

JIS

JAPANESE INDUSTRIAL STANDARD

General Rule for Pneumatic Systems

JIS B 8370—1988

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In the event of any doubt arising,
the original Standard in Japanese is to be final authority.

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General Rule for Pneumatic Systems

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1. Scope

This Japanese Industrial Standard specifies the general items related to pneumatic systems to be used in mechanical equipment, hereinafter referred to as the "system". The mechanical equipment herein mentioned designates any equipment to be used in production, such as machining, assembly, pneumatically actuated and controlled.

Further, this Standard is to be guidelines for both manufacturer and purchaser to ensure the following items:

- (1) Securing the safety of personnel
- (2) Prevention of failure and accident
- (3) Long life of equipment
- (4) Easy and economic maintenance

Further, this Standard is to be reference and guidelines for determination and designing of detailed specifications related to mechanical equipment utilizing pneumatic components and devices.

- Remarks 1. This Standard has been prepared on the base of ISO 4414 and is basically in accord with contents.
2. The items specified for safety are enclosed in a rectangle the title of item or text.
 3. The items with titles which are starred * need the agreement between parties of delivery to define the requirements and responsibility of execution.
 4. The units and numerical values shown in { } in this Standard are in accordance with conventional system of units and are appended for informative reference.

2. Applicable Standards

The applicable standards are shown as follows.

JIS B 0125, JIS B 0142, JIS B 8371, JIS B 8372, JIS B 8378,
JIS C 4003, JIS C 4505.

3. Definitions

For the purpose of this Standard, the definitions given in JIS B 0142 apply.

Applicable Standards and Corresponding International Standard: See page 25.

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4. General Requirements

4.1 Safety

4.1.1 Fall-Safe Concept When designing pneumatic circuits, the state of possibility of failures (including the abnormalities of control system) shall be considered in all aspects. The components shall be selected, applied, mounted and adjusted so that in the event of any failure, the safety of personnel shall be the prime consideration and the damage to equipment may be minimized.

4.1.2 Application of Concept The application of concept shall be as follows:

- (1) The components constructing system shall be operated within the range of specifications indicated by manufacturer.
- (2) The parts constructing system shall be protected against over-pressure.
- (3) The system shall be designed and constructed so that components are located at the positions where they are easily accessible and may be able to be safely adjusted and serviced.
- (4) The loss of pressure even if occurred shall not cause hazard.
- (5) The exhausting air shall not cause hazard.
- (6) The protection measures against earthquake shall be taken.

4.2 Specification Requirements

4.2.1 Special Site Conditions* The supplier and purchaser shall investigate special site conditions and the design of system shall take account of these conditions.

Further, examples of special site conditions are shown in the following:

- (1) Vibration, excessive contamination and high humidity
- (2) The siting of equipment at altitudes 1000 m or higher above sea level
- (3) Generation of fire hazard
- (4) Special maintenance conditions
- (5) Specifications of electric circuits, e.g. voltage and its tolerance, frequency, available power (if limited), etc.
- (6) Protection of electrical devices

4.2.2 Ambient Temperature of System The range of ambient temperature of the site where the equipment is set shall be stated. The equipment shall operate satisfactorily under these conditions.

4.2.3 Maintenance Requirements

4.2.3.1 Equipment Location Pneumatic equipment and piping shall be accessible and so mounted as not to interfere with the adjustment or maintenance of equipment. Particular attention shall be given to the location of equipment which needs regular maintenance.

4.2.3.2 Component Replacement Components shall be installed so that they can be easily replaced without dismantling other adjacent components.

4.2.3.3 Lifting All components, equipment or assemblies with mass 15 kg or over shall be equipped with sling fitting at adequate place.

4.2.3.4 Equipment Installation All components shall be installed according to manufacturer's instruction to use.

4.2.4 Layout Drawings

4.2.4.1 Setting and Foundations The supplier shall provide the purchaser with details of setting drawing and foundation requirements. If there are two or more assemblies, the dimensional relationships shall be clearly described.

