



SEC Bangalore

MANIPULATOR ARM – P1 TYPE

Doc Code

Prep By

App. By

ATP

KNL

Rev Lvl

Page

Tot Page

Acceptance Test Procedure

Document Number : ATP

R00

1

24

ACCEPTANCE TEST PROCEDURE **FOR** **MANIPULATOR ARM (PHASE – 1)**

Revision R00

Prepared By

Larsen & Toubro Ltd

Strategic Electronics Center

#145/2, Komarla Solitaire

Old Madras Road, C.V.Raman Nagar

Bangalore

Approved By

For
ASIMOV
Kochi

For
Larsen & Toubro
Bangalore

Restricted



SEC Bangalore

MANIPULATOR ARM – P1 TYPE

Doc Code

Prep By

App. By

ATP

KNL

Acceptance Test Procedure

Rev Lvl

Page

Tot Page

Document Number : ATP

R00

2

24

AMENDMENT RECORD

REV NO	DESCRIPTION	SIGNATURE	DATE
R00	ORIGINAL		7 SEP 2017

Restricted



SEC Bangalore

MANIPULATOR ARM – P1 TYPE

Doc Code

Prep By

App. By

ATP

KNL

Acceptance Test Procedure

Rev Lvl

Page

Tot Page





Document Number : ATP

R00

3

24

FIRST AID INSTRUCTIONS IN CASE OF ELECTRIC SHOCK

FIG. 1. 	1	SWITCH OFF. If this is not possible, PROTECT YOURSELF with dry insulating material and pull the victim clear off the conductor. DO NOT TOUCH THE VICTIM WITH YOUR BARE HANDS until he is clear off the conductor, but DO NOT WASTE TIME.
FIG. 2 	2	(a) Place the victim in the supine position. (b) Keep the air passages clear by turning the head to one side, opening the patient's mouth and clearing it of water, saline, mucus or blood, a lot of which might have accumulated in the back of the throat. (Figure 1).
FIG. 3 	3	If the jaw is rigid, try to force the mouth open by pressure on the gum behind the last molar tooth of the lower jaw. When the upper air passages are thus cleared, tilt the head backward and force the jaw forwards from the angles of the jaw in front of the ears. This would prevent mechanical obstructions to the upper air passages. (Figure 2-3)
FIG. 4 	4	(a) Then hold the chin up and forward with one hand and pinch the nostrils of the victim with the other. (Figure 4) (b) Take a very deep breath and apply your mouth to that of the victim and blow into his mouth, until the chest of the victim moves up indicating filling of the lungs. (NEVER ALLOW THE CHIN TO SAG). (Figure 4)
		When the chest has moved up, withdraw your mouth and allow the chest to sink back. REPEAT this process every three to four seconds until the victim begins to breathe again or until he is taken over by a medical attendant. This method can be continued in an ambulance during transit of the patient from the site of accident to the nearest medical Centre.
		Have someone else and send for a doctor.
		Keep patient warm and loosen his / her Clothing.
		Do not give liquids until the patient is conscious.

Restricted



SEC Bangalore

MANIPULATOR ARM – P1 TYPE

Doc Code

ATP

Prep By

KNL

App. By

Acceptance Test Procedure

Document Number : ATP

Rev Lvl

R00

Page

4

Tot Page

24

ABBREVIATION

Sl. No.	Abbreviations	Description
1	ATP	Acceptance Test Procedure
2	CAD	Computer Aided Design
3	HHU	Hand Held Unit
4	Kg	Kilo Gram
5	KMPH	Kilo Meter Power Hour
6	LIDAR	Light Detection and Ranging
7	MARF	Multi Agent Robotic Framework
8	MCS	Master Control System
9	mm	Millimeter
10	ROS	Robot Operating System
11	UGV	Unmanned Ground Vehicle
12	USB	Universal Serial Bus
13	V	Volts

