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TECHNICAL REPORT

Mnemonics and designations of symbols for measuring relays, instruments and related device

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

MNEMONICS AND DESIGNATIONS OF SYMBOLS FOR MEASURING RELAYS, INSTRUMENTS AND RELATED DEVICE

FOREWORD

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IEC 62711, which is a technical report, was prepared by IEC technical committee 3: Information structures, documentation and graphical symbols.

The text of this technical report is based on the following documents:

Enquiry draft	Report on voting
3/1029A/DTR	3/1041/RVC

Full information on the voting for the approval of this technical report 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 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

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- withdrawn,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

A bilingual version of this standard may be issued at a later date.

MNEMONICS AND DESIGNATIONS OF SYMBOLS FOR MEASURING RELAYS, INSTRUMENTS AND RELATED DEVICE

1 Scope

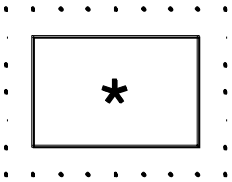
This Technical Report provides recommendations for consistent use of mnemonics and qualifying symbols to be applied to symbols representing devices used in systems for monitoring, protection, switching, and controlling of apparatus in electrical substations, generating stations, power utilization and conversion facilities, and equipment designed for automatic protection of power systems. The recommendations are intended for designers, manufacturers and engineers of such systems.

For symbols of measuring relay and measuring instrument, it is intended to serve two purposes, namely:

– Give a review of standardized designations (as defined in this report);

– Limit the range of possible variants (after final standardization and introduction in IEC 60617).

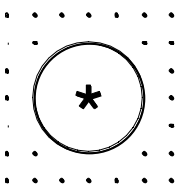
Symbols for measuring relays are symbols in which the functional behaviour of an element, mostly because of its complexity, is described by qualifying symbols e.g. IEC 60617-S00328 (2001-07), IEC 60617-S00337 (2001-07), particularly by referring to supporting documentation; the relevant rules and explanations are to be found in IEC 60617 in the application notes associated with the symbols, e.g. IEC 60617-S00327 (2001-07) (A00091 through A00094).



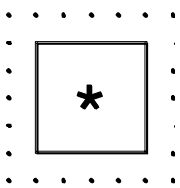
IEC 60617-S00327 (2001-07):
Measuring relay

Figure 1 – The general symbol for a measuring relay in IEC 60617

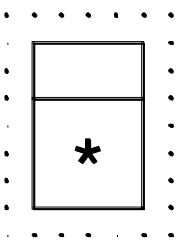
Symbols for indicating, recording or integrating instruments are symbols in which the functional behaviour of an element is fully described by standardized means. The relevant rules and explanations are to be found in IEC 60617 in the application notes associated with the symbols IEC 60617-S00910 (2001-07), IEC 60617-S00911 (2001-07) and IEC 60617-S00912 (A00144 through A00147).



IEC 60617-S00910 (2001-07):
Indicating instrument



IEC 60617-S00911 (2001-07):
Recording instrument



IEC 60617-S00912 (2001-07):
Integrating instrument

Figure 2 – The general symbols for a measuring instrument in IEC 60617

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 60617, *Graphical symbols for diagrams*

ISO/IEC 81714-1, *Design of graphical symbols for use in the technical documentation of products – Part 1: Basic rules*

3 Terms and definitions

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

3.1
protection relay
measuring relay which, either solely or in combination with other relays, is a constituent of a protection equipment

[IEC 60050-448:1995, 448-11-02]

4 Measuring relay symbols

Power systems are extremely complicated electrical networks that are geographically spread over very large areas. The power systems are so complex that a complete conventional diagram showing all the connections is impractical. There is some concise way of communicating the basic arrangement of power system components. This is done by using diagrams with universally accepted symbols in IEC 60617.

When measuring relay symbols are required, pick the general symbol IEC 60617-S00327 (2001-07) (see Figure 1), and then combine it with one or more appropriate supplementary symbols.

Some devices, especially newer devices, may not have universally accepted symbols. These devices could be represented in a number of ways, usually a matter of personal choice. In such instances, the symbol is usually accompanied by a verbal description.

When an appropriate symbol does not exist, either the general symbol IEC 60617-S00327 (2001-07) should be applied, or a symbol may be constructed following the rules of IEC 60617 and ISO/IEC 81714-1.

5 Measuring instruments

When measuring instrument symbols are required, pick the general symbols from among IEC 60617-S00910 (2001-07), IEC 60617-S00911 (2001-07) and IEC 60617-S00912 (2001-07) according to the function, that is, indicating, recording and integrating (see Figure 1). Then the asterisk within the symbol is replaced with the letter symbol or the graphical symbol.

The replacing symbol is related to the information displayed by the instrument regardless of the means used to obtain the information.

6 Mnemonics and designations for measuring relays and instruments

6.1 Overview

Where in Tables 1 to 19 below the letter “M” is shown in the second column, this means that the designation concerned may be used in measuring relay symbols. A letter “I” in the second column means that the designation concerned may be in indicating instrument symbols. A letter “R” in the second column means that the designation concerned may be in recording instrument symbols. A letter “G” in the second column means that the designation concerned may be in integrating instrument symbols. In these tables, the English descriptions appear in the fourth column, because in many cases designations are derived from terms in English.

