INTERNATIONAL STANDARD

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Pneumatic tools and machines — Electronic interfaces

Machines portatives pneumatiques et machines pneumatiques — Interfaces électroniques

Reference number
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Contents

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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.

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.

International Standard ISO 11123 was prepared by Technical Committee ISO/TC 118, *Compressors, pneumatic tools and pneumatic machines*, Subcommittee SC 3, *Pneumatic tools and machines*.

Introduction

Portable and fixed pneumatic tools used primarily for driving threaded fasteners are often produced with electronic devices for monitoring and control. Until now, there has been no International Standard giving guidance to manufacturers on a uniform means of connection of pneumatic tools and electronic equipment.

Contributions and comments solicited from manufacturers and users of both pneumatic tools and electronic equipment have lead to the preparation of this International Standard which is intended to promote the interchangeability of tools and equipment to the mutual benefit of manufacturers and users.

Pneumatic tools and machines — Electronic interfaces

1 Scope

This International Standard specifies requirements for the interface between a pneumatic tool and its electric or electronic monitoring and control system.

This International Standard is applicable to pneumatic tools and machines for applications where there is a need for electric or electronic monitoring or control. Since this type of interface is most commonly used in tools for driving threaded fasteners, the tool is referred to as a nutsetter throughout this International Standard.

Requirements are given for portable hand-held or fixed single-spindle nutsetters (as illustrated in figure 1) and for multiple-spindle nutsetters [as illustrated in figures 2 a) and 2 b)].

2 Normative reference

The following standard contains provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the edition indicated was valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent edition of the standard indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

MIL-C-26482,[1] *General specification for electrical (circular, miniature, quick-disconnect, environment resisting) receptacles and plugs.*

1) US military specification.

3 General electronic parameters

3.1 Torque transducers

3.1.1 Design

Torque transducers shall use a 700 Ω full-bridge configuration. The sensitivity at rated torque shall be in the range 0,5 mV/V to 2 mV/V. The transducer shall be capable of withstanding up to 30 V r.m.s. excitation voltage.

3.1.2 Shunt calibration values

The following values apply with the calibration resistor connected between the (+) signal and (+) excitation leads for the forward (clockwise) direction, and between the (+) signal and (−) excitation leads for the reverse (counter-clockwise) direction:

0,5 mV/V: 349,65 kΩ

0,8 mV/V: 218,4 kΩ

1 mV/V: 174,65 kΩ

1,6 mV/V: 109 kΩ

2 mV/V: 87,15 kΩ

3.1.3 Accuracy classification

3.1.3.1 The inherent accuracy characteristics of transducers incorporated in a nutsetter are not totally indicative of the accuracy of the nutsetter. The accuracy of a nutsetter is influenced by the joint rate and the instrument systems, e.g. control elements and encoders, but these factors are outside the scope of this International Standard. The accuracy of the transducer employed in a nutsetter is an important determinant of the accuracy class of the nutsetter,

and certain minimum accuracy requirements are included in this International Standard.

NOTE 1 The method for testing and evaluating the installation torque of pneumatic tools for threaded fasteners is described in ISO 5393:1994, *Rotary tools for threaded fasteners — Performance test method.*

3.1.3.2 Two accuracy classes are specified (see table 1). Class A is intended to apply to those operations requiring a critical assessment of the applied torque, while class B is intended to apply to operations requiring only functional monitoring.

3.2 Angle encoders

Angle encoders shall be incremental and use dual track outputs. The outputs shall be capable of sinking 10 mA at a voltage no higher than 0,5 V when in the low state and of having an output voltage higher than 3 V at 0,1 mA output current when in the high state. The supply voltage shall be 5 V. The encoder shall produce a minimum of one pulse per 2° of spindle rotation.

3.3 Control devices

Control devices such as reverse valves, shut-off valves, etc., when integrated with the nutsetter, should operate at a maximum excitation voltage not exceeding 36 V d.c. The average continuous current shall be less than 1 A.

3.4 Connectors

Connector designations are given in tables 2 to 5.

4 Single-spindle systems

4.1 Monitoring and control equipment for single-spindle nutsetters can be connected in three different ways depending on the monitoring and control equipment included, as illustrated in figure 1.

