Substation Automation Products

Relion® 670/650 series IEC and ANSI Hardware
Relion® 670/650 series hardware

Contents

- Introduction
- Modules
- I/O Capability
- Mounting Flexibility
- Communication
- IED HMI
Relion® 670 series Hardware
Relion® 670 series

- Common hardware (HW) and software (SW) for the entire 670 series
- Function library according to IEC 61850
- Extensive analog and binary I/O capability
- Type tested platform
Relion® 670 series

- Few spare parts on modular level
- Type tested platform
- Easy future extensions

Minimized cost for maintenance
Relion® 670 series

Ventilated casing with common look for all products

- 3 sizes - 1/2, 3/4 or 1/1 of 19”
- 6U high (266mm)
- Small or large HMI unit
Hardware structure
670 series

- Transformer Input Module TRM 6I + 6U, 9I + 3U or 12I
- One or two - TRM1 & TRM2 for 12 or 24 analog CT or VT inputs
- Analog Digital Conversion module ADM1 and ADM2 for TRM inputs
- Central Processing Unit NUM
- GPS time synchronization module GSM (option)
- Time synchronization via binary signal and communication ports IRIG-B
- Binary Input / Output modules BIM, SOM, BOM, IOM, MIM
- Power supply module PSM
Hardware platform
670 series

Relion 670 series

Introduction
Modules
I/O Capability
Mounting Flexibility
Communication
IED HMI
View from rear side with contacts

670 series

Relion 670 series

Introduction
Modules
I/O Capability
Mounting Flexibility
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IED HMI
View from rear side with ringlugs
670 series

Relion 670 series
Introduction
Modules
I/O Capability
Mounting Flexibility
Communication
IED HMI
Numerical module
670 series

- Main Controller/CPU type
  IBM 3200 PowerPC 750FX/GX, 600 MHz
- Internal communication with cPCI bus
  100 Mbit/s
- Memory
  - Up to 128 Mb FLASH
  - Up to 256 Mb DRAM
- Cycle time in 670 series
  - 1 or 3 ms for protection
  - 8 or 100 ms for logic
Interfaces on the numerical module
670 series

Motherboard interface

Mounting position for serial communication module with SPA, LON, IEC -103

Mounting position for IRIG-B module

Mounting positions for two 64 kbit communication modules

Internal communication cPCI bus
Analog / digital conversion module
670 series

- Analog inputs from transformer module
- Mounting position for Optical Ethernet module (only on AD1)
- cPCIbus
- Mounting positions for EIA-485 module (only on AD1)
- Mounting positions for 2 extra LDCM modules (only on AD1)
Transformer input module
670 series

- Up to 12 analog inputs can be connected
  - 0 - 6 U, 110-220 V rated range 50/60 Hz
  - 6 - 12 I, 1 A or 5 A rated current
- Isolation barrier preventing disturbances to enter into IED
- Adapt measured values to static circuitry
# Standardized transformer modules

## 670 series

<table>
<thead>
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<th>Transformer module (TRM 12)</th>
<th>1 A</th>
<th>5 A</th>
<th>110/220 V</th>
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Power supply module
670 series

- Input range: 24-60 V DC
- Input range: 90-250 V DC
- Internal fail relay output
- DC/DC Converter provides full isolation between IED and external battery system
GPS time synchronization module
670 series

- For multi-terminal current differential protection
  - 1 MHz High Accuracy output; < 1μs
  - Minute pulse / IRIG-B
    - Accuracy 1ms (Not suitable for differential protection)
  - IEC 61850-8-1 synchronization
    - Accuracy < 1 ms
  - LON synchronization
    - Accuracy < 2 ms
The IRIG interface to the IED supplies two possible synchronization methods, IRIG-B and PPS.

- IRIG-B is a protocol used only for time synchronization.
- An optical PPS signal can be supplied to the optical interface of the IRIG module.
- Max 1 IRIG-B module per IED.
- Mounting position for the IRIG-B module is pos 302 on NUM.
Relion 670 series
Introduction
Modules
I/O Capability
Mounting Flexibility
Communication
IED HMI

GPS antenna and coaxial cable
670 series

- Accurate synchronization of sampled data
  - 1 microsecond accuracy
- Line Differential Protection applications with switched communication network
- Wide Area Protection and Phasor Measurement Unit applications
- SMA contact for connection to GSM

