



**PHARMA DEVILS**

QUALITY ASSURANCE DEPARTMENT

**FACTORY ACCEPTANCE TEST FOR WFI GENERATION PLANT**

**FACTORY ACCEPTANCE TEST**  
**FOR**  
**300 ltr/hr. WFI GENERATION PLANT**  
with Allen Bradley PLC (With Real time Tracking)  
PVP 400 HMI



**FACTORY ACCEPTANCE TEST FOR WFI GENERATION PLANT**

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**1.0 SYSTEM INFORMATION:**

<b>Supplier</b>	Pharmalab India Pvt. Ltd.
<b>Customer</b>	
<b>Site</b>	
<b>Proposed Installation Location</b>	

**2.0 DOCUMENT DETAILS:**

<b>Document Generated By</b>	<b>Name</b>	<b>Sign</b>	<b>Date</b>	<b>Revision</b>
Pharmalab				
<b>Document Approved By</b>				
Pharmalab				

**3.0 PROTOCOL APPROVAL FROM CUSTOMER:**

<b>Department</b>	<b>Name</b>	<b>Sign</b>	<b>Date</b>
Production			
Engineering			
Q.A.			
Consultant			



**FACTORY ACCEPTANCE TEST FOR WFI GENERATION PLANT**

**4.0 OBJECTIVE:**

To confirm, by physical inspection and testing, that the fabrication and assembly of the equipment and any auxiliary support systems, conforms to the Design parameters as per the Design Review,

**5.0 SCOPE OF THIS DOCUMENT:**

This Factory Acceptance Test (FAT) protocol is applicable to the Multi Column Water Still.

The tests shall be carried out at M/S Pharmedia.

The verification of compliance to specifications as per DR documents and to GMP requirements Shall be done by:

- Confirmation that all design Documents, specifications and test certificates are approved, available and accurate.
- Physical Inspection of the electrical hardware.
- Mechanical inspection of the construction of the equipment.
- Functional testing (including safety tests) of the equipment with printouts for tests that Require supporting documentation.



## **FACTORY ACCEPTANCE TEST FOR WFI GENERATION PLANT**

### **6.0 ACCEPTANCE CRITERIA:**

- The design documents specifications and test certificates shall be approved and accurate.
- The electrical hardware shall comply with the approved design specifications.
- The individual tests performed shall conform to the agreed acceptance criteria.

Any tests not performed (due to limitations of resources, complexity of the complete assembly of the equipment and complexity of the tests) during the FAT shall be performed during the OQ of the equipment at site and the SAT test report shall clearly indicate these tests.

If any deviations from the approved protocol occur or the user requests any changes these deviations shall be reviewed by the SAT execution team, agreed upon and then hand marked in the original protocol with initials and date.

All non-conformances shall be noted and corrective actions listed.  
The vendor shall agree upon an action plan on the corrective actions with mutually agreed time frame.

The FAT may be repeated fully or in part (related to the deviation observed) depending upon the impact of the deviation.

### **7.0 RESPONSIBILITIES:**

#### **Approval of the Document**

The heads of Engineering & Q.A. shall approve the document and the results of the evaluation.

#### **Inspection**

Customer or their authorized representatives are responsible for the visit the Vendor's site and execution of the FAT based on this FAT document.

All documents shall be checked and approved by customer or their authorized representatives.

The vendor shall conduct all tests.



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**8.0 ABBREVIATIONS:**

<b>ABBREVIATIONS</b>	<b>FULL FORM</b>
PO	Purchase Order
MOC	Material Of Construction
PLC	Programmable Logic Controller
RPM	Rotations Per Minute
HP	Horse Power
T/C	Triclover
FAT	Factory Acceptance Test
ASME	American Society of Mechanical Engineers
MMI	Man Machine Interface
DP	Diaphragm
AV	Air vent
PG	Pressure Gauge
SV	Safety Valve
STU	Steam Trap Unit



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## FACTORY ACCEPTANCE TEST FOR WFI GENERATION PLANT

### 9.0 CHECK POINTS & TESTING:

#### LIST OF REFERENCE DOCUMENTS

<b>Objective</b>	To check the documents required for job as per checklist.
<b>Material</b>	Documents list submitted in the FAT.
<b>Method</b>	The Vendor shall present documents as listed in the “ <b>List of Documents</b> “. The submitted documents shall be checked for correct Documents No., version No., date and authorization details against the details submitted in the FAT Test form by the vendor
<b>Acceptance Criteria</b>	The documents submitted shall be as specified in the list of reference documents.

