INGEPAC™ EF ZT is a distance protection relay with five independent zones of operation on which **MHO or quadrilateral** characteristic can be set independently, suitable for transmission lines, or **multibreaker configurations** such us, breaker and a half or ring. It determines the **type of fault**, differentiating among three-phase, two-phase and earth faults.

INGEPAC™ EF ZT includes backup units for one or two breakers, **synchronism checking** functions or **automatic reclose** with different timings for single-pole or three-pole trips. It also provides **teleprotection schemes** or **fault locator function** that provides distance to the fault.

Its design is compliant with all the requirements of standards in the electrical sector, including **IEC 61850**. INGEPAC™ EF ZT provides **comprehensive and detailed information**, by means of its **monitoring and events recording capabilities**, these being fundamental elements in an electrical grid's improvement process.
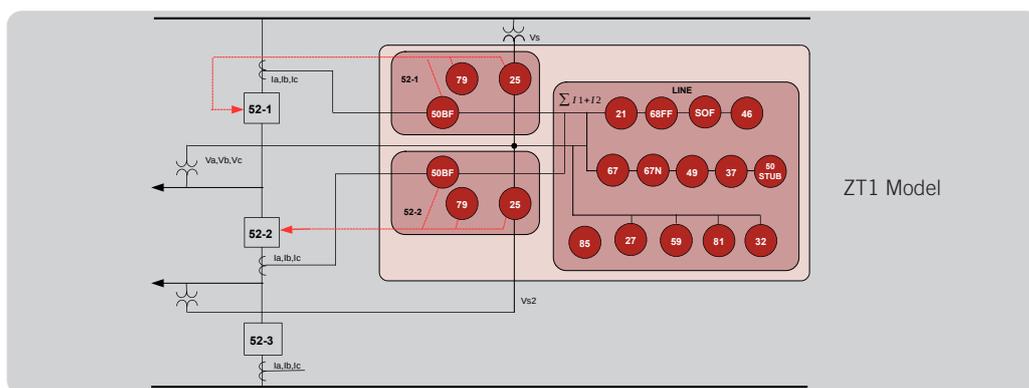
Software

All the equipment in the INGEPAC™ family can be accessed using powerful software tools developed by Ingeteam and which run on Windows®.
The application software is specifically designed for simple and user-friendly access to the equipment.

INGESYS EFS

ZT1 Model

Distance functions
21 Quadrilateral (5 zones)
21 MHO (5 zones)
21 High speed zone
21 Zone 1 extension
Double line adaptation
Serial compensation line adaptation
Current and directional control
General protection functions
SOTF Switch on-to fault
27
59
59N Neutral overvoltage

47 V2 overvoltage
81M/m
81R ROCOF Rate of Change of Frequency
3x50/51 (67)
50N/51N (67N)
50G/51G Earthing overcurrent
46TOC(67Q), 46IOC(67Q)
46BC Open phase / Broken conductor
Second harmonic restraint
37 Undercurrent
49 Thermal image
32 High / Low / Reverse Power

Stub bus
Stub bus differential
50BF One-pole / Three-pole breaker failure
50BF Low load breaker failure
Teleprotection
Teleprotection (21)
Teleprotection (67/67Q)
Monitoring units
68LE Load zone block
68FF Fuse failure
78 Power swing
Fault locator
Breaker monitoring
kI2 per pole

Closing and trip circuit monitoring
Excessive number of trips
Dead line / open pole detector
Breaker status logic
Pole discrepancy
Automation
25 Synchronism check
79 Single-pole/three-pole auto-reclose
Data acquisition functions
Phase and neutral current
A and B side voltage
Active and reactive power

Active and reactive energy counters, both directions
Chronological historical events and fault recording
Oscillography
Measurements historical reports
Breaker monitoring
Power quality
Sags & swells record
Current and Voltage THD
Individual harmonics measurements

