8IDV Transformer Protection and Control IED

A complete and innovative solution for transformer bays and other machines

- Additional overcurrent protection for each winding.
- Connection to RTD temperature probes.
- Up to 13 analog inputs covering most complex protection schemes.
- Wide range of measurements per winding scanned at 32 samples / cycle.

Contributing to improved Safety, Quality of Service and Profitability of Electrical Systems
Protection Functions

Protection and control IEDs model IDV are based on the most advanced digital technology and are designed for maximum flexibility and versatility.

They have all the necessary functions to protect, control and meter a transformer, autotransformer or reactance bay. Their programmable logic unit allows the user to freely define the operational logic of the protection and control functions to adapt them to the specific bay and system requirements.

The IDV series is based on the latest digital technology and has been designed to provide maximum flexibility and versatility.

Flexible Programming Logic

- Basic relationships between the configurable modules of 8IDV IEDs
Protection

IDV terminals include a wide range of protection functions to cover most complex applications. Protection functions can be enabled or disabled during configuration or by commands transmitted via the communications ports, operator interface (HMI) or digital inputs.

Control

IDV IEDs can support control functions required in a machine bay with all the characteristics of an intelligent RTU:

- Captured and calculated metering data via analog inputs and transducers (0-5mA, ±2.5mA, 4-20mA, etc.).
- Data capture from digital inputs and internal signal states.
- Local and remote control of substation equipment via auxiliary outputs.
- Input/output logic, interlocks, control hierarchy and programmable control functions.
- Communications ports for connections to the substation HMI or directly to the Control Center and/or SCADA.

As an option:

- Programmable voltage regulation function (tap changer control).
- Acquisition of the tap changer position by programming status contact inputs (in BCD code) or from a transducer input (mA) indicating the tap changer position.
- Capture and calculation of metering values and interface for connecting to RTD probes Pt100 / Ni120 / Ni100 / Cu10 (with RTD open / shorted).

Metering

IDV models provide readings of:

- Captured analog values: phase currents of each winding, ground currents of one or two windings and phase voltages (phase-ground or phase-phase) and ground (depending on the model).
- Differential and restraint currents of each winding.
- Values of positive, negative and zero sequence of currents of each winding.
- Harmonic content of the phase A currents of each winding up to that of the 8th harmonic.
- Power calculated from the magnitude of the phase current and the phase voltage (phase-ground or phase-phase) of the same winding: active, reactive and apparent power.
- Cosine $\varphi$.
- Frequency.
- Thermal image.

The sampling frequency of the metering units is 32 samples per cycle (1920 Hz in 60 Hz systems and 1600 Hz in 50 Hz systems). All samples are used for metering and oscillography storage.

Metering values are used as inputs for the protection functions built into the IED. Additionally, any reading, whether measured or calculated, can be selected as an input to user-programmed functions (communications, display, logic, etc.).

<table>
<thead>
<tr>
<th>Metering Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phase and ground currents of each winding calculated (3I0).</td>
</tr>
<tr>
<td>Tank grounding currents.</td>
</tr>
<tr>
<td>Differential currents of each winding.</td>
</tr>
<tr>
<td>Restraint currents of each winding.</td>
</tr>
<tr>
<td>Harmonics of the currents of each winding.</td>
</tr>
<tr>
<td>Phase voltage and ground voltage.</td>
</tr>
<tr>
<td>Positive, negative and zero sequence currents of each winding.</td>
</tr>
<tr>
<td>Active, reactive and apparent power.</td>
</tr>
<tr>
<td>Cosine $\varphi$.</td>
</tr>
<tr>
<td>Frequency.</td>
</tr>
<tr>
<td>Thermal image.</td>
</tr>
</tbody>
</table>
Overcurrent Protection

Overcurrent protection is used as a backup in the event of short-circuits in the machine and for faults external to the machine. It includes instantaneous and time units for the three-phases, calculated ground and earth.

Over-undervoltage Protection

The overvoltage protection protects the machine against excessively high voltages that can damage the insulation and generate excessive flux in the core. The purpose of the ground overvoltage element is to detect ground faults on the grid.

The purpose of the undervoltage protection is to detect abnormal conditions in the system. It can detect a malfunction in the voltage regulators and overload situations.

Frequency Protection

There are twelve frequency elements (overfrequency, underfrequency and rate of change). They are used in protection and control applications of the power system, such as the load shedding algorithms and generator protection.

Overexcitation Protection (V/Hz)

Used to detect conditions of excessive flux or induction in transformers and generators. An excessive increase in the induction quickly leads to saturation of the core of the machine, and, consequently, excessive heat is generated.

Breaker Failure

There is a breaker failure element for each winding of the machine. They provide fast backup for clearing faults when the breaker fails to open.

Overcurrent Protection with Harmonic Restraint

It is a non-directional instantaneous one-phase overcurrent unit including, as an option, harmonic restraint (available in 3-winding models).

