



PHARMA DEVILS

QUALITY CONTROL DEPARTMENT

OPERATIONAL QUALIFICATION PROTOCOL CUM REPORT FOR PLC FOR AUTOOCATER 66“

**OPERATIONAL QUALIFICATION PROTOCOL
OF PLC
FOR
AUTOCOATER 66“**



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EQUIPMENT ID NO. :
AREA :
MAKE : SOLACE ENGINEER(MKTG.) PVT. LTD.
EQUIPMENT NAME : AUTO COATER 66“
PROTOCOL NO. :

The purpose of this document is to qualify the **PLC SYSTEM FOR AUTO COATER 66“** and its control systems.

This document provides evidence that the PLC system is installed according to design specification and operates as per design specification and complies with that standard operating practice and thus meets the cGMP obligation.

PROTOCOL PRE-APPROVAL PAGE

Signing of this approval page of protocol No: indicates agreement with the qualification approach described in this document. Modifications to the qualification approach become necessary, an addendum shall be prepared and approved. The protocol cannot be used for execution unless approved by the following authorities.

Name and Designation of Authorized Person	Signature	Date
Performed by: M/s.		
PROJECT ENGINEER		
Reviewed by: M/s		
ENGINEERING		
Approved by: M/s		
Q.A		



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Title:

Test specification: Operational Qualification
References: General Principles of PLC Validation

1.0 DOCUMENT REVISION HISTORY

Version No.	Reason for Revision	Status	Approval Date
1.0	First Version	Approved	

1.1 GLOSSARY/ DEFINITIONS

PLC	Programmable Logic Controller
HMI	Human Machine Interface
OIT	Operator Interface Terminal
NA	Not Applicable
GUI	Graphical User Interface
PC	Personal Computer
IQ	Installation Qualification
OQ	Operational Qualification
LED	Light Emitting Diode
CPU	Central Processing Unit
SOP	Standard Operating Procedure
ID	Identification



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2.0 GENERAL

2.1 OBJECTIVE

The objective of developing and executing this protocol is to collect sufficient data pertaining to the PLC of Autocoater 66“ and define the qualification requirements and acceptance criteria for the PLC of Autocoater 66“. Successful completion of these qualification requirements will provide assurance that the Autocoater 66“ operates as required in the processing environment and meets operational requirements.

2.2 SCOPE

The qualification study shall be performed to the control system (the PLC) supporting the Autocoater 66“.

The direction of the sequence of operation shall be controlled by a control system (PLC unit).

This Protocol shall define the test procedures, documentation, references and acceptance criteria to establish that the control system operates as intended.

This study verifies

- Qualification of the unit installation and examination of all background information is Performed to assure conformance of project requirements of M/s. manufacturer's specifications.
- The equipment meets the current Good Manufacturing Practices (cGMP) requirements and all other regulatory obligations.
- No unauthorized or unrecorded modifications have taken place.
- All critical instrumentation has been identified.
- All utilities are properly connected.
- All safety features are accounted for, All relevant test reports, Drawings have been attached.



