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Low-voltage switchgear and controlgear – Controllers for drivers of stationary fire pumps

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Title : IEC 62091, Ed. 1: Low-voltage switchgear and controlgear - Controllers for drivers of stationary fire pumps

Note d'introduction

Introductory note

IEC CO note: The document 17B/1359/MCR issued 2004-08-20 indicated that the revision of the TS to an IS would lead to Ed.2.0. This was an error.

The IS will be **IEC 62091, Ed.1.0.** The work programme has been modified accordingly.

ATTENTION	ATTENTION
CDV soumis en parallèle au vote (CEI) et à l'enquête (CENELEC)	**Parallel IEC CDV/CENELEC Enquiry**

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

LOW-VOLTAGE SWITCHGEAR AND CONTROLGEAR – CONTROLLERS FOR DRIVERS OF STATIONARY FIRE PUMPS

FOREWORD

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International Standard IEC 62091 has been prepared by subcommittee 17B: Low-voltage switchgear and controlgear, of IEC technical committee 17: Switchgear and controlgear.

This second edition cancels and replaces the first edition which was issued as a technical specification in 2003. It now has the status of an International Standard.

The text of this standard is based on the following documents:

FDIS	Report on voting
17B/XXXX/FDIS	17B/XXXX/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

The committee has decided that the contents of this publication will remain unchanged until 2008. At this date, the publication will be

- reconfirmed;
- withdrawn;
- replaced by a revised edition, or
- amended.

INTRODUCTION

IEC 62091 pertains to life-safety equipment and is based in part on NFPA 20 (1996) *Standard for the Installation of Centrifugal Fire Pumps*. When called upon to work by automatic signal, manual-electric signal or manual-emergency actuation, the controller is expected to start the pump driver (motor or diesel engine) because "the building is on fire". Failure to carry out its mission will increase fire damage to the building, its contents and people therein.

These controllers default to a RUN state. They are intended to be located in compliance with local requirements which generally will place them in pump rooms or pump houses that have some specified degree of fire protection. These locations often have sweating overhead pipes, are possibly sprinklered and are in the vicinity of vaults housing other building distribution equipment.

Fire pumps are intended to boost water pressure. Many sprinkler systems are assumed to have small leaks for which "Jockey Pumps" (also known as make-up pumps) are installed to maintain desired pressure in the sprinkler pipes, thus preventing the main fire pump from excessive starts and stops. Experience has shown that leakage water flowing through the fire pump (at rest) over long periods of pump inactivity can carry sand, aggregates, rocks, rust and such which collect in the fire pump. These contaminants may prevent normal starting until the pump impeller accelerates to clear the pump housing. This standard recognizes the condition of under-exercised fire pumps by permitting up to 20 s at locked rotor current whether the starts are "cold starts" (initial starts) or "hot starts" (restarts). Starting a distressed pump may cause temporary or permanent damage to electrical conductors, equipment and the motor because shutdown for equipment protection could possibly permit its destruction by fire along with the building and its contents.

Several examples of the construction and installation applications between a fire pump controller and other controllers include the following:

1) **all fire pump controllers**

   a) The main circuit conductors and components are considered to be sacrificial (i.e. temporary and permanent damage levels are permitted) during any attempt to start a distressed motor/pump and to keep it operating.

   b) They are expected to provide a high degree of reliability to start the pump driver automatically and suppress a fire upon sensing a pressure drop in the sprinkler pipe or by other automatic fire detection equipment.

   c) Failures in external control circuits should not prevent operations of pumps from all other internal or other external means.

   d) External control circuits are expected to be arranged so that failure of any external circuit (open or short-circuit) will not prevent operation of pump(s) from all other internal or external means. Breakage, disconnecting, shorting of the wires or loss of power to these circuits can cause continuous running of the fire pump but should not prevent the controller(s) from starting the fire pump(s) due to causes other than these external circuits.

   e) External automatic starting means should be accomplished by opening a normally closed contact on the external means to de-energize a normally energized control circuit in the controller.

f) While external start buttons or other starting means are permitted, the controller should not be equipped with any means to accommodate remote stopping (a remote STOP button should not be used).

g) Nuisance starts are permitted in the case where a failure of internal control components might cause the motor to start running.

