ENGINEERING REPORT			
TITLE:	TEST RIG SPECIFICATION - PRODUCTION ACCEPTANCE TEST RIG FOR DASSAULT F6X TRAS, PIVOT DOOR ACTUATORS (PDA) AND PRIMARY LOCK ACTUATORS (PLA)		
PROJECT:	DASSAULT F6X TRAS		
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SUMMARY

This document details the test equipment required for testing the fully assembled Dassault F6X, Pivot Door Actuators (PDA) and Primary Lock Actuators (PLA) of Thrust Reverser Actuation System (TRAS) at UTC Aerospace Systems (UTAS), India.

The Test Rig will be required to perform all the tests in accordance with the Test Specification provided.

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UTC AEROSPACE SYSTEMS – ACTUATION & PROPELLER SYSTEMS - WOLVERHAMPTON	
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CHANGE HISTORY

Issue	Author	Date	Comment
1	Chiranjeevi Prasannakumara	Mar-19	Original Issue

COMPLIANCE STATEMENT

This document has been prepared and approved in accordance with procedures 'Control of Engineering Data' 05-04-0070 and Selection, Training, Accreditation and Approvals Delegation of Engineering Staff 05-04-0072.

ABBREVIATIONS

Term/Acronym	Definition
A/C	Aircraft
AP	Acceptance Test Procedure
APS	Actuation and Propeller System
ATEX	ATmosphères Explosives
BNC	Bayoneted N-type Connector
CDR	Critical Design Review
CE	Conformité Européene
COTS	Commercial Off The Shelf
DAQ System	Data Acquisition System
DOP	Design Operating Pressure
E - Stop	Emergency Stop
EEC	Engine Electronic Control
EHS	Environmental Health and Safety
FPO	Front Page Only
GA	General Assembly
GUI	Graphical User Interface
LOTO	Lock Out Tag Out
LVDT	Linear Variable Differential Transducer
PAT	Production Acceptance Test
PDA	Pivot Door Actuators
PDR	Provisional Design Review
PLA	Primary Lock Actuators
PLU	Primary Lock Unit
REACH	Registration, Evaluation, Authorisation and Restriction of Chemicals
SP	Specification
TPM	Total Preventive Maintanance
TRAS	Thrust Reverser Actuation System
TRG	Test Rig Group
TRS	Test Rig Specification
UPS	Uninterruptable Power Supply
UTAS	UTC Aerospace Systems
UTC	United Technologies Corporation
UUT	Unit Under Test

'Actuation Systems' is used in this document as an abbreviation of UTC Aerospace Systems – Actuation & Propeller Systems. The legal entity of the site at Wolverhampton is 'Goodrich Actuation Systems Limited' which is a UTC Aerospace Systems company.

REFERENCES

Ref.	Title/Reference Number	Author/Publisher
[1]	Module 1 – General Specification for Test Rig Mechanical Requirements ED/99901/3023/SP, Latest Issue	APS
[2]	Module 2 – General Specification for Test Rig Hydraulic Requirements ED/99901/3024/SP, Latest Issue	APS
[3]	Module 3 – General Specification for Test Rig Electrical and Electronic Requirements ED/99901/3025/SP, Latest Issue	APS
[4]	Module 4 – General Specification for Test Rig Control System Requirements ED/99901/3026/SP, Latest Issue	APS
[5]	Test Rig Specification Standard Work :- 05-04-9843 Latest Issue	APS
[6]	Test Equipment Commissioning Standard Work Instruction 05-04-9849 Issue 02	APS
[7]	Production Acceptance Test Schedule for Dassault F6X TRAS Pivot Door Actuator TY4013. ED/4013/04/AP Issue 01 (Pending)	APS
[8]	Production Acceptance Test Schedule for Dassault F6X TRAS Pivot Door Actuator TY4014. ED/4014/02/AP Issue 01 (Pending)	APS
[9]	Production Acceptance Test Schedule for Dassault F6X TRAS Primary Lock Actuator TY4016. ED/4016/02/AP Issue 01 (Pending)	APS
[10]	Standard Work Instructions - Calibration Control 05-11-01 (Latest Issue)	APS
[11]	Fluid Cleanliness Requirements SAE AS 4059	Aerospace Industries Association of America
[12]	Fluid Specification MIL-PRF-5606	US Department of Defence

DEFINITIONS

Must	The word “must” indicates mandatory compliance with Regulations, Standards and/or other Legislation which must be followed without exception.
Shall	The word “shall” indicates mandatory requirements that shall be followed without exception.
Should	The word “should” indicates non-mandatory requirements that can be considered as design objectives.
Will	Sentences containing the word “will” are statements of provision, intent or service and do not represent requirements.
Common Cause	Event or failure which bypasses or invalidates redundancy or independence.
Common Mode Failure	An event which affects a number of elements otherwise considered to be independent.
Independence (1)	(1) A design concept which ensures that the failure of one item does not cause failure of another item.
Independence (2)	(2) Separation of responsibilities that assures the accomplishment of objective evaluation.
Separation	The maintenance of independence by means of physical distance between two hardware components.
Segregation	The maintenance of independence by means of a physical barrier between two hardware components.
Validation	The determination that the requirements for a product are sufficiently correct and complete.
Verification	The evaluation of an implementation to determine that applicable requirements are met.
When	The word ‘When’ is used to indicate something that needs to occur on the occurrence of an event i.e. discrete in nature.
While	The word ‘While’ is used to indicate something that needs to occur during the occurrence of a condition i.e. continuous in nature.

REGULATIONS & STANDARDS

The Supplier MUST adhere to and demonstrate compliance with the following Standards and Regulations in the design and supply of this equipment, to Actuation Systems.
If the supplier wishes to comply with a different regulation to meet the requirement, the supplier SHALL be required to clearly state their reasons and demonstrate how compliance of a different regulation is both relevant and appropriate with respect to legislative and UTC requirements.

S.No	Title/Description	Reference Document
1	Quality System	BS EN ISO 9001:2008
2	Machinery Directive	2006/42/EC
3	Low Voltage Directive	2006/95/EC
4	Pressure Equipment Directive	97/23/EC
5	Electromagnetic Compatibility Directive	2004/108/EC
6	Simple Pressure Vessels Directive	2009/105/EC
7	Equipment for Explosive Atmospheres Directive (ATEX)	94/9/EC
8	Chemical Substances Regulations (REACH)	1907/2006
9	Provision and use of Work Equipment Regulations	(PUWER) 1998
10	Manual Handling of Loads	90/269/EEC
11	Display Screen Equipment	90/270/EEC
12	Manual Handling Operations Regulations	1992
13	Hydraulic fluid power. General rules and safety requirements for systems and their components	BS EN ISO 4413:2010
14	Pneumatic fluid power. General rules and safety requirements for systems and their components	BS EN ISO 4414:2010
15	Pressure Systems and Transportable Gas Containers	BS EN 1968:2002
16	Safety Requirements for Electrical Equipment for Measurement, Control & Laboratory Use. General requirements	BS EN 61010-1:2010
17	UTC EHS Standard Practice Machine/ Equipment Safeguarding	SP-008
18	UTC EHS Standard Practice Control of Hazardous Energy	SP-013
19	UTC EHS Standard Practice Electrical Safety	SP-014
20	UTC EHS Standard Practice Elevated Work	SP-015
21	UTC EHS Standard Procedure Environmental Requirements	SP0200-02

Heading	Requirement	Supplier Compliance	Comments /Exceptions	Actuation Systems approval
1.00	**INTRODUCTION**			
1.01	The purpose of this test rig is to perform the Production acceptance test (PAT) on Dassault F6X TRAS Pivot Door Actuators (PDA) and Primary Lock Actuators (PLA).			
1.02	PAT on PDA Upper as per ED/4013/04/AP, Ref [7].			
1.03	PAT on PDA Lower as per ED/4014/02/AP, Ref [8].			
1.04	PAT on PLA as per ED/4016/02/AP, Ref [9].			
1.10	**Test Rig Philosophy**			
1.11	The test rig SHALL be designed to mount and operate the unit in accordance with PAT procedures from Ref [7] to Ref [9].			
1.12	The new test rig required to test the units that are outlined above to be located in the Test Lab based at UTAS Bangalore, India.			
1.13	The test Bench SHALL be connected to a hydraulic supply capable of performing PAT as per the Test Definitions defined in Section 3.0 of this Document.			
1.14	The hydraulic system, Control System and DAQ system (for PAT) SHALL be part of test rig.			
1.15	Refer to Figure - 1 of Appendix -1 for Test Rig representative Layout and Scope of Supply.			
1.16	This test rig design SHALL incorporate mounting geometry, hydraulic / electrical input, measurement and loading.			
1.17	This rig will be operated 24 hours x 5 days a week for 20 years therefore the consideration SHALL be given for quality and reliability of the components used on this rig.			

Heading	Requirement	Supplier Compliance	Comments /Exceptions	Actuation Systems approval
1.18	It is expected that the supplier SHALL utilize their experience and expertise to design the complete rig hydraulic circuit, and present a design that meets the specification for review and approval.			
1.19	The rig SHALL be capable of performing the following functional tests:			
1.20	1) Pivot Door Actuator Upper & Lower. a) Bleeding/Running In. b) Proof Pressure Test. c) Lock Integrity. d) Limit Load End of Stroke Test. e) Snubbing Performance Test. f) Breakout Pressure. g) Lock Operation (Hydraulic Unlock/Lock) and Deploy Pressure. h) Manual Unlock Test. i) External Leakage – 25 cycles. j) Low Pressure leakage Test.			
1.21	Primary Lock Actuator a) Bleeding/Running In b) Proof Pressure Test c) Limit Load Test d) Breakout Pressure and Retract Pressure test e) Response Time Test f) External Leakage Test g) Low Pressure Leakage Test			
1.22	The Test Rig Requirements are defined in Section 5.0 of this document.			
1.23	Appendix 2 and Appendix 10 defines the mechanical, hydraulic and electrical characteristics of the unit and the rig instrumentations respectively.			

Heading	Requirement	Supplier Compliance	Comments /Exceptions	Actuation Systems approval
2.00	**SYSTEM / UNIT DESCRIPTION**			
2.01	The TRAS system consists of Pivot Door Actuator (PDA) Upper, Pivot Door Actuator (PDA) Lower, Primary Lock Assemblies and other sub systems. Figure - 2 of Appendix - 1 provides an overview of the PDA and PLA mounting location in the TRAS system.			
2.10	**Pivot Door Actuators**			
2.11	The Pivot Door Actuators (PDA) are linear hydraulic actuators incorporating a hydraulically or manual released mechanical lock to prevent inadvertent door movement in the event of a primary lock failure.			
2.12	PDA Upper operates the upper door and PDA Lower operates the lower door.			
2.13	The PDA's also includes monitoring of the locking engagement status by uses of proximity sensors, which interface with the Engine Electronic Controller (EEC).			
2.14	Refer to Appendix - 6 & Appendix - 9 for PDA Technical Specification (Actuator envelope, lengths and mounting interface details) and Electrical Power Requirement respectively.			
2.15	The PDAs are regenerative in nature with annular differential area between Cylinder and piston causes the actuator to deploy.			
2.20	**Primary Lock Actuators**			
2.21	Figure - 2 in Appendix - 1 provides an overview of Primary Lock Assembly.			
2.22	The Primary Lock Actuator is a single acting cylinder with a spring loaded piston, the application of pressure causes the piston to retract and unlock the Primary Lock Unit (PLU).			
2.23	Refer to Appendix - 7 for PLA Technical Specifications.			

