




# 15,000 PSI ISOLATED HYDRAULIC POWER UNIT FACTORY ACCEPTANCE TEST DOCUMENT No. DSS-TL-PRO-TBD

**SIGNATURE LEGEND:**

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	Signatures				
DRAFT	Issued for <i>Internal Review</i>	RW	BG	AL	25FEB2015
REV	ACTION	ORIGIN	CHECK	APPROVAL	DATE

REVISION HISTORY			
REVISION	AMENDED SECTION	DATE	DESCRIPTION OF CHANGES

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## 1 PURPOSE AND SCOPE

The purpose of the Factory Acceptance Test is to verify that Delta Subsea, LLC - Tooling Solutions Group 15,000 PSI Isolated Hydraulic Power Unit (DSS-028-SCHH-01000-00) meets the stated performance requirements.

## 2 ABBREVIATIONS AND DEFINITIONS

ABBREVIATION	DEFINITION
DCV	Directional Control Valve
FAT	Factory Acceptance Test
GPM	Gallons per minute
JSA	Job Safety Analysis
PSI	pounds per square inch
TBT	Tool Box Talk

## 3 REFERENCES

/1./ DSS-028-TL-SCHH-01000-00, High Pressure i-HPU Hydraulic Schematic

## 4 RESPONSIBILITIES

The Tooling Solutions Group and/or Tooling Manager has the sole responsibility to modify this document.

## 5 EQUIPMENT AND SUPPLIES REQUIRED

- 1) All PPE and safety equipment required for high pressure testing
- 2) Hydraulic test stand supply capable of 13 gpm @ up to 2200 psi (actual load induced pressure will be less)
- 3) Pressurized water supply sufficient to sustain 2 gpm at 50 psi (municipal water supply or equal)
- 4) 5 gallon bucket or equal known volume container
- 5) Stop watch
- 6) 2 each high pressure ball valves rated at 20,000 psi

## 6 SETUP

- 1) Complete all safety actions and documentation in preparation for this test, including but not limited to JSA and TBT
- 2) Mark serial number (or equivalent identifying nomenclature) on each unit before testing
- 3) Gather equipment, and test unit to be tested to an area that:
  - a. Is flat, level and stable
  - b. has an ambient temperature that is above freezing and will remain stable throughout the duration of the test
  - c. is near the test water supply and HPU
  - d. facilitates the safe use of high pressure equipment
- 4) Secure area with barricades and notify personnel that high pressure testing will occur
- 5) Plumb hydraulics per referenced schematic
- 7) Connect pressurized water supply to pump inlet

## 7 TESTING

### 7.1 BLEED WARNING

Due to the high intensification ratio of the high pressure pump, thorough bleeding is required to prevent cavitation induced damage to the i-HPU. Positive pressure on the suction inlet is required during any surface testing.

### 7.2 LOW PRESSURE BLEED

<input checked="" type="checkbox"/>	<b>ACTION</b>
<input checked="" type="checkbox"/>	Secure hot stab hoses A <u>AND</u> B with ports open
<input checked="" type="checkbox"/>	Set test HPU flow to approximately 2 gpm and the pressure to minimum setting (near zero)
<input checked="" type="checkbox"/>	Set high pressure relief to minimum setting (sufficient to allow relief line fluid circulation)
<input checked="" type="checkbox"/>	Pilot DCV "A"
<input checked="" type="checkbox"/>	Pilot isolation ball valve to the open position
<input checked="" type="checkbox"/>	Pilot logic element so that flow is available to high pressure pump
<input checked="" type="checkbox"/>	Increase HPU drive pressure until high pressure pump begins to cycle – use the minimum amount of pressure to sustain flow (it may be necessary to marginally increase the high pressure relief valve setting)
<input checked="" type="checkbox"/>	Continue to run for several minutes after unit is bled while monitoring for leaks
<input checked="" type="checkbox"/>	Pilot DCV – "B"
<input checked="" type="checkbox"/>	Continue to run for several minutes after unit is bled while monitoring for leaks
<input checked="" type="checkbox"/>	Turn off pilot signals to logic element and DCV
<input checked="" type="checkbox"/>	Shut down test HPU