Differential Units with and without Restraint

There are three differential elements, which use operating and restraint magnitudes calculated with data from the currents of the machine's two or three windings. They have percentage as well as 2nd and 5th harmonic restraint. These restraints block the differential unit when there are external faults, in-rush currents due to energizing the transformer (2nd harmonic) and situations of overexcitation (5th harmonic).

They also have three differential elements without restraint. They are usually adjusted to more than 10 times the tap. This pickup value is surpassed only for severe internal faults, providing fast trips.

Restricted Ground Fault Units

The restricted ground fault unit protects the machine from internal ground faults in star-connected windings, including autotransformers that cannot be detected by the phase differential unit. Its operating principle is based on comparing the grounding current and the zero sequence current calculated with data from the phase currents. This provides great sensitivity, speed and safety.

Thermal Image Protection

This unit prevents damage caused by thermal overloads in power transformers, rotating machines, reactance and wires. It uses two methods to detect the overload. It estimates the heating based on the magnitude of the circulating currents and it calculates the temperature of the hot spot and the rate of aging of the insulation with RTD temperature probes.

Thermal Image protection unit prevents damage caused by thermal overloads in power transformers, rotating machines, reactance and wires. Functions
### Additional Functions

#### Cold Load Pick-Up
This function prevents trips when reconnecting heavy loads. This is achieved by temporarily selecting a different settings group.

#### Frequency Load Shedding
Frequency units 1 and 2 can work on pairs, i.e., underfrequency or frequency rate of change together with overfrequency, to perform a load shedding scheme. This operation mode permits up to 2 load shedding levels. For more than 2 levels, programmable logic should be configured using the signals from the rest of frequency units.

#### Event Recording and Programmable Event Logs
A 400-record-capacity sequence of events log is stored in non-volatile memory. A user can generate event-triggering signals. The events are recorded with 1-ms resolution. The log can include up to 12 selectable analog quantities.

#### Fault Reporting
Capacity for storing up to 15 fault reports with relevant data, such as picked-up units, tripped units, pre-fault metering, fault metering, current interrupted, etc.

#### Metering Logs
Up to twelve minimum and maximum values will be stored for each selected quantity in the metering logs for each time slot. Time slot resolution can be adjusted to the needs of the application by configuring day and recording intervals. Up to 168 records can be stored.

#### Oscillographic Recording
The oscillography record allows up to 64 oscillographs to be saved in a cyclical memory. Sampling frequency is 32 samples per cycle, with a total recording time of 15 seconds. The records are guaranteed to be saved for 27 days in the event of a sustained loss of auxiliary power.

Recordable values include analog signal metering, digital inputs and internal signals generated by the protection functions and the logic control units.

IEDs are supplied complete with a display and analysis program that allows the waveform records to be converted to COMTRADE format.

#### Integrated Simulator
The IDV models include a special test and simulation mode that allows operations to be simulated using waveforms loaded in via the front-panel communications port.

#### Time Synchronization
The IEDs include an internal clock with a resolution of 1 ms. This can be synchronized via GPS (IRIG-B protocol) or by communications through the remote communications port (DNP3 or PROCOME 3.0).

#### Programmable Logic
The inputs to the logic functions can be any of the signals or readings generated by the following functions: protection units, digital inputs, communications, command functions, analog inputs.

The user can define a logical operation using primitive logic functions (AND, OR, XOR, NOT, etc.), flip-flops, timers, comparators, etc.

The programming function allows the user to define trip logic, control logic, interlocks, functional modules and control hierarchy required for complete protection and operation of a bay.

The logical outputs produced when processing input signals can be assigned to auxiliary output contacts, HMI display, communications, HMI external, etc.
Application

The use of differential protections is recommended for identifying internal faults of the protected machine as well as faults occurring within the zone of influence of its CTs. It is also very important for the protection to include restraint elements to avoid false trips due, primarily, to the current produced in energizing the transformers or the high values of current produced by external faults, that might cause the saturation of some CT.

This application presents additional problems due to the very nature of differential protection. The CTs use different transformer ratios but do not compensate that difference. Also, the power transformer connection could displace the phase angles between the primary and secondary currents.

The IDV differential protection IED ensures stability against:

- Saturation and errors in the CTs.
- Energizing maneuvers.
- All types of internal and external faults.
- Variation in the transformer taps and/or their connection group.

IDV is suitable for all types of two or three winding machines (transformers, autotransformers, motors, generators and reactance). This IED can compensate the transformer taps and the connection group of the machine to be protected eliminating the need for matching transformers.

IDV units are designed to work best as part of an integrated protection and control system, although their performance and use offers significant advantages when they are used as stand-alone components of conventional protection systems.
Application

Due to their flexible communications structure, IDV units provide great versatility when applied to distributed integrated protection and control systems. Systems of this type have the following fundamental characteristics:

- Physical distribution of the analog and digital data acquisition and local control IEDs.