Heading	Requirement	Supplier Compliance	Comments /Exceptions	Actuation Systems approval
3.000	**TEST DEFINITION**			
3.001	The tests described in this section are applicable to PDAs and PLA.			
3.002	Appendix -2 details the Mechanical, Hydraulic & Electrical requirement for the PDAs and PLA.			
3.003	While these details are supplied to enable the supplier to quote, it is expected that the manufacture of the rig will reflect the test requirements detailed in PAT schedule from Ref [7] to Ref [9].			
3.004	**Tests on PDAs**			
3.005	Blank one Deploy port and one Stow port of PDA Upper until the completion of all the test cases defined in the test definition for PDA Upper.			
3.010	**Bleeding and Running In**			
3.011	The purpose of this test is to bleed any air from the actuator by cycling the unit under hydraulic power.			
3.012	Install the unit on the PAT Rig and make the hydraulic/electrical connections as defined in Appendix 3.			
3.013	Record Pressure, Position vs Time & Number of cycles during Bleeding and Running In test (For information only)			
3.014	Set the rig Flow Control Valve to 15 lpm flow (Flow rate subjected to change).			
3.015	Apply 1500 psi, (104 bar) to the Stow port of the actuator. Command the rig to cycle the actuator for 5 cycles by applying and removing 1500 psi, (104 bar) to the Deploy port to exclude any trapped air (Bleeding).			
3.016	Apply of DOP to the Stow port of the actuator. Command the rig to cycle the actuator 25 times by applying and removing DOP to the Deploy port to complete Running In.			
3.017	Reduce hydraulic pressure to zero and Record Compliance			

Heading	Requirement	Supplier Compliance	Comments /Exceptions	Actuation Systems approval
3.020	**Proof Pressure and Internal Leakage Test**			
3.021	The purpose of this test is to ensure that the assembled unit will withstand a proof pressure at the Deploy port, Stow Port, Static seals.			
3.022	Prior to test, ensure that the unit is dry, without evidence of hydraulic fluid on its surface.			
3.023	Record Pressure, Position, Time during Proof pressure test.			
3.024	**Stow Port Proof Pressure Test**			
3.025	Install the unit on the PAT Rig and make the hydraulic/electrical connections as defined in Appendix 3.			
3.026	Gradually increase the hydraulic pressure to the Stow port until a pressure of 1.5*DOP is achieved and stabilised, hold this pressure for a minimum of 2 minutes to maximum of 3 minutes.			
3.027	There shall not be any leakage from the unit.			
3.028	Reduce pressure to zero and record compliance.			
3.030	**Deploy Port Proof Pressure Test**			
3.031	Install the unit on the PAT Rig and make the hydraulic/electrical connections as defined in Appendix 3.			
3.032	Gradually increase the hydraulic pressure to the Deploy port until a pressure of 1.5*DOP is achieved and stabilised, hold this pressure for a minimum of 2 minutes to maximum of 3 minutes.			
3.033	There shall not be any leakage from the unit.			
3.034	Reduce pressure to zero and record compliance.			

Heading	Requirement	Supplier Compliance	Comments /Exceptions	Actuation Systems approval
3.040	**Limit Load Test**			
3.041	**Lock Integrity Test**			
3.042	The purpose of this test is to ensure that the locking elements have been correctly assembled and can withstand Limit load.			
3.043	Record Load, Position & Time during Lock Integrity Test.			
3.044	Install the unit on the PAT Rig and make the hydraulic/electrical connections as defined in Appendix 3			
3.045	With the actuator in the stowed position, and all ports at zero pressure apply a tensile load of 250 lbf (1112 N). Ensure the actuator moved to locked position.			
3.046	Gradually increase the tensile load up to the limit load as per Appendix - 2 and hold for a minimum of 2 minutes to maximum of 3 minutes.			
3.047	The lock mechanism of the actuator should holds the actuator in the stowed position on limit load application on lock mechanism.			
3.048	Reduce the tensile load to zero lbf and record compliance			
3.050	**Limit Load End of Stroke Test**			
3.051	The purpose of this test is to ensure that the unit can withstand a limit load without visible distortion, such as may occur due to incorrect assembly or material defects.			
3.052	Record Load, Position & Time during Limit Load End of Stroke Test.			
3.053	Install the unit on the PAT Rig and make the hydraulic/electrical connections as defined in Appendix 3			
3.054	Apply DOP to stow and deploy ports and deploy the actuator to the fully deployed position. Maintain this stabilised pressure.			
3.055	Gradually increase the tensile end load to the maximum Limit Load as per Table - 1 of Appendix - 2 and maintain for a minimum of 2 minutes to maximum of 3 minutes.			
3.056	There should be no visible deformation of the actuator during test.			
3.057	Reduce the load to zero.			

Heading	Requirement	Supplier Compliance	Comments /Exceptions	Actuation Systems approval
3.058	Stow the actuator by removing the pressure from the deploy line.			
3.059	Reduce all pressures to zero and record compliance.			
3.060	**Snubbing Performance Test**			
3.061	The purpose of this test is to check that the Deploy and Snubbing performance of the actuator meets the specified limits while ensuring that the Proximity Sensor operates correctly.			
3.062	Record Position, oil Temperature, Snubbing Velocity (mm/sec), Proximity Voltage (VDC), Stow Pressure, Deploy Pressure and Time during Snubbing Performance Test.			
3.063	Install the unit on the PAT Rig and make the hydraulic/electrical connections as defined in Appendix 3			
3.064	Apply DOP to the stow port of the actuator. While maintaining stow pressure, command the rig to cycle the actuator from fully stowed and fully deployed position once by applying and removing the supply pressure of DOP to the deploy port. (No Tensile Loading Required)			
3.065	Review the data recorded to confirm operational compliance over 1 cycle.			
3.066	Reduce all pressures to zero.			

Heading	Requirement	Supplier Compliance	Comments /Exceptions	Actuation Systems approval
3.070	**Breakout Pressure Test**			
3.071	The purpose of this test is to ensure that the actuator seal frictions are not excessive and that the actuator will deploy and stow with no evidence of stiction.			
3.072	Record Pressure, Position & Time during Breakout Pressure Test			
3.073	**Breakout Pressure Test - Stow Operation**			
3.074	Install the unit on the PAT Rig and make the hydraulic/electrical connections as defined in Appendix 3			
3.075	Manually rotate the manual unlock lever and provide hydraulic supply to deploy port to fully deploy the actuator.			
3.076	Reduce deploy pressure to zero.			
3.077	Provide hydraulic supply to stow port, set actuator to mid-stroke, approximately 3 - 5 inches from its deployed position and reduce the stow pressure to zero.			
3.078	Mechanically Support the actuator cylinder with a Test Fixture and disconnect the loading system.			
3.079	Connect an external LVDT to the actuator rod end. (To check the actuator movement).			
3.080	Gradually increase the supply pressure to the Stow port until the actuator begins to Stow.			
3.081	Record the pressure at which actuator movement occurs.			
3.082	Stow the actuator completely and reduce pressures to zero.			
3.083	**Breakout Pressure Test - Deploy Operation**			
3.084	Install the unit on the PAT Rig and make the hydraulic/electrical connections as defined in Appendix 3			
3.085	Manually rotate the manual unlock lever and provide hydraulic supply to deploy port of the actuator until actuator moves approximately 3 - 5 inches from its fully stowed condition and reduce deploy pressure to zero.			
3.086	Mechanically Support the actuator cylinder with a Test Fixture and disconnect the loading system.			

Heading	Requirement	Supplier Compliance	Comments /Exceptions	Actuation Systems approval
3.087	Connect an external LVDT to the actuator rod end. (To check the actuator movement).			
3.088	Gradually increase the pressure to the Deploy port until the actuator begins to Deploy.			
3.089	Record the pressure at which actuator movement occurs.			
3.090	Reduce the pressure to zero.			
3.091	**Lock Operation (Hydraulic Unlock/Lock) and Deploy Pressure**			
3.092	The purpose of these tests is to verify that the locking mechanism sequence functions correctly. The test demonstrates that the lock sleeve has moved to the unlocked position before the piston rod deploys.			
3.093	Record Pressure, Position & Time during Lock Operation (Hydraulic Unlock/Lock), Proximity Sensor output and Deploy Pressure.			
3.094	Install the unit on the PAT Rig and make the hydraulic/electrical connections as defined in Appendix 3			
3.095	With the actuator in the stowed position, apply DOP to the stow port.			
3.096	Manually increase the supply pressure to the deploy port until Proximity Switch voltage reads ≥ 15.75 Vdc. (This indicates the actuator's unlocked position). Record Compliance.			
3.097	Continue to increase the hydraulic pressure to the deploy port until the actuator begins to deploy. (i.e. the point at which the actuator moves from overstow and starts to deploy). Record Pressure.			
3.098	Decrease the hydraulic pressure to the deploy port until the Proximity Switch voltage reads < 2VDC. (This indicates actuator's locked position). Record Compliance.			
3.099	Reduce pressures to zero.			

Heading	Requirement	Supplier Compliance	Comments /Exceptions	Actuation Systems approval
3.100	**Manual Unlock Test**			
3.101	The purpose of this test is to ensure that the proximity switches indicate unlocked prior to lock disengagement.			
3.102	Record Load, Proximity Voltage (Vdc), Position & Torque during Manual Unlock Test.			
3.103	Install the unit on the PAT Rig and make the hydraulic/electrical connections as defined in Appendix 3.			
3.104	Ensure all ports are connected back to tank or at zero pressure.			
3.105	Apply a tensile load of 250 lbf (1112 N) to the actuator.			
3.106	Ensure that the actuator is fully locked. Record the Proximity Switch voltage.			
3.107	Move the unlock lever in the unlock direction until the Proximity Switch voltage changes to ≥15.75VDC and verify that the actuator remains locked.			
3.108	Continue to unlock to confirm the actuator begins to deploy.			
3.109	Reduce the tensile load to zero.			
3.110	Apply sufficient pressure to the stow port and overstow the actuator.			
3.111	Reduce the pressure to zero.			
3.112	Measure and record the torque required to unlock the actuator.			
3.113	Apply the recorded torque to the unlock lever and pin the unlock lever in the unlocked position.			
3.114	Apply tensile load and ensure the actuator deploys.			
3.115	Record Compliance			
3.116	Apply sufficient pressure to the stow port and overstow the actuator.			
3.117	Note: The test rig shall have access to allow the lock lever to be rotated using a torque measuring device. Safety regulations should be met during this operation and pressure shall be set temporarily at zero while the operation is being carried out.			

