOM and the PLC, the PLC will send a 'SOM status' signal to the SOM. The SOM will then send a 'SOM status' signal to the PLC. The SOM status signal is sent to the PLC via the PLC's SOM status input. The SOM status signal is sent to the PLC via the PLC's SOM status input.
- General
- This diagram shows the logic for the SOM status signal.
  - The SOM status signal is sent to the PLC via the PLC's SOM status input.
  - The SOM status signal is sent to the PLC via the PLC's SOM status input.
- In this document, PSD SIV logic is simplified to show the intertie signals. Full detail can be found in PSD SIV logic diagram.

Sheet 6 - Gengibre Water Injection North PSD

Legend:

- PSD (Status Distribution Unit)
- Manifold
- Water Injection Line

Project Information:

Project Name: Gengibre Water Injection North  
 Drawing Title: ESO Logic Diagram  
 Engineer: John R. Tushneto  
 Date: 10/11/2017  
 Reason for Issue: RFI

Revision History:

Rev	By	Date	Description
1	JRT	10/11/2017	Issue for RFI
2	JRT	10/11/2017	Issue for RFI

Item	Description	Author	Check	Date	By
01	DESIGN FOR CONSTRUCTION	J. Tushneto	N. Elise	10/11/2017	J. Tushneto
02	ACCEPTED FOR CONSTRUCTION	J. Tushneto	N. Elise	10/11/2017	J. Tushneto
03	AS-BUILT FOR CONSTRUCTION	J. Tushneto	N. Elise	10/11/2017	J. Tushneto
04	ACCEPTED FOR CONSTRUCTION	J. Tushneto	N. Elise	10/11/2017	J. Tushneto
05	AS-BUILT FOR CONSTRUCTION	J. Tushneto	N. Elise	10/11/2017	J. Tushneto
06	ACCEPTED FOR CONSTRUCTION	J. Tushneto	N. Elise	10/11/2017	J. Tushneto
07	AS-BUILT FOR CONSTRUCTION	J. Tushneto	N. Elise	10/11/2017	J. Tushneto
08	ACCEPTED FOR CONSTRUCTION	J. Tushneto	N. Elise	10/11/2017	J. Tushneto
09	AS-BUILT FOR CONSTRUCTION	J. Tushneto	N. Elise	10/11/2017	J. Tushneto
10	ACCEPTED FOR CONSTRUCTION	J. Tushneto	N. Elise	10/11/2017	J. Tushneto

Item	Description	Author	Check	Date	By
11	DESIGN FOR CONSTRUCTION	J. Tushneto	N. Elise	10/11/2017	J. Tushneto
12	ACCEPTED FOR CONSTRUCTION	J. Tushneto	N. Elise	10/11/2017	J. Tushneto
13	AS-BUILT FOR CONSTRUCTION	J. Tushneto	N. Elise	10/11/2017	J. Tushneto
14	ACCEPTED FOR CONSTRUCTION	J. Tushneto	N. Elise	10/11/2017	J. Tushneto
15	AS-BUILT FOR CONSTRUCTION	J. Tushneto	N. Elise	10/11/2017	J. Tushneto
16	ACCEPTED FOR CONSTRUCTION	J. Tushneto	N. Elise	10/11/2017	J. Tushneto
17	AS-BUILT FOR CONSTRUCTION	J. Tushneto	N. Elise	10/11/2017	J. Tushneto
18	ACCEPTED FOR CONSTRUCTION	J. Tushneto	N. Elise	10/11/2017	J. Tushneto
19	AS-BUILT FOR CONSTRUCTION	J. Tushneto	N. Elise	10/11/2017	J. Tushneto
20	ACCEPTED FOR CONSTRUCTION	J. Tushneto	N. Elise	10/11/2017	J. Tushneto

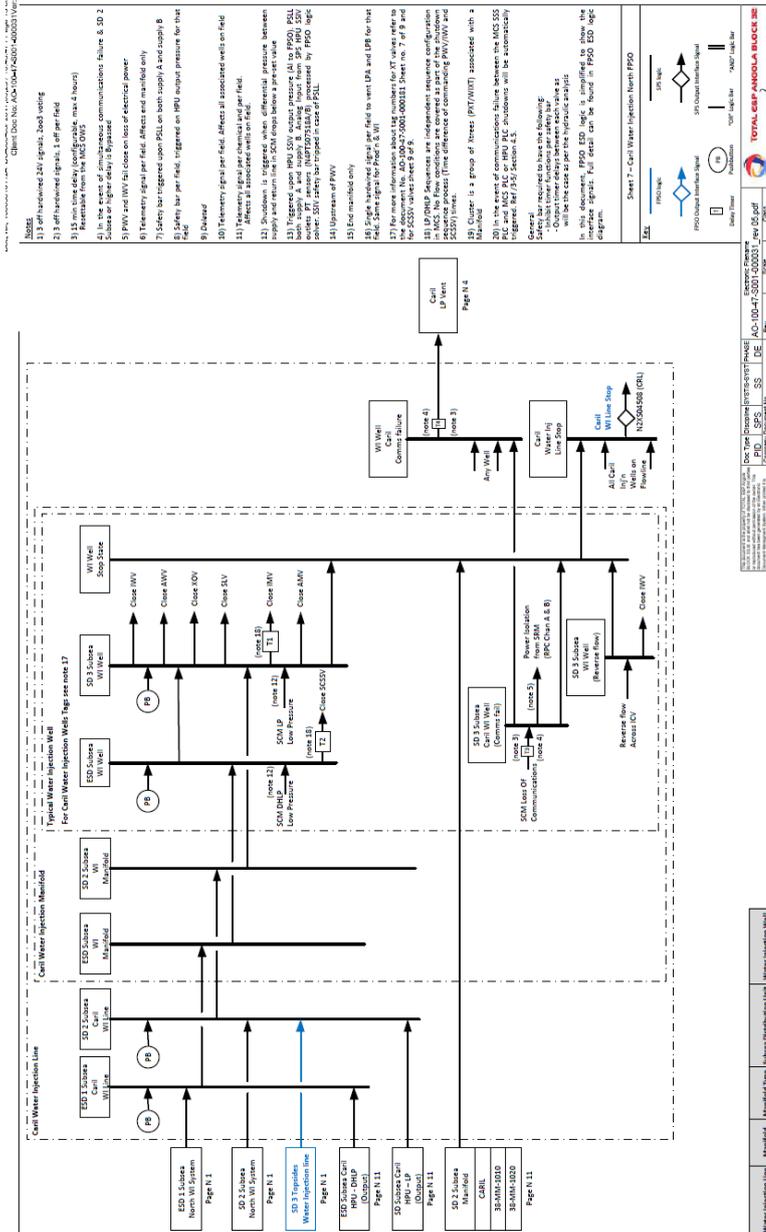
Water Injection Line	Manifold	Status Distribution Unit	Water Injection Well
34-MM-1001	34-KT-0001	34-KT-0001	34-KT-0001
34-MM-1002	34-KT-0002	34-KT-0002	34-KT-0002
34-MM-1003	34-KT-0003	34-KT-0003	34-KT-0003
34-MM-1004	34-KT-0004	34-KT-0004	34-KT-0004
34-MM-1005	34-KT-0005	34-KT-0005	34-KT-0005
34-MM-1006	34-KT-0006	34-KT-0006	34-KT-0006
34-MM-1007	34-KT-0007	34-KT-0007	34-KT-0007
34-MM-1008	34-KT-0008	34-KT-0008	34-KT-0008
34-MM-1009	34-KT-0009	34-KT-0009	34-KT-0009
34-MM-1010	34-KT-0010	34-KT-0010	34-KT-0010
34-MM-1011	34-KT-0011	34-KT-0011	34-KT-0011
34-MM-1012	34-KT-0012	34-KT-0012	34-KT-0012
34-MM-1013	34-KT-0013	34-KT-0013	34-KT-0013
34-MM-1014	34-KT-0014	34-KT-0014	34-KT-0014
34-MM-1015	34-KT-0015	34-KT-0015	34-KT-0015
34-MM-1016	34-KT-0016	34-KT-0016	34-KT-0016
34-MM-1017	34-KT-0017	34-KT-0017	34-KT-0017
34-MM-1018	34-KT-0018	34-KT-0018	34-KT-0018
34-MM-1019	34-KT-0019	34-KT-0019	34-KT-0019
34-MM-1020	34-KT-0020	34-KT-0020	34-KT-0020

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## BLOCK 32 - KAOMBO SPS

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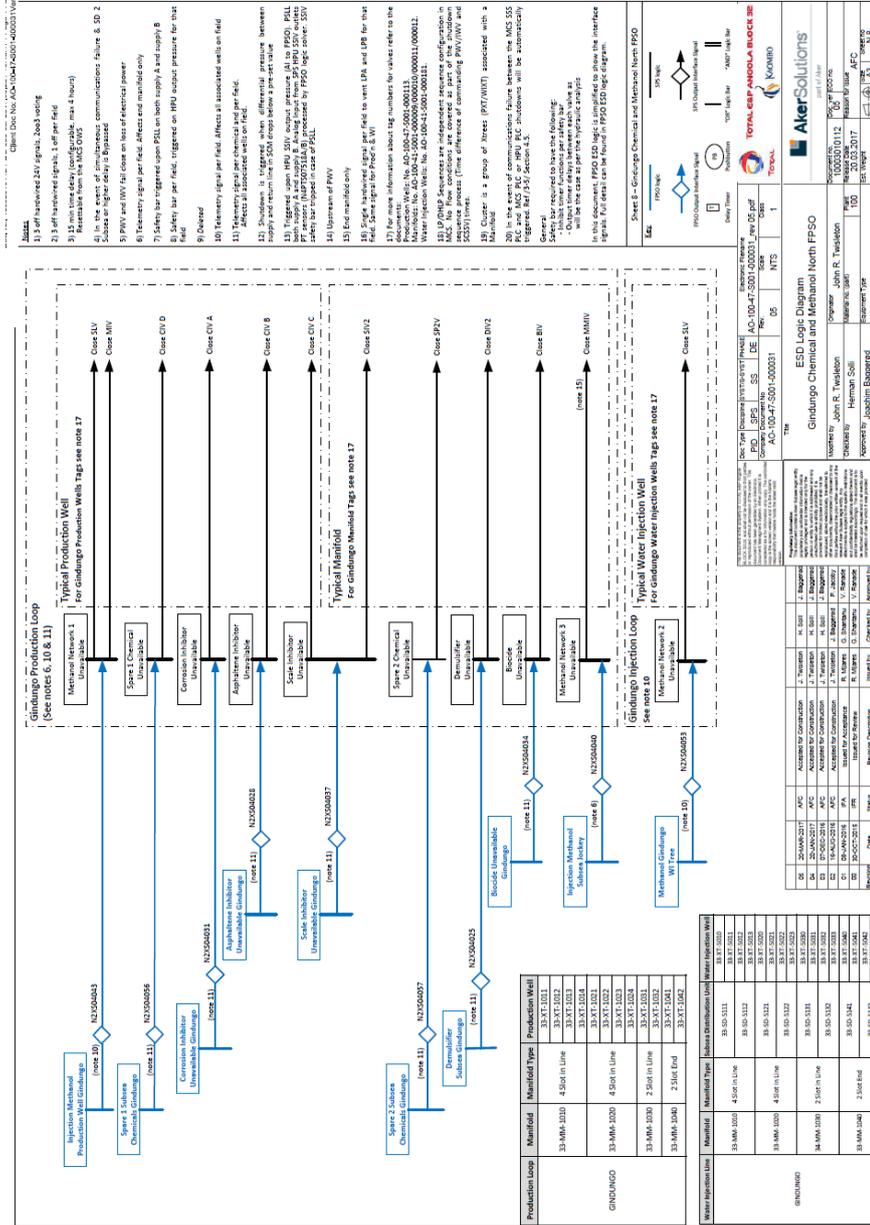
7



- Legend:**
- ESD 1 Subarea Manifold Signal
  - ESD 2 Subarea Manifold Signal
  - ESD 3 Subarea Manifold Signal
  - Normal Stop
  - Water In Line Stop
  - All Carl WI Line Stop
  - In/Out of Phase on Pump or Motor
  - Reverse Flow Anomaly
- General:**
- Safety bar requires to have the following status:
- Operation delays between each case as indicated in this document.
  - ESDO logic is simplified to show the interlocking signals. Full detail can be found in PFD0 ESD logic diagram.
- Revision History:**
- | Rev. | Date       | Description            | Drawn by  | Checked by  | Approved by  |
|------|------------|------------------------|-----------|-------------|--------------|
| 01   | 2017-09-05 | Issue for Construction | R. Sharda | G. Stokhove | V. Raghavaan |
| 02   | 2017-09-05 | Issue for Construction | R. Sharda | G. Stokhove | V. Raghavaan |
| 03   | 2017-09-05 | Issue for Construction | R. Sharda | G. Stokhove | V. Raghavaan |
| 04   | 2017-09-05 | Issue for Construction | R. Sharda | G. Stokhove | V. Raghavaan |
| 05   | 2017-09-05 | Issue for Construction | R. Sharda | G. Stokhove | V. Raghavaan |
| 06   | 2017-09-05 | Issue for Construction | R. Sharda | G. Stokhove | V. Raghavaan |
- Document Information:**
- Doc. Title: ESD Logic Diagram
  - Doc. No: AkerSolutions-10002504361-PDC-000-05-2017-09-05
  - Project Name: Carl Water Injection North
  - Rev. 05: 2017-09-05
  - Author: John R. Tronholm
  - Checker: John R. Tronholm
  - Approver: Joachim Baggegaard
  - Project No: 10002504361
  - Issue Date: 2017-09-05
  - Revision: 05
  - Page: 115 of 315

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BLOCK 32 - KAOMBO SPS



- Notes:
- 1) All 240V/480V signals, 300V/600V
  - 2) 33-VT-1011, 33-VT-1012, 33-VT-1013, 33-VT-1014, 33-VT-1021, 33-VT-1022, 33-VT-1023, 33-VT-1031, 33-VT-1032, 33-VT-1033, 33-VT-1041, 33-VT-1042, 33-VT-1051, 33-VT-1052
  - 3) 33-VT-1011, 33-VT-1012, 33-VT-1013, 33-VT-1014, 33-VT-1021, 33-VT-1022, 33-VT-1023, 33-VT-1031, 33-VT-1032, 33-VT-1033, 33-VT-1041, 33-VT-1042, 33-VT-1051, 33-VT-1052
  - 4) In the event of simultaneous communications failure, SDO 2 status or higher delay is bypassed
  - 5) PNM and WW fail close on loss of electrical power
  - 6) Temporary signal per field. Affects end manifold only
  - 7) Safety bar triggered upon PILL on both supply A and supply B
  - 8) Safety bar per field. Triggered on MPU output pressure for that field
  - 9) Overseer
  - 10) Temporary signal per field. Affects all associated with on field
  - 11) Affects all associated with on field
  - 12) Affects all associated with on field
  - 13) Shutdown is triggered when differential pressure between supply and return line in SDN drops below a pre-set value
  - 14) In the event of simultaneous communications failure, SDO 2 status or higher delay is bypassed
  - 15) Triggered upon HPL SDV output pressure (A) to FPSO. PILL per sensor (M2100251.0.A) is generated by FPSO logic when SDV safety bar is triggered in case of PILL
  - 16) Downstream of PNM
  - 17) End manifold only
  - 18) Safety bar per field. Triggered on MPU output pressure for that field
  - 19) Safety bar per field. Triggered on MPU output pressure for that field
  - 20) Safety bar per field. Triggered on MPU output pressure for that field
  - 21) Safety bar per field. Triggered on MPU output pressure for that field
  - 22) Safety bar per field. Triggered on MPU output pressure for that field
  - 23) Safety bar per field. Triggered on MPU output pressure for that field
  - 24) Safety bar per field. Triggered on MPU output pressure for that field
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  - 82) Safety bar per field. Triggered on MPU output pressure for that field
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  - 98) Safety bar per field. Triggered on MPU output pressure for that field
  - 99) Safety bar per field. Triggered on MPU output pressure for that field
  - 100) Safety bar per field. Triggered on MPU output pressure for that field

Sheet 8 - Grinding Chemical and Methanol North FPSO

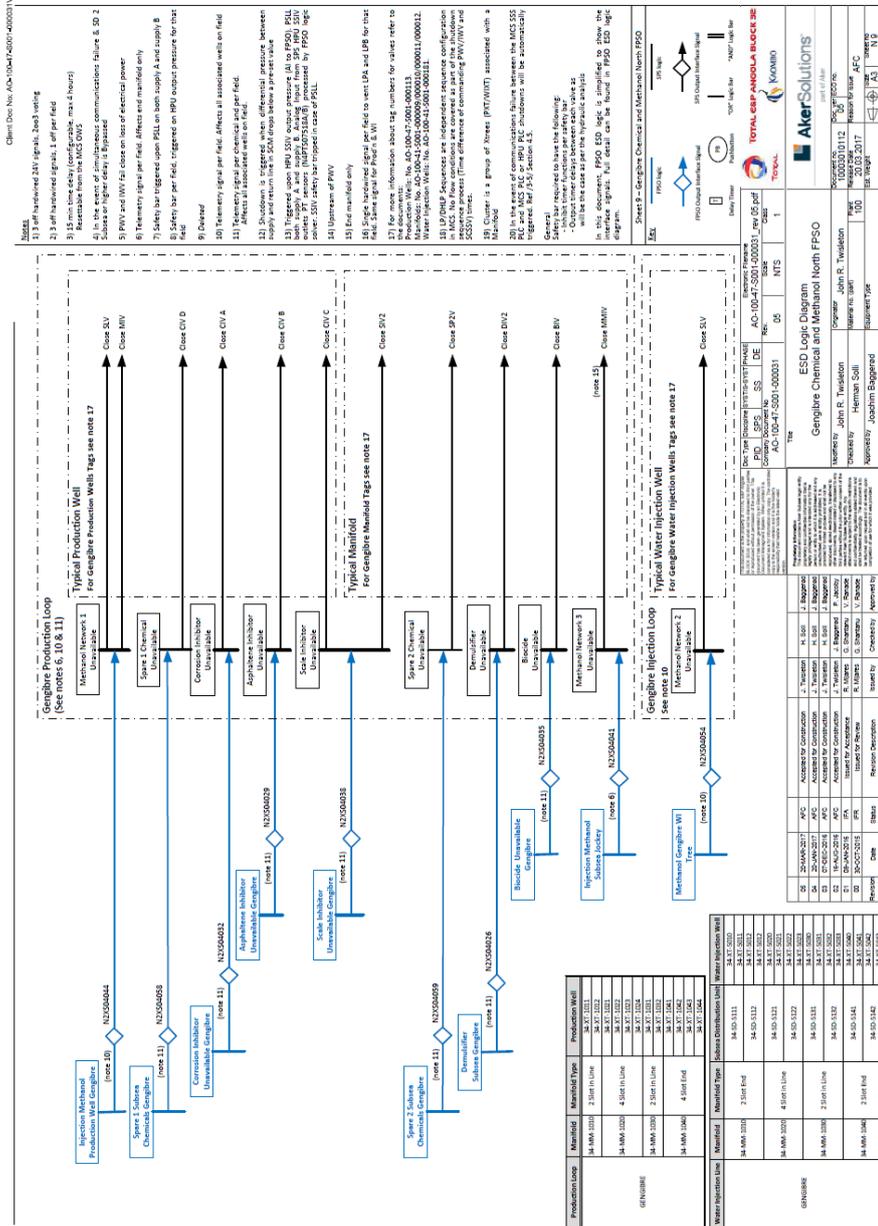
Doc No: AO-100-40-S001-000185 Ver: 04  
 PDC-000-05  
 DE  
 AO-100-40-S001-000185  
 NTS  
 05

ESD Logic Diagram  
 Grinding Chemical and Methanol North FPSO  
 Operator: John R. Tuckson  
 Designer: John R. Tuckson  
 Date: 11/17/2017  
 Reason for Issue: ACC  
 Issue No: 1117  
 Issue Date: 11/17/2017  
 Issue Type: Safety

# SPS HANDBOOK TABLE OF CONTENT

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**Legend**

- RTD: Temperature sensor
- PSLL: Pressure Safety Limit
- PLC: Programmable Logic Controller
- ... [Other symbols and their descriptions]

**General**

- Diagrams are to be used for reference only
- Output cover delays between each valve as per the interlock logic
- The interlock logic is implemented in the PLC
- The interlock signals are implemented in the PFD0 ESD logic diagram
- Refer to the PFD0 ESD logic diagram for details
- Refer to the PFD0 ESD logic diagram for details
- Refer to the PFD0 ESD logic diagram for details

**Legend**

- RTD: Temperature sensor
- PSLL: Pressure Safety Limit
- PLC: Programmable Logic Controller
- ... [Other symbols and their descriptions]





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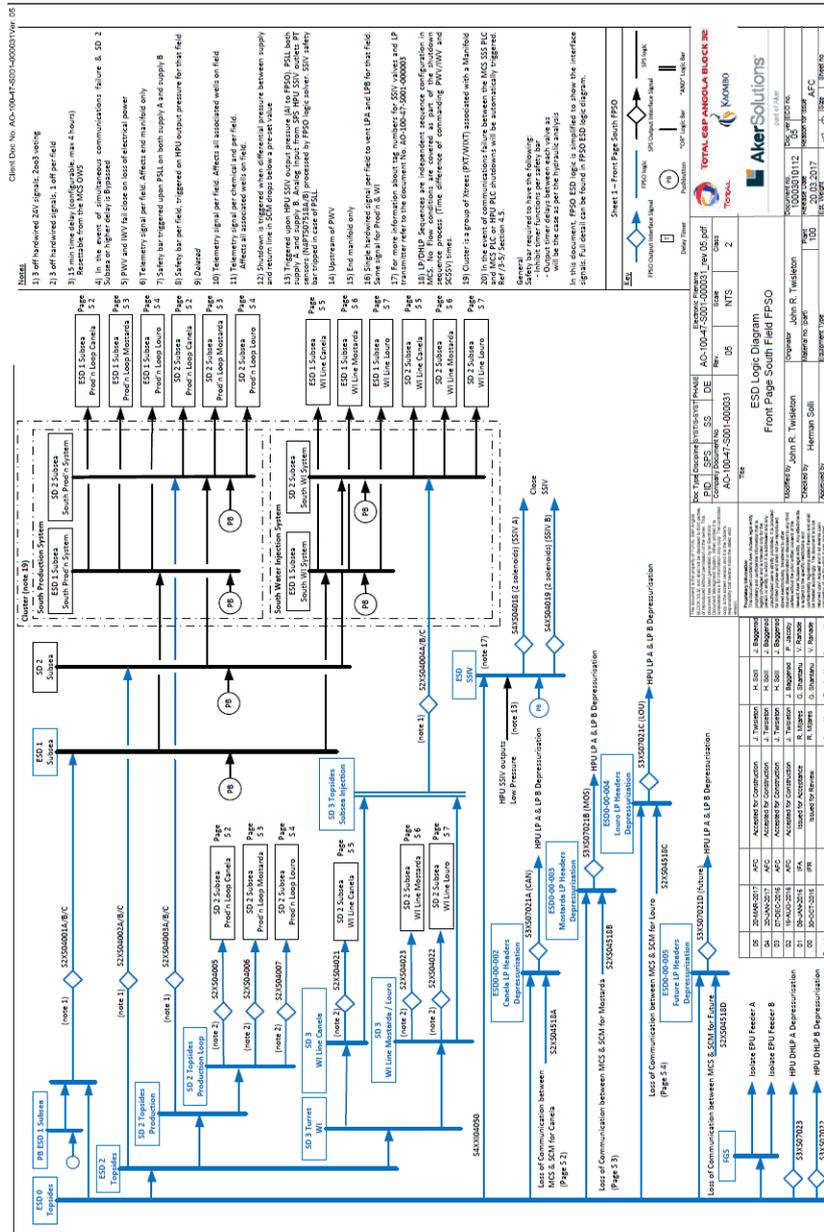
BLOCK 32 - KAOMBO SPS

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2.18.2 ESD logic diagram South

*HOLD; feasibility of inclusion in handbook pending draft example from sub-supplier*

1/11



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113 Self-protected 24V signals. Load voltage

114 Self-protected 24V signals. Load voltage

115 Self-protected 24V signals. Load voltage

116 Self-protected 24V signals. Load voltage

117 Self-protected 24V signals. Load voltage

118 Self-protected 24V signals. Load voltage

119 Self-protected 24V signals. Load voltage

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123 Self-protected 24V signals. Load voltage

124 Self-protected 24V signals. Load voltage

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158 Self-protected 24V signals. Load voltage



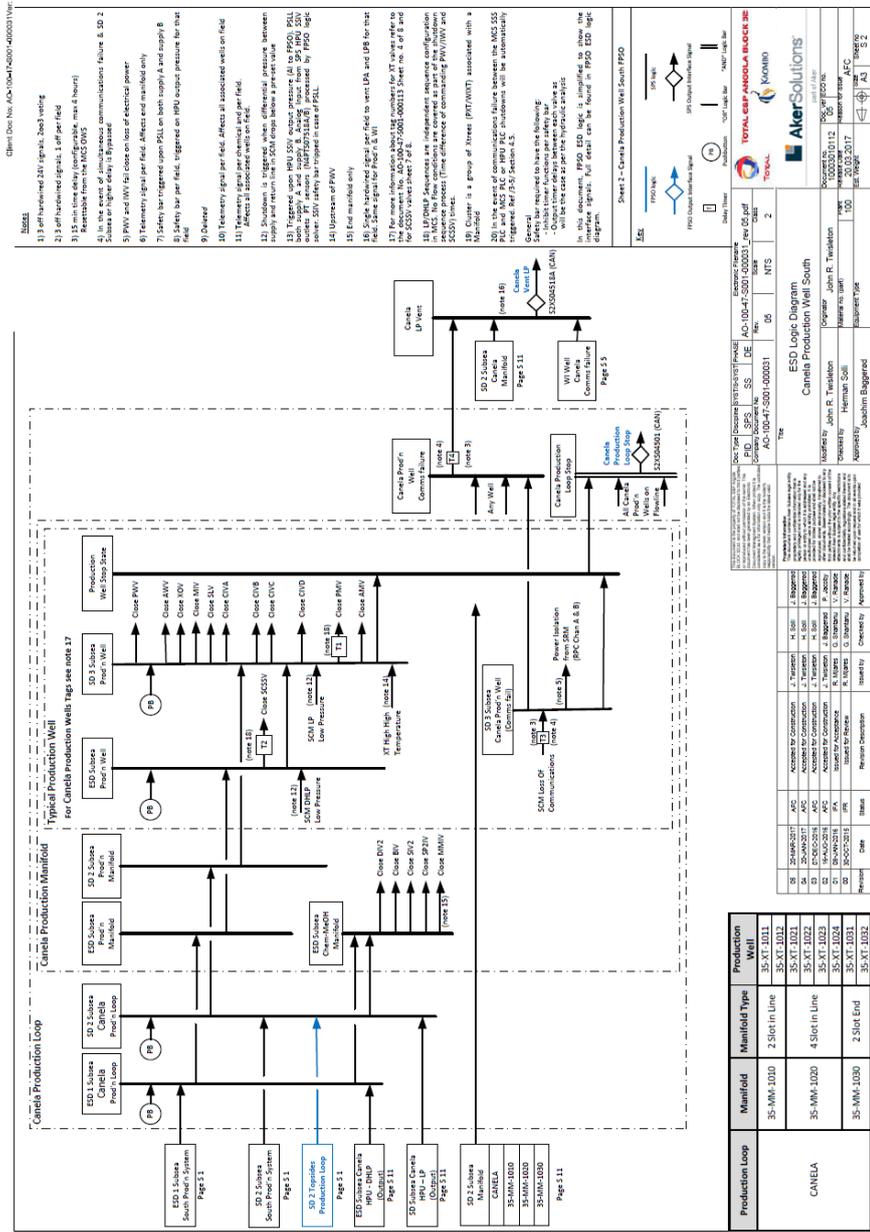
Preferred partner

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Client Doc No. AO-100-40-S001-000185 Ver. 0.4

NOTES

- 1) Self-vented 24V signals, each zone.
- 2) Self-vented signals, 1 set per field.
- 3) Safety signal, 1 set per field.
- 4) In the event of simultaneous communications failure, ESD 2 Subsea or higher delay is bypassed.
- 5) PVI and WVI fail close on loss of electrical power.
- 6) Telemetry signal per field. Affects and nullified only.
- 7) Safety bar triggered upon PSL on both supply A and supply B.
- 8) Safety bar per field, triggered an HPU output pressure for that field.
- 9) Delayed.
- 10) Telemetry signal per field, affects all associated wells on field.
- 11) Telemetry signal per manifold and per field.
- 12) PSLs are interlocked, differential pressure between supply and return, with SCA trips below a pre-set value.
- 13) Triggered upon HPU SCA output pressure (AI to PFD). PSLs are interlocked, differential pressure between supply and return, with SCA trips below a pre-set value.
- 14) Upstream of PVI.
- 15) For nullified only.
- 16) Single harvested signal per field to vent LA and JBR for that field.
- 17) Safety signal per field, 1 set per field.
- 18) In the event of simultaneous communications failure between the document 10002504361-000112 Sheet no. 4 of 8 and 10002504361-000113 Sheet no. 4 of 8.
- 19) In the event of simultaneous communications failure between the document 10002504361-000114 Sheet no. 4 of 8 and 10002504361-000115 Sheet no. 4 of 8.
- 20) In the event of simultaneous communications failure between the document 10002504361-000112 Sheet no. 4 of 8 and 10002504361-000113 Sheet no. 4 of 8.
- 21) In the event of simultaneous communications failure between the document 10002504361-000114 Sheet no. 4 of 8 and 10002504361-000115 Sheet no. 4 of 8.
- 22) In the event of simultaneous communications failure between the document 10002504361-000112 Sheet no. 4 of 8 and 10002504361-000113 Sheet no. 4 of 8.
- 23) In the event of simultaneous communications failure between the document 10002504361-000114 Sheet no. 4 of 8 and 10002504361-000115 Sheet no. 4 of 8.
- 24) In the event of simultaneous communications failure between the document 10002504361-000112 Sheet no. 4 of 8 and 10002504361-000113 Sheet no. 4 of 8.
- 25) In the event of simultaneous communications failure between the document 10002504361-000114 Sheet no. 4 of 8 and 10002504361-000115 Sheet no. 4 of 8.
- 26) Counter is a group of three (PIT/WIT) associated with a Manifold.
- 27) In the event of communications failure between the MCS 355 and MCS 356, the counter will be automatically triggered. Ref P.3/5, Section 4.5.
- 28) General Safety Interlocks by the following:
  - Inhibit timer function per safety bar.
  - Inhibit timer function per safety bar.
  - Inhibit timer function per safety bar.

Sheet 2 - Canella Production Well South PFD

Legend:

- HP High
- LP Low
- FF Flow Failure
- PSL Output Manual Signal
- FF Output Manual Signal
- PSL Output Manual Signal
- FF Output Manual Signal

Notes:

- 1. Self-vented 24V signals, each zone.
- 2. Self-vented signals, 1 set per field.
- 3. Safety signal, 1 set per field.
- 4. In the event of simultaneous communications failure, ESD 2 Subsea or higher delay is bypassed.
- 5. PVI and WVI fail close on loss of electrical power.
- 6. Telemetry signal per field. Affects and nullified only.
- 7. Safety bar triggered upon PSL on both supply A and supply B.
- 8. Safety bar per field, triggered an HPU output pressure for that field.
- 9. Delayed.
- 10. Telemetry signal per field, affects all associated wells on field.
- 11. Telemetry signal per manifold and per field.
- 12. PSLs are interlocked, differential pressure between supply and return, with SCA trips below a pre-set value.
- 13. Triggered upon HPU SCA output pressure (AI to PFD). PSLs are interlocked, differential pressure between supply and return, with SCA trips below a pre-set value.
- 14. Upstream of PVI.
- 15. For nullified only.
- 16. Single harvested signal per field to vent LA and JBR for that field.
- 17. Safety signal per field, 1 set per field.
- 18. In the event of simultaneous communications failure between the document 10002504361-000112 Sheet no. 4 of 8 and 10002504361-000113 Sheet no. 4 of 8.
- 19. In the event of simultaneous communications failure between the document 10002504361-000114 Sheet no. 4 of 8 and 10002504361-000115 Sheet no. 4 of 8.
- 20. In the event of simultaneous communications failure between the document 10002504361-000112 Sheet no. 4 of 8 and 10002504361-000113 Sheet no. 4 of 8.
- 21. In the event of simultaneous communications failure between the document 10002504361-000114 Sheet no. 4 of 8 and 10002504361-000115 Sheet no. 4 of 8.
- 22. In the event of simultaneous communications failure between the document 10002504361-000112 Sheet no. 4 of 8 and 10002504361-000113 Sheet no. 4 of 8.
- 23. In the event of simultaneous communications failure between the document 10002504361-000114 Sheet no. 4 of 8 and 10002504361-000115 Sheet no. 4 of 8.
- 24. In the event of simultaneous communications failure between the document 10002504361-000112 Sheet no. 4 of 8 and 10002504361-000113 Sheet no. 4 of 8.
- 25. In the event of simultaneous communications failure between the document 10002504361-000114 Sheet no. 4 of 8 and 10002504361-000115 Sheet no. 4 of 8.
- 26. Counter is a group of three (PIT/WIT) associated with a Manifold.
- 27. In the event of communications failure between the MCS 355 and MCS 356, the counter will be automatically triggered. Ref P.3/5, Section 4.5.
- 28. General Safety Interlocks by the following:
  - Inhibit timer function per safety bar.
  - Inhibit timer function per safety bar.
  - Inhibit timer function per safety bar.

Doc Type	Doc No.	Doc Title	Doc Date	Doc Version	Doc Status	Doc Author	Doc Approver
ESD Logic Diagram	10002504361-000112	Canella Production Well South	2017.11.17	05	Final	John R. Twiskin	John R. Twiskin
ESD Logic Diagram	10002504361-000113	Canella Production Well South	2017.11.17	05	Final	John R. Twiskin	John R. Twiskin
ESD Logic Diagram	10002504361-000114	Canella Production Well South	2017.11.17	05	Final	John R. Twiskin	John R. Twiskin
ESD Logic Diagram	10002504361-000115	Canella Production Well South	2017.11.17	05	Final	John R. Twiskin	John R. Twiskin

Revision	Date	By	Reason	Checked By	Approved By
1	2017.11.17	John R. Twiskin	Initial Issue	John R. Twiskin	John R. Twiskin
2	2017.11.17	John R. Twiskin	Revised	John R. Twiskin	John R. Twiskin
3	2017.11.17	John R. Twiskin	Revised	John R. Twiskin	John R. Twiskin
4	2017.11.17	John R. Twiskin	Revised	John R. Twiskin	John R. Twiskin
5	2017.11.17	John R. Twiskin	Revised	John R. Twiskin	John R. Twiskin
6	2017.11.17	John R. Twiskin	Revised	John R. Twiskin	John R. Twiskin
7	2017.11.17	John R. Twiskin	Revised	John R. Twiskin	John R. Twiskin
8	2017.11.17	John R. Twiskin	Revised	John R. Twiskin	John R. Twiskin
9	2017.11.17	John R. Twiskin	Revised	John R. Twiskin	John R. Twiskin
10	2017.11.17	John R. Twiskin	Revised	John R. Twiskin	John R. Twiskin

Legend:

- HP High
- LP Low
- FF Flow Failure
- PSL Output Manual Signal
- FF Output Manual Signal
- PSL Output Manual Signal
- FF Output Manual Signal

Notes:

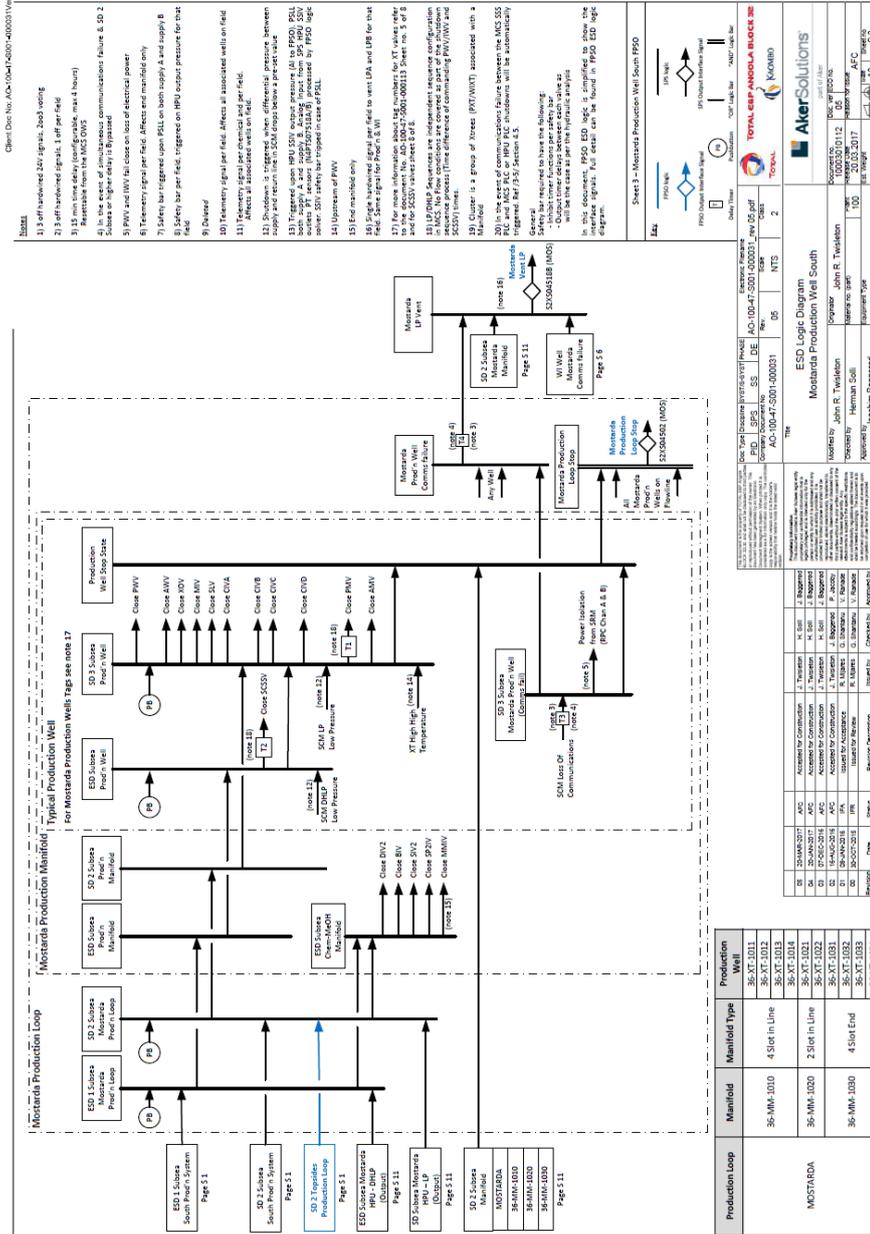
- 1. Self-vented 24V signals, each zone.
- 2. Self-vented signals, 1 set per field.
- 3. Safety signal, 1 set per field.
- 4. In the event of simultaneous communications failure, ESD 2 Subsea or higher delay is bypassed.
- 5. PVI and WVI fail close on loss of electrical power.
- 6. Telemetry signal per field. Affects and nullified only.
- 7. Safety bar triggered upon PSL on both supply A and supply B.
- 8. Safety bar per field, triggered an HPU output pressure for that field.
- 9. Delayed.
- 10. Telemetry signal per field, affects all associated wells on field.
- 11. Telemetry signal per manifold and per field.
- 12. PSLs are interlocked, differential pressure between supply and return, with SCA trips below a pre-set value.
- 13. Triggered upon HPU SCA output pressure (AI to PFD). PSLs are interlocked, differential pressure between supply and return, with SCA trips below a pre-set value.
- 14. Upstream of PVI.
- 15. For nullified only.
- 16. Single harvested signal per field to vent LA and JBR for that field.
- 17. Safety signal per field, 1 set per field.
- 18. In the event of simultaneous communications failure between the document 10002504361-000112 Sheet no. 4 of 8 and 10002504361-000113 Sheet no. 4 of 8.
- 19. In the event of simultaneous communications failure between the document 10002504361-000114 Sheet no. 4 of 8 and 10002504361-000115 Sheet no. 4 of 8.
- 20. In the event of simultaneous communications failure between the document 10002504361-000112 Sheet no. 4 of 8 and 10002504361-000113 Sheet no. 4 of 8.
- 21. In the event of simultaneous communications failure between the document 10002504361-000114 Sheet no. 4 of 8 and 10002504361-000115 Sheet no. 4 of 8.
- 22. In the event of simultaneous communications failure between the document 10002504361-000112 Sheet no. 4 of 8 and 10002504361-000113 Sheet no. 4 of 8.
- 23. In the event of simultaneous communications failure between the document 10002504361-000114 Sheet no. 4 of 8 and 10002504361-000115 Sheet no. 4 of 8.
- 24. In the event of simultaneous communications failure between the document 10002504361-000112 Sheet no. 4 of 8 and 10002504361-000113 Sheet no. 4 of 8.
- 25. In the event of simultaneous communications failure between the document 10002504361-000114 Sheet no. 4 of 8 and 10002504361-000115 Sheet no. 4 of 8.
- 26. Counter is a group of three (PIT/WIT) associated with a Manifold.
- 27. In the event of communications failure between the MCS 355 and MCS 356, the counter will be automatically triggered. Ref P.3/5, Section 4.5.
- 28. General Safety Interlocks by the following:
  - Inhibit timer function per safety bar.
  - Inhibit timer function per safety bar.
  - Inhibit timer function per safety bar.

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BLOCK 32 - KAOMBO SPS

3



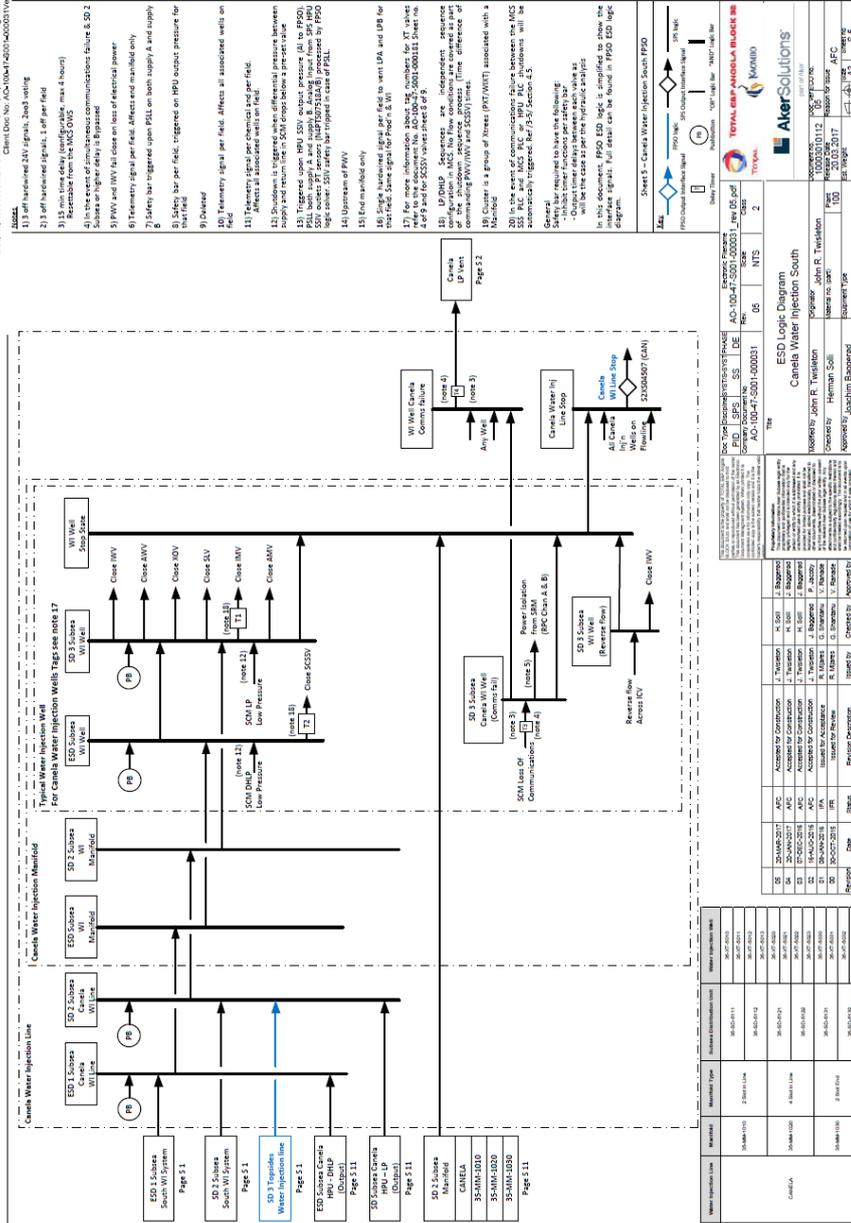


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## BLOCK 32 - KAOMBO SPS

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Issue date: 2017.11.17  
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Client Doc No: AO-100-40-S001-000185

- 1) off hatched 24V signal, both voting
- 2) off hatched signal, 1 off per field
- 3) 15 min time delay (configurable, max 4 hours)  
Resets from the MCS OWS
- 4) In the event of simultaneous communications failure & SD 2 safety bar tripped, the system will be in a safe state.
- 5) PNV and NRV fail close on loss of electrical power
- 6) Testimony signal per field. Affects and unaffected only
- 7) Safety bar tripped upon PSL on both supply A and supply B
- 8) Safety bar per field, triggered on HPU output pressure for that field
- 9) 30 second
- 10) Testimony signal per field. Affects all associated wells on field
- 11) Testimony signal per chemical per field
- 12) 30 second (configurable, max 4 hours) (resets on PNV trip) and 10 second (resets on NRV trip) between supply and return line in SDM (closed below a preset value)
- 13) Triggered upon HPU SSV output pressure (AI to PPSD), both supply A and supply B (AI to PPSD) (resets on PNV trip and NRV trip) (resets on PPSD logic power SSV safety bar tripped in case of PSL)
- 14) Upstream of PNV
- 15) End in analog only
- 16) Single hatched signal per field to vent LPA, and LPR for that field. Same signal for PPSD & WI
- 17) For more information about the sequence of events for XT valves refer to the PPSD logic sheet 4 of 9 and for SSSV valves sheet 3 of 9.
- 18) Up/Down sequences are independent sequence of the shutdown sequence process (Time difference of commanding PNV/NRV and SSSV) times.
- 19) Cluster is a group of valves (PNV/NRV) associated with a common setpoint
- 20) In the event of communication failure between the MCS SSSV PNC and MCS REC or HPU REC shutdowns will be automatically triggered. Ref PPSD section 4.3.
- 21) Safety bar required to have the following:  
- Out of sequence per safety bar  
- Out of sequence per safety bar  
- Out of sequence per safety bar  
In this document, PPSD ESD logic is simplified to show the sequence of events. Full detail can be found in PPSD ESD logic diagram.

Sheet 5 - Canela Water Injection South PPSD

Legend:  
 PPSD Output Member Signal  
 PPSD Output Member Signal  
 PPSD Output Member Signal  
 PPSD Output Member Signal  
 PPSD Output Member Signal

Rev. 05.00  
 Rev. 04.00  
 Rev. 03.00  
 Rev. 02.00  
 Rev. 01.00

Doc Type: Construction Phase  
 Doc Ref: AO-100-40-S001-000185  
 Title: ESD Logic Diagram  
 Canela Water Injection South  
 Project: JOINT VENTURE  
 Client: TOTAL, ABU-ADHABI, BLACK & VEATCH  
 Designer: Aker Solutions  
 Date: 2017.11.17  
 Rev: 05  
 Status: Approved



Preferred partner

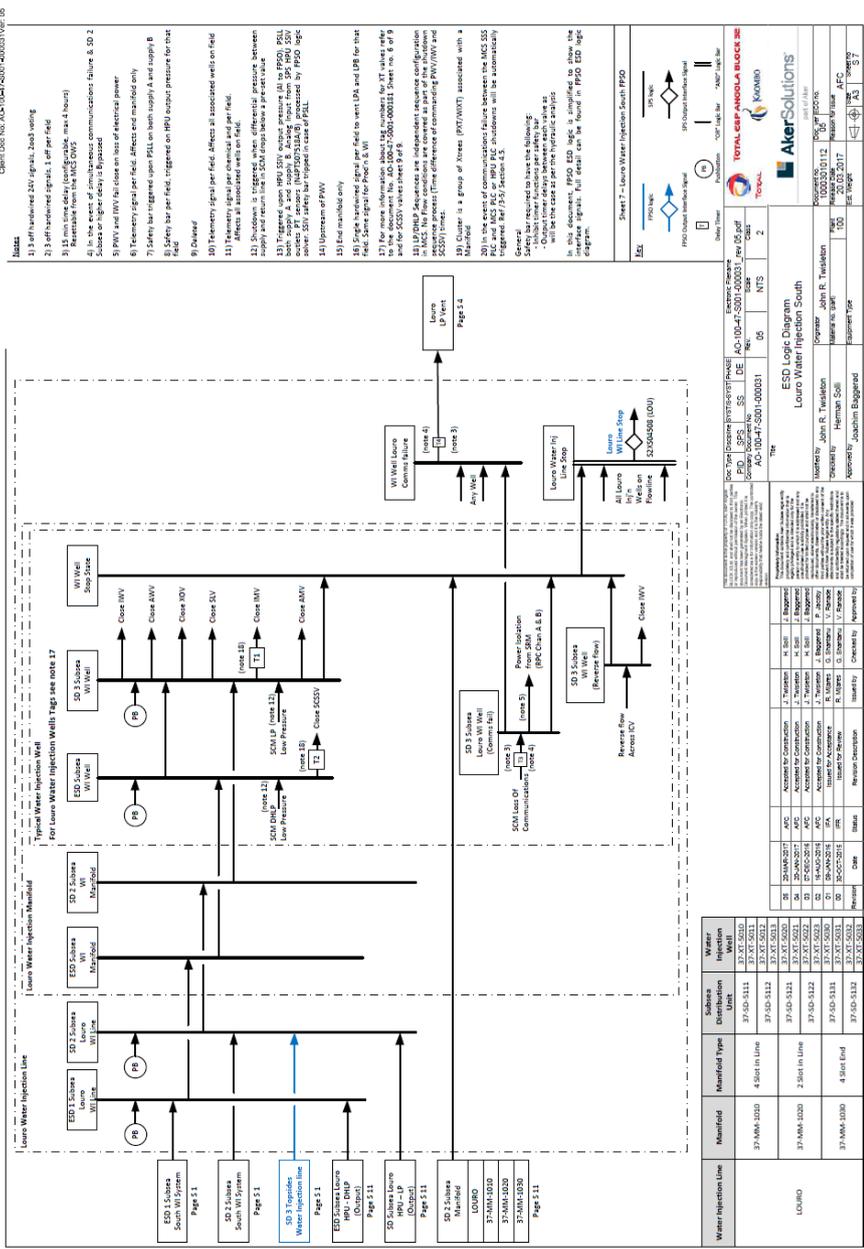


# SPS HANDBOOK TABLE OF CONTENT

## BLOCK 32 - KAOMBO SPS

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Sheet 7 - Loro Water Injection South PFD

**Legend:**

- ESD 1: ESD 1 (Intermittent signal)
- ESD 2: ESD 2 (Intermittent signal)
- ESD 3: ESD 3 (Intermittent signal)
- ESD 4: ESD 4 (Intermittent signal)
- ESD 5: ESD 5 (Intermittent signal)

**ESD Logic Diagram**

PD: SPS SS DE AO-100-40-S001-000185 Ver: 05  
 Project: KAOMBO  
 Sheet: 7  
 Date: 2017.11.17

**ESD Logic Diagram Summary:**

Event	Detector	Initiator	Logic	Action	Response
ESD 1	ESD 1 (Intermittent signal)	ESD 1	ESD 1	Close MV	Normal
ESD 2	ESD 2 (Intermittent signal)	ESD 2	ESD 2	Close MV	Normal
ESD 3	ESD 3 (Intermittent signal)	ESD 3	ESD 3	Close MV	Normal
ESD 4	ESD 4 (Intermittent signal)	ESD 4	ESD 4	Close MV	Normal
ESD 5	ESD 5 (Intermittent signal)	ESD 5	ESD 5	Close MV	Normal

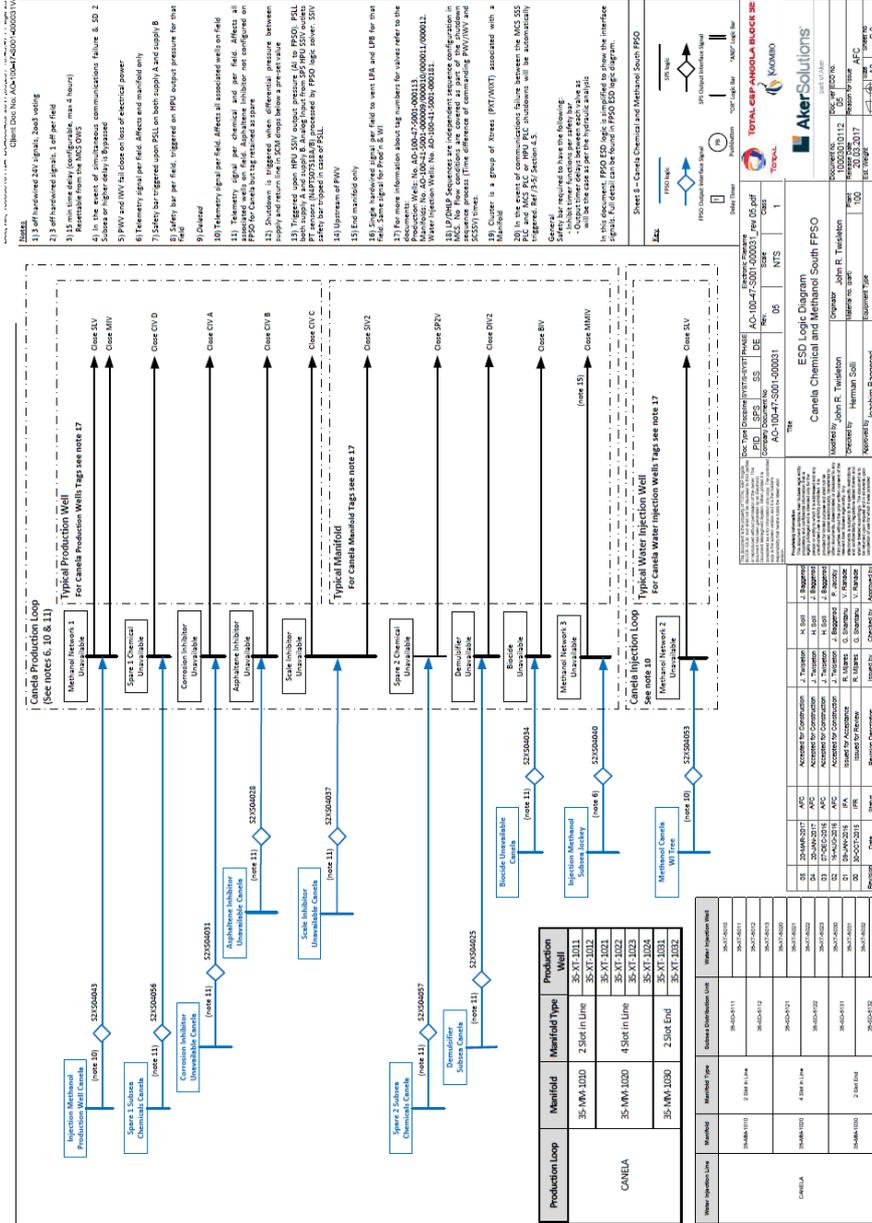
**Notes:**

- In the event of communication failure between the MCS SPS and the Loro Water Injection South Well, the SPS will automatically shut down the well.
- In the event of communication failure between the MCS SPS and the Loro Water Injection South Well, the SPS will automatically shut down the well.
- In the event of communication failure between the MCS SPS and the Loro Water Injection South Well, the SPS will automatically shut down the well.
- In the event of communication failure between the MCS SPS and the Loro Water Injection South Well, the SPS will automatically shut down the well.
- In the event of communication failure between the MCS SPS and the Loro Water Injection South Well, the SPS will automatically shut down the well.

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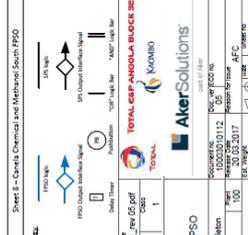
Document: 10002504361-PDC-000  
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Notes:  
1) All hardware tags (signals, loop wiring)  
2) All hardware tags (signals, loop wiring)  
3) All hardware tags (signals, loop wiring)  
4) In the event of simultaneous communications failure, SPS will be bypassed.  
5) Pumps and solenoid valves will be controlled by the PLC.  
6) Safety bar per field, triggered an HPU output pressure for that field.  
7) Safety bar per field, triggered an HPU output pressure for that field.  
8) Safety bar per field, triggered an HPU output pressure for that field.

9) Downstream of PWS  
10) Telemetry signal per field, affects all associated wells on field.  
11) Telemetry signal per well, affects all associated wells on field.  
12) Telemetry signal per well, affects all associated wells on field.  
13) Telemetry signal per well, affects all associated wells on field.  
14) Telemetry signal per well, affects all associated wells on field.  
15) Telemetry signal per well, affects all associated wells on field.  
16) Telemetry signal per well, affects all associated wells on field.  
17) For more information about tag numbers for valves refer to the Production Well: No. AO-100-40-S001-000013, Water Injection Well: No. AO-100-40-S001-000013, Water Injection Well: No. AO-100-40-S001-000013.  
18) PWS (PWS) Sequences are independent sequence configuration in the SPS. For more information about tag numbers for valves refer to the Production Well: No. AO-100-40-S001-000013, Water Injection Well: No. AO-100-40-S001-000013.  
19) Cluster is a group of three (PWT/AVT) associated with a PWT/AVT and a PWS/AVT. For more information about tag numbers for valves refer to the Production Well: No. AO-100-40-S001-000013, Water Injection Well: No. AO-100-40-S001-000013.  
20) In the event of communications failure between the SPS, SPS will be bypassed. For more information about tag numbers for valves refer to the Production Well: No. AO-100-40-S001-000013, Water Injection Well: No. AO-100-40-S001-000013.  
21) Safety bar per field, triggered an HPU output pressure for that field.  
22) Safety bar per field, triggered an HPU output pressure for that field.  
23) Safety bar per field, triggered an HPU output pressure for that field.  
24) Safety bar per field, triggered an HPU output pressure for that field.  
25) Safety bar per field, triggered an HPU output pressure for that field.  
26) Safety bar per field, triggered an HPU output pressure for that field.  
27) Safety bar per field, triggered an HPU output pressure for that field.  
28) Safety bar per field, triggered an HPU output pressure for that field.  
29) Safety bar per field, triggered an HPU output pressure for that field.  
30) Safety bar per field, triggered an HPU output pressure for that field.  
31) Safety bar per field, triggered an HPU output pressure for that field.  
32) Safety bar per field, triggered an HPU output pressure for that field.  
33) Safety bar per field, triggered an HPU output pressure for that field.  
34) Safety bar per field, triggered an HPU output pressure for that field.  
35) Safety bar per field, triggered an HPU output pressure for that field.  
36) Safety bar per field, triggered an HPU output pressure for that field.  
37) Safety bar per field, triggered an HPU output pressure for that field.  
38) Safety bar per field, triggered an HPU output pressure for that field.  
39) Safety bar per field, triggered an HPU output pressure for that field.  
40) Safety bar per field, triggered an HPU output pressure for that field.  
41) Safety bar per field, triggered an HPU output pressure for that field.  
42) Safety bar per field, triggered an HPU output pressure for that field.  
43) Safety bar per field, triggered an HPU output pressure for that field.  
44) Safety bar per field, triggered an HPU output pressure for that field.  
45) Safety bar per field, triggered an HPU output pressure for that field.  
46) Safety bar per field, triggered an HPU output pressure for that field.  
47) Safety bar per field, triggered an HPU output pressure for that field.  
48) Safety bar per field, triggered an HPU output pressure for that field.  
49) Safety bar per field, triggered an HPU output pressure for that field.  
50) Safety bar per field, triggered an HPU output pressure for that field.



Revision	Date	By	Description
01	20-08-2017	AAS	As per Construction
02	20-08-2017	AAS	As per Construction
03	20-08-2017	AAS	As per Construction
04	20-08-2017	AAS	As per Construction
05	20-08-2017	AAS	As per Construction
06	20-08-2017	AAS	As per Construction
07	20-08-2017	AAS	As per Construction
08	20-08-2017	AAS	As per Construction
09	20-08-2017	AAS	As per Construction
10	20-08-2017	AAS	As per Construction
11	20-08-2017	AAS	As per Construction
12	20-08-2017	AAS	As per Construction
13	20-08-2017	AAS	As per Construction
14	20-08-2017	AAS	As per Construction
15	20-08-2017	AAS	As per Construction
16	20-08-2017	AAS	As per Construction
17	20-08-2017	AAS	As per Construction
18	20-08-2017	AAS	As per Construction
19	20-08-2017	AAS	As per Construction
20	20-08-2017	AAS	As per Construction

ESD Logic Diagram  
Canela Chemical and Methanol South FPSO  
Operator: John R. Trueland  
Author: John R. Trueland  
Reviewer: John R. Trueland  
Approved: John R. Trueland

Revision	Date	By	Description
01	20-08-2017	AAS	As per Construction
02	20-08-2017	AAS	As per Construction
03	20-08-2017	AAS	As per Construction
04	20-08-2017	AAS	As per Construction
05	20-08-2017	AAS	As per Construction
06	20-08-2017	AAS	As per Construction
07	20-08-2017	AAS	As per Construction
08	20-08-2017	AAS	As per Construction
09	20-08-2017	AAS	As per Construction
10	20-08-2017	AAS	As per Construction
11	20-08-2017	AAS	As per Construction
12	20-08-2017	AAS	As per Construction
13	20-08-2017	AAS	As per Construction
14	20-08-2017	AAS	As per Construction
15	20-08-2017	AAS	As per Construction
16	20-08-2017	AAS	As per Construction
17	20-08-2017	AAS	As per Construction
18	20-08-2017	AAS	As per Construction
19	20-08-2017	AAS	As per Construction
20	20-08-2017	AAS	As per Construction

Project: Canela Chemical and Methanol South FPSO  
Client: TOTAL  
Contract No: AO-100-40-S001-000013  
Revision: 05  
Date: 2017.11.15

Logo for Aker Solutions and other project partners.

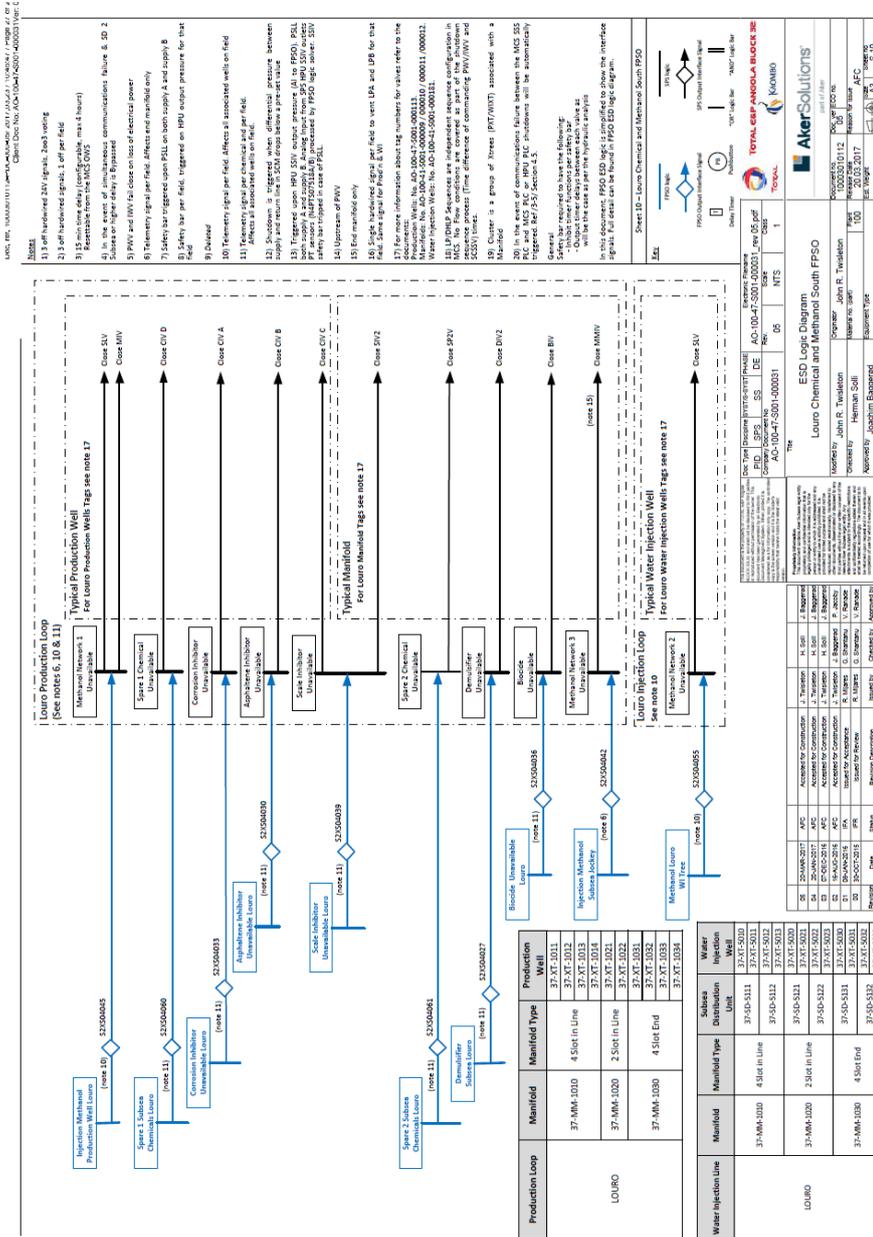


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Production Loop	Manifold	Manifold Type	Production Well
Luro	37-AM-10D	4 Slot in Line	37-XT-1011 37-XT-1012 37-XT-1013
	37-AM-10D	2 Slot in Line	37-XT-1021 37-XT-1022
	37-AM-10D	4 Slot End	37-XT-1031 37-XT-1032 37-XT-1034
	37-AM-10D	4 Slot End	
Water Injection	Manifold	Manifold Type	Subsea Injection Unit
			Production Well
			Injection Well
37-AH-10D	4 Slot in Line	37-AT-1001 37-AT-1002 37-AT-1003	
37-AH-10D	2 Slot in Line	37-AT-1004 37-AT-1005	
37-AH-10D	4 Slot End	37-AT-1006 37-AT-1007 37-AT-1008	

**Legend:**

- 37-XT: High pressure
- 37-AT: High pressure
- 37-XT: Medium pressure
- 37-AT: Medium pressure
- 37-XT: Low pressure
- 37-AT: Low pressure

**Sheet 10 - Luro Chemical and Methanol South FPSO**

Rev: 05 NTS

Project: Luro Chemical and Methanol South FPSO

Author: John R. Trivelpiece

Checked by: John R. Trivelpiece

Approved by: John R. Trivelpiece

Issue Date: 2017-11-17

Scale: 1:100

Block: 32

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# SPS HANDBOOK TABLE OF CONTENT

## BLOCK 32 - KAOMBO SPS

11/11

Client Doc No: AO-100-40-S001-000185 Ver: 0

Notes	Water Injection Well	Subsea Distribution	Mantle/Type	Mantle/ID	Water Injection Line	Production Loop	Mantle/Type	Mantle/ID	Production Well	IP Vent
1) SPS are covered by 250 SPS. Each well has 250 SPS. (see 4)	250 SPS	250 SPS	250 SPS	250 SPS	250 SPS	CAMELA	250 SPS	250 SPS	250 SPS	Page 2
2) SPS are covered by 250 SPS. (see 4)	250 SPS	250 SPS	250 SPS	250 SPS	250 SPS		250 SPS	250 SPS	250 SPS	Page 2
3) SPS are covered by 250 SPS. (see 4)	250 SPS	250 SPS	250 SPS	250 SPS	250 SPS		250 SPS	250 SPS	250 SPS	Page 3
4) In the event of simultaneous communications failure & SD 2 sources on higher safety is bypassed										
5) PMS and WVI fail on loss of electrical power										
6) Safety bar triggered per field. Affect and disabled only.										
7) Safety bar triggered per field. Affect and disabled only.										
8) Safety bar triggered per field. Affect and disabled only.										
9) Disabled										
10) Emergency signal per field. Affect all associated wells on field.										
11) Disabled										
12) Shutdown is triggered when differential pressure between supply and return line is 50m drops below a pre-set value										
13) Triggered when PMS 50% drops pressure (As to PMS) PMS 50% drop pressure (As to PMS)										
14) Upstream of PMS										
15) End manifold only										
16) For more information about the numbers for values refer to the document: (see 4)										
17) For more information about the numbers for values refer to the document: (see 4)										

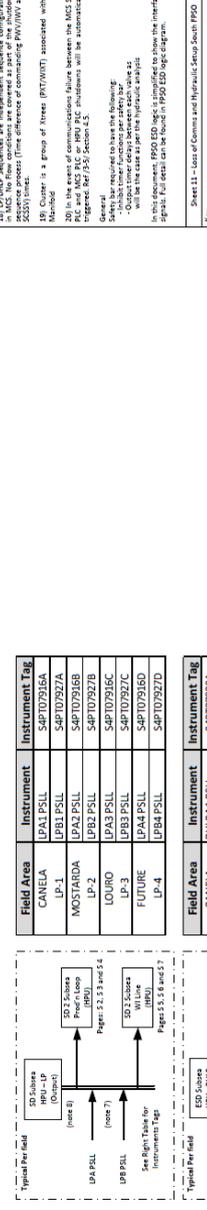
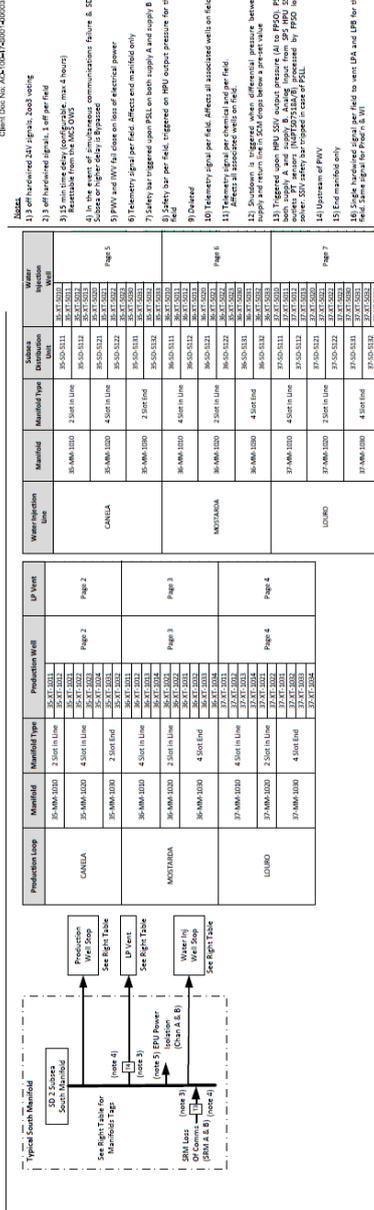
Field Area	Instrument	Instrument Tag
CAMELA	LP41 PSLL	S4P107916A
UP-1	LP42 PSLL	S4P107927A
MOSTARDA	LP43 PSLL	S4P107916B
UP-2	LP44 PSLL	S4P107927B
LQURO	LP45 PSLL	S4P107916C
UP-3	LP46 PSLL	S4P107927C
FUTURE	LP47 PSLL	S4P107916D
UP-4	LP48 PSLL	S4P107927D

Field Area	Instrument	Instrument Tag
CAMELA	DHP41 PSLL	S4P107916A
DHP-1	DHP42 PSLL	S4P107916B
MOSTARDA	DHP43 PSLL	S4P107916B
DHP-2	DHP44 PSLL	S4P107916B
LQURO	DHP45 PSLL	S4P107916C
DHP-3	DHP46 PSLL	S4P107916C
FUTURE	DHP47 PSLL	S4P107916D
DHP-4	DHP48 PSLL	S4P107916D

Revision	Date	Issue	By	Reviewed	Checked	Approved
01	2016-02-27	ACS	J. Hopper	J. Hopper	J. Hopper	J. Hopper
02	2016-02-27	ACS	J. Hopper	J. Hopper	J. Hopper	J. Hopper
03	2016-02-27	ACS	J. Hopper	J. Hopper	J. Hopper	J. Hopper
04	2016-02-27	ACS	J. Hopper	J. Hopper	J. Hopper	J. Hopper
05	2016-02-27	ACS	J. Hopper	J. Hopper	J. Hopper	J. Hopper



**Sheet 11 - Loss of Comms and Hydraulic Setup South Field FPSO**

Document No: AO-100-40-S001-000031 Rev 05 PDF  
 Doc Ref: AO-100-40-S001-000031 Rev 05 PDF  
 Project: 10002504361-PDC-000-0017  
 Client: TOTAL  
 Engineer: J. Hopper  
 Designer: J. Hopper  
 Checker: J. Hopper  
 Issued by: J. Hopper  
 Approved by: J. Hopper  
 Date: 2016-02-27  
 Issue: ACS

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Issue date: 2017.11.17

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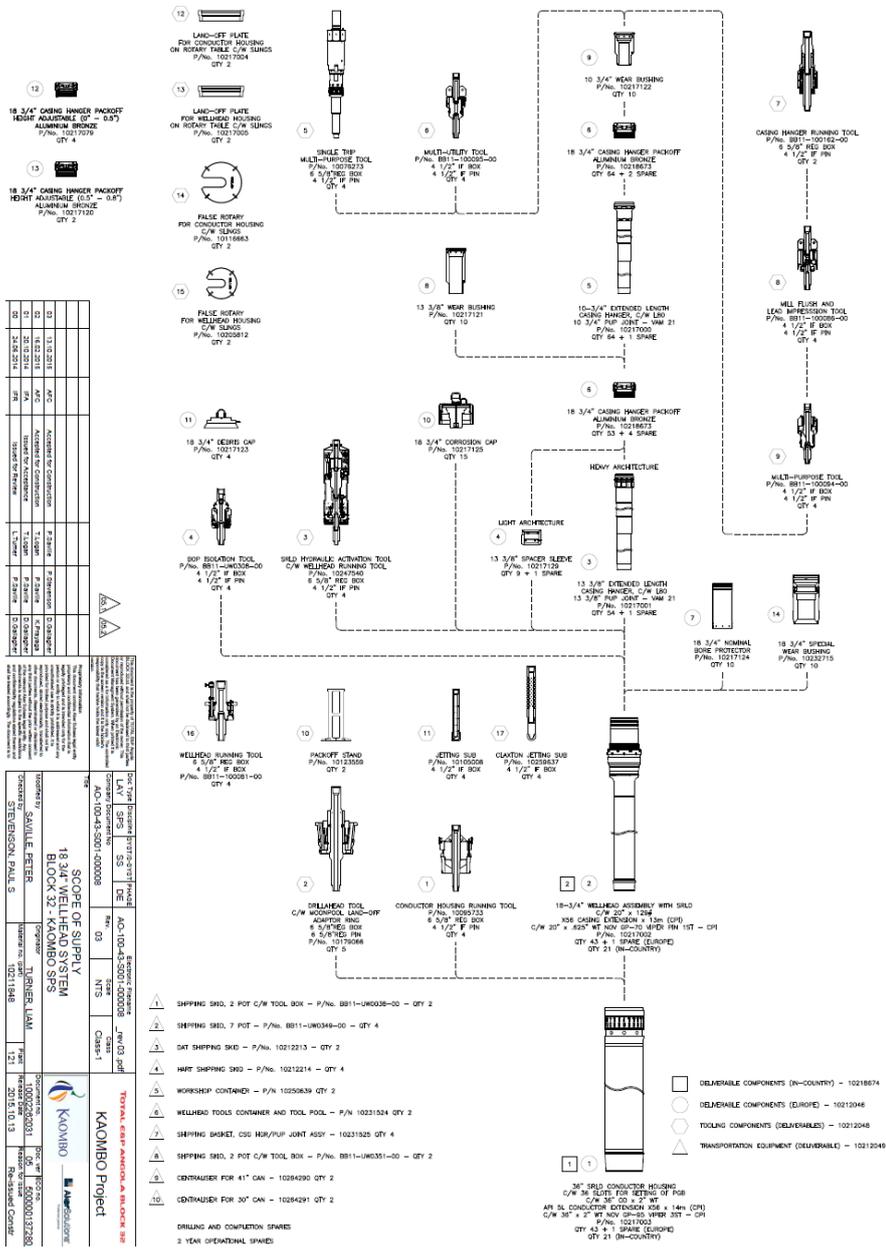
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## **3 WELLHEAD SYSTEM**