#### LIST OF DOCUMENTS:

- 1) List of the reference drawings
- 2) Material history chart with Test Certificates
- 3) Bought – out components
- 4) Components certification & calibration.
- 5) Dimensional report
- 6) Surface finish report
- 7) Hydrostatic Test Report
- 8) Operation Qualification Report



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## FACTORY ACCEPTANCE TEST FOR WFI GENERATION PLANT

### LIST OF REFERENCE DOCUMENTS:

S.No.	Title of Document	Submittal Stage	Document No.	Remarks
1.	List of the reference drawings	FAT/IQ	QR-824-16	
2.	Material history chart with Test Certificates	FAT/IQ	QR-824-16	
3.	Bought – out components	FAT/IQ	QR-824-16	
4.	Components certification & calibration.	FAT/IQ	QR-824-16	
5.	Dimensional report	FAT/IQ	QR 824-16	
6.	Surface finish report	FAT/IQ	QR 824-16	
7.	Hydrostatic Test Report	IN-PROCESS	QR 824-16	
8.	Operation Qualification Report	FAT/OQ	QR 824-16	

<b>Corrective action in case of Non Compliance</b>		
<b>Conclusions</b>		
	<b>Performed by</b>	<b>Checked by</b>
<b>Name</b>		
<b>Signature</b>		
<b>Date</b>		





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## **10. Installation Qualification**

### **TABLE OF CONTENTS**

<b>Description</b>
List Of Reference Drawings
Material History Chart
Bought –Out Components
Components Certification & Calibration
Dimensional Report
Surface Finish Report
PLC Input Output check Report (If applicable)



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## FACTORY ACCEPTANCE TEST FOR WFI GENERATION PLANT

### LIST OF REFERENCE DRAWINGS

<b>Objective</b>	To check reference drawing required for job against list mention below.
<b>Material</b>	Approved drawings list submitted in the FAT/Final Document.
<b>Method</b>	The Vendor shall present all the drawings as listed in the “ <b>List of Drawings</b> “ The submitted Drawings shall be checked for correct Drawings No., version No., date and authorization details against the details submitted in the FAT Test form by the vendor. Record all the data on Form.
<b>Acceptance Criteria</b>	The drawings submitted shall be as specified in the list of reference drawing.

### LIST OF DRAWINGS

- 1) AS BUILT G.A. Drawing
- 2) P & I Diagram
- 3) Wiring diagram
- 4) Pneumatic diagram
- 5) PLC Logic Diagram



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**LIST OF REFERENCE DRAWINGS**

S. No.	Title Of Drawing	Submittal Stage	Drawing No.	Rev.	Remarks
1.	G.A.Drawing	FAT			
2.	P & I Diagram	FAT			
3.	Wiring Diagram	FAT			
4.	Pneumatic diagram	FAT			
5.	PLC Logic Diagram	FAT			

<b>Corrective action In case of Non Compliance</b>		
<b>Conclusions</b>		
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<b>Name</b>		
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**MATERIAL HISTORY CHART**

<b>Objective</b>	To prove that the materials used for construction of components are as per the DR specification/ Approved drawing.
<b>Material</b>	Material test certificates.
<b>Method</b>	<p>The Vendor shall present certificates for the materials listed in the “<b>Material History Chart</b>”.</p> <p>The submitted certificates shall be checked for correct material usage against the details submitted in the DR , by the vendor</p>
<b>Acceptance criteria</b>	The certificates shall prove that the materials used for construction of components are as per the approved specifications.



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**MATERIAL HISTORY CHART**

S.No.	Part Description & Size	Acceptance Criteria		Result	Remarks
		Material	Certificate No.		
1.	Column Fabrication 14 SWG Sheet.	AISI 316L	CT2015		
2.	Condenser Fabrication 5" OD x 10 SWG Thk.	AISI 316L	CT2127		
3.	Condenser Tubes 12.7 MM OD X 1 MM Thk.	AISI 316L	CT2051		
4.	Separator Fabrication 20 SWG Sheet	AISI 316L	CT1719		
5.	F.W & C.W Cooler Fabrication 12 SWG Sheet	AISI 316L	CT2025		
6.	Feed Water Cooler & Cooling water cooler Tubes 12.7 MM OD X 1 MM Thk.	AISI 316L	CT2051		
<b>PIPE LINES</b>					
1.	Pure Steam Line, 1 1/2" OD X 16 SWG Thk.	AISI 316L	CT2167		
2.	WFI outlet line, 1 1/2" OD X 16 SWG Thk	AISI 316L	CT2167		
3.	Cooler Air vent line, Boiler steam line, 3/4" OD X 16 SWG Thk	AISI 316L	CT2060		
4.	Feed water & cooling water Line & WFI Inter connecting line, Boiler Steam line, 12.7 MM OD X 1MM Thk.	AISI 316L	CT2051		
5.	Boiler steam line, 1.5 " NB X SCH10 Pipe	AISI 304	CT2108		
<b>GASKETS</b>					
1.	MINI T/C Gasket	Silicone	Q20332		
2.	1/2" T/C Gasket	Silicone	Q19522		
3.	1" T/C Gasket	Silicone	Q20333		
4.	3" T/C Gasket	Silicone	Q19131		

