



**PHARMA DEVILS**

**DESIGN QUALIFICATION  
PROTOCOL CUM REPORT  
FOR  
SS JACKETED MANUFACTURING VESSEL (2000 LITER)**

**PROTOCOL No.:**

**DESIGN QUALIFICATION  
PROTOCOL CUM REPORT  
FOR  
SS JACKETED MANUFACTURING  
VESSEL  
CAPACITY: 2000 Liter  
(FFS LINE)**

<b>DATE OF QUALIFICATION</b>	
<b>SUPERSEDES PROTOCOL No.</b>	<b>NIL</b>



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**1.0 PROTOCOL PRE- APPROVAL:**

**INITIATED BY:**

<b>DESIGNATION</b>	<b>NAME</b>	<b>SIGNATURE</b>	<b>DATE</b>
<b>OFFICER/EXECUTIVE (QUALITY ASSURANCE)</b>			

**REVIEWED BY:**

<b>DESIGNATION</b>	<b>NAME</b>	<b>SIGNATURE</b>	<b>DATE</b>
<b>HEAD (PRODUCTION)</b>			
<b>HEAD (ENGINEERING)</b>			

**APPROVED BY:**

<b>DESIGNATION</b>	<b>NAME</b>	<b>SIGNATURE</b>	<b>DATE</b>
<b>HEAD (QUALITY ASSURANCE)</b>			



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**2.0 OBJECTIVE:**

- To prepare the installation Qualification on basis of User Requirement Specification, Purchase Order and information given by Supplier.
- To ensure that all Critical Aspects of Equipment / Product Requirement, cGMP and Safety have been considered in designing the Equipment and is properly documented.
- To specify the performance basis for acceptance of equipment.

**3.0 SCOPE:**

- The Scope of this Qualification Document is limited to the Design Qualification for SS jacketed Manufacturing tank (2000 ltr.) procured from Pharmatech Process Equipment at the site.
- The Equipment shall operate under the Controlled Environmental Conditions as per the cGMP requirements.
- The drawings and P & IDs provided by Vendor shall be verified during Design Qualification.



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**4.0 RESPONSIBILITY:**

The Validation Group, comprising of a representative from each of the following Departments, shall be responsible for the overall compliance of this Protocol cum Report:

<b>DEPARTMENTS</b>	<b>RESPONSIBILITIES</b>
<b>Quality Assurance</b>	<ul style="list-style-type: none"> <li>• Preparation, Review and Approval of Design Qualification Protocol cum Report.</li> <li>• Assist in the verification of Critical Process Parameter, Drawings, as per the Specification.</li> <li>• Co-ordination with Production and Engineering to carryout Design Qualification.</li> <li>• Monitoring of Design Qualification activity.</li> <li>• Review of Design Qualification Protocol cum Report after Execution.</li> </ul>
<b>Production</b>	<ul style="list-style-type: none"> <li>• Review of Design Qualification Protocol cum Report.</li> <li>• Assist in the verification of Critical Process Parameter, Drawings, as per the Specification.</li> <li>• Review of Design Qualification Protocol cum Report after Execution.</li> </ul>
<b>Engineering</b>	<ul style="list-style-type: none"> <li>• Review of Design Qualification Protocol cum Report.</li> <li>• Assist in the Preparation of the Protocol cum Report.</li> <li>• To co-ordinate and support the Activity.</li> <li>• To assist in Verification of Critical Process Parameter, Drawings, as per the Specification i.e.               <ul style="list-style-type: none"> <li>• GA Drawing</li> <li>• Specification of the sub-components / bought out items, their Make, Model, Quantity and Backup Records / Brochures.</li> <li>• Details of Utilities</li> <li>• Identification of components for Calibration</li> <li>• Material of Construction of all components</li> <li>• Brief Equipment Description</li> <li>• Safety Features and Alarms</li> </ul> </li> <li>• Review of Design Qualification Protocol cum Report after Execution.</li> </ul>



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**5.0 PROJECT REQUIREMENTS:**

To confirm the safe delivery of the Equipment from the supplier Site. To ensure that no Unauthorized and / or Unrecorded design modification shall take place. If at any point in time, any change is desired in the mutually agreed design, Change Control procedure shall be followed and documented.