Insulation and electromagnetic tests

· Dielectric withstand	**IEC 60255-27**
· Insulation resistance measurement	**IEC 60255-27**
· Impulse voltage	**IEC 60255-27**
· Electrostatic discharge immunity	**IEC 61000-4-2**
· Radiated radiofrequency electromagnetic field immunity	**IEC 61000-4-3**
· Electrical fast transient / burst immunity	**IEC 61000-4-4**
· Surge immunity	**IEC 61000-4-5**
· Immunity to conducted disturbances, induced by radiofrequency fields	**IEC 61000-4-6**
· Power frequency magnetic field immunity	**IEC 61000-4-8**
· Impulse magnetic field immunity	**IEC 61000-4-9**
· Damped oscillatory magnetic field immunity	**IEC 61000-4-10**
· Ripple on dc input power port	**IEC 61000-4-17**
· Damped oscillatory wave immunity	**IEC 61000-4-18**
· Voltage dips, short interruptions and voltage variations immunity	**IEC 61000-4-29**
· Power frequency immunity	**IEC 60255-22-7**
· Withstand to radiated electromagnetic interference from transceivers	**IEEE 37.90.2**
· Measurements of radiated and conducted radiofrequency disturbances	**EN 55022**

Climatic

· Cold	**IEC 60068-2-1**
· Dry heat	**IEC 60068-2-2**
· Change of temperature	**IEC 60068-2-14**
· Damp heat, cyclic	**IEC 60068-2-30**
· Damp heat steady	**IEC 60068-2-78**
· External protection level	**IEC 60529**

Mechanical

· Vibrations	**IEC 60255-21-1**
· Shock and bump	**IEC 60255-21-2**
· Seismic	**IEC 60255-21-3**

Main features

- Five zones on which MHO or quadrilateral characteristic can be applied independently; each zone can be set as forward, reverse or non-directional
- Independent analysis per each phase combination (AN, BN, CN, AB, BC, CA), characteristic (quadrilateral and MHO) and zone
- Single-phase or three-phase trip, applicable with or without teleprotection schemes
- Backup units: overcurrent, overvoltage, undervoltage, frequency, etc.
- Distance units supervision: power swing, load encroachment, fuse failure, etc.
- Algorithm for application with capacitive voltage transformers (CVT)
- Fault locator
- Automatic reclose with different timings for single-pole or three-pole trips and for application in breaker-and-a-half and ring schemes
- Synchronism checking functions for one or two breakers, depending on model
- Communication protocols: IEC 61850 Ed. 1 and 2, DNP 3.0, IEC 60870-5-103, IEC 60870-5-104, PROCOME
- Graphical and textual logic programming based on IEC 61131-3
- Chronological events record, fault reports, load curves and oscillography
- Metering: current, voltage, power, power factor, energy, frequency, negative sequence current, demand maximeter, fundamental values and RMS
- Front panel for setting and display: 4.9" monochromatic graphic display, programmable function keys with 2 LED each, 19 programmable LED and 1 fixed two-colour hardware status LED, numerical keypad, menu keys, and 9 programmable graphics pages
- Ethernet RJ45 and USB ports on the front
- Synchronisation from communications protocols, SNTP, IEEE 1588 (PTP), demodulated IRIG-B input or PPS input
- Web server for monitoring and setting without needing additional software
- Cybersecurity features: sFTP, HTTPs, firewall, audit log, password accessing

Options

- Two housing types: 5U 1/2 x 19" rack and 4U 19" rack, which can contain the following modules in different configurations:
  - 11 digital inputs and 9 digital outputs
  - 16 digital inputs and 16 digital outputs
  - 16 digital inputs and 8 digital outputs
  - 32 digital inputs
  - 16 digital inputs and 8 analog inputs
  - 16 digital inputs and 8 analog inputs (4 isolated)
  - 8 digital inputs, 4 digital outputs and 4 High Break Current outputs
  - 8 digital inputs, 4 digital outputs and 4 High Speed-High Break Current outputs
  - 8 digital inputs and 8 digital outputs
- Selectable rear port connectivity:
  - Up to 6 serial communications
  - Up to 2 Ethernet communications
- Serial ports in glass fibre optic, plastic fibre optic, RS232 or RS485
- Ethernet ports in glass fibre optic or RJ45
- HSR, PRP and D-Link communications redundancy
- Captures analog measurements using Sampled Values (SV) protocol, through IEC 61850-9-2 or IEC 61869-9 standards
- Different models for auxiliary voltages most commonly found in electrical installations
- Remote inputs capturing and outputs using INGEPAC™ RIO
- Redundant power supply

Applications

- Primary or secondary protection for cables, overhead or mixed lines in transmission and undertransmission grids
- Redundant or double protection schemes as main unit
- Breaker-and-a-half schemes
- Backup with another distance protection, line differential protection or overcurrent directional protection
- Grid Automation

CE