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Agricultural irrigation equipment — Control heads

Matériel agricole d'irrigation — Installations de tête

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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 3.

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 International Standard may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO 11738 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.

Agricultural irrigation equipment — Control heads

1 Scope

This International Standard specifies requirements for the components and method of installation of pressurized irrigation system control heads, referred to hereinafter as irrigation control heads, with a nominal size of up to and including 200 mm.

This International Standard is applicable only to the above-ground components of irrigation control heads for sprinkler irrigation and micro-irrigation (mini-sprinklers, drip irrigation, etc.). It is applicable to the basic irrigation control head, on which other irrigation control and command components (electrical, electronic and hydraulic) may be assembled, but does not deal with these additional components.

This International Standard is not applicable to systems and/or components that may be required to prevent the water from freezing in the irrigation control head, such as dry-barrel hydrants or other types of hydrants.

This International Standard does not specify construction or operating requirements for the individual components that make up the irrigation control head. These requirements are specified in the relevant standards for each component.

Systems whose irrigation control heads contain components for the injection of agricultural chemicals should be protected by backflow prevention system interlocks, injection line check valves and other safety devices in accordance with local standards or regulations. This International Standard does not cover such equipment.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC 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 7005-1:1992, *Metallic flanges — Part 1: Steel flanges.*

ISO 7005-2:1988, *Metallic flanges — Part 2: Cast iron flanges.*

ISO 4064-1:1993, *Measurement of water flow in closed conduits — Meters for cold potable water — Part 1: Specifications.*

ISO 4064-3:1999, *Measurement of water flow in closed conduits — Meters for cold potable water — Part 3: Test methods and equipment.*

ISO 4422 (all parts), *Pipes and fittings made of unplasticized poly(vinyl chloride) (PVC-U) for water supply — Specifications.*

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

ISO 7714:—[1)], *Agricultural irrigation equipment — Volumetric valves — General requirements and test methods.*

ISO/TR 8059:1986, *Irrigation equipment — Automatic irrigation systems — Hydraulic control.*

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

ISO 9635:1990, *Irrigation equipment — Hydraulically operated irrigation valves.*

ISO 9911:1993, *Agricultural irrigation equipment — Manually operated small plastics valves.*

ISO 9912-2:1992, *Agricultural irrigation equipment — Filters — Part 2: Strainer-type filters.*

ISO 9912-3:1992, *Agricultural irrigation equipment — Filters — Part 3: Automatic self-cleaning strainer-type filters.*

ISO 9952:1993, *Agricultural irrigation equipment — Check valves.*

ISO 10522:1993, *Agricultural irrigation equipment — Direct-acting pressure-regulating valves.*

ISO 11419:1997, *Agricultural irrigation equipment — Float type air release valves.*

3 Terms and definitions

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

3.1
activating valve
manually operated valve, hydraulically operated valve, electrically operated valve, volumetric valve or any other type of valve that is used to initiate and shut off the flow of water through an irrigation control head

3.2
automatic self-cleaning strainer-type filter
filter having automatic flushing capability that automatically activates flushing by pressure differential, by duration of filtration, by volume of water filtered, or by some other physical quantity or by any combination of these

3.3
air release valve
valve which opens automatically to allow air from the atmosphere to enter the water pipeline during drainage of the line and/or venting of air from the water pipeline to the atmosphere during filling or during normal operation of the pipeline under pressure

3.4
backflow preventer
mechanical assembly designed to prevent unintended flow of water backwards into the distributing pipes of a water supply system in order to protect against entry of substances that may constitute a hazard to health or the environment

3.5
check valve
valve which is opened by the flow of water and closed by the weight of a check mechanism or by mechanical pressure caused, for example, by a spring, permitting flow in one direction only and preventing reversal of flow

3.6
fertilizer injector tank
pressure vessel connected to an irrigation system in an in-line or on-line configuration, together with the pipes and fittings connecting it to the irrigation system, for the purpose of injecting chemicals into the irrigation system

1) To be published. (Revision of ISO 7714:1995)