Restricted


 SEC Bangalore	MANIPULATOR ARM – P1 TYPE	Doc Code ATP	Prep By KNL	App. By
	Acceptance Test Procedure Document Number : ATP	Rev Lvl R00	Page 5	Tot Page 24

TABLE OF CONTENTS

CHAPTER NO.	DESCRIPTION	PAGE NO
1.	Introduction	9
2.	Objective of the ATP	9
2.1.	General Checkup.....	9
2.2.	System acceptance Testing.....	9
3.	Manipulator Description	9
3.1.	Manipulator Arm	10
4.	Applicable Documents	10
5.	Test / Measuring Instruments	11
6.	Test Fixtures and accessories	11
7.	Acceptance Test Procedures.....	12
7.1.	Manipulator Individual_Joint_Cmd_01.....	12
7.2.	Manipulator All_Joint_Cmd_02.....	13
7.3.	Manipulator Home_Position_Cmd_03.....	14
7.4.	Manipulator Gripper_Open_Cmd_04.....	16
7.5.	Manipulator Gripper_Close_Cmd_05	16
7.6.	Manipulator Cartesian _Control_Orientation_Constant _06	17
7.7.	Manipulator Cartesian _Control_Position_Constant_07	18
7.8.	Manipulator Cylindrical_Control _08.....	20
7.9.	Manipulator Joint_Control _9.....	21
7.10.	Manipulator Camera_10	22
8.	Summary	24



SEC Bangalore

MANIPULATOR ARM – P1 TYPE

Doc Code

ATP

Prep By

KNL

App. By

Acceptance Test Procedure

Document Number : ATP

Rev Lvl

R00


Page

6

Tot Page

24

Restricted

 SEC Bangalore	MANIPULATOR ARM – P1 TYPE	Doc Code ATP	Prep By KNL	App. By
	Acceptance Test Procedure Document Number : ATP	Rev Lvl R00	Page 7	Tot Page 24

LIST OF FIGURES

FIGURE NO	DESCRIPTION	PAGE NO
Figure 3.1-1:	Manipulator Arm.....	10

LIST OF TABLES

TABLE NO	DESCRIPTION	PAGE NO
Table 5.1-1:	List of Test/ Measuring Instruments.....	11
Table 6.1-1:	List of Test Fixtures and Accessories	11
Table 7.1-1:	Manipulator Individual_Joint_Cmd_01.....	12
Table 7.2-1:	Manipulator All_Joint_Cmd_02.....	13
Table 7.3-1:	Manipulator Home_Position_Cmd_03.....	15
Table 7.4-1:	Manipulator Gripper_Open_Cmd_04.....	16
Table 7.5-1:	Manipulator Gripper_Close_Cmd_05	17
Table 7.6-1:	Manipulator Cartesian_Control_Orientation_Constant_Cmd_06.....	18
Table 7.7-1:	Manipulator Cartesian_Control_Position_Constant_Cmd_07	19
Table 7.8-1:	Manipulator Cylindrical_Control_Cmd_08.....	20
Table 7.9-1:	Manipulator Joint_Control_Cmd_09.....	21
Table 7.10-1:	Manipulator Camera_Feed_Cmd_10	22



SEC Bangalore

MANIPULATOR ARM – P1 TYPE

Doc Code

ATP

Prep By

KNL

App. By

Acceptance Test Procedure

Document Number : ATP

Rev Lvl

R00

Page


8

Tot Page

24

THIS PAGE IS INTENTIONALLY LEFT BLANK

Restricted

 SEC Bangalore	MANIPULATOR ARM – P1 TYPE	Doc Code ATP	Prep By KNL	App. By
	Acceptance Test Procedure Document Number : ATP	Rev Lvl R00	Page 9	Tot Page 24

1. Introduction

The purpose of this test procedure is to ensure all functional, Operational and Design requirements of Manipulator Arm. The Manipulator arm will be mounted on the MiniUGV. This manipulator arm does the function of material handling under tele-operated condition.

The Acceptance Test Procedure (ATP) is prepared for the Manipulator Arm against Scope of work document “Manipulator ARM-Scope Of Work for Complete software- R00”dated on 27/06/2017.