The Compounding Vessel, its associated components and stirrer are designed to process pharmaceutical products in accordance with cGMP principles.

**6.0 BRIEF EQUIPMENT DESCRIPTION:**

The Manufacturing Vessel is the Jacketed, Insulated & Cladding vessel having Bottom entry low shear magnetic mixer to perform heating & cooling with stirring operations respectively during the mixing Process .the vessel is incorporated with high shear mixer tank plate for future installation of mixer, if required .the respective electrical components have been organized in the control panel except VFD .it's also designed of having compatible with clean in process and steam in process with in-built facilities of the same .some process valves are manually operated & some are pneumatically operated as per process Requirements. All utility valve are pneumatically operated to perform the heating & cooling operation automatically & control the Same.

- Shell
- Jacket
- Insulation & cladding
- Stirrer
- SS panel
- Legs
- Spray ball
- Compound gauge
- safety valve
- 0.2 micron plain vent filter
- Manual operated diaphragm valve



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- Sparger tube
- Rupture disc
- Temperature sensor with transmitter
- Manual operated flush bottom diaphragm valve with sampling valve arrangement.
- Safety valve for jacket.
- PG For Jacket
- Auto Ball Valve
- Manual ball valve
- Auto steam trap unit
- Variable frequency drive
- Load cell
- PLC panel



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**7.0 EQUIPMENT SPECIFICATION :**

Equipment Specification is a document provided to Manufacturer for Engineering Equipment as per the specifications mentioned in User Requirement Specification.

**8.0 CRITICAL VARIABLES TO BE MET:**

**8.1 PROCESS / PRODUCT PARAMETERS:**

<b>CRITICAL VARIABLES</b>	<b>ACCEPTANCE CRITERIA</b>	<b>REFERENCE</b>
<b>Application:</b> The purpose of manufacturing vessel is mixing of pharmaceutical product with magnetic stirrer.	Manufacturing vessel shall be <ul style="list-style-type: none"><li>• Able to dissolve the Solid content in the Solvent Media to provide solution</li><li>• Leak free</li><li>• Jacketed to control the temperature of the solution</li></ul>	Process Requirement
<b>Working</b>	Should work smoothly and should run without producing any unwanted sound.	Process Requirement
<b>Electrical Control Panel</b>	The system should have Electrical Control Panel.	Design Requirement

**8.2 UTILITIY REQUIREMENTS / LOCATION SUITABILITY :**

<b>CRITICAL VARIABLES</b>	<b>ACCEPTANCE CRITERIA</b>	<b>REFERENCE</b>
Electrical Supply	415 Volts AC , 50 Hz & 3 phase	Design Requirement
Room Condition	Should be able to meet the requirement of Clean Environment.	cGMP Requirement





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**8.3 TECHNICAL SPECIFICATIONS / KEY DESIGN FEATURES**

<b>CRITICAL VARIABLES</b>	<b>ACCEPTANCE CRITERIA</b>	<b>REFERENCE</b>
<b>Gross Capacity</b>	2400 lt.	Design Requirement
<b>Working Capacity</b>	2000 lt.	Design Requirement
<b>Sr.No</b>	15-16/SJ/000279	Design Requirement
<b>Contact Part</b>	SS316 L	Design Requirement
<b>Non Contact Part</b>	SS304	Design Requirement
<b>Impeller</b>	<b>Type</b> : Magnetic Stirrer <b>Make</b> : Kweng <b>Mounting</b> : Bottom <b>Sweep Dia</b> : 195 mm <b>MOC</b> : SS316 L <b>Model</b> : BAGI -5K	Process Requirement
<b>Gear Box</b>	<b>Make</b> : Bonfiglioli <b>Type</b> : Worm with body flange <b>Model</b> : W63 U 7P90 B5 B3 <b>Ratio</b> : 7:1 <b>Outer Driving Head Torque</b> : 10 Nm <b>Sr. No</b> : 1500000 77403130001	Design Requirement
<b>Motor</b>	<b>Make</b> : Siemens <b>Type</b> : Non Flame Proof <b>Rating</b> : 1.5 KW <b>Power Supply</b> : 415 VAC, 50 Hz, 3 Phase <b>RPM</b> : 2800 <b>Mounting</b> : Flange Mounted <b>Sr.No</b> : 0783	Design Requirement