3.7
water-driven chemical injector pump
hydraulic pump intended to inject chemicals into an irrigation system, powered by a single source energy supplied by irrigation water through a hydraulic motor, such as a piston or turbine

3.8
irrigation control head
assembly of components and pipes installed at the head of an irrigated area which serves to control the functioning of an irrigation system from the aspect of initiating and shutting off the flow of water, pressure regulation, water metering, filtration, and injection of chemicals

3.9
irrigation system
assembly of field-installed equipment (pipes, components, devices) which is intended to irrigate a specific area

3.10
irrigation water
water at a temperature not exceeding 60 °C which is of potable quality, water which may contain chemicals of a type and concentration generally used in agricultural irrigation, or water of a quality approved for use in irrigation by national or local standards or codes

3.11
nominal size of an irrigation control head
numerical designation used to refer to the diameter of the pipe at the inlet or the outlet, whichever is smaller, of an irrigation control head

3.12
nominal size of a component
numerical designation used to refer to the size of an irrigation control head which is identical to the nominal diameter of the pipe or pipes to which the irrigation control head is intended to be connected directly without an intermediate fitting

NOTE A single number designation is adequate if the inlet and outlet ports are of the same size.

3.13
pressure regulator
direct-acting pressure-regulation valve
valve in which the water passage widens or narrows automatically to maintain the pressure at the outlet of the valve under varying pressures or flow rates at the inlet of the valve

3.14
union
threaded coupling which is used to connect two pipes and which does not require rotation of the pipes during assembly and disassembly

3.15
media filter
depth filter
media depth filter
filter in which clogging material is trapped within the interior of a three-dimensional filter medium, such as sand, gravel, textile, fibres or a porous mass of bonded particles

3.16
strainer-type filter
filter containing a filter element that consists of a perforated plate, screen or mesh, or a combination of these, intended to retain suspended particles larger than a given size from the water flowing through the component

3.17
volumetric valve
valve designed to deliver automatically pre-set quantities of water for irrigation purposes at various rates of flow by measuring volumetrically the quantities of water flowing through the valve

3.18
pressure regulation
reduction of pressure prevailing in a supply line to maintain it close to a pre-set value in an irrigation system

3.19
filtration
process which employs a permeable medium and/or a spinning component to separate from the water any materials that would clog an irrigation system and which also employs a means for removing these materials from the permeable medium or the spinning component in order to renew the capacity of the permeable medium or the spinning component to separate these materials from the water

3.20
chemigation
injection of chemicals, including fertilizers, into irrigation water and conveyance of these chemicals to plants

3.21
automation
methods and means of activating or terminating operation of an irrigation system or of changing its operating conditions according to a pre-set plan without direct manual intervention

3.22
flow regulation
controlling the flowrate of water to reduce it to that required in an irrigation system and maintain it at a relatively constant value

4 Classification

Irrigation control heads are classified according to their main function, as indicated in 4.1 to 4.6.

NOTE Most irrigation control heads fulfil a number of functions simultaneously. The following classification is made principally in order to facilitate reference to these functions in this International Standard.

4.1 Irrigation control head for filtration

Strainer-type filter, automatic filter, media filter, etc.

See examples in Figures A.1, A.3 and A.4.

4.2 Irrigation control head for automation

Volumetric valve-controlled, hydraulically operated, electrically operated, electronically operated, computer-controlled, etc.

See examples in Figures A.2 and A.3.

4.3 Irrigation control head for pressure or flow regulation

See examples in Figures A.2 and A.3.

4.4 Irrigation control head for chemigation

With chemical injection tank unit or electrically or hydraulically operated chemical injection pump.

See example in Figure A.5.

4.5 Irrigation control head for measuring flow rate and/or volume

With water meter, flow meter.

See examples in Figures A.2 and A.3.

4.6 Irrigation control head for safety

With check valve, backflow preventer, vacuum relief valve or air-release valve.

See example in Figure A.5.

5 General requirements

5.1 The components comprising an irrigation control head shall comply with the relevant International Standards (see clause 2 for the relevant International Standards in effect at the time of publication of this International Standard).