### **3.1 Reference List**

### 3.2 Wellhead Scope of Supply



01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17
18 3/4" CASING HANGER																

**SCOPE OF SUPPLY**  
 18 3/4" WELL-HEAD SYSTEM  
 BLOCK 32 - KAOMBO SPS

Contracted by: SAMUEL FEJER  
 Drawn by: THOMAS LAM  
 Checked by: [Name]  
 Approved by: [Name]

KAOMBO Project  
 TOTAL ENERGY AFRICA

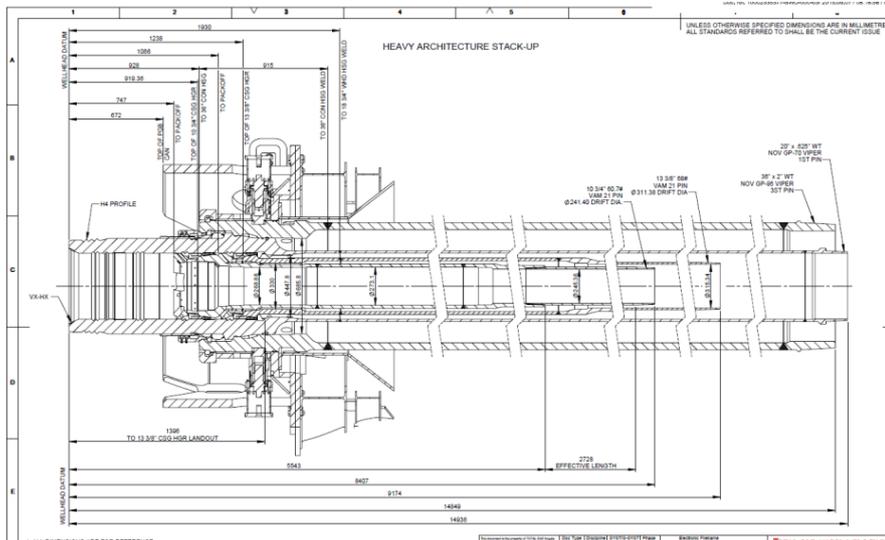
Wellhead SOS	10002262031	AO-100-43-S001-000008	N/A
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**TYPE 3 Use as is (if possible)**

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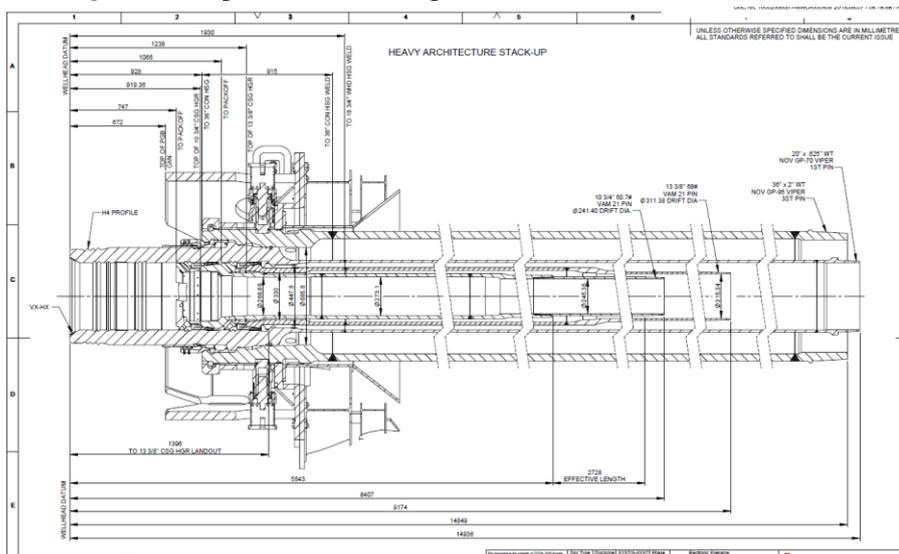
### 3.3 Stack-Up Well Head (WH) System Light Architecture



Wellhead System Light architecture	10002335377	AO-100-43-S001-000830	N/A
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**TYPE 3 Use as is (if possible)**

### 3.4 Stack-Up WH System Heavy Architecture

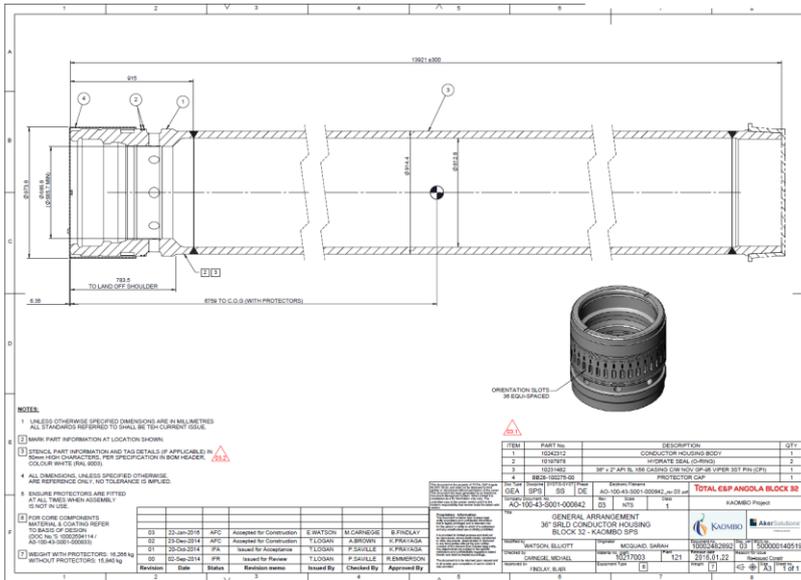


Wellhead System heavy architecture	10002335377	AO-100-43-S001-000830	N/A
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**TYPE 3 Use as is (if possible)**

### 3.5 Wellhead system components

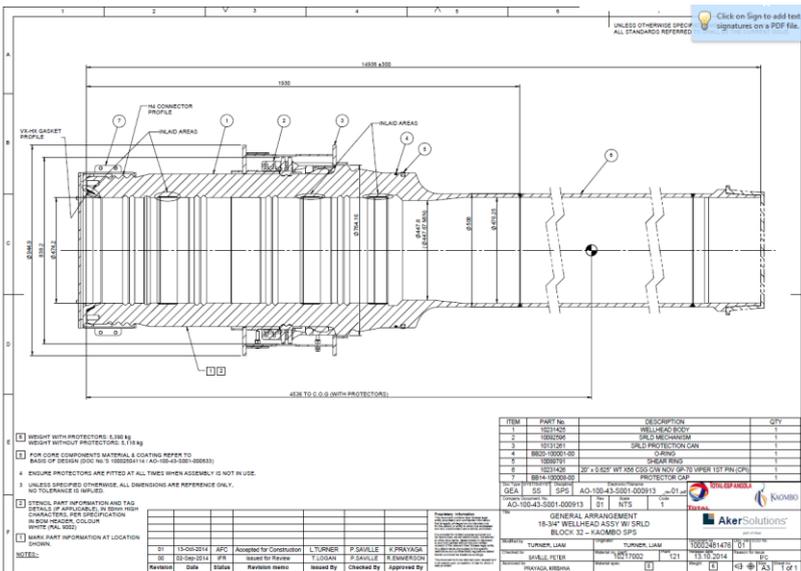
#### 3.5.1 36" Conductor Housing



36" SRLD Conductor Housing	10002482892	AO-100-43-S001-000842	10217003
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**TYPE 3 Use as is (if possible)**

#### 3.5.2 18-3/4 "Wellhead assembly with Slimline Rigid Lockdown (SRLD)



18 3/4" WH assembly with SRLD	10002481476	AO-100-43-S001-000913	10217002
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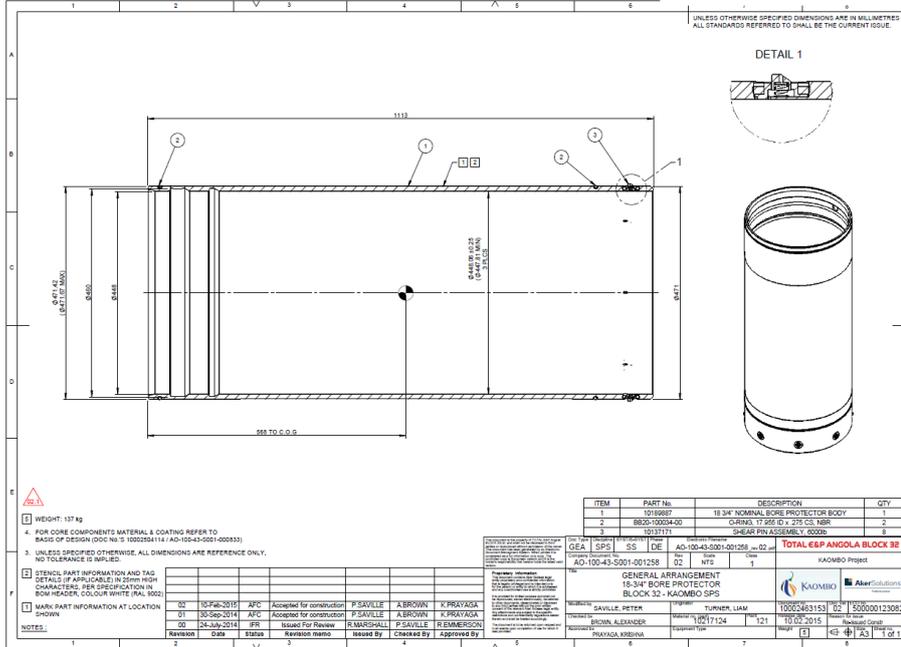
**TYPE 3 Use as is (if possible)**

SPS HANDBOOK TABLE OF CONTENT

BLOCK 32 - KAOMBO SPS

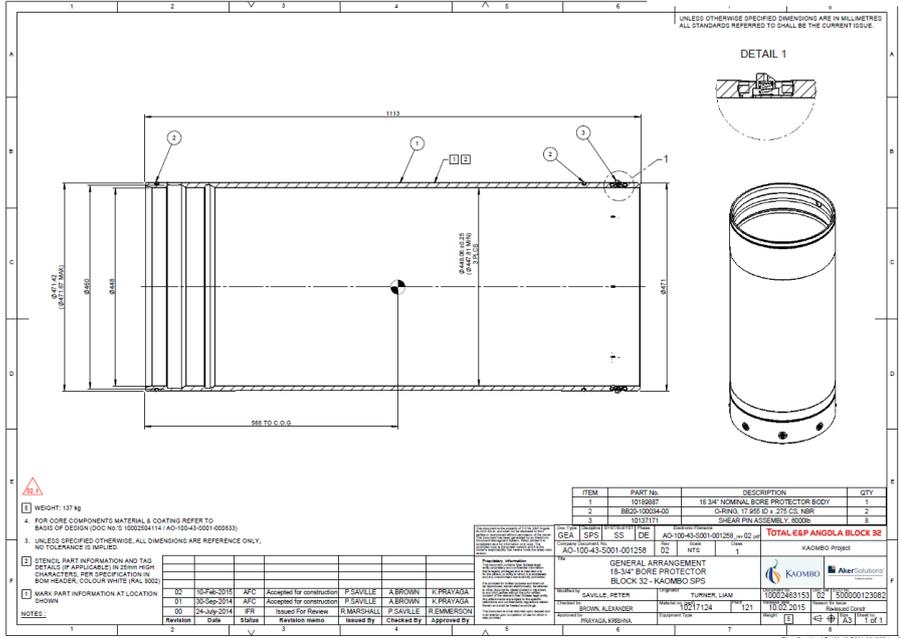
Document: 10002504361-PDC-000  
 Version: 05 - Re-issued Constr  
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3.5.3 18 3/4 Bore protector



18 3/4" Bore Protector	10002463153	AO-100-43-S001-001258	10217124
<b>TYPE 3 Use as is (if possible)</b>			

3.5.4 18 3/4 Special Wear Bushing



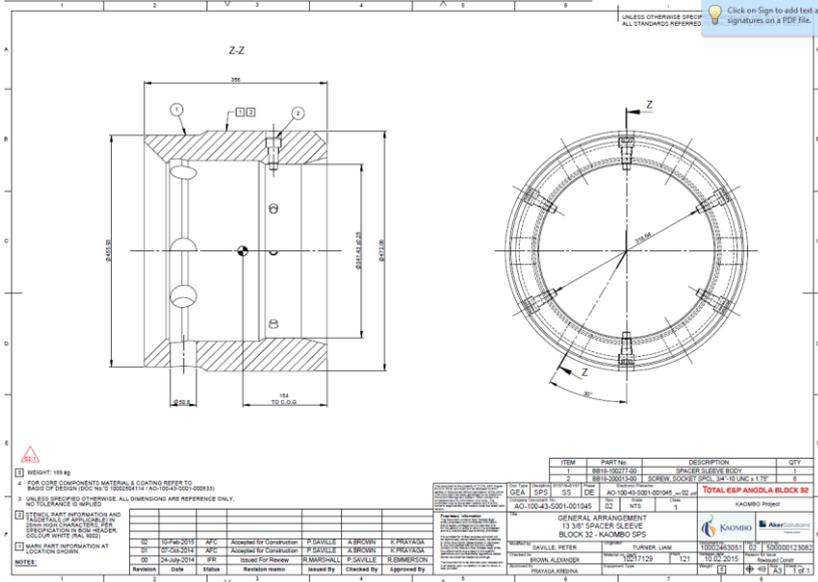
18 3/4" Special Wear Bushing	10002497266	AO-100-40-S001-000192	10232715
<b>TYPE 3 Use as is (if possible)</b>			

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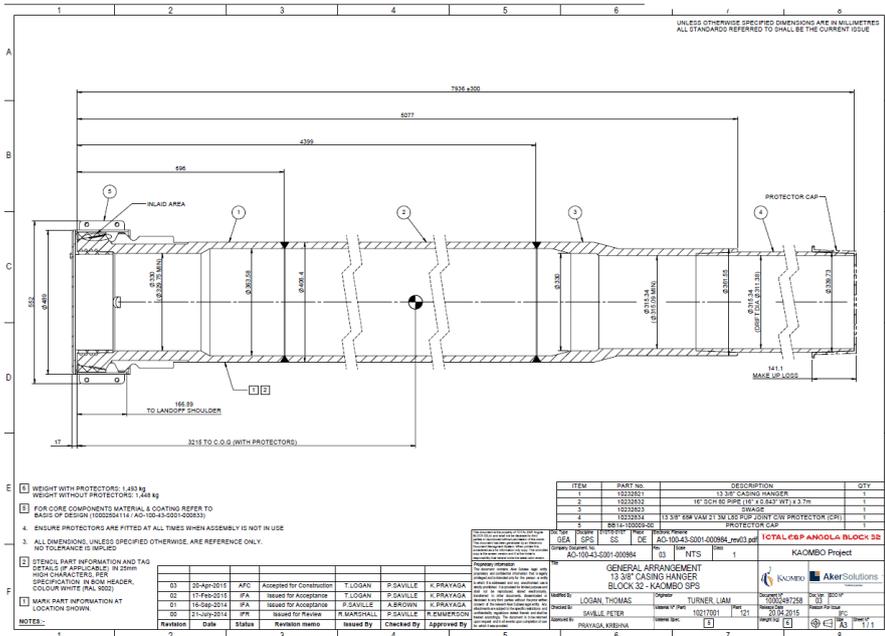
3.5.5 13 3/8" Spacer sleeve



13 3/8 Spacer sleeve	10002463051	AO-100-43-S001-001045	10217129
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**TYPE 3 Use as is (if possible)**

3.5.6 13 3/8" Casing Hanger



13 3/8 Casing Hanger	10002497258	AO-100-43-S001-000984	10217001
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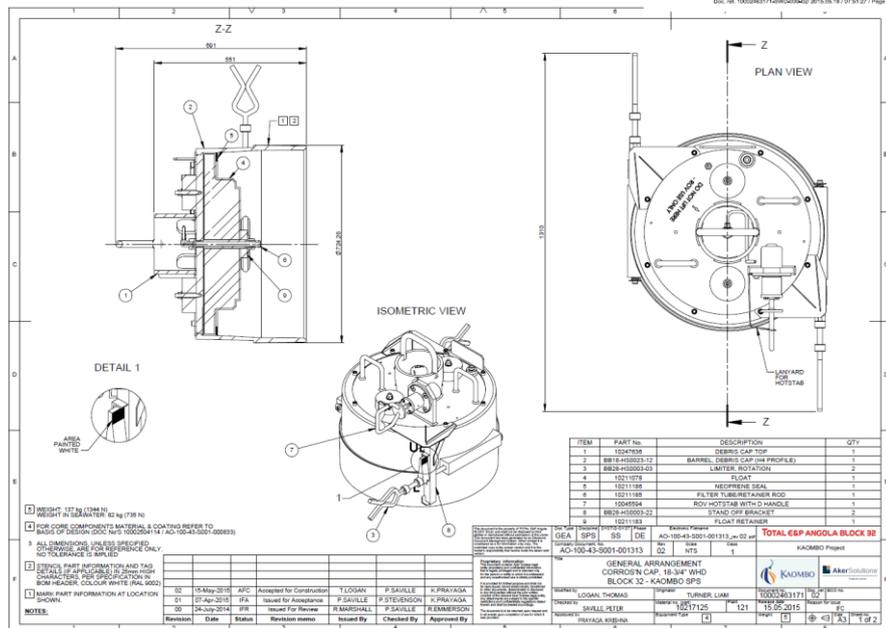
**TYPE 3 Use as is (if possible)**

SPS HANDBOOK TABLE OF CONTENT

BLOCK 32 - KAOMBO SPS

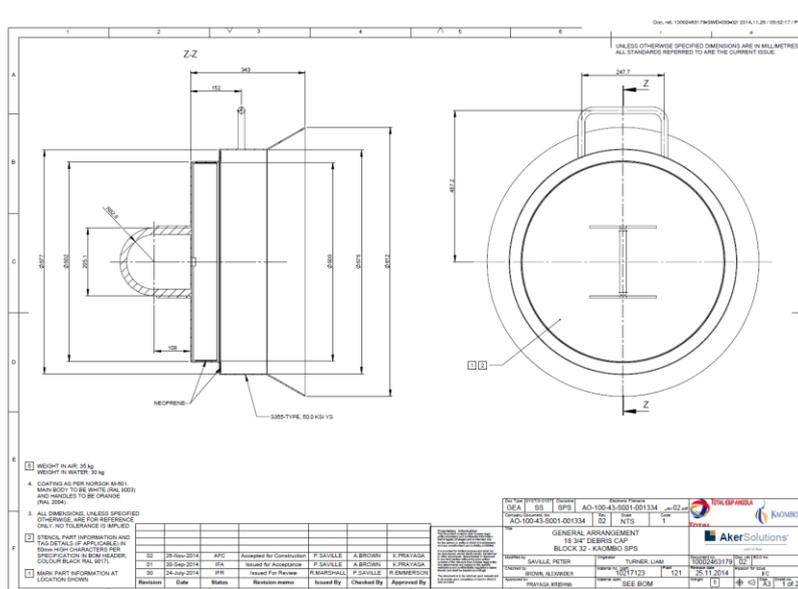
Document: 10002504361-PDC-000  
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3.5.7 18 3/4 Corrosion Cap



18 3/4 Corrosion Cap	10002463171	AO-100-43-S001-001313	10217125
<b>TYPE 3 Use as is (if possible)</b>			

3.5.8 18 3/4 Debris Cap



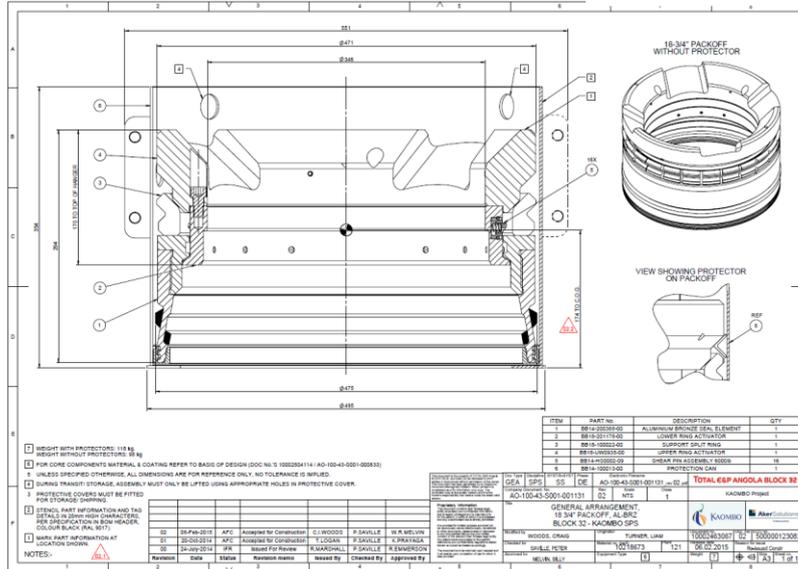
18 3/4 Debris Cap	10002463179	AO-100-43-S001-001334	10217123
<b>TYPE 3 Use as is (if possible)</b>			

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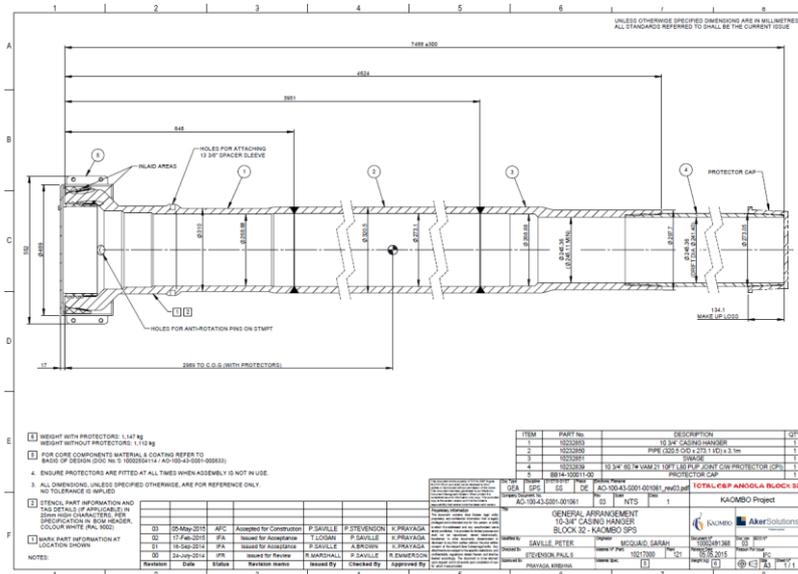
3.5.9 18 3/4 Casing Hanger Packoff



18 3/4 Casing Hanger Packoff	10002463067	AO-100-43-S001-001131	10218673
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**TYPE 3 Use as is (if possible)**

3.5.10 10 3/4" Casing hanger



10 3/4 Casing Hanger	10002491368	AO-100-43-S001-001061	10217000
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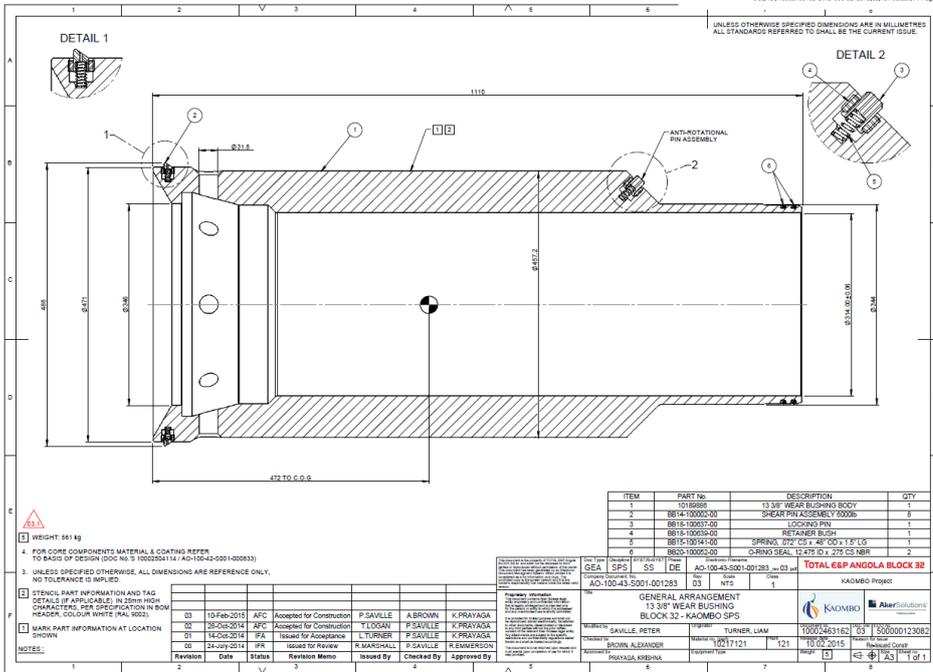
**TYPE 3 Use as is (if possible)**

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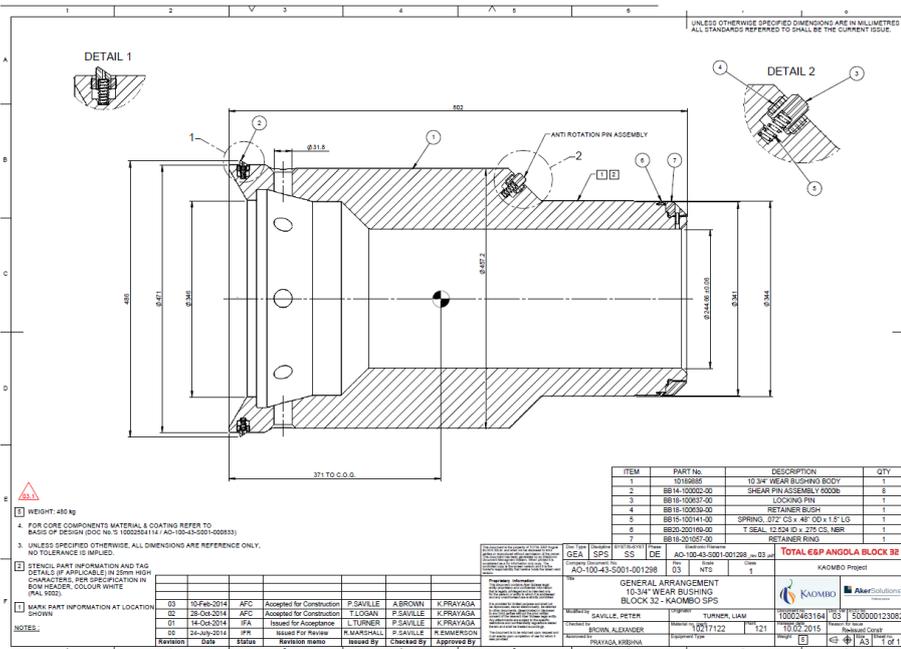
3.5.11 13 3/8 Wear Bushing



13 3/8 Wear Bushing	10002463162	AO-100-43-S001-001283	10217121
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TYPE 3 Use as is (if possible)

3.5.12 10 3/4" Wear Bushing

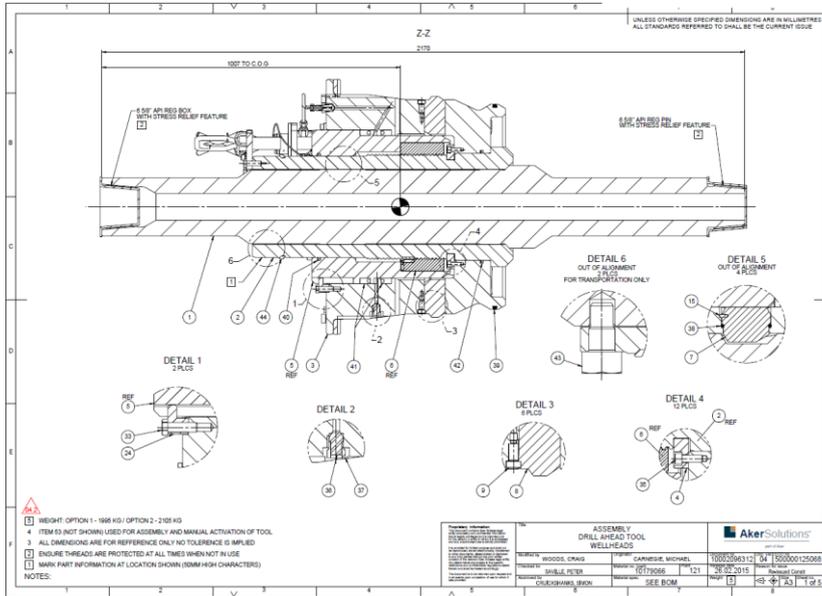


10 3/4" Wear Bushing	10002463164	AO-100-43-S001-001298	10217122
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TYPE 3 Use as is (if possible)

### 3.6 Wellhead tools

#### 3.6.1 Drill Ahead Tool

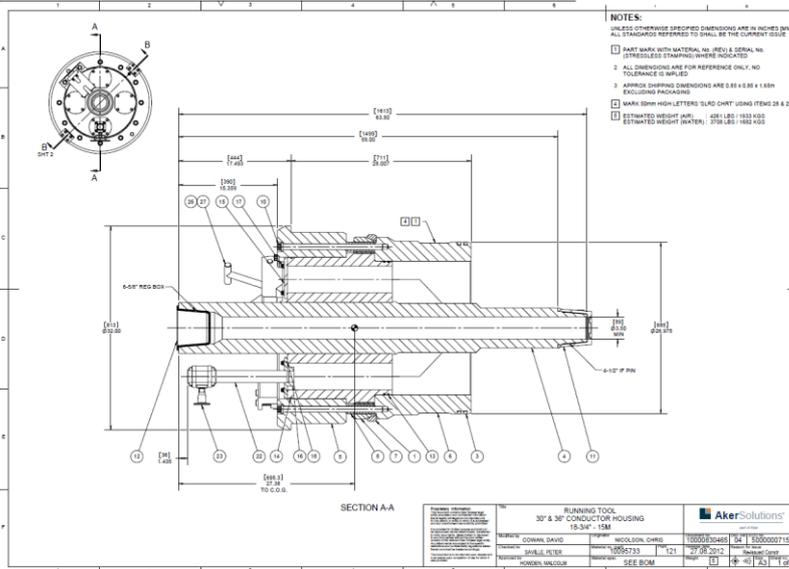


GA, Drillahead Tool	10002515041	AO-100-43-S001-001399	10179066
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**TYPE 3 Use as is (if possible)**

#### 3.6.2 Conductor Housing Running Tool (RT)

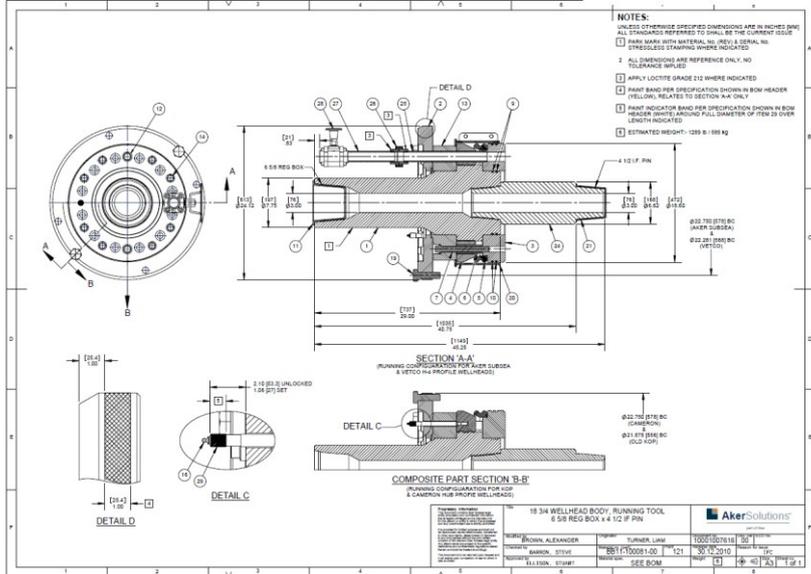
MOHO COPY



Conductor Housing RT	10002515030	AO-100-43-S001-001388	10095733
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**TYPE 3 Use as is (if possible)**

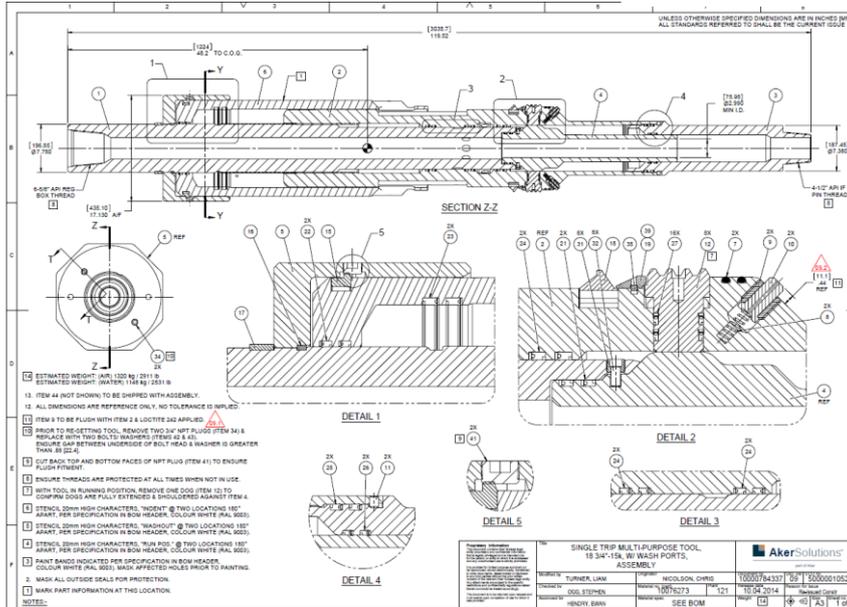
### 3.6.3 18 3/4 Wellhead Running Tool



18 3/4 Wellhead RT	10002515050	AO-100-43-S001-001408	BB11-100081-00
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**TYPE 3 Use as is (if possible)**

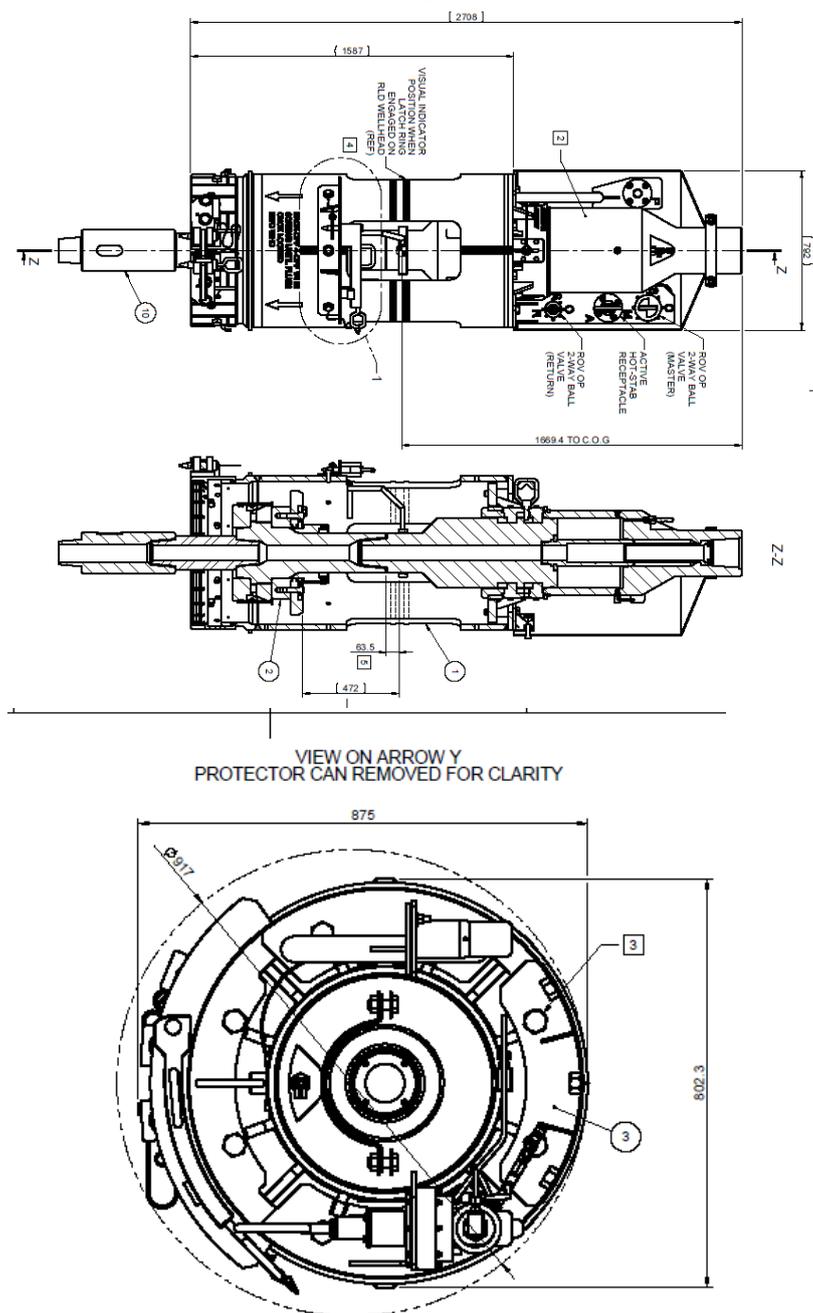
### 3.6.4 Single Trip Multi-Purpose Tool (STMPT) MOHO COPY



Single Trip Multi-Purpose Tool	10002515074	AO-100-43-S001-001432	10076273
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**TYPE 3 Use as is (if possible)**

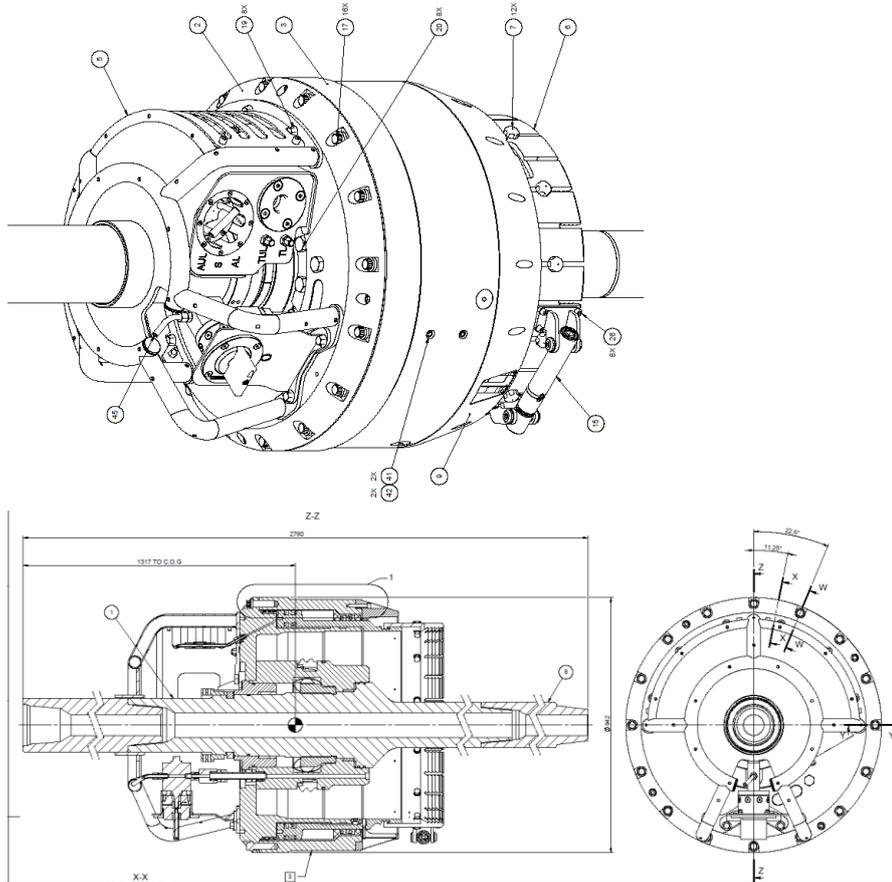
### 3.6.5 Hydraulic Activated Running Tool (HART) tool



GA SRLD HYDRAULIC ACTIVATION TOOL	10002515058	AO-100-43-S001-001416	10247540
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**TYPE 2A Colour screenshot solidworks ISO VIEW + drawing as is**

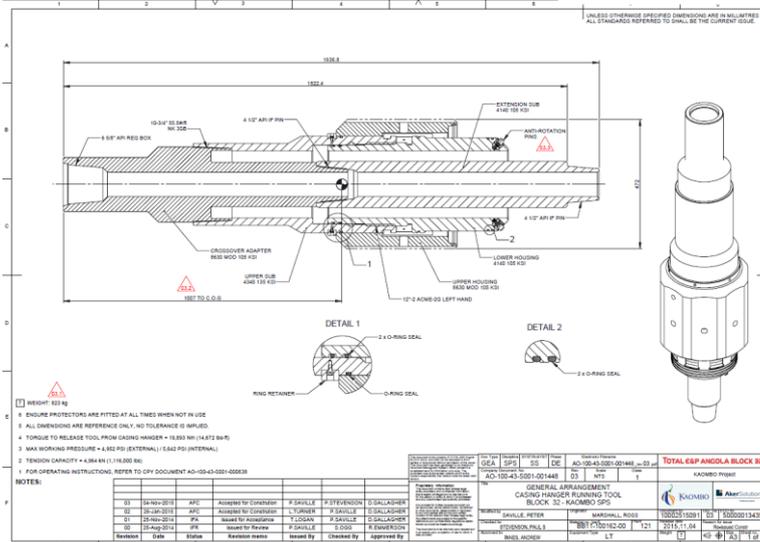
### 3.6.6 SRLD Activation Tool



SRLD Activation Tool	10003419537	AO-100-43-S001-002545	10251072
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**TYPE 2A Colour screenshot solidworks ISO VIEW + drawing as is**

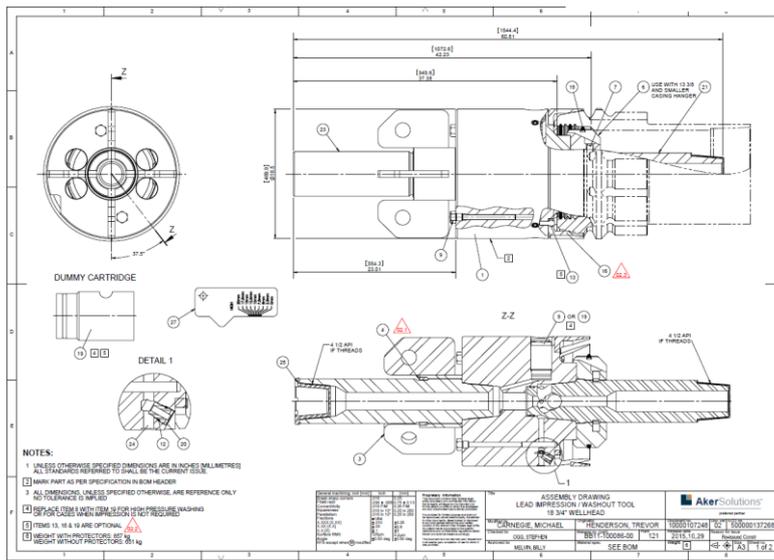
### 3.6.7 Casing Hanger RT MOHO COPY



Casing Hanger RT	10002515091	AO-100-43-S001-001448	BB11-100162-00
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**TYPE 3 Use as is (if possible)**

### 3.6.8 Lead Impression/Washout Tool MOHO COPY



Lead Impression/Washout Tool	10002515098	AO-100-43-S001-001454	BB11-100086-00
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**TYPE 3 Use as is (if possible)**

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## **4 PRODUCTION GUIDE BASE (PGB) SYSTEM**

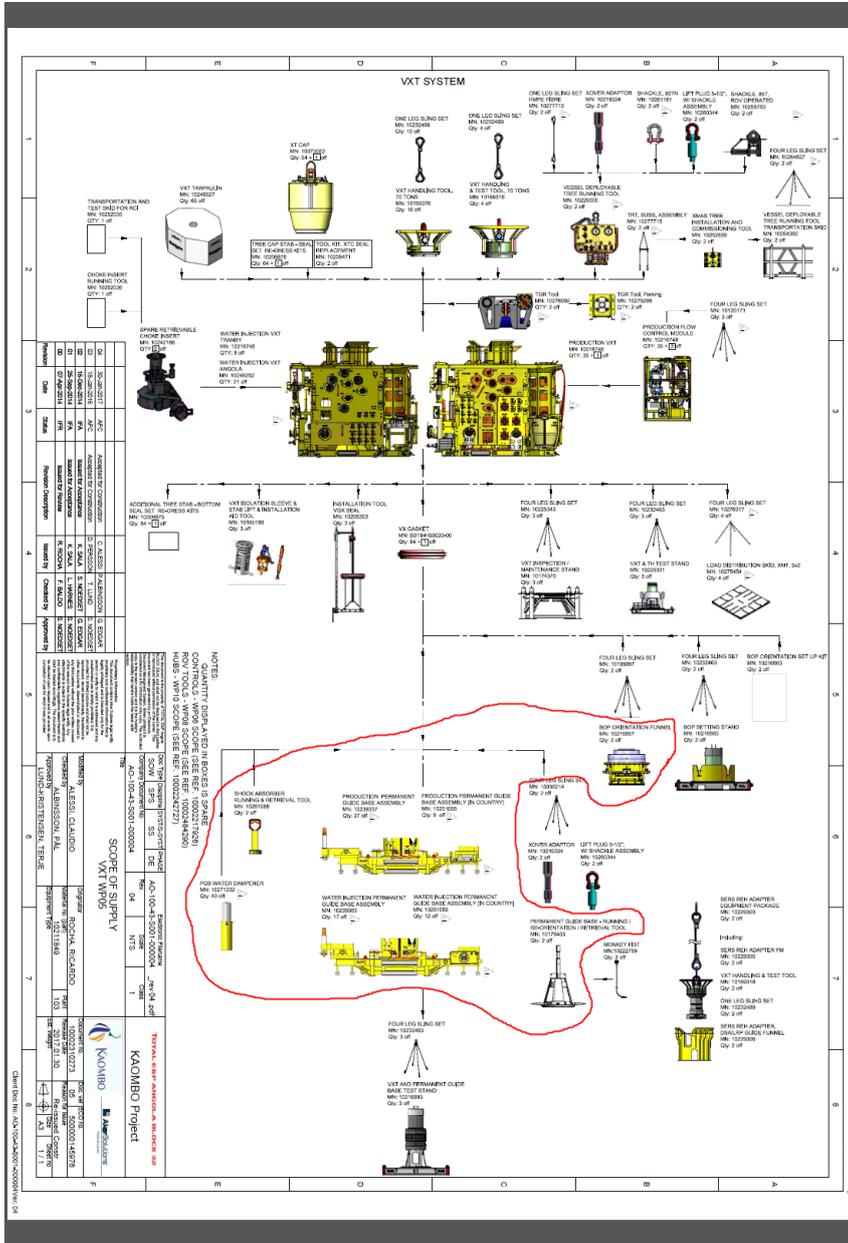
### **4.1 Reference List**

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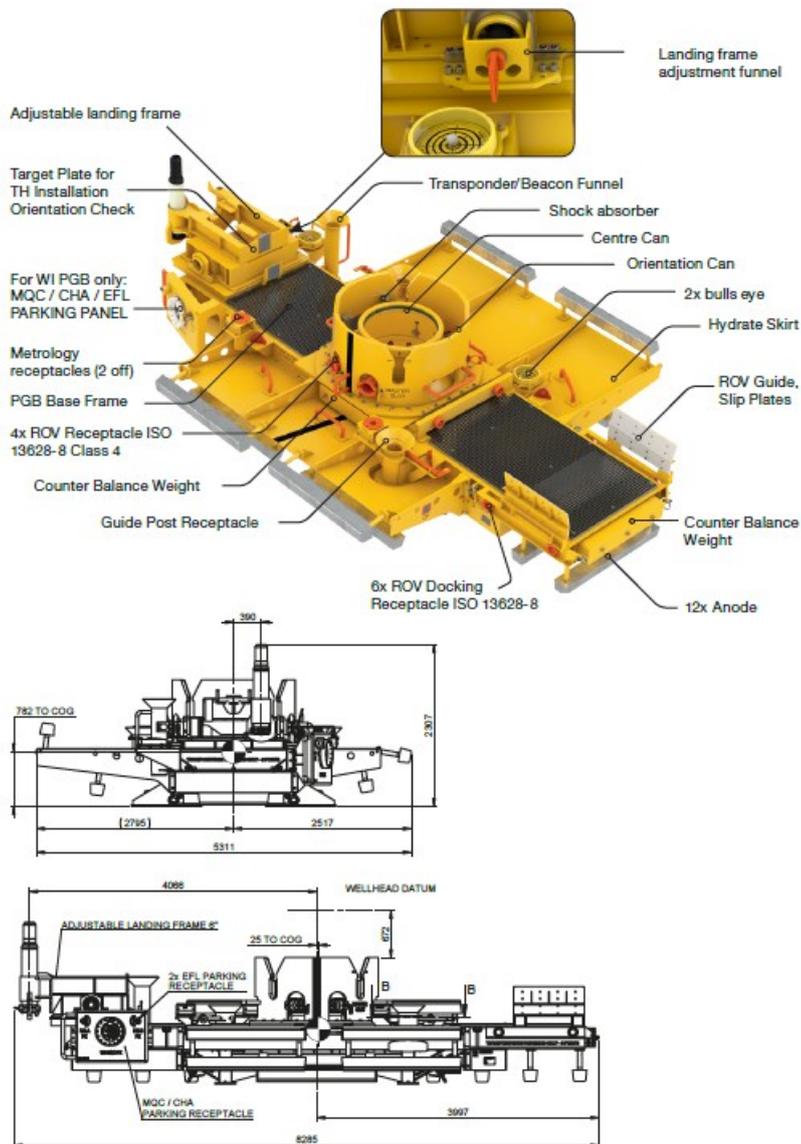
4.2 PGB Scope of Supply



Components inside red line is covered in this section  
 Grey out the components outside the red line

PGB SCOPE OF SUPPLY	10002310273	AO-100-43-S001-000004	N/A
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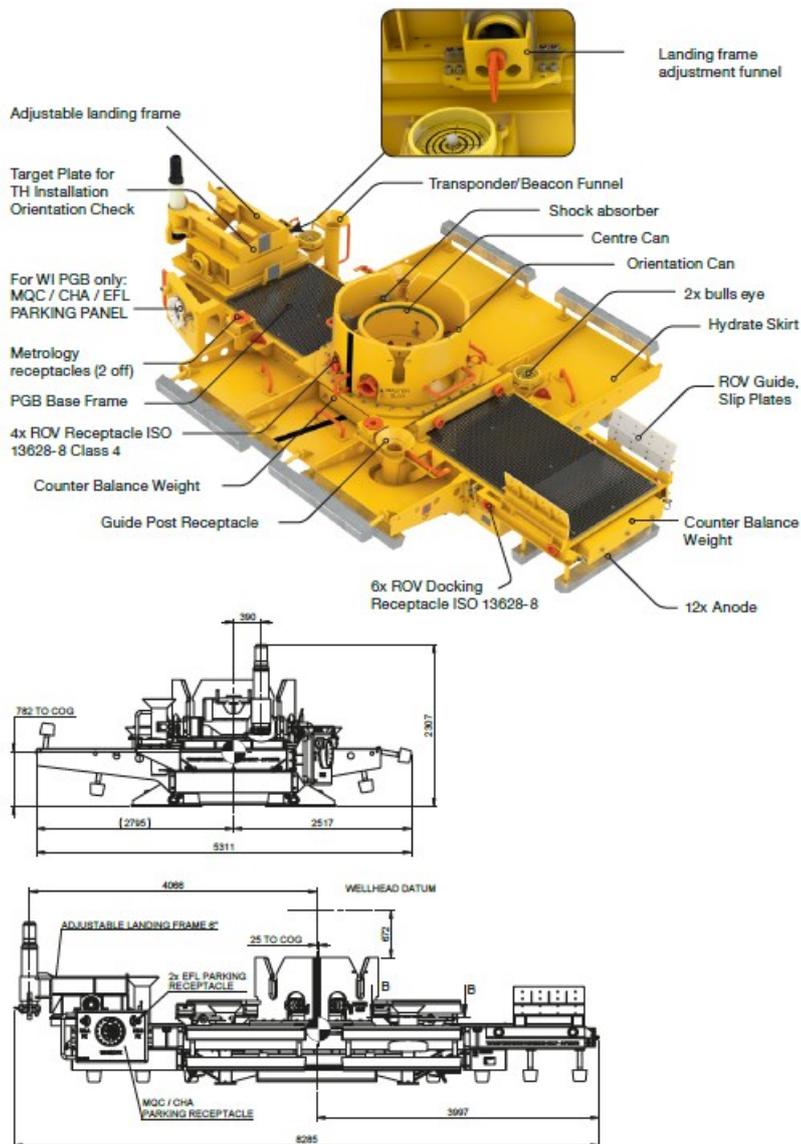
### 4.3 Production PGB



**TYPE 1A Glossy 3-D rendering quality + drawing as is**

GA PGB PRODUCTION,	10002512466	AO-100-43-S001-000125	10239337
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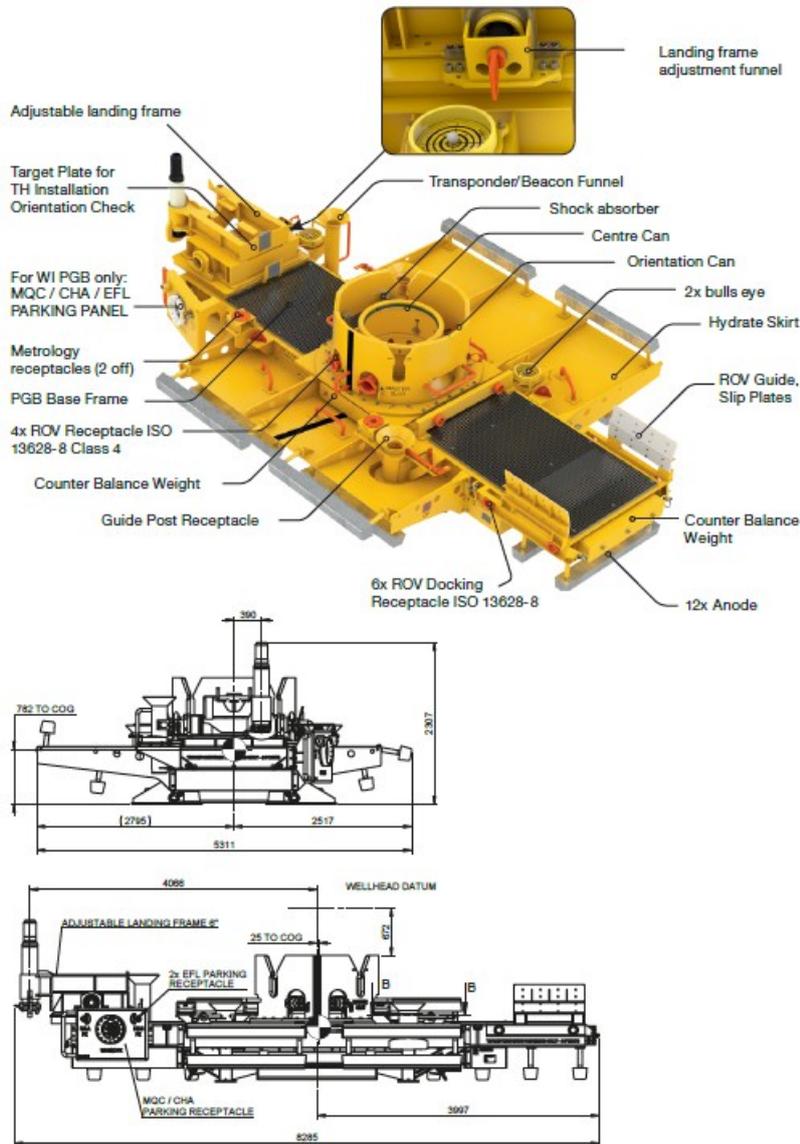
### 4.4 WI PGB



**TYPE 1A Glossy 3-D rendering quality + drawing as is**

GA PGB WI	10002668997	AO-100-43-S001-001574	10239383
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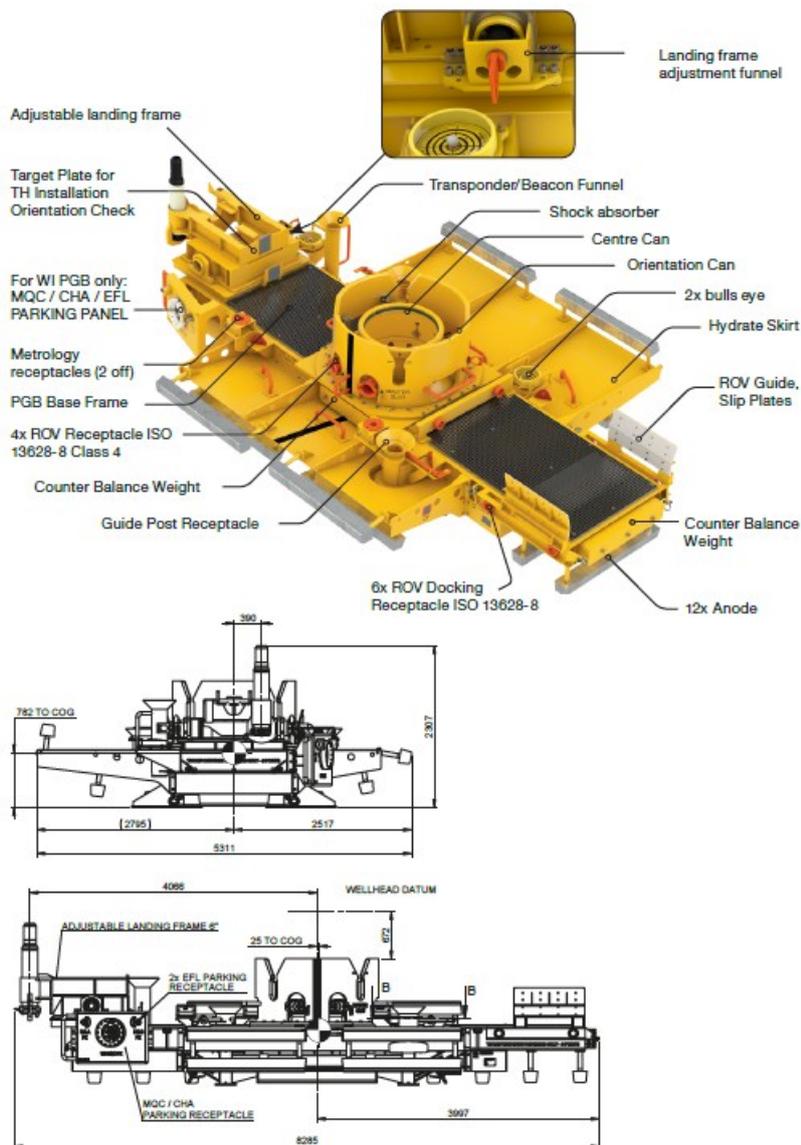
## 4.5 Production PGB IN COUNTRY



**TYPE 1A Glossy 3-D rendering quality + drawing as is**

GA PGB PRODUCTION, IN COUNTRY	10002816845	AO-100-43-S001-001666	10251055
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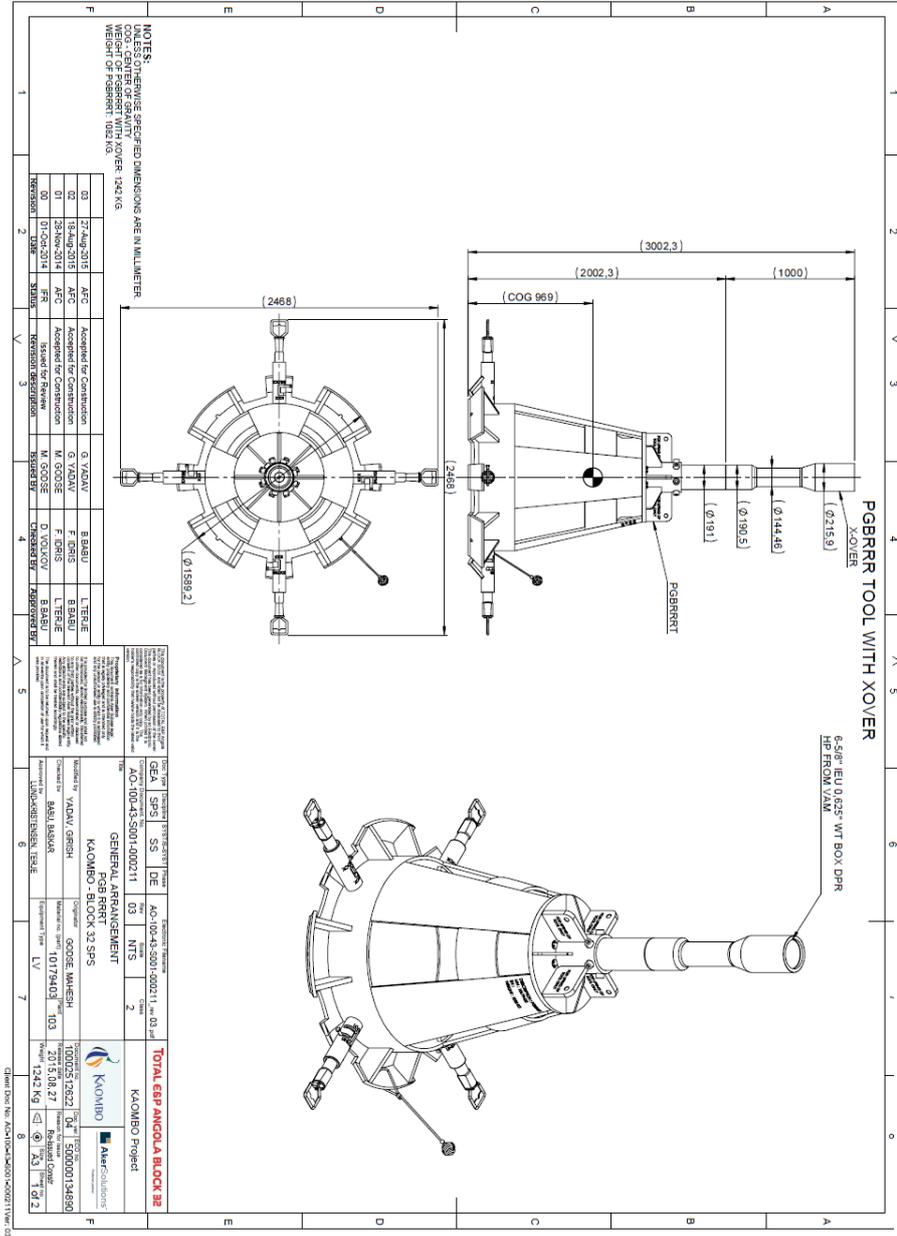
### 4.6 WI PGB IN COUNTRY



**TYPE 1A Glossy 3-D rendering quality + drawing as is**

GA PGB WI IN COUNTRY	10002816848	AO-100-43-S001-001665	10251056
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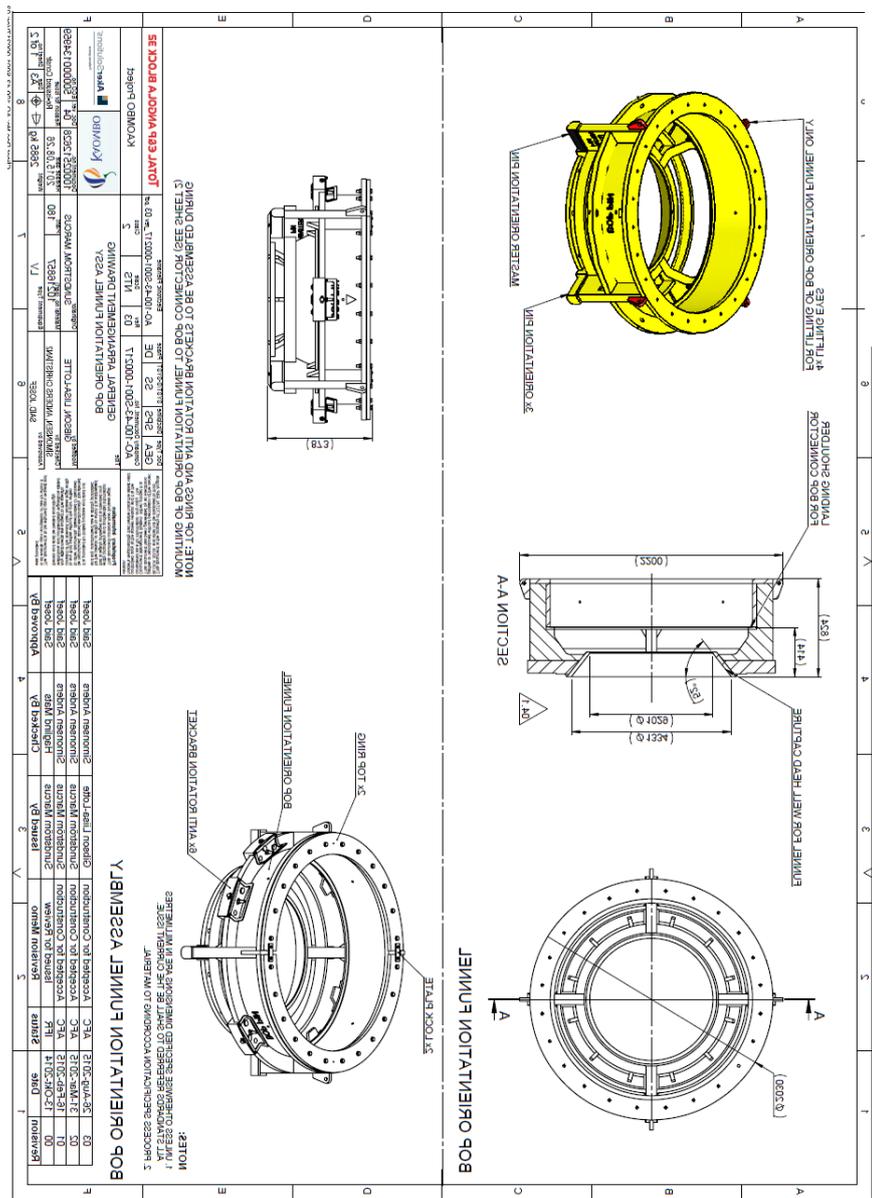
### 4.7 PGB Running Retrieval Re-orientation Tool



TYPE 2 Colour screenshot solidworks ISO VIEW + drawing as is

PGRRRT	10002512622	AO-100-43-S001-000211	10179403
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### 4.8 Blowout Preventer (BOP) Orientation funnel



**TYPE 2** Colour screenshot solidworks ISO VIEW + drawing as is

GA BOP ORIENTATION FUNNEL	10002512628	AO-100-43-S001-000217	10216857
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## **5 TUBING HANGER (TH) SYSTEM**

### **5.1 Reference List**

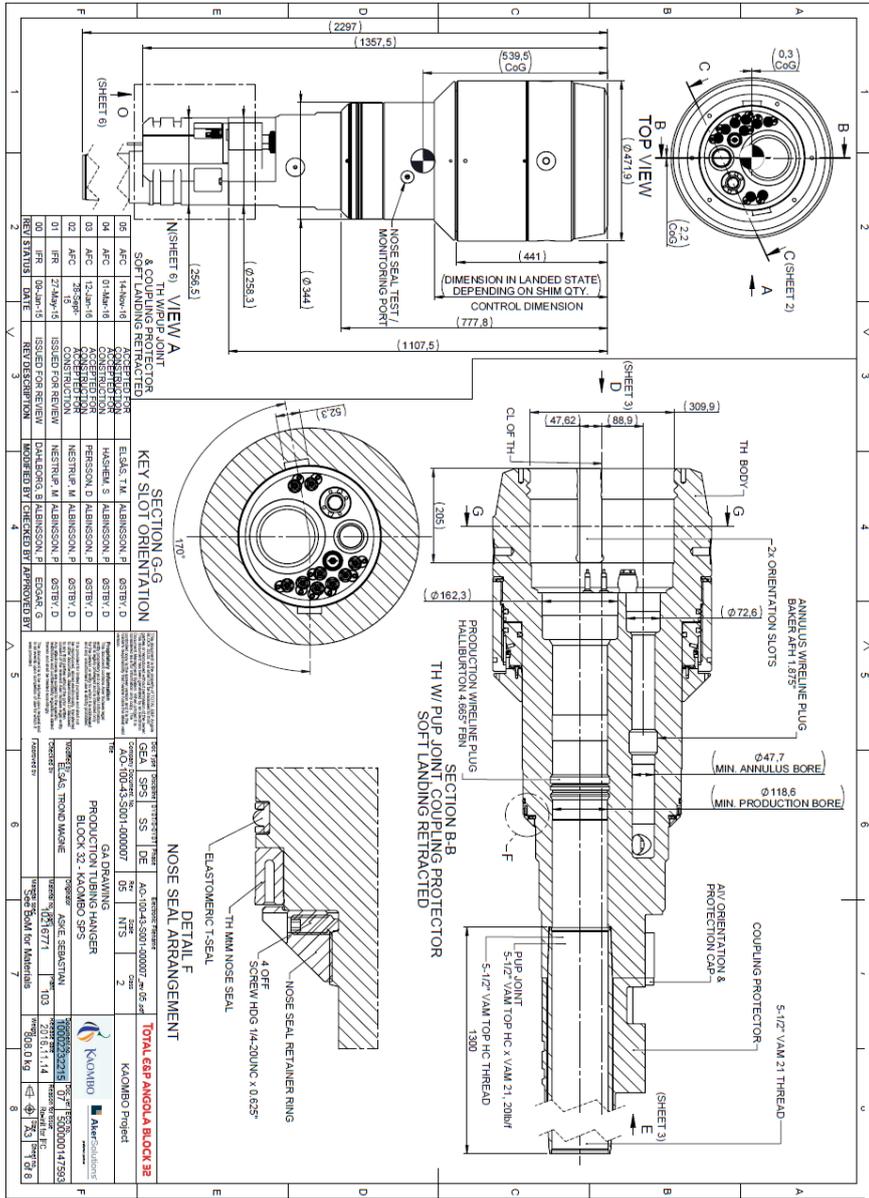


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5.2.2 Production Tubing Hanger



Production TH GA	10002232215	AO-100-43-S001-000007	10216771
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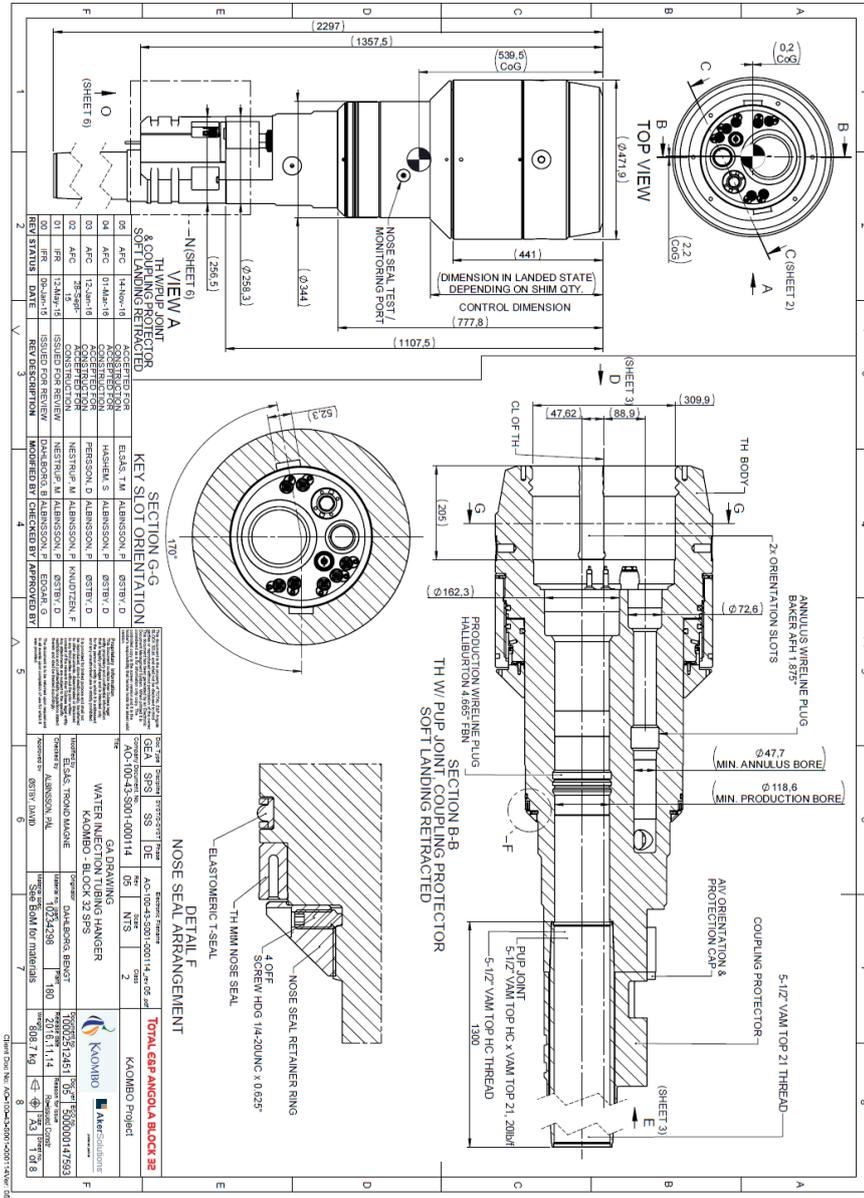
TYPE 5 Drawing as is + colouring

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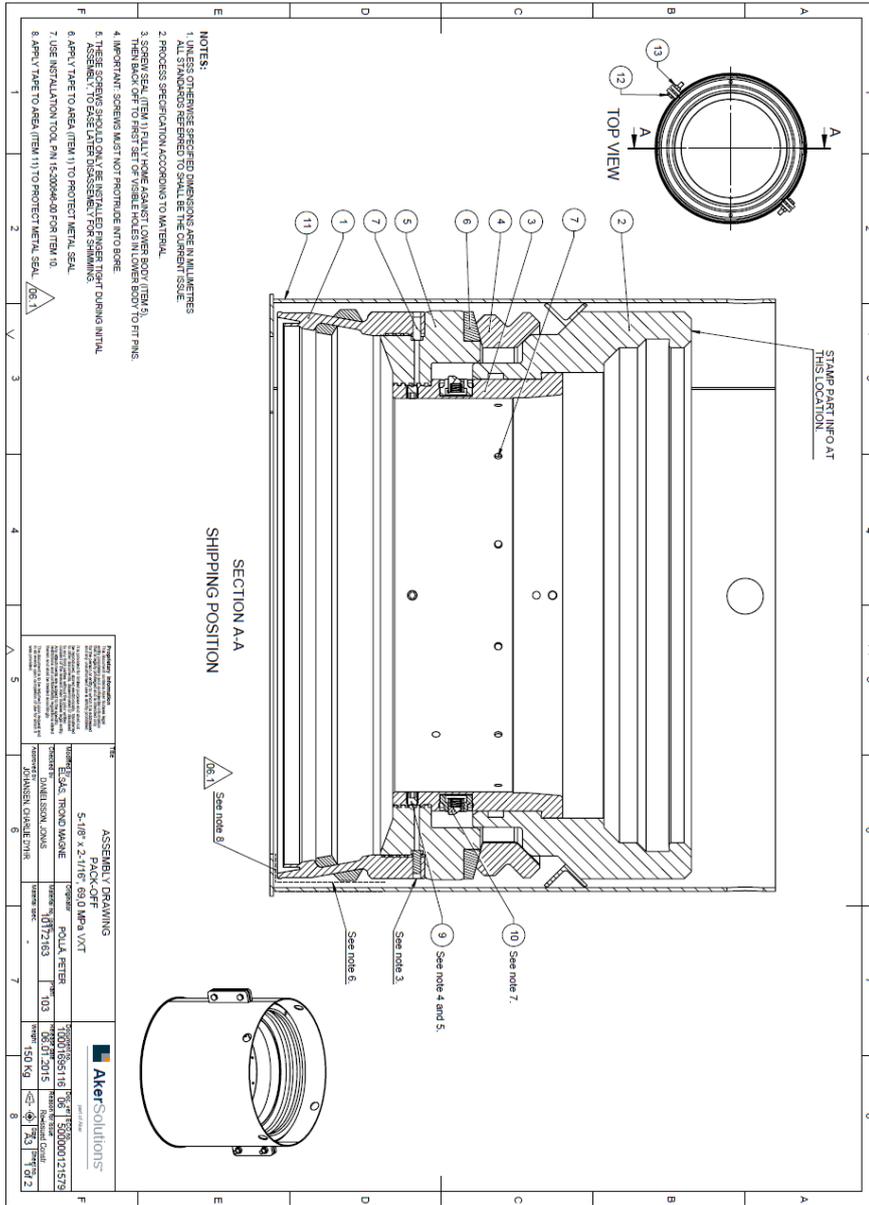
5.2.3 Water Injection tubing hanger



WI TH GA	10002512451	AO-100-43-S001-000114	10234298
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TYPE 5 Drawing as is + colouring