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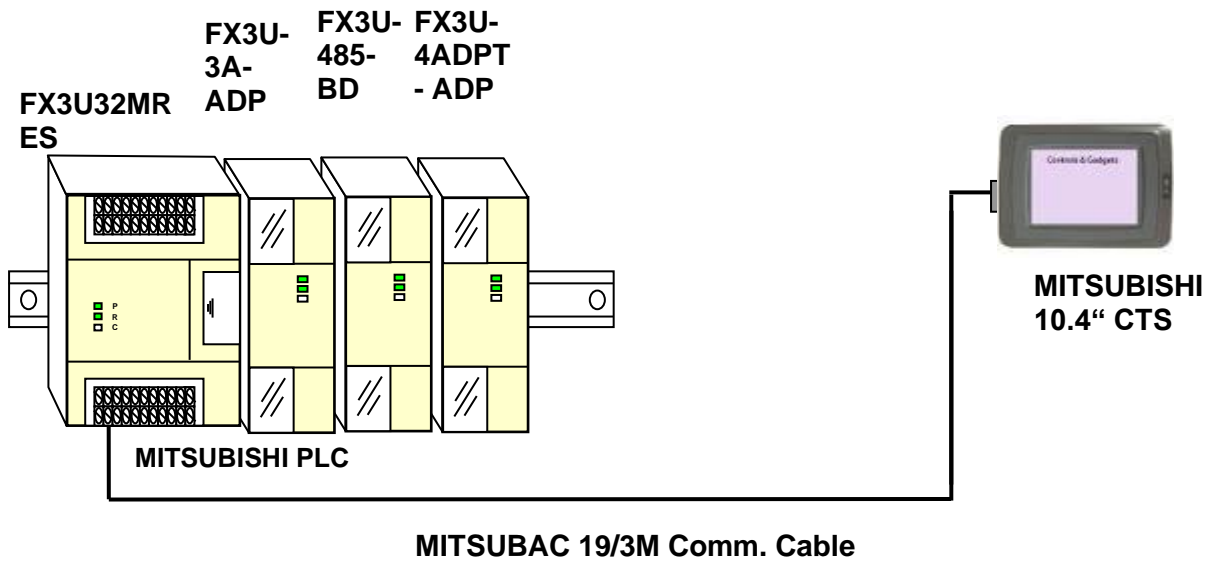
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3.0 EQUIPMENT / SYSTEM ARCHITECTURE

System Architecture:





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3.1 DESIGN DOCUMENTS

Design requirements and sequence of operation are based on the following documentation:

- System details and documents
- System Operation Manuals & Guides

3.2 TEST QUALIFICATION INSTRUMENTS

To execute this protocol, the following will be needed by the executor:

A. Standard devices (used for reference readings) calibration certificates shall be provided.

1. Multimeter - 600 volts minimum, 10 amperes maximum.
2. Digital Calibrator.

The above test instruments should have valid calibration on the date of protocol execution and validity certificate to that effect should be available and traceable to National standard.



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4.0 EXECUTION

4.1 GENERAL

The satisfactory operation and integration of the Autocoater 66“ shall be verified by executing the qualification studies described in this protocol. Successfully executed protocol documents that the Autocoater 66“ operates satisfactorily.

4.2 IDENTIFICATION OF PERFORMERS AND EXECUTOR

All Performers involved in this protocol execution are to sign within the prescribed format given below:

Name	Designation	Signature	Initial	Date



Title:

Test specification Operational Qualification
References: General Principles of PLC Validation

5.0 PURPOSE OF THE OPERATIONAL QUALIFICATION

The Operational Qualification documents, prepared by the M/s. provide the documentary evidence that the Autocoater 66“ are in accordance with that specified in the operation manual of the system. Qualified personnel will carry out the Operational tests described in these documents.

6.0 CONTENTS OF THE OPERATIONAL QUALIFICATION

In order to guarantee that the System corresponds to the specified design, the following items are checked:

- Check for the System Healthiness
- Check for the PLC Inputs/Outputs
- Check for the Display function keys, command buttons and displays
- Check for the Online Program Access
- Check for the Power Failure condition
- Check for the Communication Failure Condition
- Check for the Alarms/Messages and safety Interlocks
- Check for the Standard operating procedures

7.0 STRUCTURE AND PROCEDURE OF THE OPERATIONAL QUALIFICATION TESTS

The individual tests consist of the following two elements:

- a) Test procedure sheet.
- b) Test result sheets and Annexure for each individual test (dependent on the respective test).

The Test Specification of the individual OQ tests are structured as follows:

- Designation of each test by a **Title**.
- The section **Purpose** describes background or aim of the test.
- The sections **Tools/reference documents** specify tools or documents required for the test.
- **A prerequisite defines** the necessary test conditions or preparations.
- The section **Test procedure** describes step by step the actions to be performed by the tester.
- The section **Acceptance criteria** defines the set of expected results that shall be met for the test to be passed.
- The section **Actual result meets acceptance criteria** must be filled out and signed by the tester.
- **Comments/Deviations** are noted by the tester if the test can't be carried out in the prescribed way or the expected result was not met.
- The section **Appendices** is used to support the test sheets.



