






**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>
AV	Alessandro Vagata	Vice President – Tooling Solutions Group
BG	Brad Gold	Fabrication Manager
RW	Roger Warnock	Hydraulic Designer

	Signatures	 RW 3-4-15	 BG 3-4-15	 AL 03/04/15	
0	Issued for Use	RW	BG	AL	25 Feb 15
REV	ACTION	ORIGIN	CHECK	APPROVAL	DATE

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"/>	<b>ACTION</b>
	Secure hot stab hoses A <u>AND</u> B with ports open
	Set test HPU flow to approximately 2 gpm and the pressure to minimum setting (near zero)
	Set high pressure relief to minimum setting (sufficient to allow relief line fluid circulation)
	Pilot DCV "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 (it may be necessary to marginally increase the high pressure relief valve setting)
	Continue to run for several minutes after unit is bled while monitoring for leaks
	Pilot DCV – "B"
	Continue to run for several minutes after unit is bled while monitoring for leaks
	Turn off pilot signals to logic element and DCV
	Shut down test HPU

**7.3 LOW PRESSURE FLOW TEST**

<input checked="" type="checkbox"/>	<b>ACTION</b>
	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.

<input checked="" type="checkbox"/>	<b>ACTION</b>
	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
	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 _____ Stop PSI _____ Differential PSI _____ (Pass if <250 psi ½ minor scale mark)		
CONNECTIONS PROPERLY TORQUED AND LEAK FREE		

**NOTES**

---



---



---



---

**APPENDIX B – DATA TABLE**

UNIT SERIAL NUMBER	
RELIEF SETTING	
WEIGHT IN AIR	
WEIGHT IN FRESH WATER	
GROSS WEIGHT (IN CASE)	
OVERALL DIMENSIONS (L-W-H)	
GAUGE CERT 1 (NUMBER, EXPIRE DATE)	
GAUGE CERT 2 (NUMBER, EXPIRE DATE)	

## APPENDIX C – SIGNATURES

Technician \_\_\_\_\_ Date \_\_\_\_\_

Fabrication Manager \_\_\_\_\_ Date \_\_\_\_\_

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