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Agricultural irrigation equipment — Plastics saddles for polyethylene pressure pipes

Matériel agricole d'irrigation — Selles de dérivation en matière plastique pour le raccordement de tuyau en polyéthylène utilisé sous pression

Reference number
ISO 13460:1998(E)

Foreword

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International Standard ISO 13460 was prepared by Technical Committee ISO/TC 23, *Tractors and machinery for agriculture and forestry*, Subcommittee SC 18, *Irrigation and drainage equipment and systems*.

Annex A of this International Standard is for information only.

International Organization for Standardization
Case postale 56 • CH-1211 Genève 20 • Switzerland
Internet iso@iso.ch

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Agricultural irrigation equipment — Plastics saddles for polyethylene pressure pipes

1 Scope

This International Standard specifies the required properties and test methods for plastics saddles for assembly on polyethylene (hereinafter, "PE") pressure pipes used in above-ground and underground irrigation systems conveying water at temperatures not exceeding 45 °C.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were 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 editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 7-1:1994, *Pipe threads where pressure-tight joints are made on the threads — Part 1: Dimensions, tolerances and designation.*

ISO 1167:1996, *Thermoplastics pipes for the conveyance of fluids — Resistance to internal pressure — Test method.*

ISO 2859-1:—[1)], *Sampling procedures for inspection by attributes — Part 1: Sampling plans indexed by acceptable quality level (AQL) for lot-by-lot inspection.*

ISO 3459:1976, *Polyethylene (PE) pressure pipes — Joints assembled with mechanical fittings — Internal under-pressure test method and requirements.*

ISO 4059:1978, *Polyethylene (PE) pipes — Pressure drop in mechanical pipe-jointing systems — Method of test and requirements.*

ISO 4427:1996, *Polyethylene (PE) pipes for water supply — Specifications.*

ISO 8779:1992, *Polyethylene (PE) pipes for irrigation laterals — Specifications.*

ISO 9625:1993, *Mechanical joint fittings for use with polyethylene pressure pipes for irrigation purposes.*

ISO 12162:1995, *Thermoplastics materials for pipes and fittings for pressure applications — Classification and designation — Overall service (design) coefficient.*

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1) To be published. (Revision of ISO 2859-1:1989)

3 Definitions

3.1
saddle
fitting used to assemble a branch outlet to a pipe through a boring in the wall of the pipe

See figure 1.

3.2
branch outlet
outlet of a saddle the axis of which is perpendicular to the axis of the pipe on which the saddle is installed

See figure 1.

3.3
nominal size
numerical designation used to refer to the size of a saddle which is identical to the nominal diameter of the pipe on which it is intended for assembly

3.4
nominal pressure
PN
pressure used to classify a saddle which is identical to the nominal pressure of the pipe on which it is intended for assembly

Without protrusion into the pipe With protrusion into the pipe

Figure 1 — Examples of plastics saddles

4 Material

The metal parts of the saddle shall be manufactured from corrosion-resistant materials.

All parts of the saddle coming in contact with water shall be resistant to agricultural chemicals used in irrigation, such as fertilizer solutions, plant protection materials and fluids used for removal of blockages in emitters and emitting pipe systems.

Plastics parts of the saddle that are exposed to ultraviolet radiation under the working conditions in which the saddle operates shall be resistant to ultraviolet radiation.

Plastics parts that enclose waterways shall be opaque or shall be provided with an opaque cover.

5 Workmanship and appearance

The saddle shall be free of burrs or other features likely to damage the pipe or present a safety hazard during installation. The bore of the saddle outlet shall be free of irregularities which may restrict the water flow.

The saddle shall be designed so as to cause minimum interference to the flow of water in the pipe on which it is assembled.

The internal and external surfaces of the saddle shall be clean and free of grooves, pinholes, voids or other features likely to affect the performance and service of the system.

The saddle shall be manufactured of such diameter and within such tolerances as will permit its use with PE pipes in accordance with ISO 8779 and ISO 4427.

The branch outlet shall have a threaded outlet or an outlet suitable for connecting a PE pipe in accordance with ISO 9625.

6 Threads

The threaded branch outlet of a saddle shall conform to ISO 7-1 as an integral thread. If the branch outlet has a different thread, an adaptor shall be used which provides a thread in accordance with ISO 7-1.

7 Sampling and acceptance tests

7.1 Type tests

The sample of test specimens shall be taken at random by the test laboratory representative from a total of at least 50 saddles. The number of test specimens required for each test shall be as specified in table 1.

