Constructor 5

Factory Acceptance Test

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1 GENERAL

1.1 PURPOSE AND SCOPE

Factory Acceptance Test is performed with the objective to verify the functional capabilities of the ROV against the contractual specifications.

This report describes the testing activities and acceptance criteria for each critical function. One signed copy of this document will also be used to log and file the testing activities.

1.2 DRAWING REFERENCES

1. AF57-1-1000E01 ROV External Cabling
2. AF57-1-1050E01, 2, 3, 5, 10, 11, 20, 21, 22, 23, 24, 25, 27, 28, 29 ROV El Pod
3. AF25-1000H01 Main Hydraulic Schematic
4. AF57-1-1000H02 Aux Hydraulic Schematic

2 TEST SET-UP AND PREPARATIONS

The FAT will be carried out at Kystdesigns premises in Møllerveien, Haugesund.

The following equipment is required to perform the FAT:

- Hydraulic Measuring instrument with the following sensors:
  - Pressure sensor 0-60Bar
  - Pressure sensor 0-250Bar
  - Temperature sensor
- Hydraulic hoses and fittings necessary to connect sensors to Rov Hydraulic system
- Test Manifold for test of Hydraulic Pressure Sensors
- Enerpack pump
- Multimeter
- Computer with two comports
- Test cable for MinK-8
- Test cable for MinK-10
- Test cable for MinL w coax
- Test cable for SH20 8p
- 500k ohm GFD test cable
-
- Topside fibre system
- Dual fibre cable and 2x 10dB fibre attenuators
- PXI w control SW
- Computer with monitor program
- PAL Video monitor
- HD-SDI Monitor

The FAT comprises dry test of control system,cameras,lamps and hydraulic sensors. The test will be performed with open valve packs and electronic pod.

3 EL. POD TEST:

3.1 POD POWER LID

Description	Acceptance criteria	Accepted
TP1 Pinout	According to drw -1050E11	☑
GND	Connected to chassis, < 1 ohm	☑
Farm type	Farm type 2 750w/1000W	☑
Fan 115vac	Fan type and flow into heat sink	☑
150vdc	Rectified supplied 115vac	☑
12vdc	+-0.1v	☑
24vdc	+-0.1v	☑
48vdc	+-0.1v	☑

3.2 POD POWER RACK & CONFIGURATION

No Link with surface rack:

Description	Acceptance criteria	Accepted
Backplane Isolation spacer	Installed	☑
Relay cards Fuse settings	According to drw -1050E10	☑
Serial Cards Piggybacks	According to drw -1050E05	☑
Video Mux Tested	Marked "Tested OK"	☑
Ethernet Mux Tested	Marked "Tested OK"	☑
Cards and modules marked	Front labels on handles	☑
150v Pow Capacitors C1	Polarity, discharge resistor installed	☑
24vdc Lin Capacitors C2	Polarity, discharge resistor installed	☑
GND	Connected to chassis, < 1 ohm frame	☑
Supplied 12vdc	12vdc, Backplane LED lit	☑
Supplied 115vac	115vac, Backplane LEDs lit	☑
Supplied 150vdc	150vdc, Backplane LED lit	☑
Supplied 24vdc external	24vdc, Backplane LEDs lit	☑
Supplied 48vdc	48vdc, Backplane LED lit	☑
Supplied 24v Lin	24vdc, Backplane LED lit	☑
Fan 24vdc	Fan type and flow up direction	☑
Relay card 1 Power	Power Led lit	☑
Relay card 2 Power	Power Led lit	☑
GFD Card power	Power Leds lit	☑
Master Card power (No link)	Power Leds lit	☑
Video Card 1 power (No link)	Power Leds lit	☑
Video Card 2 power (No link)	Power Leds lit	☑
Serial Card 1 power (No link)	Power Leds lit	☑
Serial Card 2 power (No link)	Power Leds lit	☑
Serial Card 3 power (No link)	Power Leds lit	☑
Video Mux AV card power	Av Card Leds lit, fan spinning	☑
Video Mux DV Card power	DV card Leds lit	☑
Status leds (With no link to surface)	Only Master Status slowly flashing Leds lit	☑

Link with surface rack:

Description	Acceptance criteria	Accepted
Link with surface	Link with all cards in rack	☑
GFD Lights	Verify min and max readings	☑
GFD 12vdc	Verify min and max readings	☑
GFD 24vdc External	Verify min and max readings	☑
GFD 48vdc	Verify min and max readings	☑
GFD 115vac	Verify min and max readings	☑
Voltage level readings	Match real values	☑
Current reading	Match real values	☑
Pod temp	Match real values	☑
Pod Water detect		☑

3.3 CONNECTORS

General for all connectors:

Serial and Ethernet links shall be tested with pier to pier communication between two units e.g. two PCs. "Loop back" test is not good enough.

