
**Pneumatic fluid power — Electro-
pneumatic continuous flow control
valves —**

**Part 1:
Main characteristics to include in the
supplier's literature**

iTeh STANDARD PREVIEW

(standardsite.com)
*Transmissions pneumatiques — Distributeurs électropneumatiques à
commande continue de débit —*

*Partie 1: Principales caractéristiques à inclure dans la documentation
du fournisseur*

<https://standards.iteh.ai/catalog/standards/sist/27de8c8f-09d7-4e94-af7d-4251877a33dd/iso-10041-1-2010>



PDF disclaimer

This PDF file may contain embedded typefaces. In accordance with Adobe's licensing policy, this file may be printed or viewed but shall not be edited unless the typefaces which are embedded are licensed to and installed on the computer performing the editing. In downloading this file, parties accept therein the responsibility of not infringing Adobe's licensing policy. The ISO Central Secretariat accepts no liability in this area.

Adobe is a trademark of Adobe Systems Incorporated.

Details of the software products used to create this PDF file can be found in the General Info relative to the file; the PDF-creation parameters were optimized for printing. Every care has been taken to ensure that the file is suitable for use by ISO member bodies. In the unlikely event that a problem relating to it is found, please inform the Central Secretariat at the address given below.

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[ISO 10041-1:2010](https://standards.iteh.ai/catalog/standards/sist/27de8c8f-09d7-4e94-af7d-4251877a33dd/iso-10041-1-2010)

<https://standards.iteh.ai/catalog/standards/sist/27de8c8f-09d7-4e94-af7d-4251877a33dd/iso-10041-1-2010>



COPYRIGHT PROTECTED DOCUMENT

© ISO 2010

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

Published in Switzerland

Contents

Page

Foreword	iv
Introduction	v
1 Scope	1
2 Normative references	1
3 Terms and definitions	2
4 Symbols and unit	3
5 Characteristics	3
5.1 General	3
5.2 Electrical characteristics	3
5.3 Static characteristics	4
5.4 Dynamic characteristics	9
6 Identification statement (reference to this part of ISO 10041)	13
Bibliography	14

iTeh STANDARD PREVIEW
(standards.iteh.ai)

ISO 10041-1:2010

<https://standards.iteh.ai/catalog/standards/sist/27de8c8f-09d7-4e94-af7d-4251877a33dd/iso-10041-1-2010>

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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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.

ISO 10041-1 was prepared by Technical Committee ISO/TC 131, *Fluid power systems*, Subcommittee SC 5, *Control products and components*.

ISO 10041 consists of the following parts, under the general title *Pneumatic fluid power — Electro-pneumatic continuous flow control valves*:

- *Part 1: Main characteristics to include in the supplier's literature*
- *Part 2: Test methods to determine main characteristics to include in the supplier's literature*

iTeh STANDARD PREVIEW
(standards.iteh.ai)

ISO 10041-1:2010

<https://standards.iteh.ai/catalog/standards/sist/27de8c8f-09d7-4e94-af7d-4251877a33dd/iso-10041-1-2010>

Introduction

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

Electro-pneumatic continuous flow control valves continuously modulate the pneumatic power of a system in response to a continuous electrical control signal and link the electrical control quantity to the effective section of each variable port of the output stage (flow rate stage). The mass flow rate that crosses each restriction depends on the downstream and upstream pressures and the type of gas.

When control of position or force, including position- or force-tracking of a pneumatic cylinder, is required, electro-pneumatic continuous flow control valves can be used to precisely modulate the mass flow rates entering or exiting each cylinder chamber, resulting in a precise positioning. It is, therefore, necessary to know some performance characteristics of these electro-pneumatic continuous flow control valves in order to determine their suitability for a particular application.

iTeh STANDARD PREVIEW (standards.iteh.ai)

ISO 10041-1:2010

<https://standards.iteh.ai/catalog/standards/sist/27de8c8f-09d7-4e94-af7d-4251877a33dd/iso-10041-1-2010>

iTeh STANDARD PREVIEW
(standards.iteh.ai)

ISO 10041-1:2010

<https://standards.iteh.ai/catalog/standards/sist/27de8c8f-09d7-4e94-af7d-4251877a33dd/iso-10041-1-2010>

Pneumatic fluid power — Electro-pneumatic continuous flow control valves —

Part 1: Main characteristics to include in the supplier's literature

1 Scope

This part of ISO 10041 specifies the characteristics of electro-pneumatic continuous flow control valves that are to be included in the supplier's literature.