2. Objective of the ATP

This document explains the Acceptance Test Procedure for Manipulator Arm. The objective of this document is as follows:-

- (a) To verify proper functioning of the Manipulator.
- (b) To verify that the performance of the system meet with the specified design intent through a series of tests.
- (c) To capture and record performance data of the Manipulator
- (d) To lay down test procedures to measure various performance parameters and compare the results with the contract specification requirements, to ensure compliance and system acceptance.

2.1. General Checkup

Before commencing the test acceptance, ensure the following:


- (a) Check proper functioning of the system.
- (b) Undertake tests as recommended for system Test.

2.2. System acceptance Testing

Final acceptance test checks of the Manipulator would be undertaken on completion of subsystem testing. An acceptance test report for the each main equipment would be prepared as per standard format.

3. Manipulator Description

The manipulator arm is an add on amenable to infield removal and attachment with minimal tooling placed in Mini UGV tracked vehicle. It consists of 6 DOF (Degree Of Freedom) with an IR camera mounted on the wrist. It can lift a pay load of 2 kg at fully extended position (1000 mm) reach by the help of a gripper provided at the end of the manipulator arm. The gripper act as an end effector which is capable of holding an cylinder object of 100 mm dia maximum.

 SEC Bangalore	MANIPULATOR ARM – P1 TYPE	Doc Code ATP	Prep By KNL	App. By
	Acceptance Test Procedure Document Number : ATP	Rev Lvl R00	Page 10	Tot Page 24

3.1. Manipulator Arm

Figure 3.3-1 shows the Manipulator arm Assembly. The manipulator arm consists of 4 assemblies as follows:-

- (a) Base & Elbow Actuator Assembly
- (b) Shoulder Actuator Assembly
- (c) RPR Actuator Assembly
- (d) Gripper Assembly

The above assemblies mounted on the base housing of manipulator arm & placed on MiniUGV. A rest for manipulator arm is provided in such a way that it helps the manipulator to rest in the home position while the platform is in moving or stop condition.