Heading	Requirement	Supplier Compliance	Comments /Exceptions	Actuation Systems approval
3.200	**External Leakage**			
3.201	The purpose of this test is to check external leakage under dynamic conditions.			
3.202	Record Pressure, Position, Number of cycles & leakage during External Leakage Test.			
3.203	Install the unit on the PAT Rig and make the hydraulic/electrical connections as defined in Appendix 3			
3.204	Deploy the actuator by applying DOP to stow and deploy ports of the actuator.			
3.205	Reduce pressures to zero.			
3.206	Wipe clean piston rod end and between piston rod & end gland so that these areas are free of oil.			
3.207	Apply DOP to the stow port of the actuator to stow the actuator.			
3.208	Reduce pressure to zero.			
3.209	Wipe clean piston rod end and between piston rod & end gland so that these areas are free of oil.			
3.210	Apply DOP to the stow port of the actuator. Command the rig to cycle the actuator from fully stowed to fully deployed position for 25 cycles by applying and removing DOP to the deploy port.			
3.211	Reduce Pressures to zero.			
3.212	Examine the end gland and piston rod end area carefully for evidence of any oil drops.			
3.213	End gland rod seal leakage is acceptable if leakage is less than 1 drop per 25 cycles. No other leakage from the actuator is permissible.			
3.214	Record Compliance.			

Heading	Requirement	Supplier Compliance	Comments /Exceptions	Actuation Systems approval
3.400	**Tests on PLAs**			
3.410	**Bleeding and Running in**			
3.411	Record Pressure, Position, Time & Number of cycles during Bleeding and Running In Test (For information only).			
3.412	Install the unit on the PAT Rig and make the hydraulic connections as defined in Appendix 4.			
3.413	Command the rig to cycle the actuator for 5 cycles by applying and removing 1500 psi, (104 bar) to the Supply port to exclude any trapped air.			
3.414	Record Compliance			
3.415	Command the rig to cycle the actuator for 25 cycles by applying and removing DOP to the Supply port to complete Running In.			
3.416	Record Compliance			
3.417	Reduce all hydraulic pressure to zero.			
3.420	**Proof Pressure and Internal Leakage test**			
3.421	The purpose of this test is to ensure that the assembled unit will withstand a proof pressure at the Supply port, Return Port, plugs and static seal leakage.			
3.422	Prior to test, ensure that the unit is dry, without evidence of hydraulic fluid on its surface.			
3.423	Record Pressure, Position, Time & leakage during Proof pressure test			

Heading	Requirement	Supplier Compliance	Comments /Exceptions	Actuation Systems approval
3.430	**Supply Port Proof Pressure Test and Internal Leakage Test**			
3.431	Install the unit on the PAT Rig and make the hydraulic connections as defined in Appendix 4.			
3.432	Gradually increase the hydraulic pressure to the Supply port until a pressure of 1.5*DOP is achieved and stabilised, hold this pressure for a minimum of 2 minutes to a maximum of 3 minutes.			
3.433	Measure the leakage through the return port during the test.			
3.434	The leakage shall be within specified limits.			
3.435	Reduce pressure to zero and record compliance.			
3.440	**Return Port Proof Pressure Test**			
3.441	Install the unit on the PAT Rig and make the hydraulic connections as defined in Appendix 4.			
3.442	Gradually increase the hydraulic pressure to the Return port until a pressure of DOP is achieved and stabilised; hold this pressure for a minimum of 2 minutes to maximum of 3 minutes.			
3.443	Measure the leakage through the return port during the test.			
3.444	The leakage shall be within specified limits.			
3.445	Reduce pressure to zero and record compliance.			

Heading	Requirement	Supplier Compliance	Comments /Exceptions	Actuation Systems approval
3.450	**Limit Load Test**			
3.451	**Limit Load Test - Tensile**			
3.452	The purpose of this test is to ensure that the unit can withstand a limit load without visible distortion, such as may occur due to incorrect assembly or material defects.			
3.453	Record Load, Position & Time during Limit Load Test.			
3.454	Install the unit on the PAT Rig and connect the loading system as per Appendix - 8.			
3.456	Gradually increase the Tensile load to the maximum Limit Load as per Appendix - 2 and maintain for a minimum of 2 minutes to maximum of 3 minutes.			
3.457	There should be no visible deformation of the actuator during test.			
3.458	Reduce the load to zero.			
3.460	**Limit Load Test - Compressive**			
3.461	The purpose of this test is to ensure that the unit can withstand a limit load without visible distortion, such as may occur due to incorrect assembly or material defects.			
3.462	Record Load, Position & Time during Limit Load Test.			
3.463	Install the unit on the PAT Rig and connect the loading system as per Appendix - 8.			
3.464	Apply supply pressure of DOP to Supply Port to retract the actuator.			
3.465	Gradually increase the Compressive load to the maximum Limit Load as per Appendix - 2 and maintain for a minimum of 2 minutes to a maximum of 3 minutes.			
3.466	There should be no visible deformation of the actuator during test.			
3.467	Reduce the load to zero.			

Heading	Requirement	Supplier Compliance	Comments /Exceptions	Actuation Systems approval
3.500	**Breakout and Retract Pressure Test**			
3.501	The purpose of this test is to ensure that the actuator seal frictions are not excessive and to check for the minimum pressure to retract the actuator.			
3.502	Record Pressure, Position & Time during Breakout and Retract Pressure Test.			
3.503	Install the unit on the PAT Rig and make the hydraulic connections as defined in Appendix 4.			
3.504	Gradually increase the supply pressure to the Supply port until the actuator begins to Retract.			
3.505	Record the pressure at which actuator movement occurs as breakout pressure.			
3.506	Further increase the pressure gradually until actuator fully retracts.			
3.507	Record this pressure as Retract pressure.			
3.508	Reduce all pressure to zero.			
3.600	**Response Time Test**			
3.601	The purpose of this test is to measure the time between the actuator movement from Lock to Unlock postion and vice versa.			
3.602	Install the unit on the PAT Rig and make the hydraulic connections as defined in Appendix 4.			
3.603	Mechanically Lock the actuator movement between lock and unlock position as defined in Appendix 7.			
3.604	Set the Supply pressure to DOP.			
3.605	Apply return line pressure of 188 psi to return port.			
3.606	Set a 5 lpm flow (Flow rate subjected to change) to the supply port and record the time required for actuator to move from lock to unlock position.			
3.607	Reduce the pressure at Supply Port to zero and record the time required for actuator to move from unlock to lock position.			
3.608	Reduce the return line pressure to zero.			

Heading	Requirement	Supplier Compliance	Comments /Exceptions	Actuation Systems approval
3.700	**External Leakage**			
3.701	The purpose of this test is to check external leakage under dynamic conditions.			
3.702	Record Pressure, Position, Retract & Relock Time, Number of cycles and dynamic seal leakage during External Leakage Test			
3.703	Install the unit on the PAT Rig and make the hydraulic connections as defined in Appendix 4.			
3.704	Wipe clean piston rod end and between piston rod and end gland so that these areas are free of oil.			
3.705	Command the Rig to cycle the actuator for 25 cycles by applying and removing DOP to the Supply port.			
3.706	Reduce all hydraulic pressures to zero.			
3.707	Examine the end gland and piston rod end area carefully for evidence of leakage.			
3.708	End gland rod seal leakage is acceptable if leakage is less than 1 drop per 25 cycles. No other leakage from the actuator is permissible.			
3.709	Record Compliance.			

4.0 TEST RIG GENERAL REQUIREMENT

The test rig consists of different modules which contribute to the overall general requirement for the test rig.

The supplier SHALL meet all of the requirements defined in modules as per Table 4-1.

An example for a typical test rig layout is shown in Figure 4-1.

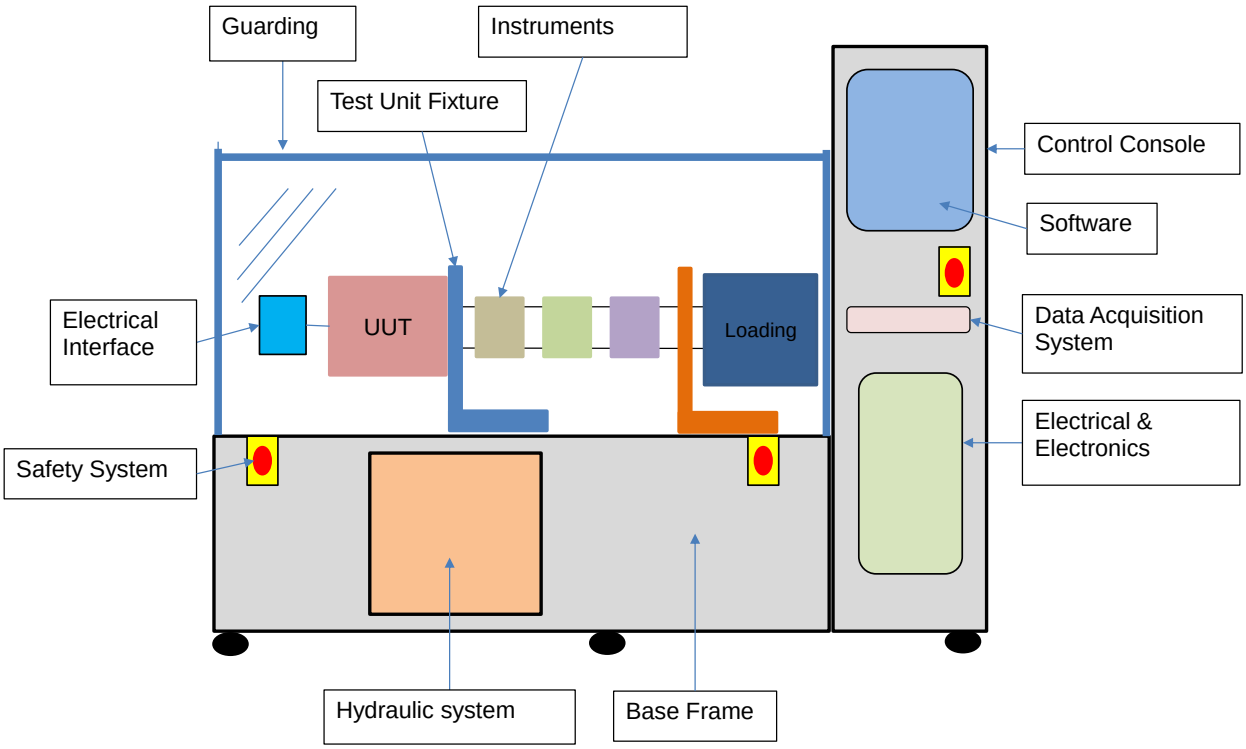


Figure 4-1 – Rig Layout – Typical

Table 4-1 – Test Rig General Requirement Modules

	Title	Description	Document Number
Module 1	Mechanical Requirement	Provides requirements for the test rig's: 1) Base frame 2) Loading System 3) Test Unit Fixture 4) Guarding 5) Example of mechanical Layout	ED/99901/3023/SP Ref.[1]
Module 2	Hydraulic Requirement	Provides requirements for the test rig's: 1) General 2) Recommended parts list 3) Reservoir 4) Example UUT Hydraulic System 5) Example off line filteration and cooling system	ED/99901/3024/SP Ref.[2]
Module 3	Electrical and Electronic Requirement	Provides requirements for the test rig's: 1) General 2) Wiring and Harness 3) Safety System 4) Instrumentation 5) Control Console	ED/99901/3025/SP Ref.[3]
Module 4	Control System Requirement	Provides requirement for the test rig's: 1) Software 2) Data Acquisition System 3) Control Functions 4) Example Control System Architecture & Hardware	ED/99901/3026/SP Ref.[4]

Heading	Requirement	Supplier Compliance	Comments /Exceptions	Actuation Systems approval
5.000	**TEST RIG UNIQUE REQUIREMENTS**			
5.001	The details contained in this section are unique to the Dassault F6X System Test Rig. This section has been broken down into a series of requirements which together with Table 4-1 forms the complete rig. It is the supplier's responsibility to provide a fully integrated rig that meets all the requirements specified in this rig specification and its associated modules.			
5.002	Refer to Appendix 8 for Test Rig Representative Layout.			
5.003	Refer to Figure 1 of Appendix -1 for the Scope of the Supplier.			
5.100	**Test Unit Interfaces**			
5.101	Appendix -5 defines the Hydraulic union sizes and thread definitions for units to tested for PAT.			
5.102	Appendix -9 details the Electrical connectors for PDA.			
5.103	Appendix - 6 defines the PDA Technical Specifications.			
5.104	Appendix - 7 defines the PLA Technical Specifications.			
5.105	Provision shall be given to externally fix the Torque Wrench to perform the Manual Unlock Test for PDA Actuators.			
5.106	The rig shall be designed to have a test bench for vertical storage of the PAT tested actuators. The actuators shall be held by the cylinder during storage.			