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8.0 AUTOOCATER 66” SYSTEM BEFORE OPERATIONAL QUALIFICATION TESTS

The following conditions have to be fulfilled before carrying out the OQ tests:

- The commissioning of the Autocoater 66“ must be completed.
- The Installation Qualification tests have to be performed.

9.0 OVERVIEW OF THE OPERATIONAL QUALIFICATION TESTS

The above-described content of the OQ is divided into the following tests:

Test no.	Title	Test purpose	Test Performed by (Date/Sign)
	System Healthiness	Check for the System Healthiness	
	PLC Inputs/Outputs	Check for the PLC Inputs/Outputs	
	Display function keys, command buttons and displays	Check for the Display function keys, command buttons and displays.	
	Online Program Access	Check for the Online Program Access	
	Power Failure Condition	Check for Power failure condition	
	Communication Failure Condition	Check for Communication failure condition	
	Alarms/Messages and safety Interlocks	Check for the Alarms/Messages and safety Interlocks	
	Standard Operating Procedures	Check for the Standard Operating Procedures	

The Overview of the OQ can also be taken as a check list for the state of test execution.

The Operational Qualification is successfully completed, if the results of all above-mentioned OQ test items meet the acceptance criteria.



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10.0 REVIEW SUMMARY

The review summary has to be filled out after carrying all operational qualification tests. Possible corrective actions or differences from the test protocols have to be recorded.



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Title:

Test OQ 1 : System Healthiness

Purpose:

To verify the normal operation of the Control System by turning ON the supply.

Tools/ reference documents:

Nil

Prerequisites:

Nil

Test procedure:

- Turn Control System power to ON position that is to power up the PLC.
- Document status of the indicators located on control system front panel.



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Title:

Test result sheet: System Healthiness

LED	Expected Status	Actual Status	Discrepancy?(Yes/No)	Acceptable?(Yes/No)
PWR	ON			
RUN	ON			
BATT	OFF			
ERROR	OFF			



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Acceptance criteria:

- Each Front panel LED/Message indication shall match with the expected result and mentioned in the System Manual.

Actual result meets acceptance criteria:

(Yes/No) _____

Tests performed at:	Verified By	Company/ Dept.	Date	Sign
Tests performed at:	Checked By	Company/ Dept.	Date	Sign

Comments/ deviations:

Appendix No : ____



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Title:

Test OQ 2 : PLC Inputs/Outputs

Purpose:

To verify the normal operation of PLC Input/Outputs after turning on the PLC.

Tools/ reference documents:

Multimeter, Calibrator.

Prerequisites:

Nil

Test procedure:

1. Turn panel power to On Position.
2. Turn PLC power to On Position.
3. Turn processor to RUN mode.
4. Simulate each Digital Input signal by doing one of the following and verify & record the status of that Input LED on PLC.
 - Shorting / opening that signal to PLC input or Operating respective field instrument/sensor/transducer.
5. In case of Analog Input signal simulate each Analog Input using calibrator signal. Feed signal of 0%, 50% and 100%. Verify and record the actual values from the operator interface (display as per range) or PLC data table (display as per channel counts).
 - In case of 4-20 mA current signals, feed 4 mA, 12 mA and 20 mA signals.
6. In case of spare input / output check that no wiring is present on the PLC terminal. In case, if wiring is present on PLC terminal to Terminal Block (TB) for future expansion, is should not be connected to any filed device.



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Title:

Test OQ 2 : PLC Inputs/Outputs

Title:

Test result sheet: PLC Inputs/Outputs

PLC Address	Description	Status of DI	Status of Component	Discrepancy?(Yes/No)	Acceptable?(Yes/No)
INBUILT DIGITAL INPUT (FX3U-32MT)					
X0	EMERGENY STOP	ON			
		OFF			
X1	MAIN AIR PRS. SWITCH	ON			
		OFF			
X2	PAN DRIVE MTR. VFD O/L RLY	ON			
		OFF			
X3	I/L BL MTR O/L RLY	ON			
		OFF			
X4	O/L BL MTR O/L RLY	ON			
		OFF			
X5	SRUBBER PUMP O/L RLY	ON			
		OFF			
X6	ATOM AIR PR SWITCH	ON			
		OFF			
X7	PRS. PUMP O/L RLY	ON			
		OFF			
X10 TO X17	SPARE	N.A.			
		N.A.			



