

INTERNATIONAL STANDARD

NORME INTERNATIONALE



**Current and voltage sensors or detectors, to be used for fault passage
indication purposes –**

Part 1: General principles and requirements

**Capteurs ou détecteurs de courant et de tension, à utiliser pour indiquer le
passage d'un courant de défaut –**

Partie 1: Exigences et principes généraux



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CONTENTS

FOREWORD.....	7
INTRODUCTION.....	9
1 Scope.....	11
2 Normative references.....	11
3 Terms, definitions, abbreviations and symbols.....	13
3.1 General terms and definitions	14
3.2 Terms and definitions related to neutral point treatment	18
3.3 Terms and definitions related to dielectrics ratings	19
3.4 Terms and definitions related to current ratings.....	21
3.5 Terms and definitions related to other ratings	21
3.6 Abbreviations and symbols	21
4 Choice of FPI requirements according to network and fault type	22
5 Overview of applications	22
5.1 General description	22
5.2 Application with regard to installation type	24
5.2.1 Overhead line applications	24
5.2.2 Underground cable application	24
5.3 Application with regard to fault detection capability	24
5.3.1 Single phase application	24
5.3.2 Three-phase application.....	24
5.3.3 Residual current application	25
5.3.4 Three-phase and residual current application.....	25
6 Application with regard to network configuration and operation	25
7 FPI's/DSU's main elements.....	25
7.1 General.....	25
7.2 Current and voltage sensors.....	25
7.2.1 General	25
7.2.2 Accuracy for current (and voltage) sensors	26
7.3 Transmission of signals between sensors and CPU.....	26
7.4 Conditioning, processing and indicating unit (CPU)	26
7.5 Human–Machine Interface (HMI)	26
7.5.1 General	26
7.5.2 Local display.....	27
7.5.3 Remote display	27
8 FPI/DSU classification and usage classes (data model and profile definition, testing).....	27
8.1 General.....	27
8.2 Integration of FPIs in the electrical grid.....	28
8.2.1 FPI for local indication of fault detection	28
8.2.2 FPIs for remote indication of fault detection	29
8.2.3 DSUs fully integrated in network operation system (SCADA)	29
8.3 Information from FPIs/DSUs	29
8.3.1 General	29
8.3.2 Information from FPIs for local indication of fault detection.....	30
8.3.3 Information from FPIs for remote indication of fault detection	30

8.3.4	Information from DSUs fully integrated in network operation system (SCADA).....	31
8.4	FPI/DSU classification through performance/capabilities classes.....	32
8.4.1	General	32
8.4.2	Fault detection capability class.....	34
8.4.3	Communication capability class.....	34
8.4.4	Power supply class	35
8.4.5	FPI/DSU additional optional feature classes not strictly related to pure fault detection	35
8.4.6	Complete FPI/DSU classification through performance/capability classes	36
9	Service conditions	41
9.1	General.....	41
9.2	Normal service conditions	41
9.2.1	Auxiliary power supply	41
9.2.2	Ambient air temperature.....	41
9.2.3	Altitude	42
9.2.4	Vibrations or earth tremors.....	42
9.2.5	Other service conditions for indoor FPI/DSU	42
9.2.6	Other service conditions for outdoor FPI/DSUs	42
9.3	Special service conditions	43
9.3.1	General	43
9.3.2	Altitude	43
9.3.3	Vibration or earthquakes	43
10	Ratings.....	43
10.1	General.....	43
10.2	Rated primary voltage	44
10.3	Standard values of rated voltage factor.....	44
10.3.1	Earthed electronic voltage transformers.....	44
10.3.2	Unearthed electronic voltage transformers.....	44
10.4	Highest insulation level for FPI primary terminals	44
10.4.1	General	44
10.4.2	Other requirements for FPI/DSU primary terminals insulation.....	46
10.4.3	Insulation requirements for low voltage components (terminals of secondary voltage sensors).....	46
10.5	Rated frequency range	48
10.6	Rated primary current.....	48
10.7	Rated short-time thermal current	48
10.8	Rated dynamic current	48
10.9	Rated supply voltage of auxiliary and control circuits	48
10.10	Rated supply frequency of auxiliary circuits	49
11	Design and construction	49
11.1	General.....	49
11.2	Requirement for insulation material in equipment.....	49
11.3	Requirements for temperature rise of sensor parts and components.....	49
11.3.1	General	49
11.3.2	Influence of altitude on temperature-rise.....	50
11.4	Earthing of equipment	51
11.4.1	General	51

