
**Agricultural irrigation equipment —
Water-driven chemical injector pumps**

*Matériel agricole d'irrigation — Pompes doseuses à moteur hydraulique
pour l'injection de produits chimiques*

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. 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.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 13457 was prepared by Technical Committee ISO/TC 23, *Tractors and machinery for agriculture and forestry*, Subcommittee SC 18, *Irrigation and drainage equipment and systems*.

This second edition cancels and replaces the first edition (ISO 13457:2000), which has been technically revised.

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Agricultural irrigation equipment — Water-driven chemical injector pumps

1 Scope

This International Standard specifies the construction, operational requirements and test methods for water-driven chemical injector pumps (hereinafter, water-driven injector pumps). These water-driven injector pumps are used to inject chemicals into irrigation systems. The chemicals include liquid fertilizers and solutions of fertilizers and other soluble agricultural chemicals such as acids and pesticides.

This International Standard is applicable to water-driven injector pumps intended to operate at water temperatures of up to 50 °C and with the types and concentrations of chemicals routinely applied in irrigation.

It does not cover the function of backflow prevention devices, nor is it applicable to water-driven devices for injecting chemicals into an irrigation system operating on the basis of the Venturi principle.

2 Normative references

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The following referenced documents are indispensable for the application 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 7-1, *Pipe threads where pressure-tight joints are made on the threads — Part 1: Dimensions, tolerances and designation*

ISO 7005-1, *Metallic flanges — Part 1: Steel flanges* ¹⁾

ISO 7005-2, *Metallic flanges — Part 2: Cast iron flanges*

3 Terms and definitions

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

3.1

water-driven chemical injector pump

hydraulic pump intended to inject chemicals into an irrigation system, operated exclusively by the energy of irrigation water driving a hydraulic device such as a piston or turbine

3.2

nominal size

conventional numerical designation used to define the size of an in-line water-driven injector pump

NOTE This size is equal to the size of the connection to the irrigation system, by means of threads, flanges or other connecting devices.

1) Under revision.

**3.3
minimum working pressure**

p_{\min}

lowest pressure declared by the manufacturer at the inlet of a water-driven injector pump at which the water-driven injector pump functions properly

**3.4
maximum working pressure**

p_{\max}

highest pressure declared by the manufacturer at the inlet of a water-driven injector pump at which the water-driven injector pump functions properly

**3.5
range of working pressures**

pressure range between the minimum working pressure and the maximum working pressure

**3.6
drive water**

irrigation water used to operate an on-line water-driven injector pump

**3.7
drive water flow rate**

rate of flow of drive water used to operate an on-line water-driven injector pump

**3.8
drive water ratio**

ratio of one unit volume of injected chemicals to the volume of drive water required to inject the same unit volume of chemical solution

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**3.9
drive water flow range**

range of flow between minimum and maximum flows stated by the manufacturer to be appropriate for operating the pump

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**3.10
irrigation water flow rate**

rate of flow of irrigation water through the irrigation pipeline serviced by the water-driven injector pump

**3.11
injection rate, pumping rate**

rate of flow of chemical solution injected into an irrigation system during operation of a water-driven injector pump

**3.12
chemical**

liquid fertilizers and solutions of fertilizers and other soluble agricultural chemicals such as acids and pesticides used in agriculture in liquid, solution or water soluble form, normally applied through, or otherwise injected into, irrigation systems

**3.13
chemical solution**

water in which one or several types of chemicals have been dissolved or diluted

**3.14
irrigation system water flow rate**

sum of the irrigation water flow rate and the injection rate

3.15**mixing ratio**

ratio of the injection rate to the total irrigation system flow rate

3.16**stroke volume****pulse volume**

volume of chemical solution injected into an irrigation system in one water-driven injector pump cycle

3.17**proportional water-driven chemical injector pump**

water-driven injector pump intended to maintain a relatively constant mixing ratio throughout the period of its operation at the irrigation water flow rates declared by the manufacturer

3.18**in-line water-driven injector pump**

water-driven injector pump installed in the main irrigation system piping or in bypass piping

See Figure 1.

3.19**on-line water-driven injector pump**

water-driven injector pump installed off the main irrigation system piping and featuring four ports

See Figure 2.

3.20**chemical storage tank**

container for storing chemicals and supplying them to a water-driven injector pump