2) **electric motor fire pump controllers**

a) They are expected to include means for external, manual mechanical operation of the controller in the event of loss of ability to close the contactor electrically/magnetically.

b) Thermally reactive over-current protective devices should not be permitted. The controller should provide short-circuit and locked rotor protection only.

c) Releases of the FPC-circuit-breaker (Fire Pump Controller-circuit-breaker) are expected to permit it to carry 300 % of rated operational motor current for an extended period of time.

3) **diesel engine fire pump controllers**

a) Should provide means to automatically exercise the engine on a weekly basis.

b) Should not prevent an engine from starting nor shutdown an engine running under demand conditions due to low oil pressure or high engine temperature.

Therefore, the most significant purpose of this standard is to characterize the unique features of fire pump controllers.

LOW-VOLTAGE SWITCHGEAR AND CONTROLGEAR – CONTROLLERS FOR DRIVERS OF STATIONARY FIRE PUMPS

1 Scope and object

This standard applies to controllers intended for starting, controlling and stopping stationary fire pumps, including automatic and non-automatic types for alternating current electric motor or diesel engine driven fire pumps. It is anticipated that a controller only controls a single driver.

Controllers for electric motor driven fire pumps always include suitable short-circuit protection as an integral part of the controller. These controllers may include an integral power transfer switch. These controllers are rated 1 000 V a.c. maximum.

Controllers for diesel engine driven fire pumps include electrical circuits that operate various control and supervisory functions such as remote control (starting), alarms, signals, indicators, and the proper operation of battery chargers.

The most significant purpose of this standard is to characterize the unique features of fire pump controllers. A further purpose is to prescribe a procedure for exercising the controllers to verify that the unique features are operative. For the purpose of this standard, this procedure is described as the "fire pump controller test protocol".

The object of this standard is to state the following:

a) the unique characteristics of fire pump controllers, their associated equipment and their operational functions;

b) the conditions with which fire pump controllers should comply with reference to:

   1) their construction;

   2) their critical components including the mounting, arrangement, wiring and connections;

   3) the degrees of protection provided by their enclosures;

   4) their modes of actuation;

   5) their operation and behaviour under normal, overload and short-circuit conditions;

   6) their capability to annunciate significant events;

   7) their electromagnetic compatibility for the environment into which they are placed;

c) the tests intended for confirming that these conditions have been met, and the methods to be adopted for these tests;

d) the information to be given with the equipment, or in the manufacturer's literature.

In this context, this standard gives the requirements for all of the electrical functions associated with both the electric motor driven and the diesel engine driven fire pumps. Special applications such as explosive atmospheres, nuclear installations, ships, aircraft, etc. are not covered by this standard. Referring to electric power sources, the requirements of this standard apply only to the extent that they place limits on the nature, behaviour and characteristics of the electrical energy that is supplied to the service entrance (see IEC 60364-5-55).

The requirements of this standard do not apply to the method or means by which the electrical energy is generated nor to the installation between the origin of the installation and the fire pump controller, which are to be found in the IEC 60364 series. This standard does not apply to diesel engine driven electric generators which may be associated with a stationary fire pump installation.

EMC considerations are correlated with other IEC standards for similar products:

a) for electric fire pump controllers, EMC considerations are covered by this standard, and

b) for diesel engine fire pump controllers, d.c. batteries are the intended source of electrical control power.

2 Normative references

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.