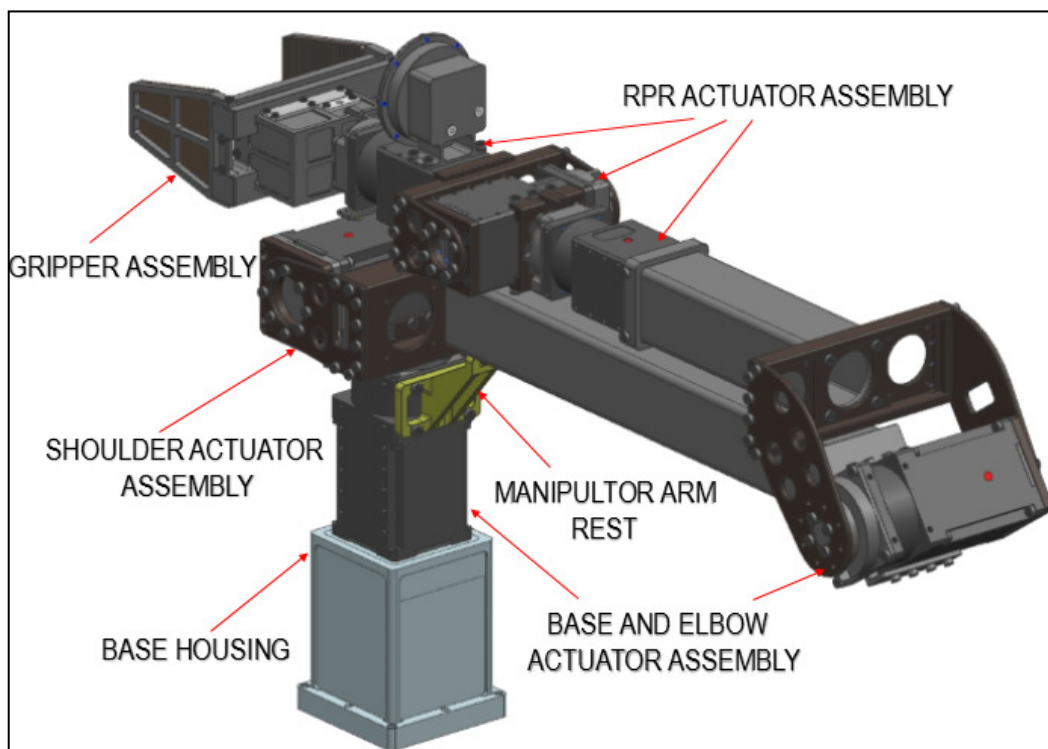


Figure 3.1-1: Manipulator Arm

4. Applicable Documents

- (a) Scope of work document “ManipulatorARM-Scope Of Work for Complete software- R00”
- (b) Interface control document “Manipulator Arm_HHU_CM Interface_Document-V3”



SEC Bangalore

MANIPULATOR ARM – P1 TYPE

Doc Code

Prep By

App. By

ATP

KNL

Acceptance Test Procedure

Rev Lvl

Page

Tot Page

Document Number : ATP

R00

11

24

5. Test / Measuring Instruments

Table 5.1-1: List of Test/ Measuring Instruments

Sl. No.	Description	Qty
1	Digital Multimeter	01
2	Measuring Tape	01
3	Weighing Scale	01
4	Inclinometer	01
5	Payload – 02 kg (100 mm dia.)	01
6	Vernier Caliper	01

Note:


(a) Any equivalent test/ measuring instrument may be used.

6. Test Fixtures and accessories

Table 6.1-1: List of Test Fixtures and Accessories

Sl. No.	Description	Qty
1	NIL	

Restricted

 SEC Bangalore	MANIPULATOR ARM – P1 TYPE	Doc Code ATP	Prep By KNL	App. By
	Acceptance Test Procedure Document Number : ATP	Rev Lvl R00	Page 12	Tot Page 24

7. Acceptance Test Procedures

7.1. Manipulator Individual_Joint_Cmd_01

7.1.1. Objective of Test

The objective of this test is to check each joint whether it is going to commanded position. Each joint position is verified with HHU status data.

7.1.2. Test Equipments Required

Sl. No.	Test Equipment	Qty	Remarks
1	Laptop/ HHU	1	

7.1.3. Test Setup

None

7.1.4. Acceptance Criteria

As specified in Test Specification.


7.1.5. Test Procedure

- Power ON Manipulator Arm.
- Switch on HHU/Laptop
- Command each joint from HHU by entering joint angle on HHU.
- Observe joint angle status on HHU. Commanded angle and actual joint angle status on HHU should be same.
- Repeat from steps (c) to (d) for all joints.

7.1.6. Test Specifications

Table 7.1-1: Manipulator Individual_Joint_Cmd_01

Sl. No.	Description	Expected		Observed on HHU	Remarks
1	Each joint will be commanded to certain position from HHU.	Base Joint			
2		Shoulder Joint			
3		Elbow joint			
4		Roll 1 Joint			
5		Pitch Joint			
6		Roll 2 Joint			

 SEC Bangalore	MANIPULATOR ARM – P1 TYPE	Doc Code ATP	Prep By KNL	App. By
	Acceptance Test Procedure Document Number : ATP	Rev Lvl R00	Page 13	Tot Page 24

7.1.7. Remarks

7.2. Manipulator All_Joint_Cmd_02

7.2.1. Objective of Test

The objective of this test is to check all joints whether they are going to commanded position together. Each joint position is verified with HHU status data.

7.2.2. Test Equipment Required

Sl. No.	Test Equipment	Qty	Remarks
1	Laptop/ HHU	1	

7.2.3. Test Setup

None

7.2.4. Acceptance Criteria

As specified in Test Specification.


