



The Edison® Idea iTP-100 is a substation IED (Intelligent Electronic Device) designed for Transmission Line Protection, Monitoring, and Control. The iTP-100 offers the following features:

- Four zones each of phase and ground distance protection; 3 forward and 1 reverse
- Zone 1 extension logic or 4th forward zone
- Directional phase, ground and negative-sequence overcurrent elements; instantaneous, definite time, and inverse time overcurrent
- Over and under voltage elements
- Multiple-Shot programmable reclosing
- Sync-check
- Out-of-step blocking logic
- Weak feed logic
- Breaker fail-to-trip and fail-to-close detection
- Switch-onto-fault logic
- Communication aided tripping logic including POTT, PUTT, DCUB, DUTT, DTT, DCB, Forward Over-reaching and Under-reaching logic
- Loss of Load Accelerated tripping
- Load encroachment logic
- Fault location
- Fuse-Fail detection
- Eight setting groups
- High-accuracy instantaneous metering of Amps, Volts, Watts, and Vars
- Demand and peak metering of amps, watts and vars
- Sequence of Events Recording
- Interactive oscillography
- Distance-to-fault calculation
- 25 programmable LED targets
- 8 instant access "Hot-Keys"
- Front panel programmability of all relay settings.
- 13 contact input and 13 contact outputs.
- IRIG-B Time Synchronization
- Three communication ports
- Modbus and DNP 3.0 protocols

■ FUNCTIONAL SPECIFICATION

Phase Mho Elements:

Forward Zones 1, 2 and 3
 Forward Zone 4 or Zone 1 Extension (Selectable)
 Reverse Zone 5

Characteristic	Mho
Maximum torque angle (phase/phase)	45-90°
Reach (per unit of line impedance)	0.05 to 20.00 pu
Time delay (Zones 2 through 5)	0 – 3600 seconds
Each zone individually selectable to be enabled or disabled.	

Ground Mho Elements:

Forward Zones 1, 2 and 3
 Forward Zone 4 or Zone 1 Extension (Selectable)
 Reverse Zone 5

Characteristic	Mho
Maximum torque angle (phase/ground)	45-90°
Reach (per unit of line impedance)	0.05 to 20.00 pu
Time delay (Zones 2 through 5)	0 – 3600 seconds
Each zone individually selectable to be enabled or disabled.	

Combined Steady State and Transient Overreach/Underreach Error

For faults at set reach at maximum torque angle, no-pre-fault load.

- Typically less than 3% of reach for ground mhos
- Typically less than 5% of reach for phase mhos

Power Swing Blocking

Selectable blocking for any combination of three-phase mhos during power swing

Slow swing detection timer	0 – 3600 seconds
Slow swing maximum allowed timer	0 – 3600 seconds
Fast swing detection timer	0 – 3600 seconds
Fast swing maximum allowed timer	0 – 3600 seconds
Trip on way in enable	
Trip on way out enable	
Left Inner and outer swing blinder resistance	-100 to -1 secondary ohms
Right Inner and outer swing blinder resistance	1 to 100 secondary ohms

Load Encroachment Detection

Selectable blocking for any combination of three-phase mhos during load encroachment.
 Area defined in load plane as a function of minimum and maximum allowable reactive power levels at minimum and maximum forward and reverse loads.

Maximum Forward load	1 to 1000 secondary volt-amperes
Reverse load	1 to 1000 secondary volt-amperes

Directional Supervisory Elements

Positive Sequence elements	0.01 to 100 Positive sequence VA 45 to 90° maximum torque angle
Negative Sequence elements	0.01 to 100 Negative sequence VA 45 to 90° maximum torque angle
Zero Sequence elements	0.01 to 100 Zero sequence VA 45 to 90° maximum torque angle

Fault Detectors

Mho element fault detectors (one per zone)	0.1 to 80A $\pm 1\% \pm 0.01A$
Positive Sequence elements	0.1 to 80A $\pm 1\% \pm 0.01A$
Negative Sequence elements	0.1 to 80A $\pm 1\% \pm 0.01A$
Zero Sequence elements	0.1 to 80A $\pm 1\% \pm 0.01A$