IEC 60364 (all parts), *Electrical installations of buildings*

IEC 60364-5-55:2001, *Electrical installations of buildings – Part 5-55: Selection and erection of electrical equipment – Other equipment*
Amendment 1 (2001)

IEC 60439-1:1999, *Low-voltage switchgear and controlgear assemblies – Part 1: Type-tested and partially type-tested assemblies*
Amendment 1 (2004)

IEC 60529:1989, *Degrees of protection provided by enclosures (IP code)*
Amendment 1 (1999)

IEC 60695-11-10:1999, *Fire hazard testing – Part 11-10: Test flames – 50 W horizontal and vertical flame test methods*
Amendment 1 (2003)

IEC 60947-1:12004, *Low-voltage switchgear and controlgear – Part 1: General rules*

IEC 60947-2:2003, *Low-voltage switchgear and controlgear – Part 2: Circuit-breakers*

IEC 60947-3:1999, *Low-voltage switchgear and controlgear – Part 3: Switches, disconnectors, switch-disconnectors and fuse-combination units*
Amendment 1 (2001)

IEC 60947-4-1:2000, *Low-voltage switchgear and controlgear – Part 4-1: Contactors and motor-starters – Electromechanical contactors and motor-starters*
Amendment 1 (2002)

IEC 60947-4-2:1999, *Low-voltage switchgear and controlgear – Part 4-2: Contactors and motor-starters – AC semiconductor motor controllers and starters*
Amendment 1 (2001)

IEC 60947-6-1:1989, *Low-voltage switchgear and controlgear – Part 6-1: Multiple function equipment – Automatic transfer switching equipment*
Amendment 1 (1994)
Amendment 2 (1997)

IEC 61000-3-2:2000, *Electromagnetic compatibility (EMC) – Part 3-2: Limits – Limits for harmonic current emissions (equipment input current ≤ 16 A per phase)*
Amendment 1 (2001)

IEC 61000-3-3:1994, *Electromagnetic compatibility (EMC) – Part 3-3: Limits – Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current ≤ 16 A per phase and not subject to conditional connection*
Amendment 1 (2001)

IEC 61000-4-2:1995, *Electromagnetic compatibility (EMC) – Part 4-2: Testing and measurement techniques – Electrostatic discharge immunity test*
Amendment 1 (1998)
Amendment 2 (2000)

IEC 61000-4-3:2002, *Electromagnetic compatibility (EMC) – Part 4-3: Testing and measurement techniques – Radiated, radio-frequency, electromagnetic field immunity test*
Amendment 1 (2002)

IEC 61000-4-4:2004, *Electromagnetic compatibility (EMC) – Part 4-4: Testing and measurement techniques – Electrical fast transient/burst immunity test*

IEC 61000-4-5:1995, *Electromagnetic compatibility (EMC) – Part 4-5: Testing and measurement techniques – Surge immunity test*
Amendment 1 (2000)

IEC 61000-4-6:2003, *Electromagnetic compatibility (EMC) – Part 4-6: Testing and measurement techniques – Immunity to conducted disturbances, induced by radio-frequency fields*

IEC 61000-4-8:1993, *Electromagnetic compatibility (EMC) – Part 4-8: Testing and measurement techniques – Power frequency magnetic field immunity test*
Amendment 1 (2000)

IEC 61000-4-11:2004, *Electromagnetic compatibility (EMC) – Part 4-11: Testing and measurement techniques – Voltage dips, short interruptions and voltage variations immunity tests*

IEC 61000-4-13:2002, *Electromagnetic compatibility (EMC) – Part 4-13: Testing and measurement techniques – Harmonics and interharmonics including mains signalling at a.c. power ports, low-frequency immunity tests*

CISPR 61000-6-3:1996, *Electromagnetic compatibility (EMC) – Part 6: Generic standards – Section 3: Emission standard for residential, commercial and light-industrial environments*

CISPR 11:2003, *Industrial, scientific and medical (ISM) radio-frequency equipment – Electromagnetic disturbance characteristics – Limits and methods of measurement*
Amendment 1 (2004)

3 Terms and definitions

For the purposes of this standard, the relevant definitions given in IEC 60947-1, together with the following definitions, apply.