<b>Corrective action In case of Non Compliance</b>		
<b>Conclusions</b>		
	<b>Performed by</b>	<b>Checked by</b>
<b>Name</b>		
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**BOUGHT – OUT COMPONENTS**

<b>Objective</b>	To prove that the Bought Out components used for construction of the equipment are as per the approved specifications.
<b>Material</b>	Bought Out components specification sheets (From the original manufacturer)
<b>Method</b>	<p>The Vendor shall present previously approved specification sheets for the Bought Out components listed in the “Bought Out components list“ for review at the start of the FAT exercise.</p> <p>Inspect the installed component. Compare Quality Certificate of the component the make, Model No. and other specifications with the approved specifications.</p>
<b>Acceptance criteria</b>	The verification shall prove that the Bought Out components used for construction of the equipment is as per the approved specifications.



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**BOUGHT OUT COMPONENTS**

S.No.	Component	Make	Certificate Type	QTY.
<b>MECHANICAL COMPONENTS</b>				
1.	Feed Pump	Grundfos	Compliance Certificate	01 No.
2.	Cooling Pump	Grundfos	Compliance Certificate	01 No.
3.	Non Return valve	Alfa Laval	Test Certificate	01 Nos.
4.	Non Return valve	Valcon	Test Certificate	01 Nos.
5.	Flow meter	George Fischer	Compliance Certificate	02 Nos.
6.	Ball Valves	Shakti	Test Certificate	03 Nos.
7.	Globe Valve	Shakti	Test Certificate	01 No.
8.	Pneumatic valve	Burkert	Compliance Certificate	03 Nos.
9.	Diaphragm Valve	Gemu	Compliance Certificate	01 No.
10.	Diaphragm Valve for Feed Pump	Crane (Saunders)	Test Certificate	01 No.
11.	Diaphragm Valve for WFI	Crane (Saunders)	Test Certificate	01 No.
12.	Pressure Gauge for Boiler Steam	Waaree	Calibration Certificate	01 No.
13.	Pressure Gauge for Feed Water	Waaree	Calibration Certificate	01 No.
14.	Steam trap	Spirax	Test Certificate	02 Nos.
15.	Safety valve	Spirax	Test Certificate	01 No.
16.	Sampling Valve	Pharmalab	Test Certificate	04 Nos.
17.	Sanitary Dumping Valve	Ciparani	Test Certificate	01 No.
18.	Needle valve	Shakti	Test Certificate	01 No.
<b>ELECTRICAL COMPONENTS</b>				
1.	PLC	Allen Bradley	Test Certificate	01 Set.
2.	Display	Allen Bradley	Test Certificate	01 No.
3.	Conductivity Converter	Yokogawa	Calibration Certificate	01 No.
4.	Conductivity Sensor	Yokogawa	Calibration Certificate	02 Nos.
5.	Pressure Switch at inlet of feed water pump	Orion	Test Certificate	01 No.
6.	Pressure switch at discharge side of feed pump	Orion	Test Certificate	01 No.
7.	Pressure switch at suction side of cooling pump	Orion	Test Certificate	01 No.
8.	Air Pressure Switch	Orion	Test Certificate	01 No.
9.	Temperature sensor	Radix	Calibration Certificate	03 Nos.
10.	Liquid Level Sensor	Pune Techtrol	Test Certificate	02 Nos.



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<b>Corrective action In case of Non Compliance</b>		
<b>Conclusions</b>		
	<b>Performed by</b>	<b>Checked by</b>
<b>Name</b>		
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<b>Date</b>		





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**COMPONENTS CERTIFICATION & CALIBRATION**

<b>Objective</b>	To verify the Test certificates and Calibration certificates of the designated components.
<b>Material</b>	Test certificates and Calibration certificates of the designated components (From the original manufacturer or from a certified calibration laboratory)
<b>Method</b>	<ul style="list-style-type: none"><li>• The Vendor shall present Test certificates and Calibration certificates of the designated components (From the original manufacturer or from a certified calibration laboratory) for verification.</li><li>• Check whether the certificate corresponds to the installed component.</li><li>• Compare the make, Model No. and other specifications from the certificate with the specifications of the component and in the table below.</li></ul>
<b>Acceptance criteria</b>	The verification shall prove that the designated components used for construction of the equipment are properly tested / calibrated.