5.2 The irrigation control head shall be located in a place which is convenient for access and operation, free from weeds or other objectionable growth, such as tall brush and heavy vines, and which is protected from accidental mechanical damage by vehicles, tractors or livestock, and fire.

In medium-textured and fine-textured soils, or in poor drainage conditions, gravel or a similar material shall be spread around the area of the irrigation control head in order to avoid accumulation of mud and maintain stable soil conditions around the irrigation control head. Alternatively, the irrigation control head may be assembled on a rigid platform made of concrete or other suitable material.

Drainage facilities shall be provided in the area of the irrigation control head, especially for those irrigation control heads that contain a filtration device, a chemical injector pump or tank, or a discharging backflow preventer.

The drainage shall be such that spills of chemicals or irrigation water containing injected chemicals cannot return directly to ground or surface water supplies and shall contain them in an environmentally sound manner.

The irrigation control head shall be installed in a manner to prevent access to it by children or unauthorized persons who might tamper with the components or with the chemicals. This can be accomplished with fenced enclosures or locking mechanisms on the various components and containers.

5.3 The height of the installation shall provide for convenient disassembly and assembly of the various components for the purpose of cleaning, repair and replacement while preventing entry of dirt or debris into the irrigation system. The components shall be installed at a minimum height of 0,4 m above the ground surface. This requirement does not apply to system components standing on the ground surface such as media filters.

5.4 Irrigation control heads shall be supported to prevent or reduce structural stresses in their components and to prevent vibration of the irrigation control heads during operation.

The required stabilization shall be obtained by a thrust block at the inlet and outlet pipes and/or suitable supports, if necessary, especially beneath the heavy components of the irrigation control head.

5.5 The distance of the different components of the irrigation control head from each other shall be sufficient to ensure reliable function of meters and gauges in accordance with manufacturer requirements and to facilitate operation of the system, maintenance and cleaning of filters and dismantling and replacement of those parts which are replaceable in the field. The exposed length of the threaded nipples after their assembly shall be sufficient to enable convenient gripping with a pipe wrench.

Water meters shall be installed in accordance with the general specifications concerning these meters.

5.6 The components of an irrigation control head shall be connected to the piping by means of threads, flanges or other suitable means of connection.

Threads of components for connection of the irrigation control head to the irrigation pipeline shall comply with ISO 7-1. However, other threads are allowed provided that a suitable adaptor is supplied with each threaded connection, making it comply with ISO 7-1.

Flanges shall comply with ISO 7005-1 or ISO 7005-2.

6 Materials

6.1 The pipes and components from which the irrigation control head is assembled shall be made of materials resistant to irrigation water under the operating conditions specified in the relevant standards (see clause 2) for each component and type of pipe.

6.2 It is advisable, wherever possible, not to connect components and pipes made from metals with different galvanic potentials but to make the connection with a dielectric union in order to avoid electrolysis and corrosion.

6.3 Components and pipes made from plastics materials shall be opaque. Components which are exposed to ultra-violet radiation shall be externally protected or shall contain additives to improve their resistance to degradation from ultra-violet radiation under normal operating conditions.

6.4 Pipes and components such as water-driven chemical injector pumps, chemical injection tank units, valves and pipes for injection of the fertilizers or other chemicals which come in direct contact with highly concentrated fertilizers or other chemicals shall be resistant to or protected against the corrosive nature of the fertilizers and other chemicals.

7 Installation of the components

7.1 The components of the irrigation control head shall be installed in a manner and sequence of assembly which is in accord with their function.

The components of all classes of irrigation control heads shall be assembled in the order shown in Figures A.1 to A.5, or according to the manufacturer's instructions.

7.2 For irrigation systems in which the inlet of the irrigation control head normally operates under pressure, the irrigation control heads for filtration and/or the irrigation control heads for chemigation shall contain a valve for flushing the filter element of the filter and/or for filling the chemical injection tank with irrigation water. See item 8 (flushing valve) in Figure A.5.

The valve shall be installed in a position which facilitates its opening so as to permit the flow of water through the valve without the water passing through the filter, the water-driven chemical injector pump or the fertilizer injector tank.

The outlet of the valve shall be threaded or shall be fitted with another device that enables it to be connected to a flexible pipe.