11.4.2	Electrical continuity	51
11.5	Maximum mass for clip on installation	51
11.6	Marking and additional information	52
11.6.1	Rating plate markings	52
11.6.2	Terminal markings	52
11.7	Degree of protection by enclosures.....	53
11.7.1	General	53
11.7.2	Protection of persons against access to hazardous parts and protection of the equipment against ingress of solid foreign objects.....	53
11.7.3	Protection against ingress of water	53
11.7.4	Recommended IP degrees: indoor installation	54
11.7.5	Recommended IP degrees: outdoor installation	54
11.7.6	Protection of equipment against mechanical impact under normal service conditions	54
11.8	Creepage distances	54
11.8.1	Pollution	54
11.8.2	Corrections	55
11.9	Flammability	55
11.10	Environmental compatibility	55
11.10.1	General	55
11.10.2	Requirements for electromagnetic compatibility (EMC).....	56
11.10.3	Requirements for climatic immunity	58
11.10.4	Mechanical requirements	59
11.11	Mechanical stresses on terminals (optional).....	59
12	Tests.....	59
12.1	General.....	59
12.1.1	Classification of tests	59
12.1.2	List of tests	60
12.2	Type tests	60
12.2.1	General provision for type tests	60
12.2.2	Information for identification of specimen.....	61
12.2.3	Information to be included in type test reports.....	61
12.2.4	Short time current test.....	62
12.2.5	Power-frequency voltage withstand tests on primary terminals	62
12.2.6	Temperature-rise test.....	63
12.2.7	Lightning impulse voltage test on primary terminals	63
12.2.8	Wet test for outdoor type transformers.....	64
12.2.9	Low-voltage component voltage withstand test	64
12.2.10	Electromagnetic Compatibility (EMC) tests.	64
12.2.11	Partial discharge test on primary terminals	65
12.2.12	Verification of markings.....	66
12.2.13	Verification of the degree of protection by enclosures	66
12.2.14	Functional tests	66
12.2.15	Climatic tests	66
12.2.16	Mechanical tests	67
12.3	Routine tests.....	67
12.3.1	General	67
12.3.2	Power-frequency voltage withstand test for primary terminals.....	67
12.3.3	Power-frequency voltage withstand test for low-voltage components	67

12.3.4	Partial discharge test on primary terminals	67
12.3.5	Functional tests	67
12.3.6	Verification of markings	67
12.4	Special tests	67
12.4.1	General	67
12.4.2	Chopped impulse voltage withstand test on primary terminals	67
12.4.3	Fire hazard test.....	68
12.4.4	Ageing test	68
12.4.5	Mechanical stresses on terminals test	68
Annex A (informative)	Example of guide for the selection of equipment according to use – information to be provided with inquiries, tenders, and orders.....	69
Annex B (informative)	Examples of possible FPI/DSU architectures	70
Annex C (informative)	Examples of FPI/DSU regarding communication capabilities	75
Bibliography	83
Figure 1	– General architecture of an FPI.....	10
Figure 2	– Possible architecture of a typical FPI	22
Figure 3	– Possible detailed architecture of a DSU in a wide extended configuration	23
Figure 4	– Example of possible coexistence of different performance level FPIs/DSUs on the same MV feeder.....	28
Figure 5	– Example of possible ports to consider concerning insulation requirements for LV components.....	47
Figure 6	– Altitude correction factor for the temperature rise.....	51
Figure B.1	– Example of a F5NC(or C) – T2 – P3 – 3 class FPI for underground cable application.....	70
Figure B.2	– Example of a F3NC(or C) – T1 – P2 – max 2 class FPI for underground cable application.....	71
Figure B.3	– Example of an F6NC – T1 – P3 – 4 class DSU for underground cable application.....	72
Figure B.4	– Example of an F6NC – T4 – P3 – 4 class DSU for underground cable application.....	73
Figure B.5	– Example of a F4C(or NC) – T2 – P4 – 3 class FPI for underground cable application.....	74
Figure C.1	– Example of an F1 (F2/F3) C (NC) – T2 – P2 – 1 (2) class FPI for outdoor installation on overhead conductors	75
Figure C.2	– Examples of an F4 (F5/F6) C (NC) – T2 – P3 (P4) – 3 (4) class DSU for underground cable application	77
Figure C.3	– Examples of an F4 (F5/F6) C (NC) – T2 – P3 (P4) – 4 class DSU for underground cable application	79
Figure C.4	– Examples of a F4 (F5/F6) C (NC) – T3 (T4) – P3 (P4) – 3(4) class DSU for underground cable application	82
Table 1	– FPI/DSU classification principles through classes to be used for data model and profile definitions and testing.....	33
Table 2	– FPI fault detection capability classes to be used for data model and profile definition and testing.....	34
Table 3	– Communication capability to be used for data model and profile definition and testing	35
Table 4	– Power supply class.....	35