4.2 The connector specifications and pin designations shall comply with table 2.

5 Multiple-spindle systems

5.1 Monitoring and control equipment for multiple-spindle nutsetters can be connected with

a) an individual connector for each signal circuit,

b) a connector for one to five signal circuits, or

c) multiples of the five-circuit connector,

as illustrated in figures 2 a) and 2 b).

5.2 Connector specifications and pin designations shall comply with

a) table 3 for encoders, connection 5,

b) table 4 for transducers, connection 6, and

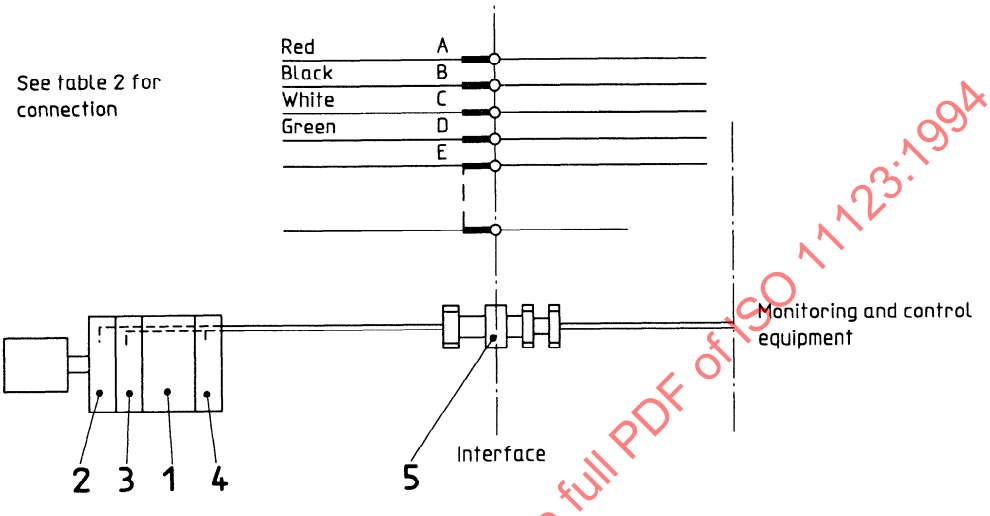
c) table 5 for integral controllers, connection 7.

Table 1 — Accuracy class requirements

Parameter	Requirement for accuracy class	
	A	B
Combined error of rated output and shunt calibration accuracy[1)]	⩽ ± 0,5 % of full scale	⩽ ± 2 % of full scale
Zero offset	± 2 % of full scale[2)]	± 15 % of full scale
Linearity[1)]	± 0,2 % of full scale	± 0,6 % of full scale
Temperature effect[1)] (0 °C to 60 °C)	0,01 %/°C	0,05 %/°C

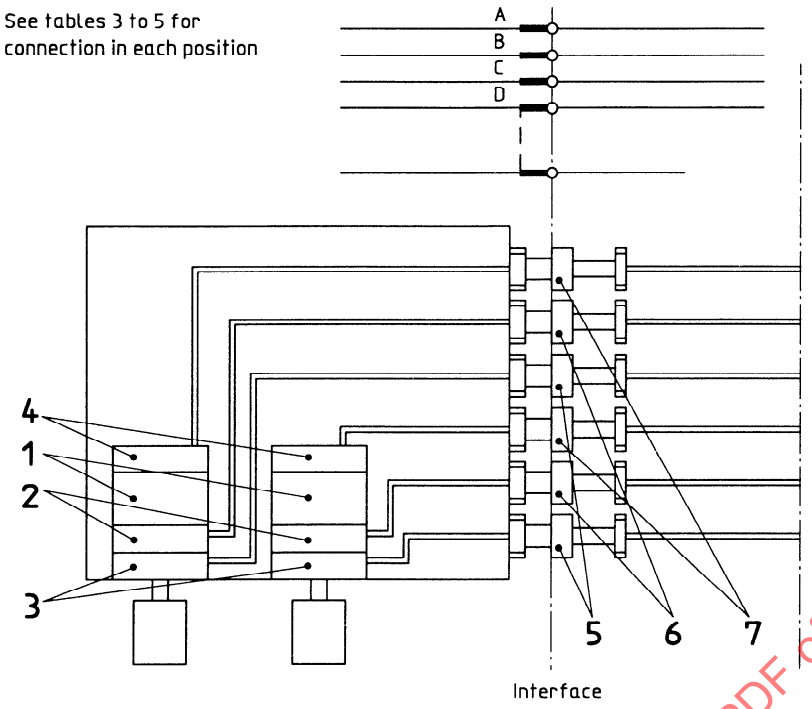
1) The transducer accuracy, linearity and temperature effects specified are applicable for a life of 500 000 cycles.

