
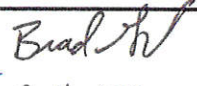





**15,000 PSI ISOLATED HYDRAULIC POWER UNIT**  
**FACTORY ACCEPTANCE TEST**  
**DOCUMENT No. DSS-TL-PRO-013**

**SIGNATURE LEGEND:**

<b>ID:</b>	<b>NAME:</b>	<b>TITLE:</b>
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	Signatures	 4 MAR 2015	 3-4-15	 03 04 15	
0	Issued for Use	RW	BG	AL	25 Feb 15
REV	ACTION	ORIGIN	CHECK	APPROVAL	DATE

SN-002

**REVISION HISTORY**

REVISION	AMENDED SECTION	DATE	DESCRIPTION OF CHANGES

## TABLE OF CONTENTS

1	PURPOSE AND SCOPE.....	4
2	ABBREVIATIONS AND DEFINITIONS.....	4
3	REFERENCES.....	4
4	RESPONSIBILITIES.....	4
5	EQUIPMENT AND SUPPLIES REQUIRED.....	4
6	SETUP .....	5
7	TESTING .....	5
	APPENDIX A – TEST RECORD .....	9
	APPENDIX B – DATA TABLE .....	9
	APPENDIX C – SIGNATURES.....	10

## **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.

## **ABBREVIATIONS AND DEFINITIONS**

<b>ABBREVIATION</b>	<b>DEFINITION</b>
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

## **REFERENCES**

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

## **RESPONSIBILITIES**

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

## **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

**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

**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"/>	ACTION
<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**

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



## APPENDIX A – TEST RECORD

CRITERIA	PASS	FAIL
FLOW RATE A $\leq$ 1.5	1.56 gallons ✓	
FLOW RATE B $\leq$ 1.5	1.56 gallons ✓	
HIGH PRESSURE TEST Start PSI <u>15,100</u> Stop PSI <u>14,350</u> Differential PSI <u>750</u> (Pass if < 250 psi $\frac{1}{2}$ minor scale mark) <sup>PWA</sup> ( $\frac{1}{2}$ % TEST PRESSURE)	✓	
CONNECTIONS PROPERLY TORQUED AND LEAK FREE	✓	

## NOTES

OBSERVED NO LEAKS DURING PRESSURE SOAK, DESIGNER REDLINED  
FAT ON 29 APRIL 2015 BASED ON  $\frac{1}{2}$  % PER 1000 PSI RULE PWA

## APPENDIX B – DATA TABLE

UNIT SERIAL NUMBER	002
RELIEF SETTING	15,550 PSI
WEIGHT IN AIR	158 LBS
WEIGHT IN FRESH WATER	
GROSS WEIGHT (IN CASE)	
OVERALL DIMENSIONS (L-W-H)	
GAUGE CERT 1 (NUMBER, EXPIRE DATE)	20K 553336 31 MAR 2016
GAUGE CERT 2 (NUMBER, EXPIRE DATE)	20K 553337 31 MAR 2016

**APPENDIX C – SIGNATURES**

Technician  Date 4-28-15

Fabrication Manager  Date 4-28-15

Client Witness \_\_\_\_\_ Date \_\_\_\_\_