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<b>CRITICAL VARIABLES</b>	<b>ACCEPTANCE CRITERIA</b>	<b>REFERENCE</b>
<b>Spray Ball</b>	<b>Make</b> : Leacher <b>Sr.No</b> : 569.139.1 Y.AL.00.3 <b>Type</b> : Self Rotating , 360° Rotating Detachable. <b>Dia</b> : 61 mm <b>MOC</b> : SS 316 L <b>Water Flow</b> : 73 LPM @ 2.0 bar <b>END Connection</b> : ¾” BPS <b>Part No.</b> : 569.139.1 Y. AL	Design Requirement
<b>Manual Diaphragm Valve</b>	<b>Make</b> : Gemu <b>Sr.No</b> : 67325D88405E02TS 1537 <b>Type</b> : Manual Operated Diaphragm Valve <b>Size</b> : 25 mm in Dia <b>Thickness</b> : 8mm <b>MOC</b> ; Contact Part SS316 L Non Contact Part SS 304 <b>End Connection</b> : T/C end <b>Application</b> : For CIP at Spary ball	Design Requirement
<b>Compound Gauge</b>	<b>Make</b> : Baumer <b>Sr.No</b> : 0716-PG-150023 <b>Type</b> : Manual Operated Diaphragm Valve <b>Size</b> : 4 mm in Dia <b>Thickness</b> : 8mm <b>MOC</b> ; Contact Part SS316 L Non Contact Part SS 304 <b>Mounting</b> : 38 mm T/C end <b>Range</b> : -760 to 10 kg/Cm2 <b>Size</b> : 4” In Dia	Design Requirement



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<b>CRITICAL VARIABLES</b>	<b>ACCEPTANCE CRITERIA</b>	<b>REFERENCE</b>
<b>Sterile Safety Valve</b>	<b>Make</b> : Pharmatech <b>Sr.No.</b> : 530/16 <b>Type</b> : Sterile Diaphragm <b>Size</b> : 9.3 mm in Dia (Inlet) / 12.5 mm in Dia (outlet) <b>MOC</b> : Contact Part SS316 L Non Contact Part SS 304 <b>Set Pressure</b> : 3.25 bar	Process Requirement
<b>Manual Diaphragm Valve</b>	<b>Make</b> : Gemu <b>Sr.No</b> : 67325D88405E02TS 1537 <b>Type</b> : Manual Operated Diaphragm Valve <b>Size</b> : 25 mm in Dia <b>Thickness</b> : 8mm <b>MOC</b> : Contact Part SS316 L Non Contact Part SS 304 <b>End Connection</b> : T/C end <b>Application</b> : For WFI Inlet	Process Requirement
<b>Plain Vent Filter</b>	<b>Make</b> : Pall <b>Type</b> : Emflon, code 7, Hydrophobic <b>Size</b> : 5 inch long <b>Filter Area</b> : 0.29 M <sup>2</sup> <b>MOC</b> : Housing SS 316 L , Cartridge Double Layer PTFE <b>Gasket</b> : Silicon <b>Mounting</b> : 25 mm T/C <b>Model</b> : Cartridge AB05HTPFR2PVH4 Housing : VSVNLI05G723H4	Design Requirement



