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**Irrigation techniques — Remote monitoring and control for irrigation  
— Part 3: Interoperability**

iTeh STANDARD PREVIEW

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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~~document 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](http://www.iso.org/directives)).

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

A list of all parts in the ISO 21622 series can be found on the ISO website.

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](http://www.iso.org/members.html).

## Introduction

The purpose of this document is to allow interoperability between the different elements of an irrigation system that exist side by side in the same installation. The introduction of a standard in irrigation control systems will lead to improvements in irrigation programming practice and establish a clear separation between decision making and decision implementation.

This document establishes the specification and location of communication interfaces to be implemented in order to enable the data exchange on commercial products, as well as its integration in an interoperable architecture.

This document defines the mechanisms to exchange and integrate data from [Remote Monitoringremote monitoring](#) and [Control Systemscontrol systems](#) (RMCS) for irrigation, making it available to any [Management Information Systemmanagement information system](#) (MIS) with permissions.

A manufacturer can adopt this document in all the described levels or specifically in one of them, implementing only the specifications of application to its product.

- The application of this document to a subsystem (RMCS) involves:
  - a. [a\)](#) the implementation of the architecture defined at [clause 5Clause 4](#), including the subsystem and the event interfaces, exclusively with the actions supported by this subsystem. Clauses [6.5](#) and [7.6](#) are related to the kinds of irrigation entities that can be controlled and/or monitored. Its data will be available to any consumer with permissions that implements the defined interface.
  - b. [b\)](#) the implementation of one of the proposed technologies for the subsystem and the event interfaces. The available implementations are described in the [annexesAnnexes](#) B or G for subsystem interface, and [annexesAnnexes](#) C or H for event interface. [The developer can use any of these sets \(Annexes B and C, or Annexes G and H\) to implement this document.](#) The implementation can be validated using the tests for subsystems. included in the [annexAnnex](#) D.
- The application of this document to a management information system (MIS) involves:
  - a. [a\)](#) the implementation of the architecture defined at [clause 5Clause 4](#), including the management interface, exclusively with the actions supported by this MIS. To access data from a subsystem the MIS requires permissions.
  - b. [b\)](#) the implementation of one of the proposed technologies for the management interface. The available implementations are described in the [annexesAnnexes](#) A or F. [The developer can use any of the two to implement the standard.](#) The implementation can be validated using the tests for MIS. included in the [annexAnnex](#) D.
- The application of this document to a coordination broker involves:
  - e. [a\)](#) the implementation of the architecture defined at [clause 5Clause 4](#) and all its interfaces.
  - a. [b\)](#) the implementation of the interfaces performed using all the technologies used in the implementation annexes ([annexesAnnexes](#) A, B, C, F, G and H). The implementations can be validated using the tests for coordination brokers, included in the [annexAnnex](#) D.
  - b. ~~the annex~~ [Annex](#) E, defines two sets of functionalities for the development of a coordination broker.

# ~~Irrigation techniques — Remote monitoring and control for irrigation systems — Part 3: Interoperability~~

## Irrigation techniques — Remote monitoring and control for irrigation systems — Part 3: Interoperability

### 1 Scope

This document establishes requirements for interoperability among systems developed for management and/or control of irrigation facilities. It can be applied under any technological platform and in any type of irrigation system, regardless of the water management scheme.

This document does not define hardware or software requirements for any of the systems to which it applies. It only concerns externally visible interfaces and places no restriction on the underlying implementations. It has been designed to avoid interference with proprietary solutions subjected to intellectual property. From the point of view of the data exchange, and to guarantee interoperability based on the previous premises, this document defines three communication interfaces (interface with management, interface with events and interface with subsystems) and the architecture to which these interfaces apply. Three levels of architecture has been defined to accommodate these interfaces:

- The Management Level, where any MIS conforming with this document is located. Out of all available data exchange [actions/methods](#), each MIS only implements those required to execute its functionalities.
- The Higher Control Level: coordination. At this level is performed the data integration among RMCS and the access control to it. A software element, called coordination broker, ensures this integration and allows the use of different technologies in its interfaces.
- The Lower Control Level: RMCS. These can also be referred to as irrigation subsystems. The RMCS perform the duties of the irrigation entity(s) under its control.

A coordination broker can be developed as a product by any of these manufacturers or by an independent developer using the standard specifications for this kind of software.

### 2 Normative reference

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 8601, *Data elements and interchange formats. Information interchange — Representation of dates and times*

### 3 Terms and definitions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org/>

#### 3.1 action

application of a ~~action~~*method* (3.7) to exchange data leading to accomplish typical irrigation duties

#### 3.2 coordination broker

message broker pattern application responsible for the mapping of irrigation entities, for the collection and consolidation of their data, and for the management of the *procedural elements* (3.13) executed by them

Note 1 to entry: It shall conform with the management, *subsystems* (3.20) and events interfaces.

#### 3.3 interface with events

functional connection that enables the exchange of information about events (according to IEC 62682) between the *coordination broker* (3.2) and the *subsystems* (3.20)

#### 3.4 interface with management

functional connection that enables the exchange of information between MIS applications and the *coordination broker* (3.2)

#### 3.5 interface with subsystems

functional connection that enables the exchange of information between the *coordination broker* (3.2) and the *subsystems* (3.20)

#### 3.6 message broker pattern

architectural software pattern for message validation, transformation, and routing

Note 1 to entry: A message broker is a software product designed as an intermediary to facilitate interactions between third-party applications. The message broker can also be called interface engine or integration broker.