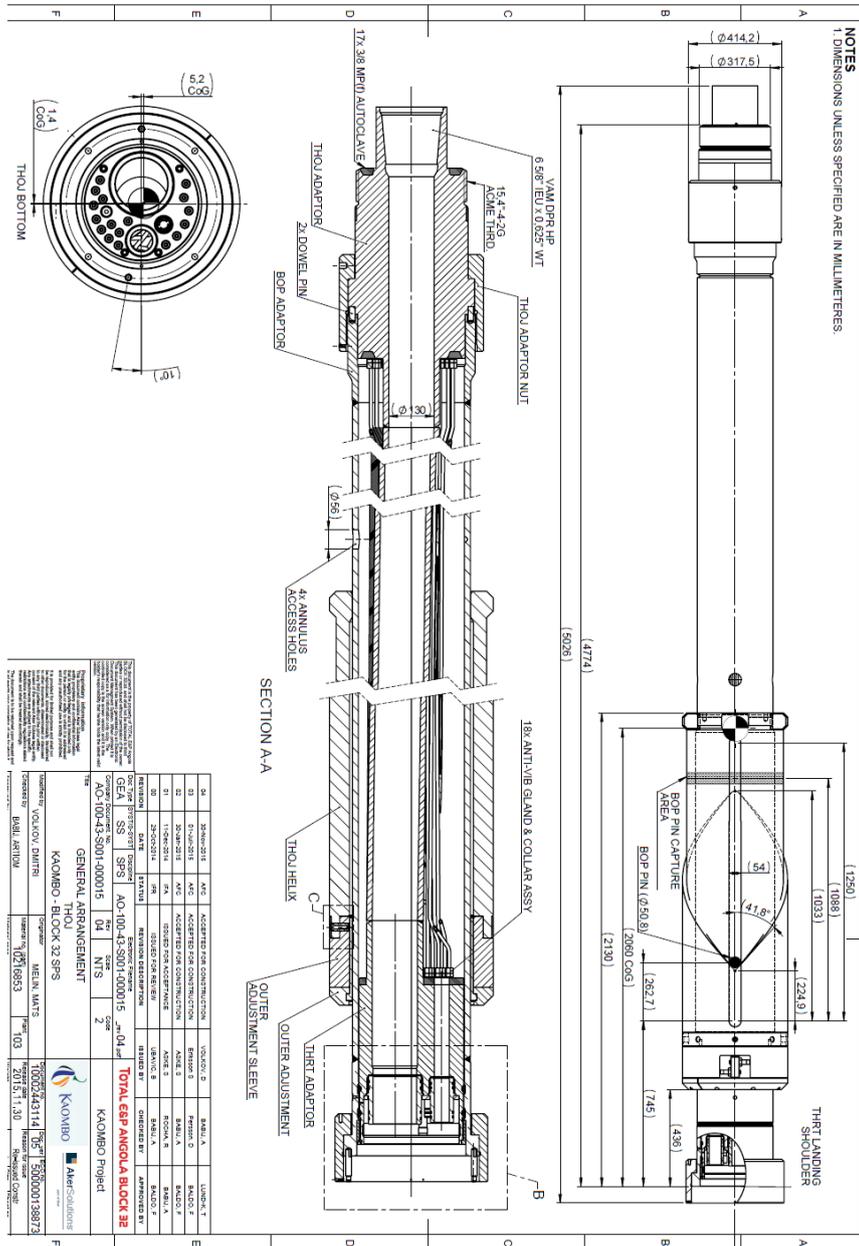
### 5.2.4 TH packoff Assembly Drawing



TH Packoff Assembly Drawing	10001695116	N/A	10172163
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**TYPE 5 Drawing as is + colouring**

### 5.2.5 TH Orientation Joint (THOJ)



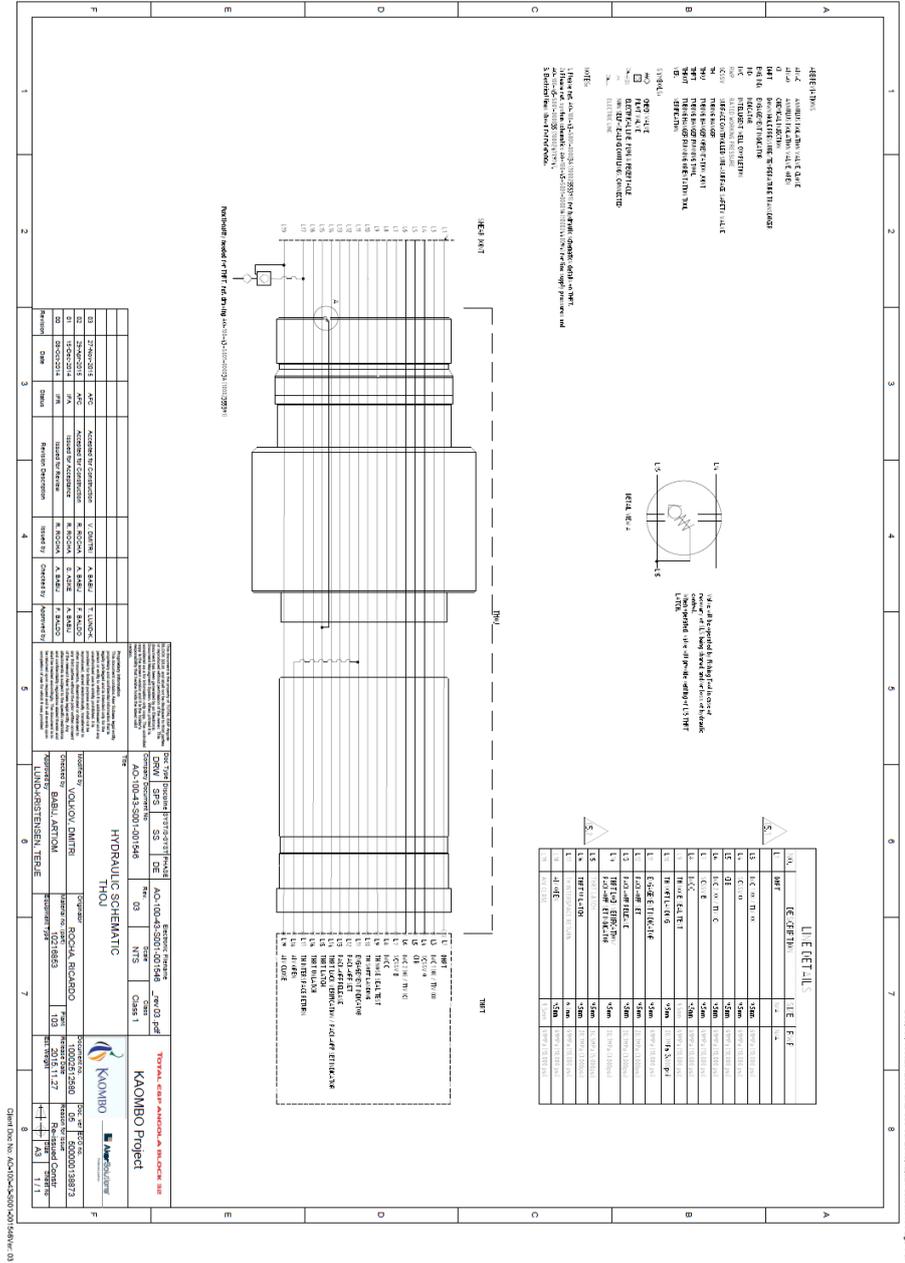
TH Orientation Joint GA	10002443114	AO-100-43-S001-000015	10216853
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TYPE 5 Drawing as is + colouring

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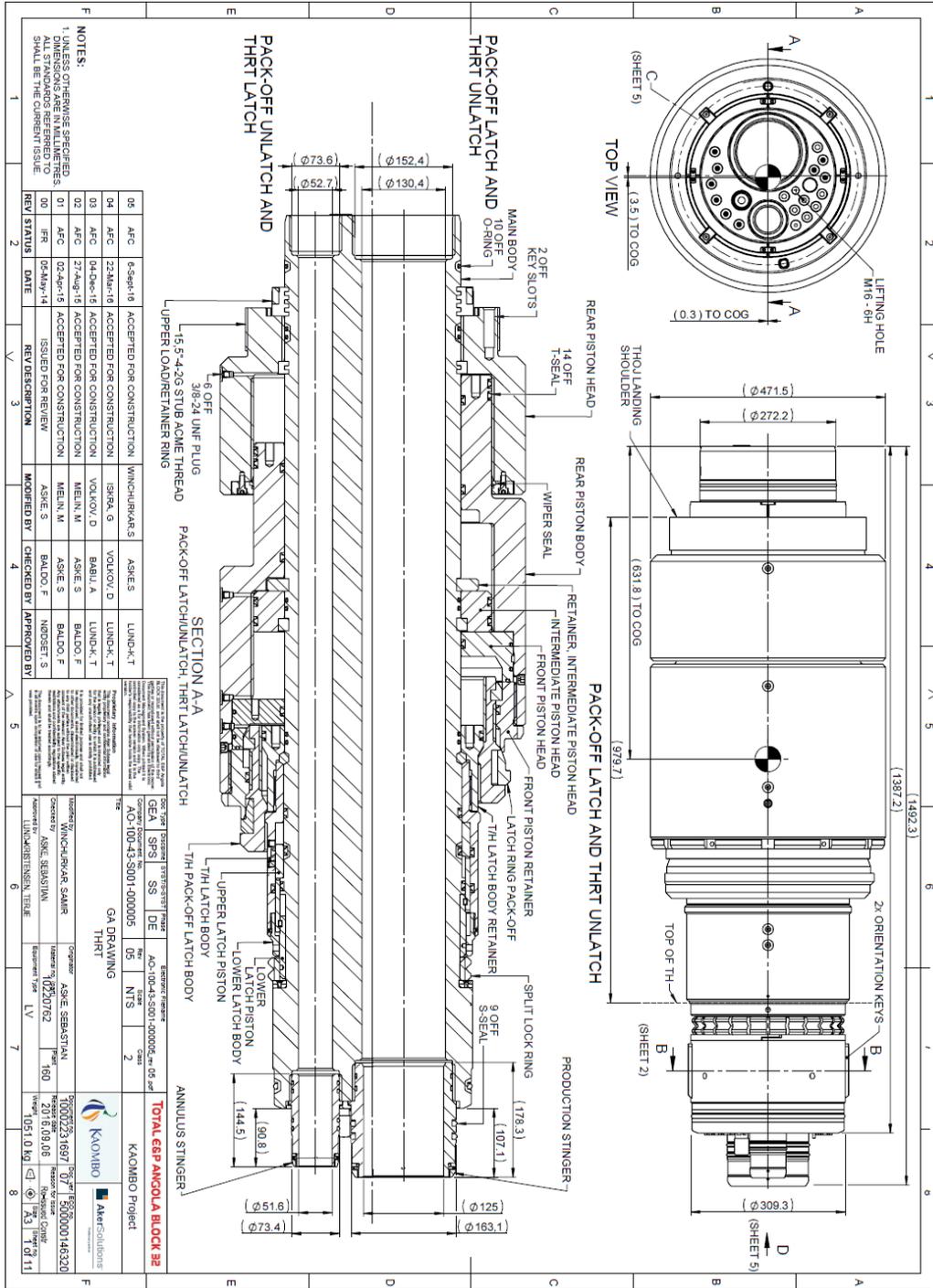
5.2.5.1 TH Orientation Joint THOJ Hydraulic Schematic



TH Orientation Joint Hydraulic Schematic	10002512580	AO-100-43-S001-001546	10216853
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TYPE 3 Use as is (if possible)

### 5.2.6 TH Running Tool (THRT)



**NOTES:**  
 1. DIMENSIONS ARE IN MILLIMETRES  
 ALL STANDARDS REFERRED TO SHALL BE THE CURRENT ISSUE.

REV	STATUS	DATE	REV DESCRIPTION	MODIFIED BY	CHECKED BY	APPROVED BY
06	AFC	8-Sep-18	ACCEPTED FOR CONSTRUCTION	WINCHURBARS	ASIS	LUNDK, T
04	AFC	22-Mar-18	ACCEPTED FOR CONSTRUCTION	GA DR	GA DR	LUNDK, T
03	AFC	04-Dec-18	ACCEPTED FOR CONSTRUCTION	GA DR	GA DR	LUNDK, T
02	AFC	27-Aug-18	ACCEPTED FOR CONSTRUCTION	MELN, M	ASIS	BALDO, F
01	AFC	02-Apr-18	ACCEPTED FOR CONSTRUCTION	MELN, M	ASIS	BALDO, F
00	IFR	05-May-14	ISSUED FOR REVIEW	ASIS	BALDO, F	INOSSET, S

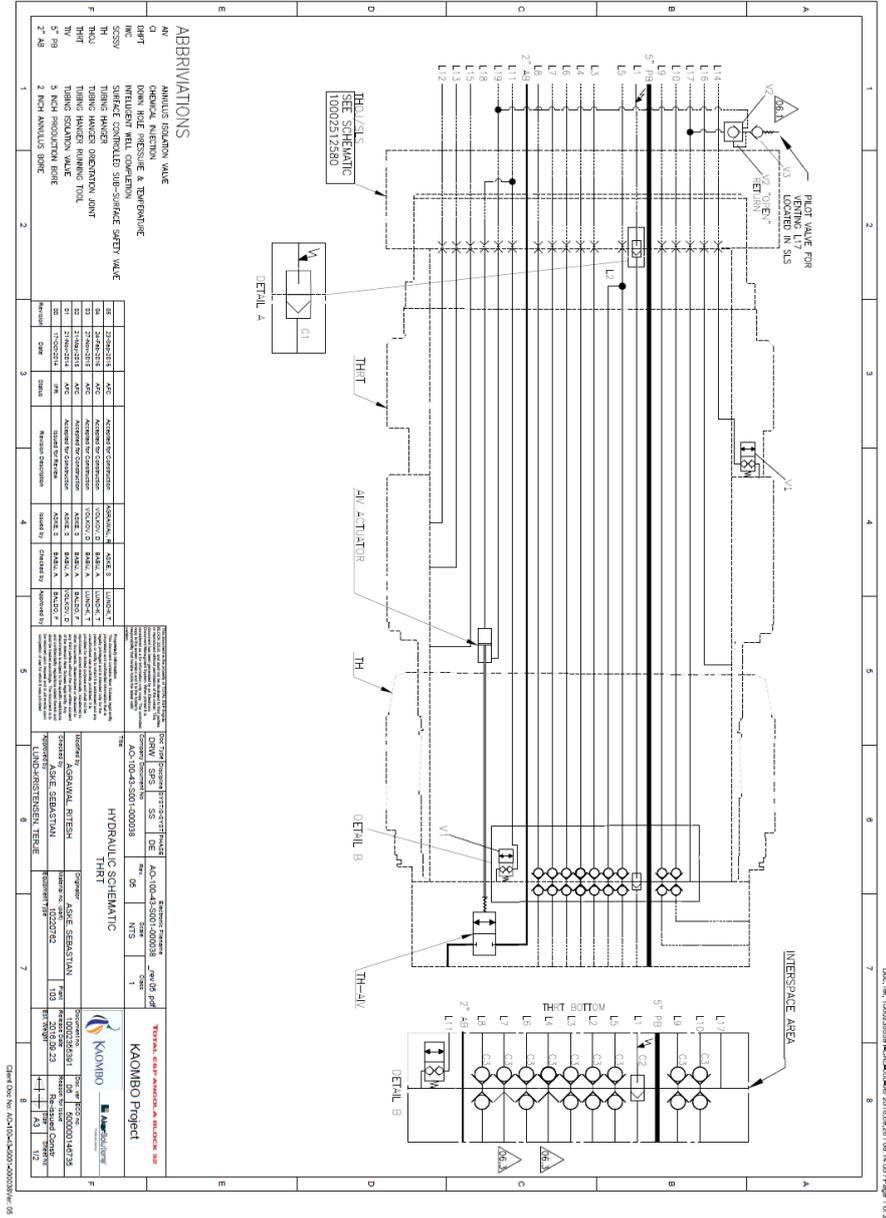
THRT GA	10002231697	AO-100-43-S001-000005	10220762
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TYPE 5 Drawing as is + colouring

SPS HANDBOOK TABLE OF CONTENT

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5.2.6.1 TH Running Tool THRT Hydraulic schematic



THRT Hydraulic Schematic	10002355391	AO-100-43-S001-000038	10220762
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TYPE 3 Use as is (if possible)

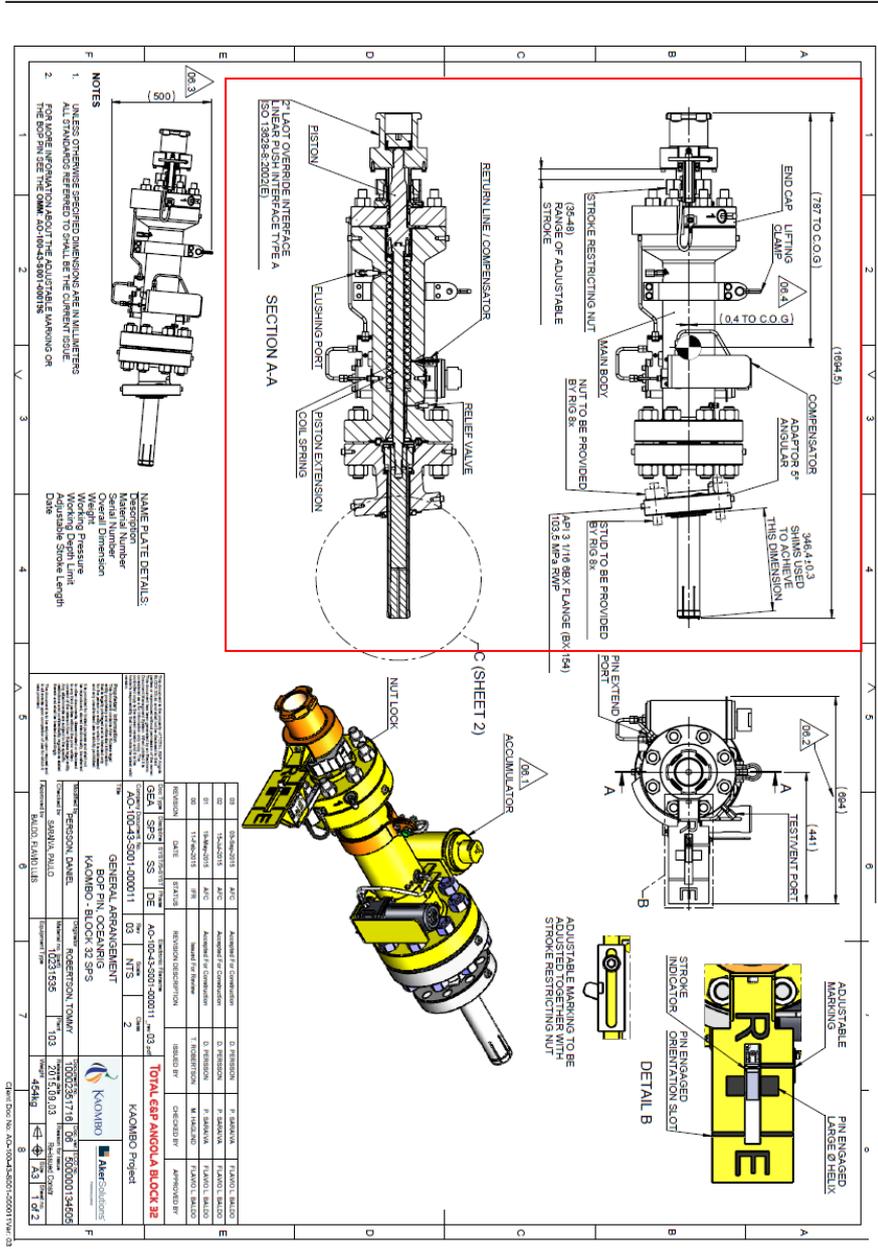
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5.2.7 BOP Pin Skyros

Use the two illustrations marked in red.



BOP PIN Oceanrig GA	10002351716	AO-100-43-S001-000011	10231535
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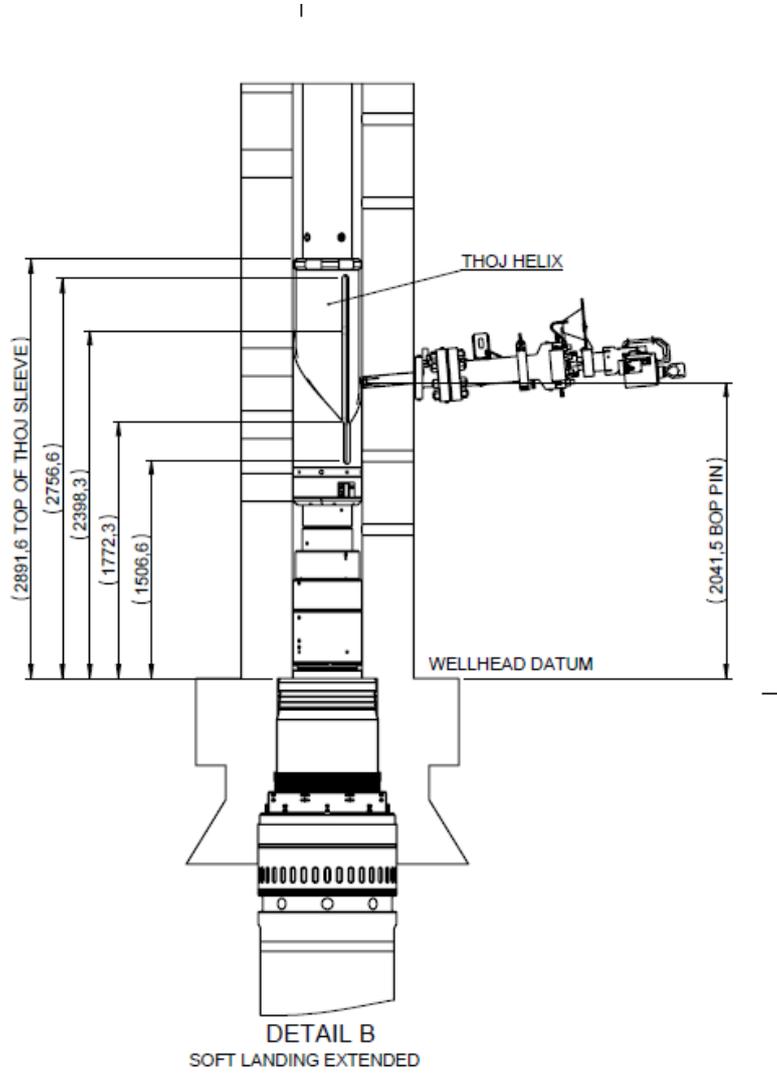
TYPE 3 Use as is (if possible)

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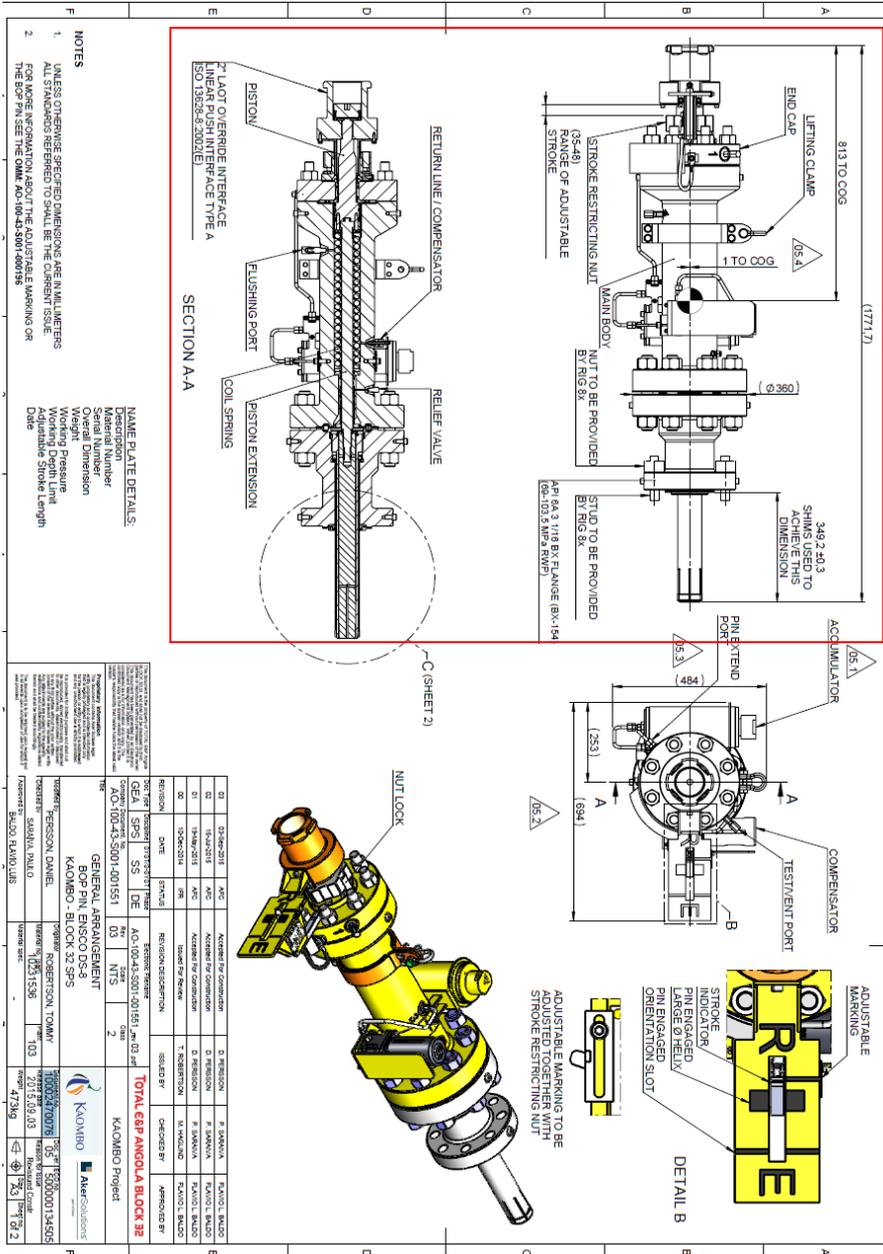
5.2.7.1 THROT/BOP PIN SKYROS



STACK-UP DRAWING TH/THROT/BOP PIN, RIG-1	10002512795	AO-100-43-S001-000323	10211849
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### 5.2.8 BOP Pin DS8

Use the two illustrations marked in red.

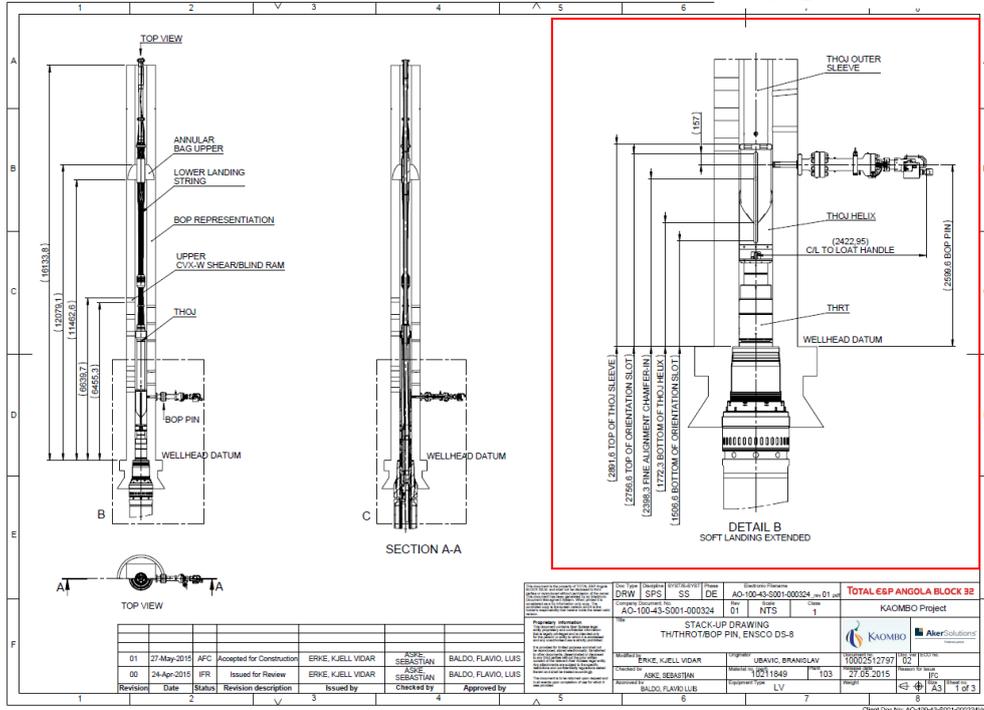


BOP PIN ENSCO DS-8	10002470076	AO-100-43-S001-001551	10231536
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**TYPE 3 Use as is (if possible)**

5.2.8.1 THROT/BOP PIN, ENSCO DS-8

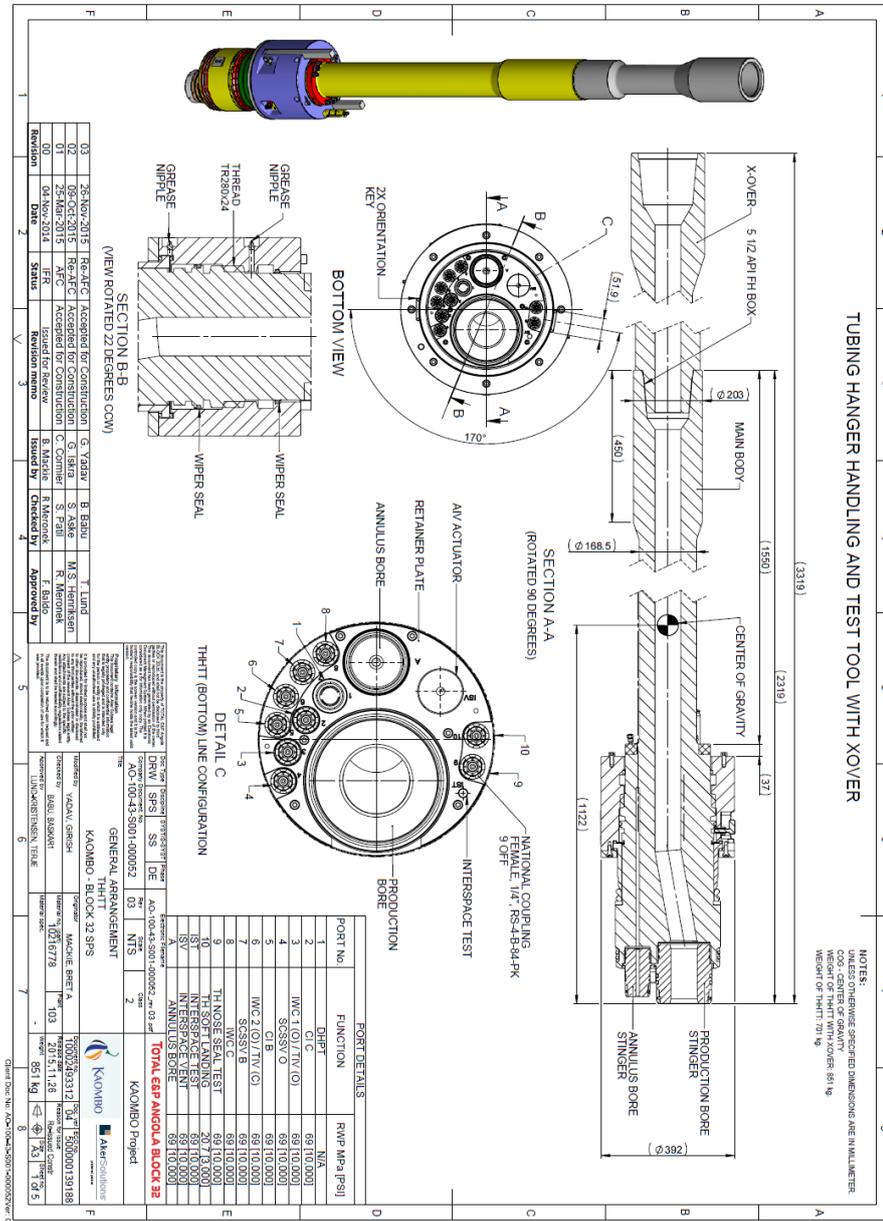
Keep the one illustration marked in red. Try to have on the same page as BOP Pin a bove.



THROT/BOP PIN ENSCO DS-8	10002512797	AO-100-43-S001-000324	10216771 10216853 10220762 10231536 10234298
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**TYPE 3 Use as is (if possible)**

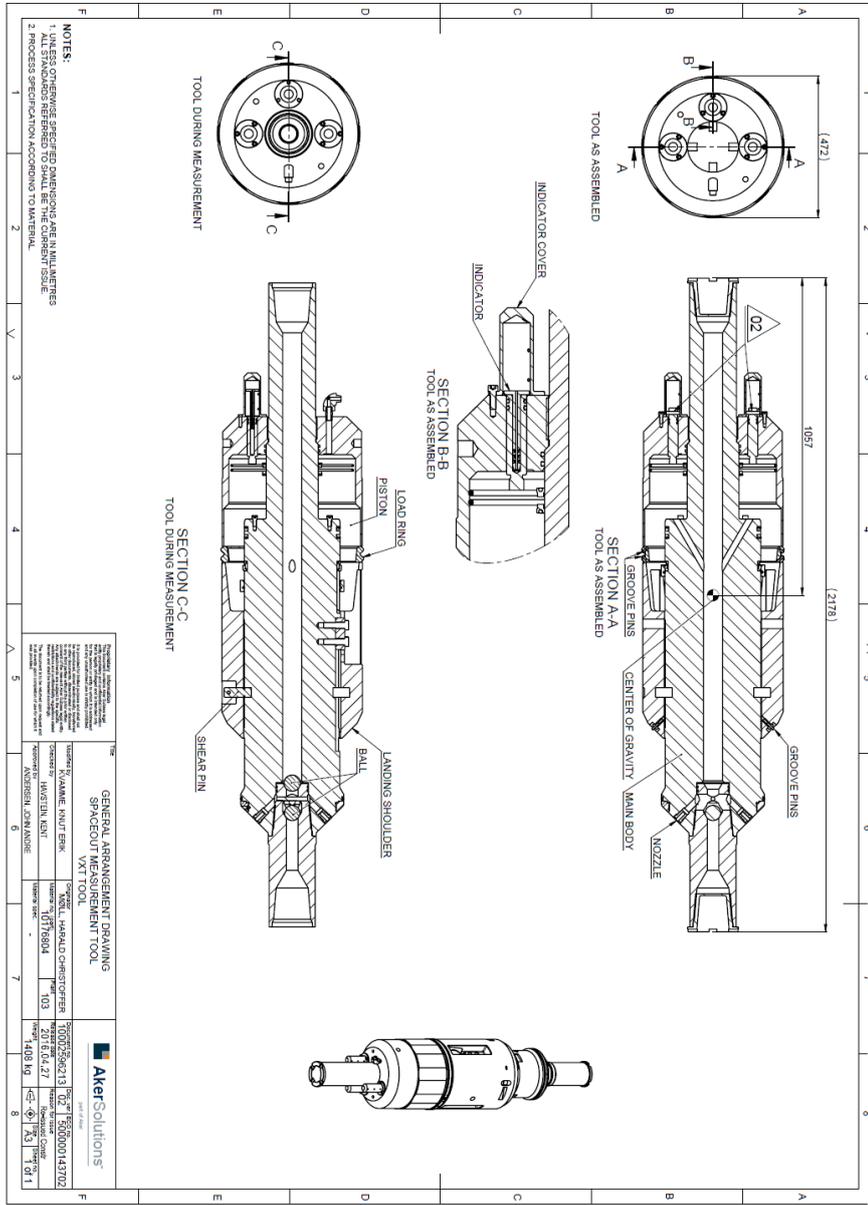
### 5.2.9 TH Handling & Test Tool (THHTT)



THHTT GA	10002493312	AO-100-43-S001-000052	10216778
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**TYPE 3 Use as is (if possible)**

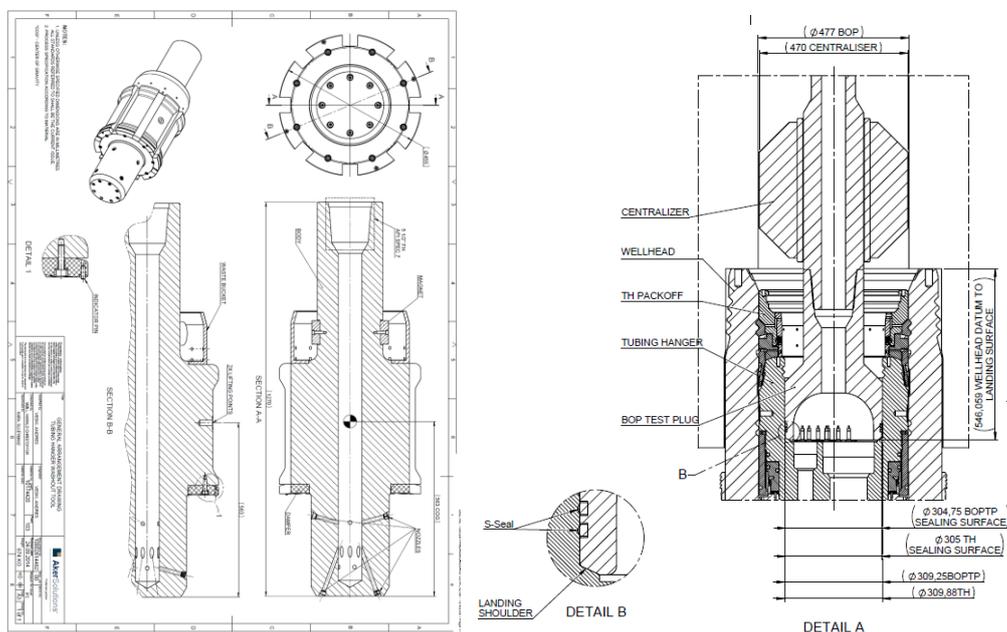
### 5.2.10 TH Space-out measurement tool



TH Space out measurement tool GA	10002512650	AO-100-43-S001-000227	10176804
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**TYPE 5 Drawing as is + colouring**

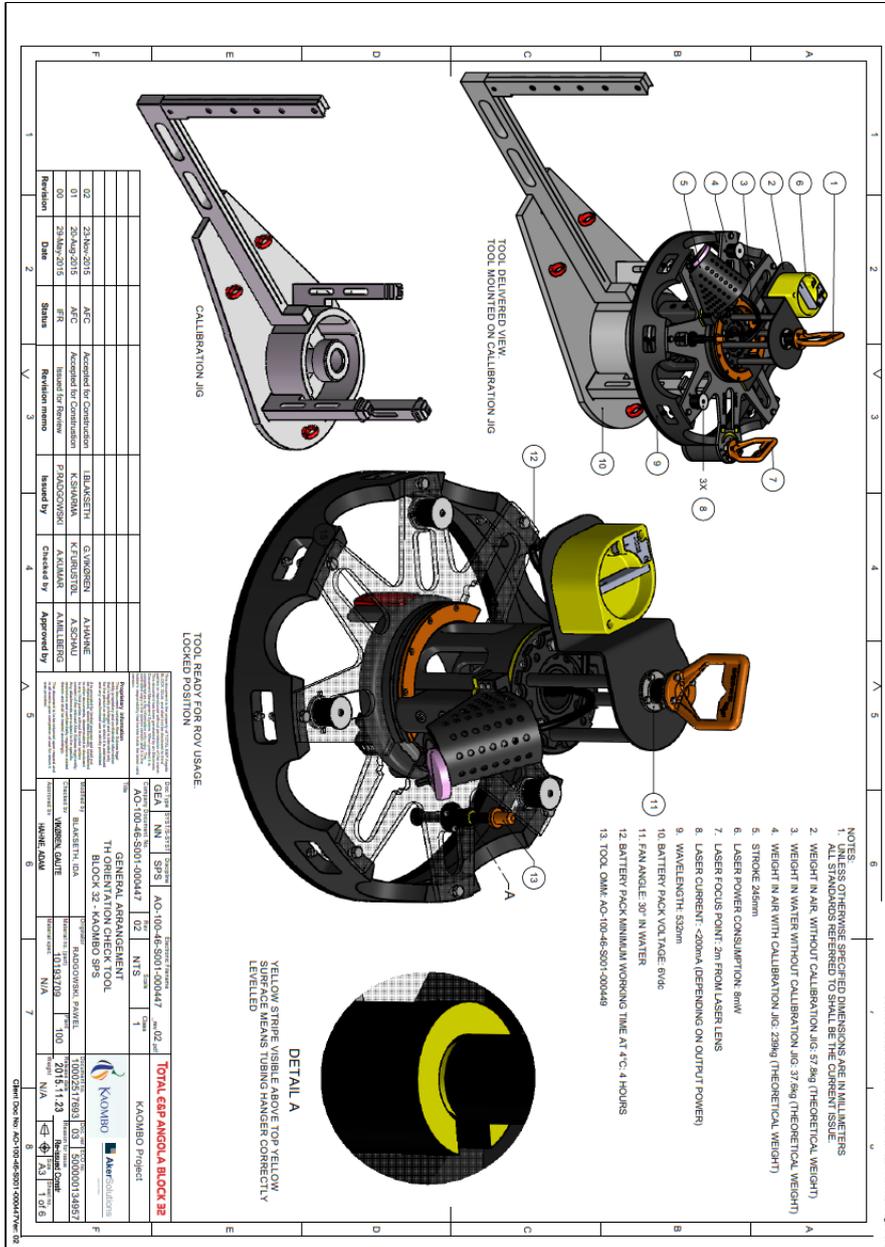
5.2.11 TH Washout tool + BOP test plug add on same page



TH washout tool	10002512690	AO-100-43-S001-000258	10174420
GA, BOP test plug	10002512676	AO-100-43-S001-000249	10237865

**TYPE 5 Drawing as is + colouring**

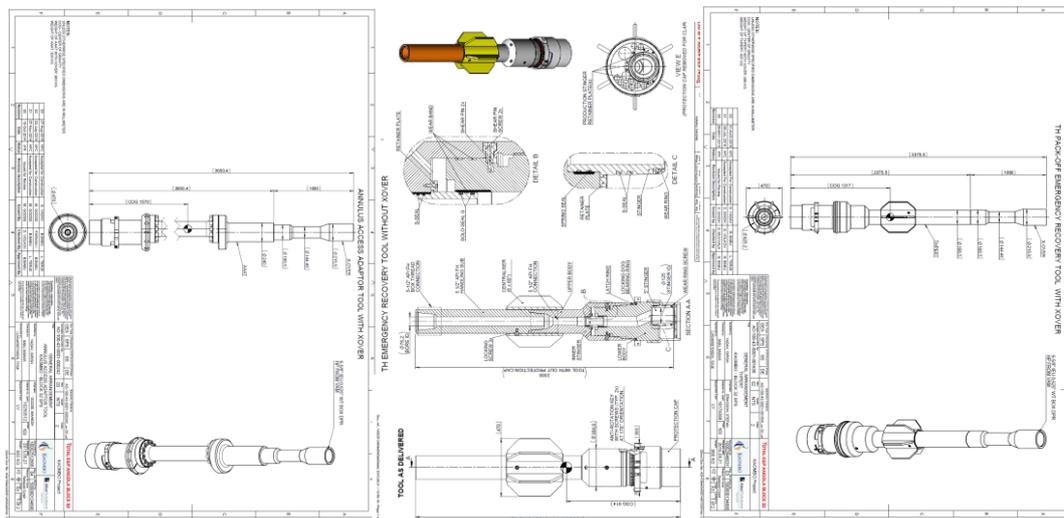
### 5.2.12 TH Orientation Check Elevation Tool (THOECT)



THOECT GA	10002517693	AO-100-46-S001-000447	10193709
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**TYPE 3 Use as is (if possible)**

5.2.13 TH contingency tools (1 page with one drawing per tool)



Annulus Access Adaptor Tool	10002512666	AO-100-43-S001-000242	10250512
STACK-UP TH/AAAT/2" WIRELINE PLUG	10002512805	AO-100-43-S001-000329	
THERT GA	10002512594	AO-100-43-S001-000189	10232276
THPERT GA	10002846831	AO-100-43-S001-001630	10174388

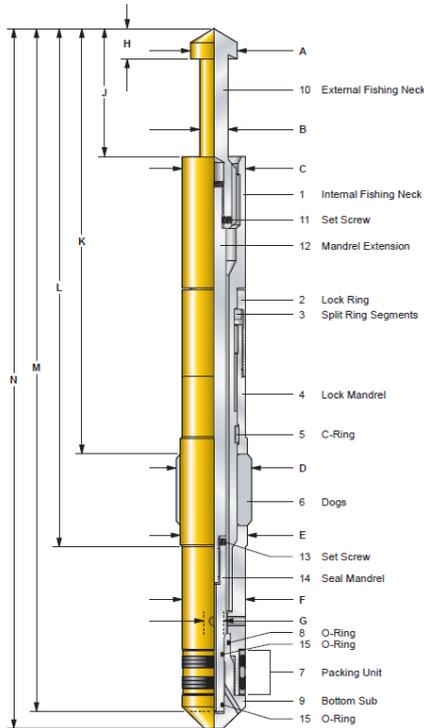
**TYPE 5 Drawing as is + colouring**

### 5.2.14 Annulus Wireline Plug

Baker Model "AFH" Short Sur-Set By-Pass Blanking Plug with Removable Mandrel



Product No. H83620



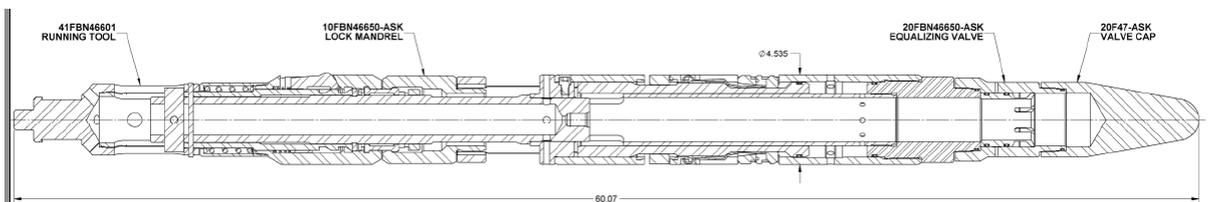
© 2004 Baker Hughes Incorporated, All Rights Reserved.

Drawing No. ABD00016709  
 New (14/09/04)

Annulus Wireline Plug	10002960716	N/A	10215153
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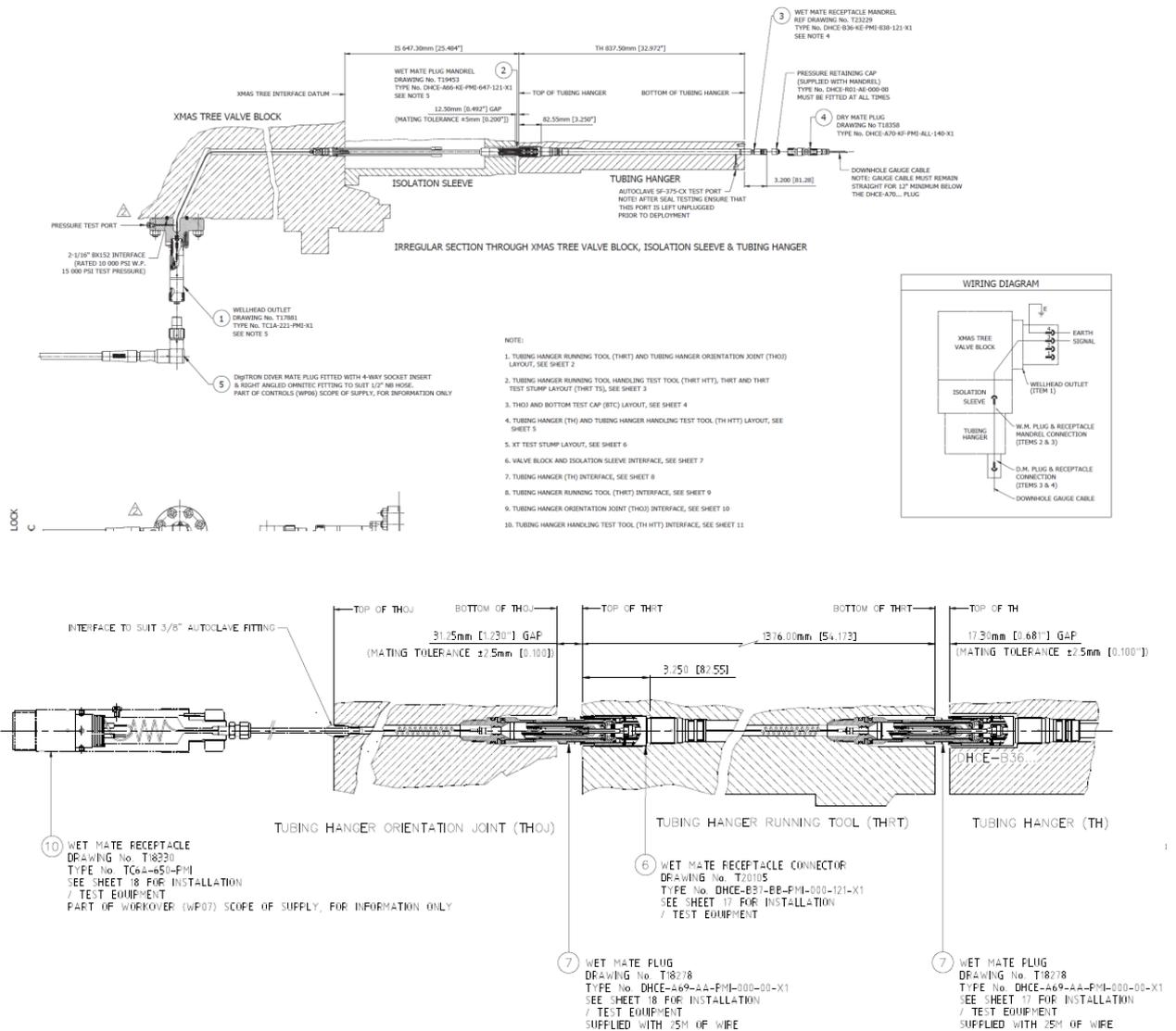
**TYPE 3 Use as is (if possible)**

### 5.2.15 5" Production Wireline Plug



4.665 FBN Lock & Running Tool Drg	N/A	CPI	N/A
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### 5.3 Electrical Feed through System (EFTS)



Remove dimensions, notes and references to drawings. Keep type No.

SIEMENS SUBSEA CONNECTORS – TRONIC SoS	10002858412	AO-100-40-S192-000016	N/A
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**TYPE 3 Use as is (if possible)**

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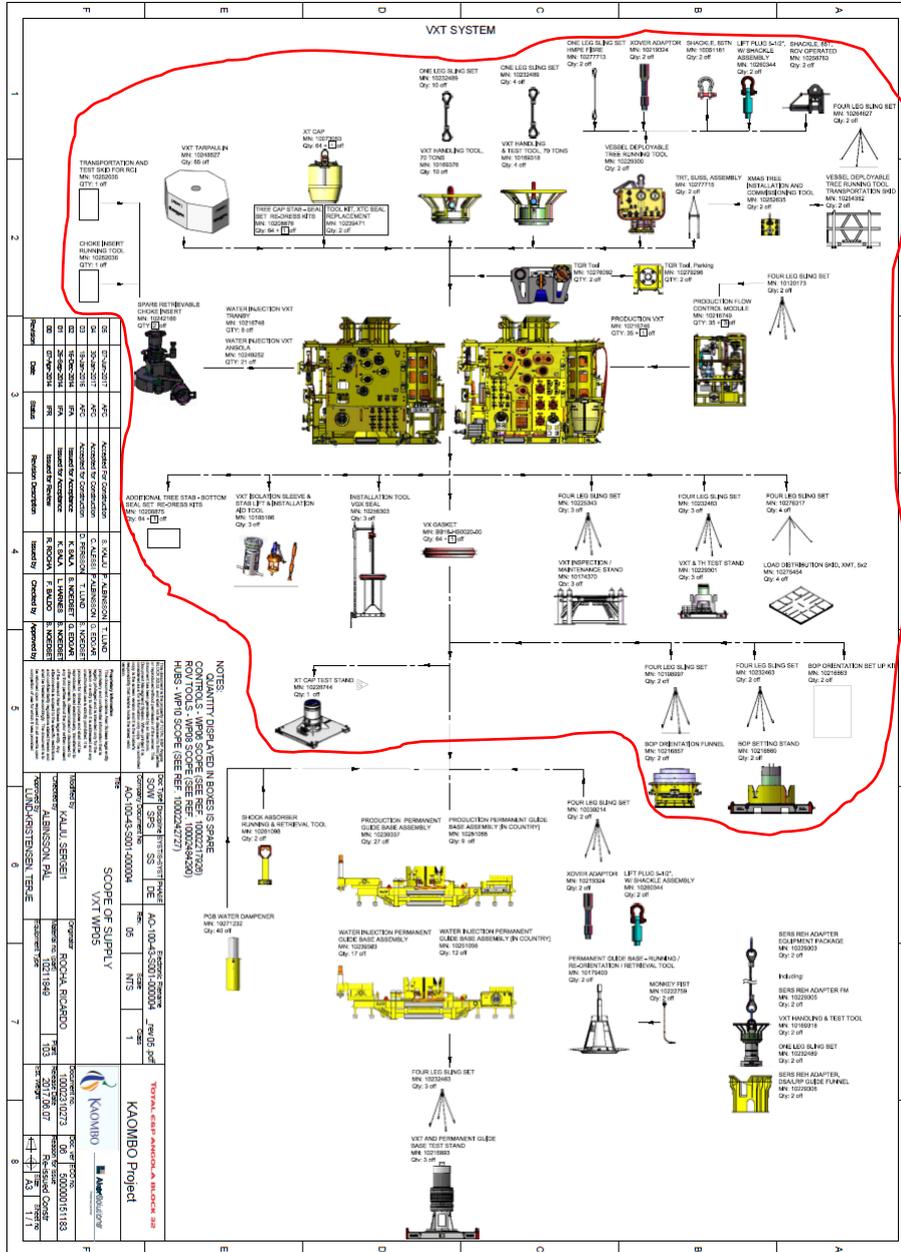
SPS HANDBOOK TABLE OF CONTENT	Document:	10002504361-PDC-000
	Version:	05 - Re-issued Constr
	Issue date:	2017.11.17
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## **6 VERTICAL SUBSEA TREE (VXT) SYSTEM**

### **6.1 Reference list**

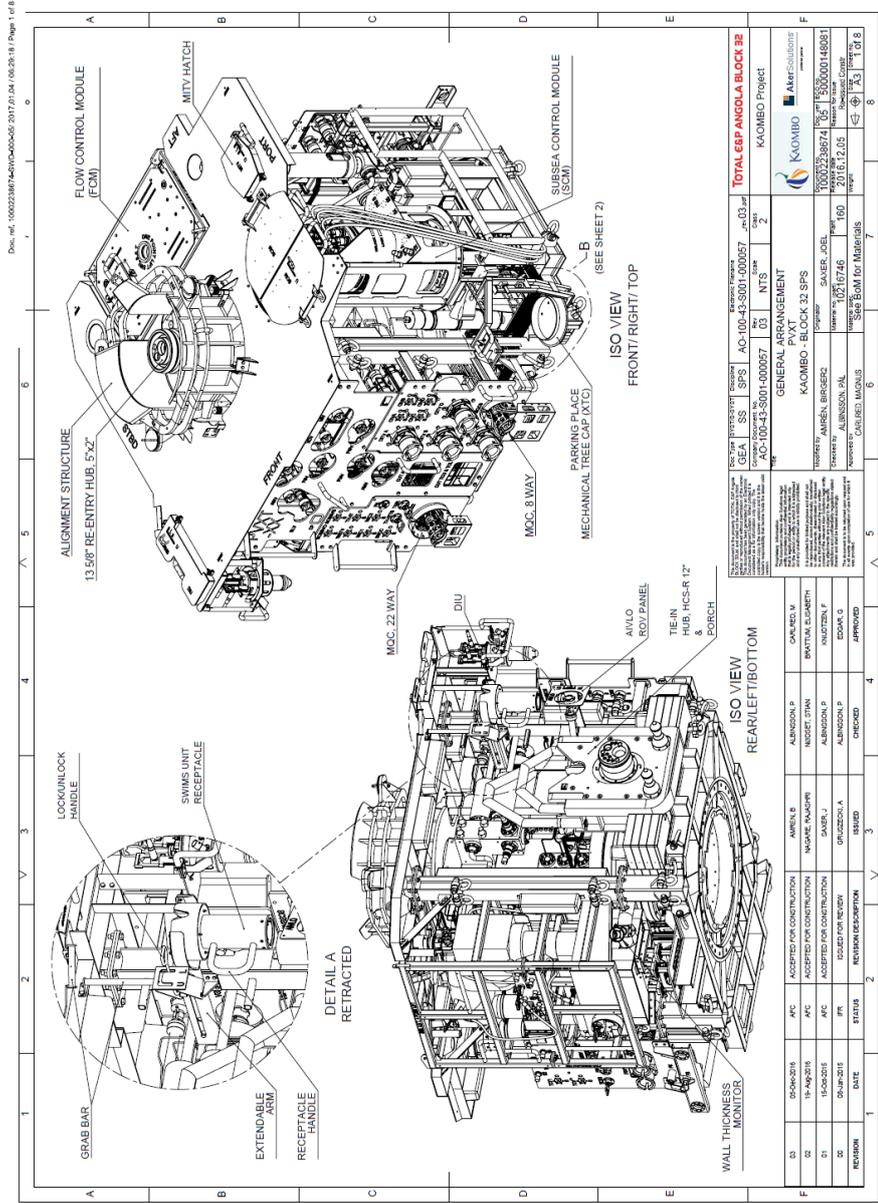
### 6.2 VXT System Scope of Supply



VXT SCOPE OF SUPPLY	10002310273	AO-100-43-S001-000004	N/A
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### 6.3 Production VXT

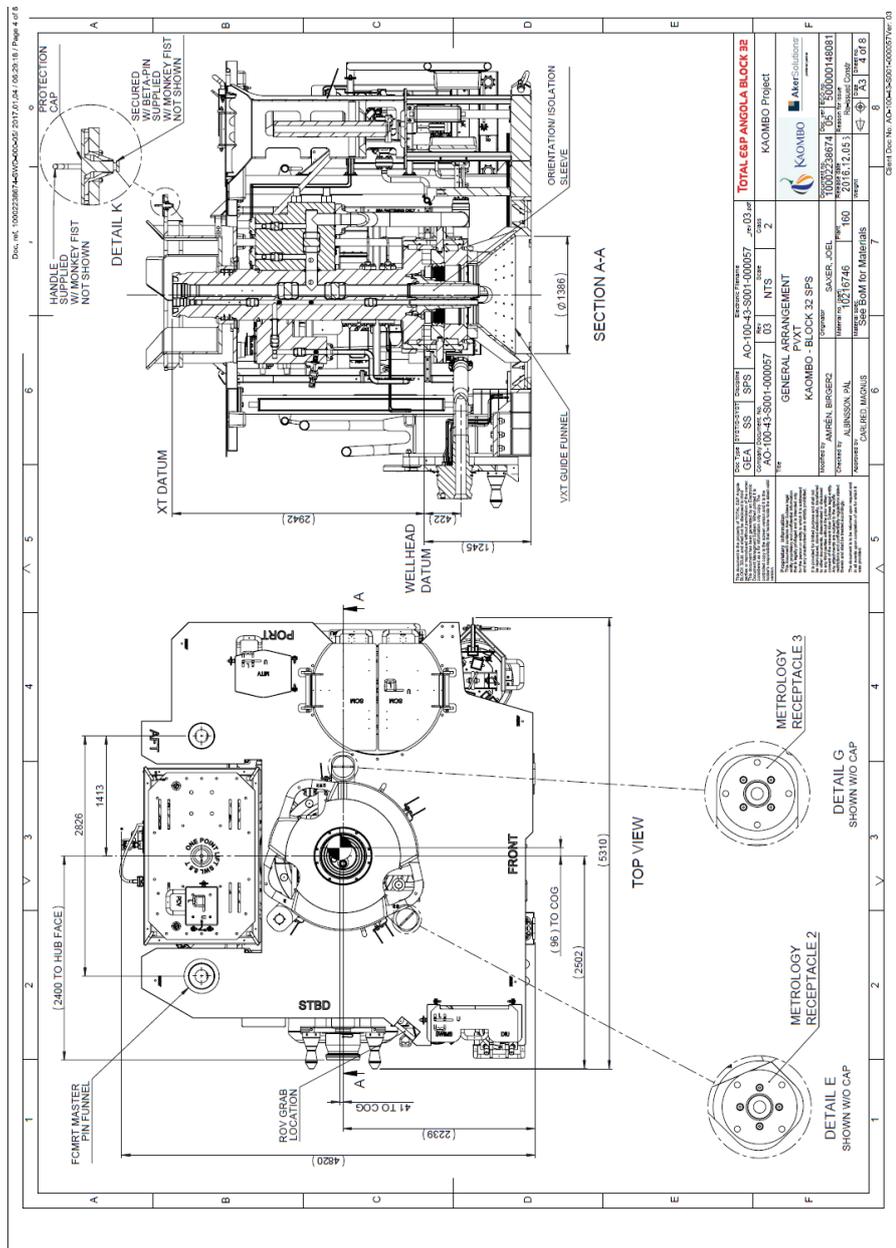
#### 6.3.1 Production PVXT ISO VIEW



PXMT GA	10002238674	AO-100-43-S001-000057	10216746
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TYPE 1C Glossy 3-D rendering quality with description/details like GA

### 6.3.2 Production PVXT DIMENSIONS



PXMT GA	10002238674	AO-100-43-S001-000057	10216746
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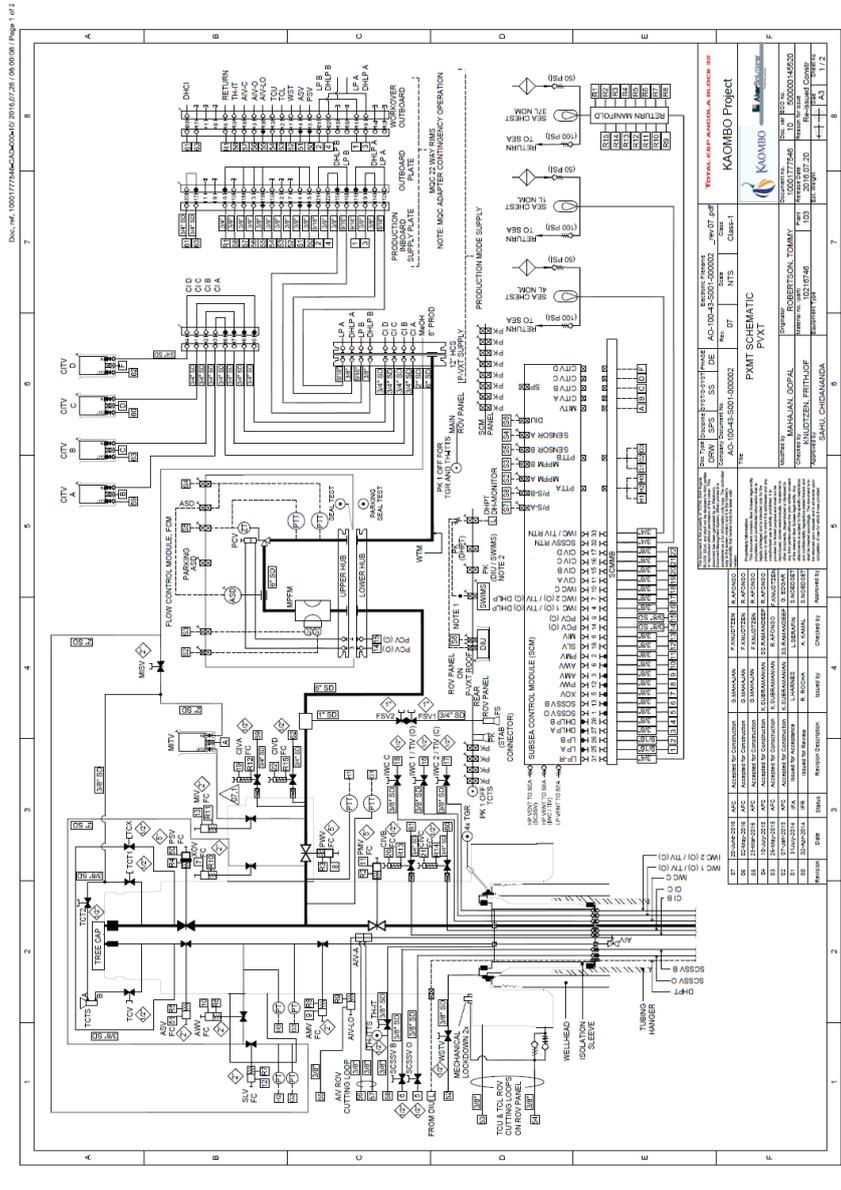
**TYPE 3** Use as is (if possible)

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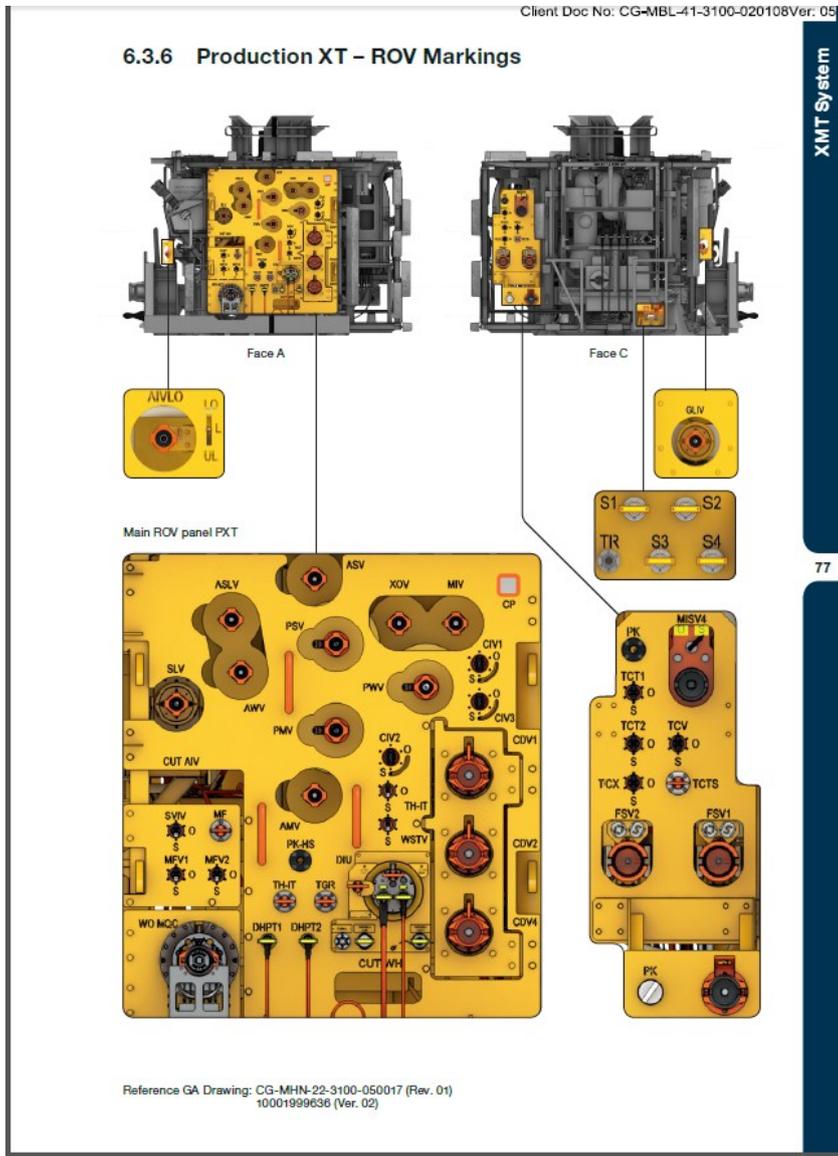
6.3.3 Production PVXT Schematic



PXMT SCHEMATIC PVXT	10001777546	AO-100-43-S001-000002	10216746
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TYPE 3 Use as is (if possible)

### 6.3.4 Production PVXT Remote Operated Vehicle (ROV) Panel & Markings



PVXT GA	10002238674	AO-100-43-S001-000057	10216746
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**TYPE 1B Glossy 3-D rendering quality like example, add roof view**

### 6.3.5 Production PVXT Valves

XMT System

Doc. ref. 1000194/480-PDC-000-06/ 2016.02.18 / 11:00:55 / Page 89 of 220  
 Client Doc No: CG-MBL-41-3100-020108Ver: 05

#### 6.3.5 Production XT Valves

Description	Functional Use / ROV Marking	Soft Tag (if B)	Fail Safe	Material Number	Valve Data Sheet	Valve Type	Action	Supplier	Qty for 1 XT
<b>Production XMT</b>									
5-1/8" Valve	PWV, PMV, PSV	K.PWV-P***, K.PMV-P***	FSC	10116148	10001346450	Gate	Hydraulic	AKSO	3
2-1/8" Valve	AMV, XOV, MV, ASV	K.AMV-P***, K.PSLV-P***, K.CVA-P***, N/A	FSC	10199044	10001346427	Gate	Hydraulic	AKSO	4
2-1/8" Valve	AWV, ASLV	K.AWV-P***, K.ASLV-P***	FSC	10198311	10001346427	Gate	Hydraulic	AKSO	2
2-1/8" Valve	GLV, SLV	K.GLV-P***, K.SLV-P***	FSC	10117136	10001346427	Gate	Hydraulic	AKSO	2
2-1/8" Valve	AV	N/A	RI	10191548 (Valve), 10080098 (Actuator)	10003023229	Plug	Hydraulic	AKSO	1
2-1/8" Valve	MSV4	N/A	NA	10182078	CG-MHN-22-310-689032 (10002716964)	Gate	ROV	PV	1
2" Valve	CDV3	K.RICDA-P***	RI	10182869	CG-MHN-25-310-960562 (10001958051)	Measuring/Throttling Valve	Electric	Cameron	1
1" Valve	FSV1, FSV2	K.FSV1-P***, K.FSV2-P***	FSC	10191900	CG-MHN-22-310-912049 (10002402655)	Gate	Hydraulic with ROV override	Cameron	2
3/4" Valve	CDV1, CDV2, CDV4	K.RICDC-P***, K.RICDB-P***, K.RICDD-P***	RI	10191761 (CDV1), 10039684 (CDV2), 10162546 (CDV4)	10002205925 / 10002205902 / 10002205987	Measuring/Throttling Valve	Electric	Silo Flo	3
1/2" Valve	CIV1, CIV3	K.CIVB-P***, K.CIVD1-P***	FSC	10180527	CG-MHN-22-310-186010 (10002197429)	Rotary Gas w/ Integral Check Valve	Hydraulic with ROV override	Bentley	2
1/2" Valve	CIV2	K.CIVD2-P***	FSC	10180526	CG-MHN-22-310-186009 (10002197428)	Rotary Gas w/ Integral Check Valve	Hydraulic with ROV override	Bentley	1
1/2" Valve	SWV	N/A	NA	10180525	CG-MHN-22-310-186008 (10002197427)	Rotary Gas	ROV	Bentley	1
3/2" Valve	TCT1, TCV, TCK, MFV1, MFV2, TCT2	N/A	NA	10180524	CG-MHN-22-310-186007 (10002197426)	Rotary Gas	ROV	Bentley	6
3/2" Valve	TH-IT, WSTV	N/A	NA	10180523	CG-MHN-22-310-186006 (10002197425)	Rotary Gas	ROV	Bentley	2

Note: \*\*\* is well tagging (for example: PWV41)

**Material Number:** 10199844 (Master Valve Block), 10191552 (Production Wing Block), 10191586 (Annulus Wing Block)  
 CG-MHN-22-3100-050017 (Rev. 01)  
 1000199936 (Rev. 02)

**Reference GA Drawing:**

PXMT GA	10002238674	AO-100-43-S001-000057	10216746
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**TYPE 1B Glossy 3-D rendering quality like example**

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6.3.6 Production PVXT Valve torque list

Item No	QTY PKMT	Valve Name	ROVID	SAP Material No.	Normal Valve Size	Valve Type	Actuation	ROV Interface	ROV Tool	Running Torque (Nm)	Break Out Torque (Nm)	Max torque (Nm)	Damage Torque (Nm)	Closing direction (CW/R Clockwise or CCW/L)	Approx. number of Turns to Open or Close
1		Crossover Valve	XOV	10201562	2-1/16"	Gate	HYDROV	ISO 15628-3 Linear Push Type "A"	LAOT & LOT	N/A	N/A	N/A	N/A	N/A	N/A
2	4	Annulus Master Valve	AMV	10201562	2-1/16"	Gate	HYDROV	ISO 15628-3 Linear Push Type "A"	LAOT & LOT	N/A	N/A	N/A	N/A	N/A	N/A
3		Annulus Swab Valve	ASV	10201562	2-1/16"	Gate	HYDROV	ISO 15628-3 Linear Push Type "A"	LAOT & LOT	N/A	N/A	N/A	N/A	N/A	N/A
4		Methanol Injection Valve	MIV	10201562	2-1/16"	Gate	HYDROV	ISO 15628-3 Linear Push Type "A"	LAOT & LOT	N/A	N/A	N/A	N/A	N/A	N/A
5	1	Annulus Isolation Valve - Lock Out	AVI-LO	10213580			HYDROV	ISO 15628-3 Linear Push Type "A"	LAOT & LOT	N/A	N/A	N/A	N/A	N/A	N/A
6		Production Master Valve	PMV	10218215	5-1/8"	Gate	HYDROV	ISO 15628-3 Linear Push Type "A"	LAOT & LOT	N/A	N/A	N/A	N/A	N/A	N/A
7	3	Production Swab Valve	PSV	10218215	5-1/8"	Gate	HYDROV	ISO 15628-3 Linear Push Type "A"	LAOT & LOT	N/A	N/A	N/A	N/A	N/A	N/A
8		Production Wing Valve	PWV	10218215	5-1/8"	Gate	HYDROV	ISO 15628-3 Linear Push Type "A"	LAOT & LOT	N/A	N/A	N/A	N/A	N/A	N/A
9	2	Annulus Wing Valve	AWV	10231848	2-1/16"	Gate	HYDROV	ISO 15628-3 Linear Push Type "A"	LAOT & LOT	N/A	N/A	N/A	N/A	N/A	N/A
10		Service Line Valve	SLV	10231848	2-1/16"	Gate	HYDROV	ISO 15628-3 Linear Push Type "A"	LAOT & LOT	N/A	N/A	N/A	N/A	N/A	N/A
11	1	Methanol Isolation Valve	MISV	10240127	2-1/16"	Gate	HYDROV	ISO 15628-3 Linear Push Type "A"	LAOT & LOT	1250	1250	2711	3500	CW	4.2
12		Chemical Injection Valve A	CIVA	10243043	1/2"	Rotary Gate	HYDROV	ISO 15628-3 Class 4 ROV Manipulator	Class 4 Torque Tool Paddle Tool	14	30	300	400	CW	10
13	4	Chemical Injection Valve B	CIVB	10243043	1/2"	Rotary Gate	HYDROV	ROV Manipulator	Paddle Tool	14	30	300	400	CW	10
14		Chemical Injection Valve C	CIVC	10243043	1/2"	Rotary Gate	HYDROV	ROV Manipulator	Paddle Tool	14	30	300	400	CW	10
15		Chemical Injection Valve D	CIVD	10243043	1/2"	Rotary Gate	HYDROV	ROV Manipulator	Paddle Tool	14	30	300	400	CW	10
16		Tubing Hanger - Space Test	TH-IT	10243045	1/2"	Rotary Gate	ROV	ROV Manipulator	Paddle Tool	20	51.5	300	400	CW	1/4
17		Surface Controlled Subsurface Safety Valve - Open	SCSSV B	10243045	1/2"	Rotary Gate	ROV	ROV Manipulator	Paddle Tool	20	51.5	300	400	CW	1/4
18		Surface Controlled Subsurface Safety Valve - Close	SCSSV O	10243045	1/2"	Rotary Gate	ROV	ROV Manipulator	Paddle Tool	20	51.5	300	400	CW	1/4
19		Wellhead Seal Test Valve	WSTV	10243045	1/2"	Rotary Gate	ROV	ROV Manipulator	Paddle Tool	20	51.5	300	400	CW	1/4
20	9	Tree Cap Vent	TCV	10243045	1/2"	Rotary Gate	ROV	ROV Manipulator	Paddle Tool	20	51.5	300	400	CW	1/4
21		Tree Cap Crossover	TCX	10243045	1/2"	Rotary Gate	ROV	ROV Manipulator	Paddle Tool	20	51.5	300	400	CW	1/4
22		Tubing Isolation Valve - Open	IMC 1	10243045	1/2"	Rotary Gate	ROV	ROV Manipulator	Paddle Tool	20	51.5	300	400	CW	1/4
23		Tubing Isolation Valve - Close	IMC 2	10243045	1/2"	Rotary Gate	ROV	ROV Manipulator	Paddle Tool	20	51.5	300	400	CW	1/4
24		Intelligent Well Completion - Close	IMC C	10243045	1/2"	Rotary Gate	ROV	ROV Manipulator	Paddle Tool	20	51.5	300	400	CW	1/4
25	2	Tree Cap Test 1	TCT1	10243046	1/2"	Rotary Gate	ROV	ROV Manipulator	Paddle Tool	20	51.5	300	400	CW	1/4
26		Tree Cap Test 2	TCT2	10243046	1/2"	Rotary Gate	ROV	ROV Manipulator	Paddle Tool	20	51.5	300	400	CW	1/4
27	2	Flow Sampling Valve 1	FSV1	10243047	1"	Gate	ROV	ISO 15628-3 Class 4	Class 4 Torque Tool	180	180	270	350	CW	3.3
28		Flow Sampling Valve 2	FSV2	10243047	1"	Gate	ROV	ISO 15628-3 Class 4	Class 4 Torque Tool	180	180	270	350	CW	3.3