- The distinction between protection equipment and control equipment disappears. The IEDs combine both functions to various degrees.

- The functions are distributed by levels so they can be executed at the optimum level, that which has the required information.

- The hierarchy of the command functions is flexible and configurable: control center, substations, local bay control, etc.

- Protection units are located at the lowest level of the hierarchy and maintain their functional integrity even in the absence of the higher levels and other units at the same level.

- Minimum use of conventional cabling is required as the connections between the data capture modules and the substation use a communications system. At the substation level, the data received is combined and presented to the local operator or to a remote operator (control room) in a suitable format, as required for each purpose: supervision, control, analysis, etc.

One or two networks, depending on the protocol and the application:

- Fiber Optic (glass / plastic) / RS232 / RS485
- Asynchronous serial links, 38,400 Bps (database refresh period: 0.5s)
- Star Topology / Switches
- Double ring

IRIG-B Synchronization

One or two networks, depending on the protocol and the application:

- Fiber Optic (glass / plastic) / RS232 / RS485
- Asynchronous serial links, 38,400 Bps (database refresh period: 0.5s)
Human-Machine Interface

The operator interface (HMI) allows a high degree of configurability. The HMI includes an alphanumeric display (4 lines of 20 characters) with a keypad that can be used to interact with the IED.

Alphanumeric Display and Keypad
This interface provides the following operations:
- Viewing and modifying settings.
- Viewing all captured and calculated metering values.
- Control operations.
- Changing setting groups.
- Data queries
- Consulting events of any protocol configured for this purpose.

Programmable Buttons
The front panel has three columns of buttons for control operations of the system's elements (lockout relay reset, breaker control, fan control, motor operated sectionalizing switches, programmable control functions, local/remote, etc.). These push-buttons allow local control of substation apparatuses or IED functions, and six of them are fully programmable. Each of these push-buttons has an associated LED indicator to display the state of the element associated with the button.

One of the buttons can be configured to reset the IED's operation LED targets.

The push-button group has a general blocking function that can be configured from the HMI or via the communications ports providing the security required for proper operation.

Communications

All IDV IEDs include two communications ports on the rear panel for remote access, plus a front panel port for local access. All IDV models have three simultaneous communications protocols: PROCOME, MODBUS and DNP3.

PROCOME protocol complies with the IEC 870-5 series of standards and is used for both protection and control data. DNP 3 and MODBUS protocols are used exclusively to communicate control data.

Some models can optionally include a 100 FX port (Ethernet over fiber optic) and an RJ45 port, as physical support for the IEC 61850 protocol / UCA 2.0.

This protocol allows interchange of data of all types, both with the higher hierarchical levels and with other IEDs. Moreover, it is based on accepted open standards (Ethernet) and supports self-description.

Local and remote communications ports can be used simultaneously.
Construction

8IDV units are designed for mounting in 19” racks, and are two, three or four units height (depending on the number of analog inputs and digital inputs/outputs). The electronic cards, or modules, are mounted horizontally and can be extracted by removing the front panel. External connections use plug-in terminal blocks on the rear panel of the enclosure, with ring lug connectors. As an option, this device is also available in a vertical construction (model 3IDV).

The enclosure is provided with a ground terminal. It is essential that this terminal be properly connected to the substation ground for the filters to protect the IED from external electromagnetic disturbances.

Voltage and Current Analog Inputs

The units include up to 13 analog inputs divided into two non self-shorting ring lug terminal blocks (block A and B). Connectors accept lugs for wires up to AWG 12 (6 mm²).

RTD Probe Inputs

For protection against thermal overloads, the IED has BUS CAN type communications inputs. RTD probe modules can be connected to them to obtain up to 12 different temperature measurements.

Contact Inputs and Outputs

- Models available for 2-winding transformers:
  The 2U model (basic model) has 8 status contact inputs, 6 auxiliary outputs, 4 trip outputs and an in-service contact.
  Additional digital inputs and outputs are available in the three-unit high models, which include an expansion board.
  In this case, the relay includes 25 status contact inputs, 12 auxiliary outputs, 4 trip outputs, an in-service contact and two transducer inputs.

- Models available for 3-winding transformers:
  The 3U model (basic model) has 11 status contact inputs, 12 auxiliary outputs, 6 trip outputs and an in-service contact.
  Additional digital inputs and outputs are available in the four-unit high models, which include an expansion board. In this case, the relay includes 28 status contact inputs, 18 auxiliary outputs, 6 trip outputs, an in-service contact and two transducer inputs.
  In all cases, connectors accept lugs for AWG 17 to 13 wires (1 to 2.5 mm²).

For vertical construction (3IDV) enclosures are always 1 rack 19” height and 3U or 4U width.
Information retrieval:

Captured and calculated metering.
Counter register information and user values configured in the programmable logic.
Contact input status.
State of the auxiliary and control outputs: trip and close.
State of the protection modules.
State of the signals used by the internally programmed logic functions.
State of the self-test functions.