#### 3.7 ~~method~~*action*

mechanisms established for the exchange of data between interoperable systems

#### 3.8 MIS application

computer program aimed at administrative and/or Operational decision-making in the irrigation entities

Note 1 to entry: A MIS is a tool acquired for an organization (like a User Community or an Irrigator) to execute one or more of the following specific functions: (This list is descriptive and not restrictive.):

- administrative control;
- accounting control;
- maintenance;
- behavior modeling;
- operational management; and
- any other purpose aiming at improving decision-making.

This list is descriptive and not restrictive.

### 3.9

#### **optional conditioned parameter**

*parameter* (3.12) that can be used once a conditioning parameter of an *action* (3.1) is set up

### 3.10

#### **optional conditioning parameter**

*parameter* (3.12) set up as a part of an *action* (3.1), that requires the activation of one or more additional required or *optional conditioned parameters* (3.9)

### 3.11

#### **optional parameter**

*parameter* (3.12) that is not required but can be activated for an *action* (3.1) without requiring the support of additional parameters

### 3.12

#### **parameter**

basic information contained by an *action* (3.1) in the interfaces

### 3.13

#### **procedural element**

specific application of a recipe in an irrigation entity

### 3.14

#### **procedural model**

representation of the reality used to describe the different parts [*procedural elements* (3.13)] of the process to be performed by the elements included in the physical model

### 3.15

#### **property**

required attribute to define an irrigation entity.

Note 1 to entry: Note the difference between a parameter, which characterizes an *action* (3.1), and a property, which characterizes an entity

### 3.16

#### **required parameter**

parameter that shall be included when an *action* (3.1) is set up

### 3.17

#### **required conditioned parameter**

-parameter required when an *action* (3.1) is set up including an optional or required conditioning parameter

### 3.18

#### **physical model**

representation of the reality used to describe the relations, dependences and hierarchy among the physical assets designed to perform a process

Note 1 to entry: The model is divided in seven levels, being the three upper levels focused on administrative purposes and the four lower levels in the process to be performed.

### 3.19

#### **standard history**

recorded set of values of a *property* (3.15) covering a daily time interval and recorded according to a predefined frequency

### 3.20

#### **subsystem**

term used by RMCS in terms of interoperability

Note 1 to entry: A remote monitoring and control system for irrigation (RMCS), is a set of hardware devices and software programs used to monitor and/or control – according to predefined parameters or user decisions – one or more irrigation entities. Typical components of a RMCS include:

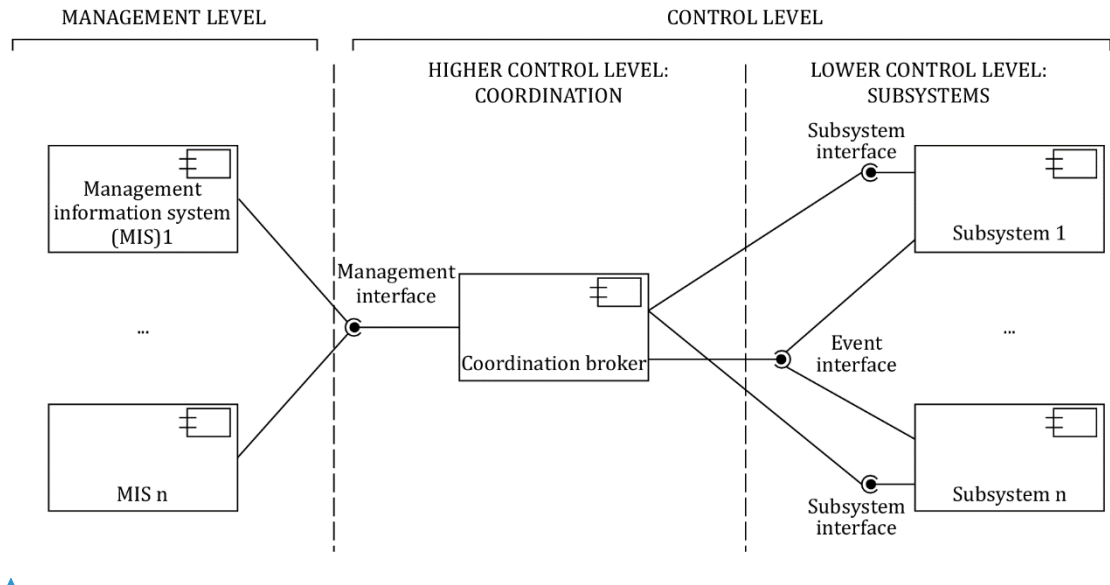
- control software, linking data transmission/acquisition and process control;
- devices controlling or monitoring irrigation entities;
- other intermediate devices required for data integration and/or communication purposes.

## **4 Interoperability I: System architecture**

### **4.1 Levels and components of an interoperable architecture**

#### **4.1.1 General**

The levels and components are presented in Figure 1.



**Figure 1 — Levels and components of an interoperable architecture**

These architecture levels can be used by irrigators or user communities. Both uses the architecture defined in this document to integrate those management tools and subsystems involved in the management and control of his/her/its own property irrigation entities.

However, it is possible to enable other permissions to facilitate the exchange of data with third parties, always with the prior authorization of the data owner.

#### 4.1.2 Control level

The control level comprises:

- the coordination broker; and
- one or more subsystems.

The subsystem interface is established between these two components.

##### 4.1.2.1 Subsystem

The control of an irrigation entity, understood as the acquisition and continuous monitoring of process variables, execution of operations, changes of set points and emergency stops, among others, is always performed at the subsystem level.

##### 4.1.2.2 Coordination broker

The coordination broker performs the following basic functions:

- mapping irrigation entities and their association to the subsystems controlling them;
- establishing an abstraction layer so that MIS applications do not require information on the subsystems responsible for each irrigation entity;