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PLC Address	Description	Status of DO	Status of Component	Discrepancy?(Yes/No)	Acceptable?(Yes/No)
INBUILT DIGITAL OUTPUT (FX3U-32MT)					
Y0	PAN DRIVE MOTOR (VFD)	ON			
		OFF			
Y1	O/L BL. MTR.(VFD)	ON			
		OFF			
Y2	I/L BL. MTR.(VFD)	ON			
		OFF			
Y3	STEAM VALVE 5/2 SOV	ON			
		OFF			
Y4	SPARY AIR 3/2 SOV	ON			
		OFF			
Y5	PERISTALITC PUMP	ON			
		OFF			
Y6	PAN LIGHT	ON			
		OFF			
Y7	ALARM	ON			
		OFF			
Y10	CHILLED WATTER 5/2 SOV	ON			
		OFF			
Y11	STEAM COND. 3/2 SOV	ON			
		OFF			
Y12	HEATER SSR	ON			
		OFF			
Y13	WASH LINE / WASH DRAIN 3/2 SOV	ON			
		OFF			



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PLC Address	Description	Status of DO	Status of Component	Discrepancy?(Yes/No)	Acceptable?(Yes/No)
Y14	SCRUBBER PUMP	ON			
		OFF			
Y15 TO Y17	SPARE	N.A.			
		N.A.			
PLC Address	Description	Status of AI/AO	Status of Component	Discrepancy?(Yes/No)	Acceptable?(Yes/No)

ANALOG INPUT AND OUTPUT (FX3U-3A-ADP)

CH-1	I/L HUMIDITY	4 mA			
		12 mA			
		20 mA			
CH-2	PRS. PUMP	0 V			
		5 V			
		10 V			
CH-3	SPARE	N.A.			
		N.A.			
		N.A.			
PLC Address	Description	Status of RTD	Status of Component	Discrepancy?(Yes/No)	Acceptable?(Yes/No)

RTD (FX3U-4AD-PT-ADP)

CH-1	I/L TEMP.				
CH-2	O/L TEMP				



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PLC Address	Description	Status of RTD	Status of Component	Discrepancy?(Yes/No)	Acceptable?(Yes/No)
CH-3	BED TEMP.				
CH-4	SPARE	N.A.			
		N.A.			
		N.A.			

Title:

Test Instrument Used

Test Instrument	Manufacturer	Tag number	Calibrated Date	Calibration Due Date
Digital Calibrator				
RTD Source				



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Acceptance criteria:

- After correctly power-up, each component should be operational. Status of individual Digital signals should reflect actual status of the system. Also status of Digital channel should reflect the simulated On/Off condition. Analog signals should be calibrated over its normal operating range.

Actual result meets acceptance criteria:

(Yes/No) _____

Tests performed at:	Verified By	Company/ Dept.	Date	Sign
Tests performed at:	Checked By	Company/ Dept.	Date	Sign

Comments/ deviations:

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Title:

Test OQ 3 : Display Function Keys, command Buttons and Displays

Purpose:

To verify each function of Function Keys, Command Buttons & Displays for Local HMI/Controller.

Tools/ reference documents:

Nil

Prerequisites:

Nil

Test procedure:

- On the Local HMI/Controller modules, verify each Function Keys, Displays & Set parameters with respective module Configuration details in Manuals.
- Verify each Command buttons, Displays & Set parameters on system for its specified function as listed in the system manuals/guides.
- For verify each function of Function Keys, Command Buttons & Displays for Local HMI/Controller.