According to ISO 5598, continuous control valves include:

- electrically modulated pneumatic proportional flow control valves,
- pneumatic proportional flow control valves,
- flow control servo-valves.

This part of ISO 10041 is limited to the characterisation of valves that exhaust into the atmosphere except for two-port valves.

<https://standards.iteh.ai/catalog/standards/sist/27de8c8f-09d7-4e94-af7d-4251877a33dd/iso-10041-1-2010>

NOTE The characteristics of electro-pneumatic continuous pressure control valves are specified in ISO 10094-1.

2 Normative references

The following referenced documents are indispensable for the application 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 10041-2:2010, *Pneumatic fluid power — Electro-pneumatic continuous flow control valves — Part 2: Test methods to determine main characteristics to include in the supplier's literature*

ISO 10094-2:2010, *Pneumatic fluid power — Electro-pneumatic pressure control valves — Part 2: Test methods to determine main characteristics to include in the supplier's literature*

3 Terms and definitions

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

3.1 electro-pneumatic continuous flow control valve
flow control valve that continuously modulates the pneumatic power of a system in response to a continuous electrical control signal and that links the electrical control quantity to the effective section of each variable port of the output stage (flow rate stage)

NOTE The mass flow rate that crosses each restriction depends on the downstream and upstream pressures and the type of gas.

3.2 flow control servo-valve
electrically modulated continuous flow control valve with internal feedback control loop

3.3 inlet pressure
pressure at the inlet port of a component, piping or system

3.4 operating pressure
pressure measured by an external transducer, mounted on a measuring tube or on a volume connected to the working port of the control valve

iTeh STANDARD PREVIEW
(standards.iteh.ai)

3.5 exhaust pressure
pressure at the air exhaust port

3.6 electrical control signal set signal
electrical signal applied to a control device

<https://standards.iteh.ai/catalog/standards/sist/27de8c8f-09d7-4e94-af7d-4251877a33dd/iso-10041-1-2010>

NOTE The median of the electrical control signal is equal to the mean of the minimum and maximum values, usually noted as 0 %. In this part of ISO 10041, the electrical control signal is a symmetrical signal graduated in percent, varying from -100 % (minimum value) to +100 % (maximum value).

3.7 control signal-flow rate characteristic curve
graphical representation of the global flow rate versus the electrical control signal over its full scale while the operating and inlet pressures are held constant

3.8 pressure-flow rate characteristic curve
graphical representation of the global flow rate versus the pressure ratio while the electrical control signal and the inlet pressure are held constant

3.9 pressure gain characteristic curve at null operating flow rate
graphical representation of the operating pressure versus the electrical control signal over its full scale while the operating flow rate is null and the inlet pressure is held constant

3.10 leakage characteristic curve at null operating flow rate
graphical representation of leakage flow rate measured at the inlet port versus the electrical control signal over its full scale while the operating flow rate is null and the inlet pressure is held constant

4 Symbols and unit

For the purposes of the present document, the symbols and units listed in Table 1 apply.

Table 1 — Symbols and units

Description	Symbol	SI Unit
Critical back-pressure ratio	b	—
Sonic conductance	C	$\text{m}^3/(\text{s}\cdot\text{Pa})$ (ANR) ^a
Subsonic index	m	—
Atmospheric pressure	p_{atm}	Pa
Stagnation gauge pressure related to the inlet port ^b	p_1	Pa
Stagnation gauge pressure related to the working port ^b	p_2, p_4	Pa
Stagnation gauge pressure related to the air exhaust port ^b	p_3, p_5	Pa
Repeatability	r	%
Electrical control signal	w	V, mA or control signal
Cracking pressure	Δp_c	Pa
Resolution	S	%
^a Reference atmosphere is defined in ISO 8778 ^[2] , i.e.: $T_0 = 293,15 \text{ K}$, $p_0 = 100 \text{ kPa}$ (1 bar) and relative humidity of 65 %.		
^b In accordance with ISO 11727.		