7.3 Irrigation control heads containing chemical injection tank units, with the exception of indirect chemical injection tank (class 4.4) units, shall carry a warning label or tag alerting the user that the mixing ratio of the material being injected is constantly changing during the injection cycle. Injectors with a variable mixing ratio are not suitable for moving irrigation systems such as moving lateral irrigation machines and centre-pivot irrigation machines.

7.4 An irrigation control head used for chemigation shall contain a filter downstream from the point of injection of the fertilizers or other chemicals, unless a filter is installed at some other point between the irrigation control head and the sprinklers or emitters.

7.5 When the irrigation control head is equipped with two filters, generally for trapping different categories of solids, the first filter shall be installed upstream from the point of injection of the chemicals and the second filter (the check filter) shall be installed downstream from the point of injection of the chemicals and close to the outlet of the irrigation control head.

7.6 Filters with different filtration functions shall be installed so that the filter with the lower filtration ability is installed upstream from the filter with the higher filtration ability.

7.7 In all irrigation control heads, there shall be at least one pressure-measurement tapping at the outlet of the irrigation control head. In irrigation control heads for pressure regulation, there shall be two pressure-measurement tappings, one at the inlet and one at the outlet of the irrigation control head.

7.8 A pressure-measurement tapping shall be installed at the inlet and outlet of the filter. Pressure-measurement tappings may be combined with those intended for a chemigation unit.

7.9 An irrigation control head which contains media filters shall also be fitted with pipes and valves necessary to reverse the flow in order to flush the filters. The irrigation control head shall include a pipe or hose to direct the flush water away from the irrigation control head, water source or intake. The flush water shall be handled in accordance with local regulations.

It is customary to install two or more media filters in parallel so that clean water from one filter can be used for back flushing another filter.

7.10 Irrigation control heads equipped for chemigation shall contain a component, or a number of components and system interlocks, to prevent water containing injected chemicals from flowing in the opposite direction to the intended direction of flow, that is, backflow. The type of component and interlock for prevention of backflow shall be determined according to the level of hazard and the type of water supply and irrigation system, and in accordance with the instructions of the authorities responsible for preventing backflow of water in or from the irrigation system.

Unless otherwise permitted by the authorities, the component for prevention of backflow shall be a reduced-pressure zone backflow preventer or an air gap. Figure A.5 shows a suitable location for a backflow preventer or an air gap.

For irrigation control heads which include chemigation components in which the chemicals are not injected hydraulically by irrigation system water, the irrigation control head shall contain devices which will prevent the continuation of injection of chemicals into the irrigation system when the flow of water is interrupted or the direction of flow is reversed.

Irrigation control heads equipped for chemigation and with automatic filter flushing devices shall have means for simultaneous filter flushing and chemical injection.

7.11 Unless the chemigation unit already contains a vacuum breaker, an irrigation control head used for chemigation shall contain a vacuum relief valve which shall prevent drainage of the chemicals from the chemical injection tank to the water supply system or to the irrigation system through the water-driven chemical injector pump or the chemical injection tank unit resulting from the generation of a vacuum in the irrigation control head.

7.12 If the irrigation control head is installed at a topographic high point, it shall contain a vacuum relief or an air-release valve which shall be installed in the upper part of the irrigation control head.

7.13 An irrigation control head used for pressure regulation shall contain a pressure regulator installed at the outlet of the irrigation control head as the component farthest downstream in the irrigation control head, unless its function is to protect components of the irrigation control head from pressures higher than those which the irrigation control head is designed to withstand.

7.14 An irrigation control head shall contain at least one flange or other coupling, to facilitate disassembly and assembly of the irrigation control head components. A separate union is not required if one of the irrigation control head components contains an integral union.

7.15 An irrigation control head shall be installed in accordance with the installation instructions, if such exist, specified in International Standards relating to the components that make up the irrigation control head.

7.16 Installation of an irrigation control head shall take into consideration the specific installation instructions for each individual component as specified in the component manufacturer's catalogue and in the assembly and operating instructions issued by the manufacturer.