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## FACTORY ACCEPTANCE TEST FOR WFI GENERATION PLANT

### COMPONENTS CERTIFICATION & CALIBRATION

S.No.	Component	Make	S.No. / I.D. No	Certificate No.
<b>MECHANICAL COMPONENTS</b>				
1.	Feed water pump: CRN 3-12 (P1)	Grundfos	NIL	Q20171
2.	Cooling water pump: CHI-2-20 (P2)	Grundfos	NIL	Q21117
3.	Non Return Valve for cooling air vent: DN25 (NRV3)	Alfa Laval	NIL	Q19149
4.	Non Return Valve at WFI rejection line: DN25 (NRV6)	Valcon	NIL	Q14943
5.	Sampling Valve :DN15 (SM2,SM3,SM4)	Pharmalab	NIL	Q21727
6.	WFI Sampling Valve : DN38 (SM1)	Pharmalab	NIL	Q21725
7.	Variable area flow meter discharge side of feed pump : SK 73 100-1000 LPH (FI1)	George Fischer	NIL	Q19341
8.	Variable area flow meter discharge side of cooling pump : SK 73 100-1000 LPH (FI2)	George Fischer	NIL	Q19341
9.	Pneumatic Valve for last column purging line: DN15 (PN1)	Burkert	NIL	Q20279
10.	Pneumatic Valve at Feed water inlet line: DN15 (PN3)	Gemu	NIL	Q21211
11.	Pneumatic Valve for cooler air vent: DN20 (PN2)	Burkert	NIL	Q21539
12.	Pneumatic Valve at cooling water inlet line: DN15 (PN4)	Burkert	NIL	Q20279
13.	Globe Valve at inlet of Plant Steam :DN40 (GV1)	Shakti	812	Q20763
14.	Diaphragm valve at WFI outlet line : DN40 (DP1)	Crane Process (Saunders)	D10L3274	Q20180
15.	Diaphragm valve at Outlet of feed pump: DN 15 (DP2)	Crane Process (Saunders)	D10I0242	Q17461
16.	Steam Trap at first column air vent: BPT – 21: 15NB (ST2)	Spirax	NIL	Q20653
17.	Steam Trap at boiler steam condensate line of first condenser : FT14, 15NB (ST1)	Spirax	NIL	Q9388
18.	Safety Valve : SV11 at inlet of plant steam line: 1" (SV1)	Spirax	NIL	Q20263
19.	Ball Valve for 1 <sup>st</sup> column drain: ½" (BV1)	Shakti	594	Q18652
20.	Ball valve at Plant steam condensate drain through first column: ½" (BV2)	Shakti	13	Q12465
21.	Ball Valve for plant steam drain condensate bypass to steam strap: ½" (BV3)	Shakti	593	Q12084
22.	Needle valve at cooling water line: ½" (NV1)	Shakti	777	Q20365
23.	Sanitary Dumping Valve; DN40 (DV1)	Ciparani	112	Q20378
24.	Pressure Gauge for plant steam line: 0-16 Kg/cm <sup>2</sup> (PG1)	Waaree	1798PG100016	Q16700
25.	Sanitary Pressure Gauge Glycerin filled at discharge side of feed pump 0-16 Kg/cm <sup>2</sup> (PG2)	Waaree	3342PG100010	Q20412



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## FACTORY ACCEPTANCE TEST FOR WFI GENERATION PLANT

### ELECTRICAL COMPONENTS

1.	PLC : 1766L32BXBA 1762 IR4	Allen Bradley	BA1046108302 7M8DJ3ZA	Q20859 Q20859
2.	Display :PVP 400	Allen Bradley	14203420	Q20859
3.	Conductivity Converter	Yokogawa	92K800285	Q19455
4.	Conductivity Sensor at inlet of feed pump (CS1)	Yokogawa	92K900154	Q20634
5.	Conductivity Sensor at the WFI line(CS2)	Yokogawa	92K800283	Q20634
6.	Temperature sensor for WFI: -50° to 200° C (TS2)	Radix	M56540	Q20627
7.	Temperature sensor for cooling water : -50° to 200° C (TS3)	Radix	M53776	Q19495
8.	Temperature sensor for Boiler steam: -50° to 200° C (TS1)	Radix	M52287	Q19060
9.	Air Pressure Switch:0.5 to 7 Bar (PS1)	Orion	A10012088	Q10840
10.	Sanitary Pressure Switch at the discharge side of feed pump: 1 to 15 Bar (PS2)	Orion	A10120053	Q18994
11.	Sanitary Pressure Switch at inlet of Feed water pump: 0.2 to 2.6 Bar (PS3)	Orion	A10110003	Q18878
12.	Pressure Switch at suction side of cooling pump: 0.2 to 2.6 Bar (PS5)	Orion	A11020622	Q21665
13.	Liquid level sensor for first column (LS1)	Pune Techtrol	101107755	Q16934
14.	Liquid level sensor for last column (LS2)	Pune Techtrol	91003944	Q7045

<b>Corrective action In case of Non Compliance</b>		
<b>Conclusions</b>		
	<b>Performed by</b>	<b>Checked by</b>
<b>Name</b>		
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<b>Date</b>		



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## FACTORY ACCEPTANCE TEST FOR WFI GENERATION PLANT

### DIMENSIONAL MEASUREMENTS

<b>Objective</b>	Dimension check against Approved GA Drawings.
<b>Instruments</b>	Measure Tape 0-3000mm , Vernier Caliper 0- 300 mm,
<b>Method</b>	Direct measurement of Overall dimensions, Connection Points. Install the plant on the suitable place. Measure the indicated dimensions and fill in the dimension report.
<b>Acceptance Criteria</b>	All the measured dimensions shall be within the dimensional tolerances.

