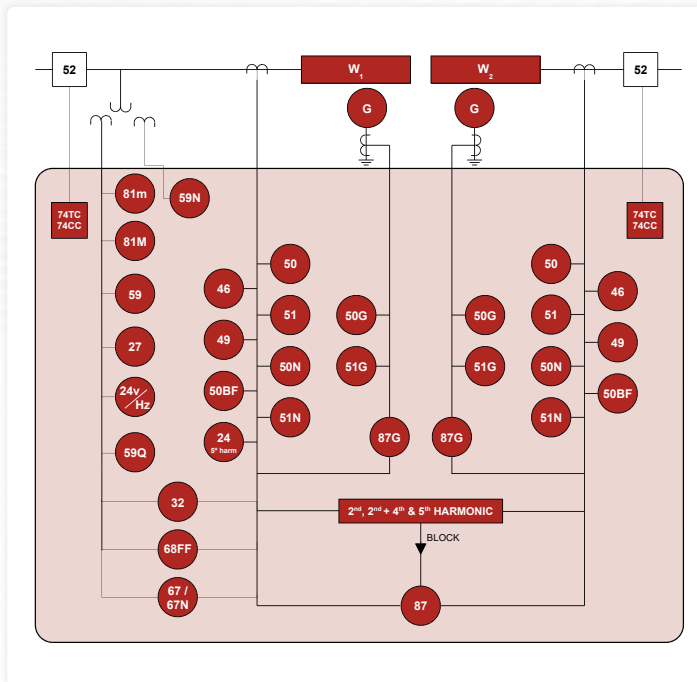


Transformer differential protection

INGEPAC™ EF TD is a range of intelligent electronic devices that provide all the **protection and control functionalities** required for two and three winding power transformers. It also provides **instantaneous and biased differential protection**, with harmonics blocking, as well as low impedance restricted earth fault.

Applications

- 2 windings transformer protection and control (EF TD0 model)
- 3 windings transformer protection and control (EF TD1 model)
- Breaker and a half topology transformer protection (EF TD2 model)



Protection functions

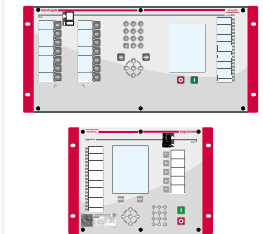
- Functions
- 87 Instantaneous and biased differential protection
 - 87REF Restricted earth fault
 - 2nd, 3rd, 4th and 5th harmonic restraining and blocking
 - 24 Over-excitation (5th harmonic)
 - 24 Over-excitation (V/f)
 - 3x50/51 (67), 50N/51N (67N)
 - 50G/51G
 - 46TOC (67Q), 46IOC (67Q)
 - 27, 59, 59N, 59Q, 47
 - 81M/m, 81 ROCOF
 - 49 Thermal image
 - 49T Overtemperature through RTD (with 11 RTD and 4 SA module)
 - 32 Power units
 - CLP
 - 51V Voltage restrained / controlled overcurrent
 - 50BF Breaker failure
 - 68FF
 - 79 Recloser

Data acquisition

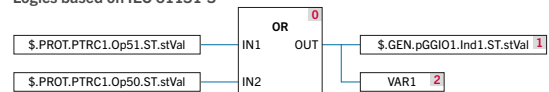
SOE (1000), faults (20)
Oscillography: 12 analog and 100 digital channels
Measurements: I, V, P, U, Q, f, T, etc.

Local HMI

4,9" display
Graphical displays
I/O/L/R pushbuttons
19 LEDs
Keyboard



Logics based on IEC 61131-3



Synchphasors*

Phasor measurement unit according to IEEE C37.118 standard; only class P filter available.
*Only available for EF TD0 models

Synchronization

IEEE 1588 v2
IRIG-B
SNTP

Communications

Protocols: IEC 61850, IEC 60870-5-103/104, DNP3, Modbus, PROCOME
Redundancy: PRP, HSR, D-link failure, switch mode
Web services: HTTP/HTTPS, FTP/sFTP, SSH

INSULATION AND ELECTROMAGNETIC TESTS

Electromagnetic compatibility requirements	IEC 60255-26
Dielectric withstand	IEC 60255-27
Insulation resistance measurement	IEC 60255-27
Voltage impulse	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
Immunity to conducted, common mode disturbances	IEC 61000-4-16
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
Withstand to radiated electromagnetic interference from transceivers	IEEE 37.90.2

CLIMATIC TESTS

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 TESTS

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



CYBERSECURITY

MAIN FEATURES

High precision in direct measurements (class 0.2 in currents and voltages)

Wide range current inputs allowing the same device to be connected to 1 A and 5 A CT secondary

Through the front USB you can access the equipment to retrieve reports and equipment CID, load an external CID, load the firewall configuration or update the equipment firmware
Synchronization from communications protocols, SNTP, IEEE 1588 v2 (PTP), demodulated IRIG-B input or PPS input, pacFactory or display

Web server for monitoring and setting without needing additional software

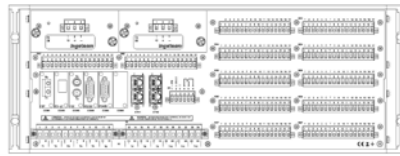
Cybersecurity features: sFTP, HTTPs, firewall, audit log, password accessing, RBAC, LDAP, session management...

Acquisition of sampled values as per IEC 61869-9 (NCIT) and IEC 61850-9-2LE (SAMU) standards (optional)

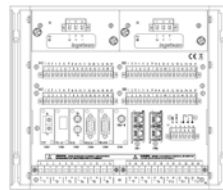
HARDWARE OPTIONS

Mounting options

- 19" 4U rack (up to 6 I/O slots)



- ½ x 19" 5U rack (up to 2 I/O slots)



Optional

- High break contact outputs
- High speed outputs

Optional IP54 front protection

Boards options

- CPU: 6 DI + 4 DO
- 11 DI + 9 DO
- 32 DI
- 16 DI + 8 DO
- 16 DI + 16 DO
- 16 DI + 8 AI (mA)
- 8 DI + 8 DO
- 11 RTD + 4 AO
 - 100 Ω platinum, 100 Ω nickel, 120 Ω nickel, 10 Ω copper

Communication ports

Front:

- RJ45
- USB

Rear:

- Up to 2 Ethernet (FO or RJ45)
- Up to 6 serial (FO, RS232, RS485)

Power supply

- 24, 48, 125 and 220 Vdc
- Power: 40 W
- Optionally redundant power supply

SOFTWARE

All the devices in the INGEpac™ product range can be accessed using powerful software tools developed by Ingeteam which run on Windows

Application specifically designed for simple and user-friendly access to the equipment

INGESYS eFS