7.17 Petcocks or tappings for pressure gauges or measurement should be installed on both sides of the components which modify the pressure such as pressure regulators, filters, water-driven chemical injector pumps, and chemical injection tank units.

7.18 Isolation valves should be installed upstream from and, when needed, downstream from all other irrigation control head components to facilitate repair of the equipment. These isolation valves eliminate the requirement to drain the main lines in order to dewater control head components.

8 Test methods and requirements

Test the irrigation control head after its installation as specified in 8.1 to 8.3.

8.1 Visual inspection

8.1.1 Visually examine the irrigation control head.

8.1.2 The assembly of the various components of the irrigation control head, including the piping, shall be as specified in 7.

8.1.3 The various components shall be assembled in accordance with the direction of flow marked on the component.

8.1.4 The assembly of the flow meters, volumetric meters, pressure regulators, pressure taps and other components whose position in the irrigation control head affects their functioning, shall be in accordance with the required distances between the various components and the required order of their installation.

8.1.5 Where chemigation components are installed in the irrigation control head, the backflow prevention devices and their installation shall comply with the hazard level of the system and with the requirements of the relevant local and/or national authorities. Bypass of the backflow prevention equipment shall not be possible.

8.1.6 The means used in the installation shall ensure the stability of the irrigation control head.

8.1.7 The means employed in installation shall ensure drainage of water from the immediate area surrounding the irrigation control head and removal or storage of flush water discharged by the filters, drive water from the water-driven chemical injector pumps, hydraulic valves, and backflow prevention devices. The flush water shall be handled in accordance with local regulations.

8.2 In-situ test of resistance and watertightness under hydraulic pressure

8.2.1 Open the valves and actuators of all components of the irrigation control head so that the water reaches all components and take the measures required to vent air from the system.

Seal the outlet of the irrigation control head by shutting off the outlet valve or by some other means. It is permitted to disconnect the outlet of the irrigation control head from the pipe system in order to seal it for test purposes.

Open the valves and actuators slowly to avoid damaging water hammer and pressure spikes.

8.2.2 Apply water pressure to the inlet of the irrigation control head and increase the pressure to the higher of one of the following:

— the nominal pressure of that component of the irrigation control head which has the lowest nominal pressure of all the components of the irrigation control head;

— the maximum design pressure of the irrigation control head as limited by measures taken upstream of the control head such as delivering water from a reservoir.

If necessary, use an auxiliary system to obtain the required pressure.

Apply the pressure selected for 15 min.

There shall be no leakage from any of the components of the irrigation control head or from any of the connections joining inflow and outflow piping to the irrigation control head and no defects shall be visible.

8.2.3 Apply at the inlet of the irrigation control head a pressure equal to 1,6 times the pressure applied according to 8.2.2 for 5 min.

None of the components of the irrigation control head shall be damaged.

8.3 Test of operation

Activate all components of the irrigation control head and pass water through the irrigation control head from its inlet to its outlet at a flow rate and pressure approximately at the mid-point of the range of flow rate and range of pressure specified by the manufacturer (if the entire irrigation control head is manufactured or assembled by one manufacturer) or by the design engineer of the irrigation system.

Operate all the various components of the irrigation control head by opening and shutting off the components and operate the components in the various intermediate ranges such as for pressure regulation and head loss for operation of water-driven chemical injector pumps. Operate the automatic self-cleaning strainer-type filters and semi-automatic flushing filters which are flushed manually and which are back flushed by water from the irrigation system for one flushing cycle.

All components of the irrigation control head shall function satisfactorily.

9 Marking

9.1 The irrigation control head shall bear a clear and visible marking which shall include the following particulars:

a) the name of the manufacturer or the manufacturer's recognized trademark, if the entire irrigation control head is manufactured or assembled by one manufacturer;

b) name and address identifying the installer of the irrigation control head, if the installer is not the manufacturer;

c) the maximum working pressure for which the irrigation control head is designed to operate under normal operating conditions;

d) an arrow indicating the direction of flow. The arrow shall be marked on a section of pipe of the inlet of the irrigation control head.

The markings can be given by means of a label permanently affixed to the irrigation control head and which can be updated whenever changes or modifications are made to the irrigation control head which require that these be noted.