### DIMENSION CHECKS

OVERALL DIMENTION:  
HEIGHT (H), LENGTH (L), WIDTH (W)

### UTILITY CONNECTIONS CHECKS

CHECK DIMENSION AGAINST GA DRAWING.



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## FACTORY ACCEPTANCE TEST FOR WFI GENERATION PLANT

### DIMENSIONAL MEASUREMENTS

Sr. No.	Parameter	Value from Approved G.A Drawing (mm)	Value from As Built G.A Drawing (mm)	Conclusion
1	Overall Height H			
2	Overall Width W			
3	Overall Depth D			
4	WFI Outlet Height			

### UTILITY CONNECTION POINTS CHECKS

Sr. No.	Description	Value from GA Drawing (mm)	Actual Value (mm)	Corresponding / Non corresponding
1.	Boiler steam inlet	1.5" ASA 150# FLANGE		
2.	Feed water Inlet	1" TRICLOVER		
3.	Cooling water Inlet	1" TRICLOVER		
4.	Compressed air inlet	½" BSP(F)THD		
5.	WFI outlet	1" TRICLOVER TO SUIT 1.5" OD TUBE		
6.	Header Drain	1.5" BSP (F) Thd.		
7.	Header air vent	1" BSP (F) Thd.		

<b>Corrective action In case of Non Compliance</b>		
<b>Conclusions</b>		
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**SURFACE FINISH TESTS**

<b>Objective</b>	To check the surface finish of the surface of the plant and to verify against the approved drawing requirement.
<b>Instruments</b>	Surface Finish Tester (Mitutoyo Surface Test Kit Sj-301)
<b>Method</b>	<p>Check the Surface Finish of the product contact surfaces with the calibrated Roughness Tester according to the instrument manual.</p> <p>Wipe dry the surfaces using a moist cloth and check for any fibers getting caught by the surface rubbed.</p> <p>Measure the indicated surfaces at 3 different points.</p> <p>Results shall be recorded.</p>
<b>Acceptance Criteria</b>	All the surfaces tested shall meet the requirements.



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## FACTORY ACCEPTANCE TEST FOR WFI GENERATION PLANT

### Surfaces

### Ra Test

Sr. No.	Surface	Checking Point	Accessibility limit ( $\mu\text{m Ra}$ )	No of measurements	Actual Value ( $\mu\text{m Ra}$ )	Conclusion
1.	Column Shell-1	1	$\leq 0.60$	1		
		2		1		
		3		1		
2.	Column Shell-2	1	$\leq 0.60$	1		
		2		1		
		3		1		
3.	Column Shell-3	1	$\leq 0.60$	1		
		2		1		
		3		1		
4.	Column Shell-4	1	$\leq 0.60$	1		
		2		1		
		3		1		
5.	Condenser Shell-1	1	$\leq 0.60$	1		
		2		1		
		3		1		
6.	Condenser Shell-2	1	$\leq 0.60$	1		
		2		1		
		3		1		
7.	Condenser Shell-3	1	$\leq 0.60$	1		
		2		1		
		3		1		
8.	Condenser Shell-4	1	$\leq 0.60$	1		
		2		1		
		3		1		
9.	F.W. Cooler Shell	1	$\leq 0.60$	1		
		2		1		
		3		1		
10.	C.W. Cooler Shell	1	$\leq 0.60$	1		
		2		1		
		3		1		

<b>Corrective action In case of Non Compliance</b>		
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## FACTORY ACCEPTANCE TEST FOR WFI GENERATION PLANT

### PLC INPUT OUTPUT CHECK (IF APPLICABLE)

<b>Objective</b>	To check the Input Output and to verify against the wiring diagram requirement.
<b>Method</b>	Check the input output against wiring diagram visually during operation. Results shall be recorded.
<b>Acceptance Criteria</b>	All the Input and output shall meet the requirements.

TEST TO BE CARRIED OUT & PROCEDURE	ACCEPTANCE CRITERION	RESULTS (PASS/ FAIL) WITH SIGN
Check the input output against wiring diagram visually during operation.	All the Input and output shall meet the requirements.	

