International Standard 4093

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Road vehicles — Fuel injection pumps — High-pressure pipes for testing

Véhicules routiers — Pompes d'injection — Tuyauteries haute pression pour essais

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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.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

International Standard ISO 4093 was prepared by Technical Committee ISO/TC 22, *Road vehicles*.

This second edition cancels and replaces the first edition (ISO 4093-1978), the dimensions table of which has been technically revised.

Users should note that all International Standards undergo revision from time to time and that any reference made herein to any other International Standard implies its latest edition, unless otherwise stated.

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Road vehicles — Fuel injection pumps — High-pressure pipes for testing

1 Scope

This International Standard specifies the functional requirements of a range of high-pressure pipes for use on benches for the testing and setting of fuel injection pumps intended for compression ignition (diesel) engines.

Only dimensions and requirements affecting the hydraulic characteristics of the pipes are defined. Other requirements, such as the type of end connections or shape of the pipes when bent, are not included as these depend on the connections provided on the pump outlets and injector inlets, and on the design features of individual pumps and test benches.

2 Field of application

This International Standard applies to a range of pipes to enable the pump and engine manufacturer to choose a suitable type of pipe for pump deliveries up to 300 mm^3/stroke/cylinder. The particular pipe to be used shall be identified by the pump manufacturer in the test schedule for each individual pump type and application.

3 Dimensions

The ten types of pipe specified in the table form a range of standardized high-pressure pipes for testing.

NOTE — If pipes of dimensions other than those specified in the table must be used for special technical reasons, the dimensions of such non-standard pipes shall be clearly specified in the pump test schedule.

4 General requirements

4.1 The pipes may be of any ferrous material, usually cold-drawn mild steel, and shall have a smooth internal bore, free from cracks or other structural weaknesses and from corrosion or other matter likely to cause damage to the fuel injection system.

4.2 After making the end connections, any closing-in of the pipe shall be removed by inserting a reamer of the nominal internal diameter of the pipe to a depth at least twice that of the length of the deformed end of the pipe. Any closing-in of the ends after extended use shall also be similarly removed.

Table — Dimensions of high-pressure pipes

Dimensions in millimetres

ISO designation	Internal diameter	External diameter	Length	Recommended bend radius min.
ISO 4093-1	2 ± 0,025	6	600 ± 5	16
ISO 4093-2	2 ± 0,025	6	845 ± 5	16
ISO 4093-3	3 ± 0,025	6	600 ± 5	25
ISO 4093-4	3 ± 0,025	6	1 000 ± 5	25
ISO 4093-5	3 ± 0,025	8	750 ± 5	50
ISO 4093-6	3 ± 0,025	8	1 000 ± 5	50
ISO 4093-7	4 ± 0,025	8	1 000 ± 5	50
ISO 4093-8	4 ± 0,025	8	1 500 ± 5	50
ISO 4093-9	2 ± 0,025	6	450 ± 5	16
ISO 4093-10	3 ± 0,025	8	600 ± 5	50

4.3 The radius of any bend subsequently made in manufacturing the pipes shall be not less than that recommended in the table measured from the centreline of the pipe.

4.4 Pipes shall be washed internally after the making of ends and bending, in order to remove extraneous matter.

For storage, the ends shall be closed off from ingress of air in order to avoid internal corrosion.

5 Designation of high-pressure pipes

Pipes shall preferably be identified by a tag or clip citing the ISO designation in accordance with the table, for example

ISO 4093-1

6 Bibliography

ISO 2974, *Road vehicles — High pressure pipe fittings with 60° female cone.*

ISO 4008, *Road vehicles — Fuel injection pump testing —*

Part 1: Dynamic conditions.

Part 2: Static conditions.

ISO 4010, *Road vehicles — Calibrating nozzle, delay pintle type.*