Retrieval, display and storage of the logs generated by the equipment:
Sequence of events.
Fault reports.
Oscillography.
Metering logs.

Programming Tools

The software provides an user-friendly interface for all of the necessary parameter setting operations and for accessing the data recorded by the equipment.

The program can be installed and used on a PC with any of the following operating systems: Windows 98, Windows 2000 or Windows XP.

The program allows to perform the following functions via serial communications (RS232 or USB) between the IED and a PC:

- Upload or download settings.
- Edit settings.
- Store settings for future editing.
- Retrieve information.
- Synchronize with PC date and time.
- Retrieve, display and store the logs generated by the equipment:
  - Load and retrieve the configuration files which define all the parameters of the IED.
  - Update the IED firmware.

Off-line programming is available for the following tasks:

- Edit settings files.
- Program digital inputs, auxiliary outputs and targets.
- Edit logic functions via graphical user interface.
- Define signals to be recorded in the event log and the metering quantities to be stored with these records.
- Define the signals to be stored in the oscillographs.
- Define the display names of the configurations.
- Define the signals to be transmitted over the communications protocols.

The software includes an oscillography display and analysis tool that can use waveforms captured by the IDV. It can also import and display data files in COMTRADE format created by other manufacturers’ IEDs.

Software package allows easy definition of logical control functions.
## Settings

### Configuration Settings

<table>
<thead>
<tr>
<th>Connection group</th>
<th>1 winding</th>
<th>2 or 3 windings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type of winding</td>
<td>0 (Y, star)</td>
<td>0 (Y, star)</td>
</tr>
<tr>
<td></td>
<td>1 (D, delta)</td>
<td>1 (D, delta)</td>
</tr>
<tr>
<td></td>
<td>2 (Z, zigzag)</td>
<td>2 (Z, zigzag)</td>
</tr>
<tr>
<td>Zero sequence filter enable</td>
<td>0-1 (filter disable/enable)</td>
<td>0-1 (filter disable/enable)</td>
</tr>
</tbody>
</table>

### Protection Units

#### Units 1 and 2 of Restricted Earth Faults (REF)

- **Pickup**: 0.05 - 10 A
- **Restraint slope of ground faults**: 0 - 100 %
- **Fixed time characteristic**: 0.00 - 300 s

#### Thermal Image Unit (by Current)

- **Constant T1**: 0.5 - 300 min
- **Constant T2**: 0.5 - 300 min
- **Maximum sustained current**: (0.20 - 2.5) In
- **Level of alarm activation**: 50 - 100 %
- **Level of connection enable (reset)**
- **Thermal memory (enable)**: YES / NO

#### Overcurrent Elements

- **Directional ground element**: YES / NO
- **Blocking due to lack of polarization**
- **Phase time overcurrent**
  - **Pickup**: 0.02 - 25 In
  - **Time curve** **IEC/IEEE/US**:
  - **Time curve index (IEC)**: 0.05 - 1
  - **Time curve index (IEEE/US)**: 0.1 - 10
  - **Fixed time characteristic**: 0.05 - 300 s
- **Ground time overcurrent**
  - **Pickup**: 0.02 - 25 In
  - **Time curve** **IEC/IEEE/US**:
  - **Time curve index (IEC)**: 0.05 - 1
  - **Time curve index (IEEE/US)**: 0.1 - 10
  - **Fixed time characteristic**: 0.05 - 300 s
- **Torque control**
  - **Ground time overcurrent**
  - **Blocking due to lack of polarization**
  - **Negative sequence time overcurrent**
  - **Ground time overcurrent**
  - **Fixed time characteristic**: 0.05 - 300 s

#### Instantaneous Differential Unit

- **Pickup**: 1 - 20 times the tap
- **Time**: 0 - 300 s

### Available Curves

#### IEC Curves
- Inverse curve
- Very inverse curve
- Extremely inverse curve
- Long-term inverse curve
- Short-term inverse curve
- Inverse curve + time limit
- Very inverse curve + time limit
- Extremely inverse curve + time limit
- Long-term inverse curve + time limit
- Short-term inverse curve + time limit

#### IEEE / ANSI Curves
- Moderately inverse curve
- Very inverse curve
- Extremely inverse curve
- Moderately inverse curve + time limit
- Very inverse curve + time limit
- Extremely inverse curve + time limit

#### US Curves
- Standard inverse curve
- Very inverse curve
- Extremely inverse curve
- Short-term inverse curve
- Moderately inverse curve + time limit
- Very inverse curve + time limit
- Extremely inverse curve + time limit
- Short-term inverse curve + time limit

**RI inverse Curve**

Used primarily to coordinate with electromechanical relays.