**Remarks:** PLC Input / Output checked & verify during cycle operation (Running Trial)

<b>Corrective action In case of Non Compliance</b>		
<b>Conclusions</b>		
	<b>Performed by</b>	<b>Checked by</b>
<b>Name</b>		
<b>Signature</b>		
<b>Date</b>		





**FACTORY ACCEPTANCE TEST FOR WFI GENERATION PLANT**

## 11. Operational Qualification



# PHARMA DEVILS

QUALITY ASSURANCE DEPARTMENT

## FACTORY ACCEPTANCE TEST FOR WFI GENERATION PLANT

### HYDROSTATIC TEST

<b>Objective</b>	To qualify the welding quality in view of Leak-tightness under Hydraulic pressured condition as per the ASME Sec. VIII Div.1 (2001) code and qualifying the vessel to operate at specified design condition.
<b>Material</b>	Water
<b>Utilities</b>	Water supply, Hydraulic pumps , compressed air
<b>Instruments</b>	Air vent valve, Pressure Gauge
<b>Method</b>	<ol style="list-style-type: none"><li>1. Prepare the tank for the shell Hydrostatic test Fill the Shell side or jacket side/ coil/ tube side parts for which weld joints are to be tested with water. Blind off all nozzles,</li><li>2. Fit the PG with vent valve on top nozzle.</li><li>3. Connect Hydraulic pump to nozzle.</li><li>4. When water flows out of vent, close the vent valve and develop pressure by pump till PG shows reading at specified Hydrostatic-test pressure.</li><li>5. Mark the Pressure on the pressure gauge and check the same after 30 minutes.</li><li>6. Check all weld joints &amp; temporary / permanent joints for leakage. Check the internal surface critically for deformity.</li></ol> <p>Record all the data on Hydrostatic Test Report</p>
<b>Acceptance criteria</b>	No pressure drop or leakage from any joint at specified Hydrostatic test pressure within 30 minutes of observation. No deformation of the inside surface.



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**HYDROSTATIC TEST**

Hydrostatic Test

Time for test 30 min/each

Part	Pressure in Kg/cm <sup>2</sup>		Expected result	Observed Result
	at the start of test	at the end of test		
<b>COLUMN, COLUMN CAP &amp; BOTTOM FLANGE. (04 Set)</b>	9		No pressure drop & No leakage	
<b>CONDENSOR (04 Set)</b>	9		No pressure drop & No leakage	
<b>FEED WATER &amp; COOLING WATER COOLER WITH COILS &amp; TUBES</b>	9		No pressure drop & No leakage	
<b>PIPE LINES (Air Test)</b>	6		No pressure drop & No leakage	

<b>Corrective action In case of Non Compliance</b>		
<b>Conclusions</b>		
	<b>Performed by</b>	<b>Review by \ Checked by</b>
<b>Name</b>		
<b>Signature</b>		
<b>Date</b>		



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**FACTORY ACCEPTANCE TEST FOR WFI GENERATION PLANT**

**CYCLE OPERATION (RUNNING TRIAL)**

<b>Objective</b>	To carry out plant running trial for observing performance/operation of all the items this are installed on the plant.
<b>Method</b>	Perform the operations as indicated in form.
<b>Acceptance Criteria</b>	<ol style="list-style-type: none"><li>1. (Refer attached <b>Form</b>).</li><li>2. The nuts, bolts shall be tightened.</li></ol>



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## FACTORY ACCEPTANCE TEST FOR WFI GENERATION PLANT

### CYCLE OPERATION (RUNNING TRIAL)

S.No.	TEST TO BE CARRIED OUT & PROCEDURE	ACCEPTANCE CRITERION	RESULTS ( PASS/ FAIL) WITH SIGN
<b>1</b>	<b>EMERGENCY STOP</b>		
	Press Emergency Stop.	Feed Pump and Cooling Pump will stop, all valves will get OFF & dumping valve will get ON as per valve position check the display which shows fault "EMERGENCY STOP "	
	Release Emergency Stop.	Feed pump and Cooling Pump will restart, valves will get ON as per interlocking & dumping valve will get OFF. Check display, it shows "PROCESS OK".	
<b>2</b>	<b>AIR PRESSURE LOW</b>		
	Set air pressure switch at higher value than actual air pressure.	Feed Pump and Cooling Pump will stop, all valves will get OFF & dumping valve will get ON. Check on the display, which show fault "AIR PRESSURE LOW"	
	Set Air pressure switch at lower value than actual air pressure.	Feed pump and Cooling Pump will restart, valves will get ON as per interlocking & dumping valve will get OFF. Now check on the display, which show "PROCESS OK"	
<b>3</b>	<b>BOILER STEAM TEMPERATURE LOW</b>		
	Close the Plant Steam valve & wait till the Plant steam temperature is lower than the set plant steam temperature.	Feed Pump will stop after 5 minutes & dumping valve will get ON. Check on the displays which show "BOI.STEAM TEMP. LOW"	
	Open the Plant Steam valve & wait till the Plant steam temperature is increase than the set plant steam temperature.	Feed pump will restart, & dumping valve will get OFF. Check on the displays which show "PROCESS OK".	
<b>4</b>	<b>DISTILL WATER LEVEL HIGH</b>		
	Disconnect wire loop given in panel board for Auxiliary input, Feed pump will stop	Check the display which show "DISTILL WATER LVL HIGH"	
	Now connect wire loop given in panel board for Auxiliary input, Feed pump will restart	Check the display which show "PROCESS OK"	
<b>5</b>	<b>FEED WATER SUCTION PRESSURE LOW</b>		
	Decrease Feed water inlet pressure less than required pressure.	As soon as water pressure becomes less than required, Feed Pump will stop check on the display which show fault "INSUFF. FEED WATER"	
	Increase Feed water inlet pressure so that pressure is maintained	Feed Pump will restart check on the displays which show "PROCESS OK".	