TYPE 3 Use as is (if possible)

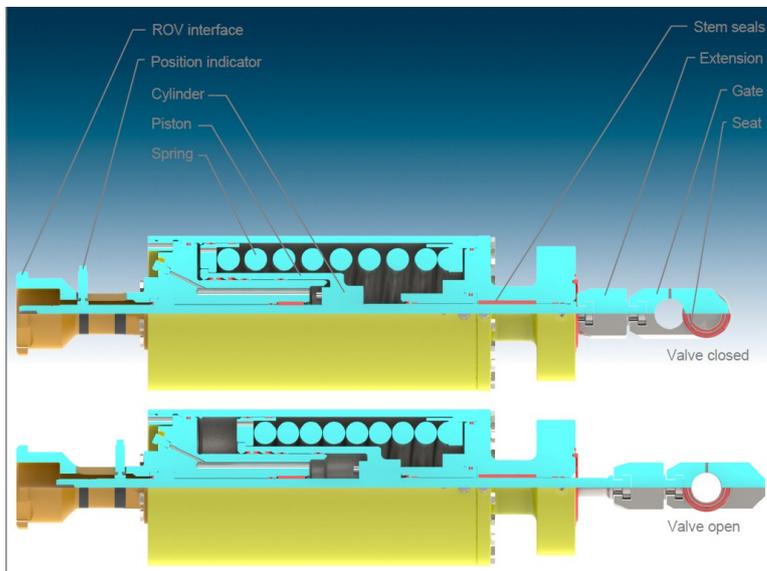
VALVE TORQUE LIST	10003313257	AO-100-40-S001-002601	10216746
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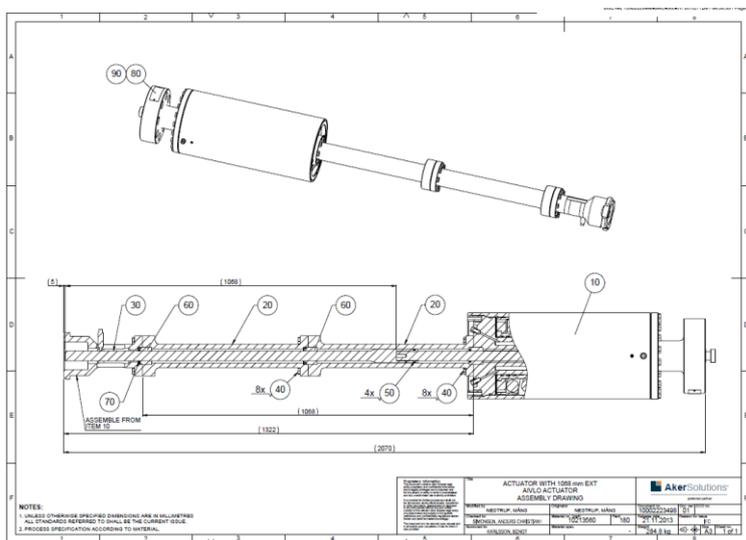
6.3.6.1 Valve cross section 2 1/16" actuator valve



2 1/16 " Actuator valve kit	10002085680	N/A	10201562
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**TYPE 5 Drawing as is + colouring**

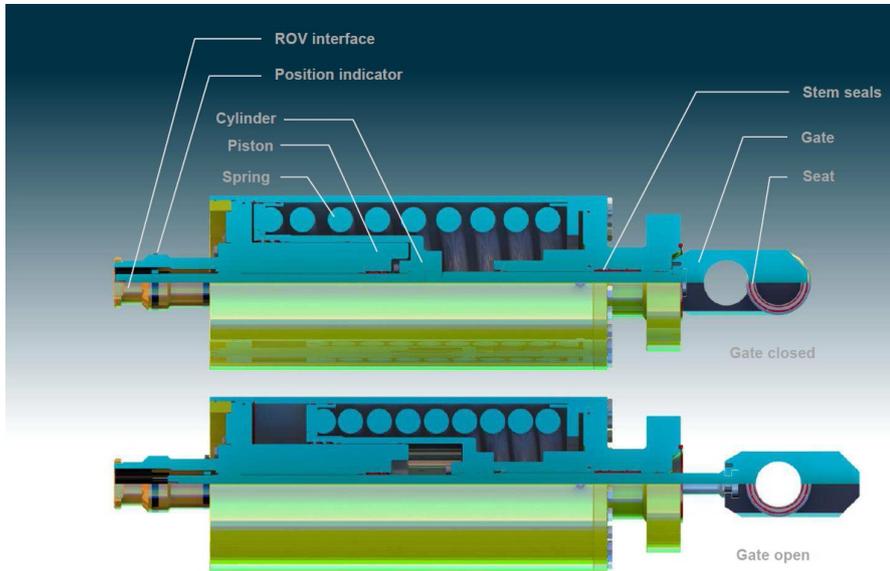
6.3.6.2 Valve cross section AIVLO ACTUATOR



AIVLO ACTUATOR	10002223498	N/A	10213560
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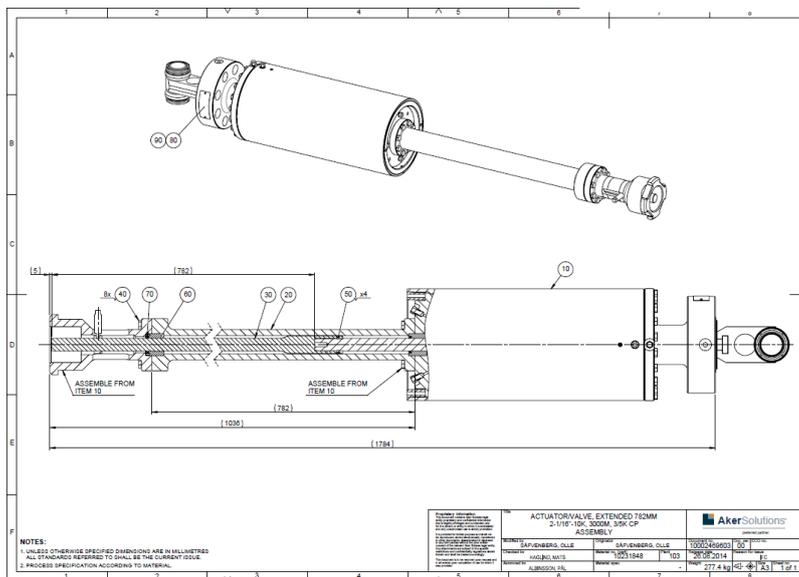
**TYPE 5 Drawing as is + colouring**

6.3.6.3 Valve cross section 5 1/8" Gate valve



5 1/8" Gate valve	10002667112	N/A	10219215
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6.3.6.4 Valve cross section 2-1/16" – 10k Actuator valve



2-1/16" – 10k Actuator valve	10002469603	N/A	10231848
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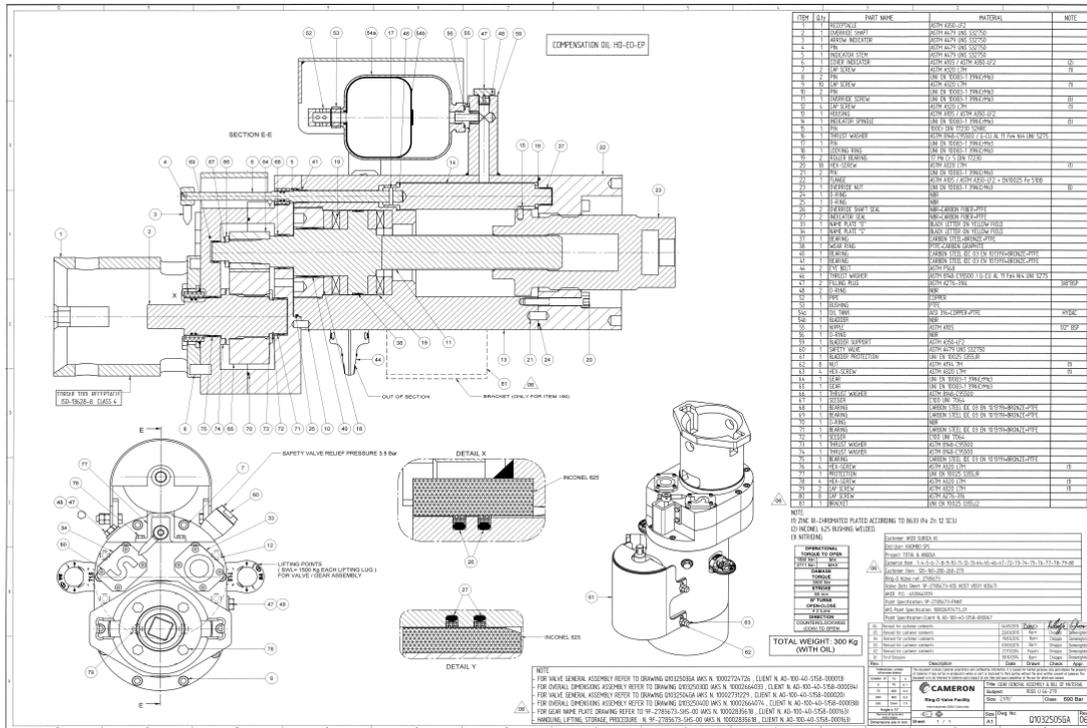
**TYPE 3 Use as is (if possible)**

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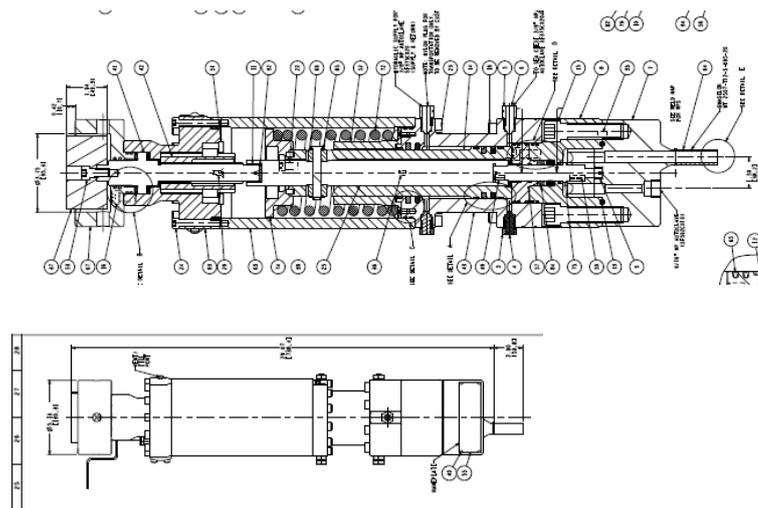
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6.3.6.5 Valve cross section 2-1/16"



Gear 2-1/16" 690 Bar	10002666788	AO-100-40-S158-000028	10237878
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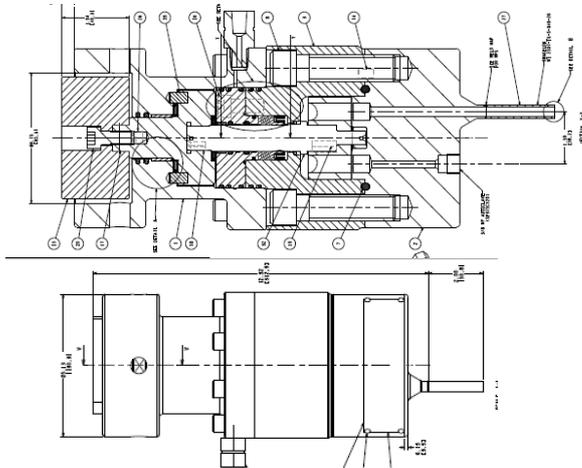
6.3.6.6 Valve cross section 1/2" Rotary Gate valve



1/2" Rotary gate valve	10002860051	AO-100-40-S104-000057	10243043
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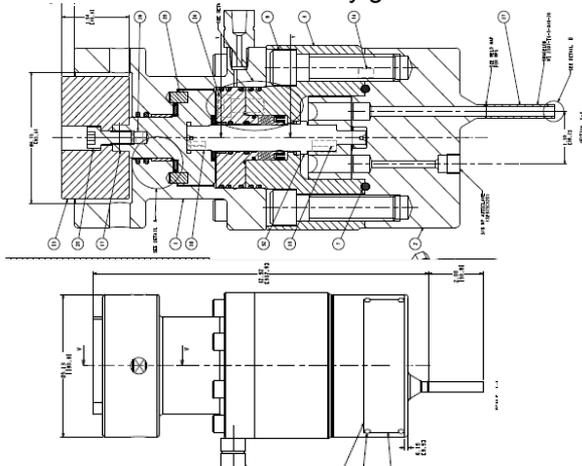
TYPE 3 Use as is (if possible)

6.3.6.7 Valve cross section 1/2" Rotary gate



1/2" Rotary gate valve	10002860077	AO-100-40-S104-000058	10243045
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Valve cross section 1/2" Rotary gate

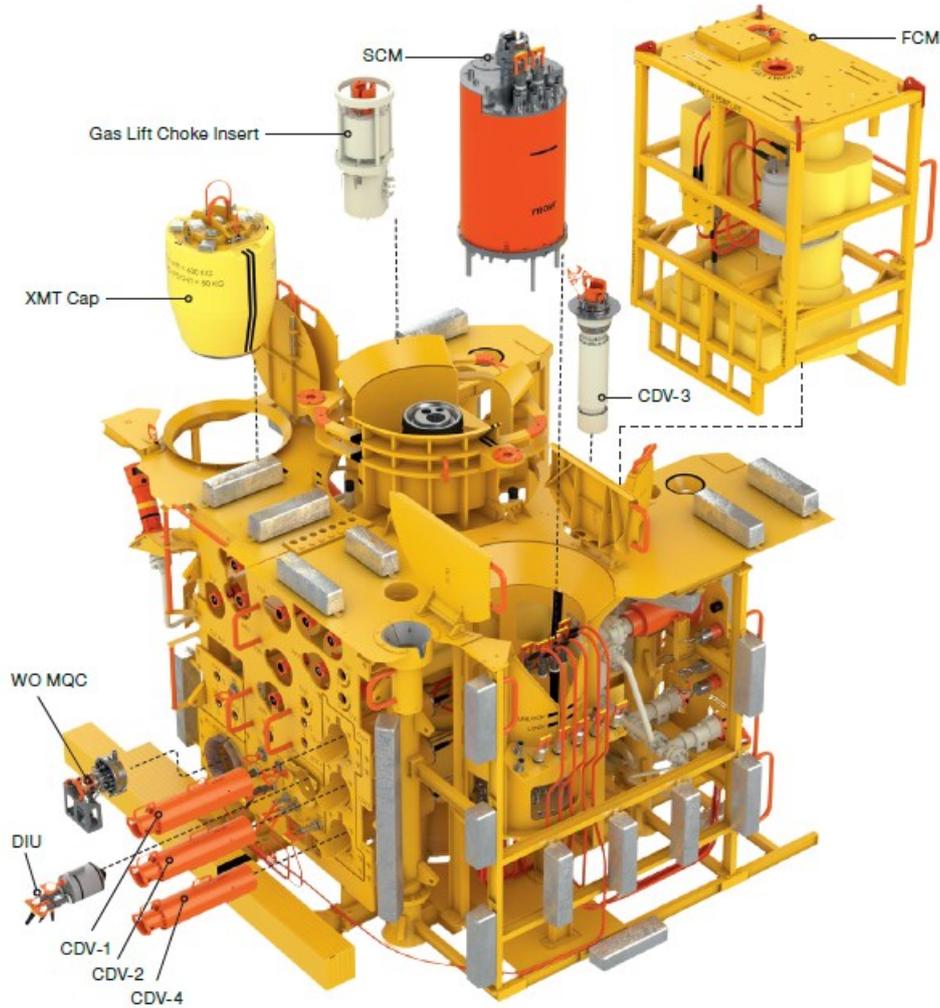


1/2" Rotary gate valve	10002908065	AO-100-40-S104-000117	10243046
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**TYPE 3 Use as is (if possible)**

### 6.3.7 Production PVXT Retrievable Components ISO overview

X-vision to create illustration



Retrievable Components				Tools	
Description	Material Number	Est. Weight in Air	Est. Weight in Water	Description	Material Number
Flow Control Module (FCM)	10191325	6500 kg	4600 kg	FCM RT	10193719
CDV-1 (SkoFlo LF CDV)	10197181	110 kg	93 kg	Torque Tool Cl. 4	10193775
CDV-2 (SkoFlo Dummy CDV)	10039684	80 kg	68 kg	Torque Tool Cl. 4	10193775
CDV-3 (Cameron HF CDV)	10182869	330 kg	250 kg	Torque Tool Cl. 4	10193775
CDV-4 (SkoFlo LF CDV)	10162546	72 kg	61 kg	Torque Tool Cl. 4	10193775
Subsea Control Module (SCM)	10189793	2136 kg	1816 kg	SCM RT	10193761
Gas Lift Choke Insert	10183526	335 kg	285 kg	Choke Insert RT	10193721
XMT Cap	10208876	598 kg	50 kg	N/A	N/A
DIU	10189835	70 kg	61 kg	N/A	N/A
WO MQC	10202387	71 kg	61 kg	Torque Tool Cl. 4	10193775

**TYPE 1B Glossy 3-D rendering quality like example**





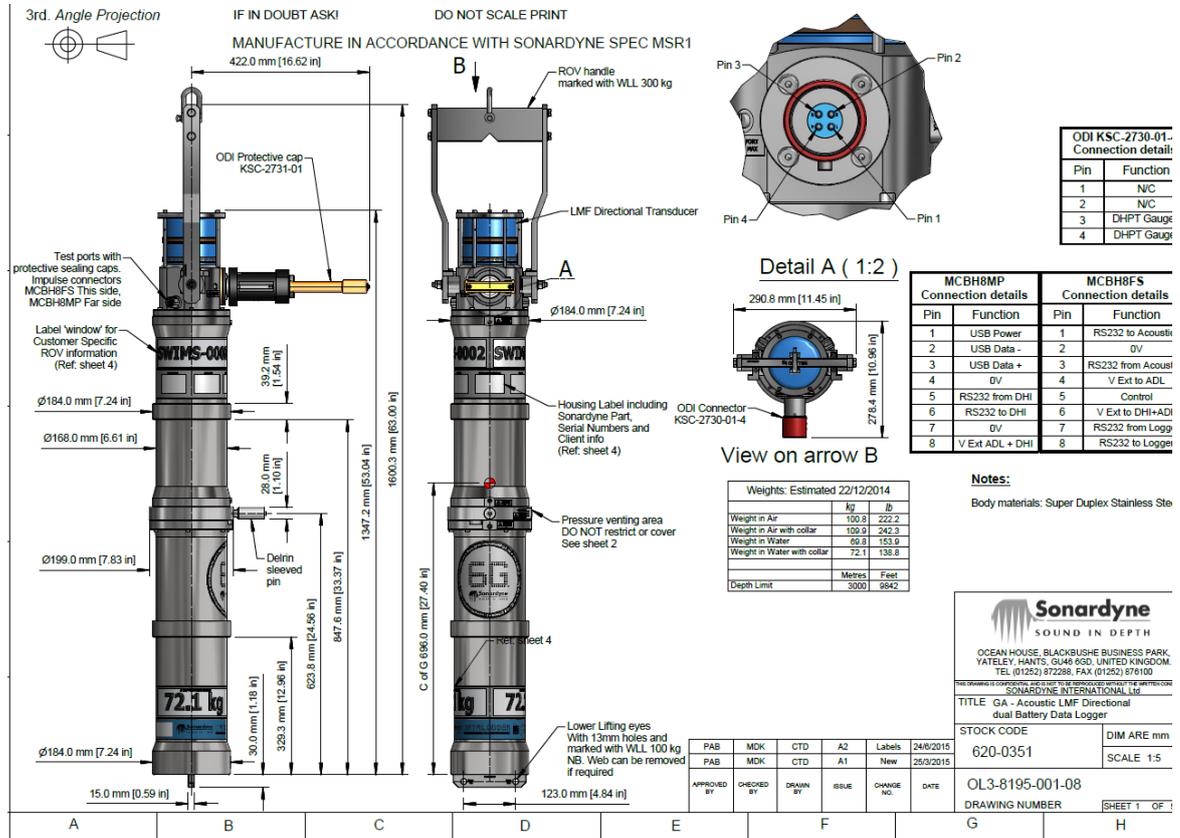


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6.3.7.2 SWIMS Maintain page as per CPY email.



SWIMS SUBSEA UNIT GA	10002523378	AO-100-44-S001-000316	10242310
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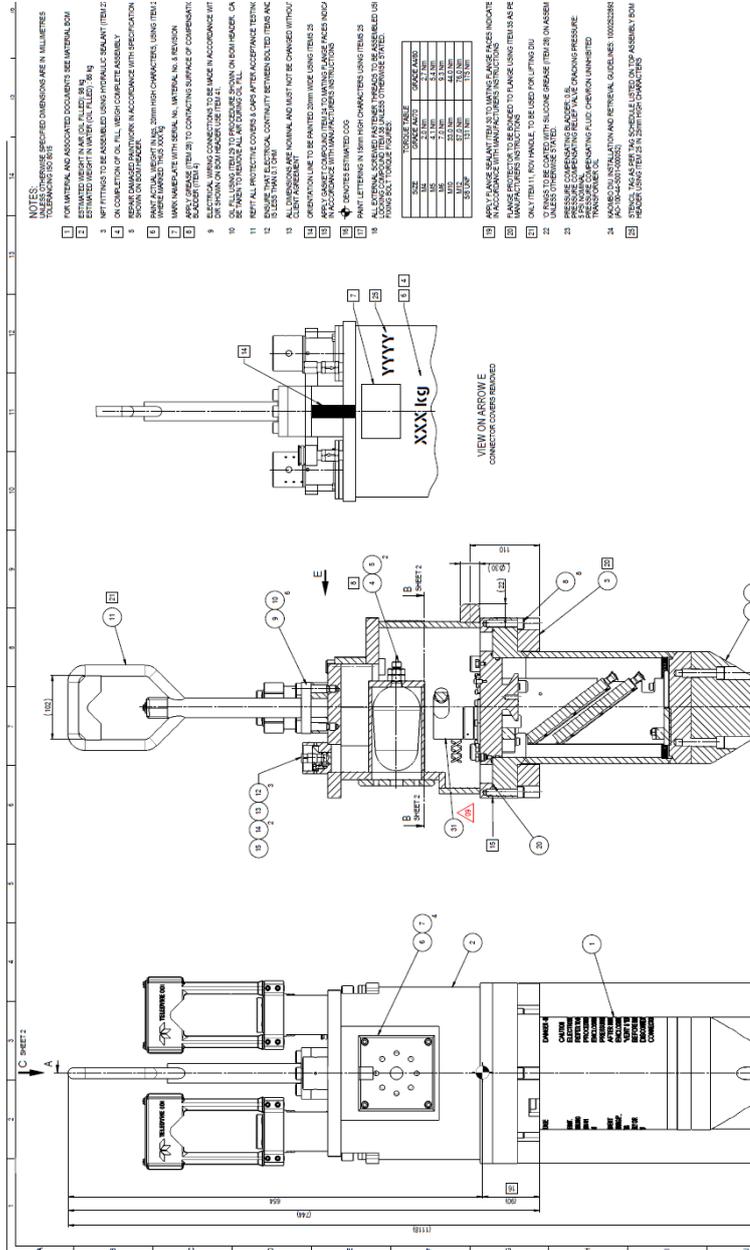
TYPE 3 Use as is (if possible)

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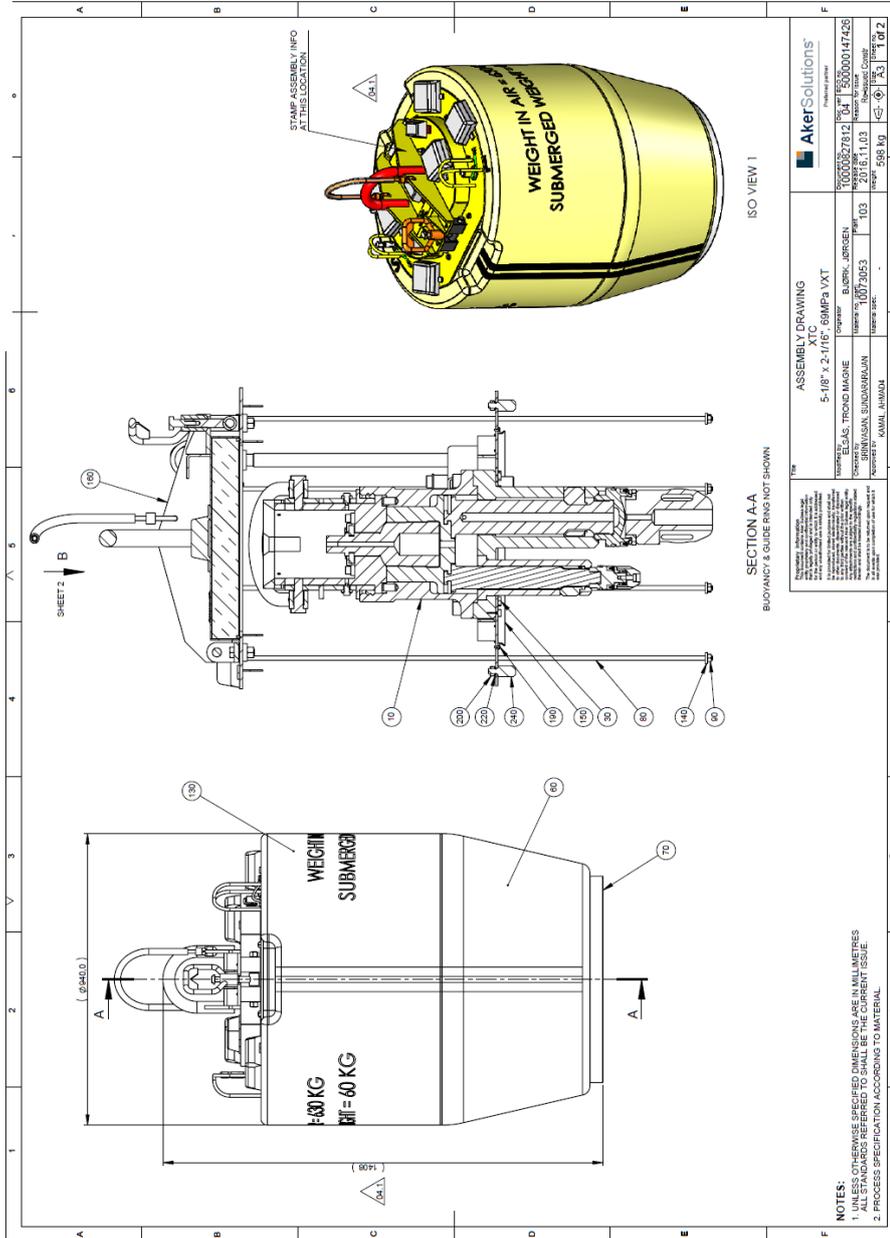
6.3.7.3 DIU Maintain page as per CPY email.



DIU GA	10002522891	AO-100-44-S001-000050	10232299
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**TYPE 3 Use as is (if possible)**

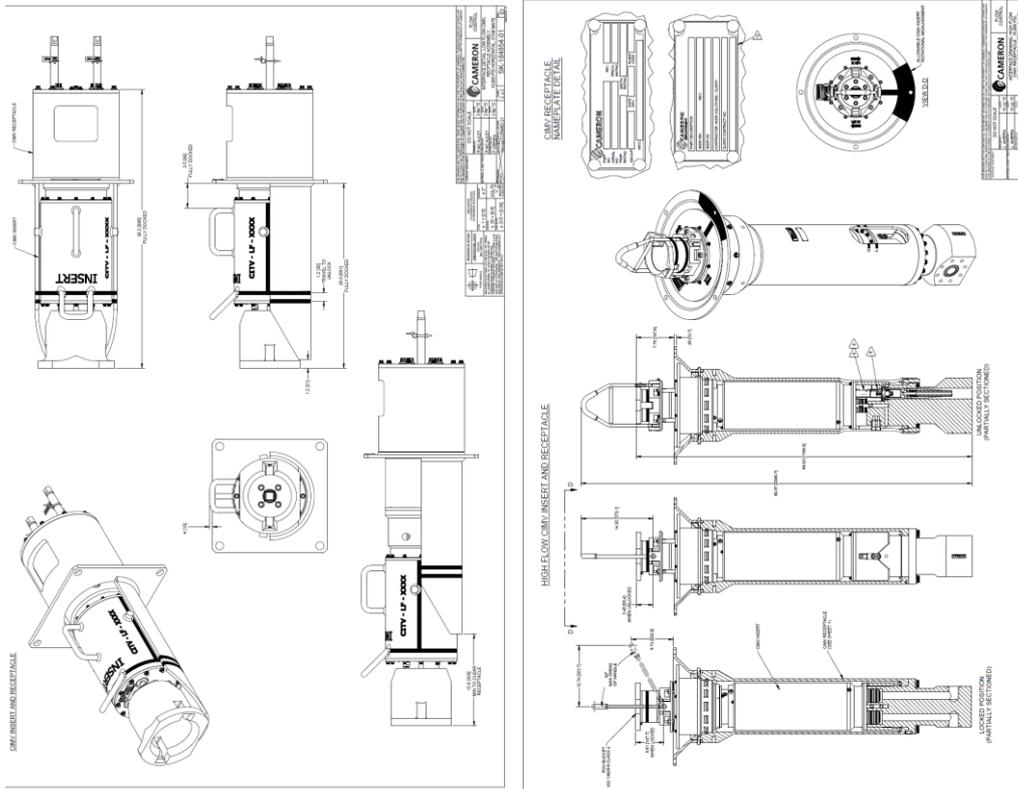
6.3.7.4 XTC CAP



XTC ASSEMBLY DRAWING	10000827812	N/A	10073053
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**TYPE 3 Use as is (if possible)**

6.3.7.5 CITV LF & CITV HF

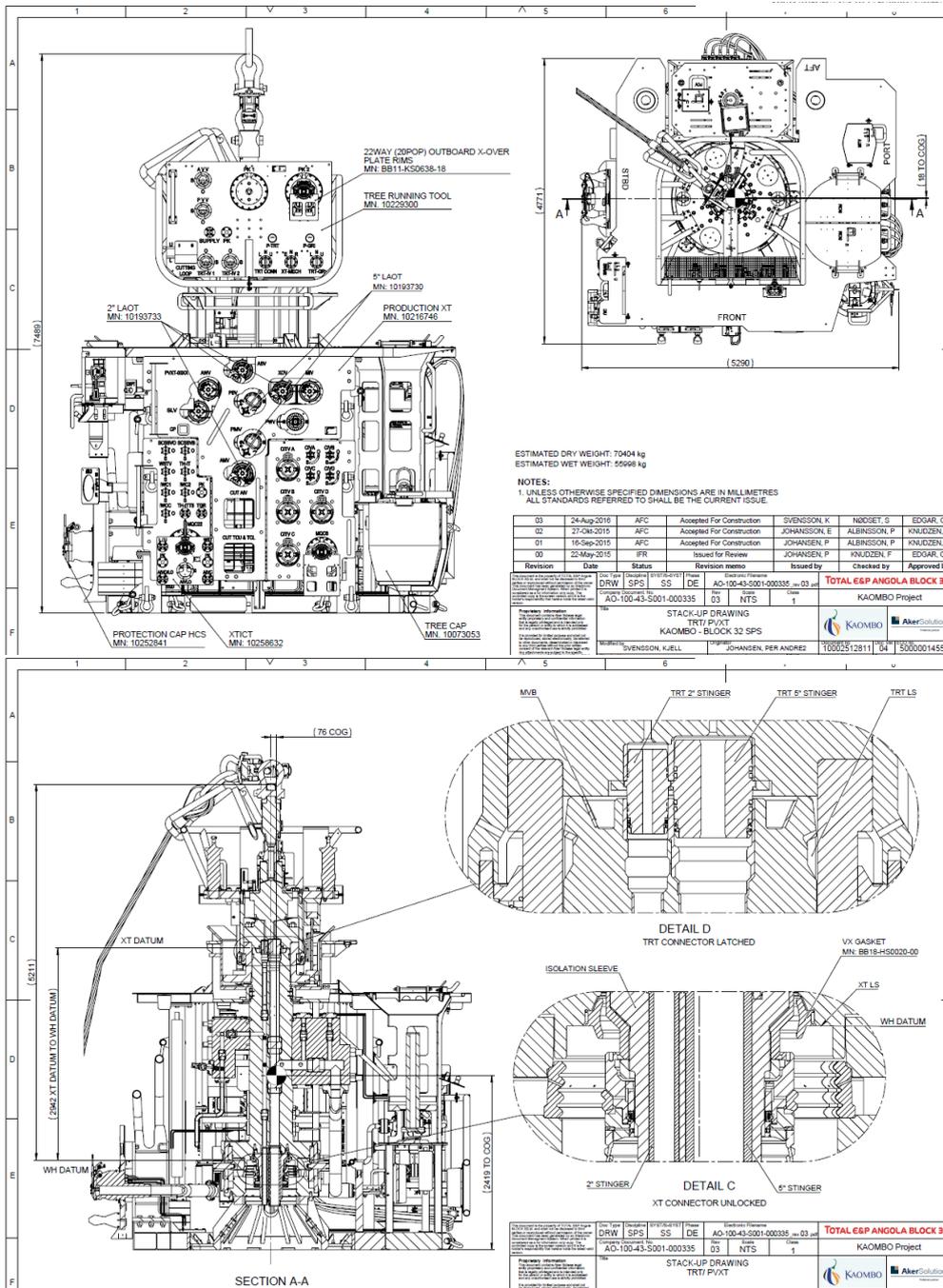


CITV LF GA / Interface Drawing	10002829755	AO-100-44-S184-000011	10234014
CITV HF GA / Interface Drawing	10002522864	AO-100-44-S184-000002	10234113

**TYPE 5 Drawing as is + colouring**

### 6.3.8 PVXT STACK-UP

#### 6.3.8.1 TRT & VXT



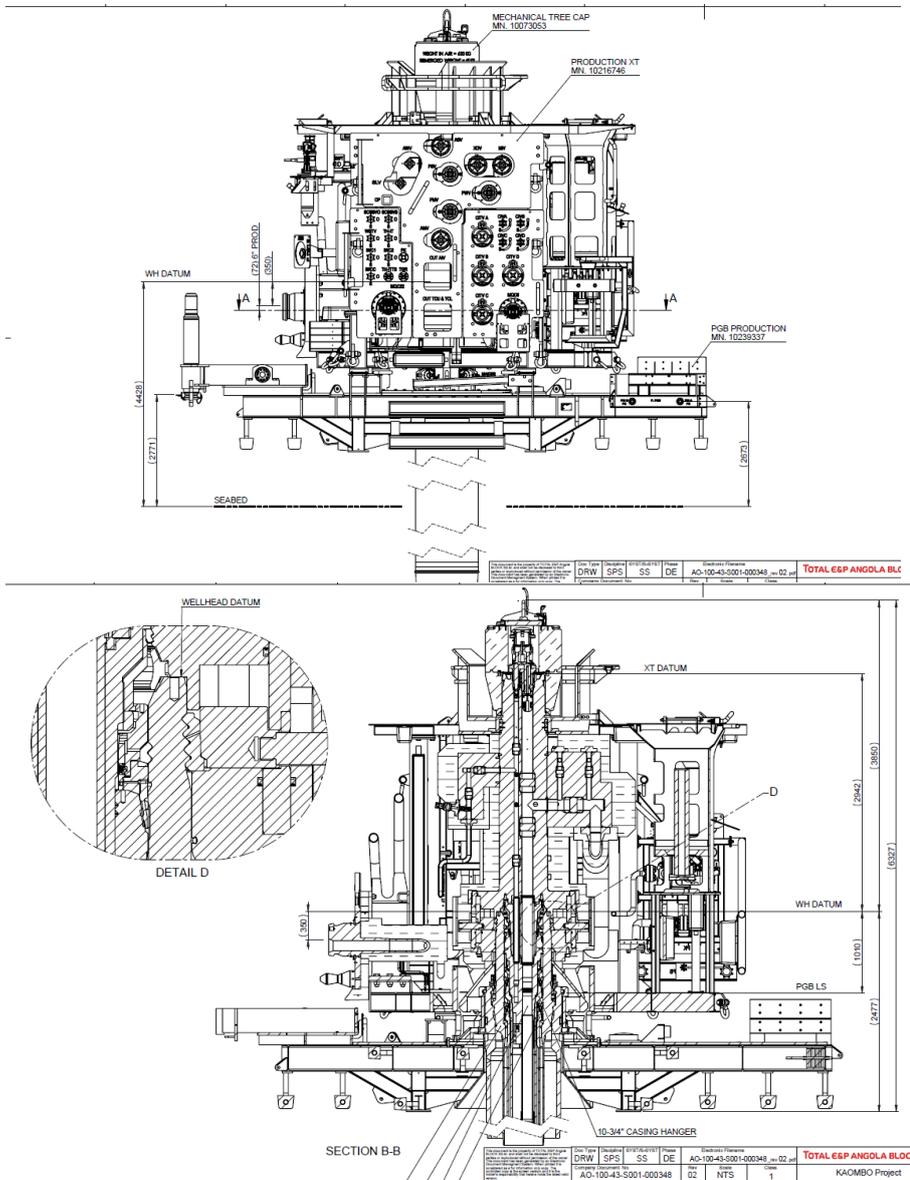
STACK-UP DRAWING TRT/ PVXT	10002512811	AO-100-43-S001-000335	10216746 10229300 10249252
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**TYPE 3 Use as is (if possible)**

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6.3.8.2 TH/WH/PGB/TREE CAP



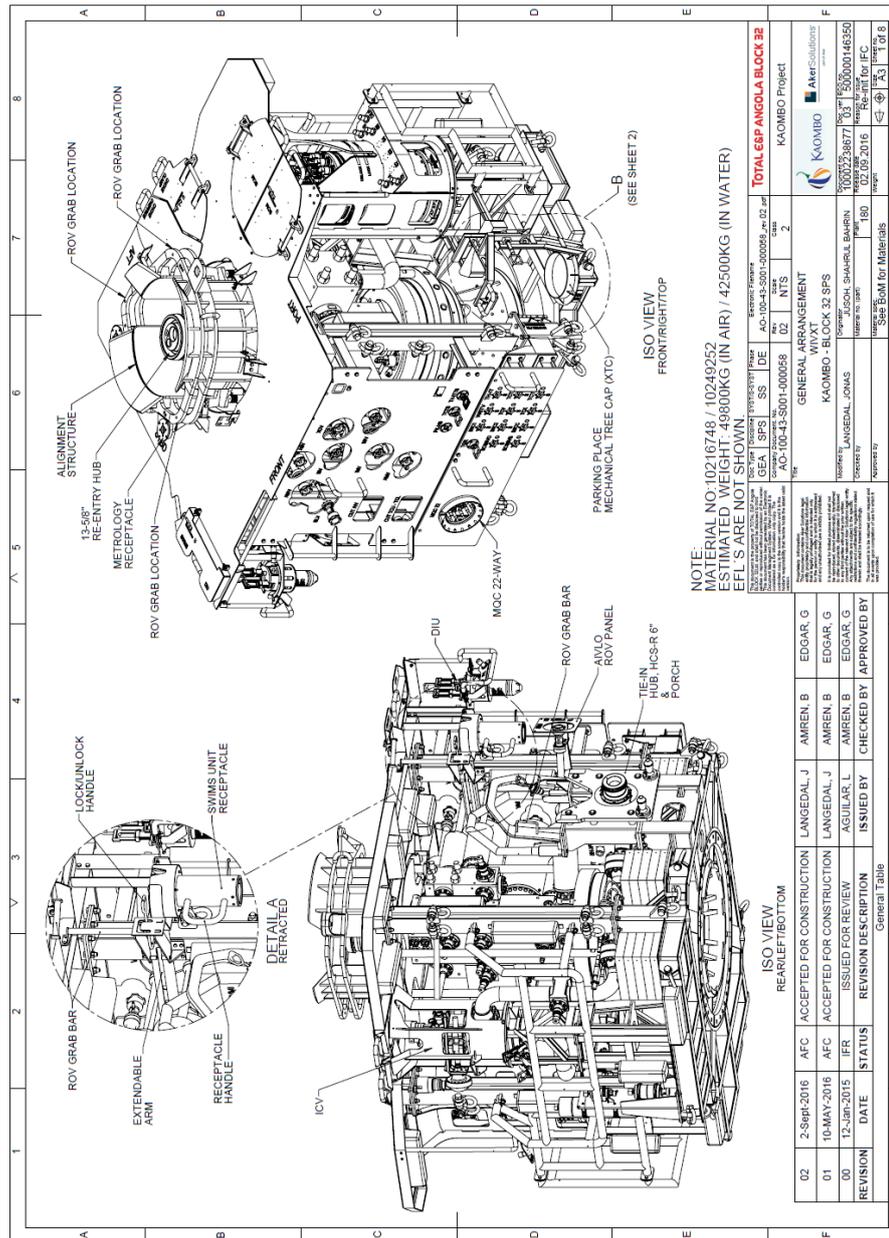
STACK-UP DRAWING, PVXT	10002512824	AO-100-43-S001-000348	10073053 10216746 10216771 10239337
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**TYPE 3 Use as is (if possible)**

## 6.4 Water Injection VXT

Include same comments as done for Production VXT

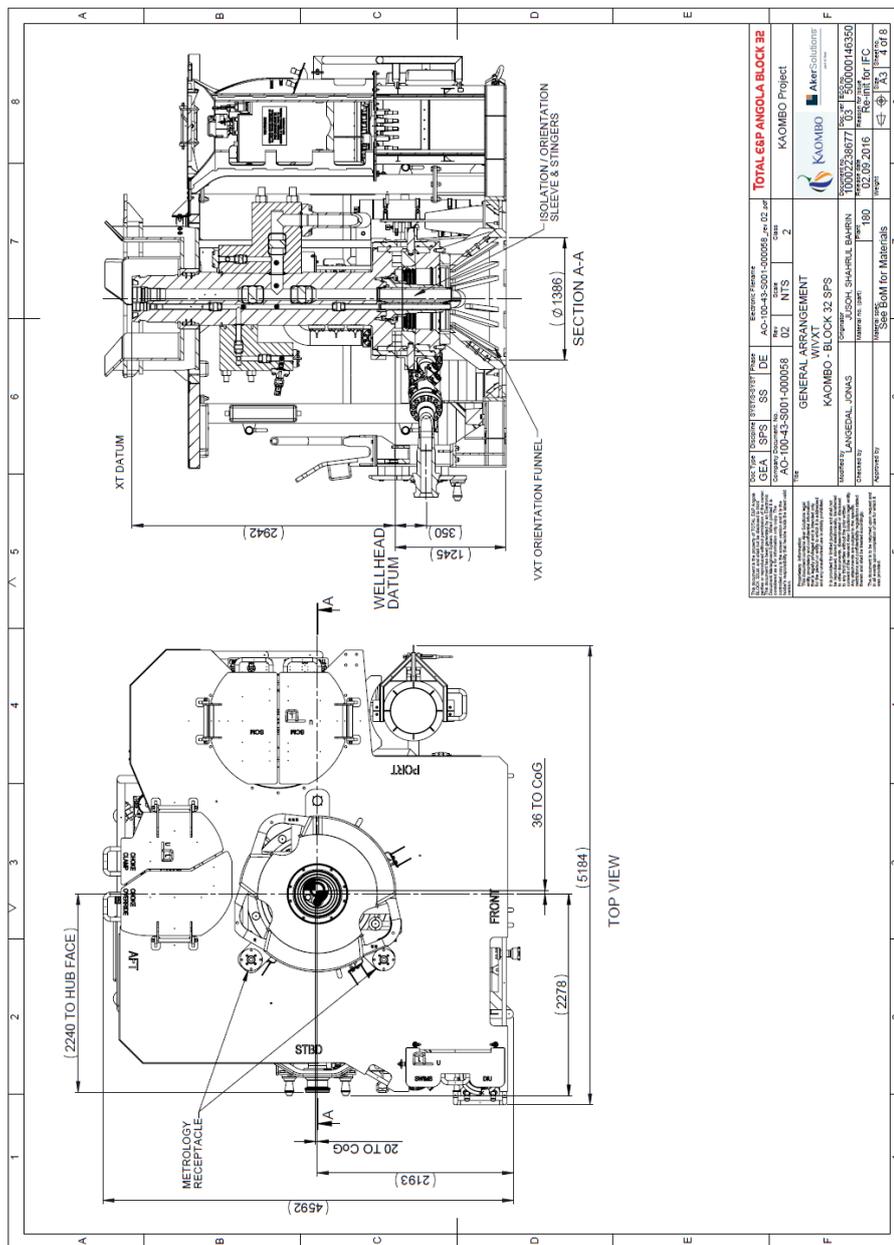
### 6.4.1 WI VXT ISO VIEW



WI XMT GA Tranby	10002238677	AO-100-43-S001-000058	10216748
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**TYPE 1C Glossy 3-D rendering quality with description/details like GA**

### 6.4.2 WI VXT DIMENSIONS

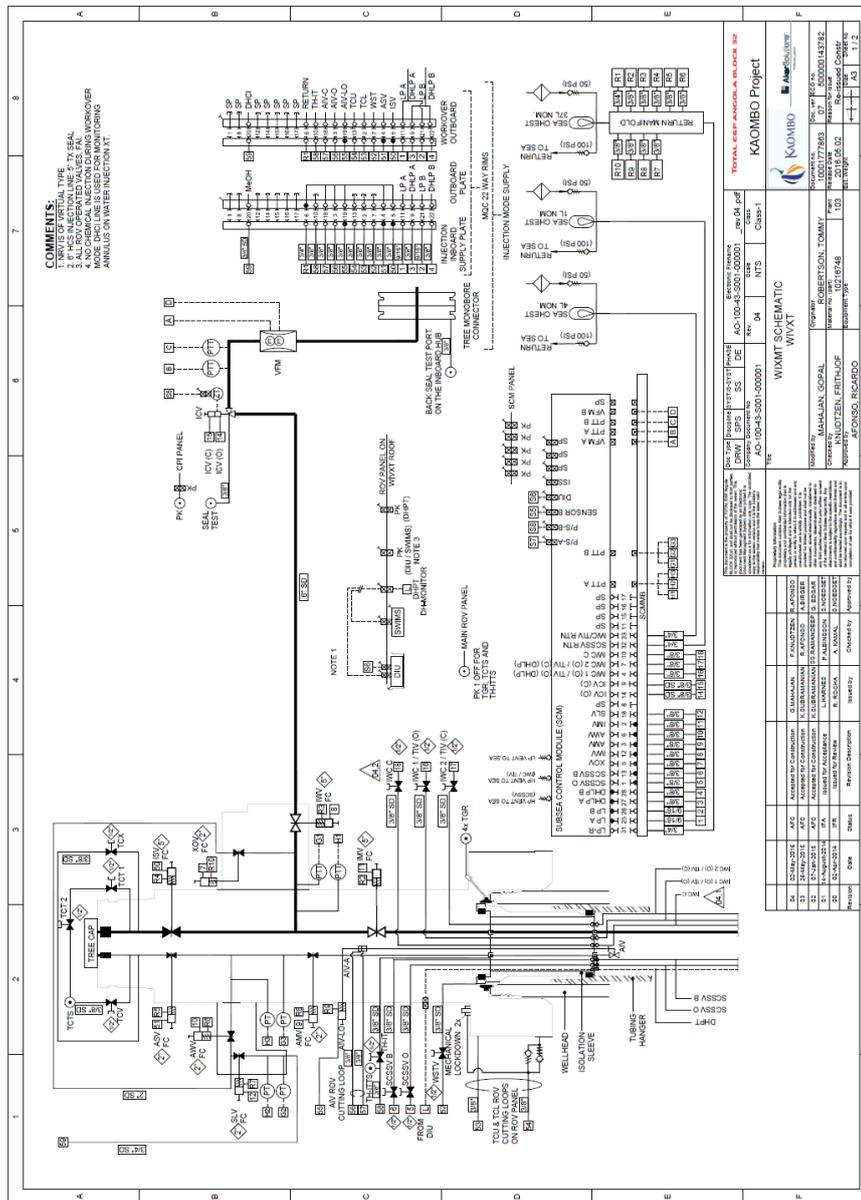


SECTION: KAOMBO SPS PROJECT: AO-100-43-S001-000058 SHEET: 02 OF 02 DATE: 02.09.2016 DRAWN BY: LAURENCE JONAS CHECKED BY: JACQUES SHARUKA BAMPIN APPROVED BY:		TOTAL 6SP ANGOLA BLOCK 32 KAOMBO Project Aker Solutions	
GENERAL ARRANGEMENT KAOMBO - BLOCK 32 SPS WYXT		10002238677 500000146350 180 14.08.8	
METROLOG RECEPTACLE PORT FRONT		METROLOG RECEPTACLE FOR IFC METROLOG RECEPTACLE FOR IFC METROLOG RECEPTACLE FOR IFC	

WI XMT GA	10002238677	AO-100-43-S001-000058	10216748 10249252
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**TYPE 3 Use as is (if possible)**

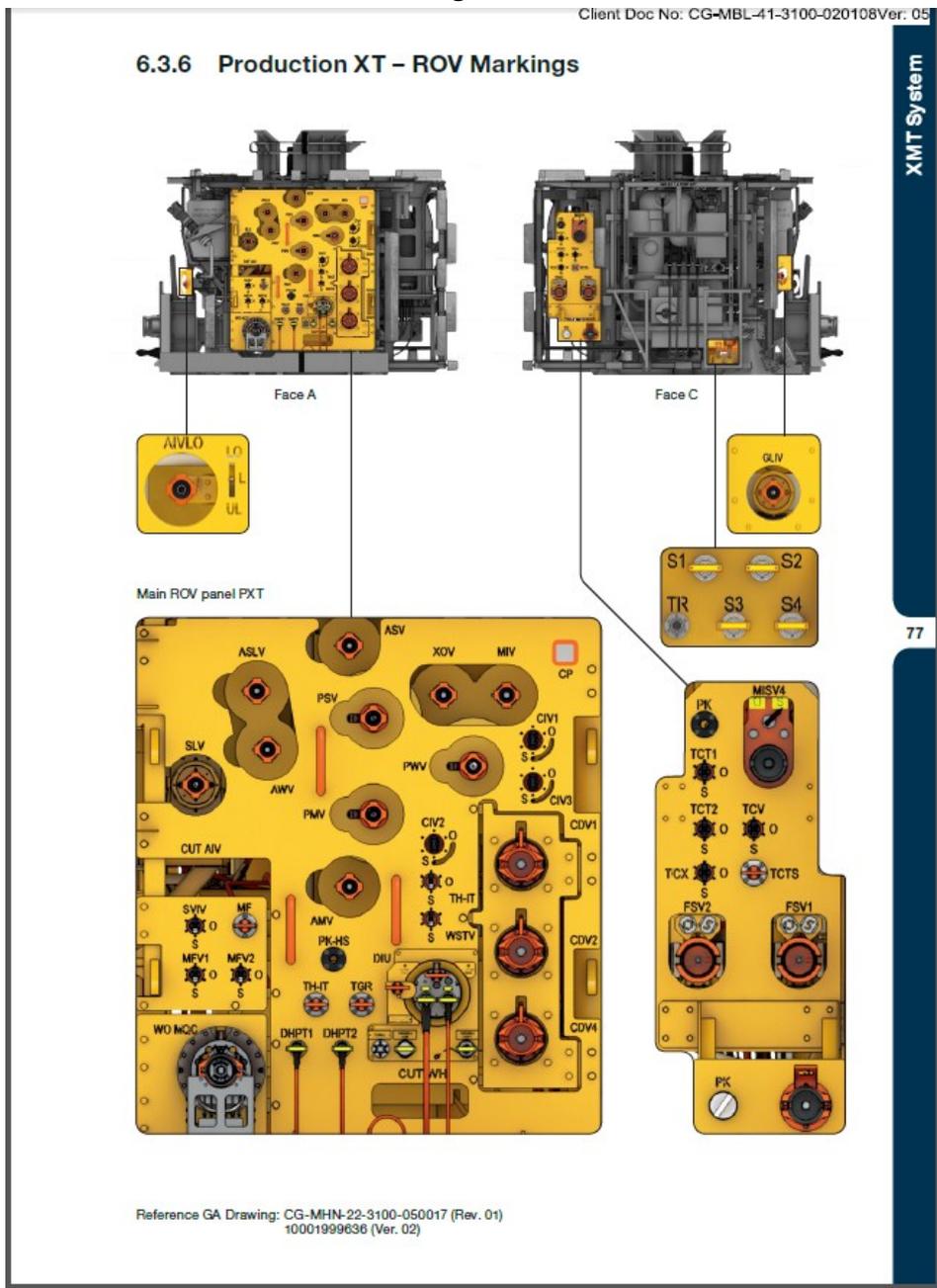
### 6.4.3 Water Injection VXT Schematic



WI XMT SCHEMATIC PVXT	10001777863	AO-100-43-S001-000001	10216748 10249252
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TYPE 3 Use as is (if possible)

### 6.4.4 WI VXT ROV Panel & Markings



WI XMT GA	10002238677	AO-100-43-S001-000058	10216748 10249252
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**TYPE 1B Glossy 3-D rendering quality like example**

### 6.4.5 WI VXT Valves

XMT System

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 Client Doc No: CG-MBL-41-3100-020108Ver: 05

#### 6.3.5 Production XT Valves

Description	Functional Use/ ROW Marking	Soft Tag (IBS)	Fail Safe	Material Number	Valve Data Sheet	Valve Type	Actuation	Supplier	Qty for VXT
<b>Production XMT</b>									
5-1/8" Valve	PWV, PMV, PSV	K-PWV-P***, K-PMV-P***	FSC	10116148	10001346450	Gate	Hydraulic	AKSO	3
2-1/16" Valve	AMV, XOV, MW, ASV	K-AMV-P***, K-PSLV-P***, K-CVA-P***, N/A	FSC	10199044	10001346427	Gate	Hydraulic	AKSO	4
2-1/16" Valve	AWV, ASLV	K-AWV-P***, K-ASLV-P***	FSC	10198311	10001346427	Gate	Hydraulic	AKSO	2
2-1/16" Valve	GLV, SLV	K-GLV-P***, K-SLV-P***	FSC	10117136	10001346427	Gate	Hydraulic	AKSO	2
2-1/16" Valve	AM	N/A	FAI	10191546 (Valve), 10080098 (Actuator)	10003023229	Plug	Hydraulic	AKSO	1
2-1/16" Valve	MSV4	N/A	NA	10180278	CG-MHN-25-3110-689032 (10002716064)	Gate	ROV	PV	1
2" Valve	COV3	K-RODA-P***	FAI	10182969	CG-MHN-25-3100-060262 (10001958051)	Mixing/Throttling Valve	Electric	Cameron	1
1" Valve	FSV1, FSV2	K-FSV1-P***, K-FSV2-P***	FSC	10191900	CG-MHN-25-3110-912049 (10002402655)	Gate	Hydraulic with ROV override	Cameron	2
3/4" Valve	COV1, COV2, COV4	K-RODA-P***, K-RODS-P***, K-RODD-P***	FAI	10197181 (COV1), 10059684 (COV2), 10162546 (COV4)	10002205625 / 10002205902 / 10002205967	Mixing/Throttling Valve	Electric	Silo Flo	3
1/2" Valve	CV1, CV3	K-CVB-P***, K-CVD1-P***	FSC	10180527	CG-MHN-25-3110-186010 (10002197428)	Rotary Gate w/ Integral Check Valve	Hydraulic with ROV override	Bentley	2
1/2" Valve	CV2	K-CVD2-P***	FSC	10180526	CG-MHN-25-3110-186009 (10002197428)	Rotary Gate w/ Integral Check Valve	Hydraulic with ROV override	Bentley	1
1/2" Valve	SWV	N/A	NA	10180525	CG-MHN-25-3110-186008 (10002197427)	Rotary Gate	ROV	Bentley	1
1/2" Valve	TCT1, TCV, TCV, MFV1, MFV2, TCT2	N/A	NA	10180524	CG-MHN-25-3110-186007 (10002197428)	Rotary Gate	ROV	Bentley	6
1/2" Valve	TH-IT, WSTV	N/A	NA	10180523	CG-MHN-25-3110-186006 (10002197425)	Rotary Gate	ROV	Bentley	2

Note: \*\*\* is well sagging (for example: PWV-41)

Material Number: 10199844 (Master Valve Block), 10191552 (Production Wing Block), 10191586 (Annulus Wing Block)

Reference GA Drawing: CG-MHN-25-3100-050017 (Rev. 01) 10001999008 (Ver. 02)

WI XMT GA	10002238677	AO-100-43-S001-000058	10216748 10249252
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**TYPE 1B Glossy 3-D rendering quality like example**

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6.4.6 WI VXT Valve torque list

MISV  
 CIV a,b,c,d  
 IWC 1,2  
 IWC C

Item No	QTY	Valve Name	ROV ID	S&P Material Nr.	Nominal Valve Size	Valve Type	Actuation	ROV Interface	ROV Tool	Running Torque (Nm)	Break Out Torque (Nm)	Max Torque (Nm)	Damage Torque (Nm)	Closing direction (CW / CCW) # Clockwise or CCW #	Approx. number of Turns to Open or Close
1		Crossover Valve	XOV	10201562	2-1/16"	Gate	HYDROV	ISO 13628-8 Linear Push Type "x"	LAOT & LOT	N/A	N/A	N/A	N/A	N/A	N/A
2	3	Annulus Master Valve	AMV	10201562	2-1/16"	Gate	HYDROV	ISO 13628-8 Linear Push Type "x"	LAOT & LOT	N/A	N/A	N/A	N/A	N/A	N/A
3		Annulus Swap Valve	ASV	10201562	2-1/16"	Gate	HYDROV	ISO 13628-8 Linear Push Type "x"	LAOT & LOT	N/A	N/A	N/A	N/A	N/A	N/A
4	1	Annulus Injection Valve - Lock Out	AMLO	10213560	N/A	N/A	HYDROV	ISO 13628-8 Linear Push Type "x"	LAOT & LOT	N/A	N/A	N/A	N/A	N/A	N/A
5		Injection Master Valve	IMV	10219215	5-1/8"	Gate	HYDROV	ISO 13628-8 Linear Push Type "x"	LAOT & LOT	N/A	N/A	N/A	N/A	N/A	N/A
6	3	Injection Wing Valve	IWV	10219215	5-1/8"	Gate	HYDROV	ISO 13628-8 Linear Push Type "x"	LAOT & LOT	N/A	N/A	N/A	N/A	N/A	N/A
7		Injection Swap Valve	ISV	10219215	5-1/8"	Gate	HYDROV	ISO 13628-8 Linear Push Type "x"	LAOT & LOT	N/A	N/A	N/A	N/A	N/A	N/A
8	2	Annulus Wing Valve	AWV	10231848	2-1/16"	Gate	HYDROV	ISO 13628-8 Linear Push Type "x"	LAOT & LOT	N/A	N/A	N/A	N/A	N/A	N/A
9		Service Line Valve	SLV	10231848	2-1/16"	Gate	HYDROV	ISO 13628-8 Linear Push Type "x"	LAOT & LOT	N/A	N/A	N/A	N/A	N/A	N/A
10		Tubing Isolation Valve - Open	IWC 1	10243045	1/2"	Rotary Gate	ROV	ROV Manipulator	Paddle Tool	20	51.5	300	400	CW	1/4
11		Tubing Isolation Valve - Close	IWC 2	10243045	1/2"	Rotary Gate	ROV	ROV Manipulator	Paddle Tool	20	51.5	300	400	CW	1/4
12		Intelligent Well Completion - Close	IWC C	10243045	1/2"	Rotary Gate	ROV	ROV Manipulator	Paddle Tool	20	51.5	300	400	CW	1/4
13		Tubing Hanger - Space Test	THT	10243045	1/2"	Rotary Gate	ROV	ROV Manipulator	Paddle Tool	20	51.5	300	400	CW	1/4
14	9	Surface Controlled Subsurface Safety Valve - Balance	SCSSV_B	10243045	1/2"	Rotary Gate	ROV	ROV Manipulator	Paddle Tool	20	51.5	300	400	CW	1/4
15		Surface Controlled Subsurface Safety Valve - Open	SCSSV_O	10243045	1/2"	Rotary Gate	ROV	ROV Manipulator	Paddle Tool	20	51.5	300	400	CW	1/4
16		Wellhead Seal Test Valve	WSTV	10243045	1/2"	Rotary Gate	ROV	ROV Manipulator	Paddle Tool	20	51.5	300	400	CW	1/4
17		Tree Cap Vent	TCV	10243045	1/2"	Rotary Gate	ROV	ROV Manipulator	Paddle Tool	20	51.5	300	400	CW	1/4
18		Tree Cap Crossover	TCK	10243045	1/2"	Rotary Gate	ROV	ROV Manipulator	Paddle Tool	20	51.5	300	400	CW	1/4
19		Tree Cap Test 1	TCT1	10243046	1/2"	Rotary Gate	ROV	ROV Manipulator	Paddle Tool	20	51.5	300	400	CW	1/4
20	2	Tree Cap Test 2	TCT2	10243046	1/2"	Rotary Gate	ROV	ROV Manipulator	Paddle Tool	20	51.5	300	400	CW	1/4

VALVE TORQUE LIST	10003313257	AO-100-40-S001-002601	10216748 10249252
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TYPE 3 Use as is (if possible)

### 6.4.7 WI VXT Retrievable Components X-vision to create illustration

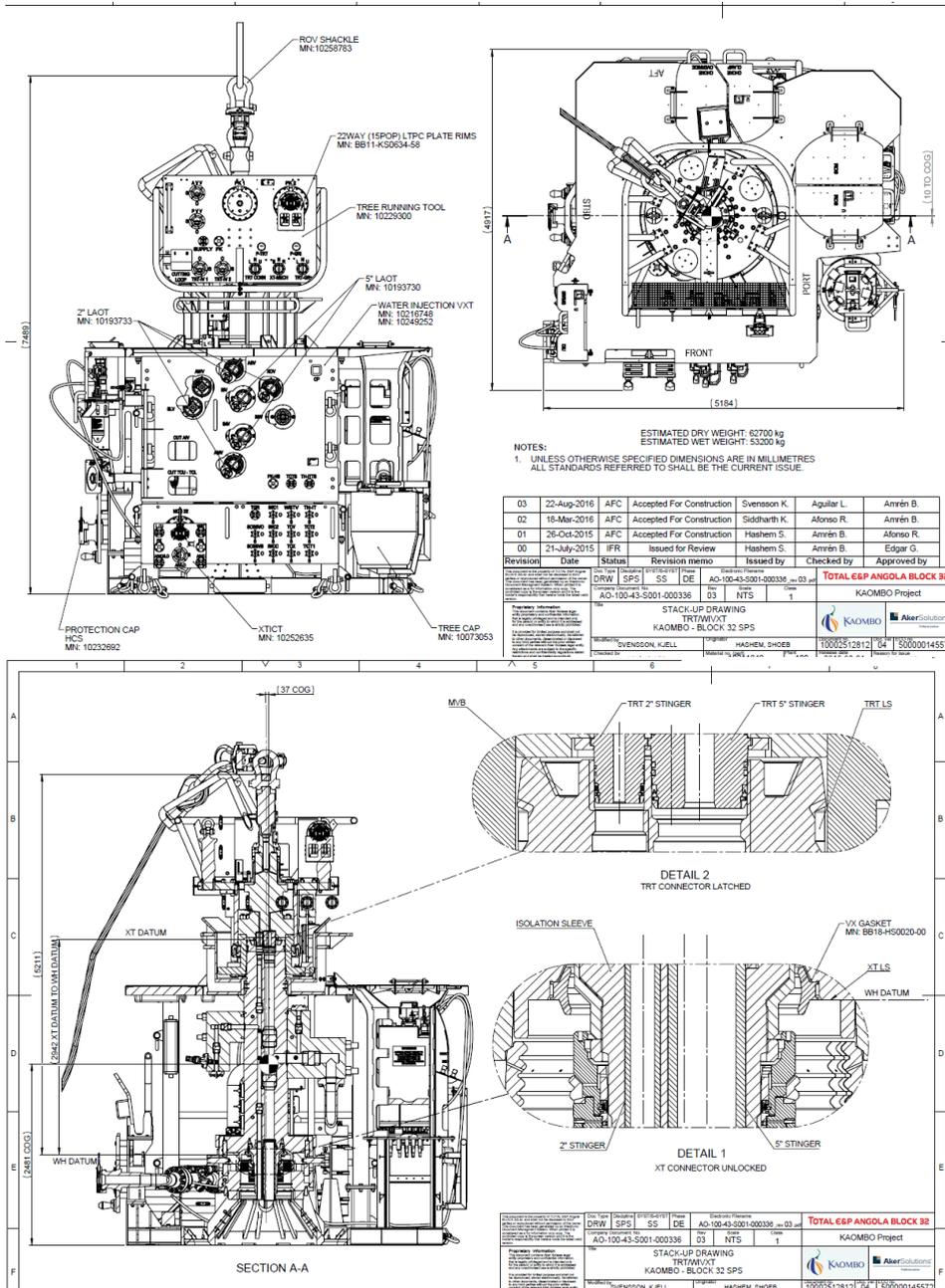


Retrievable Components				Tools	
Description	Material Number	Est. Weight in Air	Est. Weight in Water	Description	Material Number
Flow Control Module (FCM)	10191326	5400 kg	4700 kg	FCM RT	10193719
Subsea Control Module (SCM)	10189793	2136 kg	1816 kg	SCM RT	10193761
XMT Cap	10208876	598 kg	50 kg	N/A	N/A
DIU	10189835	70 kg	61 kg	N/A	N/A
WO MQC	10202387	71 kg	61 kg	Torque Tool Cl. 4	10193775

**TYPE 1B Glossy 3-D rendering quality like example**

### 6.4.8 WI VXT STACK-UP

#### 6.4.8.1 TRT / WIVXT



TRT/WIVXT	10002512812	AO-100-43-S001-000336	10216746 10229300
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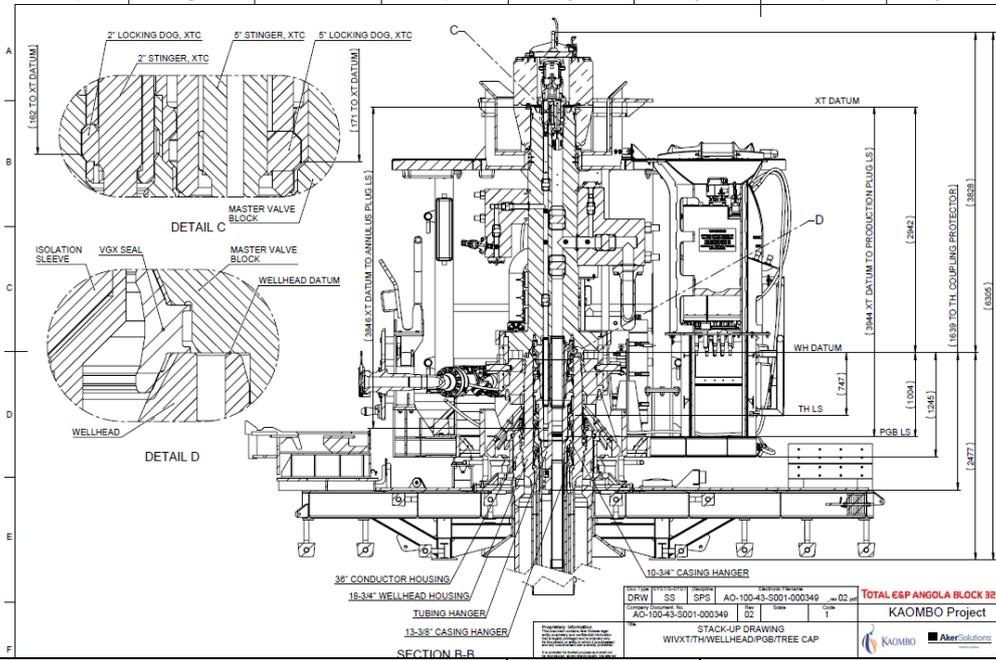
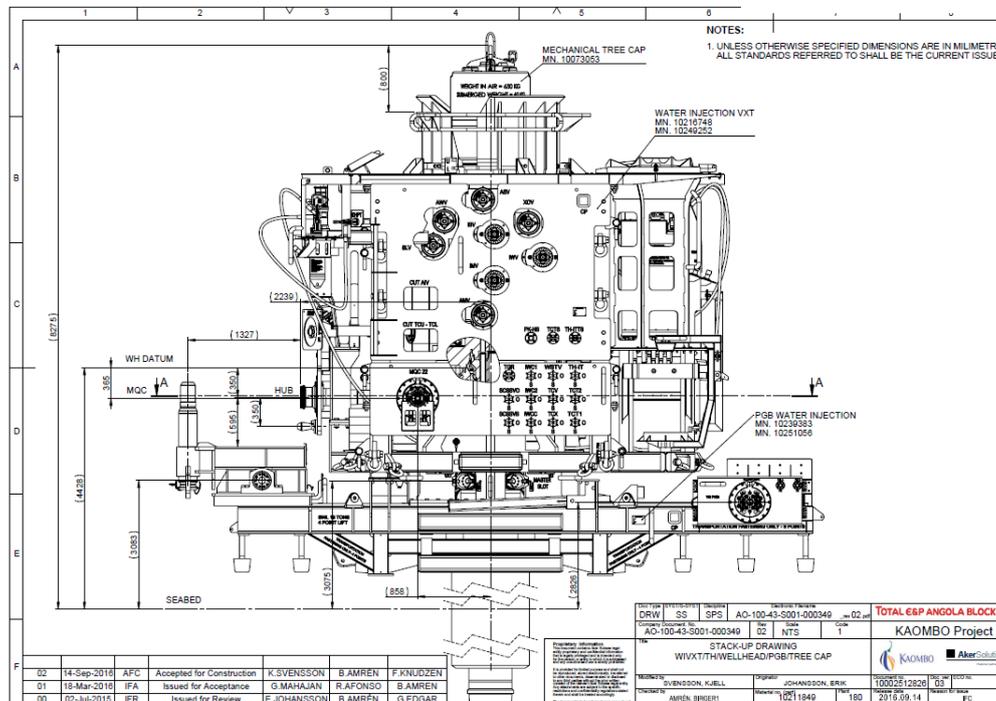
**TYPE 3 Use as is (if possible)**

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6.4.8.2 TH/WH/PGB/TREE CAP

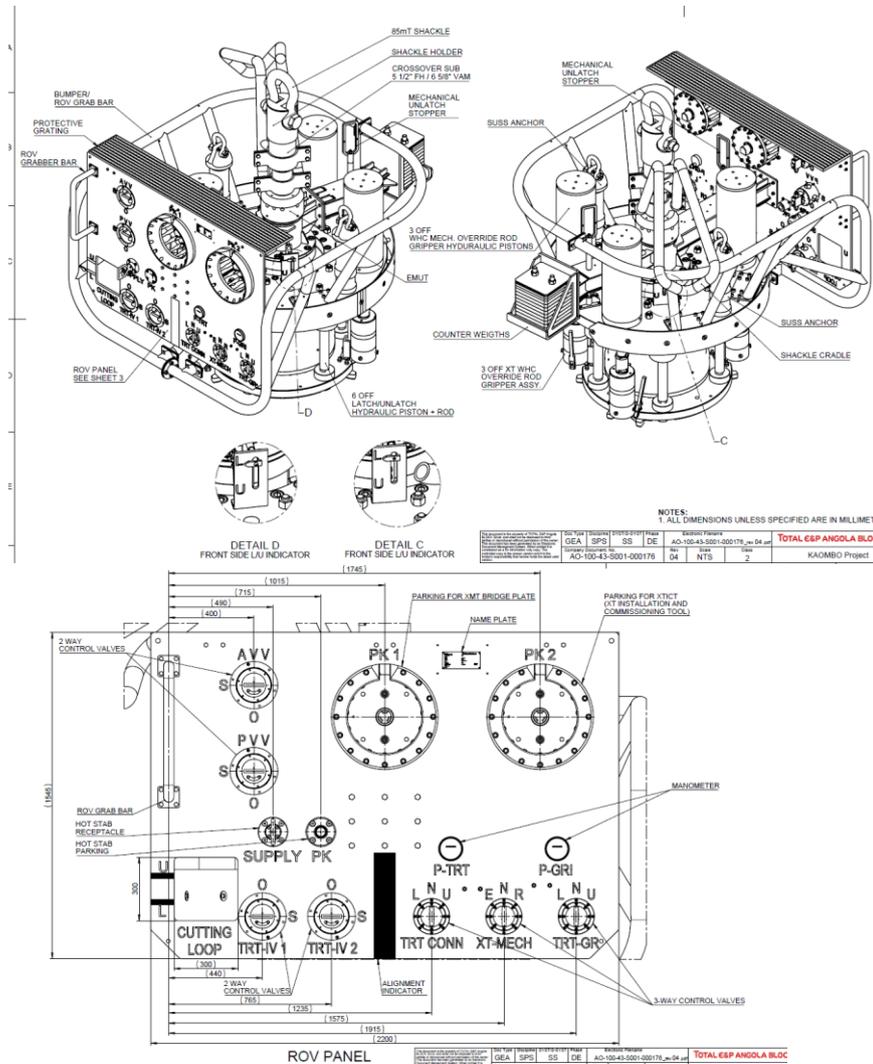


TH/WH/PGB/TREE CAP	10002512826	AO-100-43-S001-000349	10073053 10216746 10249252 10234298 10239383 10251056
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TYPE 3 Use as is (if possible)

## 6.5 VXT tooling

### 6.5.1 Tree Running Tool (TRT)



TRT	10002512558	AO-100-43-S001-000176	10229300
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TYPE 1A Glossy 3-D rendering quality + drawing as is



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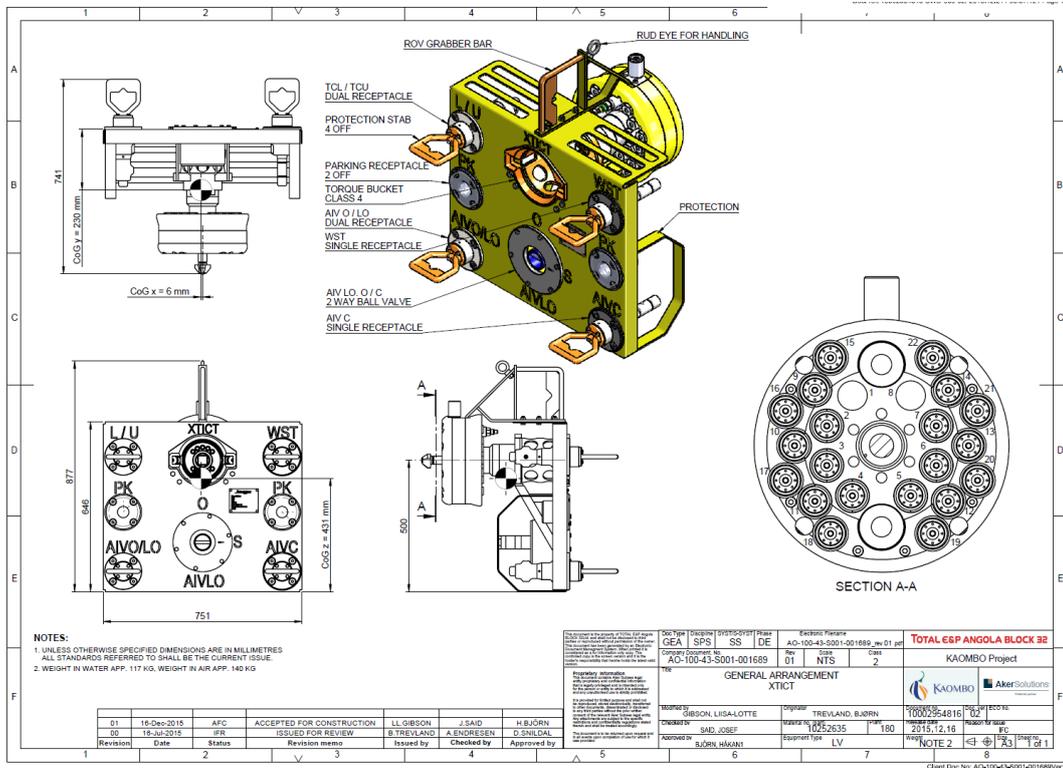
Document: 10002504361-PDC-000  
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6.5.1.2 TRT Valve torque list

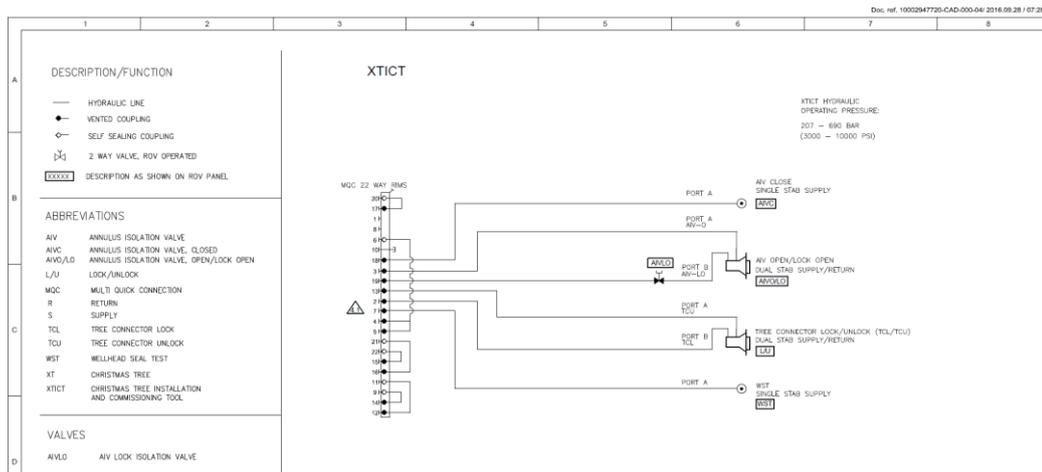
Item No	QTY TRT	Valve Name	ROV ID	SAP Material Nr.	Nominal Valve Size	Valve Type	Actuation	ROV Interface	ROV Tool	Running Torque (Nm)	Break Out Torque (Nm)	Max torque (Nm)	Damage Torque (Nm)	Closing direction (CW/R counter-clockwise)	Approx. number of Turns to Open or Close
1		Annulus Vent Valve	AVV	10025835	3/8"	2-Way Ball	ROV	ROV Manipulator	Paddle Tool	20	30	100	160	CW	1/4
2		Production Vent Valve	PVV	10025835	3/8"	2-Way Ball	ROV	ROV Manipulator	Paddle Tool	20	30	100	160	CW	1/4
3	4	Connector Pressure Isolation Valve 1	TRT-IV 1	10025835	3/8"	2-Way Ball	ROV	ROV Manipulator	Paddle Tool	20	30	100	160	CW	1/4
4		Connector Pressure Isolation Valve 2	TRT-IV 2	10025835	3/8"	2-Way Ball	ROV	ROV Manipulator	Paddle Tool	20	30	100	160	CW	1/4
		Valve Name	ROV ID	SAP Material Nr.	Nominal Valve Size	Valve Type	Actuation	ROV Interface	ROV Tool	Running Torque (Nm)	Break Out Torque (Nm)	Max torque (Nm)	Damage Torque (Nm)	Closing direction (CW/R counter-clockwise)	Approx. number of Turns to Open or Close
5		Tree Running Tool Connector Latch / Unlatch Valve	TRT CONN	10022914	3/8"	3-Way control valve	ROV	ROV Manipulator	Paddle Tool	25	15	N/A	Latch	Neutral	Unlatch
6	3	XT secondary Unlatch Cylinder Extend / Retract	XT MECH	10022914	3/8"	3-Way control valve	ROV	ROV Manipulator	Paddle Tool	25	15	N/A	Engage	Neutral	Retract
7		XT secondary Unlatch / Gripper Lock / Unlatch Valve	TRT-GR	10022914	3/8"	control valve	ROV	ROV Manipulator	Paddle Tool	25	15	N/A	Latch	Neutral	Unlatch

VALVE TORQUE LIST	10003313257	AO-100-40-S001-002601	10229300
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### 6.5.2 XT Installation and Commissioning Tool (XTICT)



XTICT, GA	10002954816	AO-100-43-S001-001689	10252635
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XTICT Hydraulic schematic	10002947720	AO-100-43-S001-001683	10252635
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**TYPE 3 Use as is (if possible)**

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## 7 WORKOVER SYSTEM

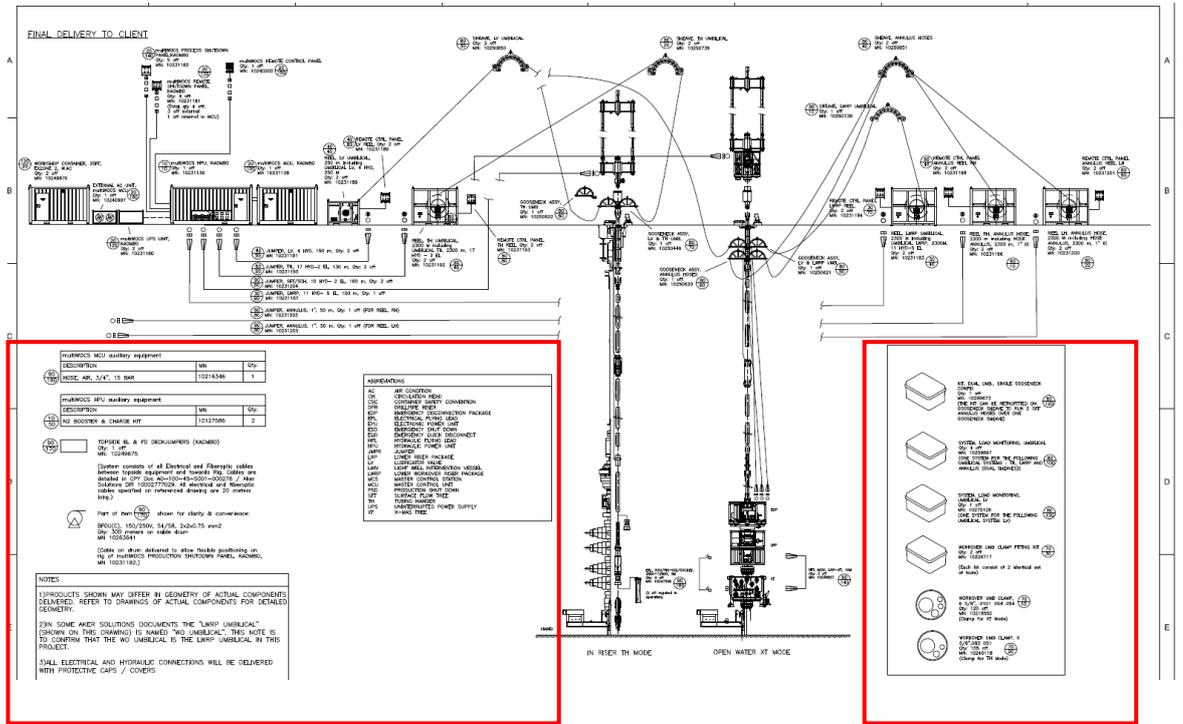
### 7.1 Reference list

Same set-up as MOHO

(For this section we might need two pages)

## 7.2 Workover Scope of supply

Remove tables in red boxes in drawing and replace with table below.