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Note: the time units with inverse time curves may be reduced due to saturation of the channel if a high value is set in the configuration. Consult the manufacturer for particular requirements.

* *with ventilation*.

** *without ventilation*.

*** See list of curves.
### Settings

#### Protection Units

**Overcurrent Elements**

- **Phase instantaneous overcurrent**
  - Pickup: 0.01 - 30 Ω
  - Time: 0 - 300 s

- **Ground instantaneous overcurrent**
  - Pickup: 0.01 - 30 Ω
  - Time: 0 - 300 s

- **Torque control**
  - 0: Non-directional
  - 1: Directional
  - 2: Reverse

- **Ground instantaneous overcurrent**
  - Pickup: 0.01 - 50 A
  - Time: 0 - 600 s

- **Negative sequence instantaneous overcurrent**
  - Pickup: 0.05 - 30 Ω
  - Time: 0 - 300 s

#### Voltage Elements

- **Phase overvoltage / undervoltage**
  - Type of voltage: V_A, V_B, V_C, U_AB, U_BC, U_CA
  - Pickup: 10 - 300 V
  - Time: 0 - 300 s

- **Ground overvoltage**
  - Pickup: 2 - 150 V
  - Time: 0 - 300 s

- **Voltage element reset settings**
  - Reset of overvoltage units: 50 - 99%
  - Reset of undervoltage units: 101 - 150%

#### Frequency Elements

- **Common settings**
  - Inhibition for minimum voltage: 20 - 150 V
  - Activation time: 3-30 half-waves
  - Reset time: 0 - 10 cycles
  - Enable load shedding frequency elements 1 and 2: YES / NO
  - Load shedding type: 0 - Underfrequency, 1 - Rate of change unit

- **Overfrequency / underfrequency**
  - Pickup: 40 - 70 Hz
  - Time: 0.00 - 300 s
  - Reset time: 0.00 - 300 s

- **Rate of change**
  - Pickup frequency: 40 - 70 Hz
  - Rate of change pickup: (-0.5) - (-10.00) Hz/s
  - Time: 0.00 - 300 s
  - Reset time: 0.00 - 300 s

#### Oscillography Settings

- **Trip required**
  - YES / NO

- **Concatenation**
  - YES / NO

- **Pre-trigger length**
  - 0 - 25 cycles

- **Oscillography record length**
  - 5 - 725 cycles

- **Start function (independent for each protection function)**
  - YES / NO

- **Analog channel mask**
  - Selectable from among all the user-definable digital inputs and status contact input signals

#### Auxiliary Units

**Cold Load Unit (Cold Load Pick-Up)**

- Time with 52-AB to change to settings group 4: 0-1800 s
- Time with 52-CE to change to working settings group:
  - 52-1: YES / NO
  - 52-2: YES / NO
  - 52-3: YES / NO

**Breaker Failure**

- Phase reset: 0.02 - 2 ln
- Ground reset: 0.02 - 2 ln
- Time: 0.00 - 2.00 s

**Overexcitation Units**

- **Pickup level**
  - 1.00 - 4.00 V/Hz

- **Shape of curve**
  - Definite time / Curve A-B-C

- **Time curve index**
  - 0.01 - 10

- **Time**
  - 0.00 - 600.00 s

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Reduce the time required to adjust the relay by using software package.
### Settings

#### Logic Settings

<table>
<thead>
<tr>
<th>Setting</th>
<th>Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trip output seal-in enable</td>
<td>YES / NO</td>
</tr>
<tr>
<td>Breaker open failure time</td>
<td>0.02-2 s</td>
</tr>
<tr>
<td>Breaker close failure time</td>
<td>0.02-2 s</td>
</tr>
<tr>
<td>Lockout enable</td>
<td>YES / NO</td>
</tr>
<tr>
<td>Pickup reports</td>
<td>YES / NO</td>
</tr>
<tr>
<td>Trip permissions (independent enable for each protection unit)</td>
<td>YES / NO</td>
</tr>
</tbody>
</table>

#### Breaker Monitor Settings

<table>
<thead>
<tr>
<th>Setting</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excessive number of trips</td>
<td>1-40</td>
</tr>
<tr>
<td>I square sum alarm</td>
<td>0-99,999.99kA²</td>
</tr>
<tr>
<td>Cumulative preset value I² (setting and information)</td>
<td>0-99,999.99kA²</td>
</tr>
<tr>
<td>Trip coil monitoring 1/2/3</td>
<td></td>
</tr>
<tr>
<td>Time to give coil failure trip</td>
<td>1-60 s</td>
</tr>
</tbody>
</table>