Heading	Requirement	Supplier Compliance	Comments /Exceptions	Actuation Systems approval
5.200	**Hydraulic System**			
5.201	The hydraulic system shall be rated to a maximum pressure of 6000 psi.			
5.202	The hydraulic power pack shall have flow capacity of 20 lpm at 3350psi.			
5.203	The system fluid shall be MIL-PRF-5606. Ref. [12].			
5.204	Cleanliness Requirement:SAE AS4059 Class 5 or better. Ref. [11].			
5.205	Replacement of oil must be straightforward with easy access. It shall have a flushing option.			
5.206	The rig shall be designed to maintain the rig oil temperature to 32 ± 16 °C.			
5.207	The rig shall be designed to have a rig protective screen to prevent oil splash around the rig.			
5.208	The rig shall have a oil collection tray under the work area, with a drain plug for accumulated oil removal.			
5.209	A separate low pressure (500psi) supply shall be provided for the PLA return port.			
5.210	The system pressure variation shall be within ±15 psi.			
5.211	The hydraulic system shall be able to control the flow with an increment of 0.5 lpm maximum.			
5.212	The rig shall be able to flush the unit prior to tests.			
5.213	Supplier shall select the Pipe sizing based on the flow and pressure requirement.			

Heading	Requirement	Supplier Compliance	Comments /Exceptions	Actuation Systems approval
5.300	**Electrical System**			
5.301	Below electrical requirements for each of the test unit's electrical components are provided in Appendix 9. 1) Maximum operating Voltage 2) Minimum operating Voltage 3) Connector Type 4) No.of channels 5) Output/Signal voltage/current 6) Electrical Pin out Configuration Details			
5.302	Rig electrical construction methods shall aim to eliminate electrical noise. Cable earth loops must be avoided. If making a cable for example, only one end of the shielding should be earthed.			
5.303	All instrumentation channels shall be free from electrical noise.			
5.304	The DC power supply shall have a voltage ripple not greater than 0.1% of full scale deflection.			
5.400	**Loading System**			
5.401	The load set up shown in Appendix - 8 SHALL meet the requirements of load application detailed in the PAT Schedule.			
5.402	The static loading system SHALL be incorporated to the rig. Refer to Appendix - 8.			
5.403	The loading system SHALL be capable of applying the load of 10,000 lbf (Compressive & Tensile) with additional 20% capability.			
5.404	The load system SHALL be fitted with a mechanical device to mitigate risk of load cell overload.			
5.405	The load System SHALL have fitted a protection system to shut down in the event of the load exceeding maximum requirements and test limits without causing damage to the UUT.			
5.406	All loading systems WILL be designed such that the load path is kept within a box frame and not reacted by cantilevered angle brackets into the main frame.			
5.407	In cases where vibration is expected the use of Nord-lock washers anti-vibration fixing SHALL be used.			
5.408	The load jack assembly on the load jack guide on test bench SHALL be designed or selected to meet the maximum stroke requirements of UUT. Refer Appendix - 2 for length and stroke of the actuator.			
5.409	The allowable variation of load during static testing SHALL be within ±20 lbf.			
5.410	The loading system shall be designed to have a load increment of 5 lbf.			

Heading	Requirement	Supplier Compliance	Comments /Exceptions	Actuation Systems approval
5.500	**Instrumentation**			
5.501	The rig shall be supplied with instrumentation to support all the tests defined in Section 3.0. All instrumentation shall be matched for each test requirement.			
5.502	Schematic diagram of the test setup, with detail showing the position of all instrumentation is provided in Appendix 8. Refer to Appendix 10 for Instrumentation List.			
5.503	All pressure transducers should be easily accessible for replacement and calibration.			
5.504	All pressure transducers shall be of vertical mount to allow ease of bleeding.			
5.505	A data acquisition system shall be provided with the test rig. This shall collect data from the PDA and PLA electrics and hydraulics for all the tests defined in Section 3.0.			
5.506	The Data logger shall have sufficient channels to log all the instruments data defined in Appendix 8.			
5.507	The data logger should contain an additional 10% more channels than required by the full system.			
5.508	A separate LVDT, Pressure Transducer and Load Cell shall be incorporated in the rig for PLA PAT tests to meet the accuracy requirements.			

Heading	Requirement	Supplier Compliance	Comments /Exceptions	Actuation Systems approval
5.600	**Control System**			
5.601	The control system shall be designed to operate the test unit as per test definitions section 3.0 of this document			
5.602	Electrical connectors shall be as per Appendix 9 and shall be compatible with the MIL-PRF-5606. Ref. [12].			
5.603	A calibration screen facility to allow access to all inputs and outputs from the instrumentation. This screen should be password protected.			
5.604	The control system shall automatically create backup copies of control configuration files for system recovery in the event of power failure.			
5.605	When control system software is to be used for data analysis and results determination, such as in production acceptance testing, a validation report will be required to be provided by the supplier in support of the rig commissioning and handover process, the validation report will demonstrate that the data and/or results presented are true, and will consider hardware/software fault tolerance, spurious data, etc.			
5.606	Provision for an uninterrupted power supply (UPS) device SHALL be provided in the control system to allow a controlled shutdown of the control computers in the event of power failure or brown out.			
5.700	**Site Services**			
5.701	The test rig supplier shall list which site services are required.			
5.702	Actuation Systems site services available consist of:-			
5.703	A water chiller unit will be available to cool the rig supply when it is installed on site at Actuation systems.			
5.704	3 phase electrical supply 415VAC			
5.705	Raw Power and UPS supply - Single phase 230VAC.			
5.706	Compressed shop air at approximately 6 bar (87 psig).			
5.707	The rig supplier shall take responsibility for all hydraulic installation on site at Actuation Systems. Electrical installation shall be the responsibility of the supplier up to the point of connection to the Actuation Systems supply.			
5.708	Water and air supply connection will be the responsibility of Actuation Systems, the supplier shall be responsible to provide suitable connections for both on the test rig.			

Heading	Requirement	Supplier Compliance	Comments /Exceptions	Actuation Systems approval
6.0	**QUOTATION REQUIREMENTS**			
a)	Where a quotation has been previously submitted based on an earlier version of this TRS, the revised quotation should take into account the changes made to the TRS and detail any effect on the initial not to exceed cost.			
b)	Quoted costs should be broken down to support evaluation against Actuation Systems test requirements, including but not limited to design and engineering, project management, significant hardware, delivery and installation, commissioning and support.			
c)	In addition to the above the following information shall be detailed within the supplier's formal quotation response:-			
d)	The technical proposal shall include the following items:-Top level Drawings and relevant circuits			
e)	Explanation of the solutions proposed against the requirements matrix			
f)	Proposed documentation deliverables (Spares / TPM requirements, manual, wiring, etc.)			
g)	Design Risk Assessment			

Heading	Requirement	Supplier Compliance	Comments /Exceptions	Actuation Systems approval
h)	Health and Safety compliance statement of compliance to the Regulations and standards defined in the TRS, Material Safety Data Sheets must be provided for substances and materials which warrant specific consideration, a complete set must be provided for all materials before delivery of the rig.			
i)	Supplier support commitments			
j)	Specification Compliance. The quotation shall include the completed compliance matrix The Compliance matrix shall reference each requirement from associated specifications and drawings and indicate the Supplier's compliance, or otherwise, with the respective requirements. In the event of non-compliance, the Supplier shall state the reason(s).			
k)	Costs including a detailed breakdown of the complete rig proposal. To include all relevant transportation and handling costs if applicable.			
l)	Supplier payment terms and schedule should be indicated			
m)	Delivery programme for the rig including design, detail, procurement, manufacturing, assembly, delivery and installation time scales. The timing plan should show an element of commissioning at Actuation Systems, with duration.			

Heading	Requirement	Supplier Compliance	Comments /Exceptions	Actuation Systems approval
7.0	**PROJECT & DOCUMENTATION REQUIREMENTS**			
a)	In addition to the information produced to support the quotation the supplier shall be expected to provide documentation to support the following phases:-			
b)	The purpose of the PDR / CDR is Validate that the rig meets the requirements of the TRS by design and by analysis. If the review is successful the rig definition is frozen and the emphasis of the process shifts towards detail design and manufacture of the rig.			
c)	The following items are required to support the CDR			
d)	Top level assembly drawings / layout			
e)	Detailed drawing of major items and UUT interface			
f)	Design Risk Assessment			
g)	Ergonomic Assessment			
h)	Detailed hydraulic schematic			
i)	Loading system detailed description			
j)	Analysis of dynamic control system			

Heading	Requirement	Supplier Compliance	Comments /Exceptions	Actuation Systems approval
k)	Detailed Electrical schematic			
l)	Calibration Capability / Procedure			
m)	Control philosophy description			
n)	Control system physical layout			
o)	Control system screen layout			
p)	Safety circuit and shutdown protocol			
q)	Instrumentation checklist with requirements validation			
r)	EH & S Statement and data sheets			
s)	Installation service and envelope requirements			
t)	Rig acceptance criteria (compliance matrix)			
u)	Review of draft technical folder			
v)	Project plan			
w)	In addition to the above mandatory review it is likely that several technical reviews will be held anywhere in the process from contract award to rig delivery. These reviews can be called by either party and will be chaired by a member of Actuation Systems TRG. It is Actuation Systems responsibility to ensure minutes are taken and distributed in accordance with 05-04-06.			