EQUIPMENT LAYOUT Workover System	10002176858	AO-100-45-S001-000001	N/A
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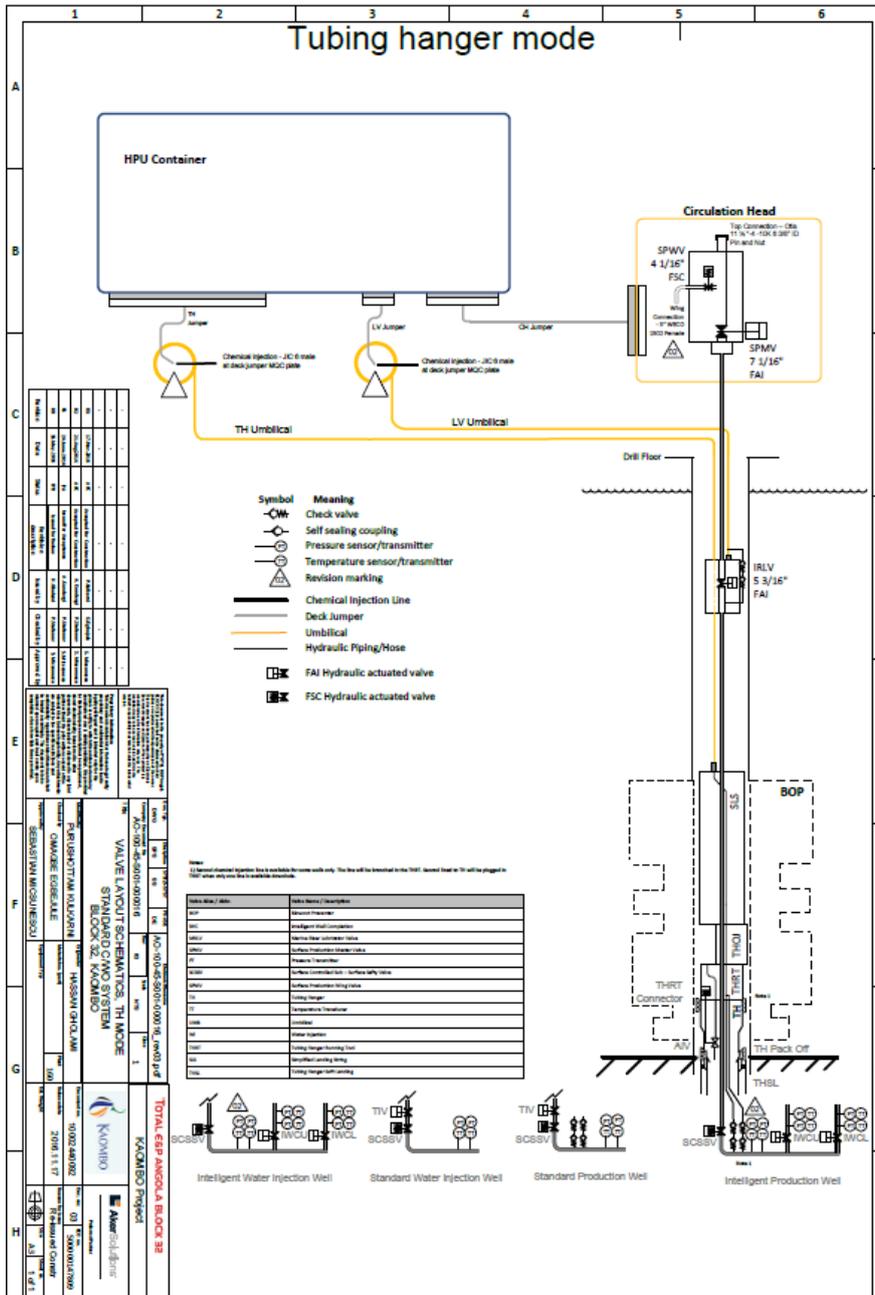
Implement table below in drawing above.

Material number	Equipment	Length[mm]	Width[mm]	Height[mm]	Approx. Gross Weight [kg]
10231138	WOCES MCU Container	6096	2648	3055	15,000
10231136	WOCES HPU Container	6176	2648	3215	21,400
10240997	External AC Unit	1800	2000	1850	1,700
10249676	Workshop Container	6058	2438	3000	5,900 excl. payload
10231188	LV Reeler	2640	2400	2375	4,800
10231192	TH Reeler	4187	5110	4206	34,000
10231196	Annulus Reeler	4140	3850	3865	21,000
10231183	LWRP Reeler	4527	6510	4206	43,500

**TYPE 3 Use as is (if possible)**

### 7.3 Workover TH Mode

#### 7.3.1 Valve layout TH mode



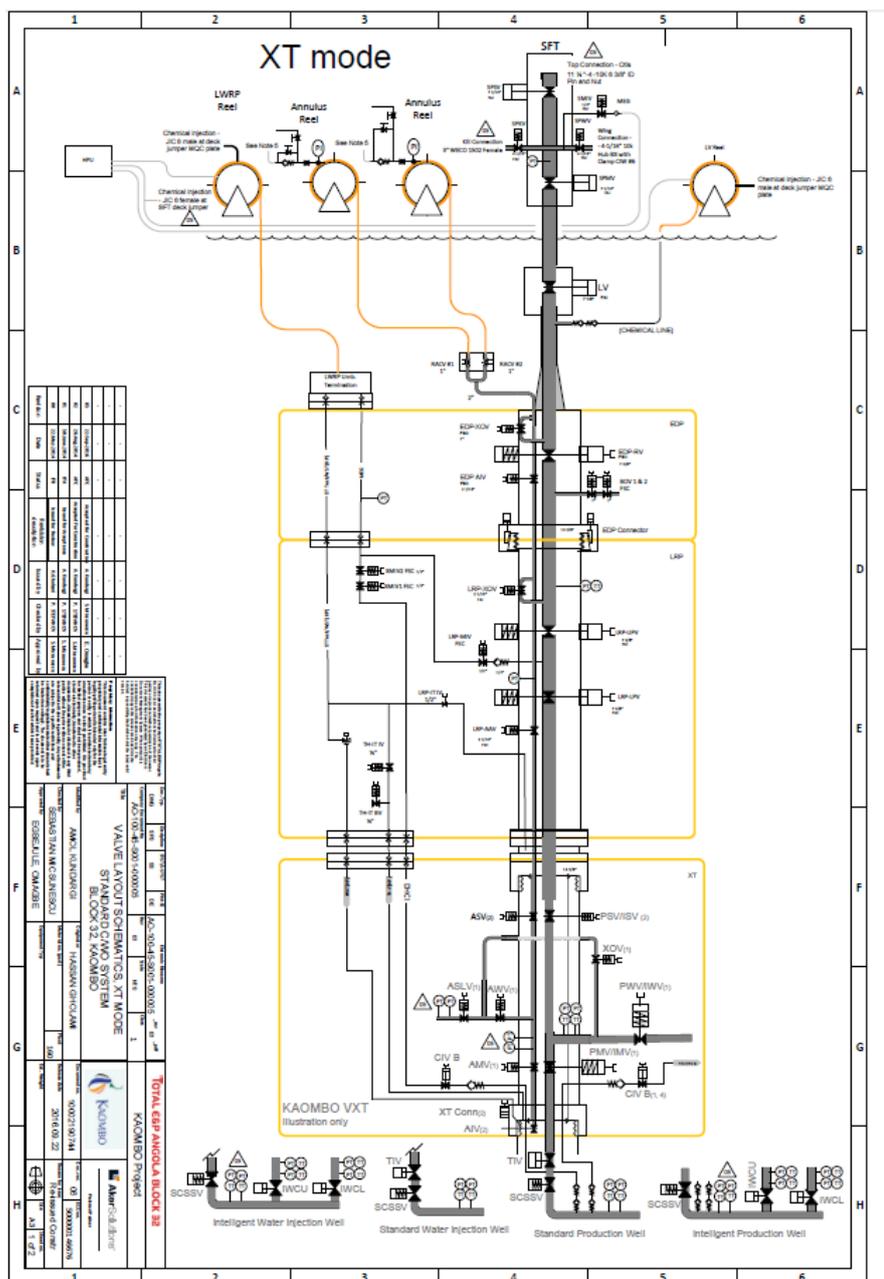
Valve layout TH mode	10002440092	AO-100-45-S001-000016	N/A
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TYPE 3 Use as is (if possible)



## 7.4 Workover XT Mode

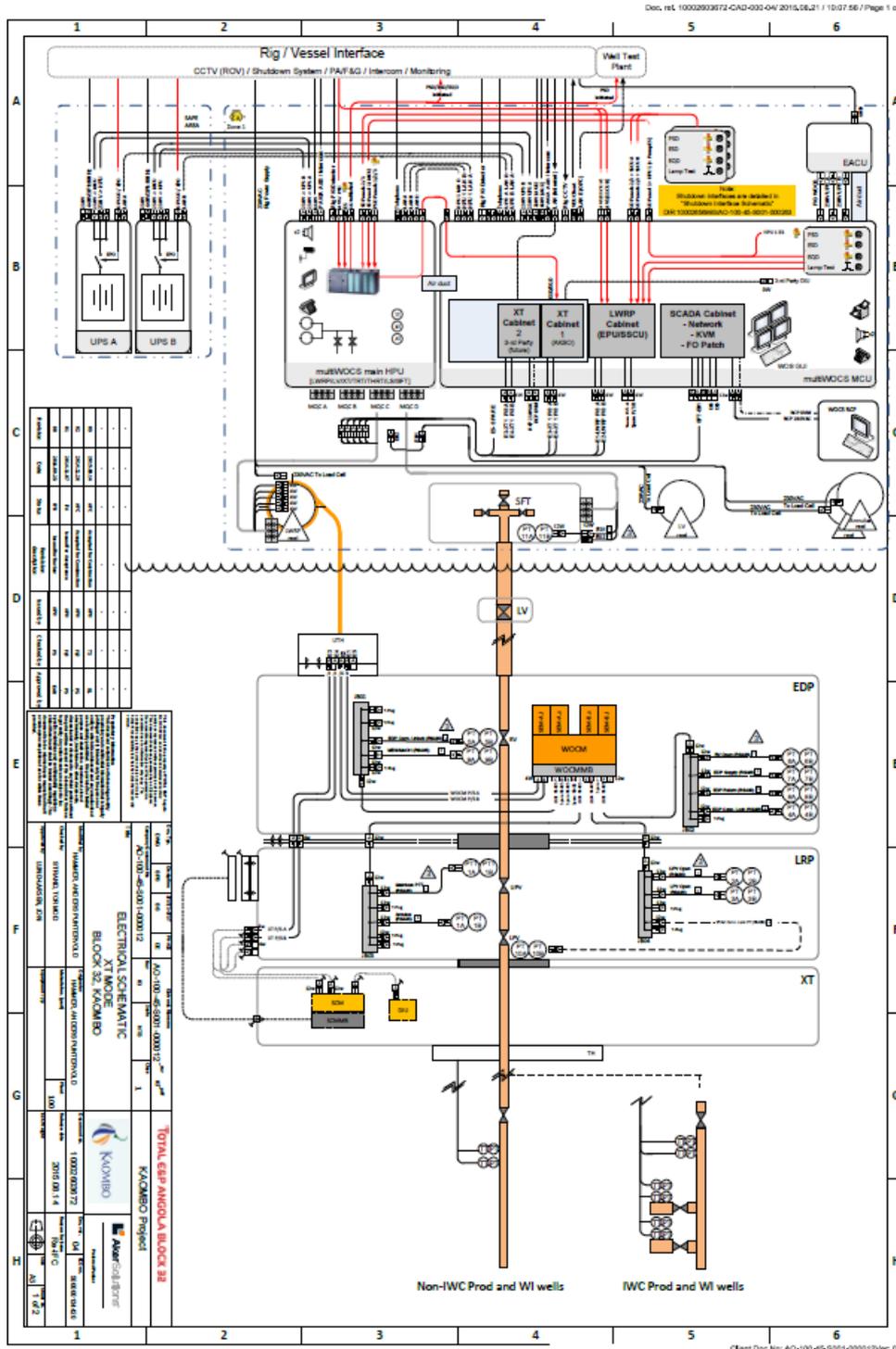
### 7.4.1 Valve layout XT mode



Valve layout XT mode	10002190744	AO-100-45-S001-000005	N/A
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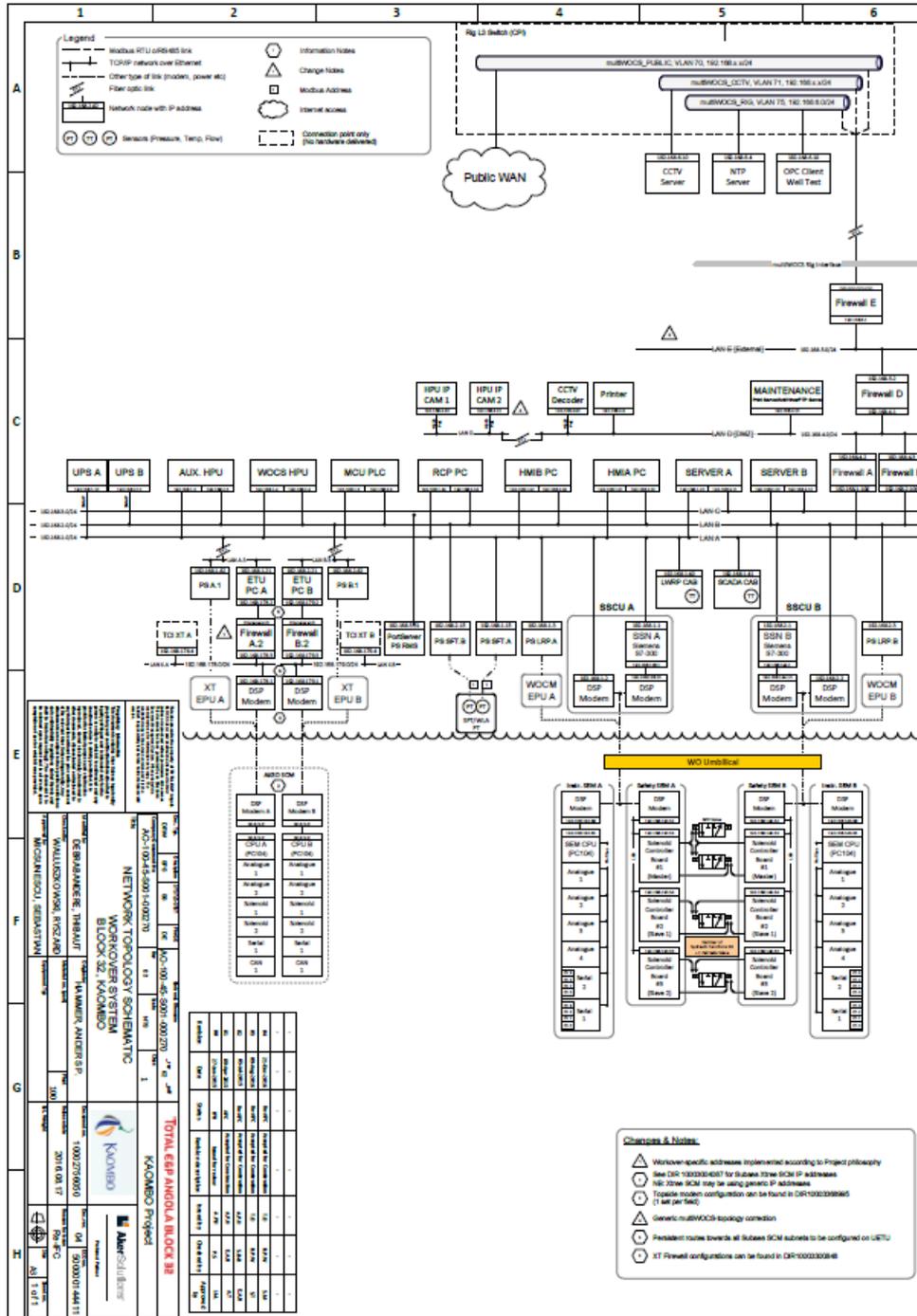
**TYPE 3 Use as is (if possible)**

### 7.4.2 XT Mode Electric Schematic



Electric schematic XT mode	10002603672	AO-100-45-S001-000012	N/A
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### 7.5 Workover Control System (WOCS) Network Diagram



WOCS Network Diagram	10002756050	AO-100-45-S001-000270	N/A
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**TYPE 3 Use as is (if possible)**

## 7.6 Workover Shut Down Sequence

### 7.6.1 Figure 4 Shutdown sequence, TH mode (in-riser), RIG Emergency Quick Disconnect (EQD)

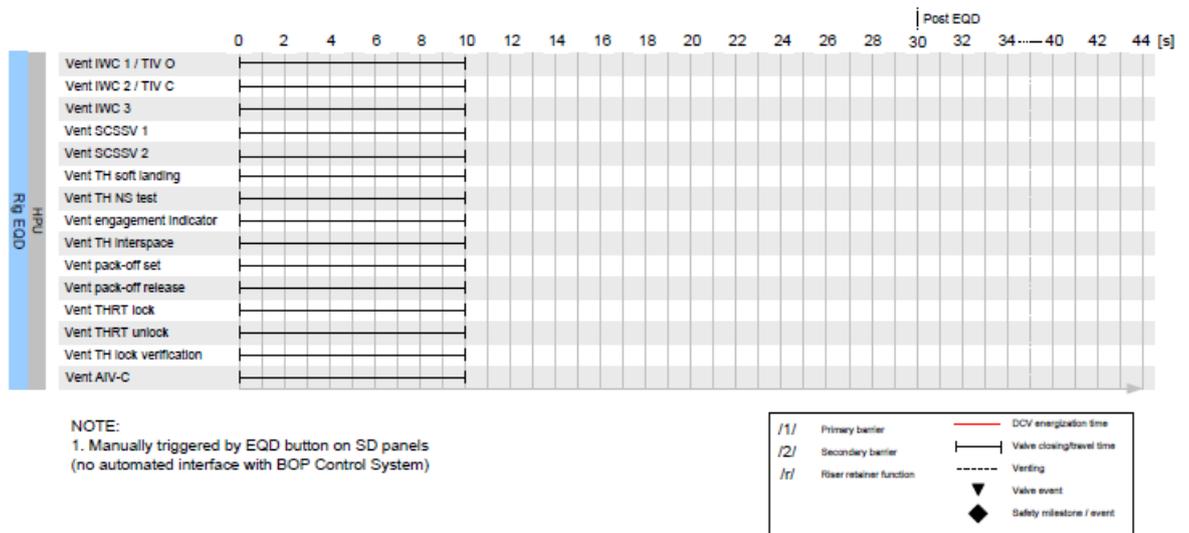


Figure 4 – Shutdown sequence, TH mode (In-riser), Rig EQD

WO shut down sequence	10002515767	AO-100-45-S001-000161	N/A
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**TYPE 3 Use as is (if possible)**

### 7.6.2 Figure 1 Shutdown sequence, XT mode (Open water) Normal / Well Flowing (non-concentric) operation

SHUTDOWN SEQUENCES	Document: 10002515767-PDC-000
WORKOVER SYSTEM	Version: 03 - IFC
BLOCK 32 - KAOMBO SPS	Issue date: 2015.02.24
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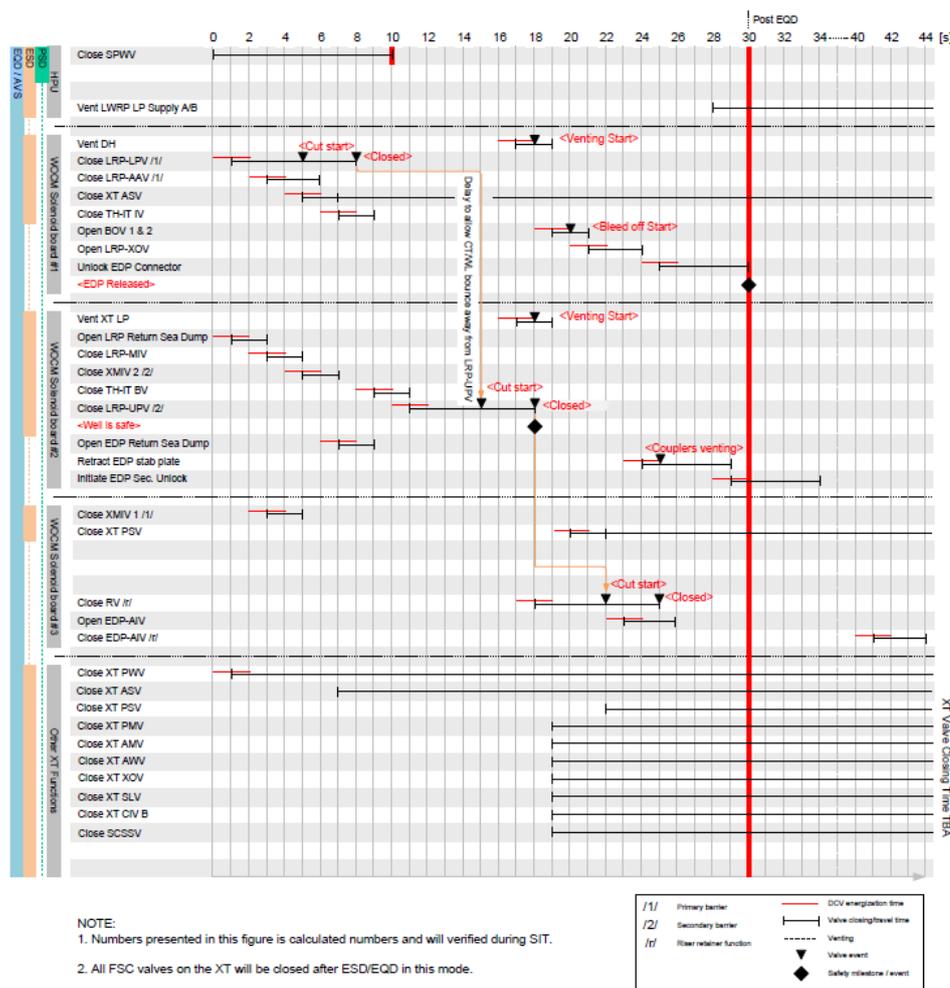


Figure 1 - Shutdown sequence, XT mode (Open water) Normal / Well Flowing (non-concentric) operation

WO shut down sequence	10002515767	AO-100-45-S001-000161	N/A
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**TYPE 3 Use as is (if possible)**

### 7.6.3 Figure 2 Shutdown sequence, XT mode (Open water) CT/WL (concentric) operation

SHUTDOWN SEQUENCES	Document: 10002515767-PDC-000
WORKOVER SYSTEM	Version: 03 - IFC
BLOCK 32 - KAOMBO SPS	Issue date: 2015.02.24
	Page: 24 of 27

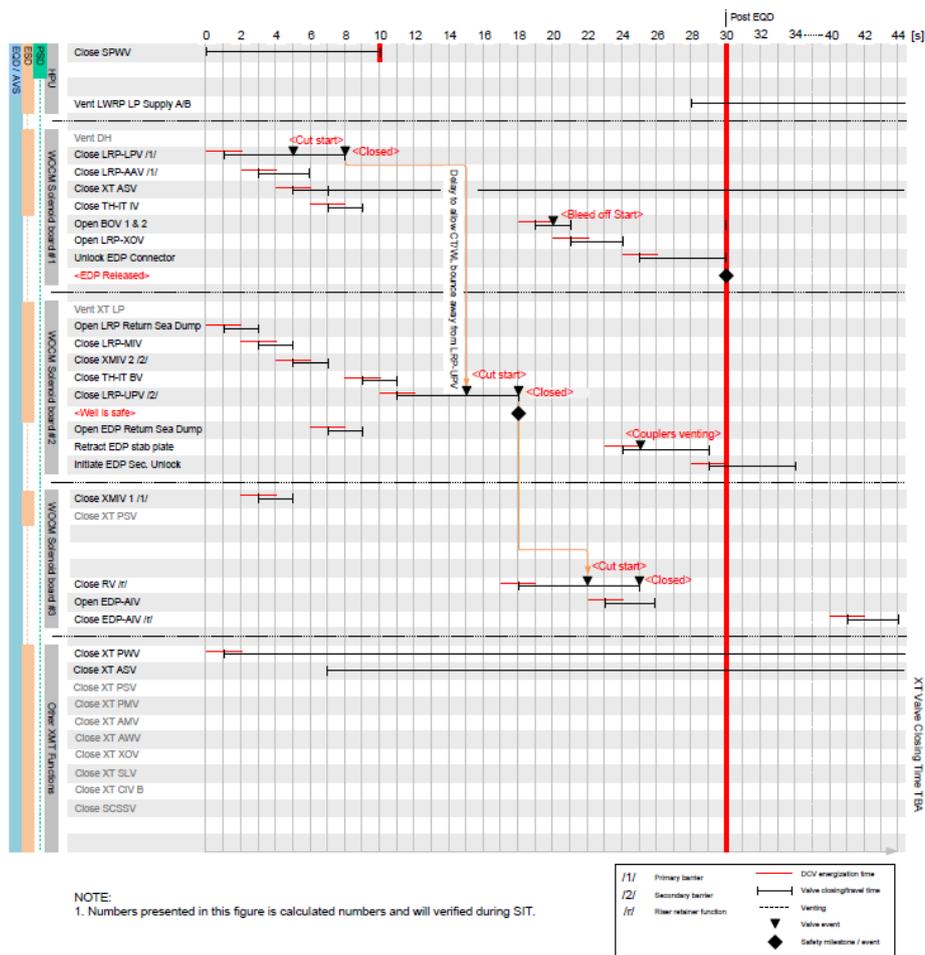


Figure 2 - Shutdown sequence. XT mode (Open water) CT/WL (concentric) operation

WO shut down sequence	10002515767	AO-100-45-S001-000161	N/A
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**TYPE 3 Use as is (if possible)**

### 7.6.4 Figure 3 - Shutdown sequence, XT mode (open water) Annulus Access

SHUTDOWN SEQUENCES	Document: 10002515767-PDC-000
WORKOVER SYSTEM	Version: 03 - IFC
BLOCK 32 - KAOMBO SPS	Issue date: 2015.02.24
	Page: 26 of 27

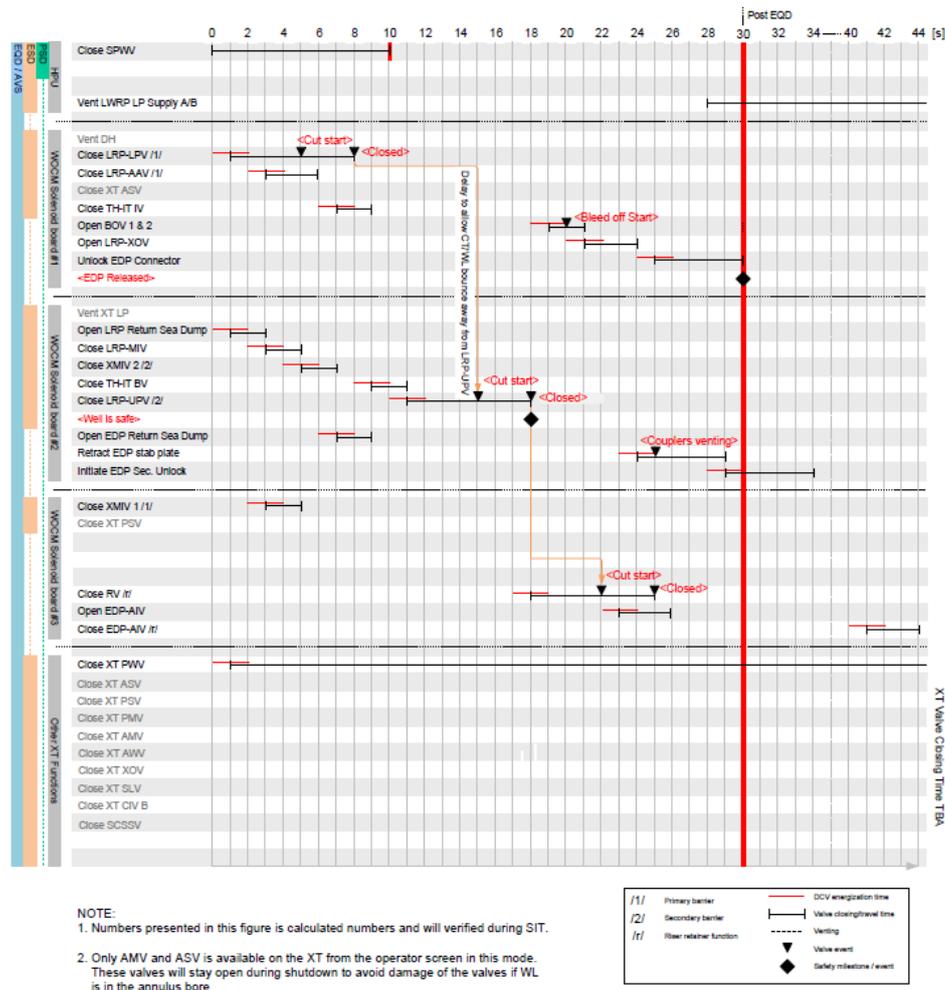


Figure 3 - Shutdown sequence, XT mode (open water) Annulus Access

WO shut down sequence	10002515767	AO-100-45-S001-000161	N/A
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TYPE 3 Use as is (if possible)

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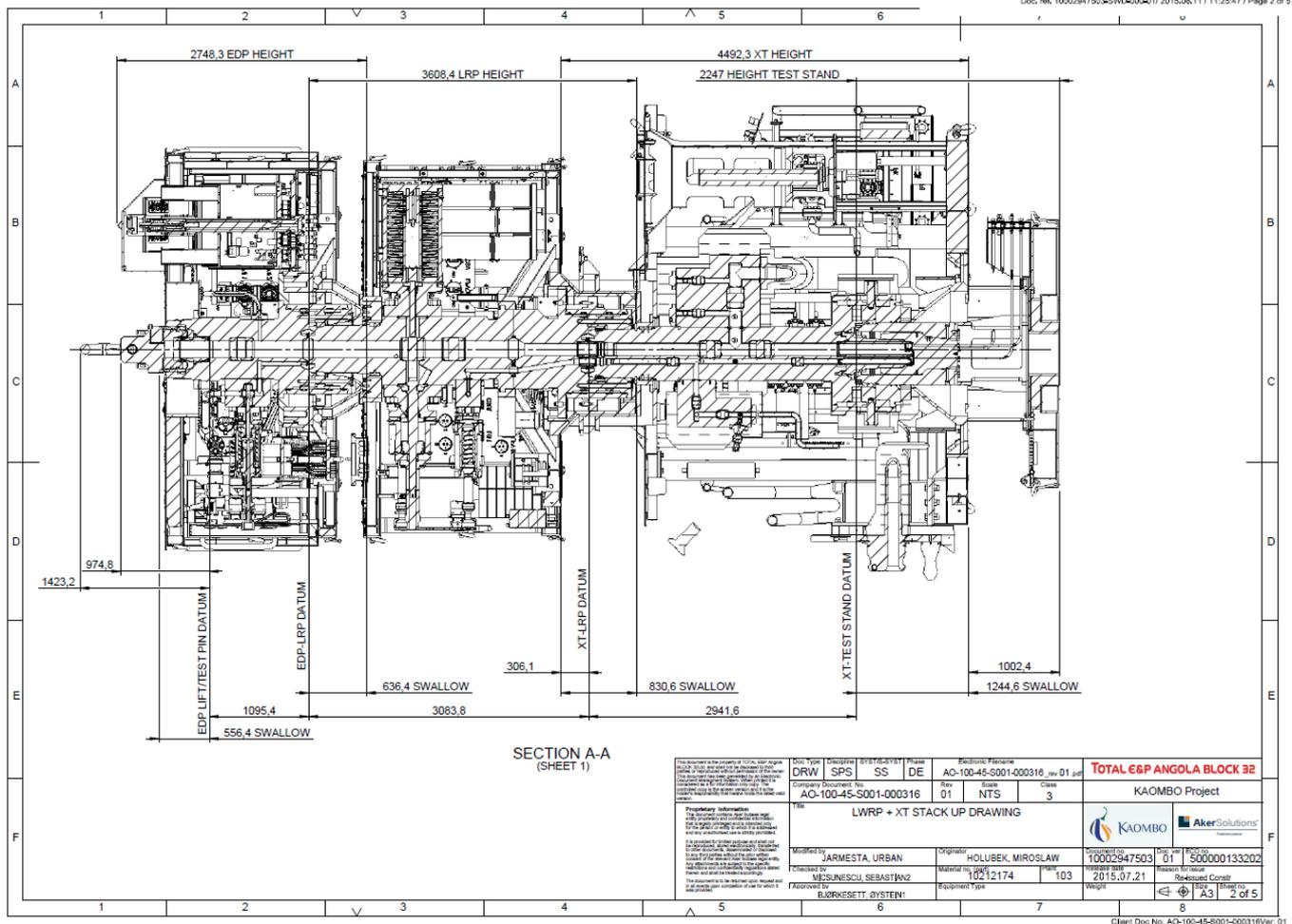
Document: 10002504361-PDC-000  
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## 7.7 Lower Workover Riser Package (LWRP)

### 7.7.1 LWRP Stack-up Drawing

Side by side with one more view (check availability of cross setion without VXT)



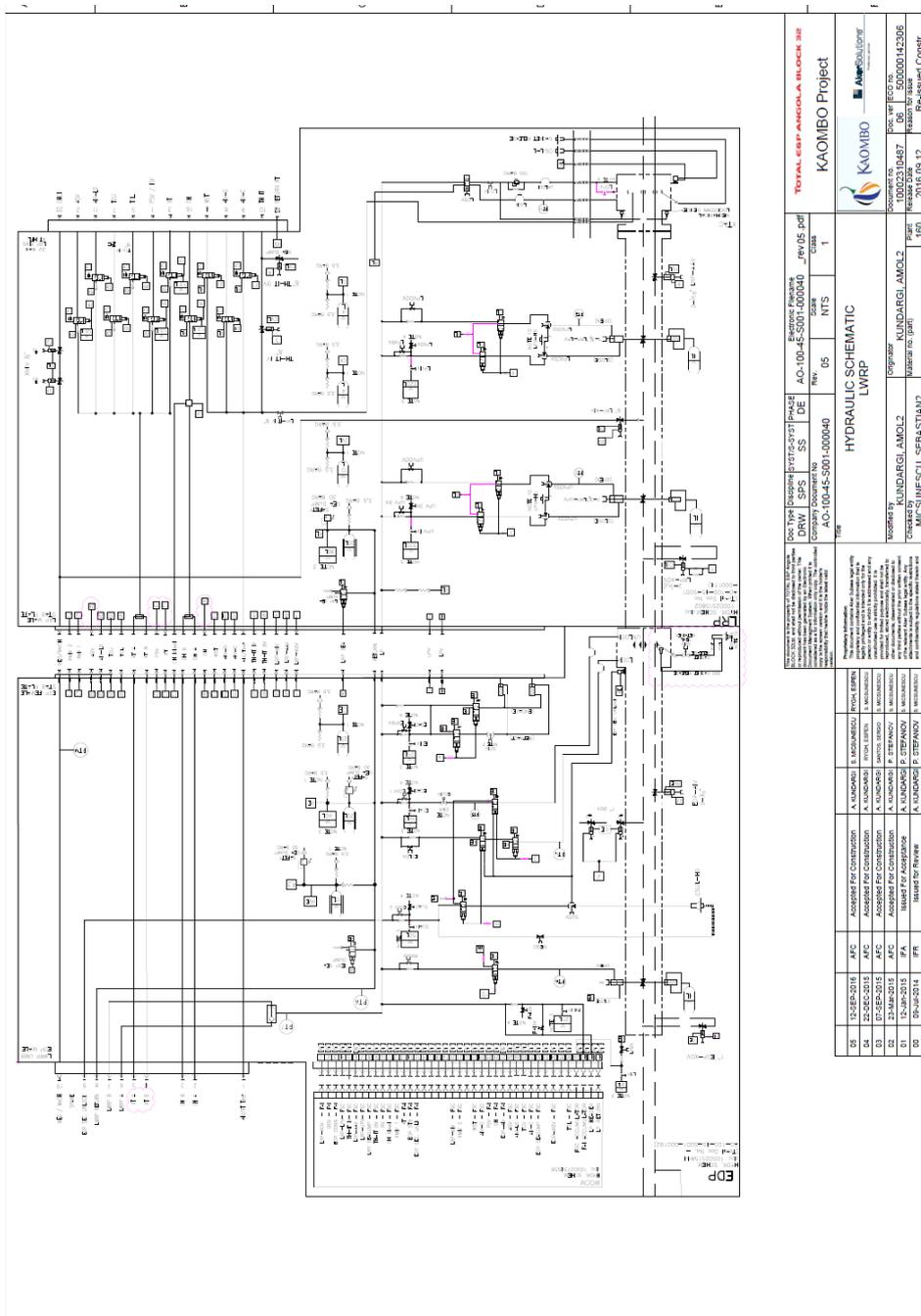
LWRP + XT STACK UP DRAWING	10002947503	AO-100-45-S001-000316	N/A
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### 7.7.2 LWRP hydraulic schematic

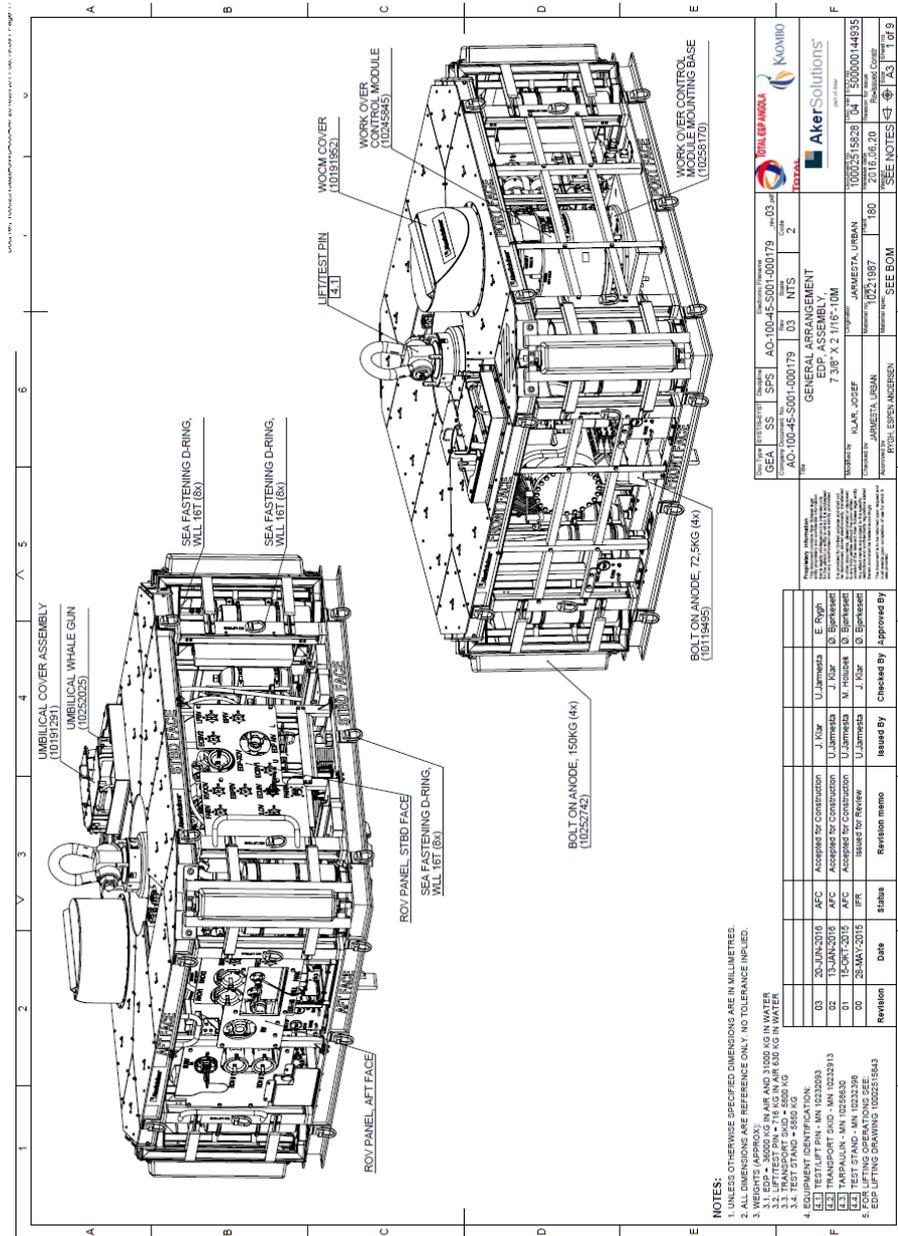


Project Name: TOTAL SSP ANGOLA BLOCK 32 Project: KAOMBO Project 	
Doc No: AO-100-45-S001-000040 Title: HYDRAULIC SCHEMATIC LWRP Drawn by: MUNDARIGI, AMCLZ Checked by: MICUNESCU, SEBASTIANZ Approved by:	Revision: 05 Scale: NTS Class: 1 Date: 2018.09.12 Page: 180 Re-issued Constr
Date: 2018-09-12 Drawn: MUNDARIGI, AMCLZ Checked: MICUNESCU, SEBASTIANZ Approved:	Project: AO-100-45-S001-000040 Title: HYDRAULIC SCHEMATIC LWRP Drawn by: MUNDARIGI, AMCLZ Checked by: MICUNESCU, SEBASTIANZ Approved by:
Date: 2018-09-12 Drawn: MUNDARIGI, AMCLZ Checked: MICUNESCU, SEBASTIANZ Approved:	Project: AO-100-45-S001-000040 Title: HYDRAULIC SCHEMATIC LWRP Drawn by: MUNDARIGI, AMCLZ Checked by: MICUNESCU, SEBASTIANZ Approved by:

LWRP hydraulic schematic	10002310487	AO-100-45-S001-000040	10221986 10221987
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**TYPE 3 Use as is (if possible)**

### 7.8 Emergency Disconnect Package (EDP)



EDP	10002515828	AO-100-45-S001-000179	10221987
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TYPE 1C Glossy 3-D rendering quality with description/details like

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## 7.8.1 EDP Stalk view and ROV Panels

As moho

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7.8.2 EDP Valve torque list

Item No	QTY EDP	Valve Name	ROV ID	SAP Material Nr.	Nominal Valve Size	Valve Type	Actuation	ROV Interface	ROV Tool	Running Torque (Nm)	Break Out Torque (Nm)	Max Torque (Nm)	Range Torque (Nm)	Closing direction (CW if Clockwise or CCW if Counter-clockwise)	Approx. number of Turns to Open or Close
1	1	Retainer Valve	RV	10082766	7-3/8"	Gate	HYDROV	ISO 13628-8 Linear Push Type 'A'	LAOT & LOT	N/A	N/A	N/A	N/A	N/A	N/A
2	1	Secondary Unblock Selection Valve EDP - Annulus Isolation Valve	SUSV EDP/ANV	10092451 10226176	3/8" 2-1/16"	3-way Ball Gate	ROV	ROV Manipulator	Paddle Tool	20	30	100	160	CW	1/4
3	1	EDP Connector Bleed Valve #1	ECBV 1	10243950	1/2"	Rotary Gate	ROV	ROV Manipulator	Paddle tool	20	51.5	300	400	CW	1/4
4		EDP Connector Bleed Valve #2	ECBV 2	10243950	1/2"	Rotary Gate	ROV	ROV Manipulator	Paddle tool	20	51.5	300	400	CW	1/4
5		EDP Connector Lock Override valve	ECLOV	10243950	1/2"	Rotary Gate	ROV	ROV Manipulator	Paddle tool	20	51.5	300	400	CW	1/4
6		EDP Connector Unblock Isolation Valve	ECLUV	10243950	1/2"	Rotary Gate	ROV	ROV Manipulator	Paddle tool	20	51.5	300	400	CW	1/4
7		EDP Sub Plate Bleed Valve	ESPBV	10243950	1/2"	Rotary Gate	ROV	ROV Manipulator	Paddle Tool	20	51.5	300	400	CW	1/4
8	10	FAI Accumulator Bleed Valve	FABV	10243950	1/2"	Rotary Gate	ROV	ROV Manipulator	Paddle tool	20	51.5	300	400	CW	1/4
9		LP system accumulator Bleed Valve	LPBV	10243950	1/2"	Rotary Gate	ROV	ROV Manipulator	Paddle Tool	20	51.5	300	400	CW	1/4
10		ROV Emergency Quick Disconnect	REOD	10243950	1/2"	Rotary Gate	ROV	ROV Manipulator	Paddle tool	20	51.5	300	400	CW	1/4
11		RV Open Override Valve	RVOOV	10243950	1/2"	Rotary Gate	ROV	ROV Manipulator	Paddle Tool	20	51.5	300	400	CW	1/4
12		Sub Plate Isolation Valve	SPV	10243950	1/2"	Rotary Gate	ROV	ROV Manipulator	Paddle tool	20	51.5	300	400	CW	1/4
13		Seal Retainer Isolation Valve	SRV	10243951	1/2"	Rotary Gate	ROV	ROV Manipulator	Paddle tool	20	51.5	300	400	CW	1/4
14	1	Bleed Off Valve #1	BOV#1	10243952	1"	Gate	HYDROV	ISO 13628-8 Class 4	Class 4 Torque Tool	180	180	270	350	CW	6.2
15	2	Bleed Off Valve #2	BOV#2	10243952	1"	Gate	HYDROV	ISO 13628-8 Class 4	Class 4 Torque Tool	180	180	270	350	CW	6.2
16		EDP - Crossover Valve	EDP-XOV	10243953	1"	Gate	HYDROV	ISO 13628-8 Class 4	Class 4 Torque Tool	180	180	270	350	CW	6.2
17	1	Riser Annulus Circulation Valve #1	RACV1	10256817	1"	Ball	ROV	ISO 13628-8 Class 4	Class 4 Torque tool	275	400	700	TBC	CW	1/4
18	2	Riser Annulus Circulation Valve #2	RACV2	10256817	1"	Ball	ROV	ISO 13628-8 Class 4	Class 4 Torque tool	275	400	700	TBC	CW	1/4

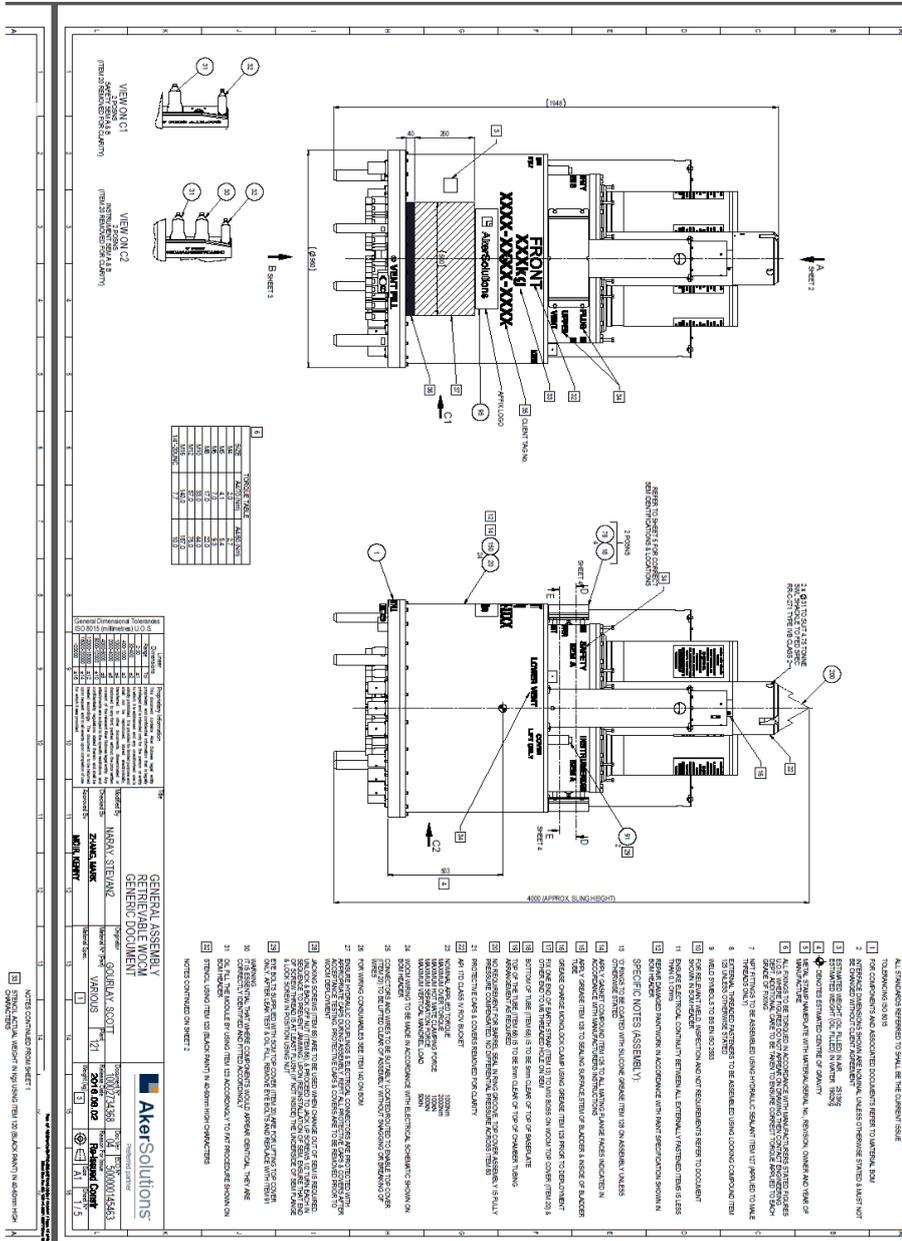
VALVE TORQUE LIST

10003313257

AO-100-40-S001-002601

10221987

### 7.9 Workover Control Module (WOCM)



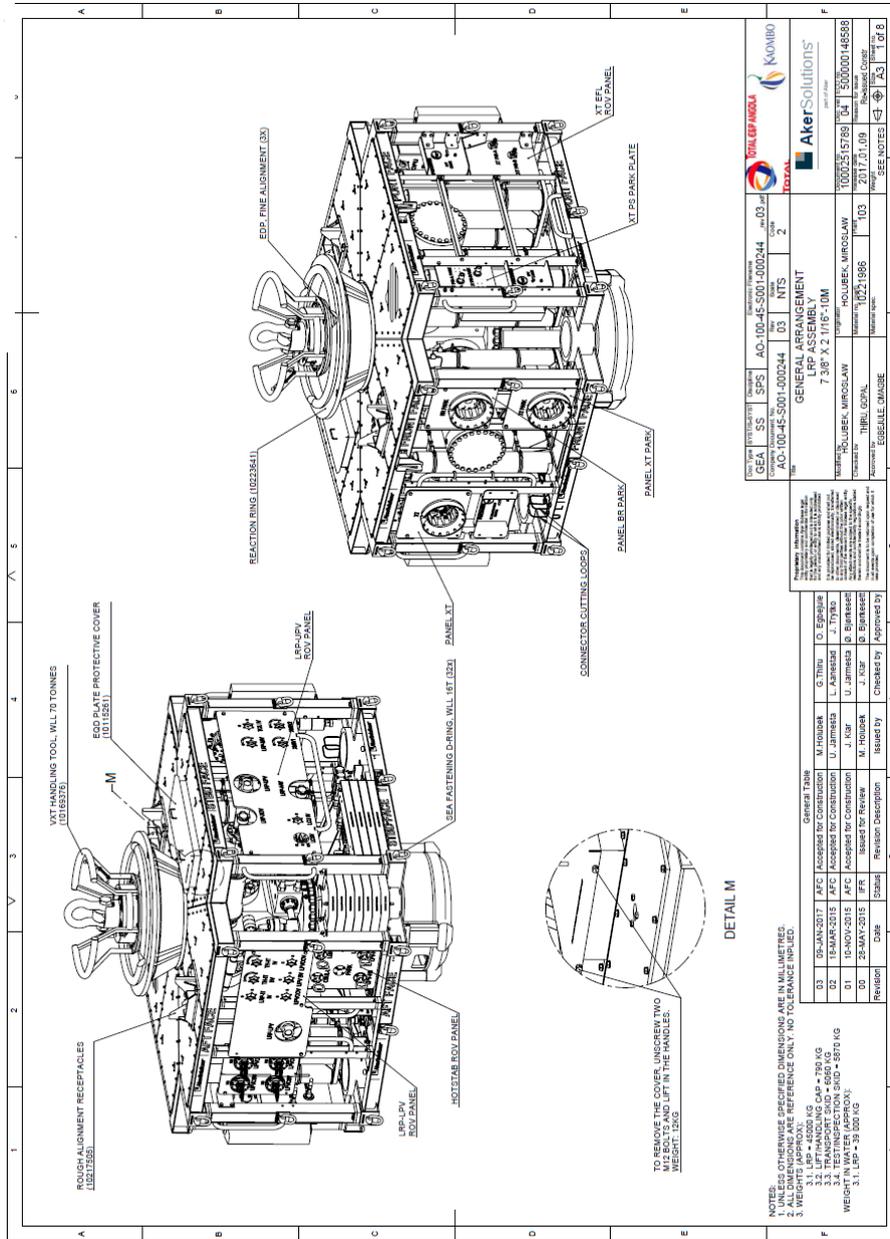
Work over control module	10002540548	AO-100-44-S001-000175	10245845
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TYPE 2A Colour screenshot solidworks ISO VIEW + drawing as is

Also include top/bottom view with connections overview



### 7.10 Lower Riser Package (LRP)



LRP	10002515789	AO-100-45-S001-000244	10221986
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TYPE 1C Glossy 3-D rendering quality with description/details like

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## 7.10.1 LRP stalk view and ROV panels

As moho

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7.10.2 LRP Valve torque list

Item No	Qty LRP	Valve Name	ROV ID	SAP Material Nr.	Nominal Valve Size	Valve Type	Actuation	ROV Interface	ROV Tool	Turning Torque (Nm)	Running Torque (Nm)	Break Out Torque (Nm)	Max Torque (Nm)	CCV position	Centre position	Closing direction (CW # clockwise or CCW # counter-clockwise)	Approx number of Turns to Open or Close
1	2	LRP - Upper Production Valve	LRP-UPV	10082766	7-3/8"	Gate	HYDROV	ISO 13628-4 Linear Push Type "A"	LAOT & LOT	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2		LRP - Lower Production Valve	LRP-LPV	10082766	7-3/8"	Gate	HYDROV	ISO 13628-4 Linear Push Type "A"	LAOT & LOT	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
3		UPV - Close Selector Valve	UPV-CSV	10082451	3/8"	3-way Ball	ROV	ROV Manipulator	Paddle Tool	20	30	100	160	CW	CW	14	14
4	4	UPV - Open Selector Valve	UPV-OSV	10082451	3/8"	3-way Ball	ROV	ROV Manipulator	Paddle Tool	20	30	100	160	CW	CW	14	14
5		LPV - Close Selector Valve	LPV-CSV	10082451	3/8"	3-way Ball	ROV	ROV Manipulator	Paddle Tool	20	30	100	160	CW	CW	14	14
6		LPV - Open Selector Valve	LPV-OSV	10082451	3/8"	3-way Ball	ROV	ROV Manipulator	Paddle Tool	20	30	100	160	CW	CW	14	14
7	1	LRP - Annulus Access Valve	LRP-AAV	10225489	2-1/16"	Gate	HYDROV	ISO 13628-4 Linear Push Type "A"	LAOT & LOT	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
8	1	LRP - Crossover Valve	LRP-XOV	10228325	2-1/16"	Gate	HYDROV	ISO 13628-4 Linear Push Type "A"	LAOT & LOT	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
9		UPV accumulator Bled Valve	UPV-BV	10243050	1/2"	Rotary Gate	ROV	ROV Manipulator	Paddle Tool	20	51.5	300	400	CW	CW	14	14
10	4	UPV Open Override Valve	UPV-OOV	10243050	1/2"	Rotary Gate	ROV	ROV Manipulator	Paddle Tool	20	51.5	300	400	CW	CW	14	14
11		LPV accumulator Bled Valve	LPV-BV	10243050	1/2"	Rotary Gate	ROV	ROV Manipulator	Paddle Tool	20	51.5	300	400	CW	CW	14	14
12		LPV Open Override Valve	LPV-OOV	10243050	1/2"	Rotary Gate	ROV	ROV Manipulator	Paddle Tool	20	51.5	300	400	CW	CW	14	14
13		LRP interspace Test Isolation Valve	LRP-TIV	10243051	1/2"	Rotary Gate	ROV	ROV Manipulator	Paddle Tool	20	51.5	300	400	CW	CW	14	14
14	3	Tree Connector Unlock - Isolation Valve	TCU-IV	10243051	1/2"	Rotary Gate	ROV	ROV Manipulator	Paddle Tool	20	51.5	300	400	CW	CW	14	14
15		LRP Connector Unlock Isolation Valve	LCU-IV	10243051	1/2"	Rotary Gate	ROV	ROV Manipulator	Paddle Tool	20	51.5	300	400	CW	CW	14	14
16		LRP - Methanol Injection Valve	LRP-MIV	10243055	1/2"	Rotary Gate	HYDROV	ROV Manipulator	Paddle Tool	14	30	300	400	CW	CW	10	10
17	3	XT Methanol Injection Valve #1	XMIW#1	10243055	1/2"	Rotary Gate	HYDROV	ROV Manipulator	Paddle Tool	14	30	300	400	CW	CW	10	10
18		XT Methanol Injection Valve #2	XMIW#2	10243055	1/2"	Rotary Gate	HYDROV	ROV Manipulator	Paddle Tool	14	30	300	400	CW	CW	10	10
19	2	Tubing Hanger Interspace Test Isolation Valve	TH-TIV	10243056	1/2"	Rotary Gate	HYDROV	ROV Manipulator	Paddle Tool	14	30	300	400	CW	CW	10	10
20		Tubing Hanger Interspace Test Bled Valve	TH-TBV	10243056	1/2"	Rotary Gate	HYDROV	ROV Manipulator	Paddle Tool	14	30	300	400	CW	CW	10	10
21	1	LRP Connector Selector Valve	LCSV	BBPH-000010803	3/8"	4-way control valve	ROV	ROV Manipulator	Paddle Tool	25	15	N/A	N/A	Connector unlock	Shut	Connector lock	N/A

VALVE TORQUE LIST	10003313257	AO-100-40-S001-002601	10221986
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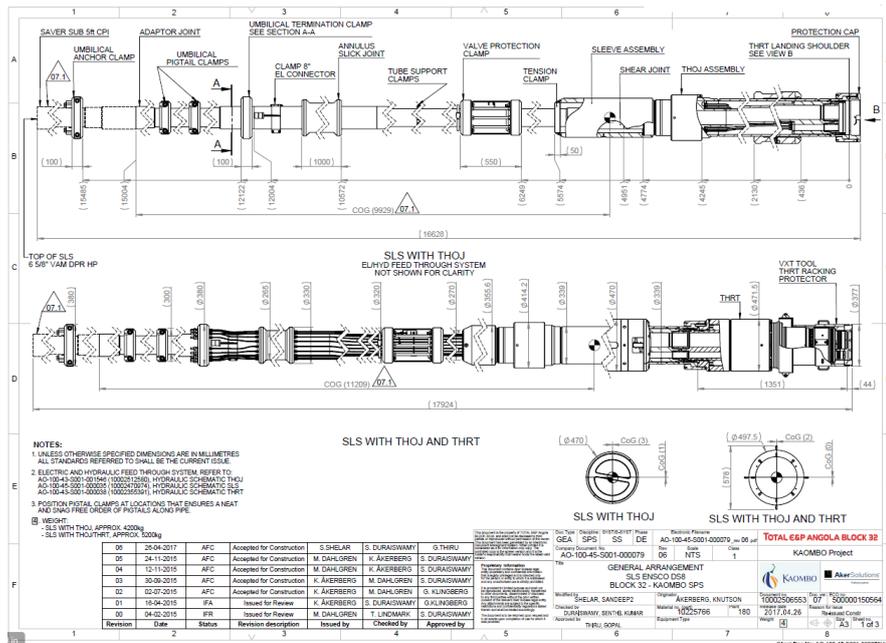
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### 7.11 Simplified Landing String (SLS)

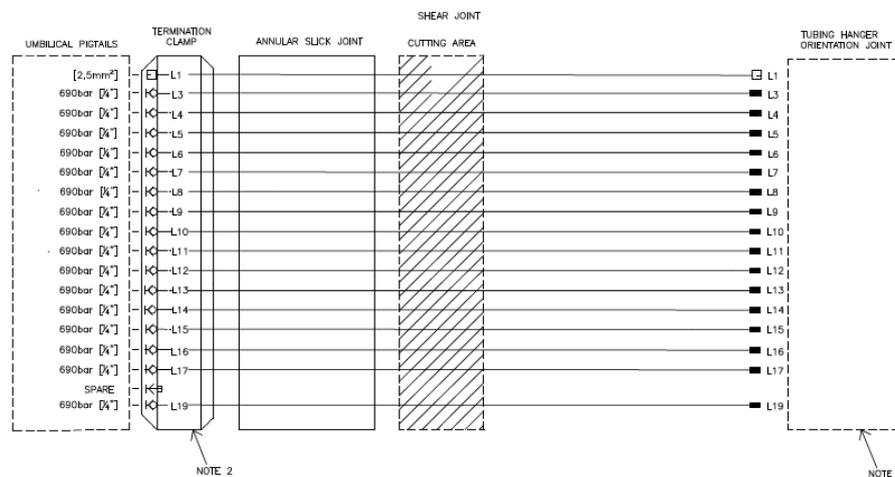
#### 7.11.1 SLS Assembly



GA SLS	10002506553	AO-100-45-S001-000079	10225766
Simplified landing string, Schematic	10002470974	AO-100-45-S001-000035	N/A

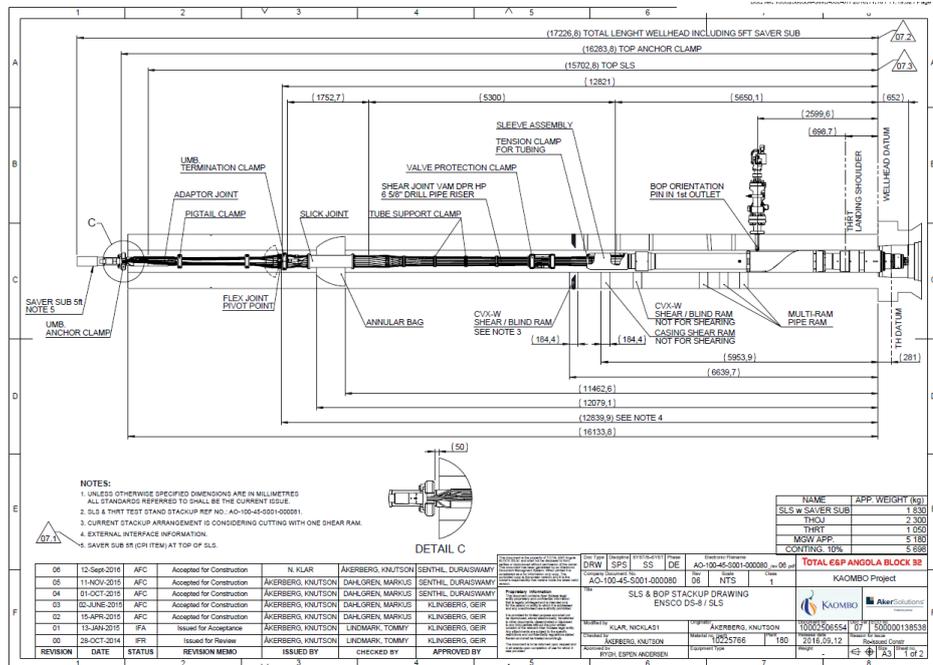
TYPE 3 Use as is (if possible)

#### 7.11.2 SLS Schematic



Try to include in one page with assembly drawing

### 7.11.3 SLS & BOP ENSCO DS-8/SLS



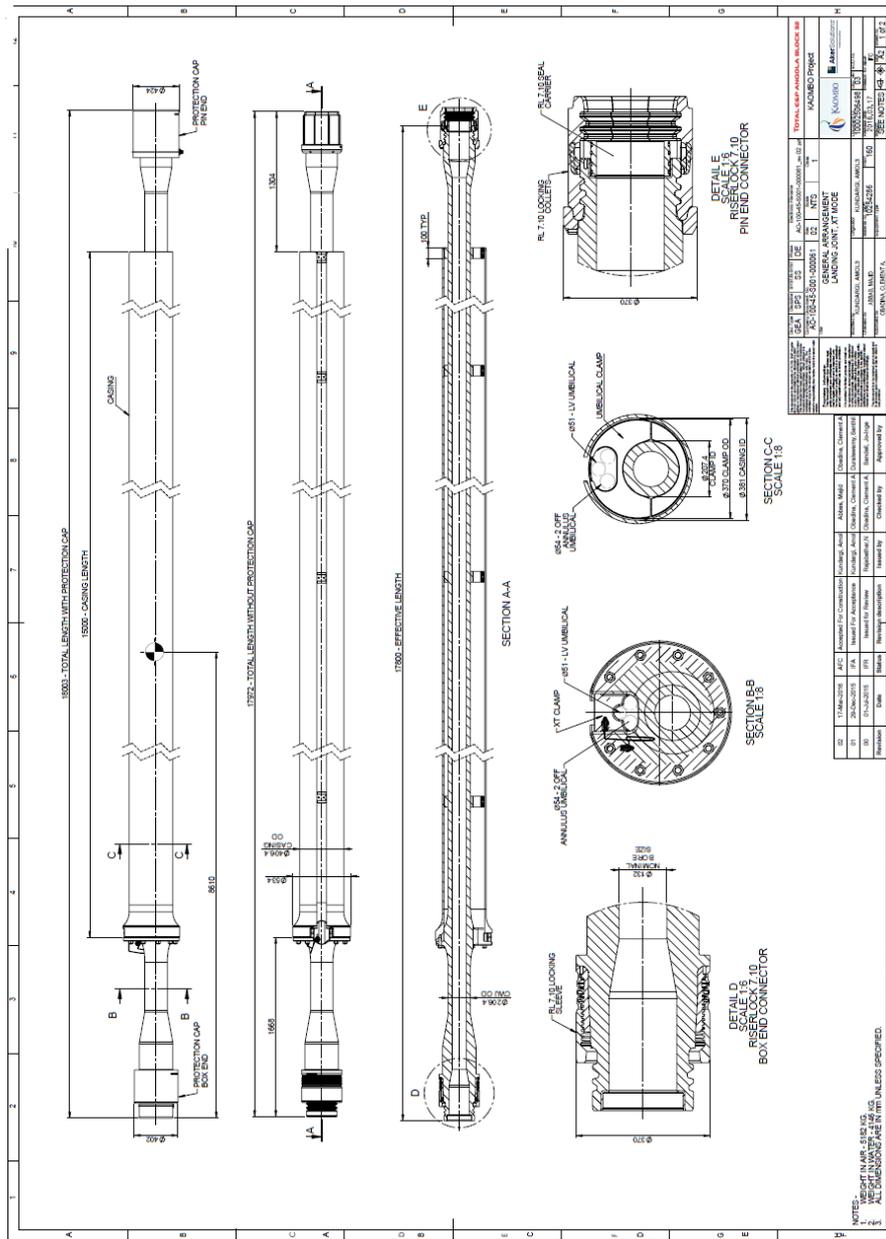
STACK-UP SLS & BOP ENSCO DS-8/SLS	10002506554	AO-100-45-S001-000080	10225766
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**TYPE 3 Use as is (if possible)**

### 7.12 Riser special joints

Use moho as reference – one section view to be included for each joint. Two joints per page.

#### 7.12.1 Landing joint + Cased wear joint (CWJ)

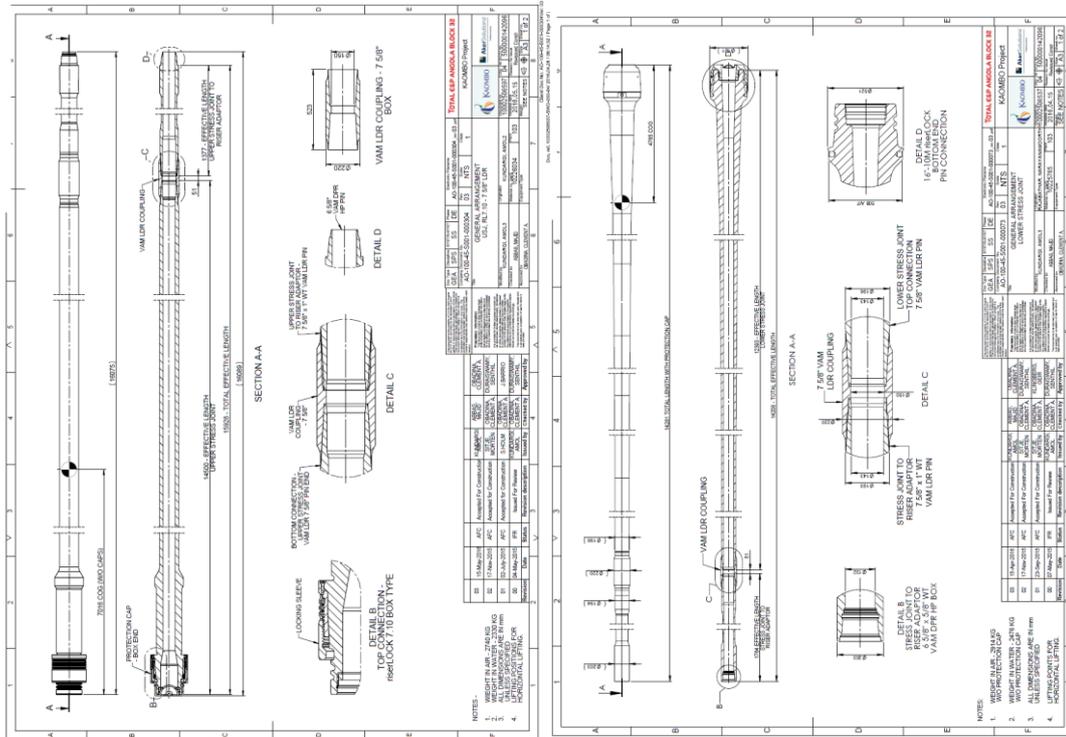


Cased wear joint (CWJ) can be grouped on same page as Landing Joint.