3.1 3.1
automatic control
control of an operation without human intervention

3.2 3.2
automatic transfer switching equipment (automatic power transfer switch)
self-acting equipment containing the transfer switching device(s) and other necessary devices for monitoring supply circuits and for transferring one or more load circuits from one supply to another (see IEC 60947-6-1)

3.3 3.3
controller
device or equipment that serves to control, in some predetermined manner, the electric power delivered to the apparatus to which it is connected

3.4 3.4
diesel engine fire pump controller
controller intended to control a diesel engine-driven fire pump

3.5 3.5
diesel engine foam pump controller
controller intended to control a diesel engine-driven foam concentrate pump

3.6 3.6
driver
electric motor or diesel engine that drives the fire pump

3.7 3.7
electric fire pump controller
controller intended to control an electric motor-driven fire pump

3.8 3.8
electric foam pump controller
controller intended to control an electric motor-driven foam concentrate pump

3.9 3.9
electromagnetic compatibility
EMC
ability of an equipment or system to function satisfactorily in its electromagnetic environment without introducing intolerable electromagnetic disturbances to anything in that environment

[IEV 161-01-07]

3.10 3.10
electromagnetic disturbance
any electromagnetic phenomenon which may degrade the performance of a device, equipment or system, or adversely affect living or inert matter

NOTE An electromagnetic disturbance may be an *electromagnetic noise*, an *unwanted signal* or a change in the propagation medium itself.

[IEV 161-01-05]

3.11 3.11
electromagnetic environment
totality of electromagnetic phenomena existing at a given location

NOTE In general, the electromagnetic environment is time dependent and its description may need a statistical approach.

[IEV 161-01-01]

3.12 3.12
emission (electromagnetic)
phenomenon by which electromagnetic energy emanates from a source

[IEV 161-01-08]

3.13 3.13
immunity (to an disturbance)
ability of a device, equipment or system to perform without degradation in the presence of an electromagnetic disturbance

[IEV 161-01-20]

3.14 3.14
externally operable
capable of being operated without the need to remove covers or open an enclosure

3.15 3.15
fire pump
pump dedicated to deliver a specified rate of water flow at a specified pressure to the fire extinguishing system of a premises

3.16 3.16
fire pump controller test protocol
procedure for exercising fire pump controllers to verify their compliance with the requirements of this standard

3.17 3.17
foam pump
pump dedicated to deliver a specified rate of foam concentrate to the system proportioner in the water fire extinguishing system of a premises

3.18 3.18
foam pump controller
controller intended to control a foam concentrate pump for use in fire suppression

3.19 3.19
lockout feature
externally accessible means to preclude an automatic controller from responding to a start signal

3.20 3.20
non-automatic control
control of an operation by human intervention

3.21 3.21
over-current
current exceeding the rated current

NOTE For the purpose of this standard, over-current protection includes motor locked-rotor and short-circuit protection only.

3.22 3.22
pumping unit
pump, driver and controller

3.23 3.23
residential fire pump controller
controller intended to control an electric motor-driven residential fire pump

NOTE Residential fire pumps are fire pumps intended for use primarily in domestic residences. They are typically limited to one- and two-family units, and are generally single-phase devices.

3.24 3.24
service equipment
necessary equipment, usually consisting of a circuit-breaker or switch and fuses and their accessories, located near the point of entrance of supply conductors to a building or other structure, or an otherwise defined area, and intended to constitute the main control and means to cut-off the supply

3.25 3.25
switch-disconnector
switch which, in the open position, satisfies the isolating requirements specified for a disconnector

[IEV 441-14-12]

3.26 3.26
system proportioner
device or coordinated group of devices which introduces foam concentrate in a prescribed proportion into the fire water stream

3.27 3.27
type-tested device
device conforming to an established type, comprised of elements (components, devices, equipment) combined and rated as a unit, replicating the constructional and performance features of the typical device which has been verified previously to be in accordance with a designated standard