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Pneumatic fluid power — Electro-pneumatic pressure control valves —

Part 2: Test methods to determine main characteristics to include in the supplier's literature

Transmissions pneumatiques — Appareils électropneumatiques de distribution à commande continue de pression —

Partie 2: Méthodes d'essai pour déterminer les principales caractéristiques à inclure dans la documentation des fournisseurs

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 131, *Fluid power systems]*, Subcommittee SC 5, *Control products and components.*

This second edition cancels and replaces the first edition (ISO 10094-2:2010), which has been technically revised.

The main changes are as follows:

— Addition of definitions for response time, settling time, and shifting time in Clause 3;

— Revision of the procedure for the repeatability test: addition of 15 % and 85 % of the electrical control signal full-scale to tested values (in addition to 50 %) in 7.2.4;

— Addition of two subclauses relating to Sensitivity (7.3.7) and Offset (7.3.8) respectively;

— Revision of the test procedure to determine leakage characteristics to simplify the test practice (10.2).

— Deletion of the no tank test version and test circuit from the test practices in Clause 11 related to dynamic characteristics;

— The former subclause 11.2, frequency characteristics, has been made an informative annex (Annex A).

A list of all parts in the ISO 10094 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

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Introduction

In pneumatic fluid power systems, power is transmitted and controlled through a gas under pressure within a circuit.

When pressure tracking or pressure regulation is required, electro-pneumatic continuous pressure control valves can be used to track a variable set point with low tracking error or to maintain the pressure of the gas at an approximately constant level.

These control valves continuously modulate the pneumatic pressure of a system in response to a continuous electrical input signal and link the electrical input value to a proportional pressure value.

It is therefore necessary to know some performance characteristics of these electro-pneumatic continuous pressure control valves in order to determine their suitability.

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Pneumatic fluid power — Electro-pneumatic pressure control valves —

Part 2: Test methods to determine main characteristics to include in the supplier's literature

1 Scope

This document specifies the test procedures and a method of presenting results concerning the parameters which define the main characteristics to be included in the supplier's literature of the electro-pneumatic continuous pressure control valves, conforming to ISO 10094-1.

The purpose of this document is:

— to facilitate comparison by standardizing the test methods and the presentation of the test results, and

— to assist in the proper application of these components in compressed air systems.

The specified tests are intended to allow comparison between the different types of continuous pressure control valves; these are not production tests to be carried out on each manufactured product.

The tests described in this document are for components with an exhaust port vented to the atmosphere.

NOTE 1 The tests related to non-electrically modulated pneumatic continuous pressure control valves are specified in ISO 6953-2.

NOTE 2 The tests related to electro-pneumatic continuous flow control valves are specified in ISO 10041-2.

NOTE 3 ISO 6953-3 provides an alternate dynamic test method for flow-rate characteristics using an isothermal tank instead of a flow meter. However, this method measures only the decreasing flow rate part of the hysteresis curve of the forward flow and relief flow characteristics.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 5598, *Fluid power systems and components — Vocabulary*

ISO 6358-1, *Pneumatic fluid power — Determination of flow-rate characteristics of components using compressible fluids — Part 1: General rules and test methods for steady-state flow*

ISO 6953-1, *Pneumatic fluid power — Compressed air pressure regulators and filter-regulators — Part 1: Main characteristics to be included in literature from suppliers and product-marking requirements*

ISO 10094-1:2021, *Pneumatic fluid power — Electro-pneumatic pressure control valves — Part 1: Main characteristics to include in the supplier's literature*

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3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 5598, ISO 6953-1 and ISO 10094-1 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1
response time
time from initial electrical signal change to an observed output pressure equal to 90 % of the total change in pressure

3.2
settling time
time lapse from initial change to the time from which the observed output pressure remains between 95 % and 105 % of its total change in pressure

3.3
shifting time
time from initial electrical signal change to an observed output pressure equal to 10 % of the total change in pressure

4 Symbols and units

Table 1 — Symbols and units

Description	Symbol	Units
Maximum sonic conductance at the inlet	$C_{f,max}$	$m^3/(s \cdot Pa)$ (ANR)[b]
Sonic conductance at the exhaust	C_r	$m^3/(s \cdot Pa)$ (ANR)[b]
Hysteresis	H	% FS
Linearity	L	% FS
Sensitivity	m	Pa/V, Pa/mA or Pa/numerical signal
Offset	O	%
Atmospheric pressure	p_{atm}	Pa
Reference pressure	p_0	Pa
Total relative pressure at the inlet port[a]	p_1	Pa
Total relative pressure at the outlet port[a]	p_2	Pa
Maximum inlet pressure	$p_{1,max}$	Pa
Maximum regulated pressure	$p_{2,max}$	Pa
Volume flow rate at standard reference atmosphere	q_V	m^3/s (ANR)[b]
Maximum volume flow rate at the inlet	$q_{V,f,max}$	m^3/s (ANR)[b]
Volume flow rate at the outlet	$q_{V,r}$	m^3/s (ANR)[b]
Repeatability	r	% FS
Resolution	S	% FS
Reference temperature	T_0	K

[a] As described in ISO 11727.

[b] The reference atmosphere is defined in ISO 8778, i.e.: T_0 = 293,15 K, p_0 = 100 kPa (1 bar) and a relative humidity of 65 %.

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