Serial channels power shall be verified to go on/off

Power shall be measured while on and off to verify that relays do turn On & Off 100%
Tip: Make a GFD and verify that it can be isolated

Use drawings to check pinout and type of signal connected for each connector tested.

3.3.1 MinK-8 Valve pack Connections (150VDC) & SH20 Light Box

1. Use the MinK-8 and SH20 8p test cables.
2. Monitor the test cable power while switching power on and off for the connection to be tested.
3. Check signal polarity.
4. Secure one end of the ground fault test cable to the ROV frame, and connect the other end to pin 8 for MinK-8, (pin 2 on D2 light box).
5. An **115VAC (24vdc light box) GFD** alarm shall now occur on the operator screen.
6. Connect the PXI to the associated surface multiplexer channel.

Conn	Data	GFD	150Vdc (24Vdc)	Remark
A1	☑	☑	☑	TCU
A2	☑	☑	☑	ACU
B1	☑	☑	☑	VP1
B2	☑	☑	☑	VP2
D1	☑	☑	☑	Light Box

3.3.2 MinM-26 Gyro Connections

1. Use the test cable.
2. Connect the laptop/PC to the associated surface multiplexer channels.
3. Monitor the test cable power while switching power on and off for the connection to be tested.
4. Use "HyperTerminal" to test data transfer, both directions (up/down).
5. Secure one end of the ground fault test cable to the ROV frame, and connect the other end to pin 1.
6. A **24V GFD** alarm shall now occur on the operator screen.

Conn	Data	GFD	24V (48vdc)
E1	☑	☑	☑
E2	☑	☑	☑

3.3.3 MinK-8 Connections (115VAC)

1. Use the test cable.
2. Connect the laptop/PC to the associated surface multiplexer channel.
3. Monitor the test cable LED while switching power on and off for the connection to be tested.
4. Use "HyperTerminal" to test data transfer, both directions (up/down).
5. Secure one end of the ground fault test cable to the ROV frame, and connect the other end to pin 7 or 8.
6. An **115VAC GFD** alarm shall now occur on the operator screen.

Conn	Data	GFD	115VAC	Remark
F1	V	V	V	IHPU 150Vdc
F2	V	V	V	
G1	V	V	V	
G2	V	V	V	

3.3.4 Mink-10 Connections

1. Use the test cables.
2. Connect the laptop/PC to the associated surface multiplexer channel.
3. Monitor the test cable power while switching power on and off for the connection to be tested.
4. Use "HyperTerminal" to test data transfer, both directions (up/down).
5. Secure one end of the ground fault test cable to the ROV frame, and connect the other end to pin 10.
6. A **24V GFD(48V L2,M1)** alarm shall now occur on the operator screen.

Conn	Data	GFD	24Vdc	Remark
H1	V	V	V	
H2	V	V	V	
I1	V	V	V	
I2	V	V	V	
J1	V	V	V	
J2	V	V	V	
K1	V	V	V	
K2	V	V	V	
L1	V	V	V	
L2	V	V	V	48Vdc
M1	V	V	V	48Vdc
M2	V	V	V (CP)	24Vdc

3.3.5 Camera Connections

1. Use cameras and cables applicable for the actual ROV
2. Check picture quality and verify that the Zoom and focus function is working
3. Check the GFD alarm by following the procedure below :
4. Disconnect camera and secure one end of the ground fault test cable to the ROV frame, and connect the other end to the pin number specified in the table below.
5. A 24V GFD alarm shall now occur on the operator screen

Camera	Conn	Type	Picture	Zoom	Focus	GFD test pin	GFD
1	N1	IP	To be tested at SAT			2	☑
2	N2					2	☑
3	O1					2	☑
4	O2					2	☑
5	P1	PAL	☑	☑	☑	3	☑
6	P2	PAL	☑	☑	☑	3	☑
7	Q1	PAL	☑	☑	☑	3	☑
8	Q2	PAL	☑	☑	☑	3	☑
9	R1	IP/ Still	To be tested at SAT			2	☑
10	R2	Pal/Manip	☑	NA	NA	2	☑
						6	☑

4 SENSORS AND LIGHTS

4.1 TEMPERATURE SENSORS

- Verify temperature reading with reference to ambient before start up.
- An IR sensor can also be used for this test. ± 1° deviation from test sensor

	Sensor	Ambient temperature	Sensor reading	Accepted
1.	El motor	14	13.7	☑
2.	Main system hydraulic oil		14.2	☑
3.	Aux system hydraulic oil.		15	☑
4.	Electronic POD		14.1	☑

4.2 LEAK SENSORS

1. All enclosures listed shall be open for this test except the electric motor.
2. Short circuit the two sensing pins
3. This action shall generate a Leak alarm on the operators monitor.
4. Simulate motor leakage by short circuiting pin 1 & 2 on TCU connector J8.