Table 1 — Required number of test specimens and acceptance number

Clause	Name of test	No. of test specimens	Acceptance no.
5	Workmanship and appearance	3	0
6	Threads	3	0
9.2	Resistance to internal hydrostatic pressure	3	0
9.3	Resistance to long-term internal hydrostatic pressure	3	0
9.4	Resistance to internal under-pressure	2	0
9.5	Resistance to pressure during application of a bending moment to the branch outlet	2	0
9.6.1	Resistance to rotational sliding	3	1
9.6.2	Resistance to axial sliding	3	1
10	Head loss	3	0

If the number of defective specimens in the sample is equal to, or less than, the acceptance number given in table 1, the quantity of saddles from which the sample was taken shall be considered acceptable. If the number of defective specimens found in the test is greater than the acceptance number, the quantity of saddles from which the sample was taken shall be rejected.

7.2 Acceptance tests

When acceptance of manufacturing lots or of shipments of saddles is required, the sampling shall be conducted in accordance with ISO 2859-1 based on AQL 2,5 and Special Inspection Level S-4. All test specimens in the sample, selected at random in accordance with table 2-A in ISO 2859-1:— (table II-A in ISO 2859-1:1989), shall be first tested for their conformity with clauses 5, 6 and subclause 9.2 of this International Standard.

If the number of defective specimens found in these tests does not exceed the acceptance number specified in ISO 2859-1, continue the tests by selecting test specimens at random from the sample in accordance with table 1. The shipment or the lot shall conform to this International Standard if the number of defective specimens found in these remaining tests does not exceed the acceptance number specified in table 1.

8 Materials test

Perform the following pressure test on an injection-moulded pipe specimen with the dimensions shown in figure 2 and made of the same plastics moulded material as the saddle body.

Dimensions in millimetres

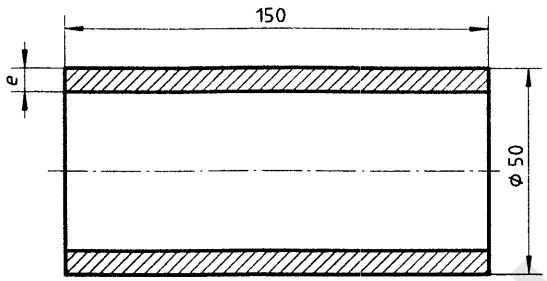


Figure 2 — Test specimen

Test the specimen in accordance with ISO 1167 to determine whether it meets the strength requirements specified in table 2.

The wall thickness of the test specimen (e), shown in figure 2, shall not be less than 2,9 mm and not more than 4,6 mm.

The test specimen shall not suffer fractures or other damage during the test.

Table 2 — Test conditions — Materials

Material[1)]	Temperature °C	Induced stress MPa	Minimum duration h
PVC-HU	60	10	1 000
PE 63	80	3,5	165
PE 80	80	4,6	165
PE 100	80	5,5	165
PP, Type I (homopolymer)	95	3,5	1 000
PP, Type II (copolymer)	95	2,5	1 000
POM	60	10	1 000
ABS	70	4	1 000

[1)] Classified in accordance with ISO 12162 as applicable.

NOTE If 2nd or 3rd party certification is applicable, this test may be omitted if the saddle manufacturer supplies the testing laboratory with a satisfactory test report on the strength requirements.

9 Mechanical and hydraulic characteristics

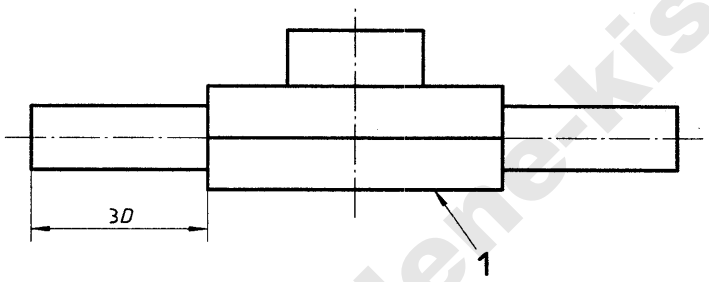
9.1 General

Test the specimens in accordance with the tests specified in 9.2 to 9.6 with each saddle joined to a PE pipe of designation PE 63 and/or PE 40 and/or PE 32. The nominal pressure of the pipe used in the tests shall be equal to or greater than the nominal pressure of the saddle.

