INTERNATIONAL STANDARD

ISO 24225

First edition
2022-06

Ships and marine technology — Pneumatic quick-closing control devices

Navires et technologie maritime — Dispositifs de commande pneumatiques à fermeture rapide

Reference number
ISO 24225:2022(E)

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Published in Switzerland

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Foreword

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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).

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This document was prepared by Technical Committee ISO/TC8, *Ships and marine technology*, Subcommittee SC3, *Piping and machinery*.

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.

Introduction

A pneumatic quick-closing control device is a remote operation system used to control quick-closing valves, fire dampers and shutters of marine quick-closing systems. It plays a vital role in protecting the safety of ships and offshore facilities, and reducing fire losses. It also helps to ensure compliance with the requirements specified in the applicable sections of *The International Convention for the Safety of Life at Sea* (SOLAS)[1].

Ships and marine technology — Pneumatic quick-closing control devices

1 Scope

This document specifies the terms and definitions, design, system components, classification, technical requirements and test methods of marine pneumatic quick-closing control devices. It also addresses system pressures, automatic controls, alarms, signal feedback, performance test methods, safety, packaging and handling of pneumatic quick-closing control devices.

This document applies to the design, manufacture and acceptance of pneumatic quick-closing control devices.

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 780, *Packaging — Distribution packaging — Graphical symbols for handling and storage of packages*

GB/T 13306, *Plates*

IEC 60068-2-1, *Environmental testing — Part 2-1: Tests — Test A: Cold*

IEC 60068-2-2, *Environmental testing — Part 2-2: Tests — Test B: Dry heat*

IEC 60068-2-30, *Environmental testing — Part 2-30: Tests — Test Db: Damp heat cyclic*

IEC 60068-2-6, *Environmental testing — Part 2-6: Tests — Test Fc: Vibration (sinusoidal)*

IEC 60068-2-11, *Basic environmental testing procedures — Part 2-11: Tests — Test Ka: Salt mist*

IEC 61000-4-5, *Electromagnetic compatibility — Testing and measurement techniques —Surge immunity test*

IEC 60529, *Degrees of protection provided by enclosures (IP code)*

IEC 60533, *Electrical and electronic installations in ships — Electromagnetic compatibility (EMC) – Ships with a metallic hull*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminology 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
pneumatic quick-closing control device
PQCD
system installation that realizes remote fast operation, status display and alarms via remote control to devices such as pneumatic quick-closing valves, pneumatic fire dampers and pneumatic shutters

3.2
control and display panel
electrical panel for electric-controlled operation and status display where the quick-closing device is installed

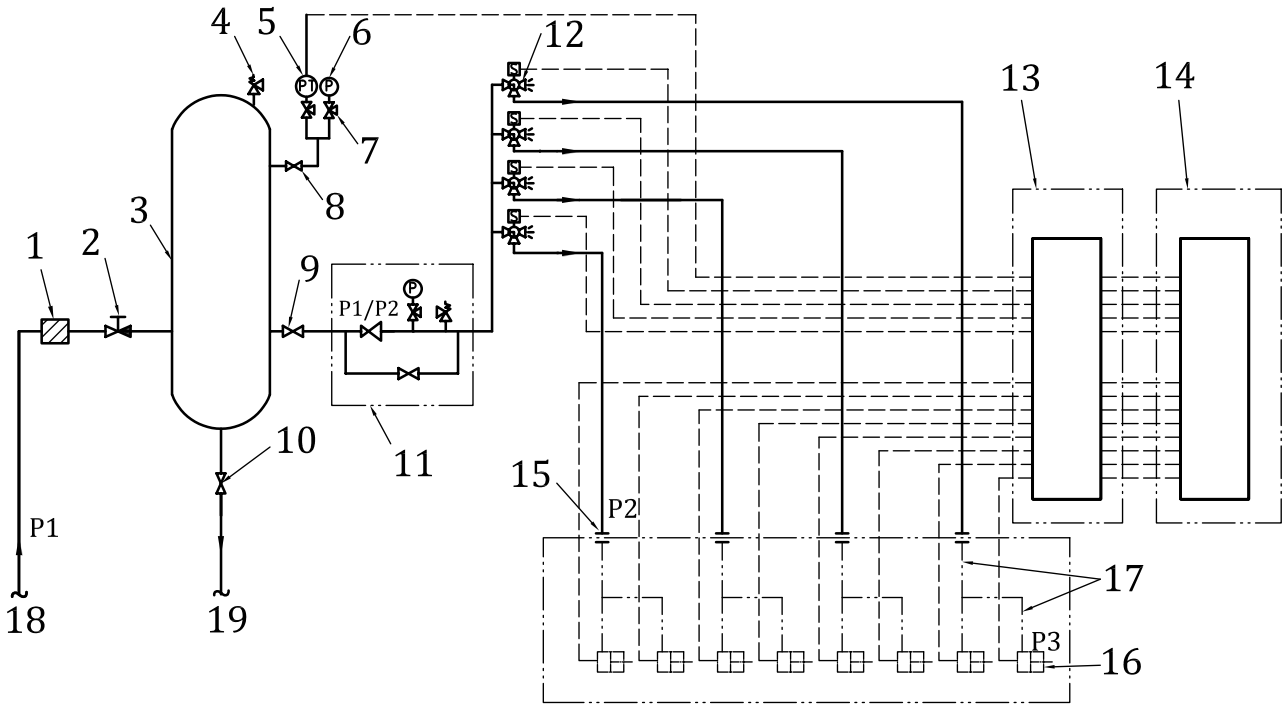
3.3
remote control and display cabinet
electrical cabinet for electric-controlled operation and status display in a location away from the quick-closing device (such as a control room)

4 Design

4.1 System composition

A pneumatic quick-closing system is composed of a pneumatic quick-closing control device (PQCD), pipelines and the objects to be controlled, such as pneumatic quick-closing valves, pneumatic fire dampers and pneumatic shutters.