6.2 Measuring relays

Tables 1 to 18 present the mnemonics and designations for measuring relays.

Table 1 – Measuring relays – Prefix

MNEMONICS DESIGNATION	M/I/ R/G	NAMES	DESCRIPTIONS	GRAPHICAL SYMBOLS
O	-	over	Actuating when the characteristic quantity is higher than the setting value.	> IEC 60617-S0 0108(2001-07)
U	-	under	Actuating when the characteristic quantity is lower than the setting value.	< IEC 60617-S0 0109(2001-07)
B	-	band	Actuating when the characteristic quantity is either higher than a given high setting or lower than a given low setting.	> < IEC 60617-S0 0110(2001-07)
R	-	reverse	Actuating when the characteristic quantity is contrary or opposite to what has been mentioned.	N/A
H	-	high or high speed	Actuating at high speed or other high level of a measured value or indicating signal.	N/A

Table 2 – Measuring relays – Suffix

MNEMONICS DESIGNATION	M/I/ R/G	NAMES	DESCRIPTIONS	GRAPHICAL SYMBOLS
B	-	balance	Relay which operates by comparing the magnitudes of two similar input quantities. NOTE The balance may be affected by counteracting electromagnetic forces on a common armature, or by counteracting magnetomotive forces in a common magnetic circuit, or by similar means, such as springs, levers, etc.	N/A
V	-	with voltage restraint	Method of restraining the operation of a relay by means of a voltage input which opposes the typical response of the relay to other inputs.	N/A
NOTE With regard to suffixes, designation variables as described in IEC 60909-0 and IEC 60909-3 may be used as a suffix.				

Table 3 – Measuring relays – General

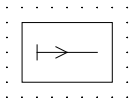
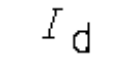
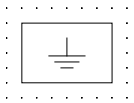
MNEMONICS DESIGNATION	M/I/ R/G	NAMES	DESCRIPTIONS	GRAPHICAL SYMBOLS
D	M	Directional relay	Relay that responds to the relative phase position of a current with respect to another current or voltage reference. NOTE the above definition which applies basically to a single phase directional relay may be extended to cover a polyphase directional relay.	 IEC 60617-S0 0104 (2001-07)
Df	M	Differential relay	Measuring relay having two windings so connected in different parts of a circuit that the relay will operate if the difference between the currents in the two circuits exceeds a specified value. (IEC 60050-811:1991, 811-31-16)	 IEC 60617-S0 0331 (2001-07)
RDf	M	Ratio (Percentage) Differential relay	Differential relay which functions when the difference between two quantities of the same nature exceeds a fixed ratio (percentage) of the smaller quantity.	 IEC 60617-S0 0332(2001-07)
G	M	Ground relay, Earth fault relay	Relay which operates when a failure of insulation to earth is detected in the equipment or circuits protected. (IEC 60050-811:1991, 811-31-15)	 IEC 60617-S0 0200(2001-07)
DG	M	Directional Ground relay	Directional relay used primarily to detect single-phase-to-ground faults, but also sensitive to double-phase-to-ground faults. NOTE This type of relay is usually operated from the zero-sequence components of voltage and current, but is sometimes operated from negative-sequence quantities.	N/A
DfG	M	Differential Ground relay	Differential relay used primarily to detect internal ground faults of generators.	N/A
S	M	Short circuit relay	Device that operates with no intentional time delay when the current exceeds a preset value.	N/A
SG	M	Selecting Ground relay	Measuring relay that, by comparing the magnitudes of the zero sequence currents in two parallel lines, will identify a line having ground fault.	N/A
SS	M	Selecting Short-circuit relay	Measuring relay that, by comparing the magnitudes of the currents in two parallel lines, will identify a line having a short- circuit fault.	N/A
DS	M	Directional Short-circuit relay	Directional relay used primarily to detect short-circuit faults.	N/A
TT	M	Transfer Trip relay	Form of remote trip in which a communication channel is used to transmit a trip signal from the relay location to a remote location.	N/A

Table 4 – Measuring relays – Current

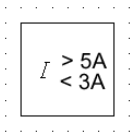
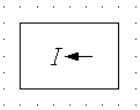
MNEMONICS DESIGNATION	M/I/ R/G	NAMES	DESCRIPTIONS	GRAPHICAL SYMBOLS
C	M	Current relay	Actuating when the current quantity is equal to a setting value.	N/A
BC	M	Band Current relay	Current relay with maximum and minimum setting.	 IEC 60617-S0 0345(2001-07)
CB	M	Current Balance relay	Balance relay that operates by comparing the magnitudes of two current inputs.	N/A
OC	M	Over Current relay	Measuring relay which operates when the value of the current exceeds the setting (operating value) of the relay. (IEC 60050-811:1991, 811-31-12)	N/A
DCG	M	Direct Current Ground relay	Device that functions when the d.c. input current exceeds a predetermined value, and in which the input current and operating time are inversely related through a substantial portion of the performance range.	N/A
OCG	M	Over Current Ground relay	Device that functions when the net (phasor sum) current flowing in the phase and neutral conductors or the total current flowing in the normal neutral to ground connection exceeds a predetermined value.	N/A
OCV	M	Over Current relay with Voltage restraint	Overcurrent relay which is used primarily to protect a generator. The function of the voltage is to prevent or moderate over current operation until the generator voltage is reduced by a fault.	N/A
DOC	M	Directional Over Current relay	Relay consisting of an overcurrent unit and a directional unit combined to operate jointly.	N/A
UC	M	Under Current relay	Relay that operates when the current is less than a predetermined value.	N/A
RC	M	Reverse Current relay	Relay that operates on a current flow in a direct-current circuit in a direction opposite to a predetermined reference direction.	 IEC 60617-S0 0339(2001-07)
CL	M	Current Limiting relay	Relay specifying a range of currents between the threshold current and the rated interrupting current within which current limitation occurs.	N/A