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Title:

Test result sheet: Display Function Keys, command Buttons and Displays

Function Keys	Function	Specified As	Expected Result	Discrepancy?(Yes/No)	Acceptable?(Yes/No)
Welcome Screen					
Logine	Screen Change	Navigate to Logine Screen			
Menu Screen					
Recipe	Screen Change	Navigate to Recipe Screen			
Load	Command	To Load Recipe			
Auto Status	Screen Change	Navigate to Auto Status Screen			
Change Login Level	Screen Change	Navigate to Change login level Screen			
Wash	Screen Change	Navigate to Wash Screen			
Temp	Screen Change	Navigate to Temp Screen			
I/o Status	Screen Change	Navigate to I/O status Screen			
Alarm	Screen Change	Navigate to Alarm Screen			
Buzzer Reset	Command	To Acknowledged Alarm			
Auto	Screen Change	Navigate to Auto Screen			
Jog Mode	Screen Change	Navigate to Jog mode Screen			
Recipe					
Back	Screen Change	Navigate to previous screen			
Next	Screen Change	Navigate to Next Screen			



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Function Keys	Function	Specified As	Expected Result	Discrepancy?(Yes/No)	Acceptable?(Yes/No)
Recipe-1					
Back	Screen Change	Navigate to previous screen			
Manu	Screen Change	Navigate to Menu Screen			
Next	Screen Change	Navigate to Next Screen			
Heating Cycle Screen					
Back	Screen Change	Navigate to previous screen			
Next	Screen Change	Navigate to Next Screen			
Spraying Cycle Screen					
Back	Screen Change	Navigate to previous screen			
Manu	Screen Change	Navigate to Menu Screen			
Next	Screen Change	Navigate to Next Screen			
Drying and Cooling Cycle Screen					
Back	Screen Change	Navigate to previous screen			
Manu	Screen Change	Navigate to Menu Screen			
Next	Screen Change	Navigate to Next Screen			
Film Coat Screen					
Back	Screen Change	Navigate to previous screen			
Store	Command	To Store Values			
Delete	Command	To delete Values			
Menu	Screen Change	Navigate to Menu Screen			



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Function Keys	Function	Specified As	Expected Result	Discrepancy? (Yes/No)	Acceptable?(Yes/No)
Auto Status Screen					
Back	Screen Change	Navigate to previous screen			
Calibration	Screen Change	Navigate to Calibration screen			
Menu	Screen Change	Navigate to Menu Screen			
Calibration Screen					
Back	Screen Change	Navigate to previous screen			
Menu	Screen Change	Navigate to Menu Screen			
PID	Screen Change	Navigate to PID screen			
Change Password Screen					
Logine	Screen Change	Navigate to Menu Screen			
Logout	Command	Logout From specified level			
Back	Screen Change	Navigate to previous screen			
Temp. Screen					
Back	Screen Change	Navigate to previous screen			
Next	Screen Change	Navigate to Next Screen			
Temp.-1 Screen					
Back	Screen Change	Navigate to previous screen			
Menu	Screen Change	Navigate to Menu Screen			



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Function Keys	Function	Specified As	Expected Result	Discrepancy? (Yes/No)	Acceptable?(Yes/No)
Input Status Screen					
Back	Screen Change	Navigate to previous screen			
Menu	Screen Change	Navigate to Menu Screen			
Next	Screen Change	Navigate to Next Screen			
Output Status Screen					
Back	Screen Change	Navigate to previous screen			
Menu	Screen Change	Navigate to Menu Screen			
Alarm Screen					
ESC	Screen Change	Navigate to Main screen			
Up	Command	To scroll Up cursor			
ACK	Command	To Acknowledge the alarm			
Down	Command	To scroll Down cursor			
Jog Operation Screen					
Back	Screen Change	Navigate to previous screen			
Status	Screen Change	Navigate to Status screen			
MIMIC	Screen Change	Navigate to MIMC screen			
Menu	Screen Change	Navigate to Menu Screen			