If the branch outlet of the saddle has a fitting complying with ISO 9625 for connecting to a PE pipe, perform the pressure tests described in 9.2 to 9.6 with a pipe of the appropriate section and with a minimum length of $3D$ measured from the branch outlet (where D is the nominal diameter of the pipe).

9.2 Resistance to internal hydrostatic pressure

Assemble the saddle on a PE pipe of nominal diameter equal to the nominal size of the saddle, according to the manufacturer's instructions. The PE pipe shall be such that it extends at least three times its nominal diameter from each side of the saddle (see figure 3).



Key

1 Saddle

Figure 3 — Extension of the PE pipe from each side of the saddle

Plug the saddle branch outlet with a plug suited to the shape of the branch outlet connection.

Plug one end of the pipe and fill the saddle with water through the other end of the pipe, taking care to ensure that all air is expelled from the system.

Increase the pressure gradually and maintain the test conditions given in table 3.

Table 3 — Test conditions for resistance to internal hydrostatic pressure

Temperature °C	Pressure bar	Test duration h
20 ± 2	2 × PN	1

There shall be no leakage, fracture, crack or other defect in the saddle or that section of the pipe on which the saddle is assembled.

9.3 Resistance to long-term internal hydrostatic pressure

Repeat the test described in 9.2 but under the test conditions given in table 4.

Table 4 — Test conditions for long-term resistance to internal hydrostatic pressure

Saddle material	Temperature °C	Pressure bar	Test duration h
PP	80 ± 2	0,5 × PN	170
PVC	60 ± 2	0,4 × PN	170

There shall be no leakage, fracture, crack or other defect in the saddle or that section of the pipe on which the saddle is assembled.

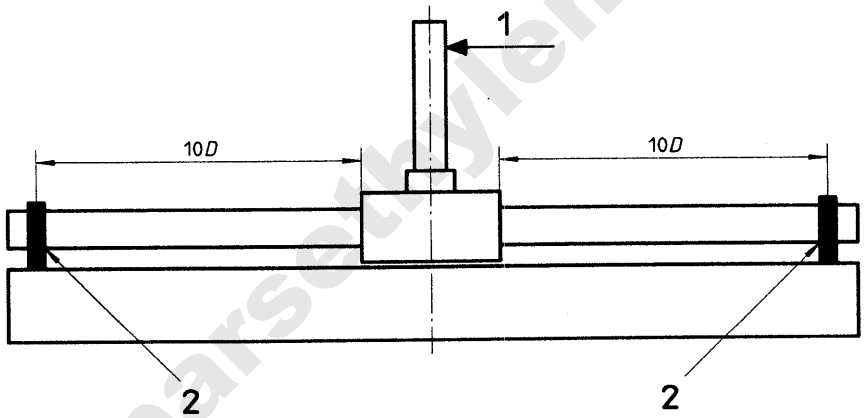
9.4 Resistance to internal under-pressure

When tested in accordance with ISO 3459, the saddle shall conform to the requirements of ISO 3459.

9.5 Resistance to pressure during application of a bending moment to the branch outlet

Assemble the saddle on a PE pipe of nominal diameter equal to the nominal size of the saddle, according to the manufacturer's instructions. Connect a suitable length of pipe to the branch outlet.

Fix the assembly firmly to a rigid surface as indicated in figure 4 so that the ends fixed to the surface are at a distance not less than 10 times the nominal diameter of the pipe from each side of the saddle.



Key

1 Bending moment

2 Fixation point of the pipe

Figure 4 — Illustration of setup for the bending moment test

Apply to the system a hydraulic pressure as specified in table 5 while applying a bending moment to the branch outlet the numerical value of which is calculated from the following equation.

$$M = 0{,}4D$$

where

M is the bending moment, in newton metres;

D is the nominal size of the saddle, in millimetres.

Apply the bending moment parallel to the pipe axis.

Table 5 — Test conditions for resistance to internal hydrostatic pressure during application of the bending moment

Temperature °C	Pressure bar	Test duration h
20 ± 3	1,5 × PN	1

There shall be no leakage, fracture, crack or other defect in the saddle or that section of the pipe on which the saddle is assembled.

9.6 Resistance to sliding of the saddle on the pipe

Assemble the saddle on a PE pipe of nominal diameter equal to the nominal size of the saddle, according to the manufacturer's instructions. Fix the pipe firmly to a rigid surface as shown in figure 4.