Accurate time synchronization for each installation
I/O-modules
670 series

- Full 19” case with 24 binary analog inputs and up to 11 (6 with ring lug) I/O modules
- Full 19” case with 12 binary analog inputs and up to 11 (7 with ring lug) I/O modules
- ¾ x 19” case with 24 analog inputs and up to 7 (3 with ring lug) I/O modules
- ¾ x 19” case with 12 analog inputs and up to 7 (4 with ring lug) I/O modules
- ½ x 19” case with 12 analog inputs and up to 3 (2 with ring lug) I/O modules

Extensive I/O capability enables unique function integration
EMC enhanced binary input module
670 series

- 16 independent Binary Inputs
- Increased interference immunity
  2 x IEC requirements for 50 ms
- Debounce filter, $T = 5$ ms
- Oscillation suppression detection within 1 s; $> 0 - 40$ Hz
- No pulse counting Auxiliary voltage
  - 24/30 V DC ($\pm 20\%$)
  - 48/60 V DC ($\pm 20\%$)
  - 110/125 V DC ($\pm 20\%$)
  - 220/250 V DC ($\pm 20\%$)
  - Threshold voltage 60 %
Binary input module for pulse counting
670 series

- 16 independent Binary Inputs
- Debounce filter, \( T = 5 \text{ ms} \)
- Oscillation suppression detection within 1 s; \( > 0 - 40 \text{ Hz} \)
- Pulse counting available for all inputs
- Auxiliary voltages
  - 24/30 V DC (± 20 %)
  - 48/60 V DC (± 20 %)
  - 110/125 V DC (± 20 %)
  - 220/250 V DC (± 20 %)
  - Threshold voltage 60 %
Binary output module
670 series

▪ Two variants
  ▪ 24 single output relays
  ▪ 12 double pole command output relays
EMC enhanced binary input/output module
670 series

- 8 independent Binary Inputs and 10 + 2 Binary Output relays
- Increased interference immunity 2 x IEC for 50 ms
- Fixed filter time 3/5 ms
- Auxiliary voltage
  - 24/30 V DC (± 20 %)
  - 48/60 V DC (± 20 %)
  - 110/125 V DC (± 20 %)
  - 220/250 V DC (± 20 %)
Static output module
670 series

- High Speed Applications
  - 6 static binary outputs
  - 6 change-over contacts
mA input module
670 series

- 6 independent input channels
- Software selected input ranges
  - 0-5, 0-10, 0-20, mA
  - 1-5, 2-10, 4-20, mA
  - ±5, ±10, ±20 mA
- Resolution: 16 bit
- Accuracy: 0,1 %
- Independent settable digital filters
- Supervision of
  - Limits
  - Overflow
  - Max/Min Range
Mounting arrangements
670 series

Several mounting alternatives

- ½, ¾ and 1/1 rack size
- Flush-, Semi-flush, wall- and rack mounting
- IP 54 front protection flush mounting
- Side by side
Rack, panel or surface mounting
670 series

Suitable for new and retrofit installations

- 1/2, 3/4 or 1/1 of 19” wide
- 6U = 266 mm high
- 205 - 245 mm deep
Serial communication module
670 series

- Communication protocols
  - LON
  - SPA
  - IEC 60870-5-103
  - DNP 3.0
- Alternative media
  - Glass fiber
  - Plastic fiber
  - Combination of glass & plastic fiber
- Max 1 module per IED
Galvanic EIA-485 communication module for DNP 3.0

- Either two or four wire connection
  - Max 1 EIA-485 module per IED
  - Mounting position for the EIA-485 module is pos 312 on AD1
Line data communication module
670 series

- Two versions for fiber optic communication:
  - Multi mode ST fiber 50/125 μm or 62.5/125 μm for short range
  - Single mode FC fiber 8/125 μm for medium and long range
- Transmission of 4 analog values and 8 binary signals
- Transmission of up to 192 binary signals when no analog
- 64 kbit communication channel in HDLC
- Optical budget:
  - Long range 26 dB or up to typically 120 km
  - Medium range 20 dB or up to typically 80 km
  - Short range 11 dB 62.5/125 μm and 7 dB 50/125 μm
  - Galvanic X21 short range for connection to multiplexers
- The IEEE/ANSI C37.94 standard format is used
- Up to 4 modules per IED with restrictions for case size
- Mounting position for the 64 kbit communication module is on NUM, AD1 or AD2
Optical ethernet module 670 series