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CRITICAL VARIABLES	ACCEPTANCE CRITERIA	REFERENCE
Manual Diaphragm Valve	<b>Make:</b> Gamu <b>Type :</b> Diaphragm PTFE with EPDM Back up <b>End Connection :</b> T/C end <b>Size :</b> 25 mm in Dia <b>Qty :</b> 2 Nos <b>MOC</b> ; Contact Part SS316 L Non Contact Part SS 304 <b>Sr. No. :</b> 67325D88405E02TS 1537	Design Requirement
Plain Vent Filter	<b>Make:</b> Pall <b>Type :</b> Emflon ,code 7, Hydrophobic <b>Rating :</b> 0.2 Micron <b>Filter Area :</b> 0.29 M <sup>2</sup> <b>MOC</b> ; Housing SS316 L Cartridge Double Layer PTFE <b>Gasket :</b> Silicon <b>Mounting :</b> 25 mm T/C <b>Model :</b> Cartidge AB05HTPFR2PVH\$ <b>Housing :</b> VSVNLI05G723H4	Design Requirement
Manual Diaphragm Valve	<b>Type :</b> Manual Operated <b>Size :</b> 25 mm in Dia <b>MOC :</b> Contact Part SS316 L Non Contact Part SS 304 Diaphargm PTFE with EPDM Backup <b>End Connection :</b> T/C end <b>Application :</b> for vent Filter Isolation	Design Requirement
Manual Diaphragm Valve	<b>Make :</b> Gemu <b>Type :</b> Manual Operated <b>Size :</b> 12 mm in Dia <b>MOC :</b> Contact Part SS316 L Non Contact Part SS 304 Diaphargm PTFE with EPDM Backup <b>End Connection :</b> T/C end	Design Requirement



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CRITICAL VARIABLES	ACCEPTANCE CRITERIA	REFERENCE
<b>Manual Diaphragm Valve</b>	<b>Make</b> : Gemu <b>Type</b> : Manual Operated <b>Size</b> : 38 mm in Dia <b>MOC</b> : Contact Part SS316 L Non Contact Part SS 304 Diaphragm PTFE with EPDM Backup <b>End Connection</b> : T/C end <b>Application</b> : for Dip Tube Outlet.	
<b>Halogen Lamp</b>	<b>Make</b> : Lumiglass <b>Type</b> : NFLP Halogen Lamp with bracket <b>Bulb</b> : 12 volt/50 W Hallogen <b>Mounting</b> : on light Glass <b>MOC</b> : Stainless Steel <b>Model</b> : USL 13 <b>Art No.</b> 3540.215.00	Design Requirement
<b>Rupture Disc</b>	<b>Make</b> : Fike <b>Size</b> : 1.5 Inch T/C <b>MOC</b> : SS 316 L <b>Gasket</b> : PTFE <b>End Connection</b> : T/C Ended <b>Operating Pressure</b> : FV to 3 Bar <b>Operating Temperature</b> : -20 to 180° C <b>Burst Pressure</b> : 3.5 kg/cm <sup>2</sup> @ 180° C <b>Sr.No</b> : 1572257	Design Requirement
<b>Temperature Sensor with Transmitter</b>	<b>Make</b> : Radix <b>Type</b> : PT 100 <b>Mounting</b> : Dr. Ingold <b>MOC</b> : Sensor –SS 316 L <b>Range</b> : 0-200° C <b>Accuracy</b> : Class A <b>Sheath Dia &amp; Length</b> : 6 X 600 mm <b>Connection</b> : 3 Wire	Design Requirement