7.2.5. Test Procedure

- Power ON Manipulator Arm.
- Switch on HHU/Laptop
- Enter each joint angle and press “ALL JOINT COMMAND” on HHU.
- All joints should move to commanded positions together.
- Observe joint angle status on HHU. Commanded angle and actual joint angle status on HHU should be same.
- Log commanded position and actual position in ROS bag file for verification

7.2.6. Test Specifications

Table 7.2-1: Manipulator All_Joint_Cmd_02

Sl. No.	Description	Expected		Observed in ROS bag file	Remarks
1	Each joint will be commanded to certain position from HHU.	Base Joint			
2		Shoulder Joint			
3		Elbow joint			
4		Roll 1 Joint			

 SEC Bangalore	MANIPULATOR ARM – P1 TYPE	Doc Code ATP	Prep By KNL	App. By
	Acceptance Test Procedure Document Number : ATP	Rev Lvl R00	Page 14	Tot Page 24

5		Pitch Joint			
6		Roll 2 Joint			

7.2.7. Results Verification

Plot all joints commanded position and actual position with respect to time (θ1 to θ6).

7.2.8. Remarks

7.3. Manipulator Home_Position_Cmd_03

7.3.1. Objective of Test

The objective of this test is to check all joints whether they are going to home position. Each joint position is verified with HHU status data.

7.3.2. Test Equipment Required

Sl. No.	Test Equipment	Qty	Remarks
1	Laptop/ HHU	1	

7.3.3. Test Setup


None

7.3.4. Acceptance Criteria

As specified in Test Specification.

7.3.5. Test Procedure

- Power ON Manipulator Arm.
- Switch on HHU/Laptop
- Press “HOME POSITION COMMAND” on HHU.
- Each joint should move to home position.
- Observe joint angle status on HHU. Manipulator position should be same as below figure.

 SEC Bangalore	MANIPULATOR ARM – P1 TYPE	Doc Code ATP	Prep By KNL	App. By
	Acceptance Test Procedure Document Number : ATP	Rev Lvl R00	Page 15	Tot Page 24