9.6.1 Resistance to rotational sliding

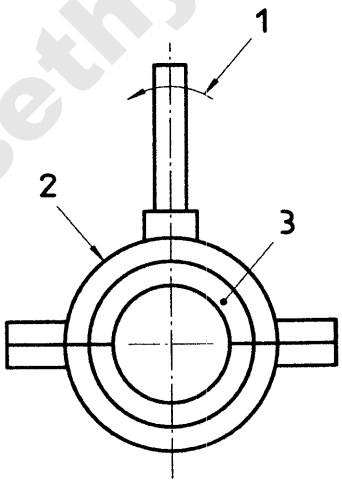
With the saddle assembled and the pipe fixed firmly as indicated in figure 4, apply a rotation moment, T, to the saddle for one minute (figure 5) where T is calculated using the following equation:

$$T = 0{,}01\,D^2$$

where

T is the rotation moment, in newton metres;

D is the nominal size of the saddle, in millimetres.



Key

1 Rotation moment

2 Saddle

3 Pipe

Figure 5 — Illustration of application of the moment to test for resistance of saddle to rotational sliding

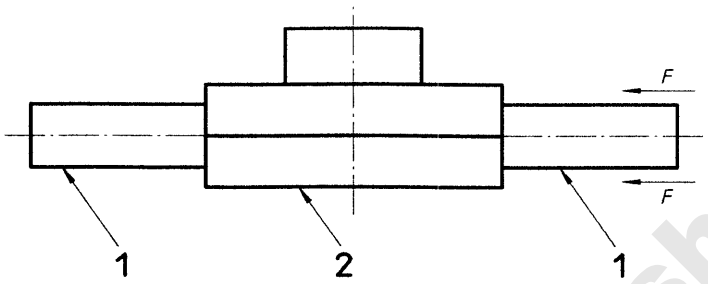
Apply the moment in a plane perpendicular to the axis of the PE pipe by means of a suitable length of pipe connected to the branch outlet.

The saddle shall not rotate on the pipe as a result of the applied moment.

9.6.2 Resistance to axial sliding

With the saddle assembled and the pipe fixed firmly as indicated in figure 4, apply a force, F, as indicated in figure 6, to the saddle along the axis of the pipe for one minute. Apply the force in such a way that no moments whatsoever are applied. The force, F, in newtons, shall be equal to the numerical value of the nominal size of the saddle in millimetres.

The saddle shall not slide on the pipe.



Key

1 Pipe

2 Saddle

Figure 6 — Application of a horizontal force to the saddle

10 Head loss

Assemble the saddle on a PE pipe of nominal diameter equal to the nominal size of the saddle, according to the manufacturer's instructions.

Using the method described in ISO 4059, measure the head loss of the saddle assembly in the direction of the pipe axis and in the direction of the branch outlet between the inlet and the outlets of the saddle.

The head loss shall not exceed the head loss declared by the manufacturer.

11 Marking

A saddle shall be marked with at least the following markings:

a) name of manufacturer or the manufacturer's trademark;

b) material from which the body of the saddle is made;

c) nominal size;

d) nominal pressure;

e) nominal size of the branch outlet;

f) thread size of the branch outlet, if the branch outlet is threaded.

12 Information to be provided by the manufacturer

The manufacturer shall provide, with the technical data sheets, all the information necessary so as to enable the hole in the pipes on which the saddles are assembled to be made correctly. If necessary, the manufacturer shall recommend the tool to be used for making the hole in the pipe so that the piece of pipe cut out is extracted and so that no residues fall into the pipe. The manufacturer should be able to supply the tool to be used, on request.

Annex A
(informative)

Bibliography

[1] ISO 161-1:1996, *Thermoplastics pipes for the conveyance of fluids — Nominal outside diameters and nominal pressures — Part 1: Metric series.*

[2] ISO 3458:1976, *Assembled joints between fittings and polyethylene (PE) pressure pipes — Test of leakproofness under internal pressure.*

[3] ISO 3501:1976, *Assembled joints between fittings and polyethylene (PE) pressure pipes — Test of resistance to pull out.*

[4] ISO 3503:1976, *Assembled joints between fittings and polyethylene (PE) pressure pipes — Test of leakproofness under internal pressure when subjected to bending.*

ICS 65.060.35

Descriptors: agricultural engineering, irrigation, agricultural equipment, irrigation equipment, piping, polyethylene, plastic tubes, fittings, specifications, tests, acceptance testing, marking.

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