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<b>CRITICAL VARIABLES</b>	<b>ACCEPTANCE CRITERIA</b>	<b>REFERENCE</b>
<b>Temperature Sensor with Transmitter</b>	<b>Make : Radix</b> <b>Type : PT 100</b> <b>Mounting : Mini T/C</b> <b>MOC : Sensor –SS 316 L</b> <b>Range : 0-200 ° C</b> <b>Accuracy : Class A</b> <b>Sheath Dia &amp; Length : 8 X 65 mm</b> <b>Connection : 3 Wire</b>	Design Requirement
<b>Flush Bottom Valve</b>	<b>Make : Gemu</b> <b>Type : manual operated, with Manual Sample Valve</b> <b>MOC : Contact Part SS316 L</b> <b>Non Contact Part SS 304</b> <b>Out let Size : 38 mm</b> <b>Diaphragm : PTFE backed by EPDM Backup</b> <b>Sample Valve : 12 mm in Dia</b> <b>Design Temperature : -80 to 200 °C</b> <b>Design Pressure : -1 to 10 Bar</b> <b>End Connection : T/C Ended</b> <b>Mounting : At Bottom of tank</b>	Design Requirement
<b>Air Vent Ball for Jacket Vent</b>	<b>Make : Micro</b> <b>MOC : SS 304</b> <b>Type : Pneumatic Operated ball Valve</b> <b>Size : 15 NB</b> <b>End Connection : T/C Ended</b>	Design Requirement
<b>Pressure Gauge for Jacket</b>	<b>Make : Baumer</b> <b>MOC : SS 304</b> <b>Type : Bourdon perforation,</b> <b>Size : 100 mm in dia</b> <b>End Connection : ½ inch BSP Threded</b> <b>Range :0-7 kg /Cm<sup>2</sup></b> <b>Accuracy : ±1.0 FSD</b>	Design Requirement



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Safety Valve for Jacket	<b>Make :</b> Fainger Leser <b>Type :</b> Conventional FLP 549 <b>MOC :</b> SS 304 <b>Over Pressure :</b> 10 % of Pressure <b>Set Pressure :</b> 3.18 bar <b>End Connection :</b> Screwed <b>Inlet Connection rating :</b> ¾ ” BSP (M) <b>Outlet Connection :</b> 1 inch BSP (F) <b>Sr.No. :</b> 10972692	Process Requirement
Ball Valve for Compressed Air inlet Jacket side	<b>Type :</b> Pneumatic operated Valve, <b>Make :</b> Micro <b>MOC :</b> SS 304 <b>Size :</b> 15 NB <b>End Connection :</b> Flanged end	Design Requirement
Ball Valve for Compressed Air Inlet & Cooling Water Supply & Return	<b>Type :</b> Pneumatic operated Valve, <b>Make :</b> Micro <b>MOC :</b> SS 304 <b>Size :</b> 40 NB <b>End Connection :</b> Flanged end <b>Qty :</b> 3 Nos <b>Make :</b> Micro	Process Requirement
Steam Trap Unit for Jacket Side	<b>Make :</b> Rex <b>Type :</b> Thermodynamic <b>Model :</b> Optiseal vent filter Cartridge <b>MOC :</b> Body SS 420 Strainer SS 304 <b>Size :</b> 20 NB <b>End Connection :</b> ¾ ”BSP Threaded	Design Requirement
Ball Valve for Steam Trap Unit	<b>Make :</b> Micro <b>Size :</b> ¾ ” NB <b>End Connection :</b> TC Ended <b>Qty :</b> 2 Nos	Design Requirement



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<b>CRITICAL VARIABLES</b>	<b>ACCEPTANCE CRITERIA</b>	<b>REFERENCE</b>
<b>Piping for Steam Strap unit</b>	<b>Make :</b> Pharmatech <b>Type :</b> ERW <b>MOC :</b> AISI 304 <b>End Connection :</b> TC Ended	Process Requirement
<b>Variable Frequency Drive</b>	<b>Make :</b> ABB <b>Rating :</b> 2HP <b>Power Supply :</b> 380- 500 V AC + 10 % /-15% , 3 phase. <b>Output Frequency :</b> 50.... 60Hz ± 5% <b>Protection :</b> IP20 <b>Ambient Temperature :</b> -10 to 55 ° C <b>Ambient Humidity :</b> Max 95 % non Condensing <b>EMC :</b> Filter Inbuilt	Design Requirement
<b>Load Cell</b>	<b>Make :</b> Mettler <b>Model :</b> SBH-2000 <b>Capacity :</b> 2 Ton/Each <b>Least Count :</b> 1 kg <b>Accuracy :</b> ±0.1 % <b>MOC :</b> SS 304 <b>Qty :</b> 3 Nos <b>Indicator :</b> IND 331	Design & Process Requirement
<b>Flexible Hose</b>	<b>Make :</b> Shanti <b>Size :</b> 25 mm Dia <b>MOC:</b> SS wire Brained <b>Length :</b> 500 mm <b>Qty :</b> 2Nos	Design Requirement
<b>Flexible Hose For Spare</b>	<b>Make :</b> Ami Polymer <b>Size :</b> 25 mm in Dia <b>MOC :</b> SS 304 <b>Length :</b> 500 mm <b>Qty :</b> 3 Nos	Design Requirement