Heading	Requirement	Supplier Compliance	Comments /Exceptions	Actuation Systems approval
x)	Refer to Form 05-04BS in Appendix B for the checklist that Actuation Systems TRG will use to record provision of deliverables and information required in order to determine if a test rig is suitable for delivery to site.			
y)	On delivery to site, a technical folder shall be supplied containing the following:-			
z)	Declaration of Conformity (CE Mark) or Declaration of Incorporation (as appropriate)			
aa)	Design Risk Assessment			
bb)	Circuit Diagram Hydraulic/Pneumatic (including pressure and flow rating)			
cc)	Circuit diagram electrical			
dd)	Circuit diagram electronic			
ee)	Complete drawing pack and parts list			
ff)	Component quality report, specifically for UUT interface items such as (but not limited to) : Splines, Fixture plates, Mounting and Eye End pins, Loading elements. This should cover key design features such as : Hardness, surface finish quality, dimensional details, etc.			
gg)	Supplier’s instrument calibration details along with any Actuation Systems data			
hh)	Calibration Certificates			
ii)	Installation GA drawings detailing all equipment and service positions			

Heading	Requirement	Supplier Compliance	Comments /Exceptions	Actuation Systems approval
jj)	Alignment report for GA items to ensure that risk of mis-alignment and side loading of drive lines and loaded elements are mitigated by: a) design and b) measurement and alignment checks of assemblies.			
kk)	Rig operation manual			
ll)	Test Certificates (where applicable)			
mm)	Manufacturer's handbooks and specification sheets for COTS equipment			
nn)	Safety documentation including a copy of the Risk Assessment as carried out by the Supplier and Actuation Systems			
oo)	On delivery to site, a technical folder should be supplied containing the following, and at the very latest shall be provided within two weeks:-			
pp)	Specific TPM maintenance schedule			
qq)	Recommended spares			
rr)	Contact telephone numbers and addresses			
ss)	Compact Disk with top level drawings and detailed parts lists			
tt)	During the procurement of the test rig it is expected that the supplier should provide an updated project plan every 2 weeks.			

APPENDIX -1 - FIGURES

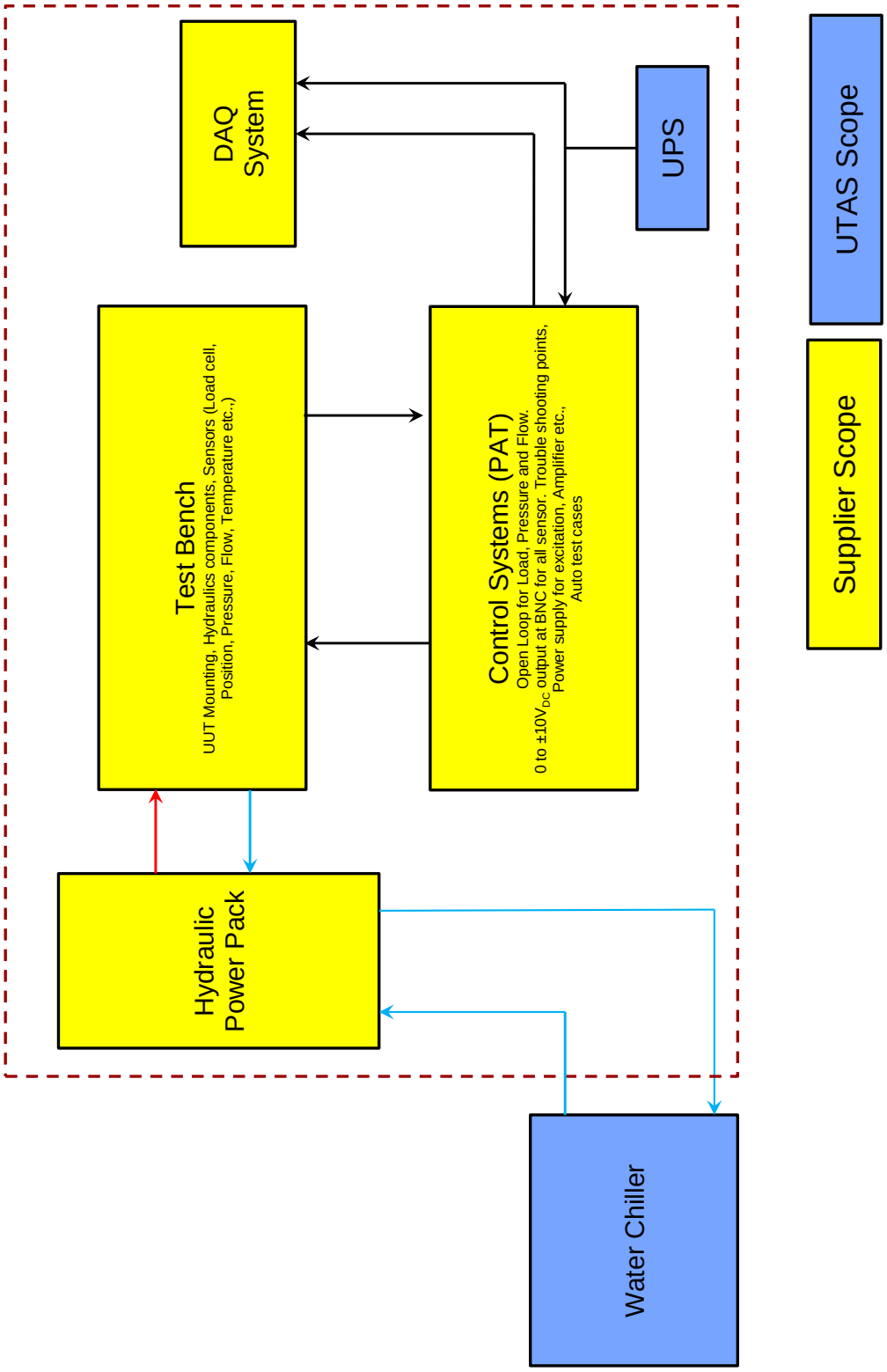


Figure - 1 Layout and Scope of Supply

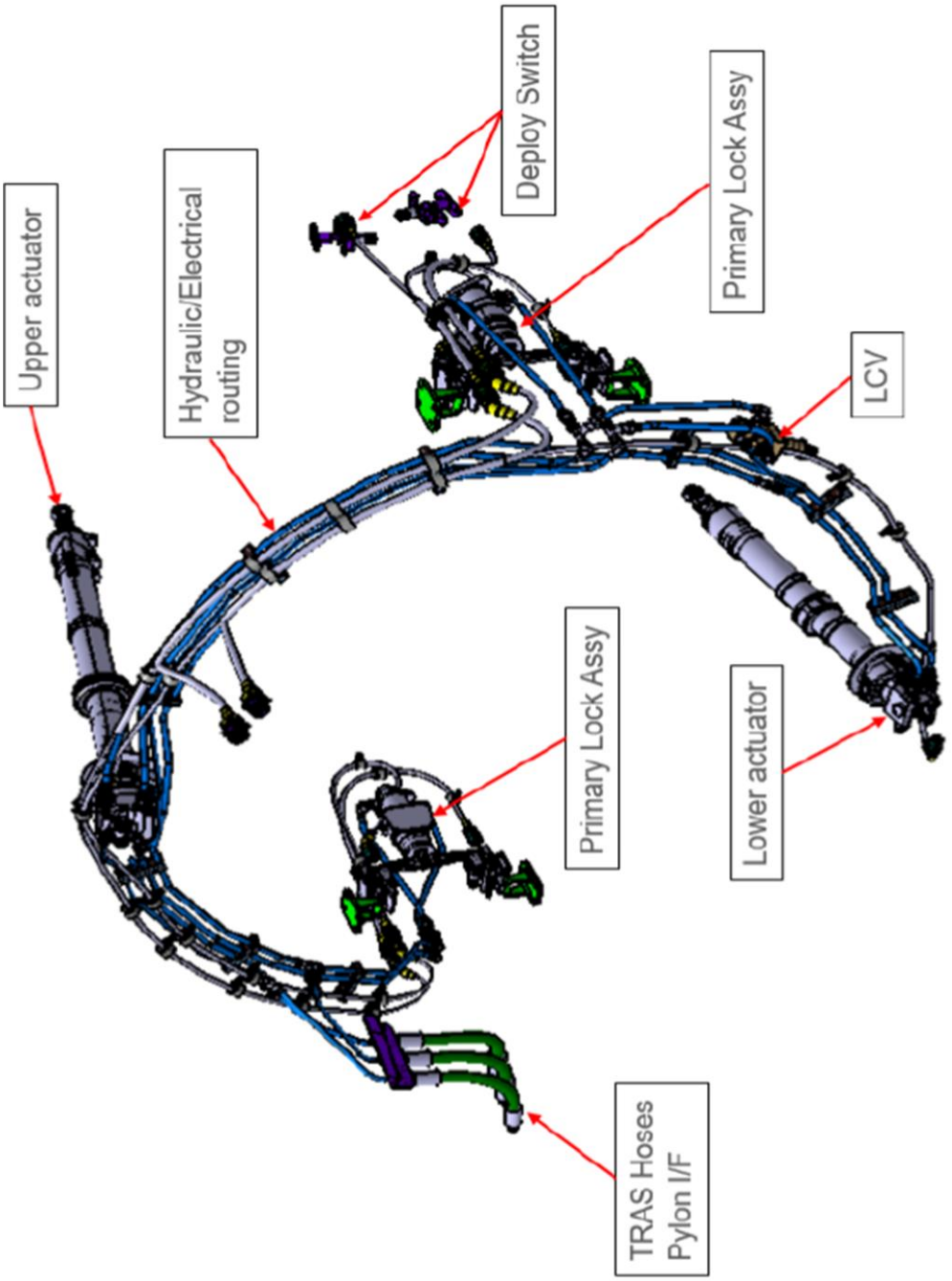


Figure - 2 TRAS System Schematic

APPENDIX - 2 Mechanical, Hydraulic and Electrical Characteristics of the Units

PARAMETERS	PIVOT DOOR ACTUATOR (PDA) UPPER	PIVOT DOOR ACTUATOR (PDA) LOWER	PRIMARY LOCK ACTUATORS (PLA)
Fluid Type	MIL-PRF-5606		
Fluid Cleanliness Level	SAE AS4059 Class 5 or better		
Fluid Temperature	32°C ± 16°C		
Hydraulic Supply - Single / Dual / Triple	Dual	Dual	Dual
Normal Operating Pressure	0 - 3000 psi (207 bar)		
Return Line Pressure	NA	NA	188 psig (6 bar)
Normal Operating Flow	20 lpm (Maximum)		
Minimum Operating / Breakout Pressure	10 psi		
Proof Pressure - Supply line (Stow & Deploy Port)	4500 psi (310 bar)		
Proof Pressure - Return line	0 - 3000 psi (207 bar)		
Limit load Tensile	7167 lbf	3934 lbf	2000*
Limit load Compressive	NA	NA	2000*
Installed Length	603.45 mm	607.55 mm	200.22 mm
Stroke	418.592 mm	418.594mm	24 mm
Electrical			
Proximity Sensor Connector Type	EN2997Y01005	EN2997Y01005	NA
Supply voltage - Proximity Switch	16 - 26 VDC		NA
Max. current - Proximity Switch	10 mA maximum		NA