Table 5 – Additional optional feature classes (not strictly related to pure fault detection)	35
Table 6 – FPIs usage classes: fault detection capabilities and communication capabilities	37
Table 7 – FPI/DSU minimum and maximum temperatures	41
Table 8 – Standard values of rated voltage factor (k_U)	44
Table 9 – Rated insulation levels.....	45
Table 10 – Partial discharge test voltages and permissible levels.....	46
Table 11 – Rated values of auxiliary supply voltage – d.c. voltage	48
Table 12 – Rated values of auxiliary supply voltage – a.c. voltage	49
Table 13 – Limits of temperature rise for various parts, materials and dielectrics of sensors	50
Table 14 – Unified specific creepage distance (USCD)	55
Table 15 – Fire hazard of electrotechnical products	55
Table 16 – Electromagnetic immunity requirements	56
Table 17 – Climatic immunity requirements	58
Table 18 – Mechanical immunity requirements.....	59
Table 19 – List of tests.....	60
Table 20 – EMC test	64
Table 21 – Climatic tests.....	66
Table 22 – Mechanical tests.....	67

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

CURRENT AND VOLTAGE SENSORS OR DETECTORS, TO BE USED FOR FAULT PASSAGE INDICATION PURPOSES –

Part 1: General principles and requirements

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International Standard IEC 62689-1 has been prepared by IEC technical committee 38: Instrument transformers.

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

FDIS	Report on voting
38/503/FDIS	38/510/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.

A list of all the parts in the IEC 62689 series, under the general title *Current and voltage sensors or detectors, to be used for fault passage indication purposes*, can be found on the IEC website.

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC web site under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication will be

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INTRODUCTION

0.1 General

The IEC 62689 series is a product family standard for current and voltage sensors or detectors, to be used for fault passage indication purposes by suitable devices or functions, indicated as fault passage indicator (FPI) or distribution substation unit (DSU), depending on their performances.

Different names are used to indicate FPIs depending on the region of the world and on their functionalities concerning capability to detect different kinds of faults, for instance:

- fault detector;
- smart sensor;
- faulted circuit indicator (FCI);
- short circuit indicator (SCI);
- earth fault indicator (EFI);
- test point mounted FCI.
- combination of the above.

Simpler versions, using only local information/signals and/or local communication, are called FPI, while very evolved versions are called DSU. The latter are explicitly designed for smart grids and based on IEC 60870-5 and IEC 61850 communication protocols. Compared to instrument transformers, digital communication technology is subject to on-going changes which are expected to continue in the future.

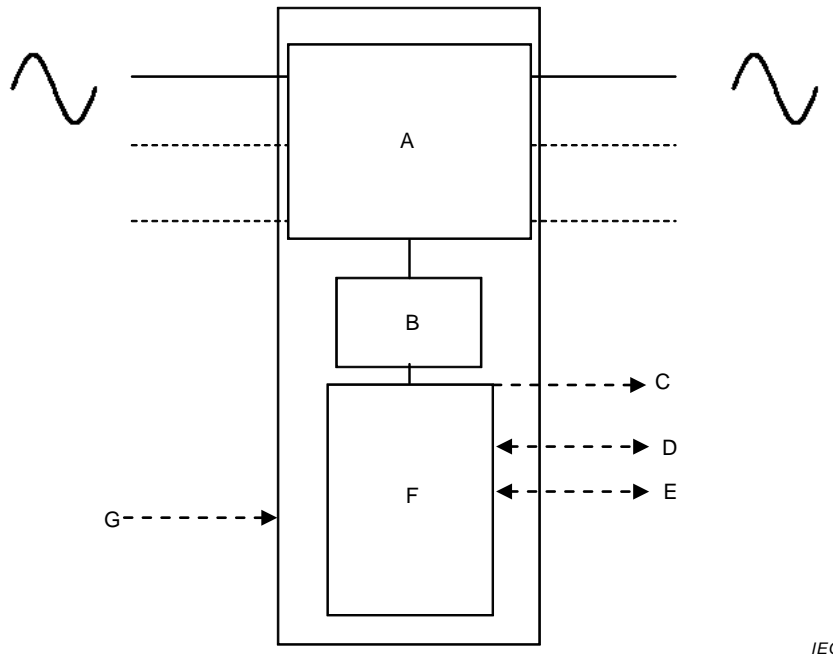
Profound experience with deep integration between electronics and instrument transformers has yet to be gathered on a broader basis, as this type of equipment is not yet widespread in the industry.