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<b>Skid</b>	<b>Make : Pharmatech</b> <b>MOC: SS304</b> <b>Size : 1900 (L) x 1550 (W)</b>	Design Requirement
<b>Control Panel</b>	<b>Make : Rittal</b> <b>Type :Dust Proof</b> <b>Mounting : Suitable</b> <b>MOC: SS304</b> <b>Gasket : Rubber</b> <b>Finish : Matt</b>	Design Requirement
<b>PLC</b>	<b>Make : Allen Bradley</b> <b>Type : Programmable Logical Controlier</b> <b>Model : ML-1400</b> <b>Power Supply : 24 VDC</b> <b>User data Space : 10 K</b> <b>Port : Serial Ethernet</b> <b>Software : RS logic 500</b> No. of DI : 20 No. of DO : 12 <b>Oper Tem. : -20 °C to + 65°C</b>	Design Requirement
<b>HMI</b>	<b>Make : Allen Bradley</b> <b>Type : Colour Touch Screen</b> <b>Model : PVP-600</b> <b>Power Supply : 18-30 VDC</b> <b>Size : 5.7 ”</b> <b>Resolution : 320 x 240 , 18 –bit color Graphics.</b> <b>Back light: CC FL, 50, 000H</b> <b>Software : RS View Factory</b> <b>Common Port : RS232, USB and Ethernet port</b> <b>Relative RH : 5 – 95 %</b> <b>Oper Tem. : 0-55 °C</b>	Process Requirement
<b>Printer</b>	<b>Make : Epson</b> <b>Type : Dot Matrix /Online printer</b> <b>Model : LX-310</b> <b>Power Supply : 230 VAC, Single Phase</b> <b>Location : On SS Printer Trolley</b> <b>Common Pin : 25 pin –RS 232</b>	Process Requirement



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FRL Unit	<b>Make :</b> Festo <b>Model :</b> FRC ¼ -D-MINI <b>Range :</b> 0-16 Bar <b>Mounting :</b> Panel Mounted	Process Requirement
Hooter	<b>Make :</b> Reputed make <b>Type :</b> Panel Mounted <b>Size :</b> 96 x 96 mm	Process Requirement

#### 8.4 MATERIAL OF CONSTRUCTION

S. No.	PARTS NAME	MATERIAL OF CONSTRUCTION
1.	Vessel shell	SS316L
2.	Jacket shell	SS 304
3.	Spray ball	SS 316L
4.	Rupture Disk	SS 316L
5.	Safety valve	SS 316L
6.	Compound Gauge	SS316 L
7.	Pressure gauge for jacket	SS304
8.	Manual Ball Valve	SS304
9.	Steam Trap unit	SS304
10.	SS Skid	SS304
11.	Control Panel	SS304
12.	Contact part	SS316 L
13.	Non Contact part	SS304
14.	Gasket	PTFE