Part	Accepted
ACU	☑
GFVP1	☑
GFVP2	☑
TCU	☑
Electro motor	☑
Term/Trafo box	☑
Light Box	☑
Control Pod	☑

4.3 COMPENSATOR & RESERVOIR VOLUMES

- Use compressed air to simulate oil volume in the compensator / reservoir
- Verify reading of 0% at empty compensator / reservoir.
- Verify reading of 100% at full compensator / reservoir.

	Sensor	Accepted
1	Main Comp	☑
2	Aux Comp	☑
3	Shaft seal comp.	☑
4	Vp. Comp.	☑
5	El. Comp.	☑
6	JB. Comp.	☑

4.4 PRESSURE SENSORS

- Fit pressure sensor to test manifold
- Pump up pressure to approx. 10% of sensor range
- Compare pressure readings of ROV sensor and test sensor
- Pump up pressure to approx. 100% of sensor range
- Compare pressure readings of ROV sensor and test sensor
- The difference between readings shall not exceed ± 1% FSV i.e. ±2,5Bar for 250Bar sensors and ±0,2Bar for 20Bar sensors

		Low value (BAR)		High value (BAR)			
	Sensor	ROV	Test Sensor	ROV	Test Sensor	Criteria	Accepted
1	Main Return	5.6	5.6	19	19	±0,2Bar	☑
2	Aux return	1.0	1.0	14	14		☑
3	Filter Main	2.1	2.1	19	19		☑
4	Main supply	7.5	7.5	219	219	±2,5Bar	☑
5	Aux Supply	1.0	1.0	203	203		☑
6	GFVP 1	2.5	2.7	201	201.3		☑
7	GFVP 2	0	0	189.3	189		☑
8	VP3-F1	11.7	11.7	211.1	211		☑
9	VP3-F2	5.2	5.4	205	205		☑
10	VP3-F3	9.2	9.2	227	227		☑
11	VP3-F4	6.2	6.3	231	231		☑
12	Filter Aux	5.3	5.3	18.9	18.9	±0,2Bar	☑

4.5 LIGHTS AND LIGHT JB

Use lamp, lamp cable, breaker test cable and ground fault test cable.
Repeat the following steps for each lamp connection

- Connect the breaker test cable. Short circuit the outlet and verify that the associated breaker is releasing and that a breaker alarm is occurring on the operator screen.
- Secure one end of the ground fault test cable to the ROV frame, and connect the other end to pin 2 or 3.
- An **115VAC Lights GFD** alarm shall now occur on the operator screen
- Connect lamp cable and lamp
- Switch the light on and regulate intensity from 0 to 100% and back to 0%

Light	Breaker	GFD	Control
1	☑	☑	☑
2	☑	☑	☑
3	☑	☑	☑
4	☑	☑	☑
5	☑	☑	☑
6	☑	☑	☑
7	☑	☑	☑
8	☑	☑	☑
9	☑	☑	☑
10	☑	☑	☑

5 ALARMS AND ALARM LEVELS

5.1 VP 24VDC GROUND FAULT ALARMS

The valve packs have separate power supplies.
To test the ground fault monitoring system we use the leak detection terminals.
Connect a wire to the ROV frame. With the other end of the wire, make contact with the leak terminals and check for alarm. You might get both leak and GFD when you do this.
Check the operator screen for alarms and indication of GFD.

Power supply	Accepted
TCU	☑
ACU	☑
GFVP1	☑
GFVP2	☑

5.2 ALARM LEVELS

Verify settings in control system.

	System	Acceptance Criteria	Accepted
1	El motor temp	70°	☑
2	TCU temp.	60°	☑
3	TCU oil volume.	50%	☑
4	Aux oil volume.	30%	☑
5	Shaft seal comp. oil volume	20% & 99%	☑
6	Vp comp. oil volume	20% & 99%	☑
7	El Motor Comp. oil volume	20% & 99%	☑
8	El Comp. oil volume	20% & 99%	☑
9	Main return Pressure	6 Bar	☑
10	ACU return Pressure	6 Bar	☑
11	TCU high Pressure	250 Bar	☑
12	TCU low pressure	20 Bar	☑
13	Water Filter Pressure	5,5 Bar	☑

COMMENTS

Customer representative _____ Date 29/02/16

Kystdesign representative _____ Date 29/01/16