Landing joint	10002506498	AO-100-45-S001-000061	10254286
GA CASED WEAR JOINT, RL7.10 - RL7.10	10002506518	AO-100-45-S001-000067	10225761

**TYPE 5 Drawing as is + colouring**

7.12.1 Upper stress joint (upper and lower stress joint in same page)

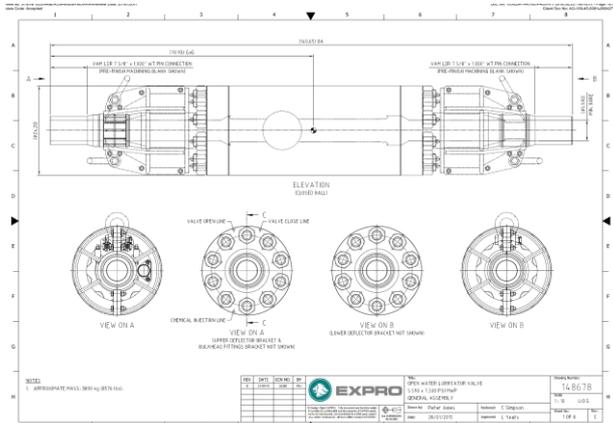


Lower stress joint	10002506537	AO-100-45-S001-000073	10225765
Upper stress joint	10002506597	AO-100-45-S001-000304	10226034

**TYPE 5 Drawing as is + colouring**

### 7.13 Lubricator valves

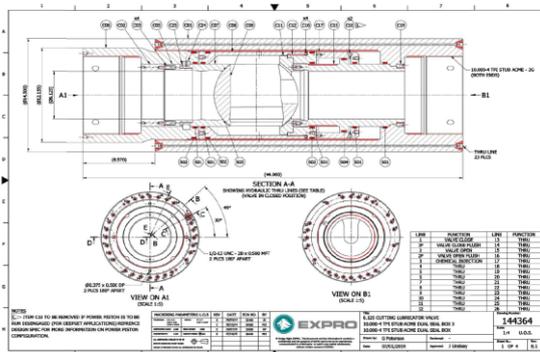
#### 7.13.1 Open water Lubricator valve 6.125 (merge page with below)



**TYPE 3 Use as is (if possible)**

Open water LV	10002941440	AO-100-45-S001-000427	10244441
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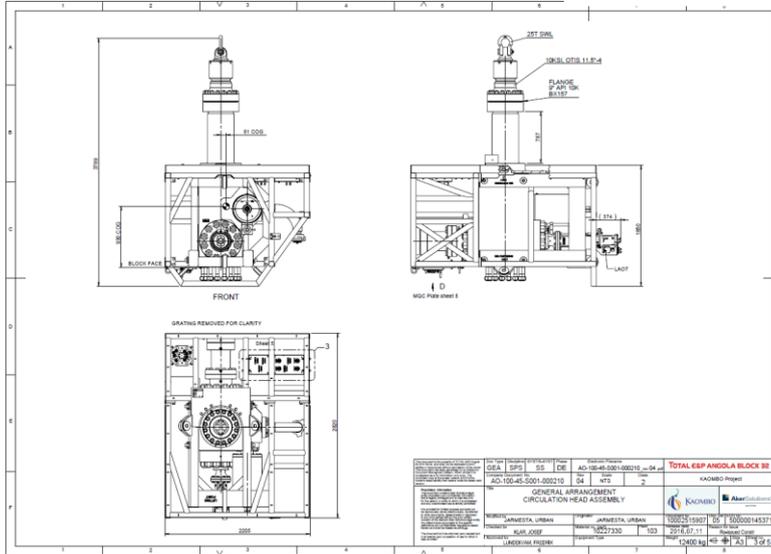
#### 7.13.2 In-riser Cutting lubricator valve 6.125



**TYPE 3 Use as is (if possible)**

Cutting water LV	10002943199	AO-100-45-S001-000432	10259656
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### 7.14 Circulation head (CH)

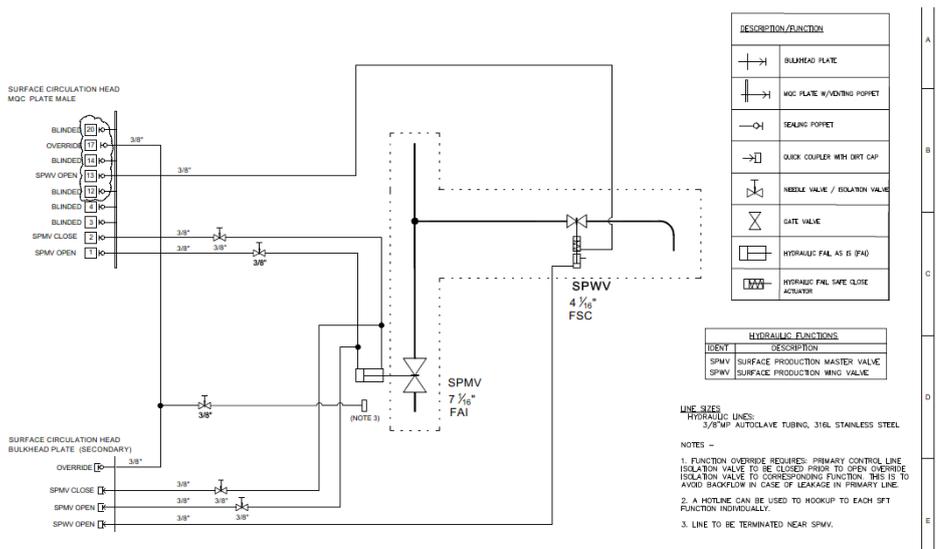


Circulation head	10002515907	AO-100-45-S001-000210	10227330
Circulation head, Schematic	10002469875	AO-100-45-S001-000034	10227330

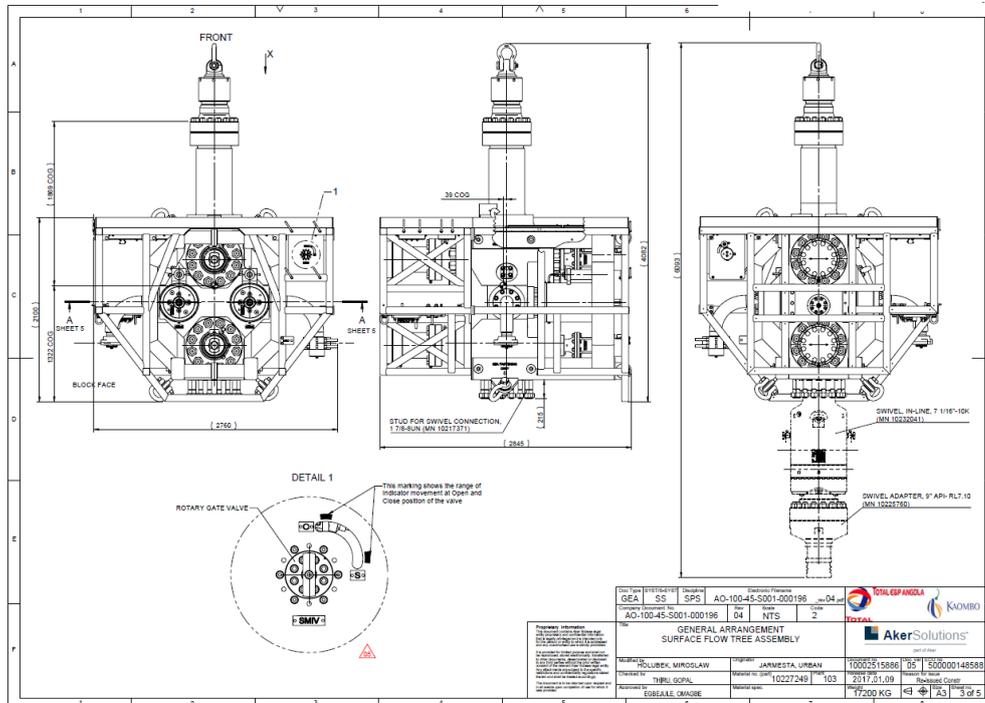
**TYPE 1C Glossy 3-D rendering quality with description/details like GA**

**Try to merge on one page with schematic**

#### 7.14.1 CH schematic



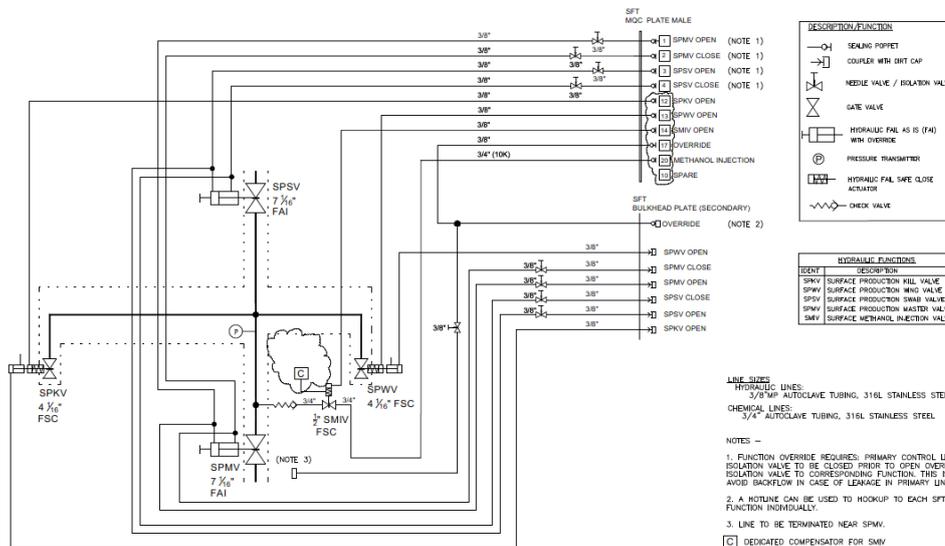
### 7.15 Surface flow tree (SFT)



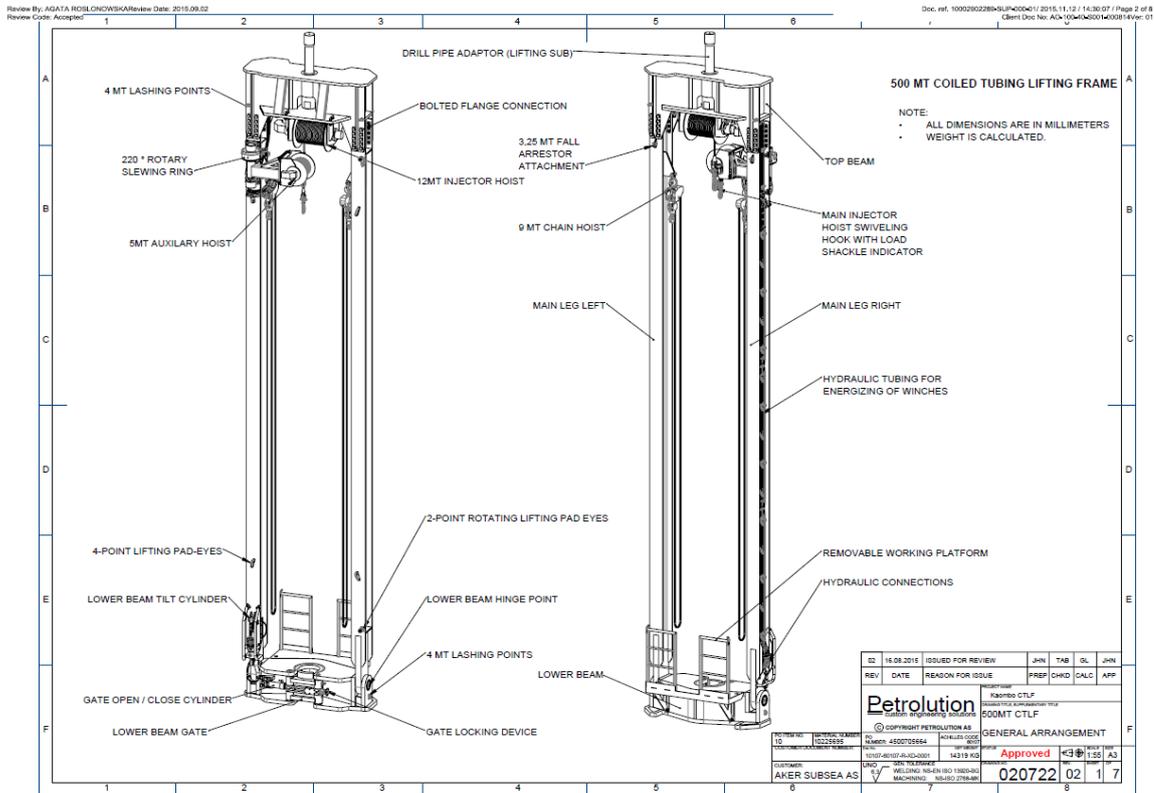
Surface flow tree	10002515886	AO-100-45-S001-000196	10227249
CTLF+SFT+CWJ ASSEMBLY	10003093275	AO-100-45-S001-000460	10227249

### TYPE 1C Glossy 3-D rendering quality with description/details like GA

#### 7.15.1 SFT schematic



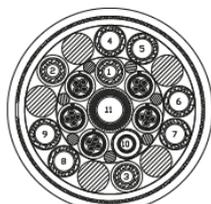
### 7.16 Coil tubing lifting frame (CTLF) One view to be included



GA COILED TUBING LIFTING FRAME	10002902289	AO-100-40-S001-000814	10234236
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**TYPE 5 Drawing as is + colouring**

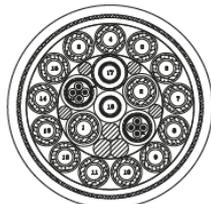
## 7.17 Umbilicals



LWRP Umbilical Cross Section

**Material Number:** 10190544  
 Reference GA Drawing: CG-MHN-20-3110-642130 (Rev. 02) / 10002184970 (Ver. 05)

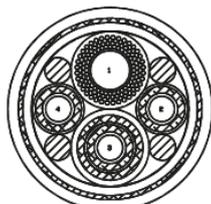
Umb Line No.	Functional Use	ND
1-3	Hydraulic	1/4"
4-9	Hydraulic	3/8"
10	Hyd/MEG/MeOH	1/4"
11	MEG/MeOH	1/2"
E1	Electric	N/A
E2	Electric	N/A
E3	Electric	N/A
E4	Electric	N/A
E5	Electric	N/A



TH Umbilical Cross Section

**Material Number:** 10190975  
 Reference GA Drawing: CG-MHN-20-3110-642131 (Rev. 01) / 10002184971 (Ver. 04)

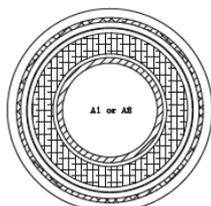
Umb Line No.	Functional Use	ND
1-15	Hydraulic	1/4"
16	Hyd/MEG/MeOH	1/4"
17	MEG/MeOH	1/4"
E1	Electric	N/A
E2	Electric	N/A



LV Umbilical Cross Section

**Material Number:** 10190976  
 Reference GA Drawing: CG-MHN-20-3110-642071 (Rev. 02) / 10002184972 (Ver. 03)

Umb Line No.	Functional Use	ND
1	MEG/MeOH	3/8"
2-3	Hydraulic	1/4"
4	Hyd/MEG/MeOH	1/4"



**Material Number:** 10190978  
 Reference GA Drawing: CG-MHN-20-3110-642044 (Rev. 02) / 10002184973 (Ver. 06)

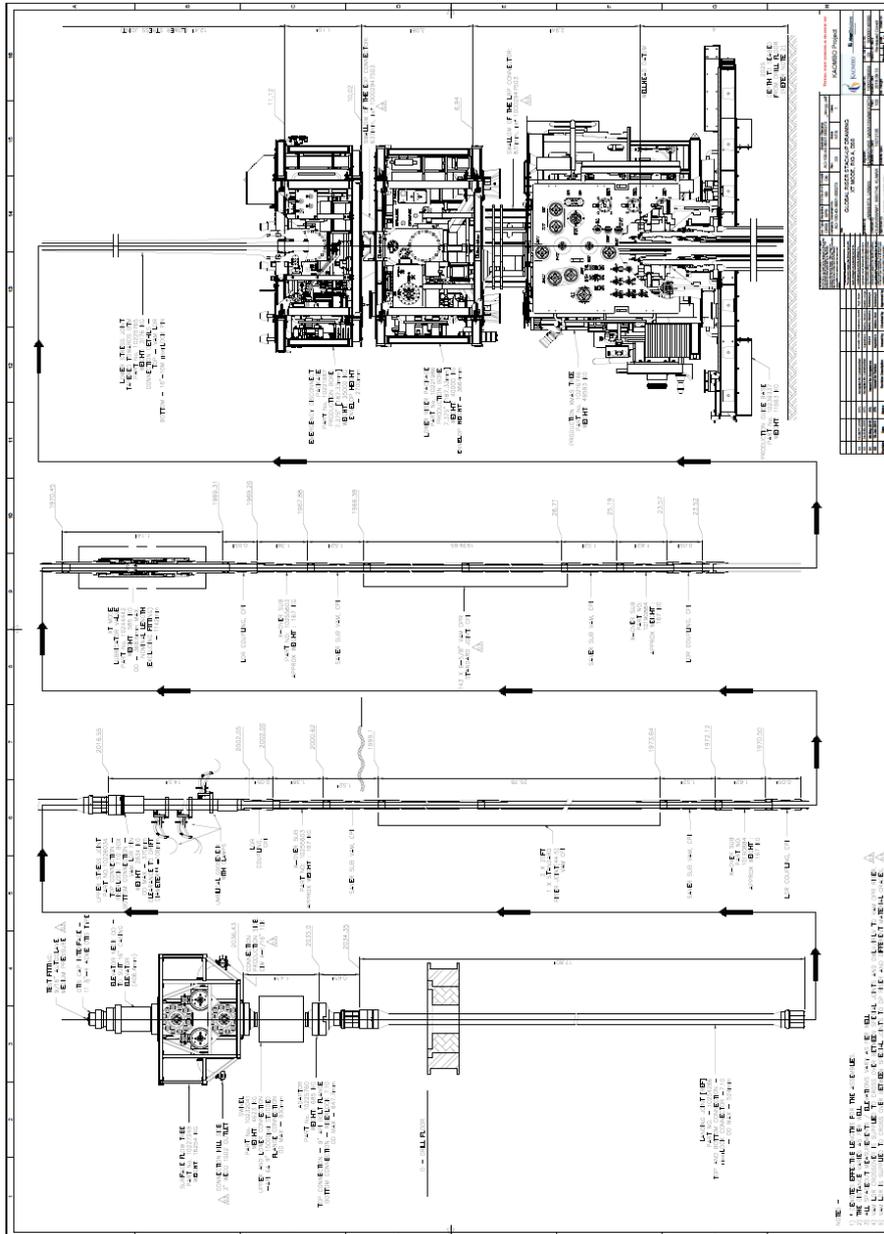
Hose No.	Umb Line No.	Functional Use	NB
1	A1	HYD/CHEM	1" HCR
2	A2	HYD/CHEM	1" HCR
3	A1	HYD/CHEM	1" HCR
4	A2	HYD/CHEM	1" HCR
5	SPARE	HYD/CHEM	1" HCR

TH Umbilical	10002898373	AO-100-40-S187-000023	10231213
LWRP Umbilical	10002898271	AO-100-40-S187-000021	10231185
Annulus Hose	10002898475	AO-100-40-S001-000779	10231197
LV umbilical	10002895386	AO-100-40-S187-000015	10231190
GA TH JUMPER	10002934257	AO-100-40-S187-000047	10231195
GA LV Jumper	10002934147	AO-100-40-S187-000048	10231191
GA SFT JUMPER	10002934296	AO-100-40-S187-000051	10231204
GA LWRP JUMPER	10002934223	AO-100-40-S187-000046	10231187
GA ANNULUS JUMPER	10002934114	AO-100-40-S187-000050	10231203

Picture above is an example from Moho. We want to have the same layout (+ deck jumpers) with the table on the right side with same type of information



7.18.2 XT MODE RIG A, SKYROS



STACK-UP XT MODE	10002768359	AO-100-45-S001-000273	N/A
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**TYPE 3 Use as is (if possible)**

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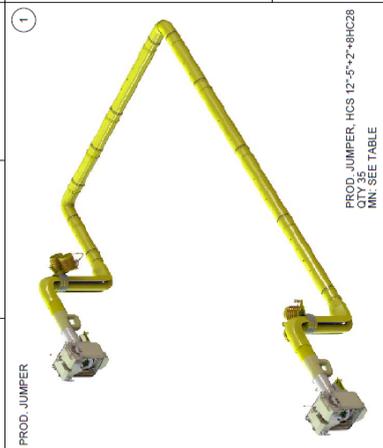
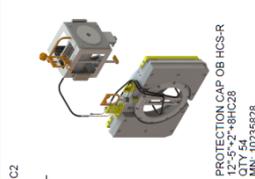
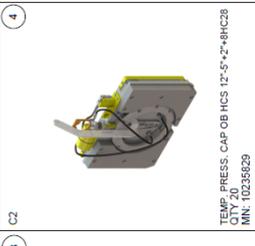
## **8 PRODUCTION JUMPER SYSTEM**

### **8.1 Reference List**

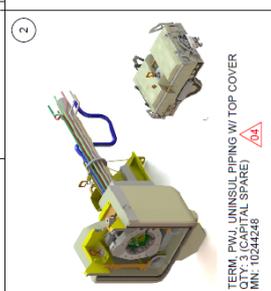
### 8.2 Scope of Supply Production Jumper

SR NO	MATERIAL NO	DESCRIPTION	FIELD
1-01	10234865	PWJ MB 33-IP-1012	GENUNGO
1-02	10234830	PWJ MB 33-IP-1013	GENUNGO
1-03	10234831	PWJ MB 33-IP-1014	GENUNGO
1-04	10234871	PWJ MB 33-IP-1033	GENUNGO
1-05	10234875	PWJ MB 33-IP-1053	GENUNGO
1-06	10234876	PWJ MB 33-IP-1055	GENUNGO
1-07	10234877	PWJ MB 34-IP-1025	GENUNGO
1-08	10234878	PWJ MB 34-IP-1045	GENUNGO
1-09	10234881	PWJ MB 34-IP-1022	GENUNGO
1-10	10234882	PWJ MB 34-IP-1021	GENUNGO
1-11	10234883	PWJ MB 34-IP-1023	GENUNGO
1-12	10234884	PWJ MB 34-IP-1024	GENUNGO
1-13	10234885	PWJ MB 38-IP-1014	CARIL
1-14	10234886	PWJ MB 38-IP-1013	CARIL
1-16	10234887	PWJ MB 38-IP-1022	CARIL
1-17	10234888	PWJ MB 35-IP-1051	CANELA
1-18	10234889	PWJ MB 35-IP-1051	CANELA
1-19	10234920	PWJ MB 35-IP-1021	CANELA
1-20	10234901	PWJ MB 35-IP-1022	CANELA
1-21	10234901	PWJ MB 35-IP-1022	CANELA
1-22	10234903	PWJ MB 35-IP-1032	CANELA
1-23	10234903	PWJ MB 35-IP-1011	MOSTARDA
1-24	10234904	PWJ MB 36-IP-1012	MOSTARDA
1-25	10234905	PWJ MB 36-IP-1022	MOSTARDA
1-26	10234905	PWJ MB 36-IP-1033	MOSTARDA
1-27	10234907	PWJ MB 36-IP-1032	MOSTARDA
1-28	10234908	PWJ MB 37-IP-1011	LOJERO
1-29	10234910	PWJ MB 37-IP-1021	LOJERO
1-30	10234911	PWJ MB 37-IP-1024	LOJERO
1-31	10234912	PWJ MB 37-IP-1023	LOJERO
1-32	10234914	PWJ MB 37-IP-1033	LOJERO
1-33	10234915	PWJ MB 37-IP-1032	LOJERO
1-34	10234919	PWJ MB TBA-1	TBA
1-35	10234919	PWJ MB TBA-2	TBA
SR NO	MATERIAL NO	DESCRIPTION	QTY
2	10244248	TERM. PWJ UNINSUL PIPING W/ TOP COVER	3
3	10235828	PROTECTION CAP OB HCSR 12" MB	54
4	10235829	TEMP. PRESS. CAP OB HCS 12"-5'-2"-8HC28	20

	1	PROD. JUMPER QTY 35 MN. 10244248
	3	PROTECTION CAP OB HCSR 12"-5'-2"-8HC28 QTY 54 MN. 10235828
	4	TEMP. PRESS. CAP OB HCS 12"-5'-2"-8HC28 QTY 20 MN. 10235829

	2	TERM. PWJ UNINSUL PIPING W/ TOP COVER QTY 3 (CAPITAL SPARE) MN. 10244248
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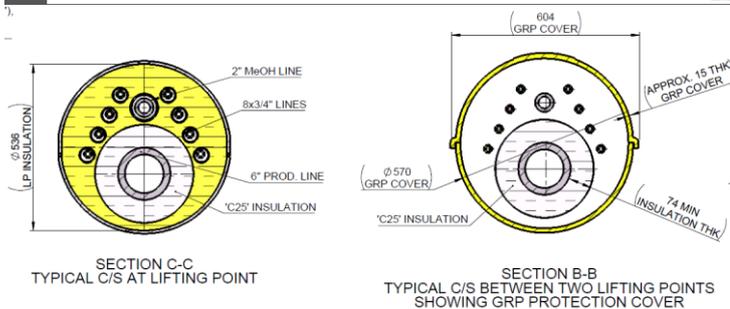
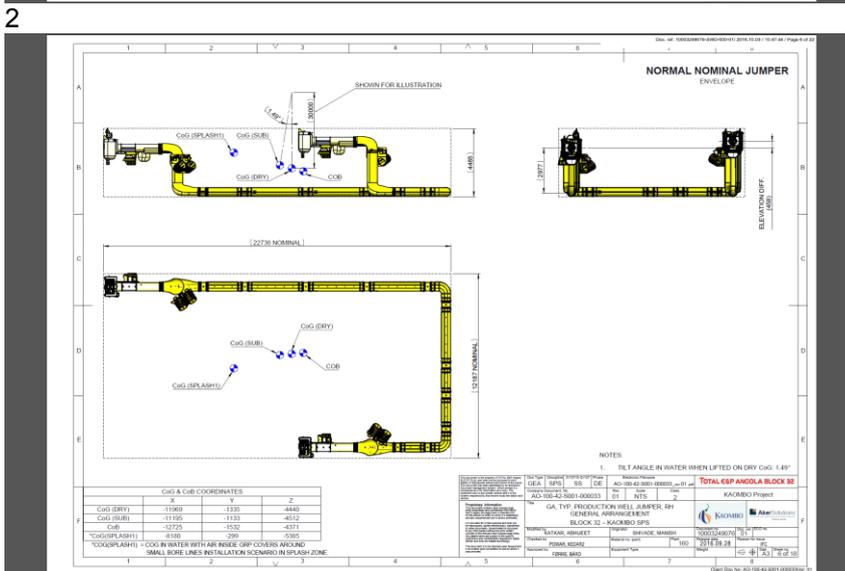
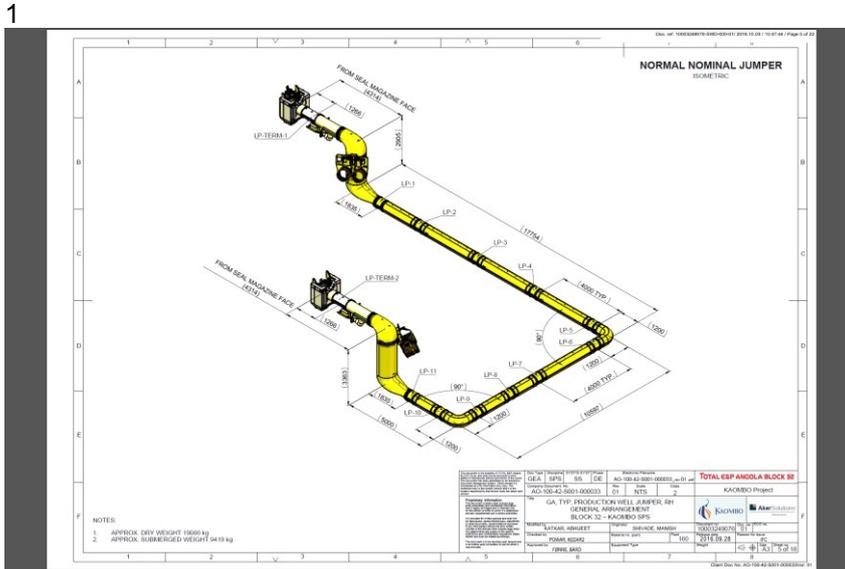
  

SR Type: Production SOW: SPS AC-100-42-S001-000003 Title: SCOPE OF SUPPLY - PRODUCTION JUMPERS TIE-IN CONNECTORS BLOCK 32 - KAOMBO SPS	Revision: 05 DE: AC-100-42-S001-000003 BA: NTS Date:	Project Name: TOTAL CBP ANGOLA BLOCK 32 KAOMBO Project  
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SOS Production Jumper	10002442979	AO-100-42-S001-000003	N/A
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TYPE 1B Glossy 3-D rendering quality like example  
 Table with all the other Jumpers on same page

### 8.3 Production Well Jumper (PWJ)

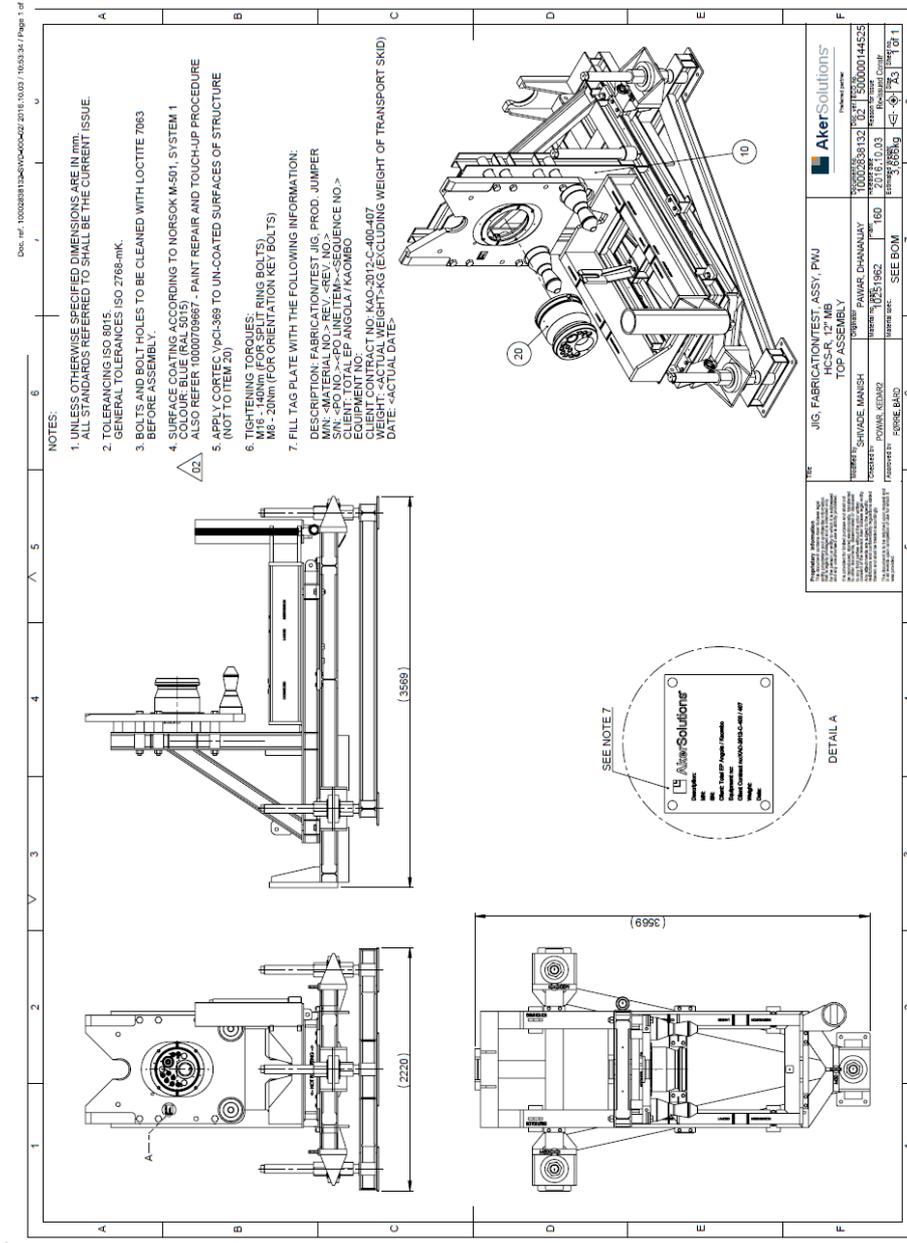


GA, Typical Production Well Jumper RH	10003249076	AO-100-42-S001-000033	N/A
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**TYPE 3 Use as is (if possible)**

Section C-C & B-B drawing to be included in picture 2, right lower corner.

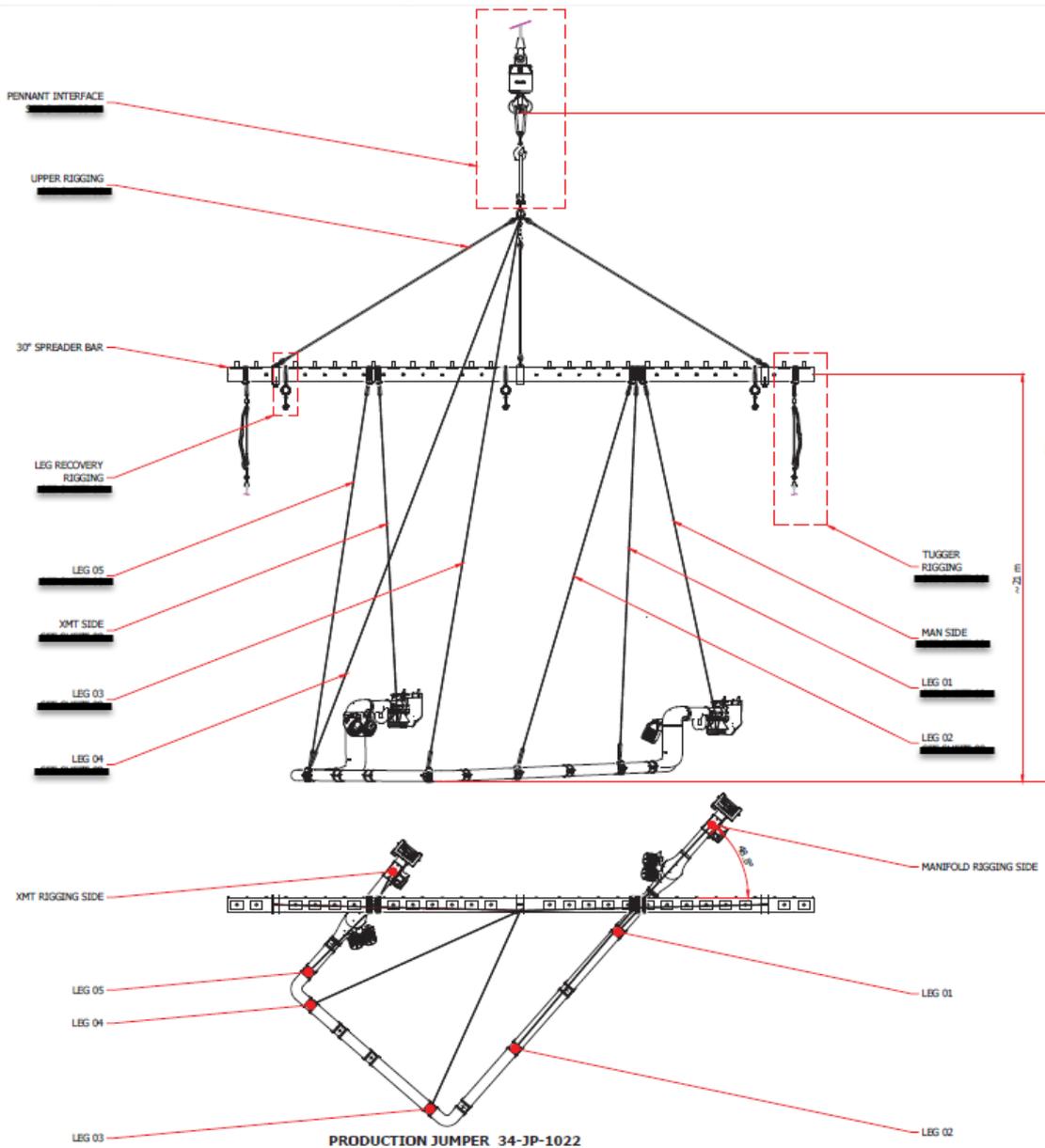
### 8.4 Fabrication/Test Jig



Fabrication/Test JIG	10002838132	N/A	10251962
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TYPE 2A Colour screenshot solidworks ISO VIEW + drawing as is

## 8.5 Typical Spreader Bar Lifting Arrangement



This sketch is for information only; note that lifting design and lifting arrangement is not supplied by Aker Solutions.

Spreader Frame Normal PWJ	N/A	AO-100-42-S001-000019 (Page 44)	N/A
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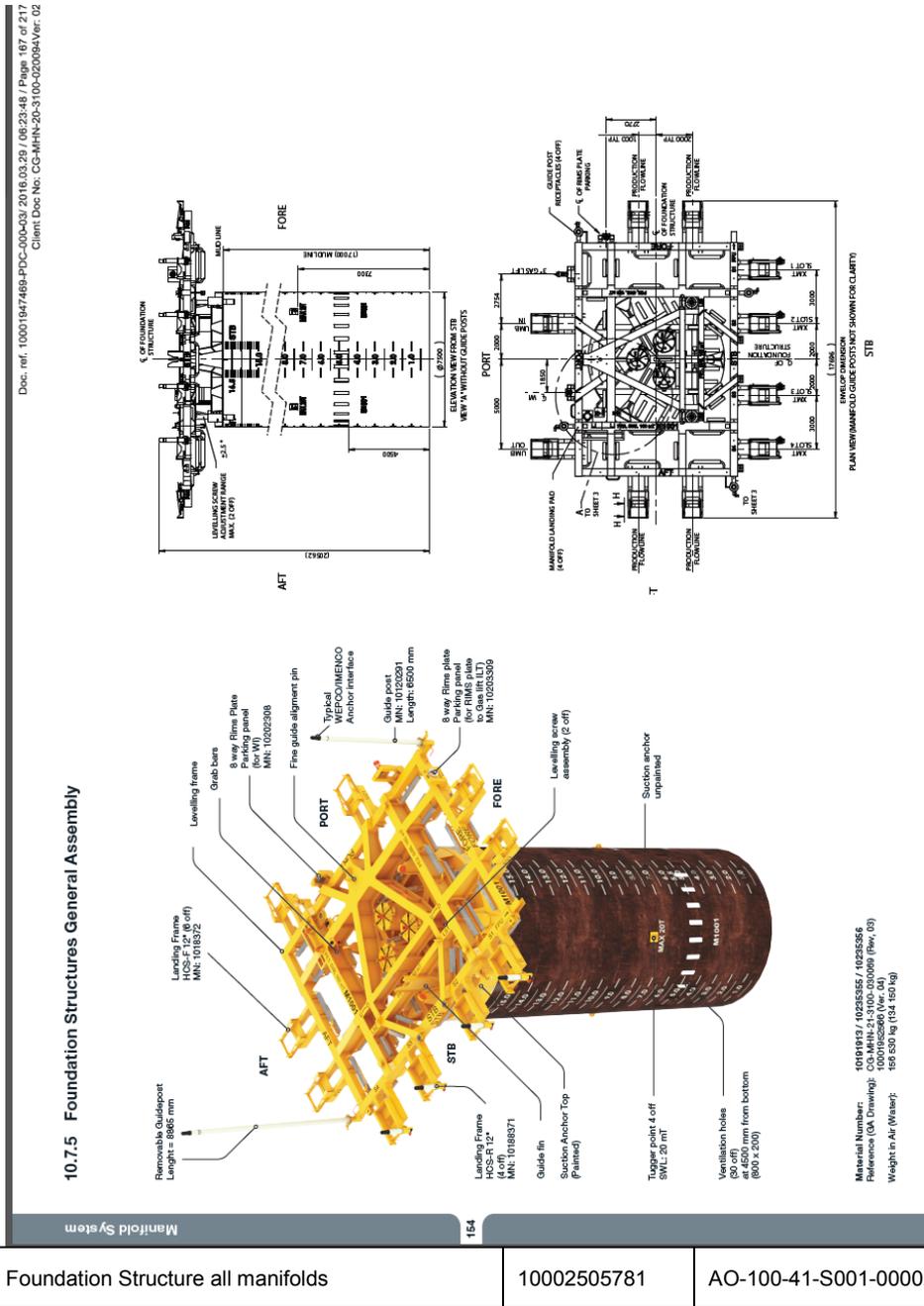
Document: 10002504361-PDC-000  
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## **9 MANIFOLD SYSTEM**

### **9.1 Reference list**

## 9.2 Foundation Structure manifold



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### 9.3 Manifold types summary Table

Summary table to be included by X-vision

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9.4 Valve torque list 2-slot & 4 slot

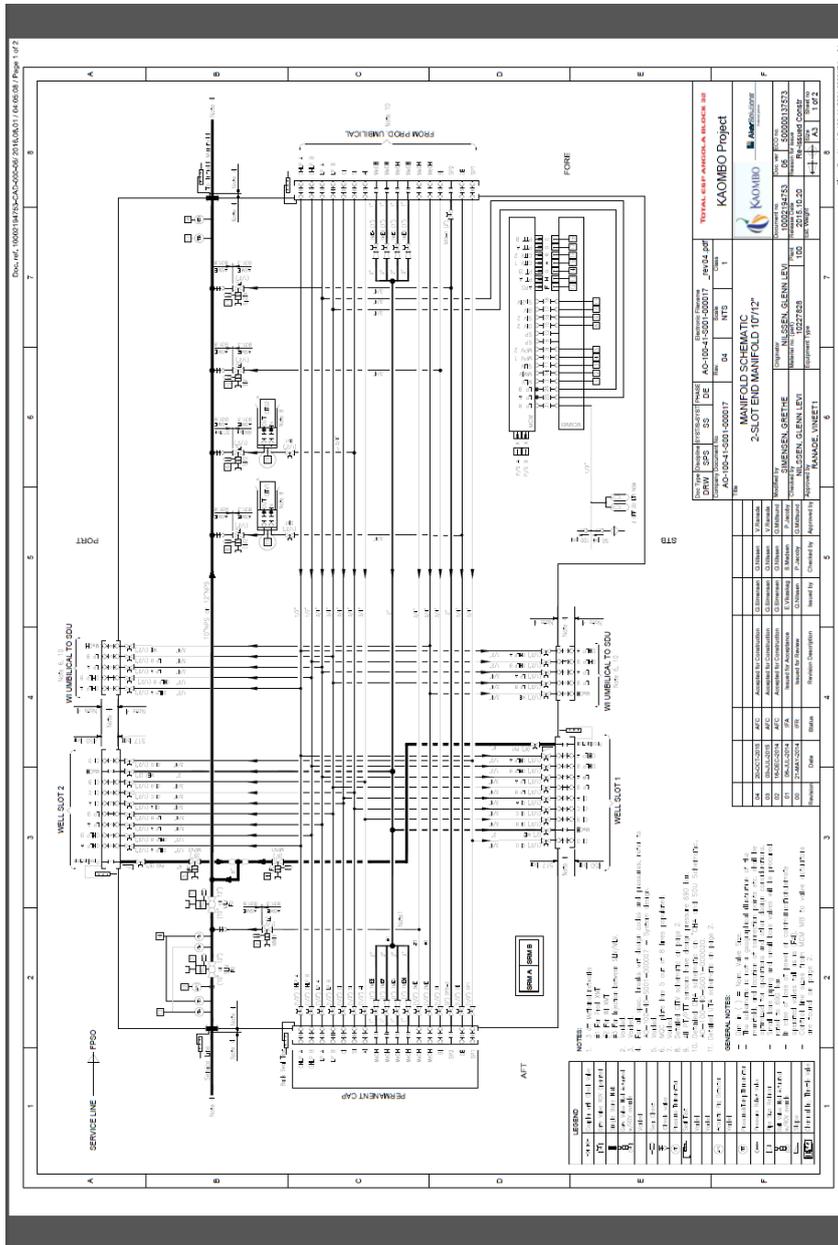
Item No	Qty 2-slot and 4-slot	Valve Name	ROV ID	SAP Material Nr.	Nominal Valve Size	Valve Type	Actuation	ROV Interface	ROV Tool	Running Torque (Nm)	Break Out Torque (Nm)	Max torque (Nm)	Damage Torque (Nm)	Clamping direction (CW or CCW # counter-clockwise)	Approx. number of Turns to Open or Close
1	2	Service Line Isolation Valve	SLIV	10237758	10"	Ball	HYDRO	ISO 13628-8 Class 4	Class 4 Torque Tool	1830	2700	2711	3000	CW	60.5
2		Manifold Line Valve	MLV	10237758	10"	Ball	HYDRO	ISO 13628-8 Class 4	Class 4 Torque Tool	1830	2700	2711	3000	CW	60.5
3	4	Spare 2 Isolation Valve (Fore)	SP2-1	10237878	2-1/16"	Gate	ROV	ISO 13628-8 Class 4	Class 4 Torque Tool	1250	1250	2711	3500	CW	4.2
4		Spare 2 Isolation Valve (Aft)	SP2-2	10237878	2-1/16"	Gate	ROV	ISO 13628-8 Class 4	Class 4 Torque Tool	1250	1250	2711	3500	CW	4.2
5		Methanol Isolation Valve (Slot 1)	ME1 (S1)	10237878	2-1/16"	Gate	ROV	ISO 13628-8 Class 4	Class 4 Torque Tool	1250	1250	2711	3500	CW	4.2
6		Methanol Isolation Valve (Slot 2)	ME2 (S2)	10237878	2-1/16"	Gate	ROV	ISO 13628-8 Class 4	Class 4 Torque Tool	1250	1250	2711	3500	CW	4.2
7	30	Spare 2 Injection Valve	Sp2IV	10242978	V2"	Rotary Gate	ROV	ROV Manipulator	Paddle Tool	14	30	300	400	CW	10
8		Biocide Injection Valve	BIV	10242978	V2"	Rotary Gate	ROV	ROV Manipulator	Paddle Tool	14	30	300	400	CW	10
9		Scale Inhibitor Injection Valve 2	SIV2	10242978	V2"	Rotary Gate	ROV	ROV Manipulator	Paddle Tool	14	30	300	400	CW	10
10		Demulsifier Injection Valve 2	DIV2	10242978	V2"	Rotary Gate	ROV	ROV Manipulator	Paddle Tool	14	30	300	400	CW	10
11		Manifold Methanol Injection Valve	MMIV	10242978	V2"	Rotary Gate	ROV	ROV Manipulator	Paddle Tool	14	30	300	400	CW	10
12		Scale Inhibitor Injection Valve 1	SIV1	10243040	V2"	Rotary Gate	ROV	ROV Manipulator	Paddle Tool	20	515	300	400	CW	V4
13		Demulsifier Injection Valve 1	DIV1	10243040	V2"	Rotary Gate	ROV	ROV Manipulator	Paddle Tool	20	515	300	400	CW	V4
14		LP A Isolation Valve (Aft)	LP A	10243040	V2"	Rotary Gate	ROV	ROV Manipulator	Paddle Tool	20	515	300	400	CW	V4
15		LP B Isolation Valve (Aft)	LP B	10243040	V2"	Rotary Gate	ROV	ROV Manipulator	Paddle Tool	20	515	300	400	CW	V4
16		Corrosion Inhibitor Isolation Valve (Aft)	CI	10243040	V2"	Rotary Gate	ROV	ROV Manipulator	Paddle Tool	20	515	300	400	CW	V4
17		Scale Inhibitor Isolation Valve (Aft)	SI	10243040	V2"	Rotary Gate	ROV	ROV Manipulator	Paddle Tool	20	515	300	400	CW	V4
18		Asphaltene Inhibitor Isolation Valve (Aft)	AI	10243040	V2"	Rotary Gate	ROV	ROV Manipulator	Paddle Tool	20	515	300	400	CW	V4
19		Methanol Manifold Isolation Valve (Aft)	3ME	10243040	V2"	Rotary Gate	ROV	ROV Manipulator	Paddle Tool	20	515	300	400	CW	V4
20		Methanol W/OXT Isolation Valve (Aft)	2ME	10243040	V2"	Rotary Gate	ROV	ROV Manipulator	Paddle Tool	20	515	300	400	CW	V4
21		Biocide Isolation Valve (Aft)	BI	10243040	V2"	Rotary Gate	ROV	ROV Manipulator	Paddle Tool	20	515	300	400	CW	V4
22		Demulsifier Isolation Valve (Aft)	DE	10243040	V2"	Rotary Gate	ROV	ROV Manipulator	Paddle Tool	20	515	300	400	CW	V4
23		Spare 1 Isolation Valve (Aft)	SP1	10243040	V2"	Rotary Gate	ROV	ROV Manipulator	Paddle Tool	20	515	300	400	CW	V4
24		LP A Isolation Valve (Slot 1)	LP A (S1)	10243040	V2"	Rotary Gate	ROV	ROV Manipulator	Paddle Tool	20	515	300	400	CW	V4
25		LP B Isolation Valve (Slot 1)	LP B (S1)	10243040	V2"	Rotary Gate	ROV	ROV Manipulator	Paddle Tool	20	515	300	400	CW	V4
26		Corrosion Inhibitor Isolation Valve (Slot 1)	CI A (S1)	10243040	V2"	Rotary Gate	ROV	ROV Manipulator	Paddle Tool	20	515	300	400	CW	V4
27		Scale Inhibitor Isolation Valve (Slot 1)	CI C (S1)	10243040	V2"	Rotary Gate	ROV	ROV Manipulator	Paddle Tool	20	515	300	400	CW	V4
28		Asphaltene Inhibitor Isolation Valve (Slot 1)	CI B (S1)	10243040	V2"	Rotary Gate	ROV	ROV Manipulator	Paddle Tool	20	515	300	400	CW	V4
29		Spare 1 Isolation Valve (Slot 1)	CI D (S1)	10243040	V2"	Rotary Gate	ROV	ROV Manipulator	Paddle Tool	20	515	300	400	CW	V4
30		LP A Isolation Valve (Slot 2)	LP A (S2)	10243040	V2"	Rotary Gate	ROV	ROV Manipulator	Paddle Tool	20	515	300	400	CW	V4
31		LP B Isolation Valve (Slot 2)	LP B (S2)	10243040	V2"	Rotary Gate	ROV	ROV Manipulator	Paddle Tool	20	515	300	400	CW	V4
32		Corrosion Inhibitor Isolation Valve (Slot 2)	CI A (S2)	10243040	V2"	Rotary Gate	ROV	ROV Manipulator	Paddle Tool	20	515	300	400	CW	V4
33		Scale Inhibitor Isolation Valve (Slot 2)	CI C (S2)	10243040	V2"	Rotary Gate	ROV	ROV Manipulator	Paddle Tool	20	515	300	400	CW	V4
34		Asphaltene Inhibitor Isolation Valve (Slot 2)	CI B (S2)	10243040	V2"	Rotary Gate	ROV	ROV Manipulator	Paddle Tool	20	515	300	400	CW	V4
35	Spare 1 Isolation Valve (Slot 2)	CI D (S2)	10243040	V2"	Rotary Gate	ROV	ROV Manipulator	Paddle Tool	20	515	300	400	CW	V4	
36	LP A Isolation Valve (PORT)	LP A (UMB)	10243040	V2"	Rotary Gate	ROV	ROV Manipulator	Paddle Tool	20	515	300	400	CW	V4	
37	LP B Isolation Valve (PORT)	LP B (UMB)	10243040	V2"	Rotary Gate	ROV	ROV Manipulator	Paddle Tool	20	515	300	400	CW	V4	
38	Methanol Isolation Valve (PORT)	ME (UMB)	10243040	V2"	Rotary Gate	ROV	ROV Manipulator	Paddle Tool	20	515	300	400	CW	V4	
39	LP A Isolation Valve (STB)	LP A (UMB STB)	10243040	V2"	Rotary Gate	ROV	ROV Manipulator	Paddle Tool	20	515	300	400	CW	V4	
40	LP B Isolation Valve (STB)	LP B (UMB STB)	10243040	V2"	Rotary Gate	ROV	ROV Manipulator	Paddle Tool	20	515	300	400	CW	V4	
41	Methanol Isolation Valve (STB)	ME (UMB STB)	10243040	V2"	Rotary Gate	ROV	ROV Manipulator	Paddle Tool	20	515	300	400	CW	V4	
42	Downhole LP A Isolation Valve (Aft)	DHLP A	10243041	V2"	Rotary Gate	ROV	ROV Manipulator	Paddle Tool	20	515	300	400	CW	V4	
43	Downhole LP B Isolation Valve (Aft)	DHLP B	10243041	V2"	Rotary Gate	ROV	ROV Manipulator	Paddle Tool	20	515	300	400	CW	V4	
44	Downhole LP A Isolation Valve (Slot 1)	DHLP A (S1)	10243041	V2"	Rotary Gate	ROV	ROV Manipulator	Paddle Tool	20	515	300	400	CW	V4	
45	Downhole LP B Isolation Valve (Slot 1)	DHLP B (S1)	10243041	V2"	Rotary Gate	ROV	ROV Manipulator	Paddle Tool	20	515	300	400	CW	V4	

TYPE 3 Use as is (if possible)

Merge these two tables together & add an extra column to the right where we write which Manifold the different valve is applicable for.

## 9.5 2 Slot 12" End Manifold

### 9.5.1 Manifold 2 slot end Schematic



Manifold Schematic	10002194753	AO-100-41-S001-000017	10234514
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**TYPE 3 Use as is (if possible)**

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9.5.2 Manifold 2 slot end GA

**NOTES:**

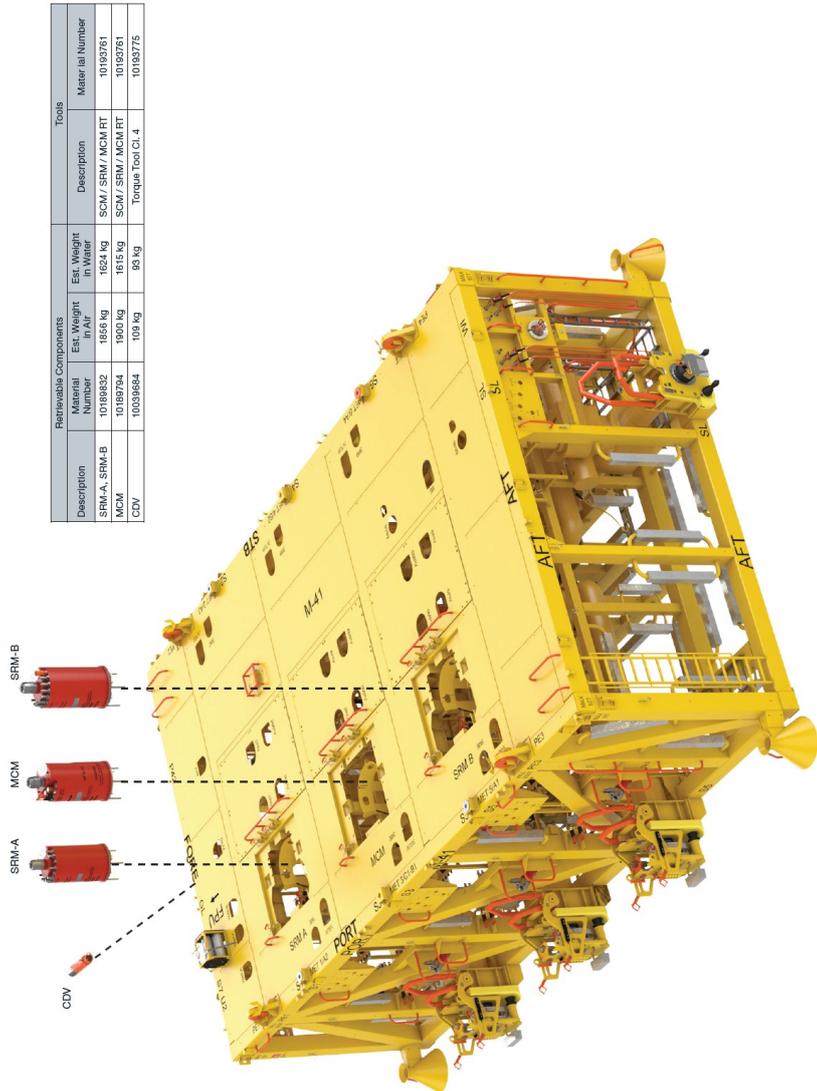
1. MAIN HATCH LOCKING ARRANGEMENT FOR RETRIEVAL OF SPM
2. TYPICAL LOCKING ARRANGEMENT PROVIDED FOR RETRIEVAL OF SPM
3. PAD EYE IS BUILT FOR 150 MT
4. WEIGHT IN WATER: 15000 KG
5. INSTALLATION CONDITIONS INCLUDING ALLOWABLE TOWING SPEEDS AND TOWING CONTROLS AND MANIFOLD IN USE ALLOWED DOWN CONTROLS AND DOWNING CONTROLS
6. FOR GENERAL NOTES AND SPECIFICATIONS, REFER TO THE DRAWING
7. FOR WEIGHT CONTROL, REFER TO THE DRAWING
8. FOR SCOPE OF SUPPLY, REFER TO THE DRAWING
9. FOR ARRANGEMENT LA SPRING, REFER TO THE DRAWING
10. FOR ARRANGEMENT LB SPRING, REFER TO THE DRAWING
11. FOR GA MANIFOLD A FISC, REFER TO THE DRAWING
12. FOR GA MANIFOLD B FISC, REFER TO THE DRAWING
13. FOR ARRANGEMENT SPRING ISOLATION, REFER TO THE DRAWING
14. FOR ARRANGEMENT SPRING ISOLATION, REFER TO THE DRAWING
15. FOR ARRANGEMENT SPRING ISOLATION, REFER TO THE DRAWING
16. FOR ARRANGEMENT SPRING ISOLATION, REFER TO THE DRAWING
17. FOR ARRANGEMENT SPRING ISOLATION, REFER TO THE DRAWING
18. FOR ARRANGEMENT SPRING ISOLATION, REFER TO THE DRAWING
19. FOR ARRANGEMENT SPRING ISOLATION, REFER TO THE DRAWING
20. FOR CABLE LENGTHS & STRAPPING ARRANGEMENT, REFER TO THE DRAWING

NO.	DESCRIPTION	QTY	UNIT	REF.
1	COMPRESSOR	1	EA	10233442
2	PORT HICAP 12" X 21" PROCSERVICE MAN	1	EA	10233442
3	BULLWHEE DE EDGE SLOPE 350MM DIA	11	EA	10210841
4	WATER DAMPER SYSTEM	1	EA	10233392
5	WAY B POP INBOARD TRANSFER PLATE RING	1	EA	10233392
6	COMP PROT CAP B HICAP 12" X 21" HICAP	1	EA	10233392
7	WAY B POP 12" X 21" HICAP	1	EA	10233392
8	ELEC CABLE 12W 12V DUMMAY FCPT	1	EA	10233342
9	WAY B POP 12" X 21" HICAP	1	EA	10233342
10	PORT HICAP 12" X 21" HICAP	1	EA	10233342
11	PORT HICAP 12" X 21" HICAP	1	EA	10233342
12	PORT HICAP 12" X 21" HICAP	1	EA	10233342
13	PORT HICAP 12" X 21" HICAP	1	EA	10233342
14	PORT HICAP 12" X 21" HICAP	1	EA	10233342
15	PORT HICAP 12" X 21" HICAP	1	EA	10233342
16	PORT HICAP 12" X 21" HICAP	1	EA	10233342
17	PORT HICAP 12" X 21" HICAP	1	EA	10233342
18	PORT HICAP 12" X 21" HICAP	1	EA	10233342
19	PORT HICAP 12" X 21" HICAP	1	EA	10233342
20	PORT HICAP 12" X 21" HICAP	1	EA	10233342
21	PORT HICAP 12" X 21" HICAP	1	EA	10233342
22	PORT HICAP 12" X 21" HICAP	1	EA	10233342

GA, 2 Slot 12" End Manifold	10002506028	AO-100-41-S001-000080	10234514
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TYPE 1C Glossy 3-D rendering quality with description/details like GA

### 9.5.3 Manifold 2 slot end – Retrievable components

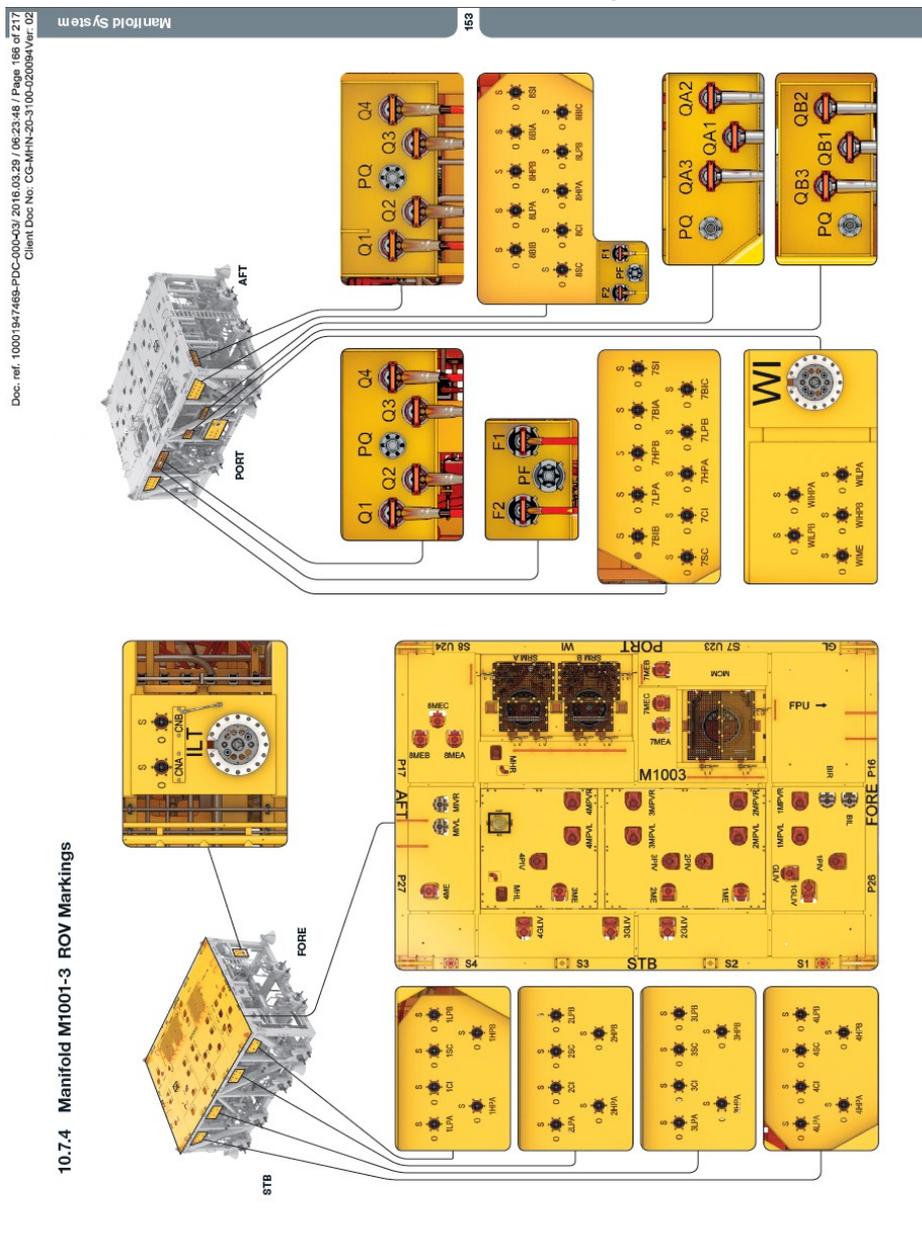


Description	Retrievable Components		Tools	
	Material Number	Est. Weight in Air	Description	Material Number
SRM-A, SRM-B	10189832	1856 Kg	SCM / SRM / MCM RT	10189761
MCM	10189784	1900 Kg	SCM / SRM / MCM RT	10189761
CDV	10039684	109 Kg	Torque Tool Cl. 4	10189775

Illustration from MOHO

GA, 2 Slot 12" End Manifold	10002506028	AO-100-41-S001-000080	10234514
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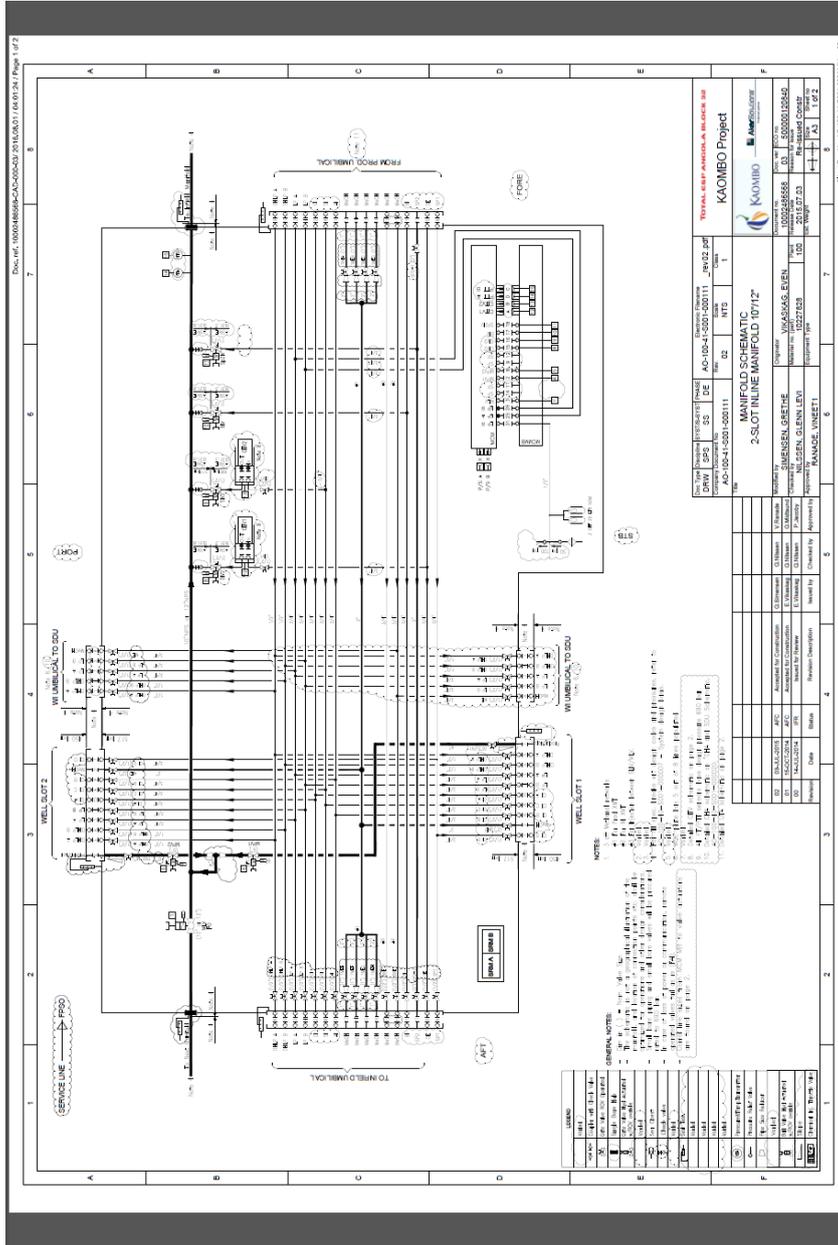
### 9.5.4 Manifold 2 slot end ROV Panel Markings



GA, 2 Slot 12" End Manifold	10002506028	AO-100-41-S001-000080	10234514
Manifold GA Subsea Marking 2 slot end	10002506029	AO-100-41-S001-000081	10260480

## 9.6 2 Slot 12" Infield Manifold

### 9.6.1 Manifold 2 slot Inline Schematic



Manifold Schematic	10002486568	AO-100-41-S001-00111	10234511
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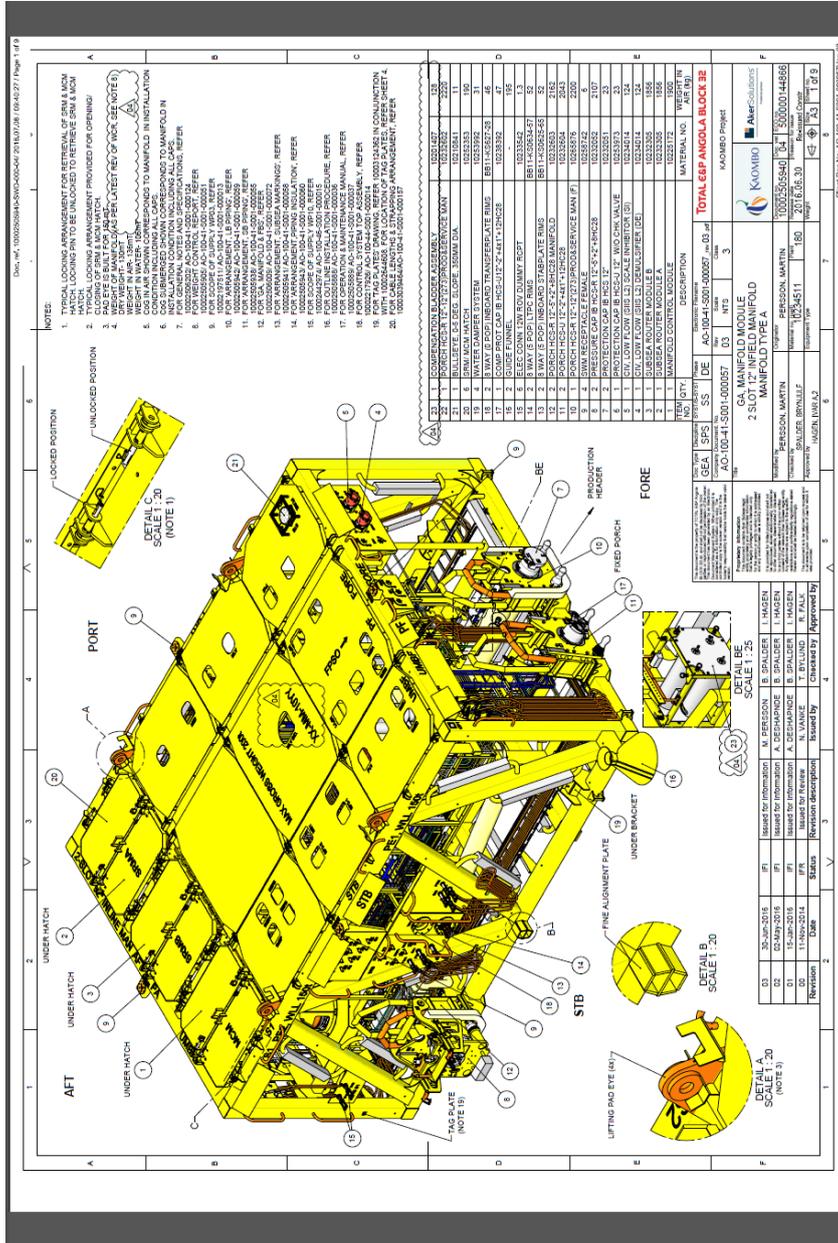
**TYPE 3 Use as is (if possible)**

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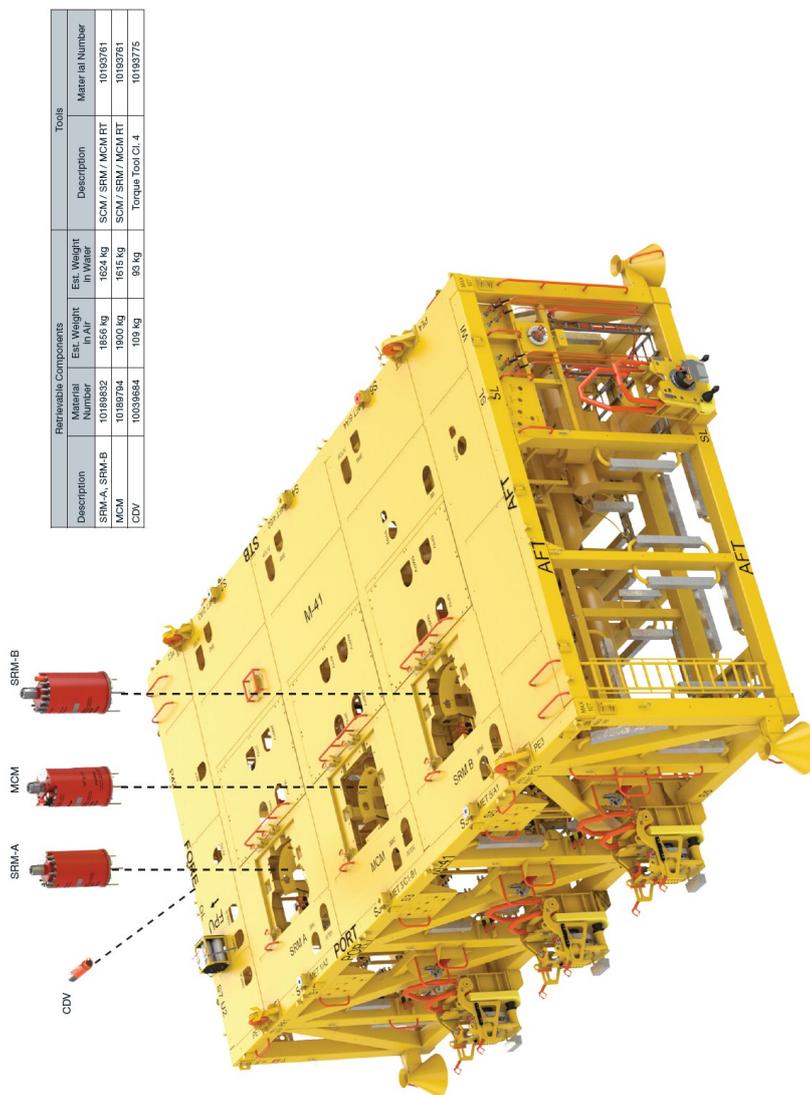
9.6.2 Manifold 2 slot Inline GA



GA, 2 Slot 12" Infield Manifold	10002505940	AO-100-41-S001-000057	10234511
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TYPE 1C Glossy 3-D rendering quality with description/details like GA

### 9.6.3 Manifold 2 slot inline – Retrievable components

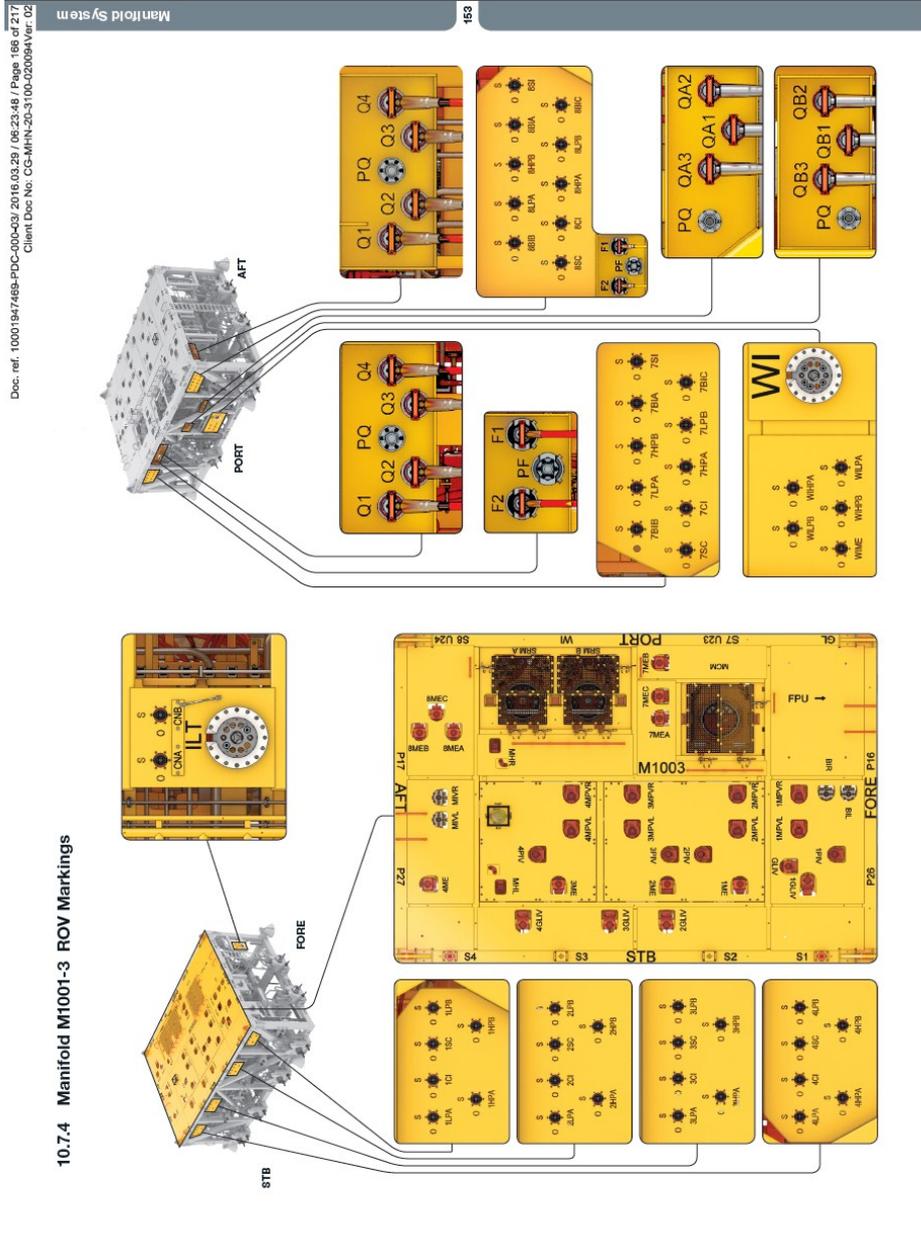


Retrievable Components		Tools	
Description	Material Number	Est. Weight in Water	Material Number
SRM-A, SRM-B	10189632	1856 kg	10193761
MCM	10189794	1615 kg	10193761
CDV	10039484	109 kg	10193775
			Torque Tool Cl. 4

Illustration from MOHO

GA, 2 Slot 12" Infield Manifold	10002505940	AO-100-41-S001-000057	10234511
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### 9.6.4 Manifold 2 slot Inline ROV Panel Markings



GA, 2 Slot 12" Infield Manifold	10002505940	AO-100-41-S001-000057	10234511
Manifold GA Subsea Marking 2 slot inline	10002505941	AO-100-41-S001-000058	10260453

Picture above is an example from Moho & is how we want it

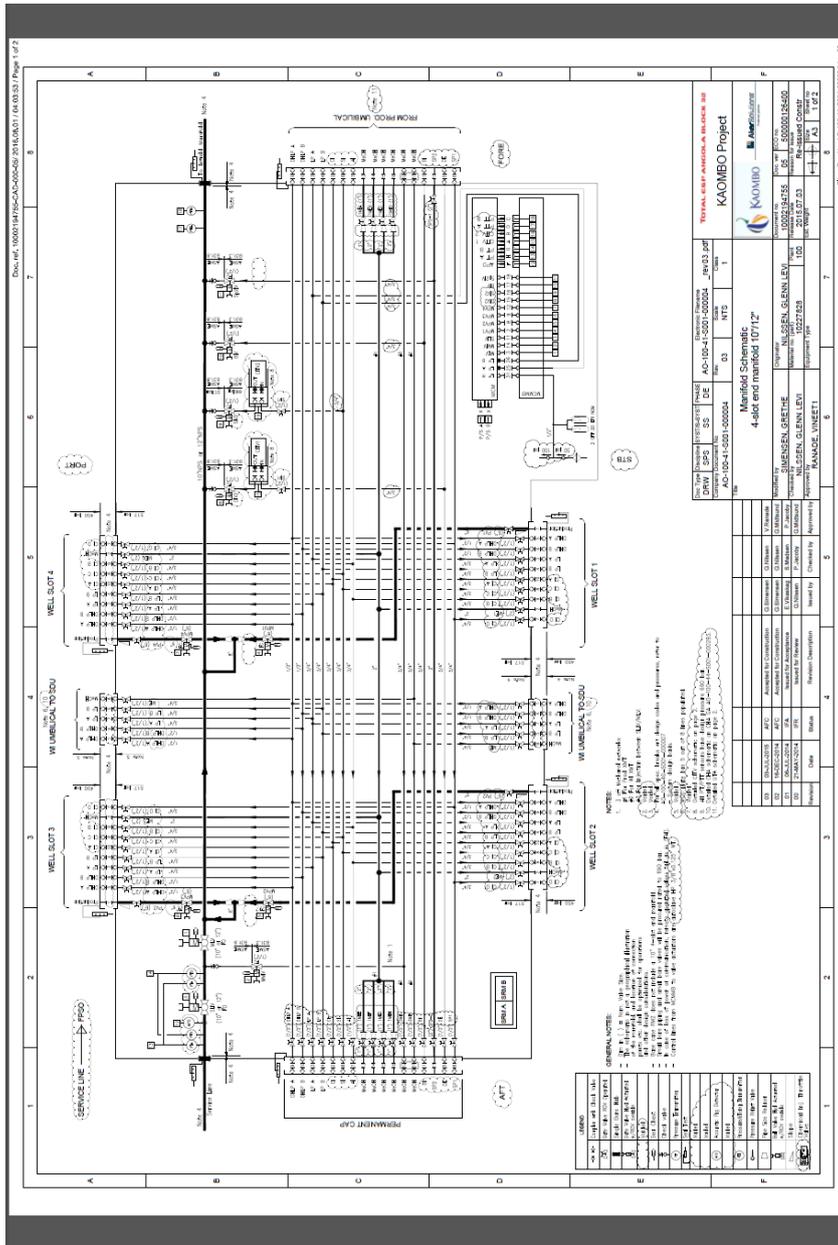
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## 9.7 4 Slot 12" End Manifold

### 9.7.1 Manifold 4 slot end Schematic



Manifold Schematic 4 slot end	10002194755	AO-100-41-S001-00004	10234513
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TYPE 3 Use as is (if possible)

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9.7.2 Manifold 4 slot end GA

**NOTES:**

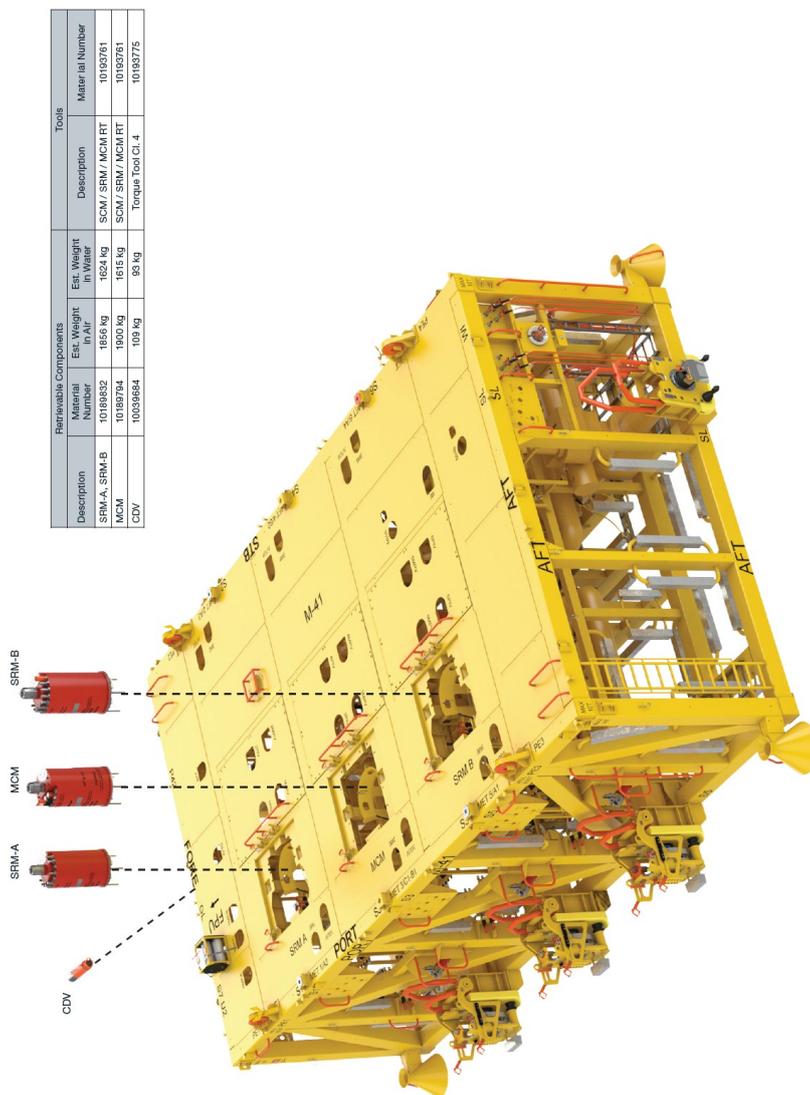
- TYPICAL LOCKING ARRANGEMENT FOR RETRIEVAL OF SRM & MCM FROM MANIFOLD. REFER TO DRAWING GA-100-41-S001-000073 FOR DETAILS.
- HATCH.
- LOCKING ARRANGEMENT PROVIDED FOR OPENING.
- CLOSING OF SRM & MCM HATCH.
- WEIGHT OF MANIFOLD AS SHOWN IN THIS DRAWING IS APPROXIMATE. WEIGHT IN AIR TEST.
- DOES IN AIR HATCHING CORRESPOND TO MANIFOLD IN MANUFACTURE.
- DOES NOT CORRESPOND TO MANIFOLD IN MANUFACTURE.
- INSTALLATION CONDITION INCLUDING ALL CASES.
- 1000250610 AC-100-41-S001-0000124 SRM HATCH, REFER.
- 1000250610 AC-100-41-S001-0000125 MCM HATCH, REFER.
- 1000250610 AC-100-41-S001-0000126 SRM HATCH, REFER.
- 1000250610 AC-100-41-S001-0000127 MCM HATCH, REFER.
- 1000250610 AC-100-41-S001-0000128 SRM HATCH, REFER.
- 1000250610 AC-100-41-S001-0000129 MCM HATCH, REFER.
- 1000250610 AC-100-41-S001-0000130 SRM HATCH, REFER.
- 1000250610 AC-100-41-S001-0000131 MCM HATCH, REFER.
- 1000250610 AC-100-41-S001-0000132 SRM HATCH, REFER.
- 1000250610 AC-100-41-S001-0000133 MCM HATCH, REFER.
- 1000250610 AC-100-41-S001-0000134 SRM HATCH, REFER.
- 1000250610 AC-100-41-S001-0000135 MCM HATCH, REFER.
- FOR SOPS OF SUPPLY, REFER.
- FOR OUTLINE INSTALLATION PROCEDURE, REFER.
- FOR OPERATION & MAINTENANCE MANUAL, REFER.
- FOR CONTROL SYSTEM TOP ASSEMBLY, REFER.
- FOR TAG PLATES DRAWING, REFER 1000132482 IN CONJUNCTION WITH DRAWING GA-100-41-S001-0000136 FOR TAG PLATE 1.
- FOR TAG PLATE LENGTHS & STRAPPING ARRANGEMENT, REFER 1000132482 IN CONJUNCTION WITH DRAWING GA-100-41-S001-0000136.