**7.3 LOW PRESSURE FLOW TEST**

☑	ACTION
✓	Secure hot stab hoses (A and B) with flow measurement container nearby
✓	Set high pressure relief to a low setting sufficient to assure flow is not bypassing through the relief
✓	Pilot DCV valve pilot A
✓	Pilot isolation ball valve to the open position
✓	Pilot logic element so that flow is available to high pressure pump
✓	Increase HPU drive pressure until high pressure pump begins to cycle – use the minimum amount of pressure to sustain flow
✓	Monitor for leaks
✓	Slowly increase flow rate until inlet flow control is saturated (the flow setting on the Test HPU is increased but the output remains constant) approximately 12 gpm
✓	Place hot stab hose A in known volume container
✓	Initiate stop watch
✓	Continue to fill for 1 minute
✓	When 1 minute has passed stop filling container and de-energize DVC A pilot
✓	Record the volume in the Data Table – Appendix A of this document
✓	Empty container
✓	Pilot DCV valve pilot B and start filling
✓	Initiate stop watch
✓	Continue to fill for 1 minute
✓	When 1 minute has passed, de-energize DVC B pilot
✓	Record the volume in the Data Table – Appendix A of this document
✓	Empty container
✓	Turn off pilot signal to logic element
✓	Turn off pilot signal to isolation ball valve
✓	Shut down test HPU

**7.4 SET RELIEF**

In compliance with manufacturer directive, do not adjust relief valve while pressurized.

☑	ACTION
✓	Install pressure rated ball valves on the A and B hot stab hoses
✓	Open A and B hot stab ball valves
✓	Set high pressure relief to an estimated mid-point of setting (approximately 5-6 threads showing)
✓	Pilot Isolation ball valve to the open position
✓	Pilot DCV valve pilot A
✓	Pilot logic element – initiating the high pressure pump
✓	Inspect for leaks
✓	Slowly close A port test ball valve while monitoring for leaks
✓	When A port test ball valve is completely closed, note gauge pressure compared to relief setting to quantify adjustment required
✓	Open A port test ball valve to relieve pressure
✓	De-energize DVC pilot
✓	Adjust relief
✓	Pilot DVC valve pilot A
✓	Repeat steps above until relief valve actuates fully at 15500 psi
✓	Note pressure setting in Data Table below
✓	Open A port test ball valve to relieve pressure and de-energize all pilots to shut down i-HPU
✓	Shut down test HPU

7.5 HIGH PRESSURE TEST

ACTION	
✓	Install pressure rated test ball valves on the A and B hot stab hoses
✓	Open A and B test ball valves
✓	Pilot isolation ball valve to the open position
✓	Pilot DCV valve pilot A
✓	Pilot logic element – initiating the high pressure pump
✓	Inspect for leaks
✓	Slowly close A port test ball valve while monitoring for leaks
✓	Once valve A port test ball valve is fully closed, pilot isolation ball valve closed
✓	De-energize DVC and logic element
✓	Shutdown test HPU and turn off pressurized water supply
✓	Confirm pump pressure gauge reads 0
✓	Record isolation gauge pressure
✓	Initiate 10 minute timer
	When timer has expired, note final isolation gauge pressure
	Shut down test HPU



**APPENDIX A – TEST RECORD**

CRITERIA	PASS	FAIL
FLOW RATE A $\leq$ 1.5	✓	
FLOW RATE B $\leq$ 1.5	✓	
HIGH PRESSURE TEST Start PSI <u>15 800</u> Stop PSI <u>14 800</u> Differential PSI <u>200</u> (Pass if <250 psi ½ minor scale mark)	✓	
CONNECTIONS PROPERLY TORQUED AND LEAK FREE	✓	

## NOTES

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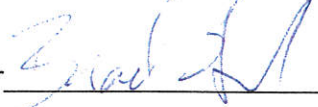
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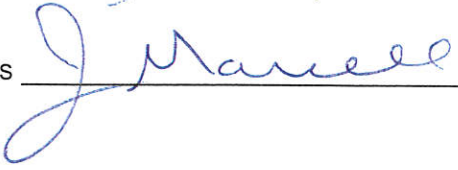
**APPENDIX B – DATA TABLE**

UNIT SERIAL NUMBER	001
RELIEF SETTING	15,500
WEIGHT IN AIR	201
WEIGHT IN FRESH WATER	150
GROSS WEIGHT (IN CASE)	N/A
OVERALL DIMENSIONS (L-W-H)	
GAUGE CERT 1 (NUMBER, EXPIRE DATE)	\$52180 2/2/2015
GAUGE CERT 2 (NUMBER, EXPIRE DATE)	\$52179 2/2/2015

**APPENDIX C – SIGNATURES**

Technician  Date 2-26-15

Fabrication Manager  Date 2-26-15

Client Witness  Date 2-26-15