7.3.6. Test Specifications-Home position

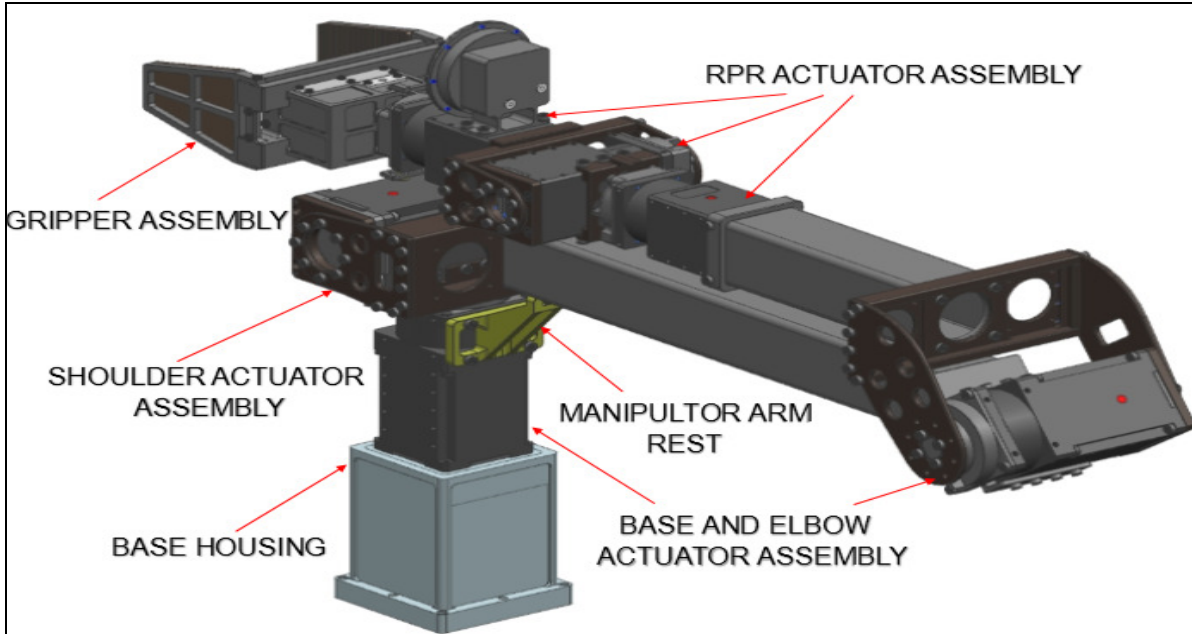



Table 03-1: Manipulator Home_Position_Cmd_03

Sl. No.	Description	Expected (Home position angles)		Observed on HHU (Actual)	Remarks
1	Each joint will be commanded to Home position from HHU.	Base Joint	0°		
2		Shoulder Joint	0°		
3		Elbow joint	0°		
4		Roll 1 Joint	0°		
5		Pitch Joint	0°		
6		Roll 2 Joint	0°		

7.3.7. Remarks

 SEC Bangalore	MANIPULATOR ARM – P1 TYPE	Doc Code ATP	Prep By KNL	App. By
	Acceptance Test Procedure Document Number : ATP	Rev Lvl R00	Page 16	Tot Page 24

7.4. Manipulator Gripper_Open_Cmd_04

7.4.1. Objective of Test

The objective of this test is to check gripper open operation and maximum diameter size(100mm) of the object that can be held in the gripper.

7.4.2. Test Equipment Required

Sl. No.	Test Equipment	Qty	Remarks
1	Laptop/ HHU	1	

7.4.3. Test Setup

None

7.4.4. Acceptance Criteria

As specified in Test Specification.

7.4.5. Test Procedure

- Power ON Manipulator Arm.
- Switch on HHU/Laptop
- Ensure that gripper is fully closed.
- Press gripper open button on HHU continuously.
- Operate the gripper to open fully.
- Place an object of size 100 mm between the fingers of the gripper.
- Check operation for different diameters

7.4.6. Test Specifications

Table 7.44-1: Manipulator Gripper_Open_Cmd_04


Sl. No.	Description	Expected		Observed	Remarks
1	Gripper will be commanded to fully open operation.	Object size of 100 mm dia should fit between the fingers of the gripper.			
2					

7.4.7. Remarks

7.5. Manipulator Gripper_Close_Cmd_05

7.5.1. Objective of Test

The objective of this test is to check gripper close operation.

 SEC Bangalore	MANIPULATOR ARM – P1 TYPE	Doc Code ATP	Prep By KNL	App. By
	Acceptance Test Procedure Document Number : ATP	Rev Lvl R00	Page 17	Tot Page 24

7.5.2. Test Equipment Required

Sl. No.	Test Equipment	Qty	Remarks
1	Laptop/ HHU	1	

7.5.3. Test Setup

None

7.5.4. Acceptance Criteria

As specified in Test Specification.

7.5.5. Test Procedure

- Power ON Manipulator Arm.
- Switch on HHU/Laptop
- Ensure gripper is fully open. Place an object of size 100 mm between the fingers of the gripper.
- Press gripper close button on HHU continuously.
- Operate the gripper to close around the object and hold it tightly.
- Lift the object using the gripper

7.5.6. Test Specifications

Table 7.55-1: Manipulator Gripper_Close_Cmd_05

Sl. No.	Description	Expected	Observed	Remarks
1	Gripper will be commanded to close operation.	Object should be lifted without slipping.		
2				

7.5.7. Remarks


7.6. Manipulator Cartesian _Control_Orientation_Constant _06

7.6.1. Objective of Test

The objective of this test is to check manipulator arm movement using Cartesian control with orientation constant.

7.6.2. Test Equipment Required

Sl. No.	Test Equipment	Qty	Remarks
1	Laptop/ HHU	1	

 SEC Bangalore	MANIPULATOR ARM – P1 TYPE	Doc Code ATP	Prep By KNL	App. By
	Acceptance Test Procedure Document Number : ATP	Rev Lvl R00	Page 18	Tot Page 24

7.6.3. Test Setup

None

7.6.4. Acceptance Criteria

As specified in Test Specification.