#### Filtering of Digital Inputs

<table>
<thead>
<tr>
<th>Setting</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time between samplings</td>
<td>2-10 ms</td>
</tr>
<tr>
<td>No. same-value samples to validate filter 1/2</td>
<td>1-10 samples</td>
</tr>
<tr>
<td>Number of changes to disable an input</td>
<td>2-60 changes</td>
</tr>
<tr>
<td>Time for disabling</td>
<td>1-30 s</td>
</tr>
<tr>
<td>Number of changes to enable an input</td>
<td>2-60 changes</td>
</tr>
<tr>
<td>Time for enabling</td>
<td>1-30 s</td>
</tr>
</tbody>
</table>

#### Log

<table>
<thead>
<tr>
<th>Setting</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Averaging calculation time interval</td>
<td>1-15 min</td>
</tr>
<tr>
<td>Logging interval</td>
<td>1 min - 24.00 h</td>
</tr>
<tr>
<td>Day calendar mask</td>
<td>Monday through Sunday</td>
</tr>
<tr>
<td>Hour range</td>
<td>0-24.00 h</td>
</tr>
</tbody>
</table>

### Dimensions

Type T, Z and Q enclosures

Measurements in mm. Mounting holes 8 mm.

- **Enclosure Type Z**
- **Enclosure Type T**
- **Enclosure Type Q**

#### Technical Assistance

High-quality local technical service is available to customers worldwide, either from our own personnel (in Spain, Brazil and the USA) or from our extensive network of local collaborators in other countries.

Several round-the-clock help services are available (24 hours/day, 365 days/year) for immediate attention.
**Technical Characteristics**

<table>
<thead>
<tr>
<th><strong>Auxiliary Voltage</strong></th>
<th><strong>Breaker Trip and Close Outputs and Auxiliary Outputs</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ranges</strong> 24 Vdc (-15% / +20%)</td>
<td>I (DC) maximum limit (*) 60A (1 s)</td>
</tr>
<tr>
<td>48-250 Vdc/Vac (- 20%)</td>
<td>I (DC) continuous service (*) 16A</td>
</tr>
<tr>
<td><strong>Current drain</strong> &lt; 20 W</td>
<td>Close 5000 W</td>
</tr>
<tr>
<td><strong>Voltage Inputs</strong></td>
<td>Breaking capability (*) 240W (48Vdc max. 5A)</td>
</tr>
<tr>
<td>Rated value (Vn) 50 - 230 Vac</td>
<td>110W (80-250Vdc)</td>
</tr>
<tr>
<td>(selectable)</td>
<td>2500 VA</td>
</tr>
<tr>
<td><strong>Thermal withstand capability</strong> 300Vac (continuously)</td>
<td>Break (L/R = 0.04 s) 120W at 125Vdc</td>
</tr>
<tr>
<td>600Vac (for 10 s)</td>
<td>Switching voltage 250 Vdc</td>
</tr>
<tr>
<td><strong>Voltage circuit burden</strong> 0.55 VA (110/120 Vac)</td>
<td>Momentary close time 100 ms</td>
</tr>
<tr>
<td></td>
<td>Trip contacts remain closed</td>
</tr>
<tr>
<td><strong>Frequency</strong></td>
<td>Break delay &lt;150 ms</td>
</tr>
<tr>
<td>Operating Range 16 - 61 Hz</td>
<td><strong>Measurement Accuracy</strong></td>
</tr>
<tr>
<td><strong>Transducer Inputs</strong></td>
<td><strong>Accuracy of the Pickup and Reset</strong></td>
</tr>
<tr>
<td>General use input ranges DC</td>
<td><strong>Differential units</strong></td>
</tr>
<tr>
<td>0-1 mA; ±1mA; ±2.5mA; 0-5 mA; 0-10 mA; 4-20 mA</td>
<td>Pickups and resettings of phases and neutral</td>
</tr>
<tr>
<td><strong>Input impedance</strong> &lt; 1kΩ</td>
<td>( \text{In} = 1A \text{ or } 5A ) \pm 3% or \pm 5mA \text{ (the greater)}</td>
</tr>
<tr>
<td><strong>RTD Probe Module (Input to the IED through BUS CAN Port)</strong></td>
<td>Overcurrent elements</td>
</tr>
<tr>
<td>RTD input type</td>
<td>Pickups and resettings of phases and neutral</td>
</tr>
<tr>
<td>3 wires 100-ohm platinum</td>
<td>( \text{In} = 1A \text{ or } 5A ) \pm 3% or \pm 5mA \text{ (the greater)}</td>
</tr>
<tr>
<td>100- or 120-ohm nickel</td>
<td>Pickups and resettings of ground</td>
</tr>
<tr>
<td>10-ohm copper (DIN 43760)</td>
<td>( \pm 3% \text{ or } \pm 5mA \text{ (the greater)} )</td>
</tr>
<tr>
<td><strong>Range</strong></td>
<td>Measuring times (of the setting)</td>
</tr>
<tr>
<td>-50 to +250° C</td>
<td><strong>Fixed time</strong> \pm 1% or \pm 20ms (the greater)</td>
</tr>
<tr>
<td><strong>Precision</strong> \pm 2° C</td>
<td><strong>Characteristic</strong></td>
</tr>
<tr>
<td><strong>IRIG-B Input</strong></td>
<td>Inverse Time Class 2 (E = 2) (UNE21-136; IEC 255)</td>
</tr>
<tr>
<td>Types of format supported</td>
<td>Transient overreach \pm 5%</td>
</tr>
<tr>
<td>IRIG-B123 and 003</td>
<td></td>
</tr>
<tr>
<td>Type of connector</td>
<td></td>
</tr>
<tr>
<td>BNC</td>
<td></td>
</tr>
<tr>
<td><strong>Input impedance</strong></td>
<td></td>
</tr>
<tr>
<td>(Default impedance 600 Q)</td>
<td></td>
</tr>
<tr>
<td>Maximum input voltage</td>
<td><strong>DC Digital Inputs</strong></td>
</tr>
<tr>
<td>10 V</td>
<td><strong>Rated voltage</strong> <strong>Activation (V)</strong> <strong>Reset (V)</strong> <strong>Max. V continuously</strong> <strong>Max. V During 1 s</strong> <strong>Burden at Rated V (W)</strong></td>
</tr>
<tr>
<td>24 Vdc</td>
<td>12 Vdc</td>
</tr>
<tr>
<td>48 Vdc</td>
<td>30 Vdc</td>
</tr>
<tr>
<td>125 Vdc</td>
<td>70 Vdc</td>
</tr>
<tr>
<td>250 Vdc</td>
<td>120 Vdc</td>
</tr>
</tbody>
</table>