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Function Keys	Function	Specified As	Expected Result	Discrepancy? (Yes/No)	Acceptable?(Yes/No)
Washing Cycle Screen					
Manual Command	Screen Change	Navigate to Manual Command screen			
Menu	Screen Change	Navigate to Menu Screen			
PID Screen					
Back	Screen Change	Navigate to previous screen			
Menu	Screen Change	Navigate to Menu Screen			
Manual Screen					
Back	Screen Change	Navigate to previous screen			
Manual Status	Screen Change	Navigate to Manual Status screen			
Print	Command	To Print Cycle			
MIMC	Screen Change	Navigate to MIMC screen			
Menu	Screen Change	Navigate to Menu Screen			



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Acceptance criteria:

- Each Function Keys, Command Button and Display shall perform as per its defined functions.

Actual result meets acceptance criteria:

(Yes/No) _____

Tests performed at:	Verified By	Company/ Dept.	Date	Sign
Tests performed at:	Checked By	Company/ Dept.	Date	Sign

Comments/ deviations:

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Title:

Test OQ 4 : Online Program Access

Purpose:

To verify that the access to the on-line application program is authorized.

Tools/ reference documents:

Nil

Prerequisites:

Nil

Test procedure:

- Verify that all user editable parameters is provides adequate security measures as defined in HMI Screen Configuration document. For each screen/parameter for which security is defined, try to access that screen/parameter with correct password and wrong password. Verify and record the results.



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Title:

Test result sheet: Online Program Access

Specified As	Procedure	Expected Result	Actual Result	Discrepancy? (Yes/No)	Acceptable? (Yes/No)
Testing of Operator Level 1 functions	Try to access Operator Level 1 functions & parameters with wrong password	Any Operator Level 1 functions or parameters should not be accessed			
	Try to access Operator Level 1 functions & parameters with correct password	All Operator Level 1 functions or parameters should be accessed			
Testing of Supervisor Level 2 functions	Try to access Supervisor Level 2 functions & parameters with wrong password	Any Supervisor Level 2 functions or parameters should not be accessed			
	Try to access Supervisor Level 2 functions & parameters with correct password	All Supervisor Level 2 functions or parameters should be accessed			



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Specified As	Procedure	Expected Result	Actual Result	Discrepancy? (Yes/No)	Acceptable? (Yes/No)
Testing of Manager Level 3 functions	Try to access Manager Level 3 functions & parameters with wrong password	Any Manager Level 3 functions or parameters should not be accessed			
	Try to access Manager functions & parameters with correct password	All Manager functions or parameters should be accessed			

Acceptance criteria:

Without supplying proper password, user shall not be access the online application program and user shall not be able to change any of the operating parameters. Also screens, which have not been secured with the password, shall open without providing password.

Actual result meets acceptance criteria:

(Yes/No) _____

Tests performed at:	Verified By	Company/ Dept.	Date	Sign
Tests performed at:	Checked By	Company/ Dept.	Date	Sign

Comments/ deviations:

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Title:

Test OQ 5 : Power Failure Condition

Purpose:

To verify operation of Control System after power failure occurs.

Tools/ reference documents:

Nil

Prerequisites:

Nil

Test procedure:

- Record all of the set parameters in the main power fail test table of results.
- While the system is operating, shut down the power to the main control panel.
- Wait for 30 seconds then restore the power to the system.
- Restart the system. Record whether the system starts normally, and note any adverse conditions.
- Verify that the parameters recorded in the step 2 are unchanged after the power failure occurs.



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Title:

Test result sheet: PLC Power Failure Verification

Test	Expected Observation	Actual Observation	Discrepancy? (Yes/No)	Acceptable? (Yes/No)
PLC Power Shut Down	Equipment must stop in safe and secure conditions without any set parameter change.			

Acceptance criteria:

- After power restart, the system set parameters shall remain unchanged.

Actual result meets acceptance criteria:

(Yes/No) _____

Tests performed at:	Verified By	Company/ Dept.	Date	Sign
Tests performed at:	Checked By	Company/ Dept.	Date	Sign

Comments/ deviations:

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Test OQ 6 : Communication Failure Condition

Purpose:

To verify the operation of control process after a communication failure occurs.