7.6.5. Test Procedure

- Power ON Manipulator Arm.
- Switch on HHU/Laptop
- Select Cartesian mode on HHU
- Select orientation constant mode on HHU.
- Operate the joystick to move the end effector in Cartesian space.
- Record commanded Cartesian velocity from joystick and actual Cartesian velocity from Inverse Kinematics in ROS bag file.

7.6.6. Test Specifications

Table 7.66-1: Manipulator Cartesian_Control_Orientation_Constant_Cmd_06

Sl. No.	Description	Expected		Observed on ROS bag file	Remarks
1.	Manipulator arm will be commanded to operate in Cartesian control	End effector X-velocity			
2.		End effector Y-velocity			
3.		End effector Z-velocity			

7.6.7. Results Verification


- Plot End effector commanded vs. actual velocity
- Plot end effector orientation α , β , γ .

7.6.8. Remarks

7.7. Manipulator Cartesian_Control_Position_Constant_07

7.7.1. Objective of Test

The objective of this test is to check manipulator arm movement using Cartesian control with position constant.

 SEC Bangalore	MANIPULATOR ARM – P1 TYPE	Doc Code ATP	Prep By KNL	App. By
	Acceptance Test Procedure Document Number : ATP	Rev Lvl R00	Page 19	Tot Page 24

7.7.2. Test Equipment Required

Sl. No.	Test Equipment	Qty	Remarks
1	Laptop/ HHU	1	

7.7.3. Test Setup

None

7.7.4. Acceptance Criteria

As specified in Test Specification.


7.7.5. Test Procedure

- Power ON Manipulator Arm.
- Switch on HHU/Laptop
- Select Cartesian mode on HHU
- Select Position constant mode on HHU
- Operate joystick to change orientation.
- Observe each joint velocity and position on HHU.
- Observe end effector position and orientation.
- Position of end effector should not change.

7.7.6. Test Specifications

Table 7.77-1: Manipulator Cartesian_Control_Position_Constant_Cmd_07

Sl. No.	Description	Expected		Observed in ROS bag file	Remarks
1.	Manipulator arm will be commanded to operate in Cartesian control(position constant)	Position of end effector should not change.			

 SEC Bangalore	MANIPULATOR ARM – P1 TYPE	Doc Code ATP	Prep By KNL	App. By
	Acceptance Test Procedure Document Number : ATP	Rev Lvl R00	Page 20	Tot Page 24

7.7.7. Results Verification

- Plot end effector α , β , γ velocities (Commanded vs actual)
- Plot end effector x, y, z position (Commanded vs actual).

7.7.8. Remarks

7.8. Manipulator Cylindrical_Control_Cmd_08

7.8.1. Objective of Test

The objective of this test is to check manipulator arm movement using cylindrical control.

7.8.2. Test Equipment Required

Sl. No.	Test Equipment	Qty	Remarks
1	Laptop/ HHU	1	

7.8.3. Test Setup

None

7.8.4. Acceptance Criteria

As specified in Test Specification.


7.8.5. Test Procedure

- Power ON Manipulator Arm.
- Switch on HHU/Laptop
- Select Cylindrical mode on HHU
- Operate the joystick in ρ , θ , Φ and check operation.
- Observe end effector position and velocity data on HHU.

7.8.6. Test Specifications

Table 7.88-1: Manipulator Cylindrical_Control_Cmd_08

Sl. No.	Description	Expected		Observed in ROS bag file	Remarks
2.	Manipulator arm will be commanded to	End effector Range in meter/sec			

 SEC Bangalore	MANIPULATOR ARM – P1 TYPE	Doc Code ATP	Prep By KNL	App. By
	Acceptance Test Procedure Document Number : ATP	Rev Lvl R00	Page 21	Tot Page 24

3.	operate in cylindrical control.	End effector Velocity Phi in deg/sec			
4.		End effector velocity Theta in deg/sec			

7.8.7. Results Verification

Plot end effector ρ , θ , Φ velocities (Commanded vs actual).