NO.	QTY.	DESCRIPTION	MATERIAL NO.	IN NET (KG)
23		CONNECTION BLANKET ASSEMBLY	1023467	128
24		PROTECTION CARBON STEEL	1023467	200
25		PROTECTION CARBON STEEL	1023467	200
26		PROTECTION CARBON STEEL	1023467	200
27		PROTECTION CARBON STEEL	1023467	200
28		PROTECTION CARBON STEEL	1023467	200
29		PROTECTION CARBON STEEL	1023467	200
30		PROTECTION CARBON STEEL	1023467	200
31		PROTECTION CARBON STEEL	1023467	200
32		PROTECTION CARBON STEEL	1023467	200
33		PROTECTION CARBON STEEL	1023467	200
34		PROTECTION CARBON STEEL	1023467	200
35		PROTECTION CARBON STEEL	1023467	200
36		PROTECTION CARBON STEEL	1023467	200
37		PROTECTION CARBON STEEL	1023467	200
38		PROTECTION CARBON STEEL	1023467	200
39		PROTECTION CARBON STEEL	1023467	200
40		PROTECTION CARBON STEEL	1023467	200
41		PROTECTION CARBON STEEL	1023467	200
42		PROTECTION CARBON STEEL	1023467	200
43		PROTECTION CARBON STEEL	1023467	200
44		PROTECTION CARBON STEEL	1023467	200
45		PROTECTION CARBON STEEL	1023467	200
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GA, 4 Slot 12" End Manifold	10002506010	AO-100-41-S001-000073	10234513
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TYPE 1C Glossy 3-D rendering quality with description/details like GA

### 9.7.3 Manifold 4 slot end – Retrievable components

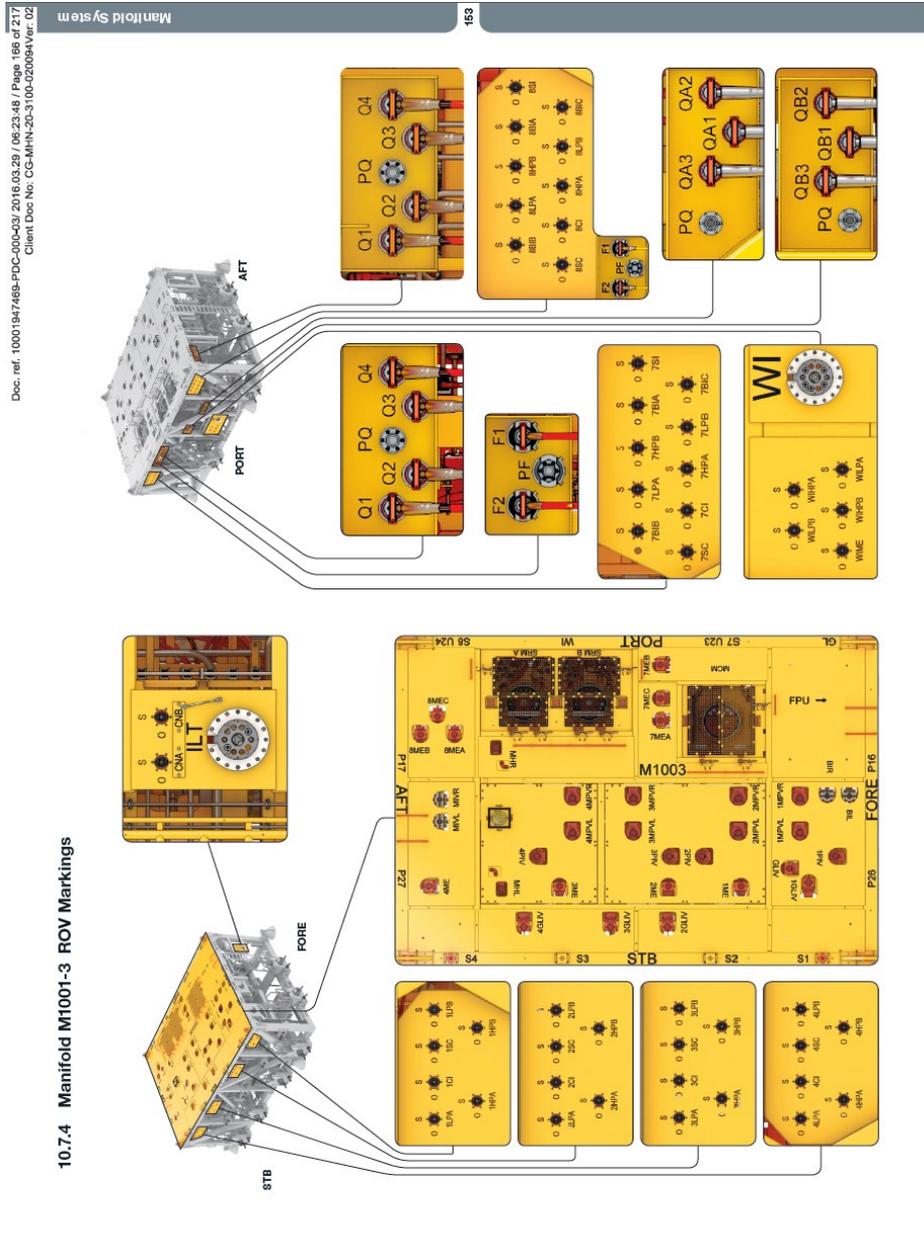


Retrievable Components		Tools	
Description	Material Number	Est. Weight in Water	Description
SRM-A, SRM-B	10189632	1856 kg	SCM / SRM / MCM RT
MCM	10189754	1615 kg	SCM / SRM / MCM RT
CDV	10039684	109 kg	Torque Tool Cl. 4
			Material Number
			10193761
			10193775

Illustration from MOHO

GA, 4 Slot 12" End Manifold	10002506010	AO-100-41-S001-000073	10234513
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### 9.7.4 Manifold 4 slot end ROV Panel Markings

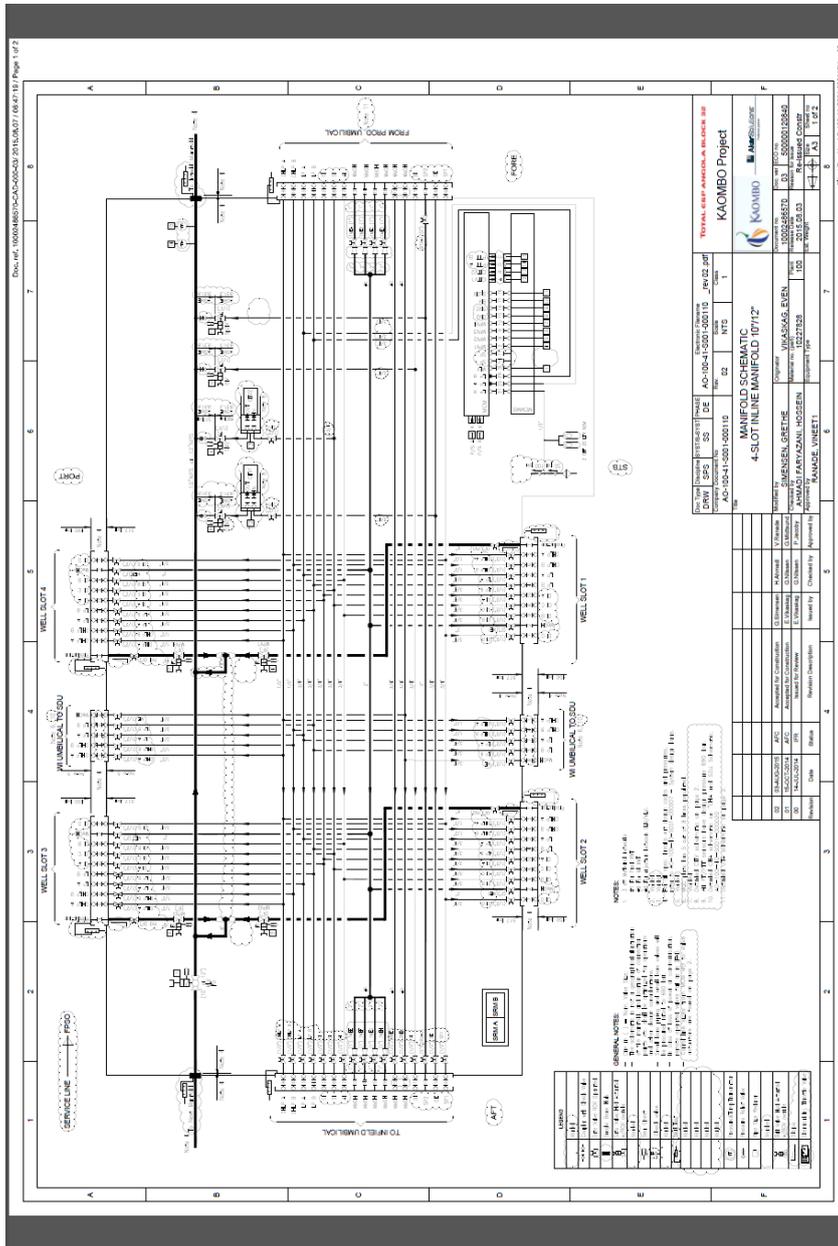


GA, 4 Slot 12" End Manifold	10002506010	AO-100-41-S001-000073	10234513
Manifold GA Subsea Marking 4 slot end	10002506011	AO-100-41-S001-000074	10260058

Picture above is an example from Moho & is how we want it

## 9.8 4 Slot 12" Infield Manifold

### 9.8.1 Manifold 4 slot Inline Schematic



Manifold Schematic 4 slot inline	10002486570	AO-100-41-S001-000110	10234512
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**TYPE 3 Use as is (if possible)**

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9.8.2 Manifold 4 slot Inline GA

**NOTES:**

1. LOCKING ARRANGEMENT FOR INTERNALS OF MAIN MANIFOLD. LOCKING PIN TO BE UNLOCKED TO PERMIT DRILL & MCM WORK.
2. TYPICAL LOCKING ARRANGEMENT PROVIDED FOR OPENING/SHUTTING DOWN OF MAIN MANIFOLD.
3. TYPICAL LOCKING ARRANGEMENT PROVIDED FOR OPENING/SHUTTING DOWN OF MAIN MANIFOLD.
4. TYPICAL LOCKING ARRANGEMENT PROVIDED FOR OPENING/SHUTTING DOWN OF MAIN MANIFOLD.
5. CHECK FOR SMOOTH OPERATION OF MANIFOLD IN INSTALLATION.
6. DO NOT SUBMERGE DOWN CORRESPONDING TO MANIFOLD IN INSTALLATION.
7. FOR GENERAL NOTES AND SPECIFICATIONS REFER TO THE DRAWING.
8. FOR WEIGHT CONTROL REPORT REFER TO THE DRAWING.
9. FOR SCOPE OF SUPPLY WORK REFER TO THE DRAWING.
10. FOR ARRANGEMENT OF SPRING REFER TO THE DRAWING.
11. FOR ARRANGEMENT OF SPRING REFER TO THE DRAWING.
12. FOR USA MANIFOLD REFER TO THE DRAWING.
13. FOR ARRANGEMENT OF SPRING REFER TO THE DRAWING.
14. FOR ARRANGEMENT OF SPRING REFER TO THE DRAWING.
15. FOR SCOPE OF SUPPLY WORK REFER TO THE DRAWING.
16. FOR SCHEMATIC INSTALLATION PROCEDURE REFER TO THE DRAWING.
17. FOR OPERATION & MAINTENANCE MANUAL REFER TO THE DRAWING.
18. FOR CONTROL SYSTEM TOP ASSEMBLY REFER TO THE DRAWING.
19. FOR TACKLING DRAWING REFER TO THE DRAWING.
20. FOR LABELING DRAWING REFER TO THE DRAWING.

**ITEM LIST:**

23	1	COMBINATION LOCKER ASSEMBLY	1002407	128
24	1	PORTCH H2S-A 12" X 12" PROCS SERVICE MAN	1002352	2202
25	1	PORTCH H2S-B 12" X 12" PROCS SERVICE MAN	1002353	2202
26	1	SEM WASH MACH	1002355	100
27	1	WATER DAMPER SYSTEM	1002352	31
28	1	WATER DAMPER SYSTEM	1002352	31
29	1	WATER DAMPER SYSTEM	1002352	31
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**DETAIL A SCALE 1:20**  
 DETAIL B SCALE 1:20  
 DETAIL C SCALE 1:20  
 DETAIL D SCALE 1:20  
 DETAIL E SCALE 1:20  
 DETAIL F SCALE 1:20

**GA MANIFOLD MODULE**  
 4 SLOT 12" INFELD MANIFOLD  
 MANIFOLD TYPE

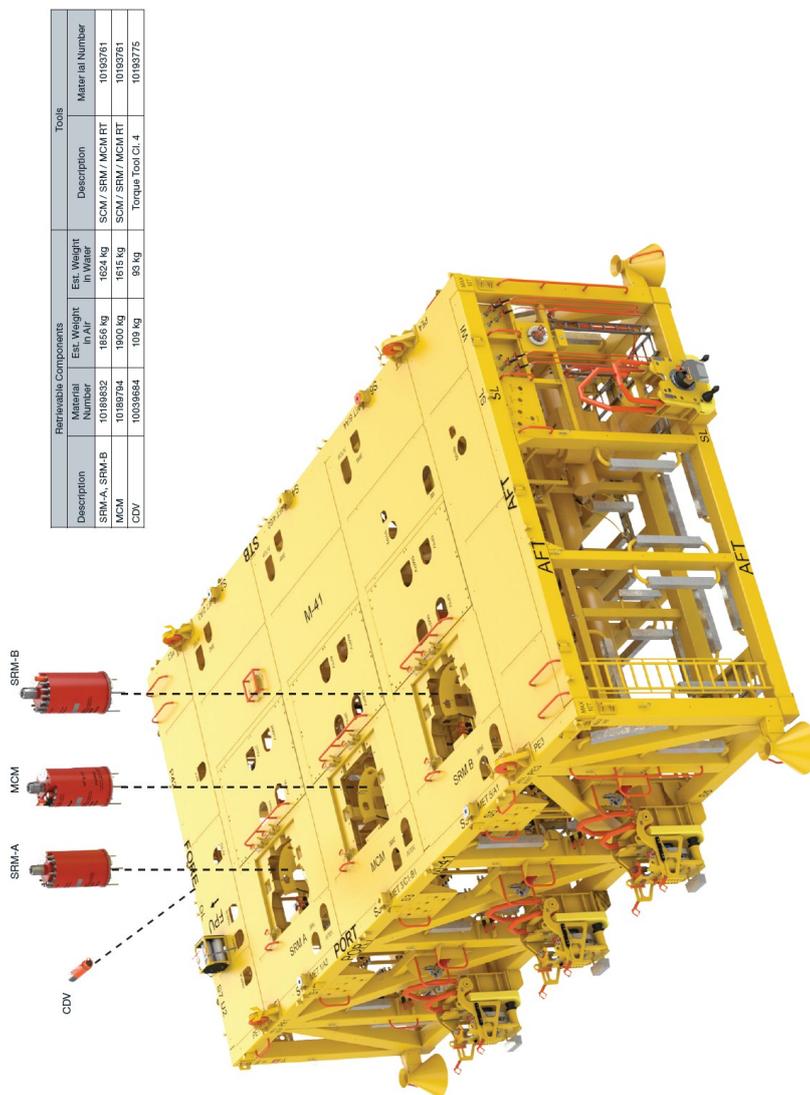
**REVISIONS:**

Rev	Date	By	Description
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02	05-04-2017	TR	ISSUE FOR CONSTRUCTION
03	05-04-2017	TR	ISSUE FOR CONSTRUCTION
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100	05-04-2017	TR	ISSUE FOR CONSTRUCTION

GA, 4 Slot 12" Infield Manifold	10002505968	AO-100-41-S001-000065	10234512
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TYPE 1C Glossy 3-D rendering quality with description/details like GA

### 9.8.3 Manifold 4 slot Inline – Retrievable components

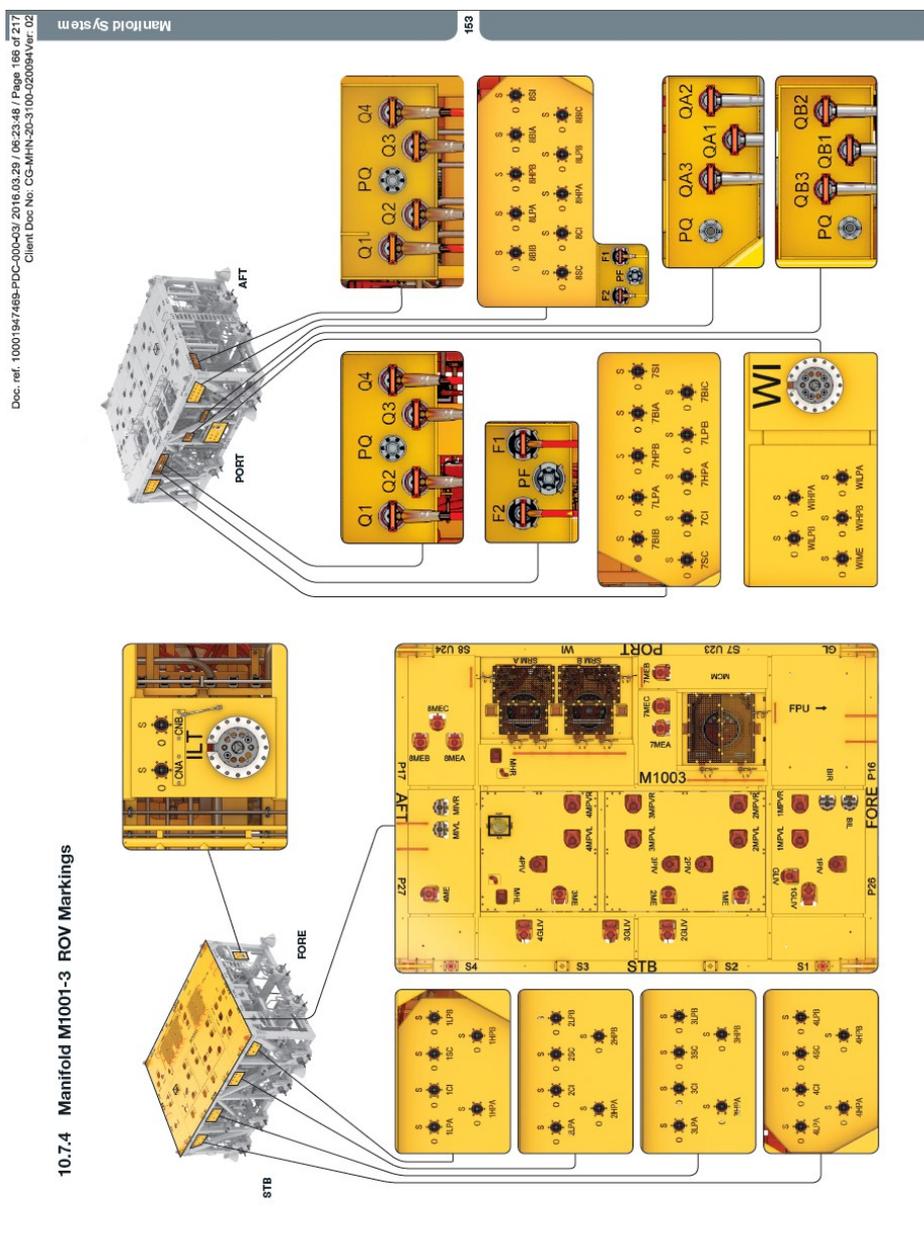


Retrievable Components		Tools	
Description	Material Number	Est. Weight in Water	Description
SRM-A, SRM-B	10189632	1856 kg	SCM / SRM / MCM RT
MCM	10189754	1615 kg	SCM / SRM / MCM RT
CDV	10039684	109 kg	Torque Tool Cl. 4
			Material Number
			10193761
			10193775

Illustration from MOHO

GA, 4 Slot 12" Infield Manifold	10002505968	AO-100-41-S001-000065	10234512
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### 9.8.4 Manifold 4 slot Inline ROV Panel Markings



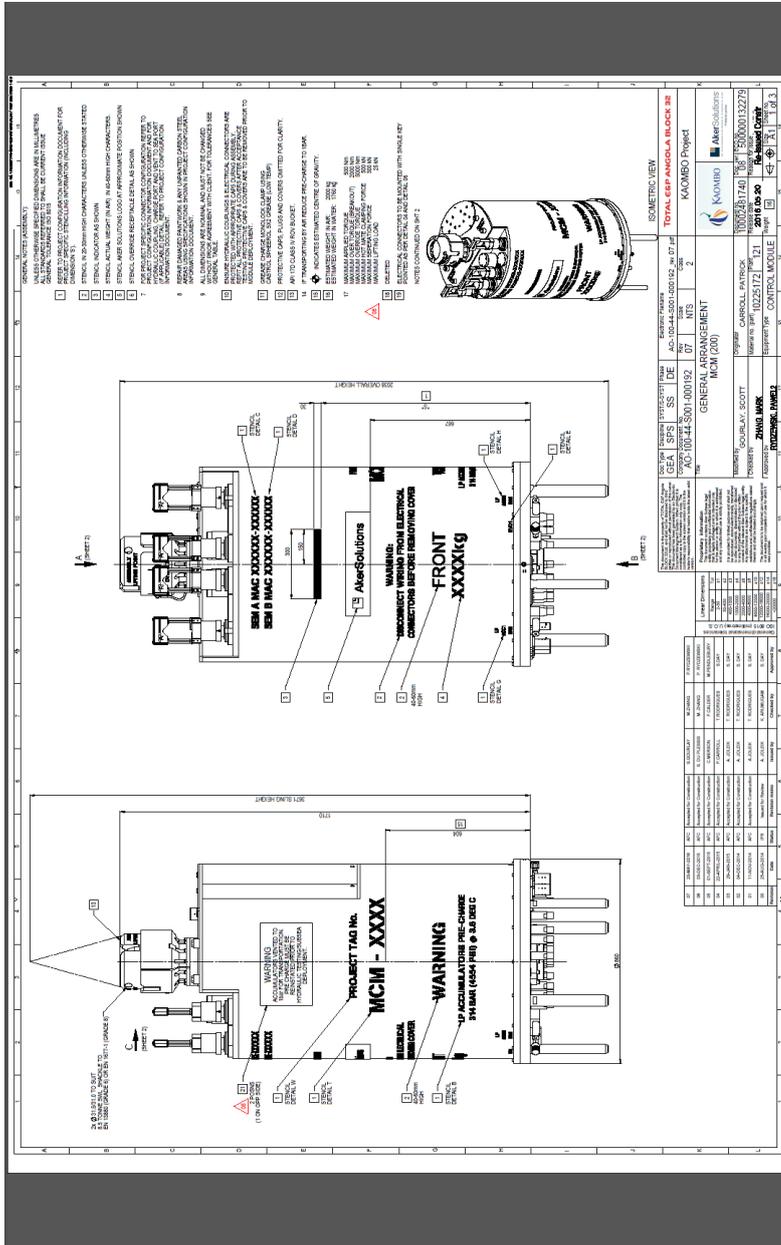
10.7.4 Manifold M1001-3 ROV Markings

GA, 4 Slot 12" Infield Manifold	10002505968	AO-100-41-S001-000065	10234512
Manifold Subsea Marking 4 slot inline	10002505969	AO-100-41-S001-000066	10260164

Picture above is an example from Moho & is how we want it



9.9.2 MCM



MCM, GA	10002481740	AO-100-44-S001-000192	10225172
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TYPE 2A Colour screenshot solidworks ISO VIEW + drawing as is

Also include top/bottom view with connections overview

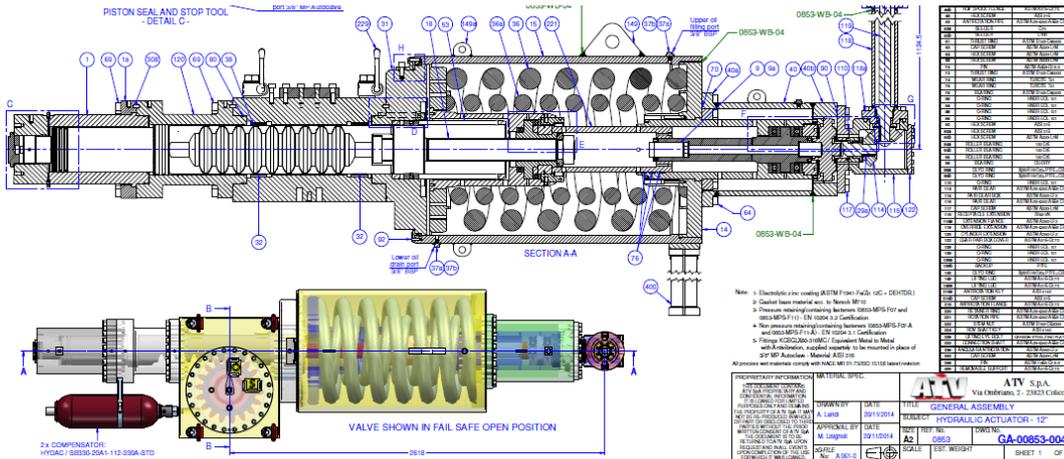
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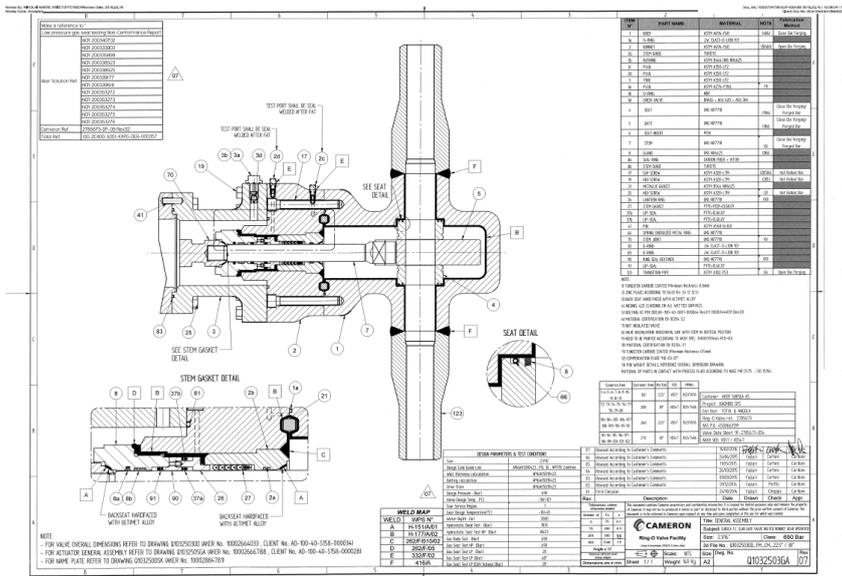
Document: 10002504361-PDC-000  
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9.10 Cross section 12” Manifold 4-slot End  
 Include if piggable.

9.10.1 Valve cross section 12” Ball Valve

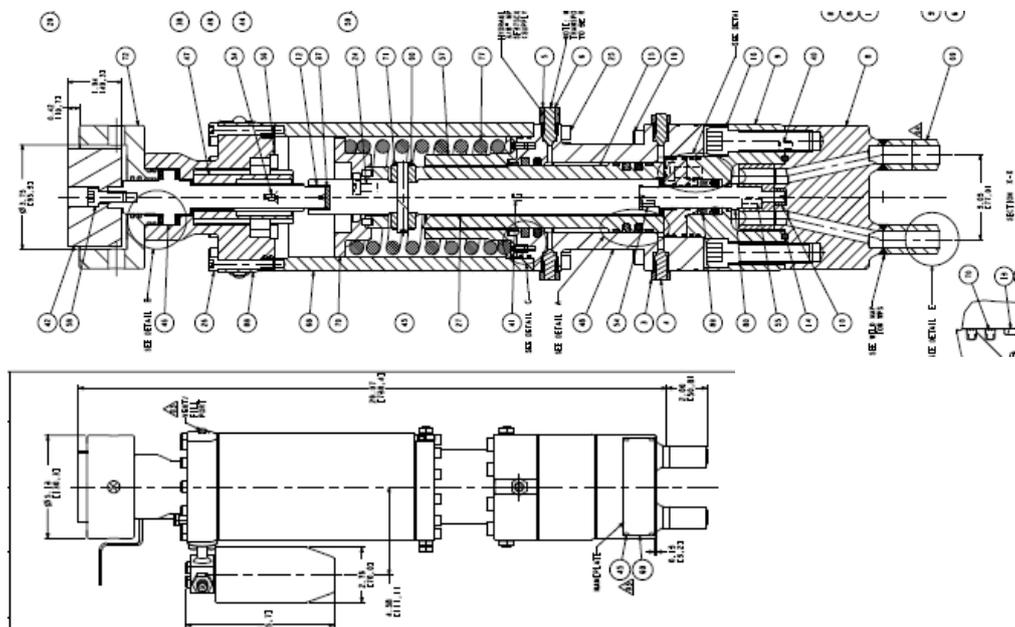


9.10.2 Valve cross section 2 1/16” Gate Valve



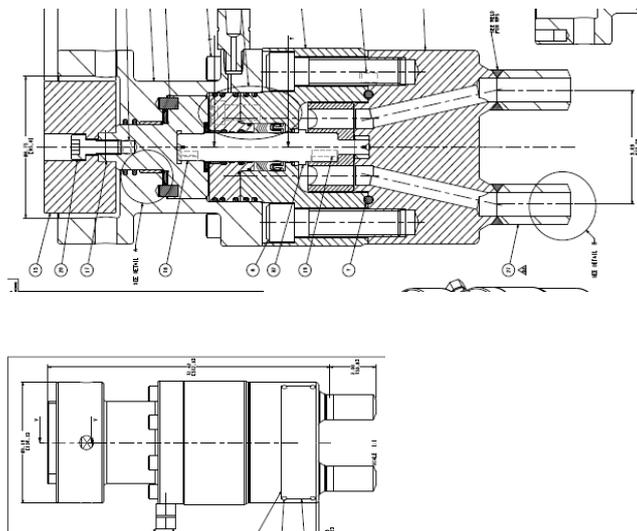
TYPE 4 Use image from sharefile

### 9.10.3 Valve cross section 1/2" Rotary Gate (10 turn) Valve



1/2" Rotary Gate Valve (10turn)	10002859716	AO-100-40-S104-000054	10242978
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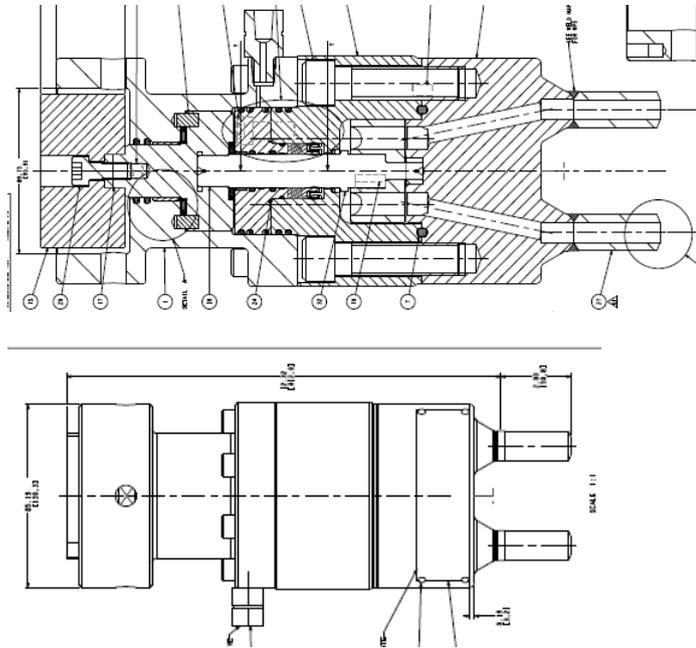
### 9.10.4 Valve cross section 1/2" Rotary Gate (1/4 turn) valve



1/2" Rotary Gate Valve (1/4 turn)	10002859828	AO-100-40-S104-000055	10243040
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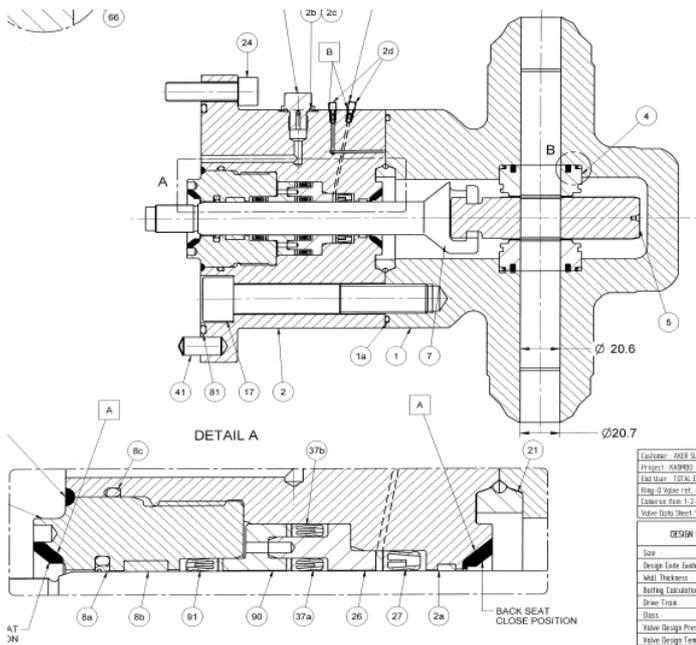
**TYPE 4 Use image from sharefile**

### 9.10.5 Valve cross section 1/2" Rotary Gate Valve



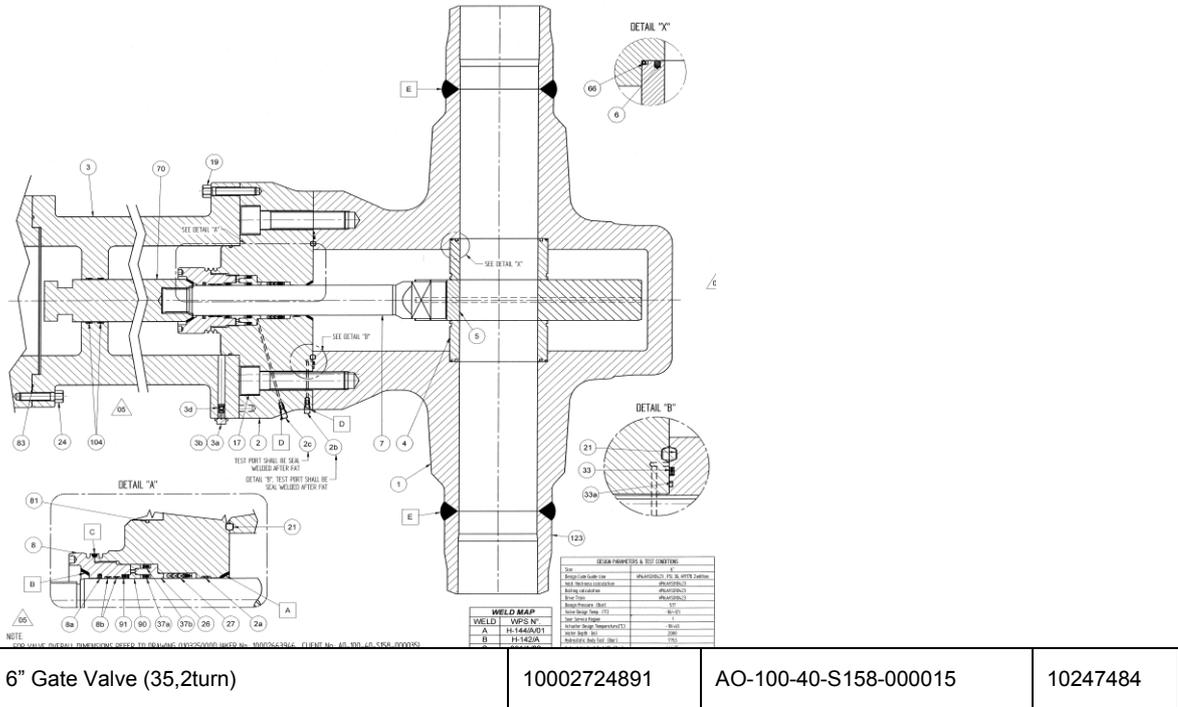
1/2" Rotary Gate Valve (1/4 turn)	10002860018	AO-100-40-S104-000056	10243041
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### 9.10.6 Valve cross section 1" Gate Valve

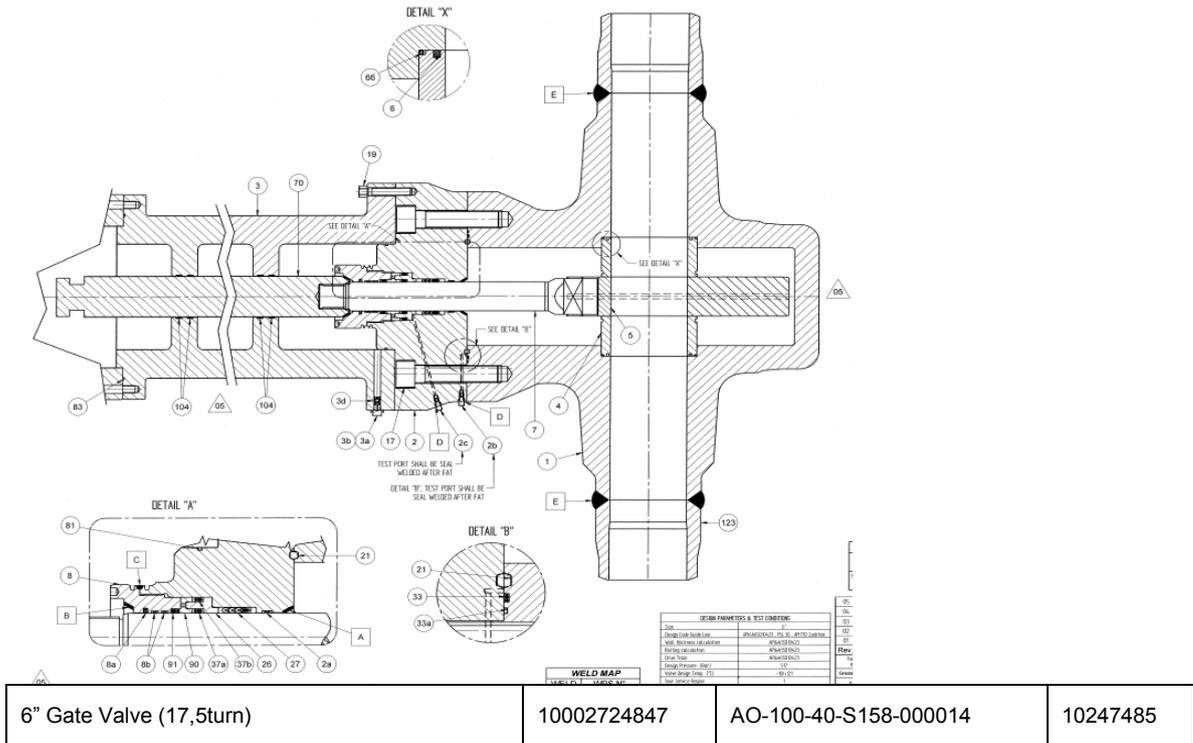


1" Gate Valve	10002786343	AO-100-40-S158-000081	10243042
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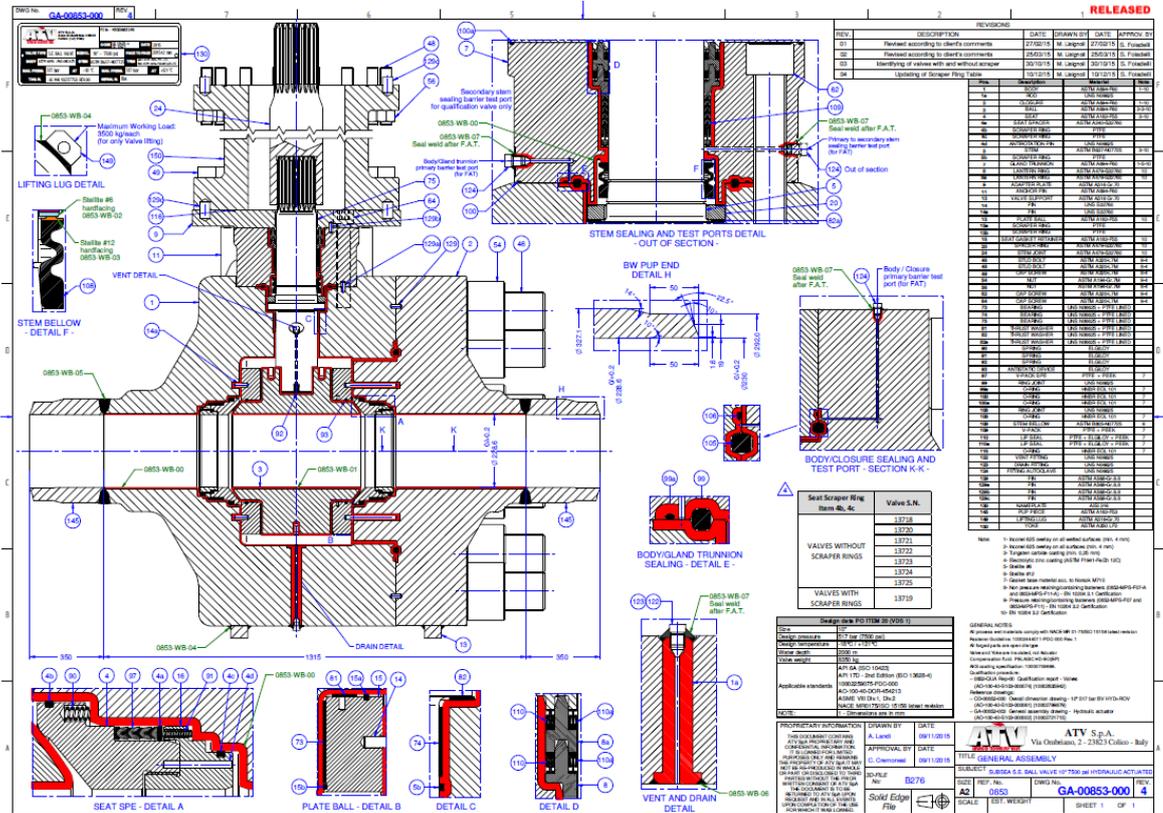
### 9.10.7 Valve cross section 6" Gate (35,2turn) Valve



### 9.10.8 Valve cross section 6" Gate (17,5turn) Valve



9.10.9 Valve cross section 10" Ball Valve



10" Ball Valve	10002687841	AO-100-40-S103-00010	10237758
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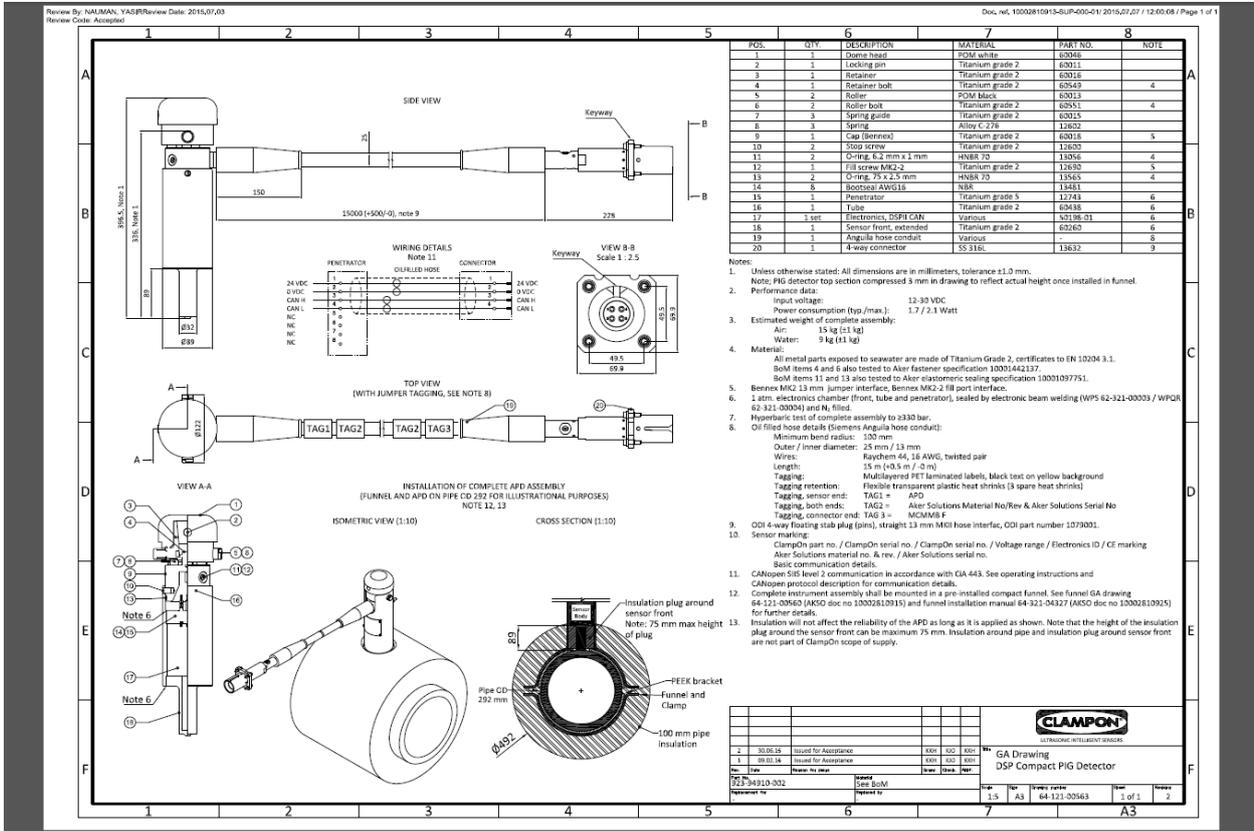
TYPE 5 Drawing as is + colouring

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9.11 Manifold Pig detector



Manifold Pig detector	10002522805	AO-100-44-S185-00002	10236323
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TYPE 5 Drawing as is + colouring

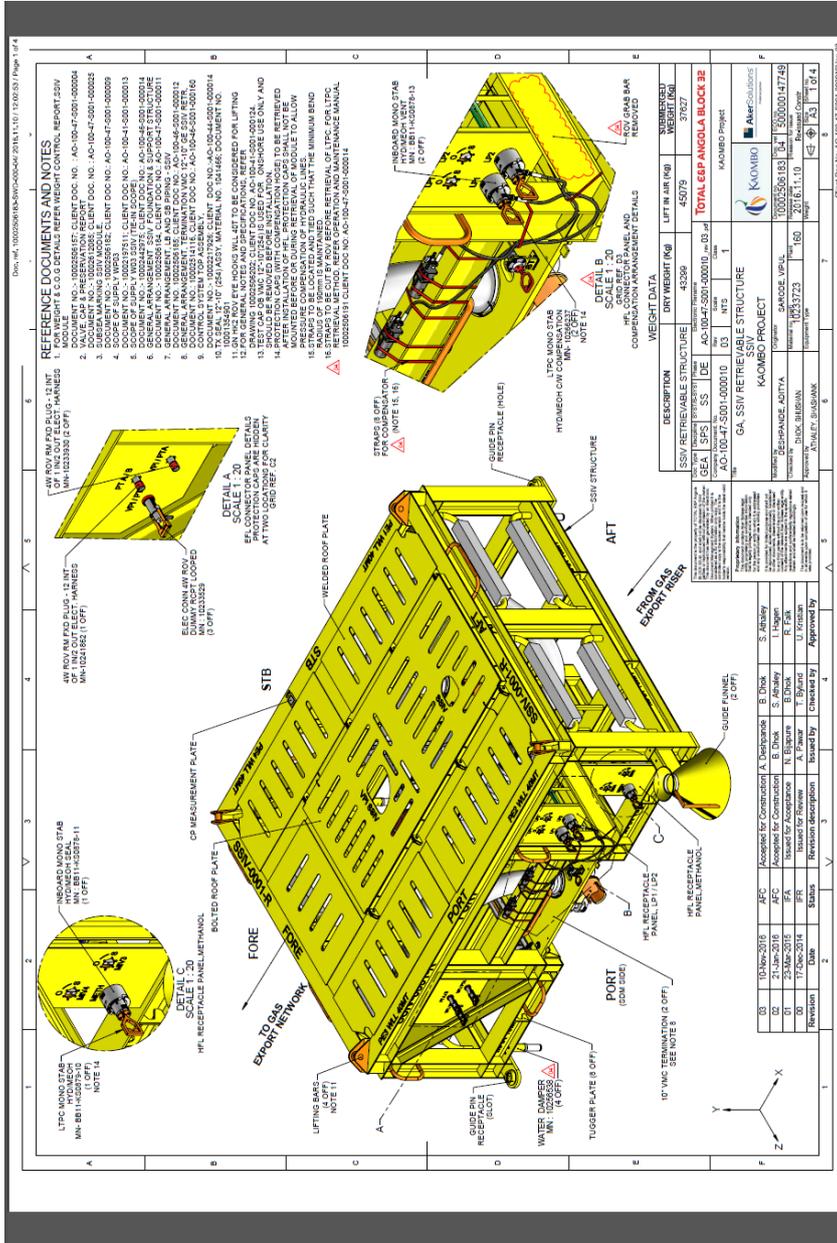


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BLOCK 32 - KAOMBO SPS

9.12.2 SSIV Retrievable structure

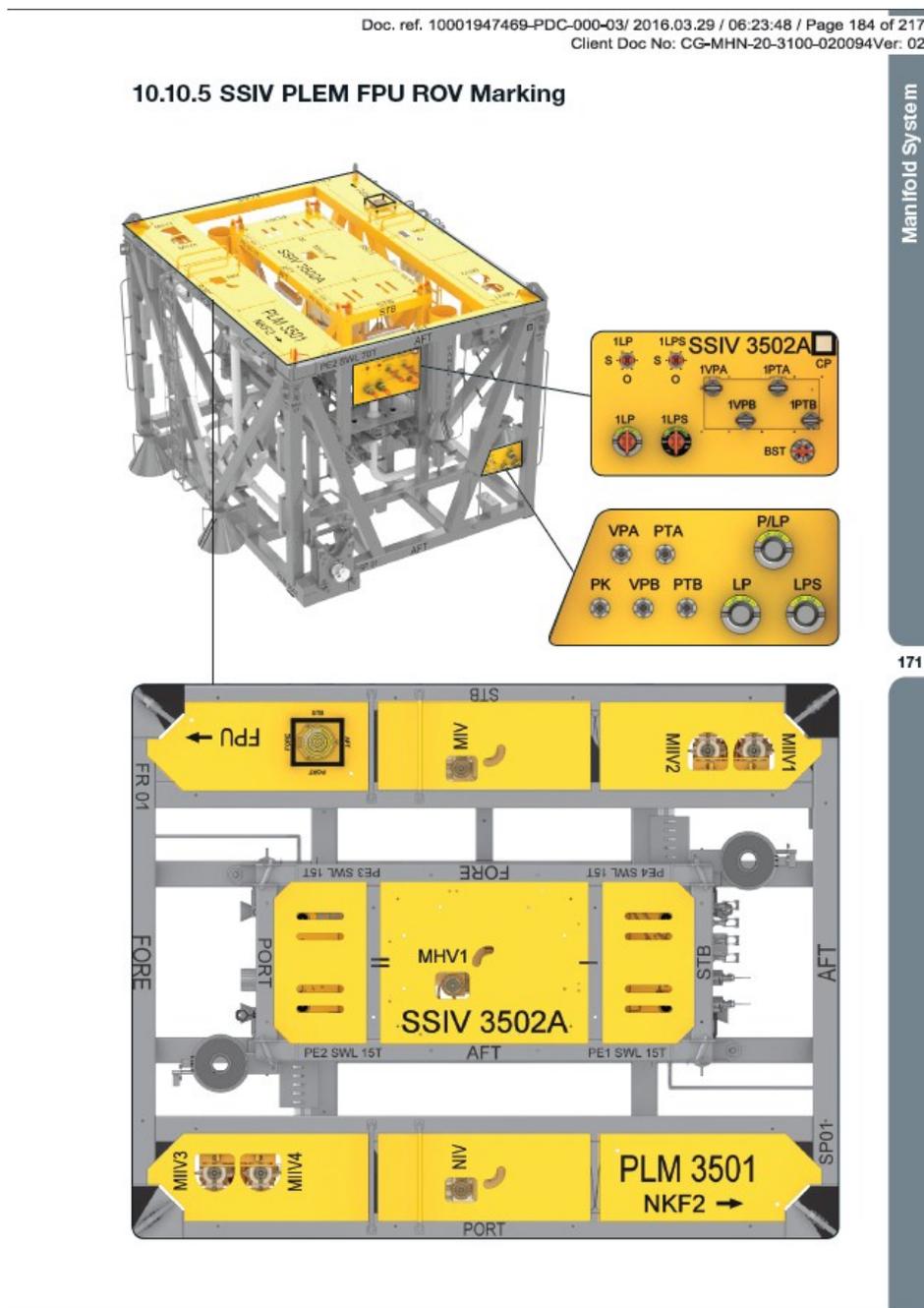


GA, SSIV Retrievable Structure	10002506183	AO-100-47-S001-000010	10233723
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TYPE 1C Glossy 3-D rendering quality with description/details like GA



## 9.12.4 SSIV ROV Panel marking



GA, SSIV Subsea Marking	10002506182	AO-100-47-S001-000009	10234570
GA, SSIV Retrievable Structure	10002506183	AO-100-47-S001-000010	10233723
GA, SSIV Foundation & Support Structure	10002506184	AO-100-47-S001-000011	10233722

Picture above is an example from Moho & is how we want it

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BLOCK 32 - KAOMBO SPS

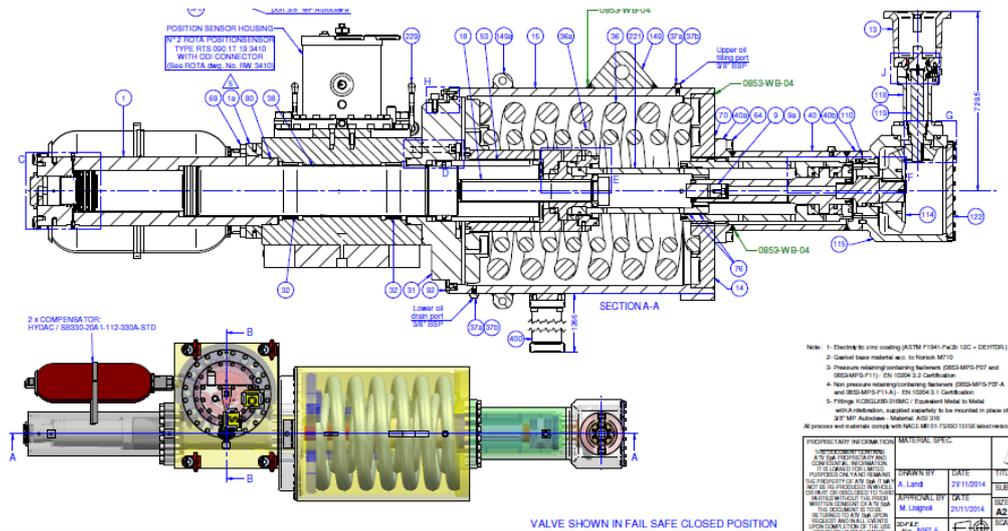
9.12.5 SSIV Valve torque list

Item No	QTY	SSIV Acetate	Valve Name	ROV ID	SAP Material Nr.	Nominal Valve Size	Valve Type	Actuation	ROV Interface	ROV Tool	Running Torque (Nm)	Break Out Torque (Nm)	Max torque (Nm)	Damage Torque (Nm)	Closing direction (CW if clockwise or CCW if counterclockwise)	Approx. number of Turns to Open or Close
1	1		Subsea Safety Isolation Valve	SSIV	10237759	10"	Ball	HYD/ROV	ISO 13628-8 Class 4	Class 4 Torque Tool	1890	1890	2711	3000	CW	60.5
2			MeOH Isolation Valve 1	MIV1	10237878	2-1/16"	Gate	ROV	ISO 13628-8 Class 4	Class 4 Torque Tool	1250	1250	2711	3500	CW	4.2
3			MeOH Isolation Valve 2	MIV2	10237878	2-1/16"	Gate	ROV	ISO 13628-8 Class 4	Class 4 Torque Tool	1250	1250	2711	3500	CW	4.2
4			MeOH Isolation Valve 5	MIV5	10237878	2-1/16"	Gate	ROV	ISO 13628-8 Class 4	Class 4 Torque Tool	1250	1250	2711	3500	CW	4.2
5			MeOH Isolation Valve 6	MIV6	10237878	2-1/16"	Gate	ROV	ISO 13628-8 Class 4	Class 4 Torque Tool	1250	1250	2711	3500	CW	4.2
6			Gas Export Valve 1	GEV1	10237900	10"	Ball	ROV	ISO 13628-8 Class 4	Class 4 Torque Tool	1890	1890	2711	3000	CW	31.5
7			Gas Export Valve 2	GEV2	10237900	10"	Ball	ROV	ISO 13628-8 Class 4	Class 4 Torque Tool	1890	1890	2711	3000	CW	31.5
8			MeOH Isolation Valve 3	MIV3	10243040	1/2"	Rotary Gate	ROV	ROV Manipulator	Paddle Tool	20	51.5	300	400	CW	1/4
9			MeOH Isolation Valve 4	MIV4	10243040	1/2"	Rotary Gate	ROV	ROV Manipulator	Paddle Tool	20	51.5	300	400	CW	1/4
10			LP Isolation Valve 1	LP1	10243040	1/2"	Rotary Gate	ROV	ROV Manipulator	Paddle Tool	20	51.5	300	400	CW	1/4
11			LP Isolation Valve 2	LP2	10243040	1/2"	Rotary Gate	ROV	ROV Manipulator	Paddle Tool	20	51.5	300	400	CW	1/4

VALVE TORQUE LIST	10003313257	AO-100-40-S001-002601	10233723
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### 9.12.6 SSIV Valves description & Cross section

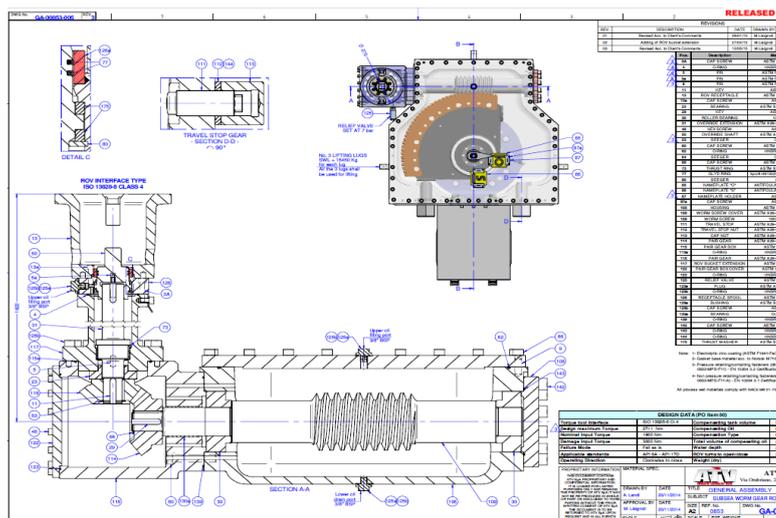
#### 9.12.6.1 Valve cross section 10" HYDRAULIC ACTUATOR



10" Ball Valve	10002728682	AO-100-40-S103-000015	10237759
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**TYPE 5 Drawing as is + colouring**

#### 9.12.6.2 Valve cross section 10" SUBSEA WORM GEAR



10" Ball Valve	10002720405	AO-100-40-S103-000001	10237900
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**TYPE 5 Drawing as is + colouring**

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## **10 TIE-IN SYSTEM**

### **10.1 Reference List**

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10.2 Tie-In Connectors Scope of Supply

BASE QUANTITY												
Description	Material No.	Total Q't	Spools & Flanges	Prod. jumpers	UTM	WPDS WXT	WPDS PXT	WPDS SSV	WPDS Mandrels	Client spare parts	Client test. equipment	Notes/Comments
PORCH HCS-R 12" 12" (273) INSULATED PROD. JLT	10232696	28	26									
PORCH HCS-R 12" 12" (273) SERVICE JLT	10232697	5	4							1		
PORCH HCS-R 12" 10" (223) INSULATED PROD. JLT	10232698	11	10							1		
PORCH HCS-R 12" 10" (223) SERVICE JLT	10232699	3	2							1		
PORCH HCS-R 12" 5" (123) INSULATED PROD. DOUBLE JLT	10232700	3	2							1		
PORCH HCS-R 12" 5" (124) SERVICE JLT	10232701	8	7							1		
PORCH HCS-R 12" 5" (124) SERVICE ASSEMBLY	10232606	4						4				
PORCH HCS-R 12" 5" 1/2" 8HC28 INSULATED PROD. JLT	10232609	36					35+1					1 of 35 delivered as spares to WPDS
PORCH HCS-R 12" 12" (273) MANFOLD ASSEMBLY	10232602	14							14			
PORCH HCS-R 12" 5" 1/2" 8HC28 MANFOLD ASSEMBLY	10232603	58							58			
PORCH HCS-R 12" 5" 1/2" 8HC28 MANFOLD ASSEMBLY	10232604	38							38			
PORCH HCS-R 12" 5" 1/2" 8HC28 MANFOLD ASSEMBLY	10232605	5							5			
PORCH HCS-R 16" 14" (355) SERVICE JLT	10232757	19	18							1		
PORCH HCS-R 6" 5" (125) SERVICE JLT	10232756	49	48							1		
PORCH HCS-R 6" 5" (125) SAS EXPORT JLT	10248410	2	2									
PORCH HCS-R 6" 5" WXT ASSEMBLY	10232691	29				29						
PORCH VMC 12" 10" (254) SIV. ASSEMBLY	10232667	4						4				
LAMING STRUCTURE HCS-R 12" MANFOLD ASSEMBLY	10235484	18							18			
PORCH HCS-R 12" 12" (273) MANFOLD ASSEMBLY	10266876	14							14			
PORCH HCS-R 12" 10" (223) MANFOLD ASSEMBLY	10266875	5							5			

BASE QUANTITY												
Description	Material No.	Total Q't	Spools & Flanges	Prod. jumpers	UTM	WPDS WXT	WPDS PXT	WPDS SSV	WPDS Mandrels	Client spare parts	Client test. equipment	Notes/Comments
TERMINATION HCS-R 12" 12" (273) INSULATED PROD. SPOOL	10232751	54	50							4		
TERMINATION HCS-R 12" 12" (273) INSULATED PROD. SPOOL	10232752	9	8							1		
TERMINATION HCS-R 12" 10" (223) INSULATED PROD. SPOOL	10232753	20	18							2		
TERMINATION HCS-R 12" 10" (223) SERVICE SPOOL	10232754	5	4							1		
TERMINATION HCS-R 12" 5" (124) SERVICE SPOOL	10232762	10	9							1		
PLA TERMINATION HCS-R 12" 12" (273) PROD. JLT	10232763	10	10									
PLA TERMINATION HCS-R 12" 10" (223) PROD. JLT	10232764	4	4									
PLA TERMINATION HCS-R 12" 5" (124) PROD. JLT	10232766	3	3									
TERMINATION HCS-U 12" STATIC (SIV)	10233880	14			13					1		
TERMINATION HCS-U 12" DYNAMIC ASSEMBLY	1023882	8			6					2		1 left for Louro field
TERMINATION HCS-R 16" 14" (355) SERVICE JLT	10232758	14	12							2		
PLA TERMINATION HCS-R 16" 14" (355) SERVICE JLT	10232765	4	4									
TERMINATION HCS-R 6" 5" (125) SERVICE JLT	10232759	30	29							1		
TERMINATION HCS-R 6" 5" (125) XT END	10275674	30	29							1		
TERMINATION VMC 12" 10" (254) SIV. ASSEMBLY SIV. MODULE	10232668	6						4+2				2 off spares delivered to WPDS
TERMINATION HCS-R 12" 5" (125) FOR PRODUCTION DOUBLE JLT	10235785	1									1	

Tie In Connectors SOS	10002242727	AO-100-46-S001-000017	N/A
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10.3 Tie-In Tools Scope of Supply

TOOLING & INSTALLATION EQUIPMENT (BLOCK 32 - KAOMBO SPS)					
1	2	3	4	5	6
<p>TORQUE TOOL 173Nm - DISPLAY                      MATERIAL NO: 1015376                      BASE QTY: 2                      WEIGHT IN AIR: 40 KG                      SUBMERGED WEIGHT: 60 KG</p> 	<p>TORQUE TOOL 40Nm - DISPLAY                      MATERIAL NO: 1015475                      BASE QTY: 2                      WEIGHT IN AIR: 40 KG                      SUBMERGED WEIGHT: 60 KG</p> 	<p>CALIBRATION JIG                      17 - 173Nm + ADJUST. CL.3                      MATERIAL NO: 1003670                      BASE QTY: 1                      WEIGHT IN AIR: 18 KG                      SUBMERGED WEIGHT: NA</p> 	<p>STROKE TOOL, HCS 1/2" &amp; 21"                      MATERIAL NO: 1012663                      BASE QTY: 2                      WEIGHT IN AIR: 118 KG                      SUBMERGED WEIGHT: 78 KG</p> 	<p>STROKE TOOL, HCS 1/2" &amp; 12"                      MATERIAL NO: 1012664                      BASE QTY: 2                      WEIGHT IN AIR: 172 KG                      SUBMERGED WEIGHT: 98 KG</p> 	<p>TOOL CARRIER, BR/TSBCT, HCS 1/2"                      MATERIAL NO: 1022950                      BASE QTY: 4                      WEIGHT IN AIR: 28 KG                      SUBMERGED WEIGHT: 42 KG</p> 
<p>TOOL CARRIER, BR/TSBCT, HCS 1/2"                      MATERIAL NO: 1013568                      BASE QTY: 2                      WEIGHT IN AIR: 247 KG                      SUBMERGED WEIGHT: 86 KG</p> 	<p>TOOL CARRIER, HCS 1/2"                      MATERIAL NO: 1014519                      BASE QTY: 4                      WEIGHT IN AIR: 446 KG                      SUBMERGED WEIGHT: 65 KG</p> 	<p>INSTALLATION TOOL                      122 HCS 1/2" 2005240                      MATERIAL NO: 1014519                      BASE QTY: 4                      WEIGHT IN AIR: 1627 KG                      SUBMERGED WEIGHT: 1590 KG</p> 	<p>INSTALLATION TOOL                      122 HCS 1/2" 2005240                      MATERIAL NO: 1022700                      BASE QTY: 4                      WEIGHT IN AIR: 862 KG                      SUBMERGED WEIGHT: 397 KG</p> 	<p>SEAL REPLACEMENT INSERT                      HCS 1/2" 14" 1002984                      MATERIAL NO: 1022984                      BASE QTY: 4                      WEIGHT IN AIR: 30.1 KG                      SUBMERGED WEIGHT: 13.0 KG</p> 	<p>CLEANING DISC, HCS 1/2" 14" 18 (85)                      MATERIAL NO: 1002981                      BASE QTY: 4                      WEIGHT IN AIR: 28 KG                      SUBMERGED WEIGHT: 12.5 KG</p> 
<p>CLEANING DISC, HCS 1/2" 14" 18 (85)                      MATERIAL NO: 1002981                      BASE QTY: 4                      WEIGHT IN AIR: 28 KG                      SUBMERGED WEIGHT: 11.5 KG</p> 	<p>SEAL REPLACEMENT INSERT                      HCS 1/2" 12" 1002987                      MATERIAL NO: 1022987                      BASE QTY: 4                      WEIGHT IN AIR: 19.0 KG                      SUBMERGED WEIGHT: 13.0 KG</p> 	<p>SEAL REPLACEMENT INSERT                      HCS 1/2" 12" 1002988                      MATERIAL NO: 1022988                      BASE QTY: 4                      WEIGHT IN AIR: 17.0 KG                      SUBMERGED WEIGHT: 10.4 KG</p> 	<p>SEAL REPLACEMENT INSERT                      HCS 1/2" 12" 1002989                      MATERIAL NO: 1022989                      BASE QTY: 4                      WEIGHT IN AIR: 16.8 KG                      SUBMERGED WEIGHT: 10.4 KG</p> 	<p>SEAL REPLACEMENT INSERT                      HCS 1/2" 12" 1002990                      MATERIAL NO: 1022990                      BASE QTY: 4                      WEIGHT IN AIR: 14.8 KG                      SUBMERGED WEIGHT: 28.5 KG</p> 	<p>CLEANING DISC, HCS 1/2" 12" 18 (27)                      MATERIAL NO: 1002981                      BASE QTY: 4                      WEIGHT IN AIR: 14.8 KG                      SUBMERGED WEIGHT: 11.1 KG</p> 

NBI IMAGES FOR REFERENCE ONLY. FINAL PRODUCT MAY VARY IN APPEARANCE.