9.2 Filters and chemical injection tank units shall bear the following warning sign:

"DANGER — UNDER PRESSURE"

or a similar warning inscribed to comply with local requirements.

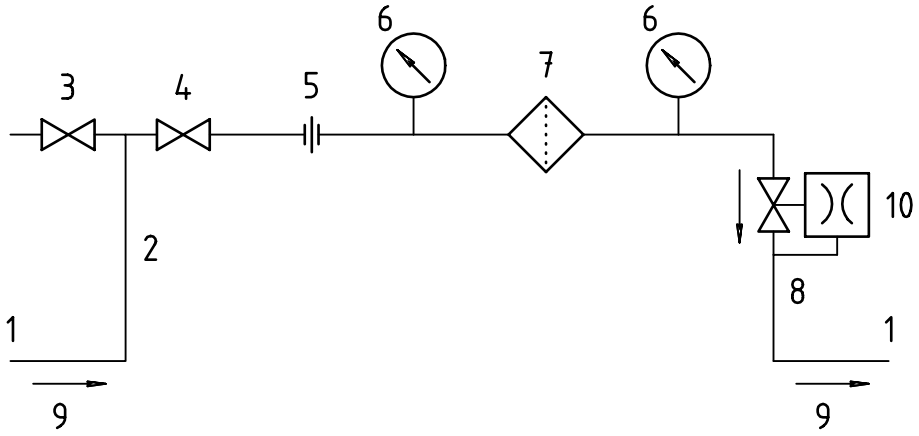
9.3 Any irrigation control head using reclaimed water should be colour-coded to advertize the fact by affixing red and purple strips or by painting the entire irrigation control head red or purple.

Annex A
(informative)

Irrigation control heads — Examples

Figures A.1 to A.5 are schematics only and are provided solely for the purpose of general guidance and information.

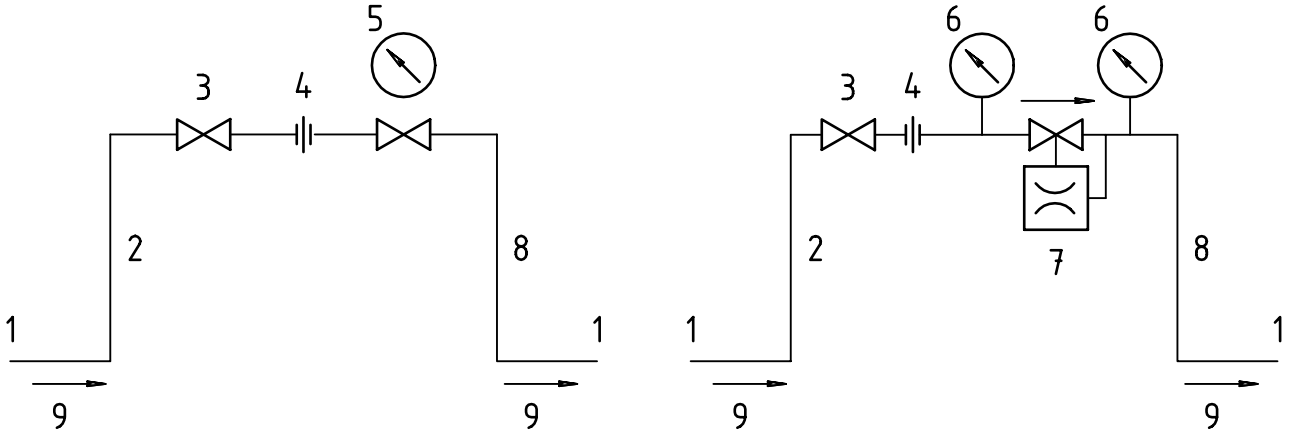
Assembly in precise compliance with these figures is not obligatory.