(*) With resistive load.

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**Warranty**

All new products sold to customers are warranted against defects in design, materials, and workmanship for a period of ten (10) years from the time of delivery. Contact [ISO 9001 Certified Company](#) for complete details.

**Quality**

[ISO 9001 Certified Company](#) is firmly committed to a Plan for Continuous Improvement within the framework of a policy of Total Quality that covers all stages from feasibility studies through commissioning of the complete system.
Model Selection

Use this table to select the most suitable model for your application:

### Functions
- 2 Windings with 3x87+ 3x87/50 + 3x50/51 + 50N/51N + 67N + 50Q/51Q + 50G/51G + 87N + 49 + 64 + 59/81/24(VHz) + 50BF + 50FA

### Options
- Standard model
  - Ports 100FX - Ethernet O.F. and RJ45 (IEC 61850 / UCA 2.0)(1)
  - Ports 100FX - 2 x RJ45 (IEC 61850 / UCA 2.0)(1)
- Local wireless communications (Bluetooth)

### Protocols
- COM1 (LOCAL) + COM2 (REM - P1) + COM3 (REM - P2)
- RS232+USB
- RS232/P.O.F.
- RS232/RS485/G.O.F.

### Number of Inputs and Outputs
- 8 inputs + 6 outputs + 4 trip outputs (Mod. 8IDV-A)
- 11 inputs + 12 outputs + 6 trip outputs (Mod. 8IDV-B)
- 25 inp. + 12 outp. + 4 trip outp. + 2 transducer inputs(2)
- 28 inp. + 18 outp. + 6 trip outp. + 2 transducer inputs(2)

### Spare
- As default

### Enclosure
- 2U x 1 19" rack (I/O type 0)
- 3U x 1 19" rack (I/O type 1 and 2)
- 4U x 1 19" rack (I/O type 3)

### Protocols
- COM1 (LOCAL) + COM2 (REM) + COM3 (REM)
- PROCOME
- PROCOME / DNP3.0 / MODBUS(3)

### Finishing
- Stainless steel + printed circuit board not tropicalized
- Stainless steel + tropicalized printed circuit board