Synch-Check

Control Options	Dead Line/Dead Bus Dead Line/Hot Bus Hot Line/Dead Bus Hot Line/Hot Bus
Maximum dead phase or synch check voltage	0.1 to 300V $\pm 1\% \pm 0.05V$
Minimum hot phase or synch check voltage	0.1 to 300V $\pm 1\% \pm 0.05V$
Maximum voltage differential for synch	0.1 to 300V $\pm 1\% \pm 0.05V$
Minimum in synch time for synch	0 to 3600 seconds

Fuse Fail

Minimum voltage for fuse fail	0 to 300Vsec
Time delay to declare fuse fail	0 to 3600 seconds

Directional Time Overcurrent

Elements available	Positive sequence, negative sequence and zero sequence elements
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Each element is selectable to be blocked or made non-directional during fuse fail conditions. Each positive sequence element is selectable to be blocked during out of step and/or load encroachment conditions.

Inverse Time

Selectable curve shapes	Moderately inverse, very inverse, extremely inverse, IEC A, IEC B, IEC C
Pick-up range	0.1 to 80A
Time Dial Setting range	0.01 to 100
Reset characteristic	Instantaneous or disk-like

Definite Time

One positive, negative and zero sequence element per zone	
Pick-up range	0.1 to 80A
Time delay	0 to 3600 seconds

Local Tripping Schemes

Step distance (STEP)
 Directional Overcurrent Tripping (DOC)
 Zone 1 Extension (Z1X)
 Loss of Load Accelerated Tripping (LOLA)

Communication Aided Tripping Schemes

Permissive Overreaching Transfer trip (POTT)
 Permissive Under-reaching Transfer trip (PUTT)
 Directional Comparison Blocking (DCB)
 Directional Comparison Unblocking (DCUB)
 Direct Under-reaching Transfer trip (DUTT)
 Direct Transfer Trip (DTT)
 Custom Communication Aided (user programmable)

Over/Under Voltage

Two levels each of under and over voltage each selectable as alarm or trip
 Pick up range 0 – 150V
 Time delay 0 – 3600 seconds

Reclosing

4 shot programmable reclosing

Switch on to Fault Logic**Metering**

Instantaneous Metering -Voltage, current, power, reactive power,
 residual current, negative sequence current
 -Metering selectable between primary or
 secondary scaled
 Demand and peak demand metering Current, power and reactive power

Fault Location

Three methods for determining fault location based upon presence of pre-fault data
 Units of measurement selectable between kilometers and miles
 Typical accuracy: 5% of line length.

Communication Protocols

Modbus (standard)
 DNP 3.0

Targets

➤ 25 programmable LED targets. Default targets are:

Relay OK	Zone/Level 1	A Phase	Ground	Breaker Open
Int. or Ext. Alarm	Zone/Level 2	B Phase	Distance/OC	Breaker Closed
Reclose Ready	Zone/Level 3	C Phase	Phase OC	Breaker Alarm
Reclose Blocked	Inverse Time Trio	Directional OC	Neg. Seq. OC	Breaker Failure
Reclose Locked Out	Comm Aided Trip	Step Distance	Reclose Trip	Ext. 68, 27, 59
			NonReclose Trip	

Control

- 8 fixed-function keys allow for easy navigation through the menu
- 4 multi-function "soft" keys whose function varies with the
- 8 programmable "Hot-Keys" for easy access to:
 - ✓ Internal Alarms
 - ✓ External Alarms
 - ✓ View Settings
 - ✓ Show Targets
 - ✓ Reset Targets
 - ✓ Last Event
 - ✓ Instantaneous Metering

Display

- 4 × 20 character LCD display provides easy access to the IΔΕΑ's extensive menu system.

Sequence of Events Recording

- 250 event user programmable SOE allows for the selection of the elements to be tagged for display.

Oscillography

Recorded values are super-imposed on the protection scheme, and the state or value at any point in the scheme can be displayed. The user can move through the event and watch the response of every element used in the scheme

- 16 samples/cycle
- Monitoring of all the analog and digital inputs and contact outputs.
- Events stored with 4 pre-fault and 8 post fault cycles.