Table 5 – Measuring relays – Voltage

MNEMONICS DESIGNATION	M/I/ R/G	NAMES	DESCRIPTIONS	GRAPHICAL SYMBOLS
V	M	Voltage relay	Relay that responds to voltage.	N/A
VB	M	Voltage Balance relay	Balance relay which operates by comparing the magnitudes of two voltage inputs.	N/A
OV	M	Over Voltage relay	Measuring relay which operates when the value of the current exceeds the setting (operating value) of the relay. (IEC 60050-811:1991, 811-31-13)	N/A
UV	M	Under Voltage relay	Measuring relay which operates when the value of the voltage is equal to or less than the setting (operating value) of the relay.	 IEC 60617-S0 0344(2001-07)
OVG	M	Over Voltage Ground relay	Relay that operates when its input zero sequence voltage exceeds a predetermined value.	N/A
VDf	M	Voltage Differential relay	Measuring relay which intended to protect grounded-wye shunt capacitor banks.	N/A
SOG	M	Selective Over voltage Ground relay	Relay that determines the fault feeders of the high impedance ground fault by shedding the feeders of the bus in predetermined order. It operates when the zero sequence voltage of the bus exceeds the specific value for a specific time.	N/A
UVC	M	Under Voltage relay with Current compensation	Undervoltage relay whose setting (operating) value is varied by the magnitude of the current.	N/A

Table 6 – Measuring relays – Frequency

MNEMONICS DESIGNATION	M/I/ R/G	NAMES	DESCRIPTIONS	GRAPHICAL SYMBOLS
F	M	Frequency relay	Relay that responds to the frequency of an alternating electrical input quantity.	N/A
Of	M	Over frequency relay	Relay that responds to the frequency of an electrical quantity, operating when the frequency or rate of change of frequency exceeds a predetermined value.	N/A
Uf	M	Under frequency relay	Relay that responds to the frequency of an electrical quantity, operating when the frequency or rate of change of frequency is less than a predetermined value.	N/A

Table 7 – Measuring relays – Impedance

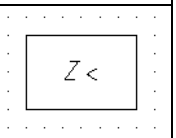
MNEMONICS DESIGNATION	M/I/ R/G	NAMES	DESCRIPTIONS	GRAPHICAL SYMBOLS
Z	M	Distance relay; Impedance relay	Relay that functions when the circuit admittance, impedance or reactance increases or decreases beyond a predetermined value.	 IEC 60617-S0 0346(2001-07)
DZ	M	Directional Distance relay	Relay consisting of a distance unit and a directional unit combined to operate jointly.	(S00346)
DGZ	M	Directional Ground distance relay	Relay consisting of a ground distance unit and a directional unit combined to operate jointly.	(S00346)
OM	M	Offset Mho relay	Distance relay for which the inherent operating characteristic on an R-X diagram is a circle which passes through the origin. NOTE The operating characteristics may be described by the equation $Z = K \cdot \cos(\theta - \alpha)$ where K and α are constants and θ is the phase angle by which the input voltage leads the input current.	(S00346)
CZ	M	Continuous curve distance-time relay	Distance relay in which the operating time is in proportion to the impedance.	(S00346)

Table 8 – Measuring relays – Power

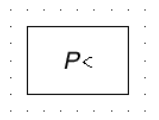
MNEMONICS DESIGNATION	M/I/ R/G	NAMES	DESCRIPTIONS	GRAPHICAL SYMBOLS
P	M	Power relay	Relay that responds to a suitable product of voltage and current in an electric circuit.	N/A
Q	M	Reactive power relay	Power relay that responds to reactive power.	N/A
RP	M	Reverse Power relay	Device that operates on a predetermined value of power flow in a given direction such as reverse power flow resulting from the motoring of a generator upon loss of its prime mover.	N/A
UP	M	Under Power relay	Relay that functions when the power flow decreases below a predetermined value.	 IEC 60617-S0 0340(2001-07)

Table 9 – Measuring relays – Phase

MNEMONICS DESIGNATION	M/I/ R/G	NAMES	DESCRIPTIONS	GRAPHICAL SYMBOLS
ϕ	M	Phase comparison relay	Form of pilot protection that compares the relative phase-angle position of specified currents at the terminals of a circuit.	N/A
ϕ B	M	Phase balance relay	Relay that responds to differences between quantities of the same nature associated with different phases of a normally balanced polyphase circuit.	N/A
ϕ Sl	M	Phase selector relay	Programming relay whose function is to select the faulted phase or phases thereby controlling the operation of other relays or control devices.	N/A