Other components in the PQCD system, including valves and piping, are illustrated in Figure 1.



Key

1 air filter
2 inlet valve
3 compressed air tank
4 safety valve
5 pressure transducer
6 pressure gauge
7 meter three-way test valve
8 meter root valve
9 outlet valve
10 drain valve
11 pressure reducing valve group (optional, shall be equipped only when P1 > P2)
12 three-way valve
13 control and display panel (optional, according to user needs)
14 remote control and display cabinet (optional, according to user needs)
15 output end of PQCD
16 object to be controlled (such as pneumatic quick-closing valve, pneumatic fire damper and pneumatic shutter)
17 pipeline
18 compressed air inlet
19 drain outlet
P1 Max. rated input pressure
P2 Max. rated output pressure
P3 Min. working pressure at the input ends of controlled objects

Figure 1 — Schematic diagram of pneumatic quick-closing system

4.2 Requirements

4.2.1 Pressures of the PQCD system shall be designed as per Table 1.

Table 1 — System pressure

Maximum rated input pressure P1	Maximum rated output pressure P2	Minimum working pressure P3
P1 ≤ 3,0 MPa	0,5 MPa –1,0 MPa	0,3 MPa –0,5 MPa

4.2.2 The air output control valve of the PQCD system shall be able to independently complete the air supply and pressure relief of the controlled pipeline, so as to facilitate the action and reset of the controlled object. A silencer shall be installed at the pressure relief outlet of the control valve. The control valve usually adopts three-way valve, which can also be replaced by other valves or valve groups with the same function as above.

4.2.3 PQCD shall be able to provide operational control to pneumatic quick-closing valves, pneumatic fire dampers and pneumatic shutters. Three-way valves shall operate correctly.

4.2.4 PQCD with valve position display shall provide real time monitoring of the open/closed status and remote display of valve position status of pneumatic quick-closing valves, pneumatic fire dampers and pneumatic shutters.

4.2.5 The PQCD shall be designed as per the fail-safe principle and shall send out alarm signals in case of failure. PQCD shall be designed such that upon failure of a component, subsystem or system, the output automatically reverts to a pre-determined design state of least critical consequence. Typical failsafe states are: as is; open; or closed. In addition, other devices or systems may also be activated as needed in order to maintain overall safety.

4.2.6 The alarms of PQCD shall include “power supply failure”, “air supply failure” and other alarms. PQCD shall separately display alarm signals of failures occurred simultaneously.

4.2.7 The indication and alarm system of the PQCD shall have a self-detection function, such as a lamp test button, which can provide an alarm (or indication) test with regard to its own fault to avoid a no alarm status or false alarm (or false indication).

4.2.8 PQCD shall be independent of other safety systems and alarm systems. In case of a fault of the PQCD, normal operation of other monitoring and alarm systems shall not be affected.

4.2.9 The design of a PQCD shall ensure that any fault occurred during the operation process does not cause any other fault occurrence, and the risks are lowered as much as possible. Power failure of PQCD or air supply interruption shall not cause the last ordered positions of pneumatic quick-closing valves, fire dampers or shutters controlled by it to change before the failure. The exception is for those controlled objects designed to act automatically in case of power failure or air supply interruption.

4.2.10 The PQCD shall be set up with a communication interface to external systems according to the user's requirements in order to transfer information (such as alarm information) to external systems and receive information from external systems.

4.2.11 In case of a power supply disruption, the PQCD can be manually operated to close all pneumatic quick-closing valves, pneumatic fire dampers and pneumatic shutters. Manual operation can be achieved by a three-way valve with manual function, or by other methods.

4.2.12 The output force of the PQCD shall meet the requirements for quick closing of controlled pneumatic quick-closing valves, pneumatic fire dampers and pneumatic shutters and 1,2 times that of the moment under minimum pressure.

4.2.13 An air filter shall be installed at the compressed air inlet of the PQCD unless the air source itself has an air filter.

4.2.14 Safety valves shall be set at the end of compressed air tanks and pressure reducing valve groups. Opening pressure of safety valves shall be 1,1 times the maximum rated working pressure. Stop check valves shall be set in the inlet of compressed air tanks.

4.2.15 The pressure reducing valve groups of the PQCD shall be equipped with a manual bypass or be set as parallel double pressure reducing valve sets.

4.2.16 Selection of pressure piping shall consider strength calculations and conform to the requirements for piping strength and materials as specified by the classification society.

4.3 Materials

4.3.1 Main materials for the PQCD system can conform to recognized national or international standards and requirements specified by the classification society.

4.3.2 Materials for compressed air tanks can conform to recognized national or international standards for pressure vessels, such as those specified by classification societies or the ASME Boiler and Pressure Vessel Code[2].

4.3.3 Materials for piping shall be quality carbon steel with yield strength no less than 200 N/mm^2. Equivalent materials complying with a national or international standard can be considered for acceptance.

4.4 Classifications and types

PQCDs are classified into different types as follows:

a) whether they are equipped with pressure reducing valve groups;

b) whether the compressed air tank is separate from the PQCD;

c) quantity of control pipelines;

d) control methods;

e) display options of valve positions.

The designation of type codes is illustrated in Figure 2.