* Limit Load (Tensile & Compressive) for PLA is an approximate value at this stage. This value is expected to change and shall be provided during Supplier PDR/Design review)

Types of Test Unit & Test Parameter

APPENDIX - 3 HYDRAULIC / ELECTRICAL CONNECTIONS DETAILS FOR TESTS ON PDA

Serial No	Tests	Stow Port	Deploy Port	Loading Guide Frame	Loading System	Proximity Sensor Supply	Torque
1	Bleeding	Supply	Supply	Connected	Disconnected	NA	NA
	Running In	Supply	Supply	Connected	Disconnected	NA	NA
2	Stow Port Proof Pressure Test	Supply	Open to atmosphere	Connected	Disconnected	NA	NA
3	Deploy Port Proof Pressure Test	Open to atmosphere	Supply	Connected	Disconnected	NA	NA
4	Lock Integrity Test	0 psi	0 psi	Connected	Connected	NA	NA
5	Limit Load End of Stroke Test	Supply	Supply	Connected	Connected	NA	NA
6	Snubbing Performance Test	Supply	Supply	Connected	Disconnected	NA	NA
7	Breakout Pressure Test - Stow Operation	Supply	Supply	Disconnected	Disconnected	NA	NA
8	Breakout Pressure Test - Deploy Operation	Supply	Supply	Disconnected	Disconnected	NA	NA
9	Lock Operation (Hydraulic Unlock/Lock) and Deploy Pressure	Supply	Supply	Connected	Disconnected	20 Vdc	NA
10	Manual Unlock Test	0 psi	0 psi	Connected	Disconnected	NA	75 Nm
11	External Leakage	Supply	Supply	Connected	Disconnected	NA	NA

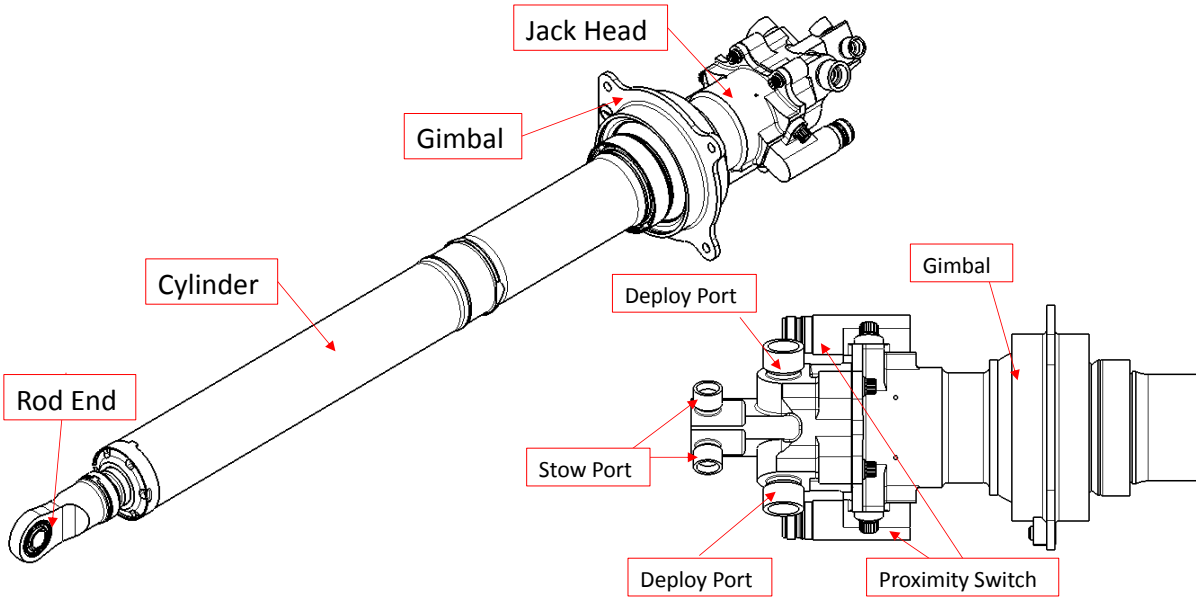
APPENDIX - 4 HYDRAULIC CONNECTIONS DETAILS FOR TESTS ON PLA

Serial No	Tests	Supply Port	Return Port
1	Bleeding	Supply	Return
	Running In	Supply	Return
2	Supply Port Proof Pressure Test	Supply	Measuring Cylinder
3	Return Port Proof Pressure Test	Measuring Cylinder	Supply
	Limit Load Tensile	Open to atmosphere	Open to atmosphere
4	Limit Load Compressive	Open to atmosphere	Open to atmosphere
5	Breakout pressure and Retract Pressure Test	Supply	Open to atmosphere
	Response Time	Supply	Return
6	External Leakage Test	Supply	Return
7	Low Pressure Leakage Test	Supply	Return

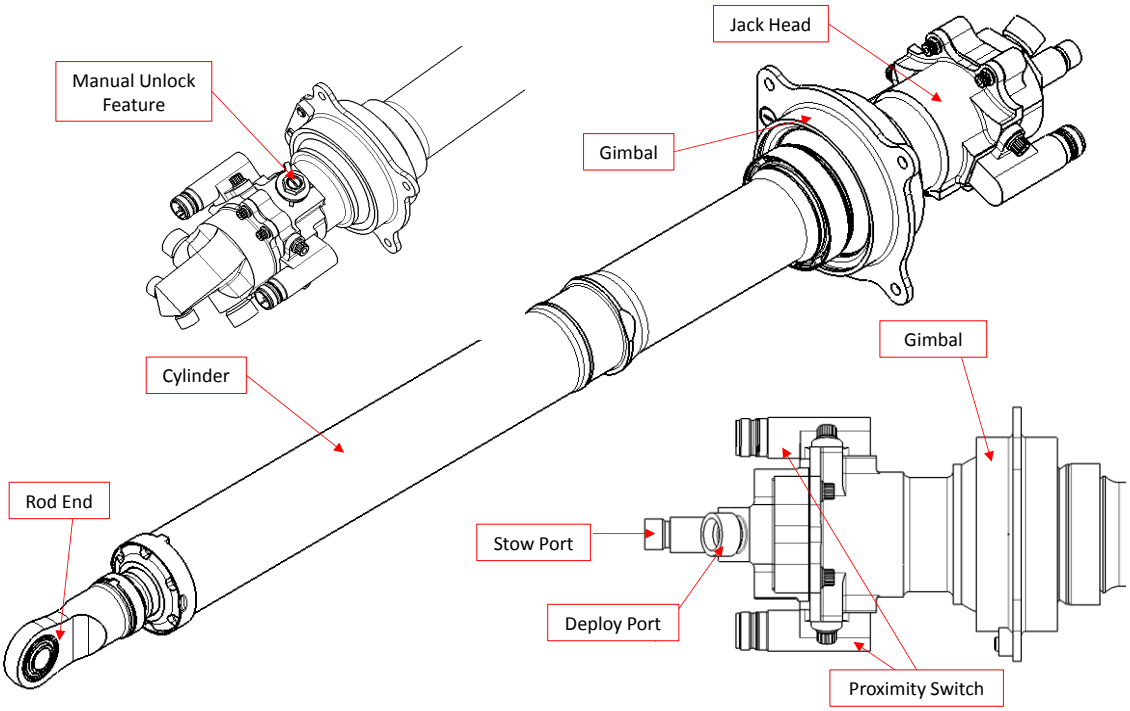
APPENDIX - 5 - Hydraulic Union Sizes

Test Unit	Supply	Return	Deploy	Stow
Pivot Door Actuator Upper	NA	NA	AS4375-08	AS4375-06
Pivot Door Actuator Lower	NA	NA	AS4375-08	AS4375-06
Primary Lock Actuator	AS4375-06	AS4375-05	NA	NA
Mating connections should be pressure rated.				

APPENDIX 6 - TECHNICAL SPECIFICATIONS OF PIVOT DOOR ACTUATORS



Pivot Door Actuator Upper, TY4013



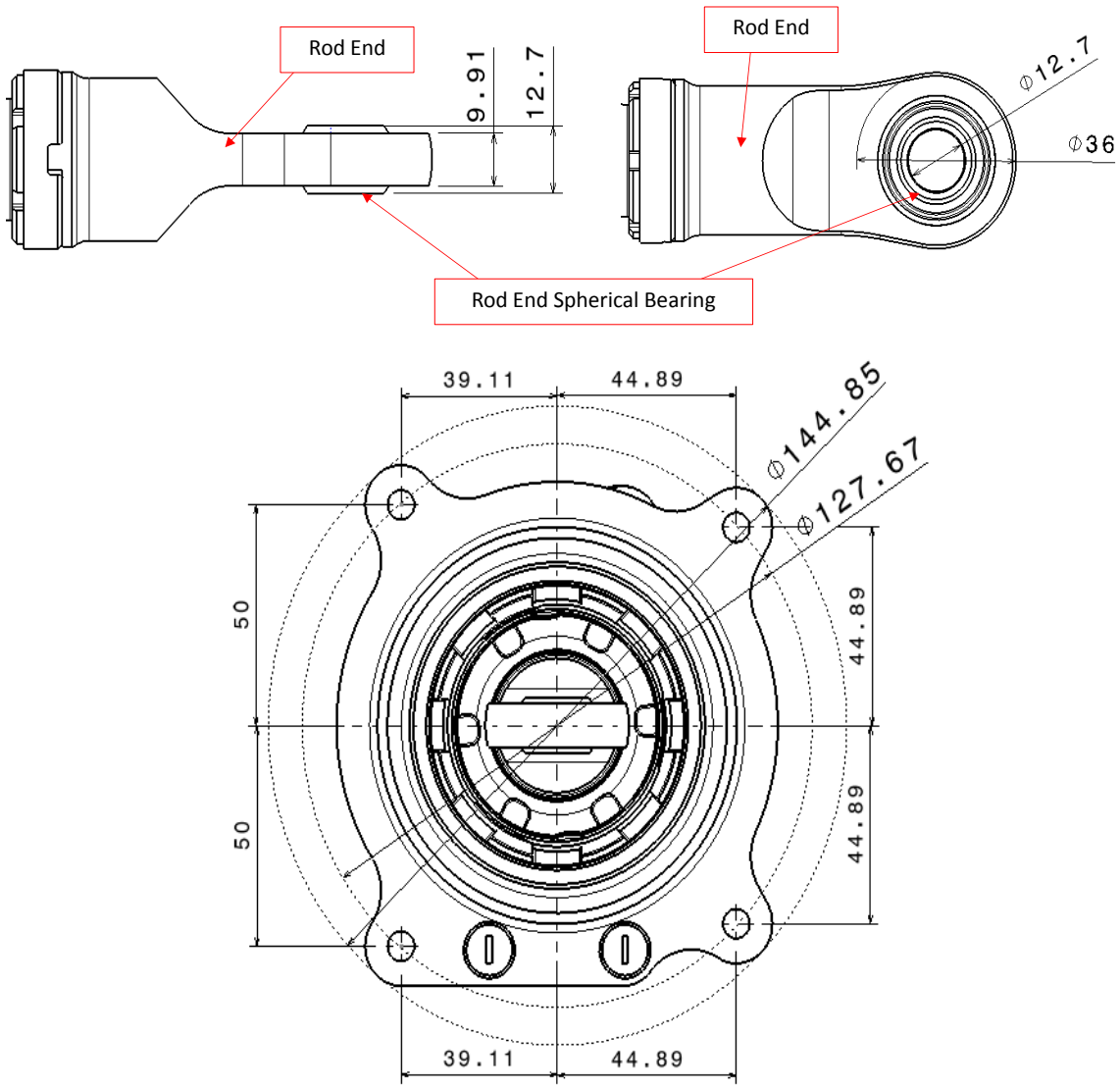
Pivot Door Actuator Lower, TY4014

Hydraulic connection details are mentioned in Appendix 5.