Table 10 – Measuring relays – Other quantities

MNEMONICS DESIGNATION	M/I/ R/G	NAMES	DESCRIPTIONS	GRAPHICAL SYMBOLS
Fl	M	Flow relay	Relay that responds to a rate of fluid flow.	N/A
ArFl	M	Air Flow relay	Relay that responds to a rate of air flow.	N/A
Pr	M	Pressure relay	Relay that responds to liquid or gas pressure.	N/A
Po	M	Position relay	Relay that responds to a position.	N/A
T	M	Temperature relay	Relay whose operation is caused by specified external temperature.	N/A
Th	M	Thermal relay	Relay whose operation is caused by heat developed within the relay as a result of specified external conditions.	N/A
v	M	Velocity relay	Relay that responds to a velocity.	N/A
VC	M	Vacuum relay	Relay that responds to a vacuum.	N/A
WL	M	Water Level relay	Relay that responds to a water level.	N/A
OS	M	Over Speed relay	Form of protection that operates when the speed of rotation exceeds a predetermined value.	N/A
OSS	M	Over-speed switch	Switch that operates when the value of the speed exceeds the setting (operating value).	N/A

Table 11 – Measuring relays – Other fault phenomenon

MNEMONICS DESIGNATION	M/I/ R/G	NAMES	DESCRIPTIONS	GRAPHICAL SYMBOLS
Fc	M	Flicker relay	Relay that functions to energize a circuit periodically or for fractions of specified time intervals, or that is used to permit intermittent acceleration.	N/A
OP	M	Open Phase relay	Polyphase relay designed to operate when one or more input phases of a polyphase circuit are open.	N/A
SP	M	Sudden Pressure relay	Relay that operates by the rate of rise in pressure of a liquid or gas.	N/A
RPH	M	Reversal Phase-sequence relay	Protection relay that prevents energizing of the protected equipment on the reversal of the phase sequence in a polyphase circuit.	N/A

Table 12 – Measuring relays – Pilot wire relay

MNEMONICS DESIGNATION	M/I/ R/G	NAMES	DESCRIPTIONS	GRAPHICAL SYMBOLS
Pw	M	Pilot wire relay	Line protection that uses a communication channel as a means to compare electrical conditions at the terminals of a line. Traditionally the pilot wire protections use an auxiliary metallic circuit for the communicating means between relays at the circuit terminals. Today optical fibre or other means of communication may be used for the comparison between line ends.	N/A
PwD	M	Pilot wire relay with Directional comparison	Pilot wire relay in which the relative operating conditions of the directional units at the line terminals are compared to determine whether a fault is in the protected line section.	N/A
PwDf	M	Pilot wire relay with Differential type	Pilot wire relay that by its design or application is intended to respond to the difference between current entering one terminal of a transmission line section and leaving another.	N/A
PwMo	M	Pilot wire Monitoring relay	Auxiliary relay to a pilot wire relay that has as its function to verify that system or control circuit conditions conform to prescribed limits.	N/A
PwTT	M	Pilot wire relay with Transfer Trip	Pilot wire relay using a carrier pilot channel to transmit a trip signal from the relay location to remote location.	N/A

Table 13 – Measuring relays – Carrier pilot relay

MNEMONICS DESIGNATION	M/I/ R/G	NAMES	DESCRIPTIONS	GRAPHICAL SYMBOLS
Cr	M	Carrier pilot relay	Form of pilot communicating relay in which the communication means between relays is a carrier current channel.	N/A
CrRe	M	Carrier pilot Received relay	Relay that operates or restrained by a signal used in connection with carrier-current or direct-current (dc) in the pilot-wire.	N/A
CrD	M	Carrier pilot relay with Directional comparison	Form of carrier pilot relay in which the relative operating conditions of the directional units at the line terminals are compared to determine whether a fault is in the protected line section.	N/A
Crφ	M	Carrier pilot relay with Phase(φ) comparison	Form of carrier pilot relay that compares the relative phase-angle position of specified currents at the terminals of a circuit.	N/A
CrTT	M	Carrier pilot relay with Transfer Trip	Form of remote trip in which its carrier pilot channel is used to transmit a trip signal from the relay location to remote location.	N/A

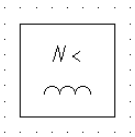
Table 14 – Measuring relays – Microwave relay

MNEMONICS DESIGNATION	M/I/ R/G	NAMES	DESCRIPTIONS	GRAPHICAL SYMBOLS
M	M	Microwave relay	Form of pilot communicating relay in which the communication means between relays is a beamed microwave radio channel.	N/A
MD	M	Microwave relay with Directional comparison	Form of microwave relay in which the relative operating conditions of the directional units at the line terminals are compared to determine whether a fault is in the protected line section.	N/A
Mφ	M	Microwave relay with phase(φ) comparison	Form of microwave relay that compares the relative phase-angle position of specified currents at the terminals of a circuit.	N/A
MTT	M	Microwave relay with Transfer Trip	Form of remote trip in which its carrier pilot channel is used to transmit a trip signal from the relay location to remote location.	N/A