4.2.4.2 Piping* Where requested on the purchase specifications and confirmed in the delivery specifications, the supplier shall present piping diagram. Photographs which clearly show the piping arrangement and assembly, may be substituted by agreement between the parties concerned.

4.2.5 Procured Products to Be Used for Equipment The supplier should, preferably, use commercially available parts (keys, bearings, seals, washers, plugs, fasteners, etc.) meeting Japanese Industrial Standards and components with size and shape specified in Japanese Industrial Standards (shaft and spline sizes, port sizes, mounting dimensions, interface patterns, etc.).

4.2.6 Language* The purchaser and supplier shall agree on the language to be used in technical data. Further, the supplier shall be responsible for ensuring that the translation has the same meaning as the original text.

4.2.7 Maintenance Data The supplier shall provide the purchaser with maintenance data for all pneumatic components and devices clearly describing the following items.

- (1) Procedures of start-up and shut-down
- (2) Procedure of adjustment
- (3) Lubricating positions and classification of lubricant
- (4) Maintenance procedures for unique assemblies
- (5) Positions of drain ports, filters, test ports, etc. that require regular maintenance.
- (6) List of all components used in the system. In this list, for the components meeting the Japanese Industrial Standards, the indication symbols shall be indicated.

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(7) List of spare parts

4.2.8 Tests

4.2.8.1 Performance Test The system shall be sufficiently performance tested to ascertain conformance with this Standard and contract specifications.

4.2.8.2 Noise Level* The noise level of installed pneumatic equipment shall be same as agreed at the time of contract.

4.2.8.3 External Leakage There shall be no external leakage from system exceeding the permissible amount at the time of purchaser's acceptance.

4.2.9 Data to Be Presented by Supplier

4.2.9.1 Final Data

(1) Final circuit diagrams, drawings and instruction of use (including maintenance data) shall conform to the equipment to be shipped and be presented to the purchaser not later than the time of equipment delivery.

(2)* Where requested on the deal sheet or order sheet of purchaser, final circuit diagram and drawings shall be on reproducible paper which shall not be folded.

4.2.9.2 Maintenance Manuals* The supplier shall advise the purchaser the availability of maintenance manuals for parts of equipment meeting the Japanese Industrial Standards [as described in 4.2.7 (6) and (7)].

4.2.9.3 Modifications Whenever the supplier makes modifications, the supplier shall record them and notify the purchaser.

4.2.10 Preparation for Transportation

4.2.10.1 Indication of Piping When the equipment and its component parts need to be transported separately, removed pipings and their corresponding terminal ports and connectors shall be marked with identical symbols.

4.2.10.2 Packaging* All equipment shall be packaged in a manner that protects it from damage and distortion and preserves its indication marks during transportation.

4.2.10.3 Sealing of Openings Exposed openings in pneumatic equipment shall be sealed. Male threads shall be protected during transportation. These seals shall only be removed immediately prior to reassembly. Sealing caps shall be used only in the case where their removal is required before reassembly.

4.3 Description of Technical Data

4.3.1 Circuit Diagrams The representation of circuit diagrams shall be as follows:

- (1) Circuit diagrams shall use graphic symbols specified in JIS B 0125.
- (2) The graphic symbols shall, unless specially notified, represent units at rest (in the state where all power off, circuits depressurized and ready for start).
- (3) Graphic symbols shall be positioned on the diagram so that the function may be easily followed on circuit.
Further, it is not necessary for the graphic symbol positions to correspond to the real arrangement of device depicted.
- (4) Cross-over of pipe lines should, preferably, be kept to a minimum.
- (5) Each item shown on the circuit diagram shall be attached with a separate designation or indication (see 4.4.2 and 4.4.4).
- (6) Ports, test points, air-bleed points and orifices should, preferably, be marked with symbols (see 4.4.3 and 7.2.6).
- (7) Pipe lines between air-pressure sources and machines shall be marked with identical symbol, at both ends.