Actuator Length and Stroke details are mentioned in Appendix 2.

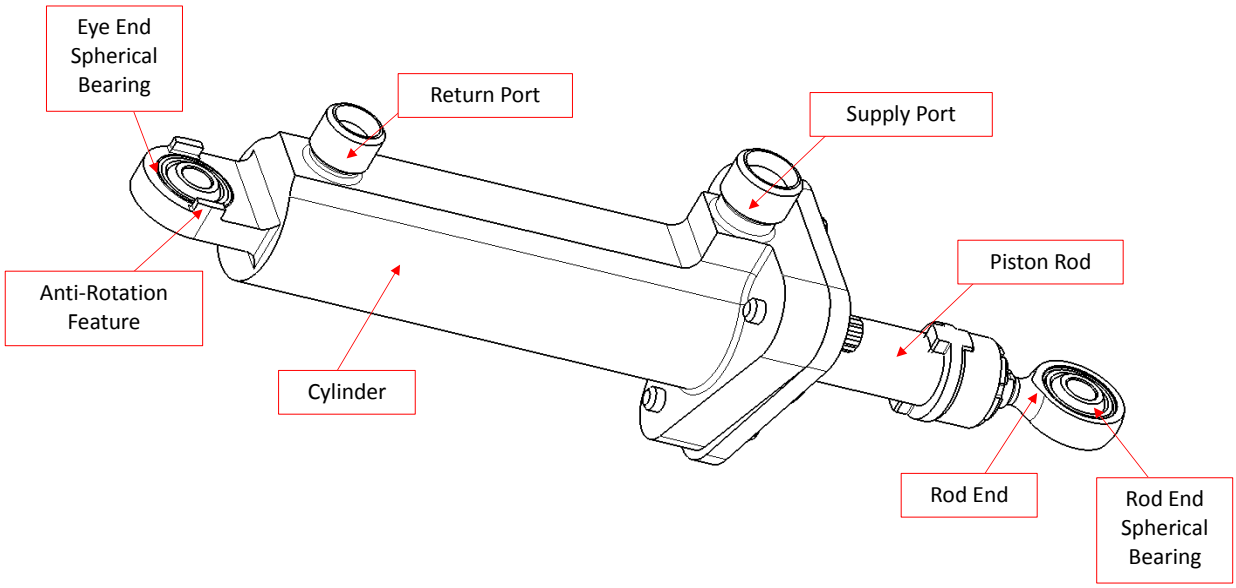
Actuator mounting ICD details for mounting bolt dimensions, bushing arrangements etc will be provided during Design Review/PDR.

All measurements are in mm.



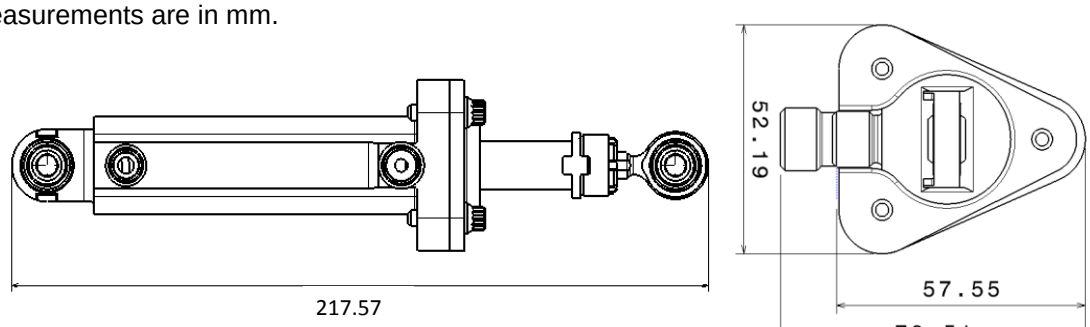
Actuator Mounting Interface Details for TY4013 & TY4014

APPENDIX - 7 - PLA TECHNICAL SPECIFICATIONS

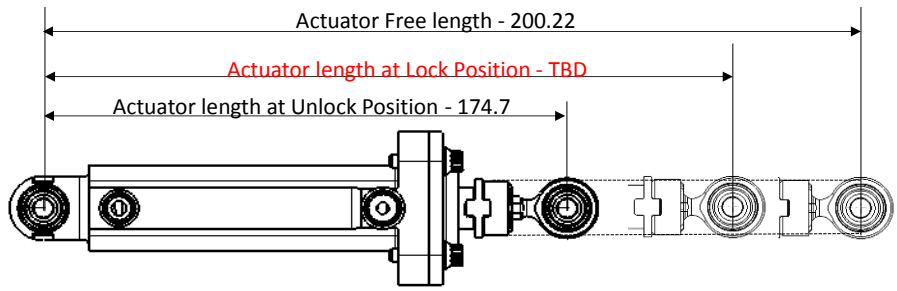


Primary Lock Actuator, TY4016

All Measurements are in mm.



Actuator Envelope Details



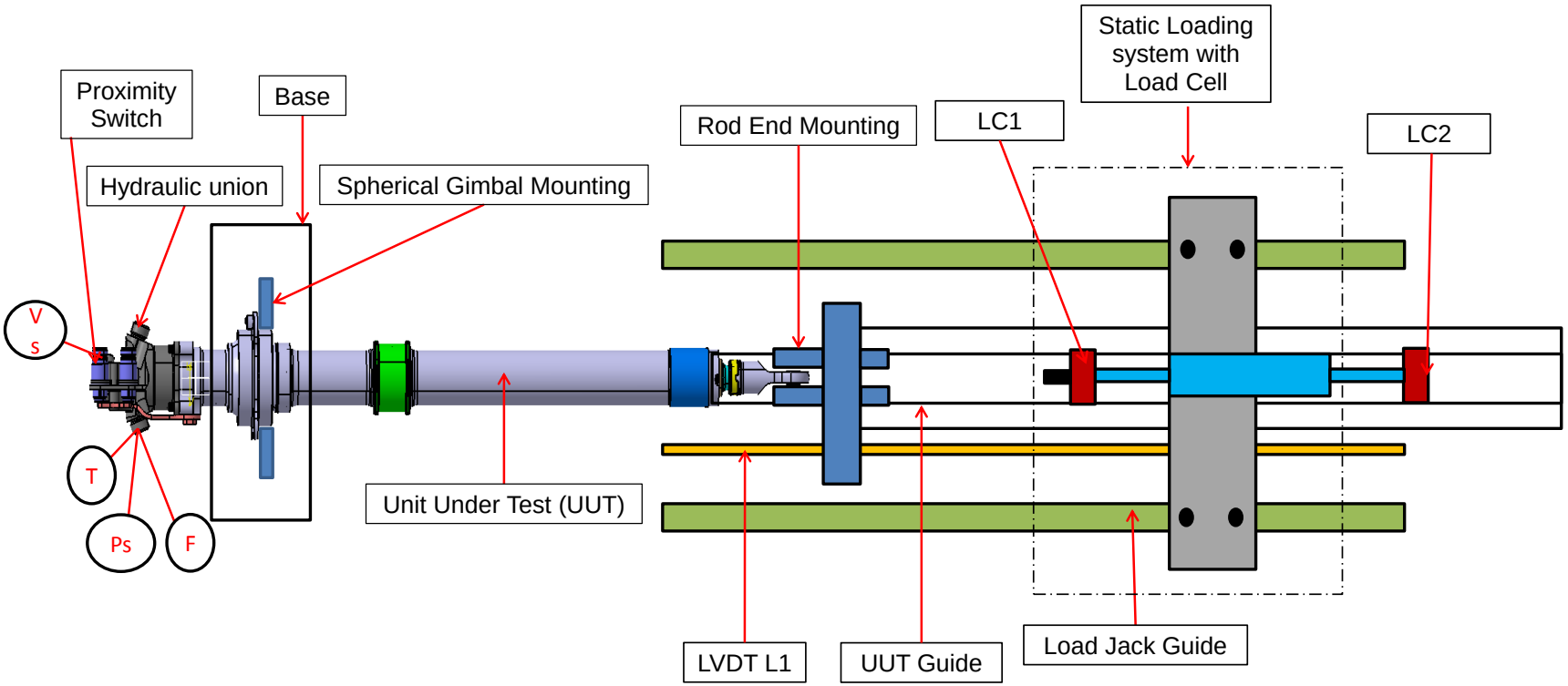
Actuator Lengths

Hydraulic connection details are mentioned in Appendix 5.

Actuator mounting ICD details for mounting bolt dimensions, bushing arrangements etc will be provided during design review/PDR.