Table 15 – Measuring relays – Calculation type

MNEMONICS DESIGNATION	M/I/ R/G	NAMES	DESCRIPTIONS	GRAPHICAL SYMBOLS
※/ ※≈1	M	Balance relay	Relay actuating when the absolute value of the quotient of two kinds of characteristic quantity deviates from 1.	N/A
U / U≈1	M	Voltage balance relay	Balance relay which operates by comparing the magnitudes of two voltage inputs.	N/A

Table 16 – Measuring relays – Apparatus protection and control

MNEMONICS DESIGNATION	M/I/ R/G	NAMES	DESCRIPTIONS	GRAPHICAL SYMBOLS
BP	M	Bus Protection relay	Protection relay used primarily to detect bus bar faults. The relay whose function is to trip the breakers of all circuits connected to the bus bar.	N/A
FA	M	Field Accelerating relay	Relay that functions automatically to maintain the rotor current within the limits, when a motor accelerating to speeds above base speed, by controlling the excitation of the motor field.	N/A
FG	M	Field Grounding relay	Protection relay used to detect ground faults in the field or exciter circuit of generators.	N/A
LyS	M	Layer Short circuit relay	Relay that used to detect short-circuits between windings in motors or generators.	 IEC 60617-S0 0347(2001-07)
LF	M	Loss-of-field relay, Loss-of-excitation relay	Device that functions on a given or otherwise abnormally value or failure of machine field current, or on an excessive value of the reactive component of rotor current in an alternating current machine indicating abnormal field excitation.	N/A

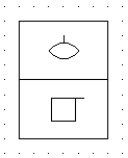
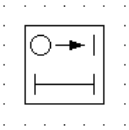
MNEMONICS DESIGNATION	M/I/ R/G	NAMES	DESCRIPTIONS	GRAPHICAL SYMBOLS
BH	M	Buchholtz's relay	Relay with two measuring devices (stages) intended to protect a power transformer. The first stage (slight failure contact) operates by gas to be generated by a slight accident and the second stage (serious failure contact) that operates by an oil flow to be generated by a sudden pressure rise.	 IEC 60617-S0 0352(2001-07)
Rec	M	Reclosing relay	Programmable relay whose function is to initiate the automatic reclosing of a circuit breaker.	 IEC 60617-S0 0353(2001-07)
Sy	M	Synchronizing relay, Synchronism-check relay	Programmable relay whose function is to initiate the closing of a circuit breaker between two ac sources when the voltages of these two sources meet a predetermined relationship of magnitude, phase angle and frequency.	N/A
SO	M	Step-out relay, Out-of-step relay	Protection relay that separates the appropriate parts of a power system, or prevents separation that might otherwise occur, in the event of loss of synchronism.	N/A
TIS	M	Tap Incomplete Sequence relay	Device that generally returns the equipment to the normal or off position and locks it out if the normal starting, operating or stopping sequence is not properly completed within a predetermined time. Applicable for control of tap changers on power transformers.	N/A
TOS	M	Tap Out of Step condition relay	Device that monitors and indicates that the main contact of a tap changer has reaches its highest or lowest position.	N/A
TF	M	Trip-free relay, Release-free relay	Auxiliary relay whose function is to open the closing circuit of an electrically operated switching device so that the opening operation can prevail over the closing operation.	N/A
OL	M	Over Load relay	Relay operative on excessive current, but not necessarily on short circuit, to cause and maintain the interruption of current flow to the device governed.	N/A

Table 17 – Measuring relays – Other type

MNEMONICS DESIGNATION	M/I/ R/G	NAMES	DESCRIPTIONS	GRAPHICAL SYMBOLS
2E	M	Two Element relay for overload and open-phase relay	Relay consisting of an overload unit and an open-phase unit.	N/A
3E	M	Three Element relay for overload, open-phase and phase-sequence reversal relay	Relay consisting of an overload unit, an open-phase unit and phase-sequence reversal unit.	N/A
ALT	M	Alternating relay	Relay designed for automatic duplex control of motors or other types of loads.	N/A
Ax	M	Auxiliary relay	Relay whose function is to assist another relay or control device in performing a general function by supplying supplementary actions.	N/A

MNEMONICS DESIGNATION	M/I/ R/G	NAMES	DESCRIPTIONS	GRAPHICAL SYMBOLS
B	M	Blocking relay	Relay whose function is to render another relay or device ineffective under specified conditions	N/A
Con	M	Control relay	Auxiliary relay whose function is to initiate or permit the next desired operation in a control sequence.	N/A
DI	M	DisInterconnecting relay; System separation relay	Programmable relay whose function is to initiate the disconnection of a faulty part while operation and service in the rest of the system continue.	N/A
EL	M	Earth Leakage relay	Ground relay that is primarily used to a low voltage circuit.	N/A
FI	M/ I	Fault Indicator	Device that presents a visual display, audible alarm, and so forth, when a failure or marginal condition exists.	N/A
K	M	Keep relay, Electric reset auxiliary relay	Relay that is so constructed that it remains in the picked-up condition even after the input quantity is removed: an independent electric input is required to reset the relay.	N/A
L	M	Lockout relay	Electrically reset or hand-reset auxiliary relay whose function is to hold associated devices inoperative until it is reset.	N/A
MgC	M	Electromagnetic Control relay	Electro-mechanical relay that operates principally by action of an electromagnetic element which is energized by the input quantity.	N/A
PI	M	Polarity relay	Relay which responds to the predetermined direct current polarity.	N/A
R	M	Receiver relay	Auxiliary relay whose function is to respond to the output of a communications set such as an audio, carrier, radio, or microwave receiver.	N/A
R ϕ C	M	Reverse-phase sequence Current relay, Negative-phase sequence Current relay	Relay that responds to the negative-phase-sequence component of a polyphase input current.	N/A
R ϕ V	M	Reverse-phase sequence Voltage relay, Negative-phase sequence Voltage relay	Relay that responds to the negative-phase-sequence component of a polyphase input voltage.	N/A
PRO	M	Protector relay	Relay whose function is to open a circuit for automatically disconnecting a transformer from a secondary network in response to predetermined electrical conditions on the primary feeder or transformer and for connecting a transformer to secondary network either through manual control or automatic control responsive to predetermined electrical conditions on the feeder and the secondary network. NOTE This is not the definition of the general term Protective relay.	N/A