Key

1	Main line	6	Pressure-measurement tapping
2	Inlet of the irrigation control head	7	Filter
3	Flushing valve	8	Outlet of the irrigation control head
4	Activating valve	9	Direction of flow
5	Union	10	Pressure regulator

Figure A.1 — Irrigation control head for filtration



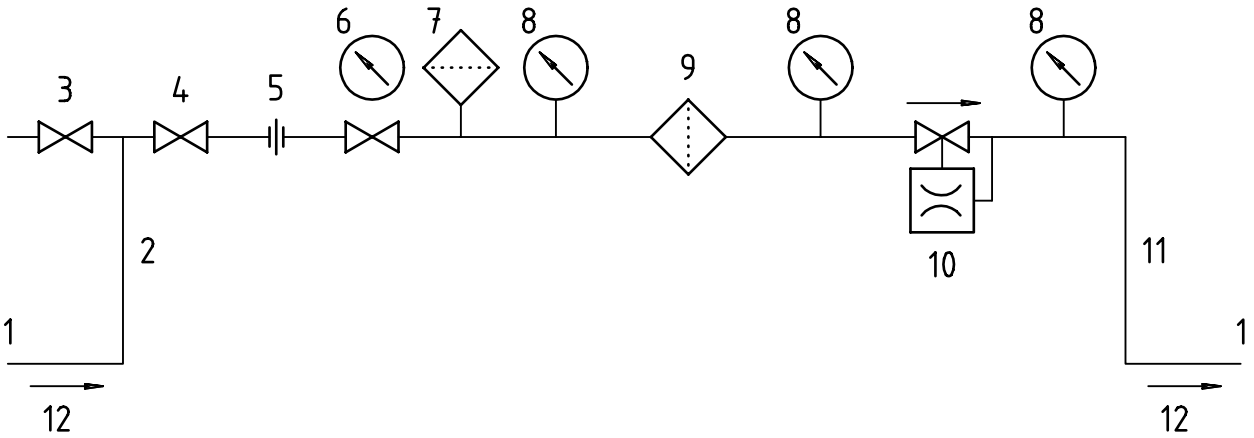
a) Irrigation control head for automation with volumetric valve or metering

b) Irrigation control head for pressure regulation

Key

1 Main line
2 Inlet of the irrigation control head
3 Activating valve
4 Union
5 Volumetric valve or water meter
6 Pressure-measurement tapping
7 Pressure regulator
8 Outlet of the irrigation control head
9 Direction of flow

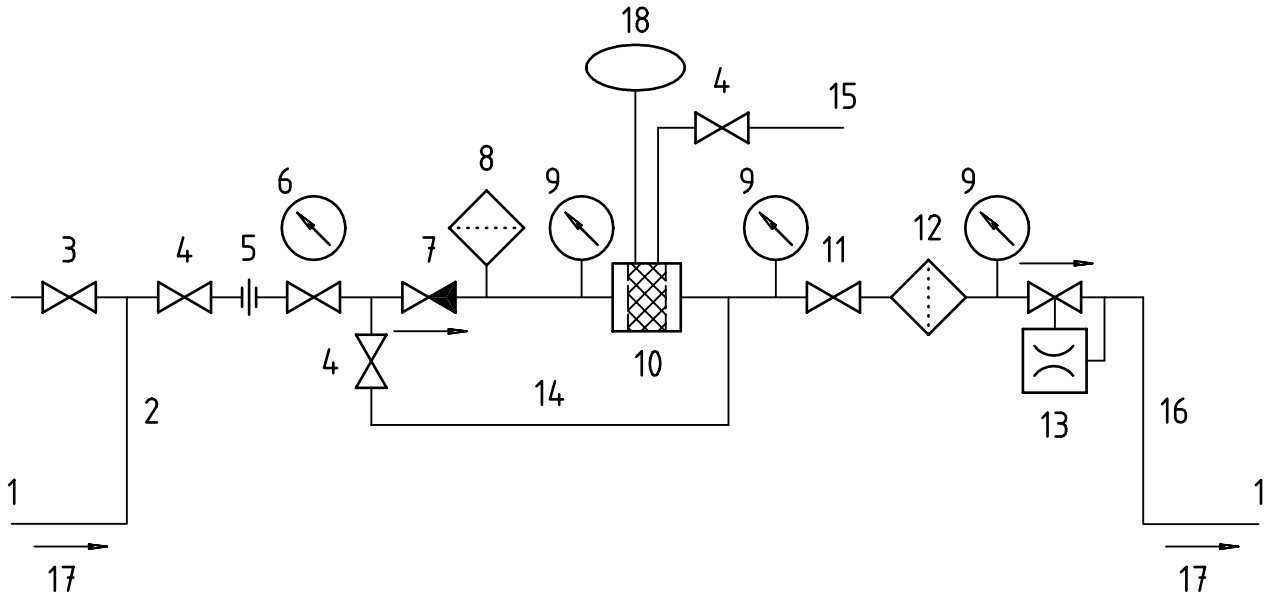
Figure A.2 — Irrigation control heads for automation and pressure regulation