ISO 10041-1:2010

5 Characteristics

5.1 General

Supplier's literature providing information about electro-pneumatic continuous flow control valves shall include the characteristics given in 5.2 to 5.4. Two-port electro-pneumatic continuous flow control valves are not concerned with the static characteristics specified in 5.3.3 and in 5.3.4 (pressure gain characteristic and maximum leakage flow rate at null operating flow rate).

The data provided by the supplier shall assist the user in selecting the electro-pneumatic continuous flow control valve that is best suited for a particular application.

The characterised valve shall be described as having a symmetrical electrical control signal varying from -100% to $+100\%$ around a median value, noted as 0% , in accordance with 3.6.

NOTE Even if the electrical control signal is not symmetrical, it is possible to describe it as a symmetrical signal as specified above. For example, in case of electrical control signal of 4 mA - 20 mA , the median value corresponds to the value of 12 mA , and the values of -100% and $+100\%$ correspond respectively to 4 mA and 20 mA .

5.2 Electrical characteristics

The required minimum voltage, the required minimum current and the required minimum power of the power supply shall be given.

5.3 Static characteristics

5.3.1 Control signal-flow rate characteristics

5.3.1.1 Characteristic curves

5.3.1.1.1 Characteristic curves shall be created using data from tests conducted in accordance with ISO 10041-2:2010, 7.2.1 to 7.2.4.

5.3.1.1.2 The actual flow rate at each working port measured at the same conditions as expected in normal use shall be indicated by curves, in accordance with Figure 1. Each curve describes the operating flow rate at the port under consideration, depending on the electrical control signal over its full scale, for given operating and inlet pressures noted in relative value, as shown in Figure 1.

5.3.1.1.3 For each working port, this graph shall have at least three curves that differ in their operating pressure, p_2 or p_4 , settings, as referenced in Figure 1, equal to, respectively:

- exhaust pressure (atmospheric pressure, p_{atm}),
- inlet pressure p_1 minus 100 kPa (1 bar), and
- inlet pressure p_1 (except for two-port valves).

5.3.1.1.4 Each curve shown in Figure 1 shall be plotted in accordance with ISO 10041-2:2010, 7.3.1.2 to 7.3.1.4, taking for each value of electrical control signal the mean value of two measured flow rates with both increasing and decreasing electrical control signals. Positive values of flow rate correspond to forward flow rates whereas negative values correspond to relief flow rates.

5.3.1.1.5 The curves obtained for the operating pressure, p_2 or p_4 , equal to the exhaust pressure (p_{atm}) show the maximum effective forward flow rate of the continuous flow control valve in relation to the electrical control signal. In the same way, the curves obtained for the operating pressure, p_2 or p_4 , equal to the supply pressure, p_1 show the maximum effective relief flow rate of the continuous flow control valve in relation to the electrical control signal. These two sets of curves define the network envelope characterising the control signal-flow rate curves for an operating pressure, p_2 or p_4 , varying between inlet (p_1) and exhaust (p_{atm}) pressure.

5.3.1.1.6 The curves obtained for the intermediary operating pressure value ($p_1 - 100$ kPa) enables the illustration of the form of the variation of the effective flow rate in relation to the electrical control signal for an operating pressure value other than the minimum or maximum.