MNEMONICS DESIGNATION	M/I/ R/G	NAMES	DESCRIPTIONS	GRAPHICAL SYMBOLS
ST	M	Starting relay	Relay, actuated by current, voltage, or the combined effect of current and voltage, used to perform a circuit-changing function in the primary winding of a single-phase induction motor within a predetermined range of speed as the rotor accelerates: and to perform the reverse circuit- changing operation when the motor is disconnected from the supply line. One of the circuit changes that are usually performed is to open or disconnect the auxiliary-winding circuit.	N/A
TD	M	Time-delay relay, Delayed relay	Relay having an assured or programmable time interval between being trigged and operating.	N/A
TL	M	Time-lag relay, Timing relay	Auxiliary relay or relay unit whose function is to introduce one or more time delays in the completion of an associated function	N/A
PCM	M	Pulse Code Modulation relay	Differential current relay operating on the deviation between time synchronized samples of digitalized measured current of the local end and the comparable measured current transmitted from a remote end of a power line.	N/A

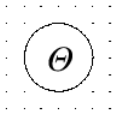
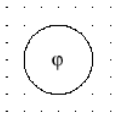
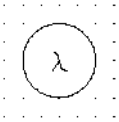
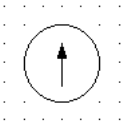
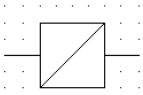
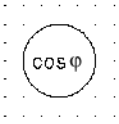
Table 18 – Measuring relays – Power system control

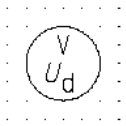
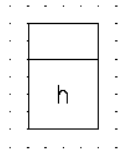
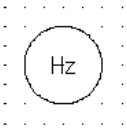
MNEMONICS DESIGNATION	M/I/ R/G	NAMES	DESCRIPTIONS	GRAPHICAL SYMBOLS
ARE	M	Automatic Restoration Equipment	Equipment that performs actions or tasks for the automatic restoration of the power system in the event of a local disturbance.	N/A
AVR	M	Automatic Voltage Regulator	Controller for automatic regulation of voltage by operation an OLTC (on load tap changer) on a power transformer as per pre-set voltage limits.	N/A
VQC	M	Voltage and Q Controller	Equipment that brings bus voltage close to its target voltage independently, by controlling the OLTC, capacitors and shunt reactors.	N/A

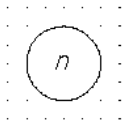
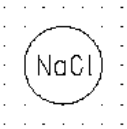
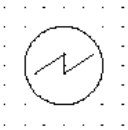
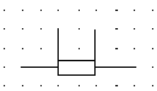
6.3 Power system measuring instruments

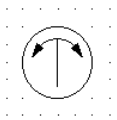
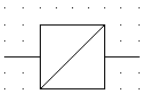
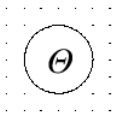
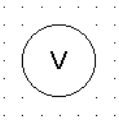
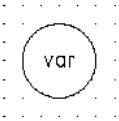
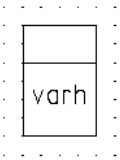
Table 19 presents the mnemonics and designations for measuring instruments.

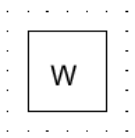
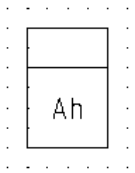
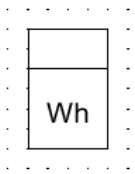
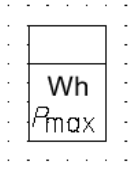
Table 19 – Measuring instruments – Power system measuring instruments