Key

1 Main line
2 Inlet of the irrigation control head
3 Flushing valve
4 Activating valve
5 Union
6 Volumetric valve or water meter
7 Air-release valve
8 Pressure-measurement tapping
9 Filter
10 Pressure regulator
11 Outlet of the irrigation control head
12 Direction of flow

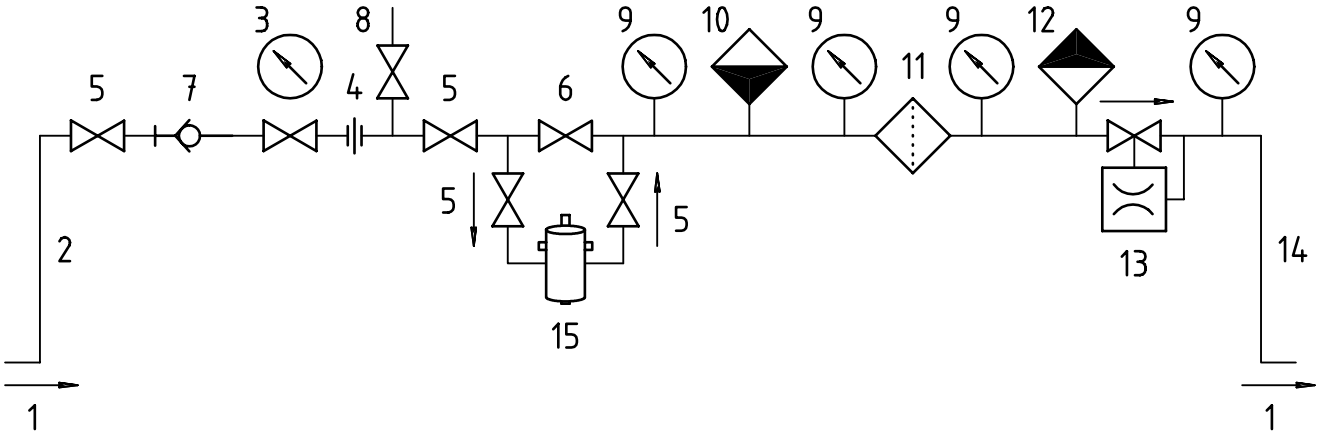
Figure A.3 — Irrigation control head for filtration and pressure regulation



Key

1	Main line	10	Media filter(s)
2	Outlet of the irrigation control head	11	Activating valve
3	Flushing valve	12	Filter
4	Activating valve	13	Pressure regulator
5	Union	14	Flushing pipe
6	Volumetric valve or water meter	15	Drain pipe
7	Check valve	16	Outlet of the irrigation control head
8	Air-release valve	17	Direction of water flow
9	Pressure-measurement tapping	18	Electronic controller for flushing the media filter(s)

Figure A.4 — Irrigation control head for filtration with media filter



Key

1 Main line
2 Inlet of the irrigation control head
3 Volumetric valve or water meter
4 Union
5 Activating valve
6 Valve to induce pressure loss
7 Device or system to prevent backflow
8 Flushing valve
9 Pressure-measurement tapping
10 Vacuum breaker
11 Filter
12 Air-release valve
13 Pressure regulator
14 Outlet of the irrigation control head
15 Chemical injection tank unit (or water-driven chemical injector pump)

Figure A.5 — Irrigation control head for chemigation

ICS 65.060.35

Price based on 13 pages