4.3.2 Technical Data The following (1) to (16) shall be shown on circuit diagram or on separate paper.

- (1) Indication by name, type number, manufacturing number (or design number) and manufacturer's name.
- (2) Nominal diameter, wall thickness and specifications of pipes and hoses.
- (3) Internal diameter of tube, rod, and stroke of each cylinder (where necessary the estimated cylinder force and speed required for use).
- (4) The amount of air consumption (converted to standard condition) and torque output required for use of each pneumatic motor and rotary actuator.
- (5) Amount of air delivery (converted to standard condition) and direction of rotation as viewed from driven shaft end of each compressor.
- (6) Output, rotatory speed and type of each compressor drive motor.
- (7) Set pressure of each pressure control valve.
- (8) Type of filters and details and quantity of filter material.
- (9) When required, time sequence chart and data describing operations including functions of related electrical and mechanical control devices and actuating equipment.
- (10) Clear and simple indication of functional elements of circuits included in manifold. Where boundary lines or boundary envelopes are used for this purpose, the boundary indicated shall not include any graphical symbol of component other than components connected with inside and outside of manifold.

- (11) Clear indication of the function of each actuator in working direction.
- (12) Location, size and type of test and drain points in the circuit.
- (13) Indication of all component and manifold ports (same as marked on component).
- (14) Necessary flow rate and range of pressure of cooling water and maximum temperature of water supply.
- (15) Volume of air receiver and maximum usable pressure.
- (16) Name, classification and volume of lubricant to be supplied to lubricator.

4.4 Identification

4.4.1 Components The following (1) to (4) shall be indicated in a permanent and easily legible manner on all components.

- (1) Manufacturer's name and address
- (2) Manufacturer's type or model number
- (3) Graphic symbols according to JIS B 0125 and correct indications of all ports
- (4) Maximum usable pressure

In addition to (1) to (4), the items shown in Table 1 should, preferably, be indicated. Where the area usable to identification is small, only the manufacturer's name and type or model number may be indicated.

4.4.2 Components of System Each pneumatic component shall be appended with item number and character symbol.

This item number shall be same as used in circuit diagram, list and layout of components.

The item number should, preferably, be indicated clearly and permanently on the adjacent installation but not on component.

4.4.3 Ports Component ports (including pilot ports, test and bleed ports) shall be indicated with marks same as need in circuit diagram and by the clear and permanent manner.

4.4.4 Operating Parts of Valves

4.4.4.1 Operating Parts Other than the Electrical Operating parts of valve and their functions shall be indicated with marks same as used in circuit diagram and by the clear and permanent manner.

4.4.4.2 Electrical Operating Parts The electrical operating parts shall use the same marks to correspond to electrical circuit diagram and pneumatic circuit diagram.

Table 1. Items to Be Preferably Indicated

Component	Item to be indicated	Remark
(1) Compressor	Rated output (amount of free air converted to intake condition) Required input Speed of rotation Direction of rotation Production number	
(2) Pneumatic motor and rotary actuator	Amount of air consumption (in standard condition) Direction of rotation Speed of rotation Production number Torque (at nominal pressure) Angle of rotation	Apply to pneumatic motor Apply to rotary actuator
(3) Cylinders	Cylinder bore diameter Piston rod diameter Stroke	
(4) Pressure control valves	Range of pressure adjustment	In accordance with JIS B 8372
(5) Electro magnetic valves (indicate on solenoid or coil)	Voltage AC frequency or DC Class of insulation	In accordance with JIS C 4003
(6) Pressure switches	Range of pressure adjustment Pressure differential range Voltage and contact capacity of switch	In accordance with JIS C 4505
(7) Air receiver and surge tanks	Hydraulic test pressure and date of test Design working pressure and code related to manufacture of vessels Volume Production number	To be marked in accordance with either of the following. (a) Stamped on a metal plate which is welded to the vessel (b) Stamped on a position of vessel low in internal stress (end plate for example) No stamping shall be allowed on the cylindrical shell.