3.21**maximum suction head**

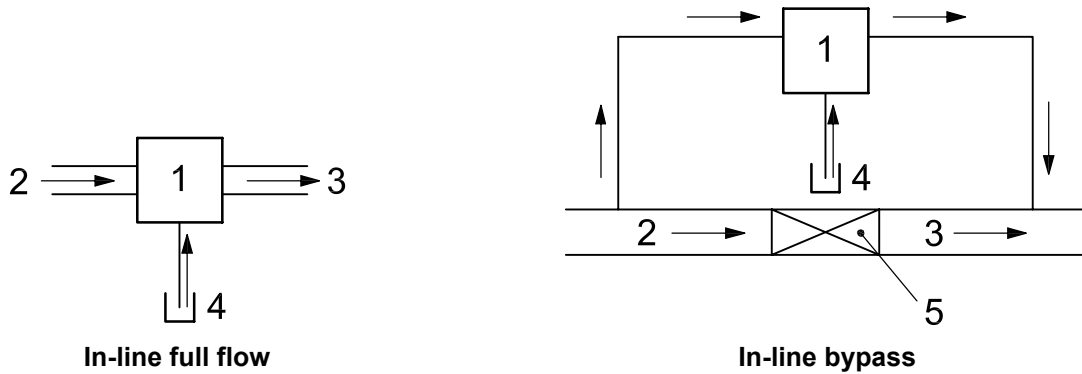
maximal distance between the centreline of the outlet of the water-driven injector pump and the lowest level of the chemical in the storage tank

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4 Classification**4.1 Classification according to installation type****4.1.1 In-line water-driven injector pump (Figure 1)**



Key

- 1 injector pump
- 2 inlet for irrigation water
- 3 outlet for irrigation water with injected chemicals
- 4 inlet for chemicals
- 5 valve

NOTE 1 The arrows denote the flow direction.

NOTE 2 The injection of a chemical occurs inside the water-driven injector pump.

Figure 1 — In-line water-driven injector pump

4.1.1.1 Full flow installation

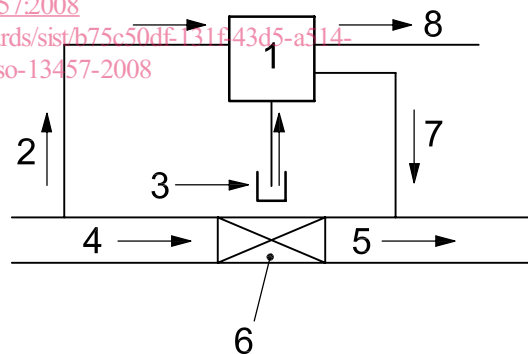
4.1.1.2 Bypass flow installation

4.1.2 On-line water-driven injector pump (Figure 2)

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Key

- 1 injector pump
- 2 inlet for drive water
- 3 inlet for chemicals
- 4 irrigation flow
- 5 irrigation water with injected chemicals
- 6 valve
- 7 outlet for chemicals
- 8 outlet for drive water



NOTE 1 The arrows denote the flow direction.

NOTE 2 The injection of a chemical into the irrigation water occurs outside the water-driven injector pump. The outlet for the chemical is intended to be connected to the main irrigation system piping. The drive water from the drive water outlet cannot be returned to the main irrigation system piping.

NOTE 3 The drive water can be ejected from the water-driven injector pump as shown or returned to the irrigation system (see Figure 1).

Figure 2 — On-line water-driven injector pump

4.2 Classification according to mixing ratio

4.2.1 Proportional water-driven injector pump

4.2.1.1 Fixed mixing ratio

4.2.1.2 Adjustable mixing ratio

4.2.2 Non-proportional water-driven injector pump

EXAMPLE An injection rate of 1 l/h into an irrigation water flow rate of 199 l/h gives an irrigation system water flow rate of 200 l/h, and a mixing ratio of 1:200.

5 Marking

The water-driven injector pump shall bear a clear, legible and durable marking giving the following information:

- a) name of manufacturer or manufacturer's trade mark;
- b) nominal size;
- c) maximum working pressure (p_{\max});
- d) model number identical with that given in the manufacturer's catalogue;
- e) year of production or a mark identifying the production series;
- f) arrows indicating the direction of flow of water and chemicals into and out of the water-driven injector pump.

6 Technical characteristics

6.1 General

The water-driven injector pump shall employ means, such as a vacuum breaker valve, to prevent emptying of the chemical storage tank to the irrigation system through the water-driven injector pump in the event that the pressure in the water-driven injector pump falls below the pressure in the chemical storage tank.

The water-driven injector pump shall employ means, such as a check valve, to prevent irrigation water passing through the water-driven injector pump from entering the chemical storage tank.

It shall be possible to disassemble and clean those parts of the water-driven injector pump subject to clogging by the chemicals or by debris in the irrigation water. These parts may be fitted with a suitable filtration device accessible for the purpose of cleaning.

For on-line water-driven injector pumps (4.1.2), in which there is water loss due to the ejection of drive water out of the pump, the outlet through which the drive water is ejected shall be fitted with suitable means, e.g. a thread or a connector, to enable connection of a pipe for draining the outflow of drive water away from the pump.

NOTE For backflow prevention, refer to the specific requirements of each country.

6.2 Materials

Plastic parts of a water-driven injector pump that are exposed to ultra-violet (UV) radiation under normal field operating conditions shall include additives to improve their resistance to UV radiation.

Plastic parts that enclose waterways shall be opaque or shall be provided with an opaque cover designed to block all light from reaching clear waterway enclosures.

Plastic pipes conveying chemicals may be transparent and may be exposed to light.