DSUs, besides FPI basic functions, may also optionally integrate additional auxiliary functions such as:

- voltage presence/absence detection for medium voltage (MV) network automation, with and without distributed energy resources presence (not for fault confirmation, which can be a basic FPI function depending on the adopted fault detection method, neither for safety-related aspects, which are covered by IEC 61243-5);
- measuring of voltage, current, and active and reactive power, etc., for various applications, such as MV network automation, monitoring of power flows, etc.;
- smart grid management (such as voltage control and unwanted island operation) by means of a proper interface with local distributed generators (DER);
- local output of collected information by means of suitable interfaces;
- remote transmission of collected information;
- others.

A general FPI scheme is outlined in Figure 1.

A DSU may have a much more complex scheme.



Key

- A: Current (and, if necessary, voltage) sensors. 1 or 3 phases may be monitored.
- B: Transmission of signals between sensors and electronics.
- C: Local indications (lamps, LEDs, flags, etc.).
- D: Analogue, digital and/or communication inputs/outputs for remote communication/commands (hard wired and/or wireless).
- E: Connections to field apparatus.
- F: Signal conditioning, processing and indicating unit (CPIU).
- G: Power supply.

Current sensor(s) may detect fault current passages without any need of galvanic connection to the phase(s) (for instance in case of cable type current sensors or of magnetic field sensor).

Not all the above listed parts or functions are necessarily included in the FPI, depending on its complexity and on its technology. However, at least 1 one of C or D functions shall be present.

Figure 1 – General architecture of an FPI

0.2 Position of this standard in relation to the IEC 61850 series

IEC 61850 is the series of International Standards intended to be used for communication and systems to support power utility automation.

The IEC 62689 series will also introduce a dedicated namespace to support integration of FPIs/DSUs into power utility automation.

In addition, it defines proper data models and different profiles of communication interfaces to support the different use cases of these FPIs/DSUs.

Some of these use cases rely on the concept of extended substation, which is intended as the communication among intelligent electronic devices (IED) through IEC 61850 located both along MV feeders and in the main substation, for the most sophisticated FPI versions (for smart grid applications, for instance, usually DSUs). Such a profile may not be limited to FPI/DSU devices, but may embrace features needed to support extensions of these substations along the MV feeders connected to the main substation themselves.

CURRENT AND VOLTAGE SENSORS OR DETECTORS, TO BE USED FOR FAULT PASSAGE INDICATION PURPOSES –

Part 1: General principles and requirements

1 Scope

This part of IEC 62689 defines the minimum requirements (therefore performances) and consequent classification and tests (with the exception of functional and communication ones) for fault passage indicators (FPIs) and distribution substation units (DSUs) (including their current and/or voltage sensors), which are, respectively, a device or a device/combination of devices and/or functions able to detect faults and provide indications about their localization.

By localization of the fault is meant the fault position with respect to the FPI/DSU installation point on the network (upstream or downstream from the FPI/DSU's location) or the direction of the fault current flowing through the FPI/DSU itself. The fault localization may be obtained

- directly from the FPI/DSU, or
- from a central system using information from more FPIs or DSUs,

considering the features and the operating conditions of the electric system where the FPIs/DSUs are installed.

In this part of IEC 62689, the FPI/DSU classification is specified in detail, in accordance with the first "core" classification defined in IEC 62689-2, which is explicitly focused on the description of electric phenomena and electric system response during faults, considering the most widely diffused distribution system architecture and fault typologies.

Thus, IEC 62689-2 is mainly focused on helping users in the correct choice of FPIs/DSUs, whereas IEC 62689-1, IEC 62689-3 and IEC 62689-4 are mainly focused on FPI/DSU requirements, communication and testing procedures, respectively.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60028, *International standard of resistance for copper*

IEC 60038, *IEC standard voltages*

IEC 60060-1, *High-voltage test techniques – Part 1: General definitions and test requirements*

IEC 60068-2-1, *Environmental testing – Part 2-1: Tests – Test A: Cold*

IEC 60068-2-14, *Environmental testing – Part 2-14: Tests – Test N: Change of temperature*

IEC 60068-2-2, *Environmental testing – Part 2-2: Tests – Test B: Dry heat*

IEC 60068-2-6, *Environmental testing – Part 2-6: Tests – Test Fc: Vibration (sinusoidal)*