2) The zero offset specified for class A applies to new equipment. For transducers in use, ± 10 % of full scale zero shift is permissible before removal from production is recommended.

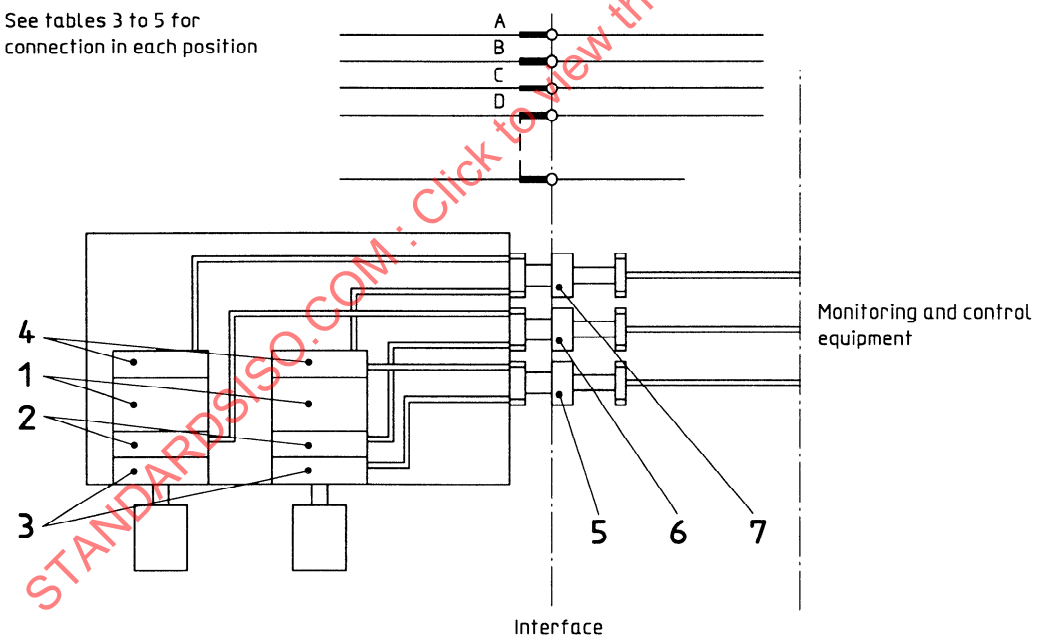


1 Nutsetter
2 Torque transducer
3 Angle encoder
4 Integral control device
5 Connector

Figure 1 — Connection for single-spindle systems



a) Connections for monitoring individual characteristics



b) Connections for monitoring common characteristics

1 Nutsetter
2 Angle encoder
3 Torque transducer
4 Control device
5 Torque transducer connection at tool
6 Angle encoder connection at tool
7 Control device connection at tool

Figure 2 — Connections for multiple-spindle nutsetters

Table 2 — Single-spindle nutsetter

Signal	**Torque transducer**		**Torque transducer and encoder**			**Torque transducer, encoder and integral control device**		
Connector designation	MS3126F-10-6P[1], MS3116F-10-6P [1] or equivalent		MS3126F-14-19P[1], MS3116F-14-19P[1] or equivalent			MS3126F-14-19P[1], MS3116F-14-19P[1] or equivalent		
Pin	**Function**	**Colour**	**Function**		**Colour**	**Function**		**Colour**
A	(+) Excitation	Red	(+) Excitation	Torque transducer	Red	(+) Excitation	Torque transducer	Red
B	(–) Excitation	Black	(–) Excitation		Black	(–) Excitation		Black
C	(+) Signal	White	(+) Signal		White	(+) Signal		White
D	(–) Signal	Green	(–) Signal		Green	(–) Signal		Green
E	Shield		Shield			Shield	Encoder	
F	[2]		Trailing pulse	Encoder	[3]	Trailing pulse		[3]
G			[2]			[2]		
H			Leading pulse		[3]	Leading pulse		[3]
J			[2]			[2]		
K			[2]			(+) Excitation	Air supply control (forward)	[3]
L			[2]			(–) Excitation		[3]
M			[2]			(+) Excitation	Air supply control (reverse)	[3]
N			[2]			(–) Excitation		[3]
P			Encoder ground		[3]	Encoder ground		[3]
R			(+) 5 V d.c. encoder		[3]	(+) 5 V d.c. encoder		[3]
S			[2]			[2]		
T			[2]			[2]		
U			[2]			[2]		
V			[2]			[2]		

1) In accordance with MIL-C-26482.