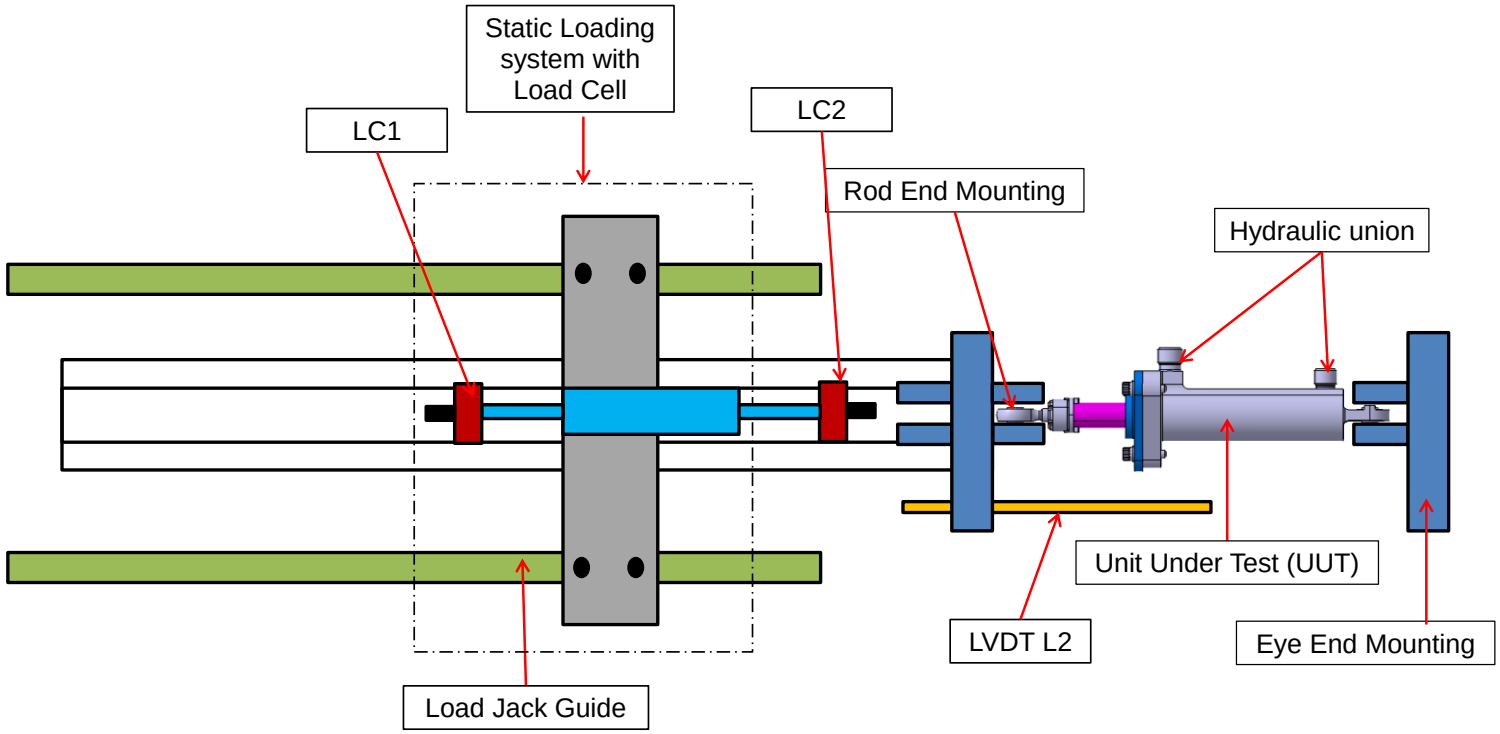
Appendix - 8 Test Rig Representative Layout

For PDA actuator:

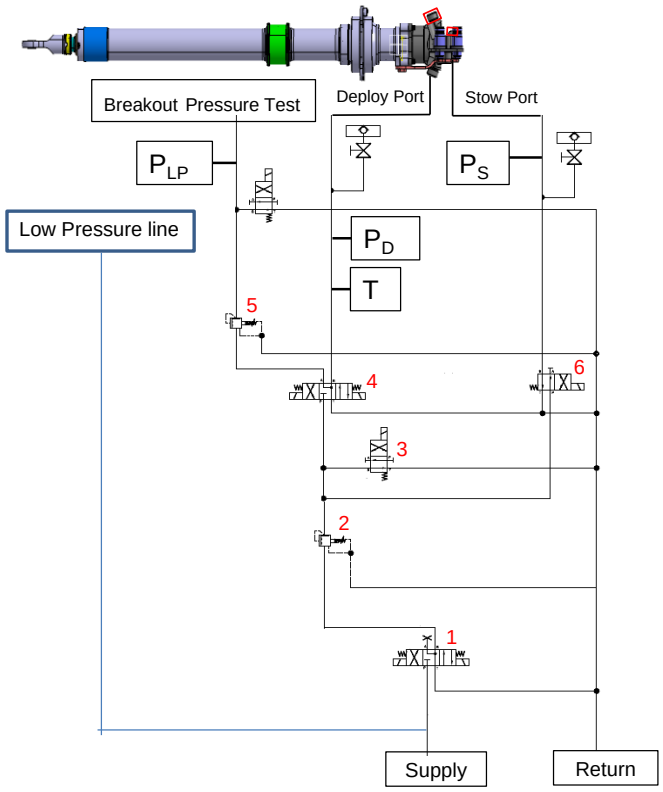


1. The loading system shall be connected to the UUT only during limit load test.

For PDA actuator:



1. The loading system shall be connected to the UUT only during limit load test.



1. Supply Direction Control Valve
2. High Pressure Reducer Valve
3. System Unloader/Dump Valve
4. Direction Control Valve
5. Low Pressure Reducer Valve
6. Stow Port Pressure Enable Valve

Test Rig Representative Hydraulic Schematic

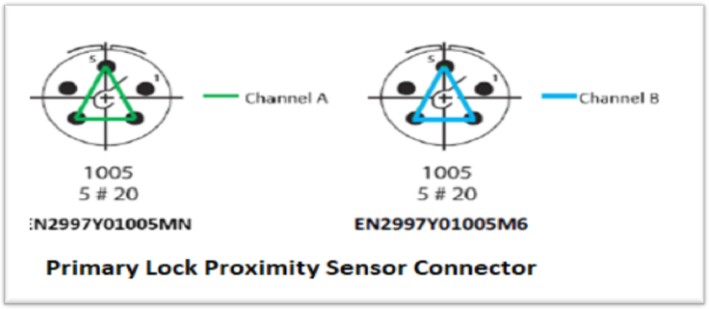
APPENDIX 9- Electrical Power Requirements

Proximity Switch: General	Proximity switches are located on the Pivot Door Actuators. They are 2 state, eddy current type proximity switches.

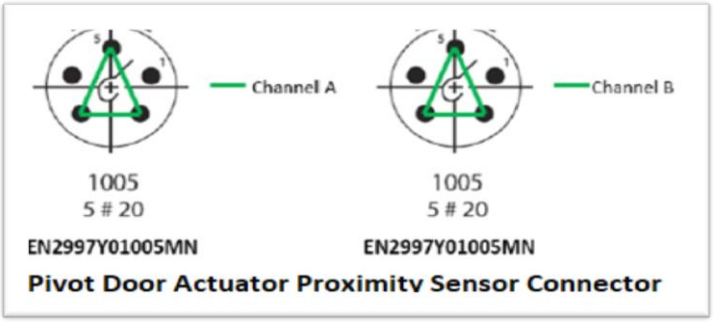
Nominal operating voltage 20.2VDC
Minimum excitation voltage 16VDC
Maximum excitation voltage 26VDC
Excitation current 10mA maximum (at maximum excitation voltage)
Switching frequency 50Hz max

Signal current (Closed/Target Near) ≤ 10mA
Signal Voltage (Closed/Target Near) 0-2VDC
Signal current (Open/Target Far) ≤ 50 micro amps max
Signal Voltage (Open/Target Far) 15.95-25.95VDC
Power On / Reset Time 15ms max

Connector Pin	Signal Name
1	Not used
2	Excitation
3	Return
4	Not used
5	Signal

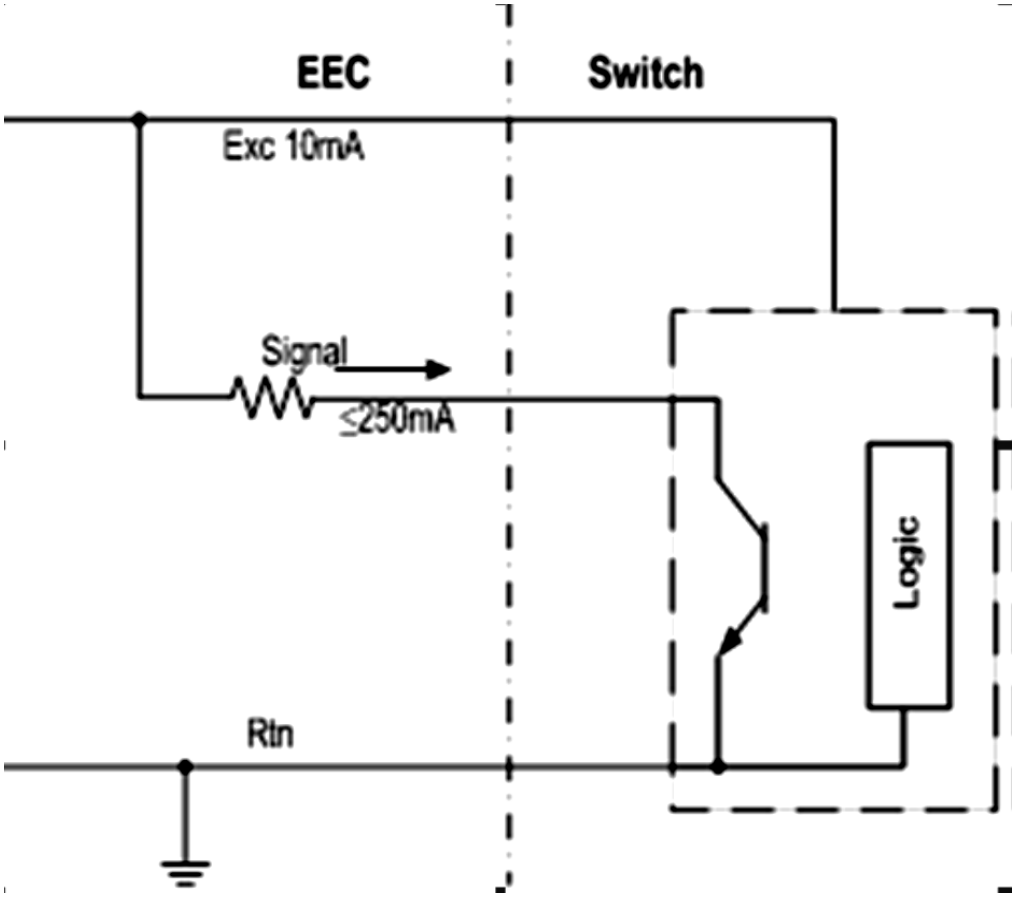


Primary Lock Proximity Sensor Connector



Pivot Door Actuator Proximity Sensor Connector

PROXIMITY SWITCH INDICATION		
LOCATION	TARGET NEAR / SWITCH CLOSED	TARGET FAR / SWITCH OPEN
Primary locks	Locked	Unlocked
Locking Actuator	Locked	Unlocked



Proximity Switch Electrical Schematic for Pivot Door Actuators

Note: For electrical connectors and pin details, if there is any change it will be provided in PDR stage.

APPENDIX - 10 - Rig Instrumentation Requirement

Nomenclatures	PARAMETERS	RANGE	SYSTEM ACCURACY
V_S	Proximity Switch Signal Voltage	0 – 32 VDC	± 0.5% FSD
L1	Rig LVDT (For PDA)	0 – 23.3 inch (0 – 600 mm)	± 0.15% FSD
L2	Rig LVDT (For PLA)	0 – 4 inch (0 – 100 mm)	± 0.5% FSD
P_R/P_D	Pressure	0 - 6000 psi (0 - 413 bar)	±15 psi
P_R	Pressure (For return pressure on PLA)	0 - 1000 psi (0 - 69 bar)	± 5 psi
P_{LP}	Pressure (For Breakout Pressure Test)	0 - 500 psi (0 - 35 bar)	± 3 psi
T	Fluid Temperature	+ 90°F ± 30°F (+32°C ± 16°C)	± 3.2° F (± 2° C)
LC1	Load (For PDA)	0 – 12,500 lbf (0 – 55,600 N)	±20 lbf
LC2	Load (For PLA)	0 – 3,000 lbf (0 – 44,48 N)	±10 lbf

Rig shall incorporate a separate LVDT and Load Cell during the PLA PAT tests to meet the accuracy requirement