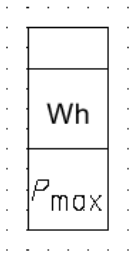
MNEMONICS DESIGNATION	M/I/ R/G	NAMES	DESCRIPTIONS	GRAPHICAL SYMBOLS
θ	I	Thermo measuring equipment	Instrument intended to measure electrical resistance.	 IEC 60617-S0 0926(2001-07)
φ	I	Phase measuring equipment, Phase-angle measuring equipment	Instrument intended to measure the phase difference between two alternating electrical quantities of the same frequency, one of which is taken as the phase reference. [IEC 60050-300:2001, 313-01-13]	 IEC 60617-S0 0918(2001-07)
Ω	I	Resistance measuring equipment, ohm measuring equipment	Instrument intended to measure electrical resistance. [IEC 60050-300:2001, 313-01-09]	N/A
λ	I	Waveform measuring equipment	Instrument for measuring waveform.	 IEC 60617-S0 0921(2001-07)
A	I/ R	current measuring equipment (Ammeter)	Instrument intended to measure the value of a current. [IEC 60050-300:2001, 313-01-01]	N/A
A_0	I	Zero phase current measuring equipment	Instrument intended to measure the value of a zero phase current of the three phase power system.	N/A
C	I	Counter	Instrument in which a number is stored and to which a constant integer number is added algebraically depending on switching variables (variable quantities) at the counter input.	N/A
CD	I	Current Detector	Instrument intended to detect a current.	 IEC 60617-S0 0924(2001-07)
CO	I	pulse COunter	Instrument for counting the number of edges on a digital signal.	N/A
CONV	I	CONVerter	Device which changes the manner of representing information from one from to another.	 IEC 60617-S0 0213(2001-07)
cos φ	I	Power-factor measuring instrument	Instrument intended to measure the ratio of the active to the apparent power in an electrical circuit. [IEC 60050-300:2001, 313-01-14]	 IEC 60617-S0 0917(2001-07)
D	I	Detector, Sensor	Device that monitors the presence of the something.	N/A

MNEMONICS DESIGNATION	M/I/ R/G	NAMES	DESCRIPTIONS	GRAPHICAL SYMBOLS
DfV	I	Differential Voltage measuring equipment	Instrument intended to measure the value of a voltage between the different parts of a circuit.	 IEC 60617-S0 0923(2001-07)
Dy	I	Dynamo measuring equipment	Instrument for measuring a net power torque by which generation torque and rotational speed are measured.	N/A
Fl	I/ G	Flow measuring equipment	Instrument for measuring the quantification of bulk fluid movement. It can be measured in a variety of way.	N/A
GD	I	Ground leakage Detector, Grounding Detector earth leakage detector	Instrument intended to detect a leakage current to earth. [IEC 60050-300:2001, 313-01-24]	N/A
H	I/ G	hour measuring equipment	Instrument for counting hour.	 IEC 60617-S0 0931(2001-07)
HLV	I	High Low Voltage measuring equipment	Instrument intended to measure the minimum and maximum occurring voltage.	N/A
Hz	I	Frequency measuring equipment	Instrument intended to measure the frequency of a periodic quantity. [IEC 60050-300:2001, 313-01-12]	 IEC 60617-S0 0919(2001-07)
L	I	Liquid level indicator	Device used to assist in the measurement of the level of liquid in a tank.	N/A
MA	I	Maximum Ampere measuring equipment	Instrument for measuring the maximum value of a current.	N/A
MA_0	I	Maximum zero-phase Ampere measuring equipment	Instrument for measuring the maximum value of a zero phase current of the three phase power system.	N/A
MCO	I	Magnetic COunter	Instrument for counting the number of edges on a digital signal by electro-magnetic coil.	N/A
MDA	I	Maximum-Demand current measuring equipment	Indicating device intended for indication of a maximum reach value of the current measurement that has occurred since the previous resetting of the device.	N/A
MDW	I	Maximum-Demand power measuring equipment	Indicating device intended for indication of a maximum reach value of the power measurement that has occurred since the previous resetting of the device.	N/A
MLT	I	MuLTiplier	Device used for the expansion of the measurement range of the direct current volt measuring equipment.	N/A
MV	I	Maximum(Minimum) Voltage measuring equipment	Instrument for measuring the maximum (minimum) voltage.	N/A
MV_0	I	Maximum zero-phase Voltage measuring equipment	Instrument for measuring the maximum zero-phase voltage.	N/A

MNEMONICS DESIGNATION	M/I/ R/G	NAMES	DESCRIPTIONS	GRAPHICAL SYMBOLS
N	I	Tacho measuring equipment	Instrument for measuring the rotation speed of a shaft or disk, as in a motor or other machine.	 IEC 60617-S0 0927(2001-07)
NaCl	I	salt measuring equipment, salinity measuring equipment	Instrument for measuring salinity.	 IEC 60617-S0 0925(2001-07)
OL	I	Oil Level indicator, Oil Level measuring equipment, Oil gauge	Instrument for measuring oil level.	N/A
OSC	I	OSCilloscope	Instrument primarily for making visible the instantaneous value of one or more rapidly varying electrical quantities as a function of time or of another electrical or mechanical quantity.	 IEC 60617-S0 0922(2001-07)
PI	I	(tap) Position Indicator	Electrical, mechanical or electromechanical device for indicating the tap position of a tap-changer. [IEC 60050-421:1991, 421-12-03]	N/A
PG	I	Pressure Gauge	Instrument is used to measure the liquid or gas pressure.	N/A
PS	I	Phase-Sequence indicator	Instrument intended to indicate, in a polyphase system, the sequence in which the instantaneous voltages of the phase conductors reach their maximum values. [IEC 60050-300:2001, 313-01-21]	N/A
RTD	I	Resistance Temperature Detector	Temperature detecting device using resistance.	N/A
RTh	I	Resistance Thermo measuring equipment	Thermo measuring equipment by resistance.	N/A
SC	I	Search Coil, Exploring coil	Device for measuring eye movement	N/A
Sh	I	Shunt	Resistor connected in parallel with the current circuit of a measuring instrument in order to extend its measuring range. [IEC 60050-300:2001, 313-09-04]	 IEC 60617-S0 0564(2001-07)
SI	I	fault Selection Indicator	Instrument that help reduce fault-finding time so that power can be restored quickly after a fault occurs.	N/A
sin φ	I	Reactive-factor measuring equipment	Instrument for measuring reactive factor. It is provided with a scale graduated in reactive factor.	N/A
SSG	I	Speed Signal Generator	Instrument for measuring the turbine rotational speed.	N/A