2) Not used or used for special purposes.

3) At choice of user.

Table 3 — Encoders

Connector for	Individual signals		One to five signals[1]		
Connector designation	MS3122E-8-4P[2] or MS3112E-8-7P[2]		MS3122E-14-19P[2], MS3112E-14-9P[2] or equivalent		
Pin	Function	Colour	Function		Colour
A	(+) 5 V	Red	(+) 5 V		Red
B	Ground	Black	Ground		Black
C	Leading pulse	White	Leading pulse	Encoder No. 1	3)
D	Trailing pulse	Green	Trailing pulse		3)
E			Leading pulse	Encoder No. 2	3)
F			Trailing pulse		3)
G			Leading pulse	Encoder No. 3	3)
H			Trailing pulse		3)
J			Leading pulse	Encoder No. 4	3)
K			Trailing pulse		3)
L			Leading pulse	Encoder No. 5	3)
M			Trailing pulse		3)
N			4)		
P			4)		
R			4)		
S			4)		
T			4)		
U			4)		
V			4)		

1) Use multiples for more than five signals.
2) In accordance with MIL-C-26482.
3) At choice of user.
4) Not used or used for special purposes.

Table 4 — Transducers

Connector for	Individual signals		One to five signals[1]		
Connector designation	MS3122E-10-6P[2], MS3112E-10-6P[2] or equivalent		MS3122E-16-26P[2], MS3112E-16-26P[2] or equivalent		
Pin	Function	Colour	Function		Colour
A	(+) Excitation	Red	(+) Excitation	Transducer No. 1	3)
B	(−) Excitation	Black	(−) Excitation		3)
C	(+) Signal	White	(+) Signal		3)
D	(−) Signal	Green	(−) Signal		3)
E	Shield		Shield		3)
F	4)		(+) Excitation	Transducer No. 2	3)
G			(−) Excitation		3)
H			(+) Signal		3)
J			(−) Signal		3)
K			(+) Excitation	Transducer No. 3	3)
L			(−) Excitation		3)
M			(+) Signal		3)
N			(−) Signal		3)
P			(+) Excitation	Transducer No. 4	3)
R			(−) Excitation		3)
S			(+) Signal		3)
T			(−) Signal		3)
U			(+) Excitation	Transducer No. 5	3)
V			(−) Excitation		3)
W			(+) Signal		3)
X			(−) Signal		3)
Y			4)		
Z			4)		
a			4)		
b			4)		
c			4)		

1) Use multiples for more than five signals.

2) In accordance with MIL-C-26482.

3) At choice of user.

4) Not used or used for special purposes.

Table 5 — Integral control devices

Connector for	Individual signals			One to five signals[1]		
Connector designation	MS3122-8-4P[2] or MS3112-8-4P[2]			MS3122E-14-12P[2], MS3112E-14-12P[2] or equivalent		
Pin	Function		Colour	Function		Colour
A	(+) Excitation	Air supply control (forward)	3)	(+) Air supply control (forward)	Motor No. 1	3)
B	(−) Excitation		3)	(+) Air supply control (reverse)		3)
C	(+) Excitation	Air supply control (reverse)	3)	(+) Air supply control (forward)	Motor No. 2	3)
D	(−) Excitation		3)	(+) Air supply control (reverse)		3)
E				(+) Air supply control (forward)	Motor No. 3	3)
F				(+) Air supply control (reverse)		3)
G				(+) Air supply control (forward)	Motor No. 4	3)
H				(+) Air supply control (reverse)		3)
J				(+) Air supply control (forward)	Motor No. 5	3)
K				(+) Air supply control (reverse)		3)
L				(−) Common air supply (forward)[4]		3)
M				(−) Common air supply (reverse)[4]		3)

1) Use multiples for more than five signals.
2) In accordance with MIL-C-26482.
3) At choice of user.
4) Shall be No. 16 heavy duty contacts.