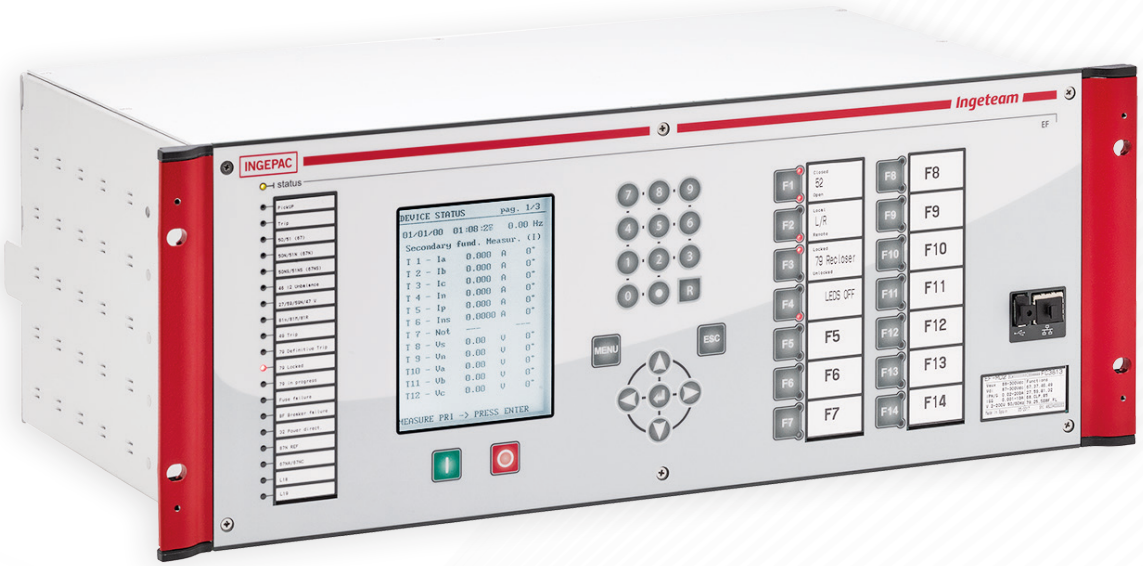
INGEPAC™ EF VR

Automatic voltage regulator



Automatic voltage regulator

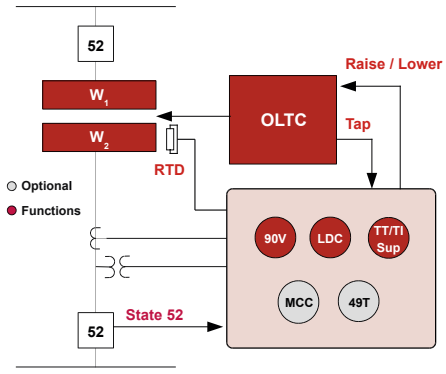
The **INGEPAC™ EF VR** allows users to **regulate the voltage on power transformers** with tap changers, keeping the output voltage of the transformers stable. INGEPAC™ EF VR measures the transformer's output voltage and compares it to a setpoint voltage defined by the user, sending the signals to raise or lower the input on the changer, depending on the difference detected.

INGEPAC™ EF VR is equipped to operate **independently** or **in parallel** configuration, with up to 5 transformers connected to the same busbar. Communication between the voltage regulators is done through protocol IEC 61850 **GOOSE messages**.

In order to monitor the status of the transformer and control its useful life, INGEPAC™ EF VR allows for **oil temperature monitoring**, which can be captured through RTD or mA inputs.

Applications

- Automatic voltage regulator with tap changer
- Automatic voltage regulator for transformers connected in parallel

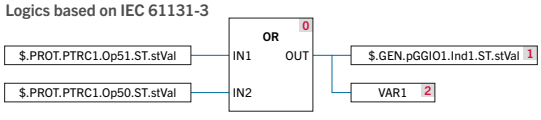


Functions
Automatic voltage regulator (auto/manual)
Independent or parallel operation up to 5 transformers
Regulation modes:
- Master / slave (GOOSE messages communication)
- Circulating current minimization (MCC)
- Load Drop Compensation LDC (LDC-Z and LDC-R&X)

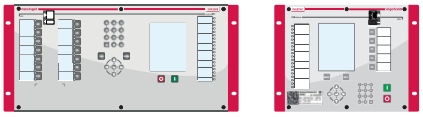
Tap monitoring
Operations verification
Overcurrent monitoring
Overvoltage monitoring
Undervoltage monitoring
Out of range voltage supervision
Tap position capture by digital input (simple or BCD) or mA input
External power supply monitoring
Battery monitoring

Optional
49T RTD temperature monitoring (needs 11 RTD + 4 AO module)

Logics based on IEC 61131-3



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



Data acquisition
SOE (1000)
Oscillographic recorder

Sinchronization
IEEE 1588 v2
SNTP
IRIG-B

Web services
HTTP / HTTPs
FTP / sFTP
SSH

Protocols
IEC 61850 (PRP/HSR redundancy)
DNP3
IEC 60870-5-103 / IEC 60870-5-104
Modbus

Measurement
I, V, P, U, Q, f
Maximeters
Power supply and battery
Temperature

Ingeteam ELECTRIFYING A SUSTAINABLE FUTURE

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

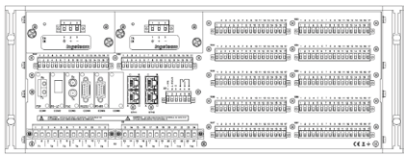
Vibrations	IEC 60255-21-1
Shock and bump	IEC 60255-21-2
Seismic	IEC 60255-21-3

MAIN FEATURES

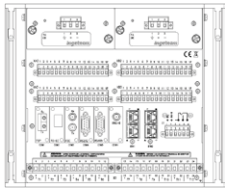
- High precision in direct measurements (class 0.2 in currents and voltages)
- Wide range current inputs allowing the same device to be connected to 1 A and 5 A CT secondary
- Application software specifically designed for simple and user-friendly access to the equipment
- Different hardware options allow to define the most suitable configuration for the application
- 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...

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

CE UKCA

CYBERSECURITY

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