Doc Type	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Company Document No.	AO-100-46-S001-000003																			
Rev	03																			
Scale	NTS																			
Class	1																			
TOTAL ESP ANGOLA BLOCK 32																				
KAOMBO Project																				

03	10-Mar-2016	AFC	Accepted for Construction	AD	TA	BL
02	04-Dec-2014	AFC	Accepted for Construction	VD	AM	BL
01	28-Oct-2014	IFA	Issued for Acceptance	VD	FM	BL
00	04-Aug-2014	IFR	Issued for Review	AJ	AM	BL
REVISION	DATE	STATUS	REVISION MEMO	MODIFIED BY	CHECKED BY	APPROVED BY

Customer Information:  
 Customer: KAOMBO  
 Project: KAOMBO SPS  
 Equipment type: SOW

Approved by: BOKDE LEF (BURSA)

Modified by: DIMBLE, ABHIJIT  
 Checked by: ANDERSSON, THOMASZ  
 Approved by: BOKDE LEF (BURSA)

Original: VALLENTIN, DANIEL  
 Material no: 1002419156  
 Weight: 160

10002419156  
 2016.03.10  
 164  
 500000140937  
 1 of 3

TYPE 3 Use as is (if possible)

Tie In Tools SOS	10002419156	AO-100-46-S001-000003	N/A
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## 10.4 Tie in general assembly connections

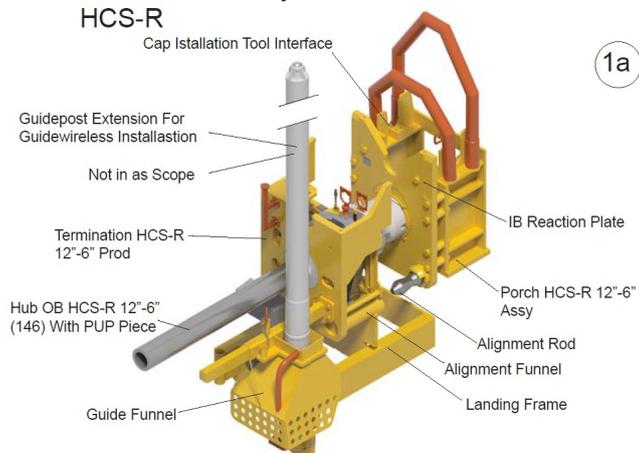
See SOS 10002242727 for full list

### 10.4.1 Horizontal Connection System (HCS)-R 16”

Use model from animation

Include description where HCS-R 16” is used on SPS

#### 12.3 General Assembly of Tie-In Connections HCS-R



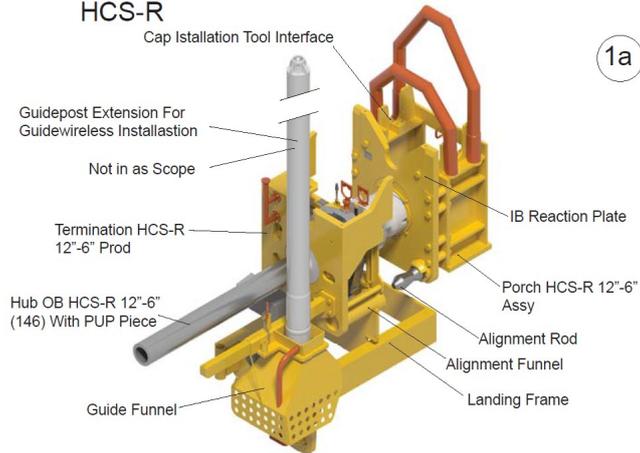
CAPS for HCS-R 16” tie-in connection to be shown here

### 10.4.2 HCS-R 12” (Insulated)

Use model from animation

Include description where HCS-R 12” is used on SPS

#### 12.3 General Assembly of Tie-In Connections HCS-R



CAPS for HCS-R 12” tie-in connection to be shown here

### 10.4.3 HCS-R 6"

Use model from animation

Include description where HCS-R 6" is used on SPS

### 12.3 General Assembly of Tie-In Connections HCS-R

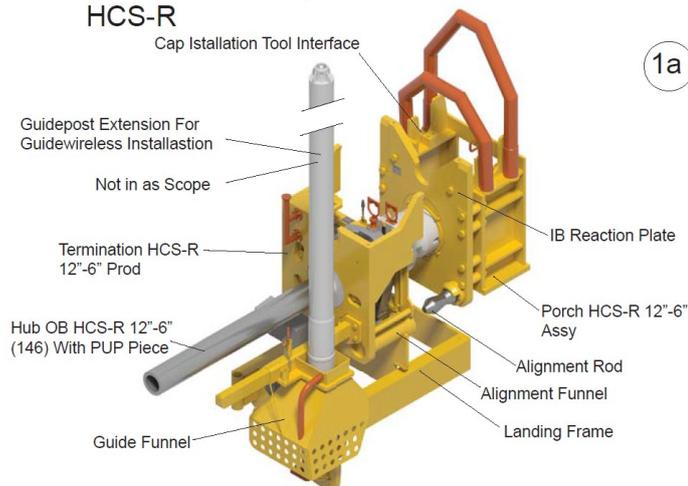


Illustration from Brynhild HB

CAPS for HCS-R 6" tie-in connection to be shown here

### 10.4.4 HCS-U 12”

Use model from animation

Include description where HCS-U 12” is used on SPS

#### 12.3 General Assembly of Tie-In Connections HCS-R

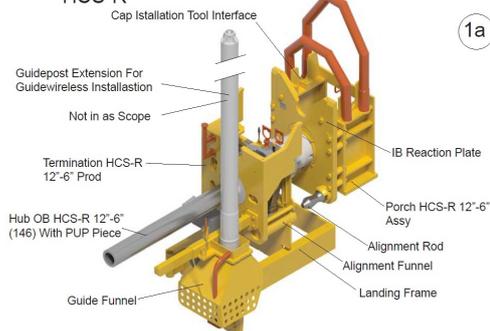


Illustration from Brynhild HB

For full SOS overview see dir below

Tie In SOS	10002242727	AO-100-47-S001-000017	N/A
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CAPS for HCS-U 12” tie-in connection to be shown here

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## 10.4.5 Flow Control Module (FCM) connection

Use model from animation  
CAPS for FCM tie-in connection to be shown here

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### 10.4.6 SSIV Vertical Connection Module (VMC)

Use model from animation  
CAPS for SSIV VMC tie-in connection to be shown here

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## 11 ROV INTERVENTION TOOLING

### 11.1 Reference list



### 11.3 Deployment Basket

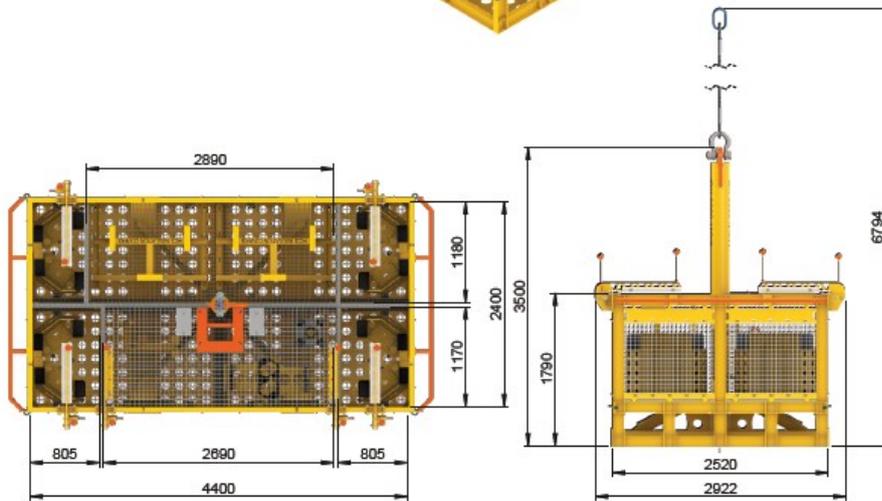
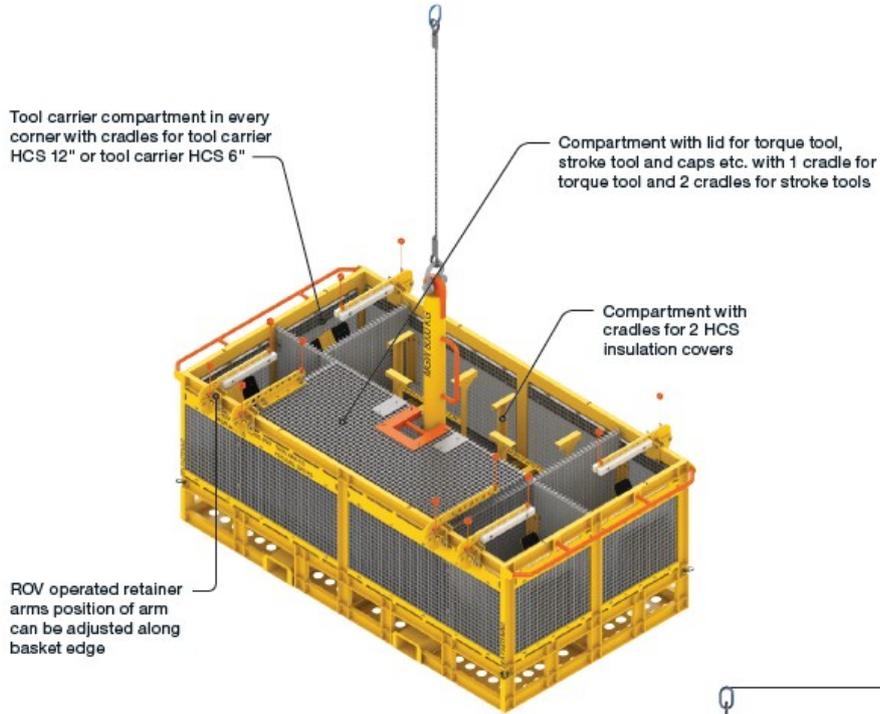


Illustration only – MOHO

GA, Deployment Basket	10002517580	AO-100-46-S001-000345	10241259
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## 11.4 SCM/SRM/MCM Running Tool

Client Doc No: CG-MHN-20-3100-020094Ver:

### 12.5 SCM/MCM/SRM Running Tool

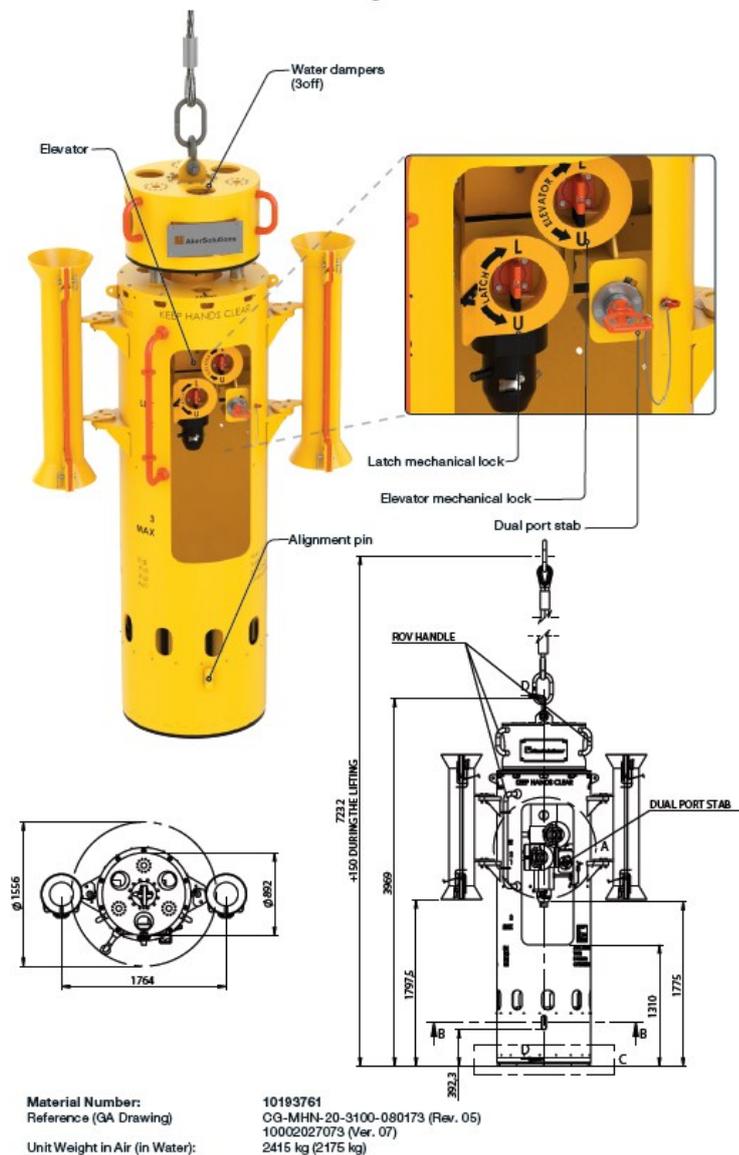


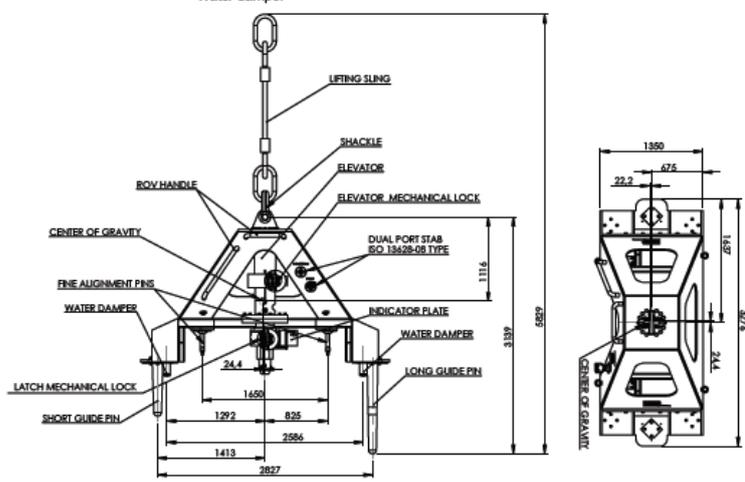
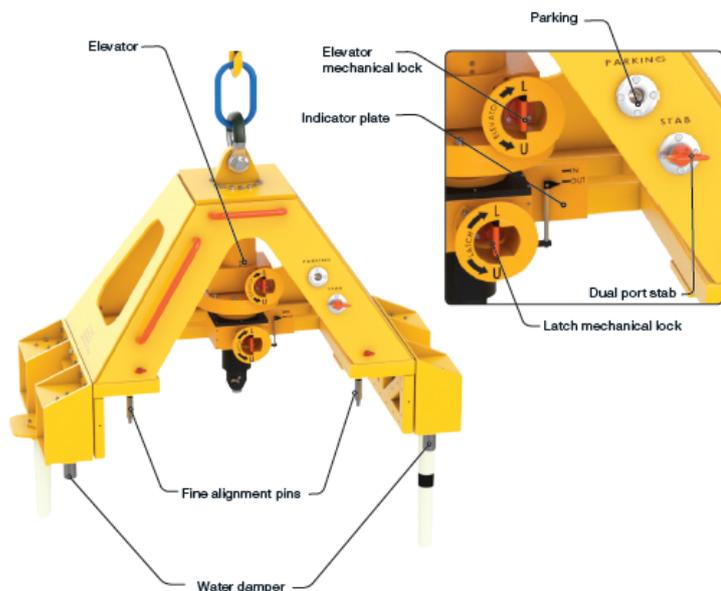
Illustration only - MOHO

GA, SCM RT, Ø860, TYPE A	10002517676	AO-100-46-S001-000430	10259351
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## 11.5 FCM running Tool

Client Doc No: CG-MHN-20-3100-020094V

### 12.6 FCM Running Tool

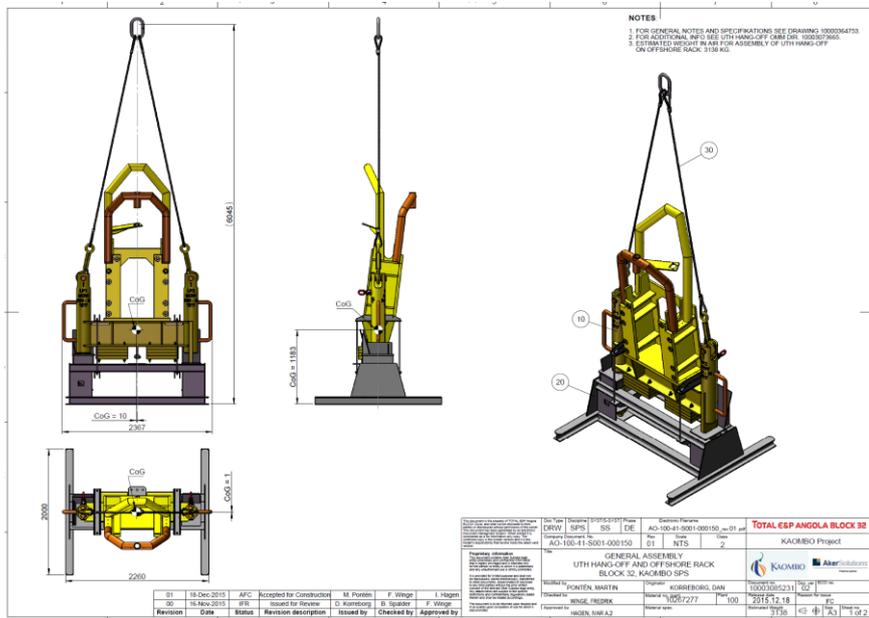


Material Number: 10193762  
 Reference (GA Drawing): CG-MHN-20-3100-080159 (Rev. 02)  
 10002027053 (Ver. 03)  
 Unit Weight in Air (in Water): 2900 kg (2550 kg)

Illustration only – MOHO

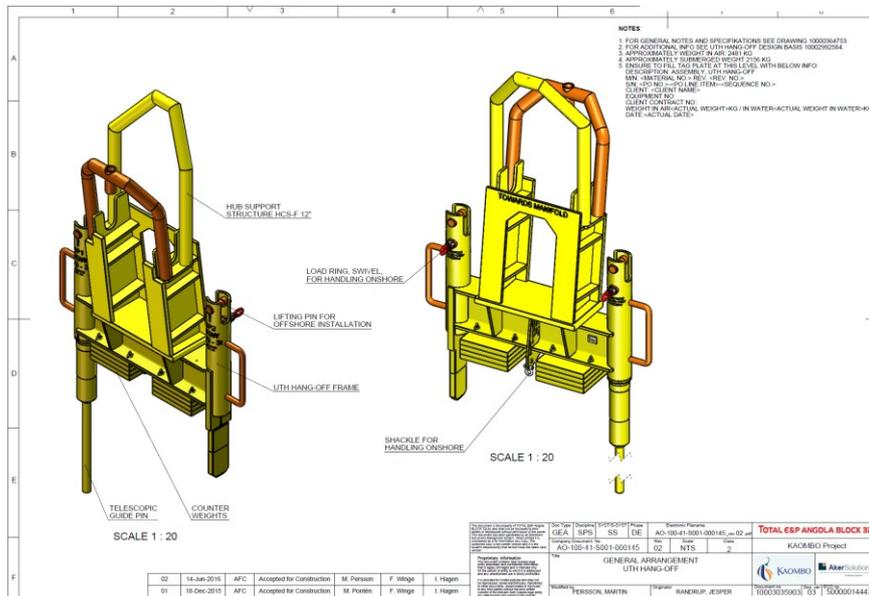
GA, SCM RT, Ø860, TYPE A	10002517667	AO-100-46-S001-000421	10261090
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### 11.6 Umbilical Termination Head (UTH) Hang-off & offshore rack



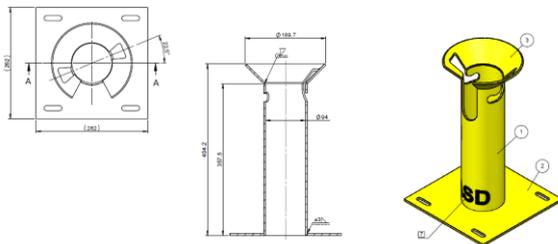
UTH Hang-off & offshore rack	10003085231	AO-100-41-S001-000150	10267277
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### 11.7 UTH temporary installation frame



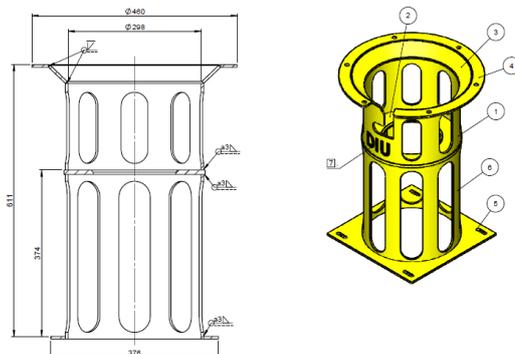
UTH GA	10003035903	AO-100-41-S001-000145	10264667
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### 11.8 Acoustic Sand Detector (ASD) CRADLE



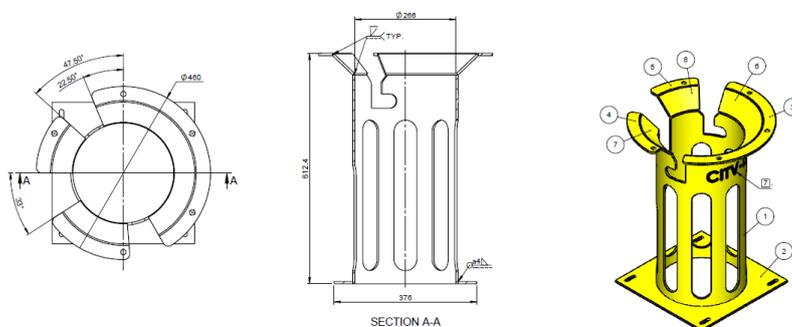
ASD Cradle	10003428793	N/A	10286442
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### 11.9 Downhole Interface Unit (DIU) CRADLE



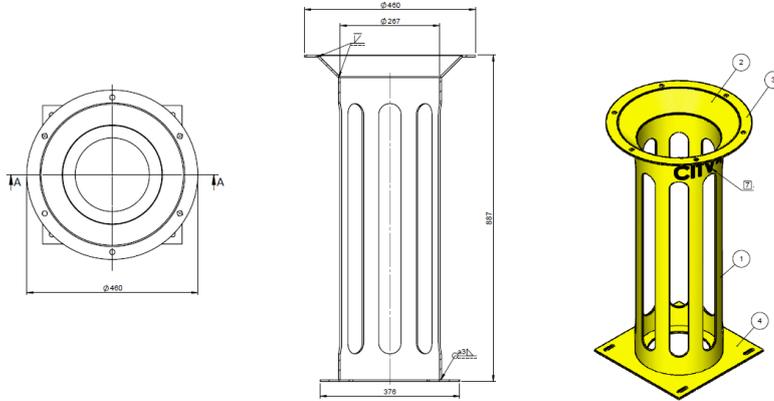
DIU Cradle	10003428511	N/A	10286440
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### 11.10 Chemical Injection Throttlet Valve (CITV) Low Flow CRADLE



CITV LF Cradle	10003428516	N/A	10286441
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### 11.11 CITV High Flow CRADLE



CITV HF Cradle	10003443304	N/A	10288048
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## **12 SUBSEA DISTRIBUTION SYSTEM**

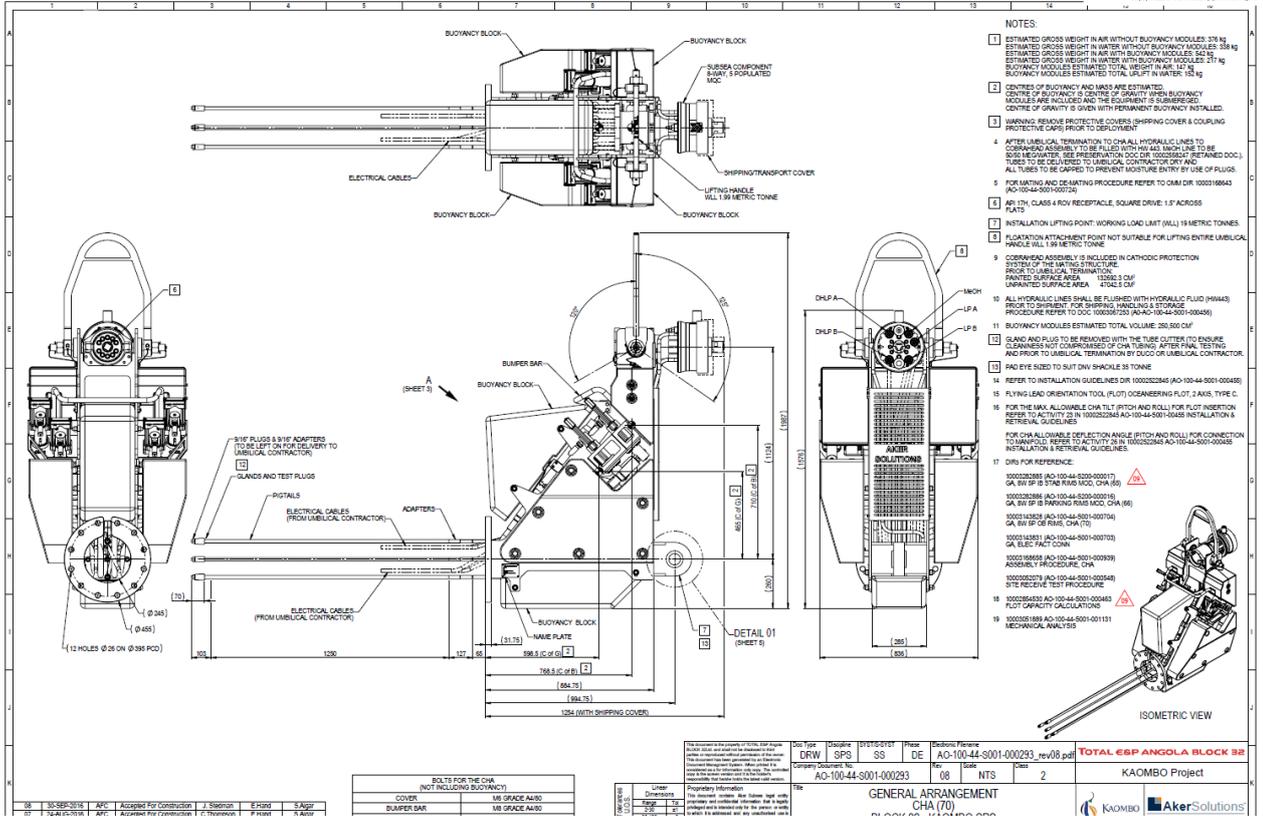
### **12.1 Reference list**

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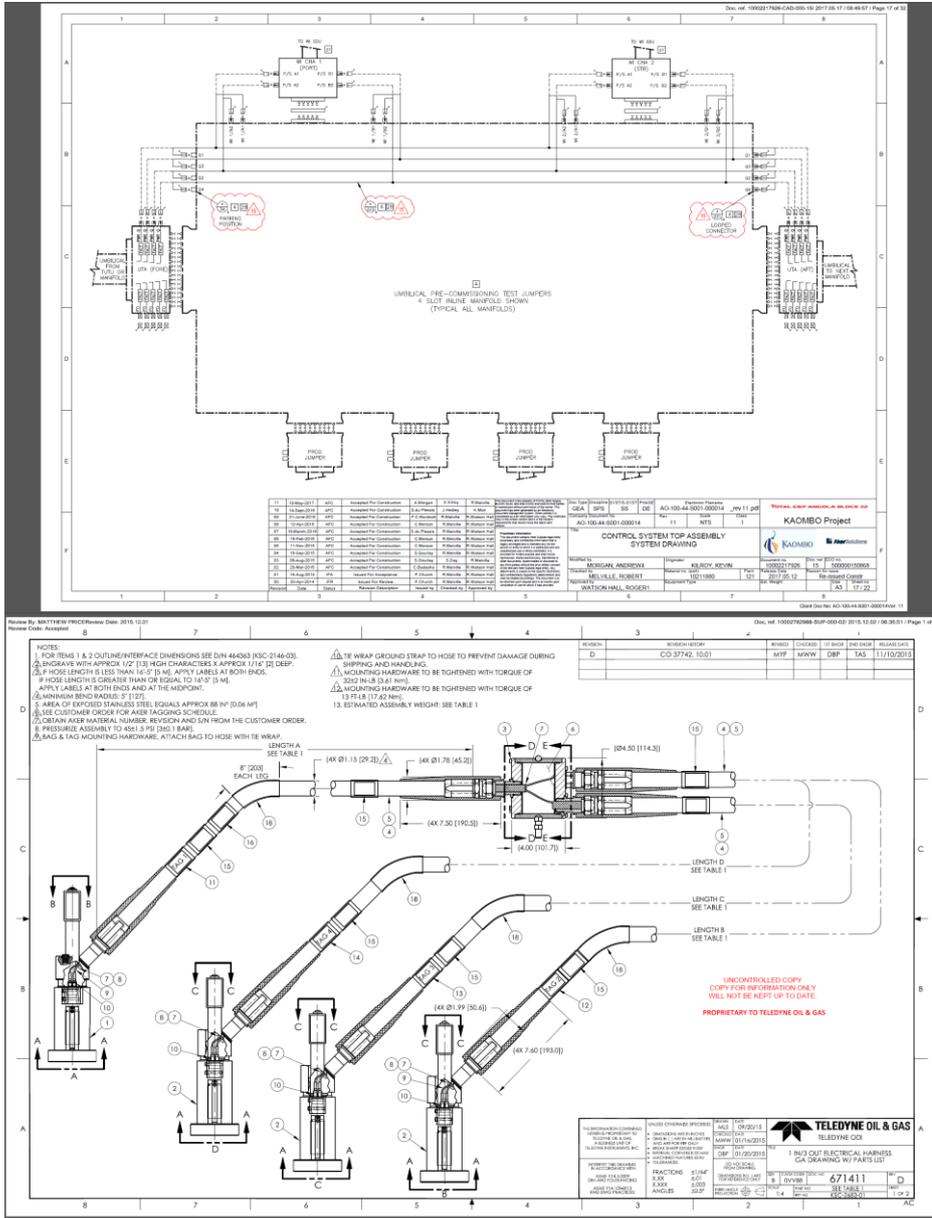
Document: 10002504361-PDC-000  
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12.2 Cobra Head



10002827894

### 12.3 Flying lead for Umbilical commissioning



10002782988

## 12.4 Electrical & Optical Flying Lead (incl. WI XT, SSIv)

### Only subsea deployable flying leads

Production Control System

#### 6.2 Equipment list

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Material	Equipment	Qty	GA		OMM		Weight [kg] dry	Length [mm]	Width [mm]	Height [mm]
			AKSO number	ENI number	AKSO number	ENI number				
	<b>Test equipment</b>									
10114719	Electronic Test Unit	2	10001202298	229A-UAS-U-XD-6095	10000901861	229A-UAS-O-MA-6016	25	560	860	465
10110068	RIMG Onboard Test & Flush 14 Way 14 Populated	4	10001000047	229A-UAS-U-XD-6044	10001078632	229A-UAS-U-MB-6023	30	357	361	297
10129548	PESU Load Bank Test Equipment	1	10000901949	229A-UAS-U-XD-6034	10000901947	229A-UAS-U-MB-6015	372.5	177	463	496
10101070	Umbilical Simulator	2	10000945200	229A-UAS-U-XD-6099	NA	NA	500	1025	780	553
10108922	SCM / SRM / SAM Shipping Frame	6	10000901930	229A-UAS-U-XD-6035	NA	NA	1015	2540	1360	1360
	<b>Jumpers</b>						<b>Weight [kg] dry</b>	<b>Length [mm]</b>	<b>Width [mm]</b>	<b>Height [mm]</b>
10098800	EFL (OF) 12W ROV_P(FM)2x4W DIV_R	11	10001018450	229A-UAS-U-XD-6070	10000901848	229A-UAS-U-MB-6020	16.7	6.5	029.2	NA
10109327	EFL (OF) 12W ROV_P(FM)2x4W+7W DIV_R	3	10001056625	229A-UAS-U-XD-6061	10000901848	229A-UAS-U-MB-6020	21.8	6.5	029.2	NA
10108547	EFL (OF) 12W ROV_P/ROV_R L=10m	6	10000901830	229A-UAS-U-XD-6024	10000901848	229A-UAS-U-MB-6020	13.1	10	029.2	NA
10098916	EFL (OF) 12W ROV_P/ROV_R L=27m (ETH3PWR)	48	10000901842	229A-UAS-U-XD-6030	10000901848	229A-UAS-U-MB-6020	28.5	27	029.2	NA
10098878	EFL (OF) 12W ROV_P/ROV_R L=6.5m	48	10000901830	229A-UAS-U-XD-6024	10000901848	229A-UAS-U-MB-6020	9.9	6.5	029.2	NA
10111854	EFL (OF) 2 x 12W ROV_P / 3 x 12W ROV_R	8	10001050953	229A-UAS-U-XD-6081	10000901848	229A-UAS-U-MB-6020	87.4	30	029.2	NA
10098871	EFL (OF) 4W ROV_P(FM)3x3DIV_R	13	10000901854	229A-UAS-U-XD-6021	10000901848	229A-UAS-U-MB-6020	21.0	6	029.2	NA
10098870	EFL (OF) 4W ROV_P(FM)DIV_R L=3m	13	10000901853	229A-UAS-U-XD-6020	10000901848	229A-UAS-U-MB-6020	5.0	3	029.2	NA
10108922	EFL (OF) 4W ROV_P(FM)DIV_R L=3m	24	10001056627	229A-UAS-U-XD-6051	10000901848	229A-UAS-U-MB-6020	4.5	3	029.2	NA
10127207	EFL (OF) 4W ROV_P/ROV_P L= 6.0m	9	10001227895	229A-UAS-U-XD-6098	10000901848	229A-UAS-U-MB-6020	6	13.4	029.2	NA
10098816	EFL (OF) 4W ROV_P/ROV_P L=40m	56	10000901827	229A-UAS-U-XD-6010	10000901848	229A-UAS-U-MB-6020	39.9	40	029.2	NA
10116416	EFL (OF) 4W ROV_P/ROV_R L=2.5m	24	10001142043	229A-UAS-U-XD-6084	10000901848	229A-UAS-U-MB-6020	6.0	2.5	029.2	NA
10098921	EFL (OF) 4W ROV_P/ROV_R L=30m	16	10000901856	229A-UAS-U-XD-6023	10000901848	229A-UAS-U-MB-6020	31.2	30	029.2	NA
10098879	EFL (OF) 4W ROV_P/ROV_R L=6.5m	12	10000901857	229A-UAS-U-XD-6025	10000901848	229A-UAS-U-MB-6020	10.2	6.5	029.2	NA
10103285	EFL (OF) 7W ROV_P/ROV_R L=25m	18	10001050850	229A-UAS-U-XD-6080	10000901848	229A-UAS-U-MB-6020	26.7	25	029.2	NA
10098911	EFL (OF) 12W STAB_R(F/L)STAB_R(F/L) L=5.5m	24	10000901858	229A-UAS-U-XD-6026	10000901848	229A-UAS-U-MB-6020	9.0	5.5	029.2	NA
10098875	EFL (OF) 4W STAB_R(F/L)STAB_R (F/L) L=5.5m	30	10000901855	229A-UAS-U-XD-6022	10000901848	229A-UAS-U-MB-6020	7.7	5.5	029.2	NA
10114475	EFL TEST 1x2W ROV_R/3 X PESU CONNECTOR	12	10001177122	229A-UAS-U-XD-6091	10000901848	229A-UAS-U-MB-6020	22	22	NA	NA
10100237	OFL (OF) 3x8W ROV_R	16	10000901829	229A-UAS-U-XD-6012	10000901848	229A-UAS-U-MB-6020	41	44	017.8	NA
10098819	OFL (OF) 8W ROV_R/ROV_R L=40m	16	10000901828	229A-UAS-U-XD-6011	10000901848	229A-UAS-U-MB-6020	20.9	40	017.8	NA
10108790	OPT FACT 1xCAB/4x8W ROV_P (RA) SPLIT FLG	8	10001015572	229A-UAS-U-XD-6090	10000901848	229A-UAS-U-MB-6020	15.1	2.3	017.8	NA
10098913	OPT FACT 1xCAB/8W ROV_P (RA) SPLIT FLG	48	10000901837	229A-UAS-U-XD-6028	10000901848	229A-UAS-U-MB-6020	9.4	2.3	017.8	NA
10110317	OPT FACT 1xCAB/8W ROV_P (RA) SPLIT FLG	8	10000901837	229A-UAS-U-XD-6028	10000901848	229A-UAS-U-MB-6020	9.4	2.3	017.8	NA
	<b>Caps</b>						<b>Weight [kg] dry</b>	<b>Length [mm]</b>	<b>Width [mm]</b>	<b>Height [mm]</b>
10108549	CONN ROV PROTECTIVE CAP UNIVERSAL	152	10000901834	229A-UAS-U-XD-6058	10000901848	229A-UAS-U-MB-6020	0.6	305	119.4	89
10109575	ROV PROTECT CVR FOR 4W PLUG LONG TERM	12	10001027037	229A-UAS-U-XD-6078	10000901848	229A-UAS-U-MB-6020	1.1	301	119.4	89
10109572	ROV PROTECT CVR FOR 12W PLUGS LONG TERM	48	10001027037	229A-UAS-U-XD-6078	10000901848	229A-UAS-U-MB-6020	1.1	301	119.4	89
10118321	ELEC CONN 4W ROV SHORTENING CAP - PLUG	56	10001167810	229A-UAS-U-XD-6087	10000901848	229A-UAS-U-MB-6020	2.3	305	119.4	89
10098912	ELEC FITA 1xCAB /4W ROV_R (RA) SPLIT FLG	64	10000901836	229A-UAS-U-XD-6027	10000901848	229A-UAS-U-MB-6020	3.4	320.5	0139.7	NA
10110316	ELEC FITA 1xCAB / 4W ROV_R (RA) SPLIT FL	64	10000901836	229A-UAS-U-XD-6027	10000901848	229A-UAS-U-MB-6020	3.4	320.5	0139.7	NA

Ref Goliat handbook

## 12.5 Hydraulic Flying Lead (incl. WI XT, SSIV)

### Only subsea deployable flying leads

Doc. ref. 10000891455-PDC-000-11/ 2014.06.05 / 06:21:02 / Page 103 of 193  
 Client Doc No: 229A-UAS-U-RA-2019Ver: C02

Production Control System

#### 6.2 Equipment list

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Material	Equipment	Qty	GA		OMM		Weight [kg] dry	Length [mm]	Width [mm]	Height [mm]
			AKSO number	ENI number	AKSO number	ENI number				
	<b>Test equipment</b>									
10114719	Electronic Test Unit	2	10001202298	229A-UAS-U-XD-6095	10000901861	229A-UAS-U-MA-6018	25	500	800	485
10110088	RIMS Onboard Test & Flush 14 Way 14 Populated	4	10001000047	229A-UAS-U-XD-6094	10001078832	229A-UAS-U-MB-6023	30	357	361	297
10128548	PESU Load Bank, Test Equipment	1	10000901949	229A-UAS-U-XD-6034	10000901947	229A-UAS-U-MB-6015	372.5	177	463	468
10101970	Umbilical Simulator	2	10000943200	229A-UAS-U-XD-6099	NA	NA	500	1025	780	553
10106922	SCM / SRM / SAM Shipping Frame	6	10000901930	229A-UAS-U-XD-6035	NA	NA	1015	2540	1360	1380
	<b>Jumpers</b>						<b>Weight [kg] dry</b>	<b>Length [mm]</b>	<b>Width [mm]</b>	<b>Height [mm]</b>
10098890	EFL (OF) 12W ROV_P(FM)2x4W DIV_R	11	10001018450	229A-UAS-U-XD-6070	10000901848	229A-UAS-U-MB-6020	18.7	6.5	029.2	NA
10109327	EFL (OF) 12W ROV_P(FM)2x4W+7W DIV_R	3	10001056625	229A-UAS-U-XD-6061	10000901848	229A-UAS-U-MB-6020	21.8	6.5	029.2	NA
10108547	EFL (OF) 12W ROV_P/ROV_R L=10m	6	10000901830	229A-UAS-U-XD-6024	10000901848	229A-UAS-U-MB-6020	13.1	10	029.2	NA
10098916	EFL (OF) 12W ROV_P/ROV_R L=27m (ETH&PWR)	48	10000901842	229A-UAS-U-XD-6030	10000901848	229A-UAS-U-MB-6020	28.5	27	029.2	NA
10098878	EFL (OF) 12W ROV_P/ROV_R L=6.5m	48	10000901830	229A-UAS-U-XD-6024	10000901848	229A-UAS-U-MB-6020	9.9	6.5	029.2	NA
10111854	EFL (OF) 2 x 12W ROV_P / 3 x 12W ROV_R	8	10001056953	229A-UAS-U-XD-6081	10000901848	229A-UAS-U-MB-6020	87.4	30	029.2	NA
10098871	EFL (OF) 4W ROV_P(FM)3x3DIV_R	13	10000901854	229A-UAS-U-XD-6021	10000901848	229A-UAS-U-MB-6020	21.0	6	029.2	NA
10098870	EFL (OF) 4W ROV_P(FM)DIV_R L=3m	13	10000901853	229A-UAS-U-XD-6020	10000901848	229A-UAS-U-MB-6020	5.0	3	029.2	NA
10108622	EFL (OF) 4W ROV_P(FM)DIV_R L=3m	24	10001056627	229A-UAS-U-XD-6051	10000901848	229A-UAS-U-MB-6020	4.5	3	029.2	NA
10127207	EFL (OF) 4W ROV_P/ROV_P L=6.0m	9	10001227695	229A-UAS-U-XD-6098	10000901848	229A-UAS-U-MB-6020	6	13.4	029.2	NA
10098818	EFL (OF) 4W ROV_P/ROV_P L=40m	56	10000901827	229A-UAS-U-XD-6010	10000901848	229A-UAS-U-MB-6020	39.9	40	029.2	NA
10118418	EFL (OF) 4W ROV_P/ROV_R L=2.5m	24	10001142043	229A-UAS-U-XD-6084	10000901848	229A-UAS-U-MB-6020	6.0	2.5	029.2	NA
10098921	EFL (OF) 4W ROV_P/ROV_R L=30m	16	10000901856	229A-UAS-U-XD-6023	10000901848	229A-UAS-U-MB-6020	31.2	30	029.2	NA
10098879	EFL (OF) 4W ROV_P/ROV_R L=6.5m	12	10000901857	229A-UAS-U-XD-6025	10000901848	229A-UAS-U-MB-6020	10.2	6.5	029.2	NA
10103285	EFL (OF) 7W ROV_P/ROV_R L=25m	18	10001056850	229A-UAS-U-XD-6080	10000901848	229A-UAS-U-MB-6020	26.7	25	029.2	NA
10098911	EFL (OF) 12W STAB_R(FL)/STAB_R(RL) L=5.5m	24	10000901858	229A-UAS-U-XD-6026	10000901848	229A-UAS-U-MB-6020	9.0	5.5	029.2	NA
10098875	EFL (OF) 4W STAB_R(FL)/STAB_R(RL) L=5.5m	30	10000901855	229A-UAS-U-XD-6022	10000901848	229A-UAS-U-MB-6020	7.7	5.5	029.2	NA
10114475	EFL TEST 12W ROV_R/3 X PESU CONNECTORS	12	10001177122	229A-UAS-U-XD-6091	10000901848	229A-UAS-U-MB-6020	22	22	NA	NA
10100237	OFL (OF) 3x8W ROV_R	16	10000901829	229A-UAS-U-XD-6012	10000901848	229A-UAS-U-MB-6020	41	44	017.8	NA
10098819	OFL (OF) 8W ROV_R/ROV_R L=40m	16	10000901828	229A-UAS-U-XD-6011	10000901848	229A-UAS-U-MB-6020	20.9	40	017.8	NA
10108790	OPT FACT 1xCAB/4x8W ROV_P (RA) SPLIT FLG	8	10001015572	229A-UAS-U-XD-6090	10000901848	229A-UAS-U-MB-6020	15.1	2.3	017.8	NA
10098913	OPT FACT 1xCAB/8W ROV_P (RA) SPLIT FLG	48	10000901837	229A-UAS-U-XD-6028	10000901848	229A-UAS-U-MB-6020	9.4	2.3	017.8	NA
10110317	OPT FACT 1xCAB/8W ROV_P (RA) SPLIT FLG	8	10000901837	229A-UAS-U-XD-6028	10000901848	229A-UAS-U-MB-6020	9.4	2.3	017.8	NA
	<b>Caps</b>						<b>Weight [kg] dry</b>	<b>Length [mm]</b>	<b>Width [mm]</b>	<b>Height [mm]</b>
10108549	CONN ROV PROTECTIVE CAP UNIVERSAL	152	10000901834	229A-UAS-U-XD-6058	10000901848	229A-UAS-U-MB-6020	0.6	305	119.4	89
10109575	ROV PROTECT CVR FOR 4W PLUG LONG TERM	12	10001027037	229A-UAS-U-XD-6078	10000901848	229A-UAS-U-MB-6020	1.1	301	119.4	89
10109572	ROV PROTECT CVR FOR 12W PLUGS LONG TERM	48	10001027037	229A-UAS-U-XD-6078	10000901848	229A-UAS-U-MB-6020	1.1	301	119.4	89
10118321	ELEC CONN 4W ROV SHORTENING CAP - PLUG	56	10001187810	229A-UAS-U-XD-6087	10000901848	229A-UAS-U-MB-6020	2.3	305	119.4	89
10098912	ELEC FITA 1xCAB /4W ROV_R (RA) SPLIT FLG	64	10000901836	229A-UAS-U-XD-6027	10000901848	229A-UAS-U-MB-6020	3.4	320.5	0139.7	NA
10110316	ELEC FITA 1xCAB / 4W ROV_R (RA) SPLIT FL	64	10000901836	229A-UAS-U-XD-6027	10000901848	229A-UAS-U-MB-6020	3.4	320.5	0139.7	NA

## 12.6 FLDF Flying Lead Deployment Frame

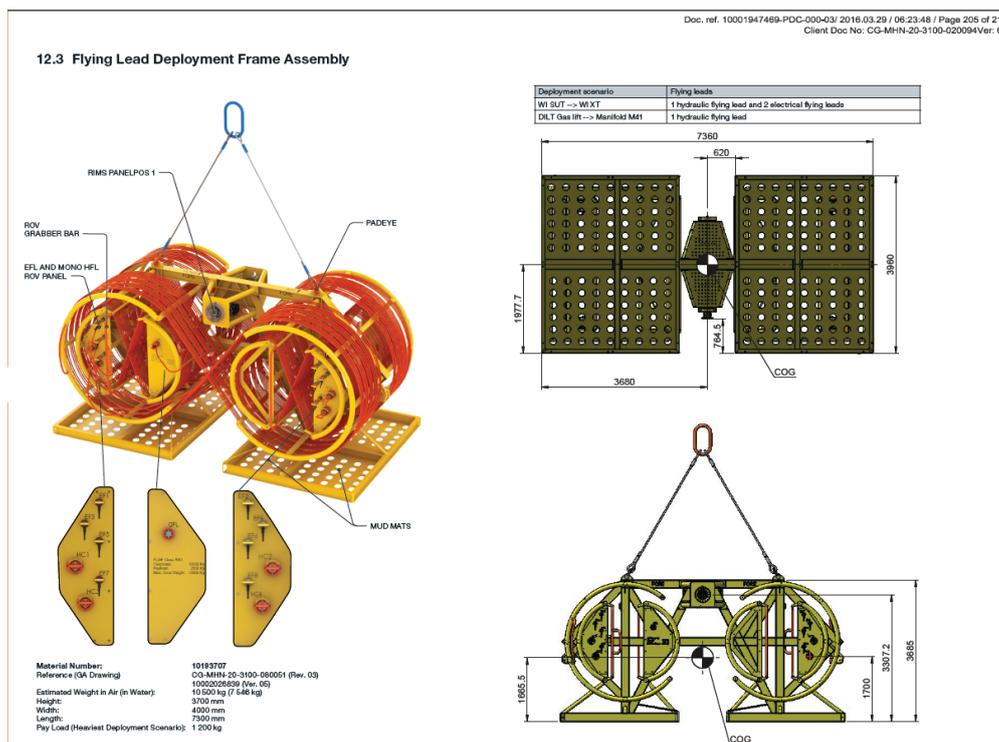


Illustration only – MOHO

DEPL. FRAME, FLYING LEADS, TYPE B	10002517598	AO-100-46-S001-000361	10241421
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### 12.7 Overlay Flying Lead Deployment Frame

**NOTES:**  
 UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETERS  
 ALL STANDARD REFERRED TO SHALL BE THE CURRENT ISSUE  
 - OPERATIONAL CLASS: DNV 2.7-3, TYPE A, CLASS R46-S45  
 FRAME CERTIFIED TO DNV 2.7-3  
 MAX. GROSS MASS: 2460 KG  
 TARE MASS: 1460 KG  
 PAYLOAD: 1000 KG  
 - COS DIMENSIONS ARE JUST AN ESTIMATED VALUES. WILL DEPEND ON THE LAYING OF EFL/OFL ON THE FRAME.  
 - WEIGHT IN AIR: 2440 KG  
 WEIGHT IN WATER: 2026 KG  
 - FOR PLACEMENT OF CRADELS SEE OMM DIR no. 10003428188  
 - SINGLE POINT LIFTING, LIFTING SLING MN 10155221 (MLL 3T)  
 - SLING HEIGHT IS NOT MORE THAN 1.3M ABOVE FRAME BOTTOM WHEN ITS HANGS OVER THE LONG SIDE OF THE FRAME.

**DETAIL B**  
 FORKLIFT  
 130 (INNER DIM.)  
 230

**DETAIL A**  
 SLING HOLDER  
 SHACKLE FOR SEA FASTENING (4 OFF)  
 RIG GRAB BAR (2 OFF)  
 PROTECTION FOR CONNECTORS

**EMPTY BASKET**

**VIEW X**  
 PADEYE  
 2507.2

Doc Type	GEA	SPS	NN	DE	AO-100-46-S001-002285	Rev	00	NTS	2	Electronic Package	AO-100-46-S001-002285	Rev	00	TOTAL ESP ANGOLA BLOCK 32
Contract	AO-100-46-S001-002285				Material	10155140	Material name		Weight	180	Created by	KULKARNI, PURUSHOTTAM3	15.03.2017	In Work

Revision	Date	Status	Revision memo	Issued By	Checked By	Approved By
00	15-MAR-2017	IFR	Issued for Review	P. Kulkarni	A. Hahne	R. Nair

FLDF	10003428503	AO-100-46-S001-002285	10155140
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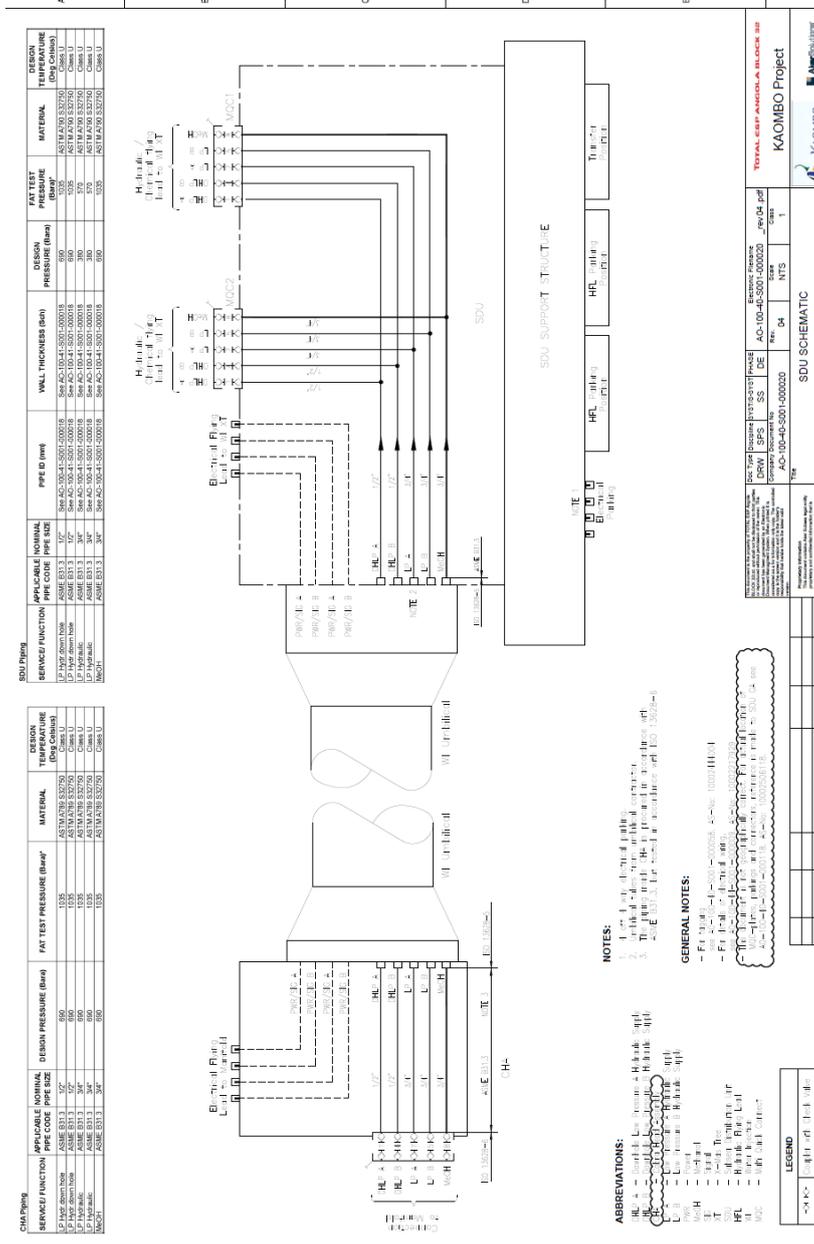
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12.8 SDU

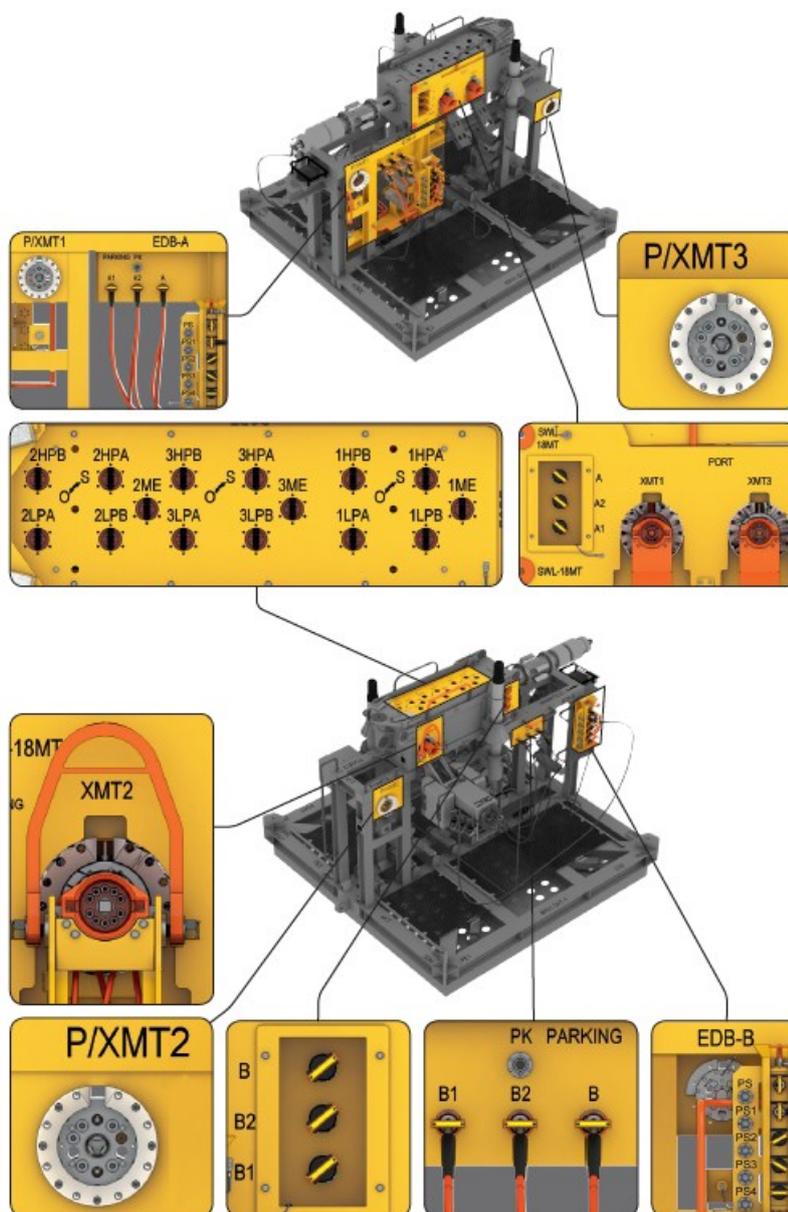
12.8.1 SDU Schematic



SDU Schematic	10002379820	AO-100-40-S001-000020	10233690
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12.8.3 ROV Panel marking SDU  
 3.4.3 WI SUT – ROV Markings

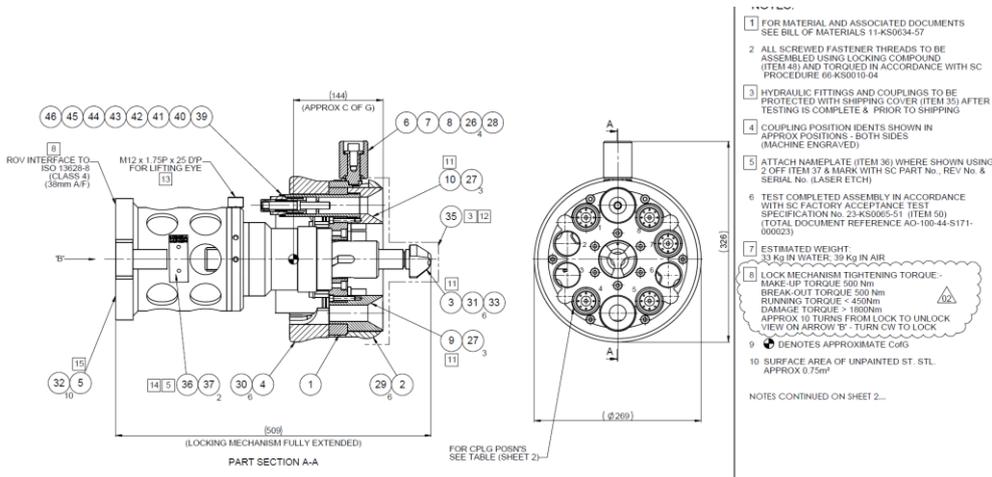


Picture is illustration from moho

SDU GA	10002506118	AO-100-40-S001-000118	10233690
SDU Markings	10002506119	AO-100-40-S001-000119	10247077 10247076

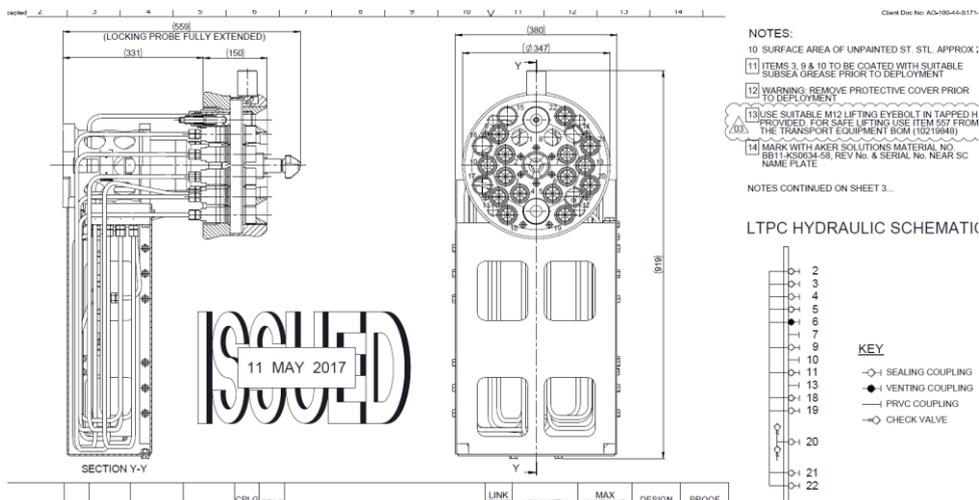
## 12.9 LTPC

### 12.9.1 8WAY (5POP) Retrievable Integrated Modular Stabplate (RIMS) Outboard (OB) Long Term Protective Cover (LTPC)



8WAY (5POP) Rims OB LTPC stabplate	10002523522	AO-100-44-S171-000008	BB11-KS0634-57
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### 12.9.2 22WAY (15POP) WI XMT RIMS LTPC



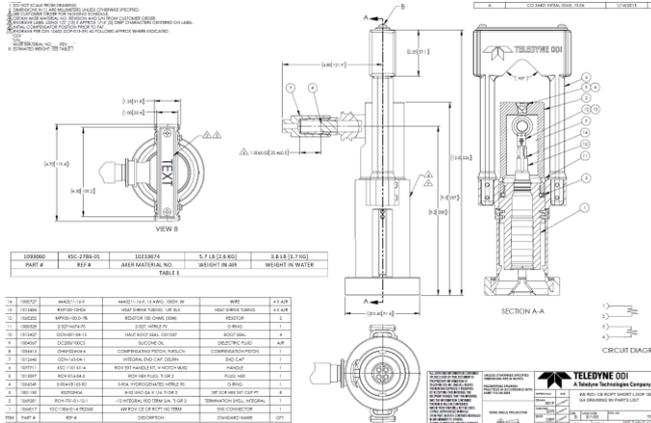
22WAY (15POP) WI XMT RIMS LTPC stabplate	10002523528	AO-100-44-S171-000006	BB11-KS0634-58
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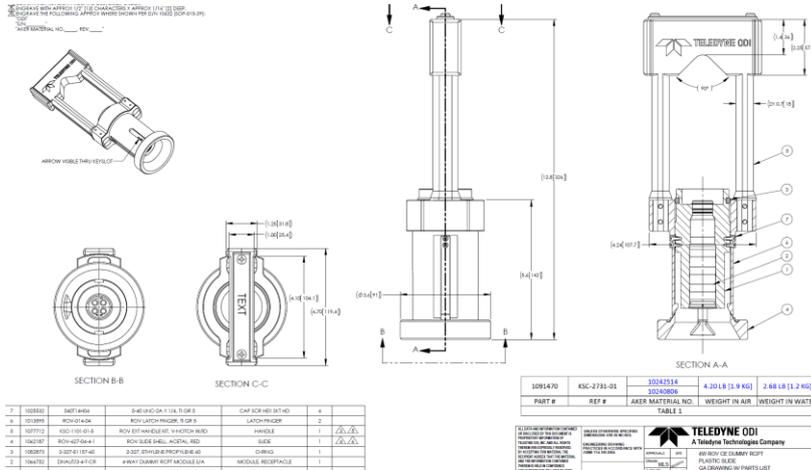
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12.9.3 4W ROV SOC LTPC



4W ROV SOC LTPC	10002696313	AO-100-44-S164-000027	10233674
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12.9.4 4W ROV ELEC SOC LTPC



4W ROV ELEC SOC LTPC	10002696315	AO-100-44-S164-000056	10242514
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## **13 SUBSEA EMERGENCY RESPONSE SYSTEM (SERS)**

### **13.1 Reference List**

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## 13.2 Scope of Supply

### WP05

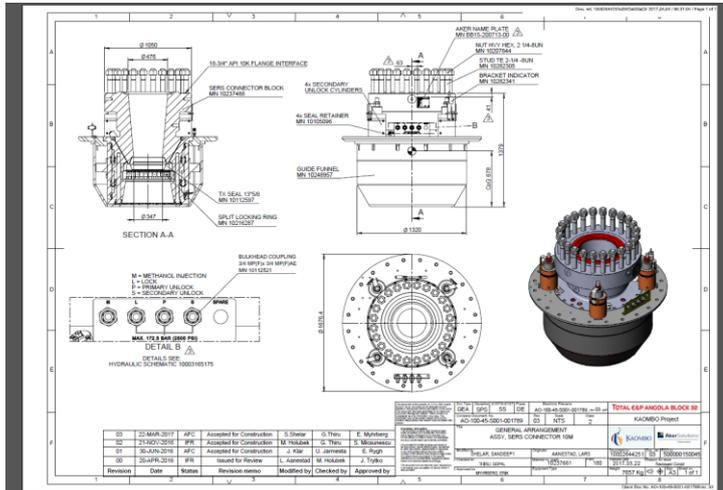
10229303	SERS REH ADAPTER - EQUIPMENT PACKAGE	2
10169318	VXT TOOLS , 5-1/8" X 2-1/16" VXT HTT	2
10232489	SLING SET, 1L, WI, 8, WLL80, SØ-	2
	10229306 SERS REH ADAPER, DSA/LRP GUIDE FUNNEL	2
10161204	GASKET, RING, BX-151, API6A, ALLOY 825	2
10257988	SEAL, BX159, 426,72x25,70x25,70, NI825	2
10115799	STUD TE, 3/4-10UNRC x 100mm, L7M	16
BB17-MX0364-00	NUT HVY HEX, 3/4-10UNC, 7M	16
10247446	AKER SOLUTIONS COMPANY SIGN KAOMBO	4
BB17-MX0014-00	DRIVE SCREW, NO.6 SMS 1549	16

### WP07.2

10237661	ASSY, SERS CONNECTOR ,10M	2
10251710	TEST STUMP 13"5/8 ASSY SERS	1
10248870	REMOVAL TOOL BX164 ASSY SERS	2
10262916	SLINGSET WITH SPREADING BEAM, SERS, ASSY	2
10251331	TRANSPORTATION SKID ASSEMBLY, SERS	2

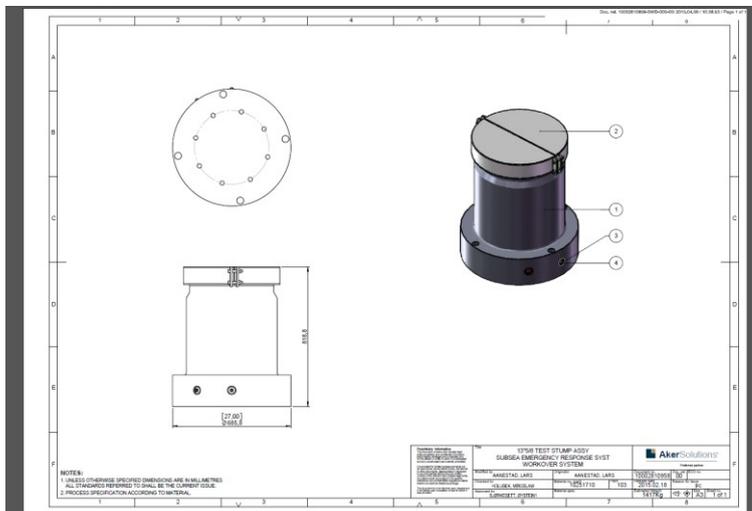
### 13.3 SERS

#### 13.3.1 SERS CONNECTOR, 10M



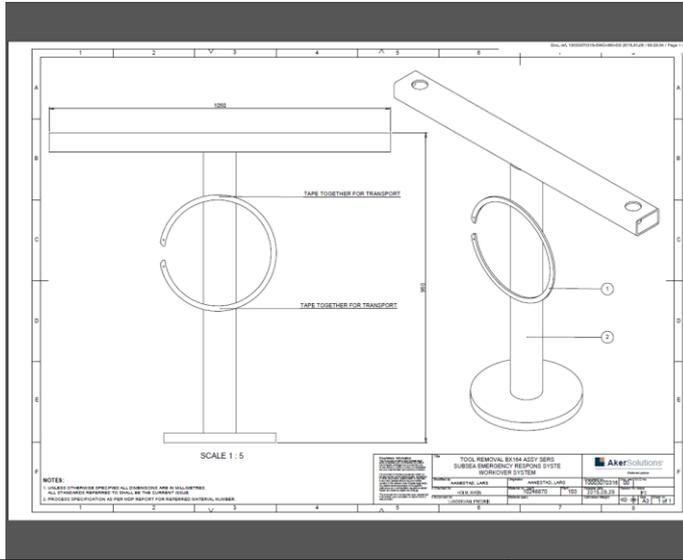
Sers connector 10M	10002644251	AO-100-45-S001-001789	10237661
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#### 13.3.2 SERS TEST STUMP 13\"/>



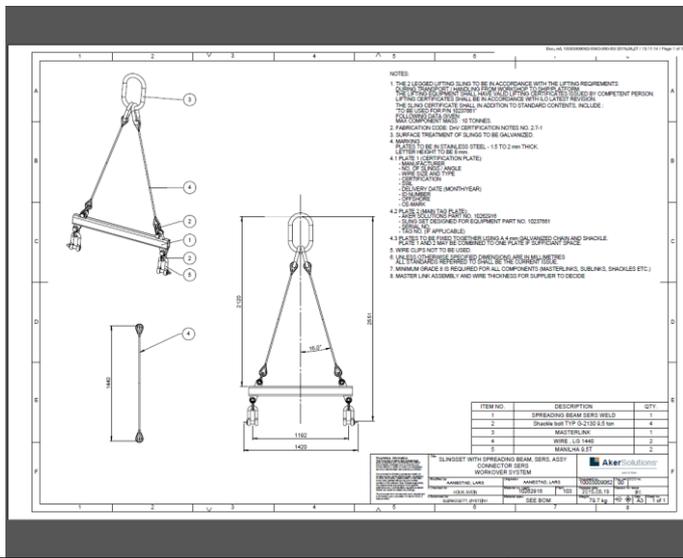
Sers connector 10M	10002810958	N/A	10251710
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### 13.3.3 SERS REMOVAL TOOL BX164 ASSY



Removal tool BX164	10003070316	N/A	10248870
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### 13.3.4 SERS SLINGSET WITH SPREADING BEAM, ASSY



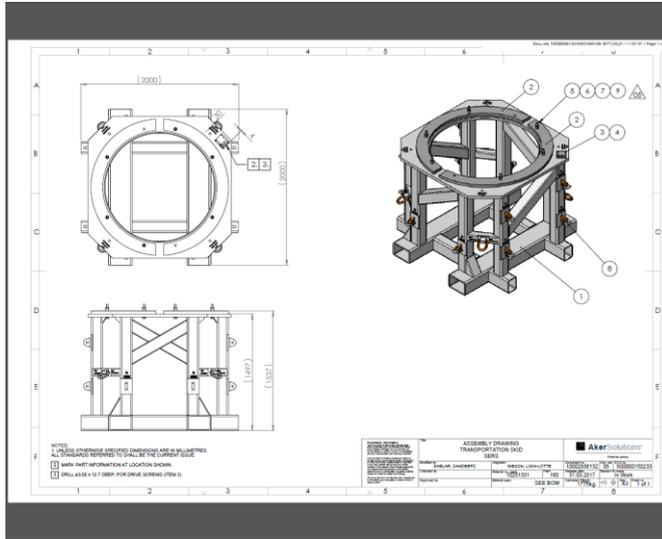
Slingset with spreading beam	10003009062	N/A	10262916
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SPS HANDBOOK TABLE OF CONTENT

BLOCK 32 - KAOMBO SPS

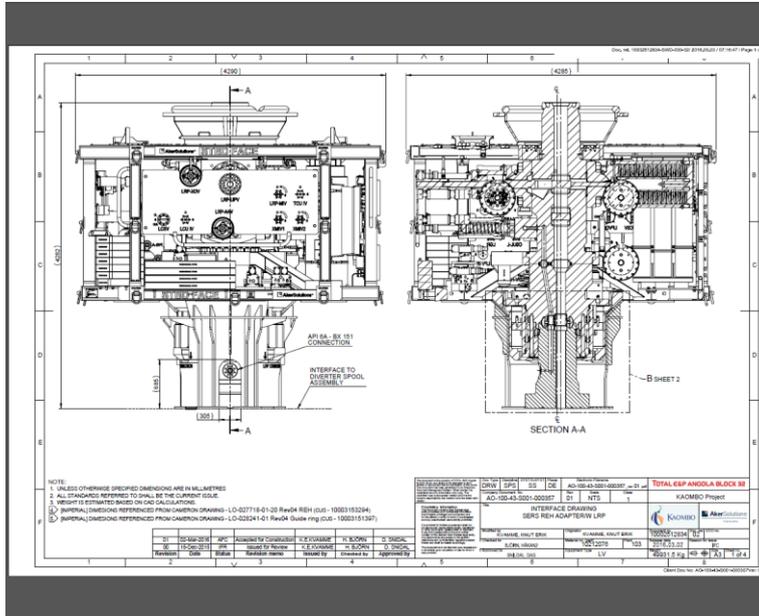
Document: 10002504361-PDC-000  
 Version: 05 - Re-issued Constr  
 Issue date: 2017.11.17  
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### 13.3.5 SERS TRANSPORTATION SKID ASSEMBLY



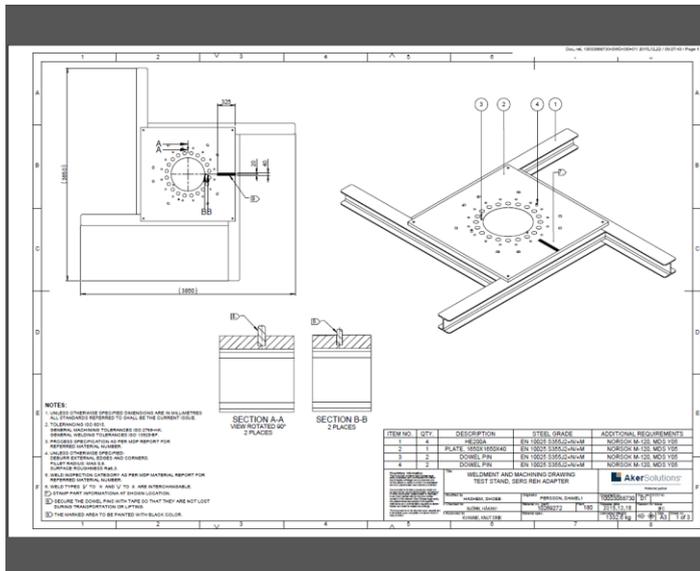
Transportation skid	10002836132	N/A	10251331
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### 13.3.6 SERS Re-entry Hub (REH) ADAPTER - EQUIPMENT PACKAGE



REH adapter W/LRP	10002512834	AO-100-43-S001-000357	10229303
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### 13.3.7 SERS FRAME, TEST STAND, ADAPTER



REH adapter W/LRP	10003088730	N/A	10269272
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