Tools/ reference documents:

Nil

Prerequisites:

Nil

Test procedure:

- Operate the equipment/system in automatic mode.
- While the equipment/system is operating, detach communication cable. Verify the display on system. After a time limit, connect the communication cable that was removed
- Verify that the message should display in HMI.
- Establish the connection between PLC and HMI and verify that system should run without any problem.



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Title:

Test result sheet: Communcation Failure Verification

Test	Expected Observation	Actual Observation	Discrepancy?(Yes/No)	Acceptable? (Yes/No)
Disconnect the PLC to HMI Communication Cable	Error Message display on HMI			

Acceptance criteria:

The system must recognize a communication failure. Communication failure message shall be displayed on HMI.

Actual result meets acceptance criteria:

(Yes/No) _____

Tests performed at:	Verified By	Company/ Dept.	Date	Sign
Tests performed at:	Checked By	Company/ Dept.	Date	Sign

Comments/ deviations:

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Title:

Test OQ 7 : Alarms/Messages and Safety Interlocks

Purpose:

To verify that all Control System alarms and safety interlock operate properly and in accordance with the System Operation Manual.

Tools/ reference documents:

Nil

Prerequisites:

Nil

Test procedure:

- Force the alarm condition with field physical intervention/parameter alarm limit change.
- This will activate the proper alarm message.
- Record all system responses and verify with specified conditions.
- Check for safety features of the system



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Title:

Test result sheet: Alarms/Messages

Alarm/Message	Expected Result	Actual Result	Discrepancy? (Yes/No)	Acceptable?(Yes/No)
Emergency Stop	Allarm message displays on HMI			
Inlet Air Blower Trip	Allarm message displays on HMI			
Exhaust Air Blower Trip.	Allarm message displays on HMI			
Pan Motor trip.	Allarm message displays on HMI			
Pan drive jam.	Allarm message displays on HMI			
Dosing stop as Bed Temp. High	Allarm message displays on HMI			
Dosing stop as Bed Temp. Low	Allarm message displays on HMI			
Incoming air pressure low.	Allarm message displays on HMI			
Atomization air pressure low	Allarm message displays on HMI			
Inlet Temp. low	Allarm message displays on HMI			
Inlet Temp. High	Allarm message displays on HMI			
Outlet Temp. Low	Allarm message displays on HMI			
Outlet Temp. High	Allarm message displays on HMI			
Tablet bed Temp. low	Allarm message displays on HMI			



PHARMA DEVILS

QUALITY CONTROL DEPARTMENT

OPERATIONAL QUALIFICATION PROTOCOL CUM REPORT FOR PLC FOR AUTOOCATER 66"

Title:

QUALIFICATION COMPLETION AND APPROVAL

Verified that all test cases required by this reports are completed, reconciled and attached to this report and are included in the Qualification summary report.

Signatures in the block below indicate that all items in this Installation Qualification have been reviewed and approved.

POST APPROVAL PAGE

Name and Designation of Authorized Person	Signature	Date
Performed by: M/s.		
PROJECT ENGINEER		
Reviewed by: M/s		
ENGINEERING		
Approved by: M/s		
Q.A		



Title:

TERMINOLOGIES

A. Alarm

A device or function that signals the existence of an abnormal condition by means of an audible or visible discrete change, or both, intended to attract attention.

B. Control System

A system in which deliberate guidance or manipulation is used to achieve a prescribed value of a variable.

C. Interlock

An arrangement of signals, which perform a logical function in a control system.

D. LED

Light Emitting Diode. Status indicators available on the PLC modules to reflect the Input/output and processor status.

E. HMI

Human Machine Interface, which is used to interface the application program with Programmable Logic Controller.

F. COQ

Control System Operational Qualification, which includes the Dynamic behaviour of the system.

G. NABL

National Accreditation Board for Testing and Calibration laboratories according to ISO 17025

H. PLC

Programmable logic Controller, which is programmed, based on the system requirement by the software. After that whole system controls based on the PLC Commands.

I. I/O

Input and Output signals of PLC system.

J. M/C

Machine