Communication

- Three communication ports
- Auto baud up to 57,600bps
- Communication ports can be accessed simultaneously
- Modbus and DNP 3.0 protocols

Application Diagram

Provides a display of all the relay's logic elements, voltages, currents, watts, and vars.

Relay Replay

This feature allows for the captured fault record to be played back to the scheme for detailed analysis of the relay logic and settings during the fault without requiring a test set.

Virtual Test Set

The VTS feature allows for testing of the relay logic and settings without using a test set.

- Six analog input sources (3 voltage inputs and 3 current inputs) and 6 contact inputs
- Three waveform switch-points: pre-fault, fault-1 and fault-clear
- Switched quantities voltage/current magnitude/phase, system frequency slip, rate of change of system frequency slip
- Internal fault calculation for single-phase fault types (ag, bg, cg, ab, bc, abg, bcb, cab, abc)
- Exponential decay time constant setting
- Simulated breaker closing time setting

- Simulated breaker opening time setting

GRAPHICALLY PROGRAMMABLE LOGIC

- The following logic tools are available to the user to create and customize the relay's logic
- Logic gates OR, AND, NOT, NAND, NOR, XOR
- Pickup Delay Timers
- Dropout Delay Timers
- Edge Detectors
- Signal Latches Sample/Hold
- Set-Reset Flip-Flops, both set and reset priority types provided.

EDISON IΔεα ITP-100 HARDWARE SPECIFICATION

Frequency	50/60 Hz
Voltage Inputs	Four voltage input channels 50 - 250 VAC continuous (phase-to-neutral)
Current Inputs	Four current input channels $I_{Nominal} = 1/5A$, $I_{continuous} = 15A$, $I_{1sec} = 300A$
Digital Inputs (Optically Isolated)	5 standard, 13 with optional I/O Expansion accessory 48-280 Vdc
Relay Outputs	4 standard, 12 with optional I/O Expansion accessory 240 Vac / 250 Vdc Make: 30A for 0.2 seconds; Carry: 6A continuous Break: 0.2A (L/R = 40 ms) Pickup time: <8ms; Dropout time: <5ms
Solid-State Outputs	1 standard 240 Vac / 250 Vdc Make: 30A for 0.2 seconds; Carry: 8A continuous Break: 10A (L/R = 40 ms) Pickup time: <1ms; Dropout time: <15ms
Power Supply	48 Vdc +/- 20% 120 Vac / 125 Vdc +/- 20% 250 Vdc +/- 20% Burden: 14W
Local/Remote communications	EIA-RS-232C, 1 ea. located on front and rear panel Baud Rates: Auto baud rate up to 57,600 bps EIA-RS-485 1 located on the rear panel
Front Panel Targets	25 Programmable LEDs
Front Panel Display	20 x 4 character LCD
Front Panel Keypad	8 fixed-function keys, 4 multi-function "soft" keys 8 programmable "Hot-Keys"
Dimensions	3 U high by 9" wide by 9" deep (135H x 216W x 216D mm)
Relay Weight	10 lb (4.5kg)
Mounting	Horizontal
Operating Temperature	-40 °F to 158 °F (- 40 °C to 70 °C) continuous -40 °F to 185 °F (- 40 °C to 85 °C) up to 16 hrs
Bump & Shock Test	IEC 255-21-2
Cold Temperature Test	IEC 68-2-1
Electrostatic Discharge	C37.90
High temperature Test	IEC 68-2-2
Humidity Test	IEC 68-2-30
Impulse/Dielectric Withstand	IEC 255-5
Radio Frequency Interference	EN 61000-4-3 and C37.90.2
Surge Withstand	ANSI/IEEE C37.90.1
Vibration Test	IEC 255-21-1
Emissions	EN 55022, Class A, Radiated and Conducted
Conducted Disturbances	IEC 6100-4-6 (150kHz-80MHz) and IEC 6100-4-16 (15Hz-150kHz)

All specifications subject to change without notice.

