



AEROSPACE RECOMMENDED PRACTICE

ARP6249™

Issued

2020-12

Hydraulic Pump Minimum Inlet Pressure Test

RATIONALE

There is a need to provide the aerospace industry with recommendations on how to conduct and evaluate minimum inlet pressure testing for axial piston hydraulic pumps where entrained air can negatively impact pump performance. This document meets this need.

FOREWORD

An axial piston pump requires a minimum inlet pressure in order to achieve rated performance over the aircraft operating conditions. When determining a pump's minimum inlet capability, differences in test setup and test procedure should be minimized in order to accurately measure pump performance.

The test setup should take into account fluid inertia, frictional pressure drop, and entrained air (dissolved air coming out of solution) losses when selecting the hydraulic line between the reservoir and pump inlet port.

Other characteristics that impact the critical inlet performance to be considered for the test procedure and setup that drive critical inlet performance include:

- Displacement size
- Fluid type
- Speed
- Temperature
- Outlet pressure
- Compensator settings

The information recommended herein is intended to capture lessons learned of minimum inlet pressure tests in order to facilitate the production of useful, reproducible results at steady state conditions.

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TABLE OF CONTENTS

1.	SCOPE.....	3
1.1	Purpose	3
2.	REFERENCES.....	3
2.1	Applicable Documents	3
2.1.1	SAE Publications.....	3
2.2	Related Publications	3
2.2.1	SAE Publications.....	3
2.3	Definitions	3
3.	MINIMUM INLET PRESSURE TEST SETUP.....	3
3.1	General	3
3.1.1	Hydraulic Fluid	5
3.1.2	Nominated Fluid Temperature	5
3.2	Reservoir Design.....	5
3.2.1	Reservoir Shape	5
3.2.2	Reservoir Capacity.....	6
3.2.3	Upper Reservoir	6
3.2.4	Reservoir Ports	6
3.3	Pressure Loss	6
3.4	System Volume	6
4.	TEST PROCEDURE.....	6
4.1	Test Circuit Preparation	6
4.2	Critical Inlet Test at Rated Flow	6
4.3	Critical Inlet Test at Different Fluid Temperatures	8
4.4	Post Test Verification	8
5.	NOTES.....	8
5.1	Performance Specification Description	8
5.2	Air Leak Points in Setup.....	8
5.3	Reservoir	9
5.4	Rate of Decaying Inlet Pressure	9
5.5	Effects of Compensator Corner Point on Results	9
5.6	Revision Indicator.....	9
Figure 1	Critical inlet test circuit	4
Figure 2	Typical performance.....	7
Table 1	Critical inlet equipment.....	5

1. SCOPE

This SAE Aerospace Recommended Practice (ARP) contains technical information for conducting and evaluating the minimum inlet pressure capability of axial piston pumps.

1.1 Purpose

The purpose of this document is to provide step-by-step guidance how to setup and conduct the minimum inlet pressure test as specified in AS19692 and AS595. The low inlet pressure capability of pumps will be used to design the inlet portion of hydraulic systems on aircraft so as to provide the required transient flow response.

2. REFERENCES

2.1 Applicable Documents

The following publications form a part of this document to the extent specified herein. The latest issue of SAE publications shall apply. The applicable issue of other publications shall be the issue in effect on the date of the purchase order. In the event of conflict between the text of this document and references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

2.1.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or +1 724-776-4970 (outside USA), www.sae.org.

AS595 Aerospace - Civil Type Variable Delivery, Pressure Compensated, Hydraulic Pump

AS19692 Aerospace - Military Type Variable Delivery, Pressure Compensated Hydraulic Pump

2.2 Related Publications

The following publications are provided for information purposes only and are not a required part of this SAE Technical Report.

2.2.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or +1 724-776-4970 (outside USA), www.sae.org.

AIR1922 Aerospace - System Integration Factors That Affect Hydraulic Pump Life

AIR5829 Air in Aircraft Hydraulic Systems

ARP4024 Aircraft/Engine Fuel Pump Net Positive Suction Pressure Performance Test and Evaluation

2.3 Definitions

NOMINATED TEMPERATURE: This is the temperature of the hydraulic fluid at which the tests are conducted.

NOTE: The nominated temperature should be agreed between the pump supplier and purchaser/contractor.

3. MINIMUM INLET PRESSURE TEST SETUP

3.1 General

See Figure 1 and Table 1 for a typical test setup. Table 1 describes the typical equipment and instrumentation used for the critical inlet pressure test setup.