7.8.8. Remarks

7.9. Manipulator Joint_Control_Cmd_9

7.9.1. Objective of Test

The objective of this test is to check individual joint control from joystick.

7.9.2. Test Equipment Required

Sl. No.	Test Equipment	Qty	Remarks
1	Laptop/ HHU	1	

7.9.3. Test Setup

None

7.9.4. Acceptance Criteria

As specified in Test Specification.

7.9.5. Test Procedure

- Power ON Manipulator Arm.
- Switch on HHU/Laptop
- Select joint mode on HHU
- Operate the joystick to control each individual joint.
- Observe end effector position and velocity data on HHU.

7.9.6. Test Specifications

Table 7.99-1: Manipulator Joint_Control_Cmd_09

Sl. No.	Description	Expected	Observed on ROS	Remarks
---------	-------------	----------	-----------------	---------



SEC Bangalore

MANIPULATOR ARM – P1 TYPE

Doc Code

Prep By

App. By

ATP

KNL

Acceptance Test Procedure

Rev Lvl

Page

Tot Page

Document Number : ATP

R00

22

24

			bag file	
1.	Each joint will be commanded to move from joystick.	Waist Joint velocity		
2.		Shoulder Joint velocity		
3.		Elbow joint velocity		
4.		Roll-1 joint velocity		
5.		Pitch Joint velocity		
6.		Roll 2 Joint velocity		

7.9.7. Results Verification

Plot each joint ((θ_1 to θ_6) velocity commanded vs actual.

7.9.8. Remarks**7.10. Manipulator Camera_10****7.10.1. Objective of Test**

The objective of this test is to check Manipulator camera feed that will be viewed on the teleoperation console.

7.10.2. Test Equipment Required

Sl. No.	Test Equipment	Qty	Remarks
1		1	

7.10.3. Test Setup

None

7.10.4. Acceptance Criteria

Both the fingers of the gripper should be visible in the lower third of the image.

7.10.5. Test Procedure


As specified in Test Specification.

7.10.6. Test Specifications

Table 7.1010-1: Manipulator Camera_Feed_Cmd_10

Sl. No.	Description	Expected	Measured	Remarks
1	Both the fingers of the	Both the fingers of the gripper		

Restricted

 SEC Bangalore	MANIPULATOR ARM – P1 TYPE	Doc Code ATP	Prep By KNL	App. By
	Acceptance Test Procedure Document Number : ATP	Rev Lvl R00	Page 23	Tot Page 24

	gripper should be visible in the lower third of the image.	visible in the lower third of the image.		
--	--	--	--	--

7.10.7. Remarks



SEC Bangalore

MANIPULATOR ARM – P1 TYPE

Doc Code

Prep By

App. By

ATP

KNL

Acceptance Test Procedure

Rev Lvl

Page

Tot Page

Document Number : ATP

R00

24

24

8. Summary

The summary of the Acceptance Test Results are presented below.

Table 8-1: Acceptance Testing Summary

Sl. No.	Test No.	Test Description	Results	Remarks
1.	7.1	Manipulator Individual_Joint_Cmd_01		
2.	7.2	Manipulator All_Joint_Cmd_02		
3.	7.3	Manipulator Home_Position_Cmd_03		
4.	7.4	Manipulator Gripper_Open_Cmd_04		
5.	7.5	Manipulator Gripper_Close_Cmd_05		
6.	7.6	Manipulator Cartesian _Control_Orientation_Constant_Cmd_06		
7.	7.7	Manipulator Cartesian _Control_Position_Constant_Cmd_07		
8.	7.8	Manipulator Cylindrical_Control_Cmd_08		
9.	7.9	Manipulator Joint_Control_Cmd_09		
10.	7.10	Manipulator Camera_Feed_Cmd_10		

Restricted