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## FACTORY ACCEPTANCE TEST FOR WFI GENERATION PLANT

<b>6</b>	<b>FEED WATER CONDUCTIVITY HIGH</b>	
	Decrease the conductivity setting of feed water set point less than the actual feed water conductivity.	Feed Pump will stop check on the display which show fault "F.W. CONDUCT. HIGH"
	Increase the conductivity setting of feed water set point more than the actual feed water conductivity.	Feed Pump will restart check on the display which show fault "PROCESS OK "
<b>7</b>	<b>FEED WATER DISCHARGE PRESSURE LOW</b>	
	Turn pressure setting knob clock-wise to set pressure more than actual pressure,	Check the display which show fault "F. W. PRESSURE LOW".
	Turn pressure setting knob Anti-clock-wise to set pressure less than actual pressure.	Check the display which shows "PROCESS OK ".
<b>8</b>	<b>INSUFFICIENT EVAPORATION</b>	
	Increase Feed water flow rate than actual required at standard temp of Boiler steam.	Now accumulation of Feed water in first column will starts. Wait till water level reaches to level sensor, as soon as water reaches to level sensor, Feed Pump will stop. Check on the display which show fault "INSUFF. EVAPORATION ". (If we close the Ball valve connected before the steam trap which also result to increase accumulation of Feed water in first column)
	Now reduce Feed water flow rate and set it standard flow rate required at standard temperature Of Boiler steam. Open the manual drain valve and drain out all water from the first column.	Feed Pump will restart. check on the display which show "PROCESS OK"
<b>9</b>	<b>PURGING ON PROBLEM</b>	
	Stop Air supply given to Pneumatic Purging Valve. Increase Feed Water flow rate. Allow water to accumulate in Last column till it reaches to level sensor (float switch).	If high level continue more than the Purging Fault ON time Feed Pump will stop. Displays show "PURGING ON PROBLEM"
	Give Air supply to Pneumatic Purging Valve. Now Water will be drained out.	Check the displays which show "PROCESS OK". Purging valve will close after purging time set parameter. If we press Acknowledge during fault condition Feed Pump will remain stop .Only after draining out water Feed pump will start
<b>10</b>	<b>PURGING OFF PROBLEM</b>	
	Decrease Feed Water Flow rates. Also keep Pneumatic Purging Valve open manually by turning manual operating screw of Solenoid Valve.	If high level not come continues more than Purging Fault OFF time Feed Pump will stop. Display will Show "PURGING OFF PROBLEM".
	Increase Feed Water flow rate & Keep Pneumatic Purging valve in auto operation. Ensure that water should reach up to level sensor. Purging valve will close after purging time set parameter.	If we press Acknowledge during fault condition Feed Pump will restart. Even if water level is till high & again fault will generate after same purging fault OFF timer.
<b>11</b>	<b>W.F.I CONDUCTIVITY HIGH</b>	
	Decrease the set parameter value than existing conductivity.	Dumping valve will ON to reject W.F.I check on display which will Show. "W.F.I. CONDUCT. HIGH"
	Increase the set parameter value than existing Conductivity	Dumping valve will OFF check on the display which show fault "PROCESS OK"