- IEC 61850-8-1 protocol
- Ethernet 100 Mbit/s link
- One or two optical ports
- Multimode fiber 62.5/125 μm
- ST fiberoptic connector
- Optical budget 13 dB
- Typical maximum distance between nodes, 1 km
- Max one module located on A/D converter one

Versatile selection of communication protocols
Optimized local control and monitoring
670 series

- Direct interaction with IEDs without any tools
- Control of up to 30 apparatuses
- The exact presentation of your switchgear arrangement on LCD
- Easy to adapt the graphical display to the changes in the process
- The arrow keys provide easy access to settings
  - All parameters can be read and set via the local HMI
- ANSI symbols in the HMI available
Quick access to important information
670 series

- IED status indication LEDs
  - Green
    - Steady: In service
    - Flashing: Internal failure
    - Dark: No power supply
  - Yellow
    - Steady: Disturbance recorder triggered
    - Flashing: IED in test mode
  - Red
    - Steady: Trip command issued
    - Flashing: IED blocked

- Measurements
- Binary signals via indication LEDs
Relion® 650 series Ver. 1.3
Hardware
Relion® 650 series

- Platform based
  - Few spare parts needed on module level
  - Common module firmware
  - Easy to add hardware if needed
  - Minimized cost for maintenance and training
Relion® 650 series

- Time synchronization
  - Time synchronization – SNTP and DNP 3.0
  - IRIG-B serial interface

- Communication
  - IEC 61850-8-1
  - Parallel Redundancy Protocol (PRP) according to IEC 62439-3 Ed. 2
  - DNP 3.0
  - IEC 60870-5-103

Dimension
- 1/1 x 19”, 3U (Ver. 1.2 and 1.3)

Mounting flexibility
- Flush-, semi-flush, wall- and rack mounting
- Side by side
Relion® 650 series

- Communication & Processor Module, COM
- Power supply module, PSM
- Transformer module, TRM
- Transformer module (2nd), AIM
- Binary input/output module, BIO
- Binary input/output module, BIO, option
Communication and processor module
650 series

- Ethernet communication, LC optical IEC61850-8-1, DNP3.0
- Optical serial port, ST connection, IEC 60870-5-103 glass fiber
- Local HMI connection. RJ45
- IRIG-B, screw terminals

Choice of communication and processor module with:

- COM05: 12 binary inputs, TCP/IP optical, IRIG-B, galvanic RS485 and optical serial communication ports
- COM03: TCP/IP optical with PRP redundancy, IRIG-B, galvanic RS485 and optical serial communication ports
Power supply module
650 series

- PSM01/02/03
  - Power supply modules from 24 to 30 V DC, 48 to 250 V DC or 100 to 240 V AC with 9 outputs, 3 of which with trip circuit supervision
  - Internal fail (IRF) self-supervision contact
  - Two LEDs Battery and Ready
Transformer modules
650 series

TRM01/AIM01 module
- 10 analog inputs per module
  - 8I+2V, 6I+4V, 4I+1I+5V, 4I+6V (TRM)
  - Sensitive current channel 0.1 / 0.5 A
  - 6I+4V, 4I+1I+5V (AIM)
Input and output modules
650 series

- I/O flexibility
- Analogue inputs
  - 10 or 20 analog inputs.
  - 1A and 5A on the same CT
- Binary inputs/outputs
  - 14 – 50 binary inputs, 9 – 45 binary outputs
  - Compression type or ring lug cable termination
IED HMI
650 series

- Efficient interaction with the IED
  - Direct interaction with IEDs without any tools
  - Graphical display adapted to the application
  - Local language support
  - Forcing of binary output when in test mode

- Monitoring
  - IED status indication LEDs
  - Measurements
  - Binary signals via indication LEDs
  - Disturbances and events
**IED HMI 650 series**

- **Control**
  - Control of up to 8 apparatus
  - The exact presentation of the configured switchgear arrangement
  - Bypass operations

- **Settings**
  - All parameters can be read and set via the IED HMI
  - Five configurable push button shortcuts with labels presented on the display for different actions
Status indication LEDs indicate the status of the IED:

- **Green**
  - Steady: In service
  - Flashing: Internal failure

- **Yellow**
  - Steady: Disturbance recorder triggered
  - Flashing: IED in test mode

- **Red**
  - Steady: Trip command issued
  - Flashing: IED blocked

Indication of binary signals via 15 three-color-state indication LEDs on up to three pages