### Standards and Type Tests

<table>
<thead>
<tr>
<th>Test</th>
<th>Standards and Type Tests</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insulation test (dielectric strength)</td>
<td>IEC-60255-5</td>
</tr>
<tr>
<td>Between all circuit</td>
<td>2 kV, 50/60 Hz for 1 min or</td>
</tr>
<tr>
<td>terminals and ground</td>
<td>2.5 kV, 50/60 Hz for 1 s</td>
</tr>
<tr>
<td>Measurement of insulation resistance</td>
<td>IEC-60255-5</td>
</tr>
<tr>
<td>Common mode</td>
<td>R ≥ 100 MΩ or 5 J</td>
</tr>
<tr>
<td>Differential mode</td>
<td>R ≥ 100 MΩ or 5 mA</td>
</tr>
<tr>
<td>Voltage impulse test</td>
<td>IEC-60255-5 (UNE 21-136-83-5)</td>
</tr>
<tr>
<td>Common mode</td>
<td>5 kV, 1.250 µs; 0.5 J</td>
</tr>
<tr>
<td>(analog inputs / DIs, DOs and CP)</td>
<td>Differential model</td>
</tr>
<tr>
<td></td>
<td>1 kV, 1.250 µs</td>
</tr>
<tr>
<td>1 MHz burst test</td>
<td>Power supply</td>
</tr>
<tr>
<td>Radiation electromagnetic field disturbance</td>
<td>IEC-60255-22-1 Class III (UNE 21-136-92-22-1)</td>
</tr>
<tr>
<td>Amplitude modulated (EN 50140)</td>
<td>10 V/m</td>
</tr>
<tr>
<td>Pulse modulated (EN 50204)</td>
<td>10 V/m</td>
</tr>
<tr>
<td>Conducted electromagnetic field disturbance</td>
<td>(IEC-61000-4-6) Class III (EN50141)</td>
</tr>
<tr>
<td>Amplitude modulated</td>
<td>10 V</td>
</tr>
<tr>
<td>Electrostatic discharge</td>
<td>IEC-60255-22-2 Class IV (UNE 21-136-92-22-4)</td>
</tr>
<tr>
<td>Temperature</td>
<td>IEC-60066-2 / IEC-61131-2</td>
</tr>
<tr>
<td>Cold work</td>
<td>-40°C, 16 h</td>
</tr>
<tr>
<td>Dry heat</td>
<td>+85°C, 16 h</td>
</tr>
<tr>
<td>Humidity</td>
<td>+40°C, 93% relative humidity, 4 days</td>
</tr>
<tr>
<td>Quick temperature changes (IED open)</td>
<td>-25°C for 3 h</td>
</tr>
<tr>
<td>Changes in humidity</td>
<td>+70°C for 3 h (5 cycles)</td>
</tr>
<tr>
<td>Endurance test</td>
<td>-25°C for 12 h (5 cycles)</td>
</tr>
<tr>
<td>Humidity</td>
<td>+25°C for 12 h (6 cycles)</td>
</tr>
<tr>
<td>Climate test</td>
<td>95% (non-condensing)</td>
</tr>
<tr>
<td>Time/Current characteristic</td>
<td>58ºC, 99% humidity, 72 hours</td>
</tr>
<tr>
<td>Power supply ripple in the power supply</td>
<td>ANSI C37.60 Class II</td>
</tr>
<tr>
<td>Polarization inversion of the power supply</td>
<td>&lt; 20% and 100ms</td>
</tr>
<tr>
<td>Resistance of ground connection</td>
<td>IEC-61131-2</td>
</tr>
<tr>
<td>Gradual step / start test</td>
<td>IEC-61131-2 (Test A)</td>
</tr>
<tr>
<td>Vibration test (sinusoidal)</td>
<td>IEC-60255-21-1 Class I</td>
</tr>
<tr>
<td>Shock and Bump Test</td>
<td>IEC-60255-21-2 Class I</td>
</tr>
<tr>
<td>External protection levels</td>
<td>8IDV models conform with the Directive 89/336/EEC</td>
</tr>
</tbody>
</table>

Electromagnetic Compatibility.

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(1) Ports as per option 5.
(2) Selectable (0.5) mA or (±2.5) mA.
(3) Selectable independently for COM2 and COM3.
External Connections

8IDV-B (3U High)

Voltage Inputs

1. A1 VPh
2. A2 VPh
3. A3 VN
4. A4 VN
5. A5 Ia-1
6. A6 Ia-1
7. A7 Ia-1
8. A8 Ib-1
9. A9 lc-1
10. A10 lc-1
11. B6 Io-1
12. B7 Io-1
13. B1 la-2
15. B3 lb-2
16. B4 lb-2
17. B5 lc-2
18. B6 lc-2
19. D1 la-3
20. D2 la-3
21. D3 lb-3
22. D4 lb-3
23. D5 lc-3
24. D6 lc-3
25. B9 lc-2
26. B10 lc-2

Current Inputs

27. D3 IN2
28. D4 IN3
29. D5 IN4
30. D6 IN5
31. D7 IN6
32. D8 IN8
33. D9 IN9
34. D10 IN10
35. D11 IN11

Programmable Digital Inputs

36. C18 + IN7
37. C19 + IN8
38. C17 + COMMON
39. C16 + IN6
40. C15 + IN5
41. C14 + IN4
42. C13 + IN3
43. C12 + IN2
44. C11 + IN1

Programmable Digital Outputs

45. OUT1
46. OUT2
47. OUT3
48. OUT4
49. OUT5
50. OUT6
51. OUT7
52. OUT8
53. OUT9
54. OUT10
55. OUT11
56. OUT12
57. OUT13
58. OUT14
59. OUT15
60. OUT16
61. OUT17
62. OUT18
63. OUT19
64. OUT20

Fault Inputs

65. E1 GND
66. E2 - I AUX
67. E3 + I AUX

Fault Outputs

68. E12
69. E13
70. E14
71. E15
72. E16
73. E17
74. E18
75. E19
76. E20
77. E21
78. E22
79. E23
80. E24

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