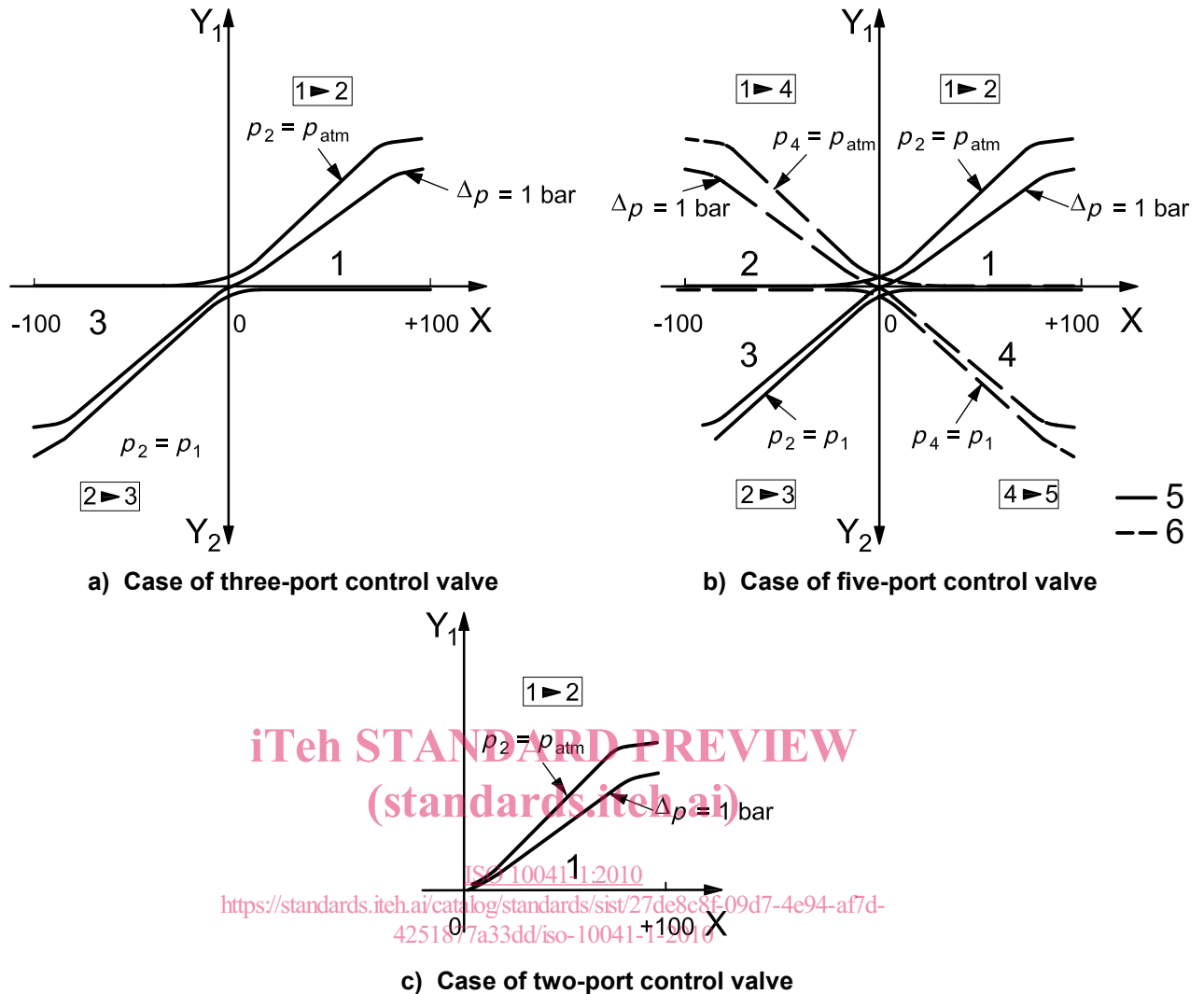


Figure 1 — Control signal-flow rate characteristic curves at inlet pressure of 630 kPa (6,3 bar)

5.3.1.2 Control signal-flow rate hysteresis

5.3.1.2.1 The hysteresis shall be calculated using the control signal-flow rate characteristic data obtained in accordance with the operating methods described in ISO 10041-2:2010, 7.2.2 to 7.2.4, for three different operating pressures (two different operating pressures for a two-port valve).

5.3.1.2.2 The control signal-flow rate hysteresis, expressed as a percentage of the operating flow rate range, shall be calculated according to ISO 10041-2:2010, 7.3.2, Equation (1).

5.3.1.2.3 The calculated value gives the maximum difference between the flow rate measured with both increasing and decreasing electrical control signal.