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**PROTOCOL No.:**

**8.5 SAFETY:**

<b>CRITICAL VARIABLES</b>	<b>ACCEPTANCE CRITERIA</b>	<b>REFERENCE</b>
Electrical Wiring And Earthing	Electrical wiring should be as per approved drawings. Double external Earthing to control machine, panel and operator should be provided	Safety Requirement
Noise Level	Below 80 db	Safety Requirement
Operation	Holding vessel should be in working condition, and it should be repeated during shutting also.	Safety Requirement
Variable Frequency Drive	Motor safety from overload	Safety Requirement
Main Supply	Main power supply should be always switched off when not in use.	Safety Requirement
Safety valve	Safety against over pressure	Safety Requirement
Air pressure switch	Protection for low air pressure for pneumatic valves	Safety Requirement
Rupture Disc	Safety against Over pressure	Safety Requirement
Insulation	For operator safety & Heat loss prevention	Safety Requirement
Emergency Button	Protection against abnormal condition	Safety Requirement
Instrument air pressure	Low air pressure protection	Safety Requirement

**8.6 VENDOR SELECTION:**

<b>CRITICAL VARIABLES</b>	<b>ACCEPTANCE CRITERIA</b>	<b>REFERENCE</b>
Selection of Vendor for Manufacturing vessel.	Selection of Vendor is done on the basis of review of vendor. Criteria for review includes Vendor Background (General / Financial), Technical know-how, Quality Standards, Inspection of Site, Costing, feedback from Market .	cGMP Requirement

**Reference:** (1) User Requirement Specifications (URS).  
(2) Design & Functional Specifications provided by Vendor.

**Verified By**  
**(Quality Assurance)**  
**Sign & Date .....**







**PHARMA DEVILS**

**DESIGN QUALIFICATION  
PROTOCOL CUM REPORT  
FOR  
SS JACKETED MANUFACTURING VESSEL (2000 LITER)**

**PROTOCOL No.:**

**13.0 ABBREVIATIONS:**

AC	:	Alternate current
AISI	:	American Iron & Steel Institute
ASME	:	American Society of mechanical Engineering
BSP	:	British Standard Pipe
cGMP	:	Current Good Manufacturing Practices
CIP	:	Clean in Place
D	:	Depth
db	:	Decible
DIN	:	Deutsches Institut for Normuung
DQ	:	Design Qualification
EHEDG	:	European Hygienic Engineering & Diagram
EPDM	:	Ethylene Propylene Dyne monomer
GA	:	General Arrangement
H	:	Heigh
HMI	:	Humen Machine Interface
HP	:	Horse Power
Hz	:	Hertz
JMT	:	Jacketed Manufacturing Tank
Kg	:	Kilograms
KW	:	Kilo Watt
LPH	:	Liter per Hours
LPM	:	liter per Minute
Ltd.	:	limited
MFT	:	Manufacturing Vessel
mm	:	Millimeter
MOC	:	Material of Construction
NO	:	Number
OD	:	outer Diameter
PEEK	:	Polyether Ether ketone
PG	:	Pressure Gauge



**PHARMA DEVILS**

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**PROTOCOL No.:**

PLC	:	Programmable Logic Controller
PO	:	Purchase Order
PT-100	:	Platinum-100
PTFE	:	Poly tetra Fluoro Ethylene
QA	:	Quality Assurance
Ra	:	Roughness Analysis
RPM	:	Revolution Per Minute
SS	:	Stainless Steel
TC	:	Triclover
Temp.	:	Temperature
URS	:	User Requirement specification
V	:	Volt
VFD	:	Variable Frequency Drive
W	:	Width
WFI	:	Water for injection



**PHARMA DEVILS**

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**PROTOCOL No.:**

**14.0 REVIEWED BY:**

<b>DESIGNATION</b>	<b>NAME</b>	<b>SIGNATURE</b>	<b>DATE</b>
<b>HEAD (ENGINEERING)</b>			

<b>DESIGNATION</b>	<b>NAME</b>	<b>SIGNATURE</b>	<b>DATE</b>
<b>HEAD (PRODUCTION)</b>			

<b>DESIGNATION</b>	<b>NAME</b>	<b>SIGNATURE</b>	<b>DATE</b>
<b>HEAD (QUALITY ASSURANCE)</b>			