MNEMONICS DESIGNATION	M/I/ R/G	NAMES	DESCRIPTIONS	GRAPHICAL SYMBOLS
Sy	I	Synchronoscope, Synchronism indicator	Instrument intended to indicate that two alternating voltages or polyphase voltage systems have the same frequency and are in phase. [IEC 60050-300:2001, 313-01-22]	 IEC 60617-S0 0920(2001-07)
TD	I	TransDucer	Device for converting an alternating measurand to a direct current, a direct voltage or a digital signal for measurement purposes. [IEC 60050-300:2001, 313-03-01]	 IEC 60617-S0 0213(2001-07)
Th	I	Thermo measuring equipment	Device that measures temperature or temperature gradient using a variety of different principles.	 IEC 60617-S0 0926(2001-07)
THC	I	THermoCouple instrument	Thermal instrument in which the current heats, due to Joule effect, one or more thermocouples on the terminals of which the source tension is measured. [IEC 60050-300:2001, 312-02-35]	N/A
TTh	I	Thermocouple Thermo measuring equipment	Thermo measuring equipment by thermocouple.	N/A
TW	I/ R	Totalizing power measuring equipment	Instrument for measuring the total electric power (or the supply rate of electrical energy) in watts of any given circuit.	N/A
V	I/ R	Volt measuring equipment	Instrument intended to measure the value of a voltage. [IEC 60050-300:2001, 313-01-03]	 IEC 60617-S0 0913(2001-07)
V_0	I	zero-phase Voltage measuring equipment	Instrument intended to measure the value of a zero phase voltage of the three phase power system.	N/A
V	I	Speed measuring equipment	Instrument for measuring the instantaneous speed of something.	N/A
Var	I/ R	var measuring equipment	Instrument intended to measure reactive power. [IEC 60050-300:2001, 313-01-07]	 IEC 60617-S0 0916(2001-07)
Varh	I/ G	var-hour measuring equipment	Instrument intended to measure reactive energy by integrating reactive power with respect to time. [IEC 60050-300:2001, 313-06-02]	 IEC 60617-S0 0945(2001-07)
VD	I	Voltage Detector	Instrument intended to detect whether or not a conductive component is live. [IEC 60050-300:2001, 313-01-25]	N/A

MNEMONICS DESIGNATION	M/I/ R/G	NAMES	DESCRIPTIONS	GRAPHICAL SYMBOLS
VG	I	Vacuum Gauge	Instrument is used to measure the pressure in a vacuum.	N/A
W	I/ R	Watt measuring equipment	Instrument intended to measure active power. [IEC 60050-300:2001, 313-01-06]	 IEC 60617-S0 0928(2001-07)
WL	I	Water Level indicator, Water Level measuring equipment	Instrument for measuring device used to assist in the measurement of the level of water in a tank.	N/A
Tm	I	Transmitter	Device for transmitting a coded signal when operated by any one of a group of actuating devices.	N/A
AT	I	Ampere Transmitter (Tele-measuring equipment)	Transmitter for the measured quantity of a current.	N/A
VT	I	Voltage Transmitter (Tele-measuring equipment)	Transmitter for the measured quantity of a voltage.	N/A
WT	I	Watt Transmitter (Tele-measuring equipment)	Transmitter for the measured quantity of a power.	N/A
VarT	I	Var Transmitter (Tele-measuring equipment)	Transmitter for the measured quantity of a reactive power.	N/A
Re	I	Receiver	Part of an automatic switching system that receives signals from a calling device or other source for interpretation and action.	N/A
Ah	G	Ampere-hour measuring equipment	Instrument intended to measure a quantity of electricity by integrating current with respect to time. [IEC 60050-300:2001, 313-01-16]	 IEC 60617-S0 0932(2001-07)
Wh	G	Watt-hour measuring equipment	Instrument intended to measure active energy by integrating active power with respect to time. [IEC 60050-300:2001, 313-06-01]	 IEC 60617-S0 0933(2001-07)
WhPmax	G	Watt-hour measuring equipment with maximum demand	Energy measuring equipment fitted with a means to indicate the highest average value of the power during successive time intervals of equal duration.	 IEC 60617-S0 0943(2001-07)

MNEMONICS DESIGNATION	M/I/ R/G	NAMES	DESCRIPTIONS	GRAPHICAL SYMBOLS
WhPmaxR	G	Watt-hour measuring equipment with maximum demand Recorder	Energy measuring equipment fitted with a means to record the highest average value of the power during successive time intervals of equal duration.	 IEC 60617-S0 0944(2001-07)
PtWh	G	Printable Watt-hour measuring equipment	Energy measuring equipment fitted with a means to print.	N/A

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