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## FACTORY ACCEPTANCE TEST FOR WFI GENERATION PLANT

<b>12</b>	<b>W.F.I TEMPERATURE LOW</b>	
	Increase the cooling water flow rate & Decrease Feed water flow rate; wait till the W.F.I out temperature is become lower than the set value.	Check on display which will show “W.F.I. TEMP. LOW” dumping valve & air vent valve will get ON and cooling pump will stop.
	Decrease the cooling water flow rate & Increase Feed water flow rate wait till the W.F.I out temperature is become higher than the set value.	Check on display which will show “PROCESS OK” dumping valve & air vent valve will get OFF and cooling pump will on.
<b>13</b>	<b>COOLING WATER TEMPERATURE HIGH</b>	
	Decrease the cooling water flow rate & wait till the cooling water out temperature is become higher than the set value.	Check on display which will show “C.W. TEMP. HIGH”
	Increase the cooling water flow rate & wait till the cooling water out temperature is become lower than the set value.	Check on display which will show "PROCESS OK"
<b>14</b>	<b>W.F.I TEMPERATURE HIGH</b>	
	Decrease the cooling water flow rate & wait till the W.F.I out temperature is become higher than the set value	Check on display which will show “W.F.I. TEMP. HIGH“
	Increase the cooling water flow rate & wait till the W.F.I water out temperature is become lower than the set value	Check on display which will show "PROCESS OK"
<b>15</b>	<b>FEED PUMP OVER LOAD</b>	
	While pump is running Set Ampere of relay till relay contact gets change over.	Immediately Feed pump will stop automatically Check the fault on Display “FEED PUMP O/L “.
	Now Again increase Ampere Setting of relay.	As soon as contact of relay gets change over Feed pump will start automatically check the Display which shows the “PROCESS OK”.
<b>16</b>	<b>COOLING PUMP OVER LOAD</b>	
	While pump is running Set Ampere of relay till relay contact gets change over.	Immediately Cooling pump will stop automatically Check the fault on Display “COOLING PUMP O/L “.
	Now Again increase Ampere Setting of relay.	As soon as contact of relay get change over Cooling pump will start automatically check the Display which shows the “PROCESS OK”.



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## FACTORY ACCEPTANCE TEST FOR WFI GENERATION PLANT

17	<b>POWER FAILURE</b>		
	Switch OFF main panel.	Entire panel will off and cycle will Stop.	
	Switch ON main panel.	Now check on the print, which show "POWER FAIL". After Power on Process will start from same phase from where it is interrupted.	
18	<b>INSUFFICIENT COOLING WATER</b>		
	Turn pressure setting knob clock-wise to set pressure more than actual pressure.	Check the display which show fault "INSUFF. COOLING WATER".	
	Turn pressure setting knob Anti-clock-wise to set pressure less than actual pressure	Check the display which shows "PROCESS OK".	
<b>INTERLOCKING</b>			
A	<b>FEED PUMP</b>	Emergency Stop	
		Air Pressure Low	
		Boiler steam temperature low (After 5 minutes feed pump will stop)	
		Conductivity Of Feed Water High	
		Insufficient Evaporation	
		Initial heating time.	
		Insufficient feed water	
		Distill Water Level High	
		Purging On Problem	
		Purging Off Problem	
B	<b>COOLING PUMP</b>	Feed pump Over load	
		Cooling pump overload	
		Low W.F.I temperature	
		Emergency Stop	
		Air Pressure Low	
C	<b>DUMPING VALVE</b>	Insufficient cooling water	
		Initial drain time	
		Low Boiler steam temperature	
		Low W.F.I. temperature	
		Conductivity of W.F.I high	
		Emergency Stop	
D	<b>AIR VENT VALVE</b>	Air Pressure Low	
		When the W.F.I. temperature low than the set value Air Vent Valve will ON. Air vent valve will operate automatically as per timer set in parameter. It will operate for set time at set interval.	
E	<b>PURGING VALVE</b>	Last column level high	
		Purging hold time	
		Shut down Timer after Process Stop	





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## FACTORY ACCEPTANCE TEST FOR WFI GENERATION PLANT

<b>Corrective action in case of Non Compliance</b>		
<b>Conclusion</b>		
	<b>Performed by</b>	<b>Checked by</b>
<b>Name</b>		
<b>Signature</b>		
<b>Date</b>		



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**FACTORY ACCEPTANCE TEST FOR WFI GENERATION PLANT**

**OPERATION SEQUENCE TEST REPORT**

<b>Objective</b>	To carry out plant Operation sequence for observing performance/operation of all the items this are installed on the plant.
<b>Method</b>	Perform the operations sequence as indicated in manual.
<b>Acceptance Criteria</b>	(Refer attached <b>Form</b> ).



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## FACTORY ACCEPTANCE TEST FOR WFI GENERATION PLANT

### OPERATION SEQUENCE TEST REPORT

S.No.	TEST TO BE CARRIED OUT & PROCEDURE	ACCEPTANCE CRITERION	RESULTS ( PASS/ FAIL) WITH SIGN
1	Check operation sequence according to procedure given in operation and maintenance manual.	As specified in Operation and Maintenance manual.	

<b>Corrective action in case of Non Compliance</b>		
<b>Conclusion</b>		
	<b>Performed by</b>	<b>Checked by</b>
<b>Name</b>		
<b>Signature</b>		
<b>Date</b>		







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## FACTORY ACCEPTANCE TEST FOR WFI GENERATION PLANT

### 13. FAT REPORT APPROVAL:

Remarks: Approved / Not Approved

Department	Name	Signature	Date
<b>FOR M/s .....</b>			
Production			
Engineering			
Q.A.			
Consultant			
<b>FOR M/s .....</b>			
Service			