



# ENSTO

## Monitoring & Control Cabinets

Overhead and  
underground grids



**Better life.**  
With electricity.

Ensto designs and supplies smart electrical solutions aimed at improving the safety, operation, reliability and effectiveness of electric grids, buildings and transport systems.

[ensto.com](http://ensto.com)

# Monitoring & Control Cabinets

## Modular and adaptable for telecontrol of all MV networks

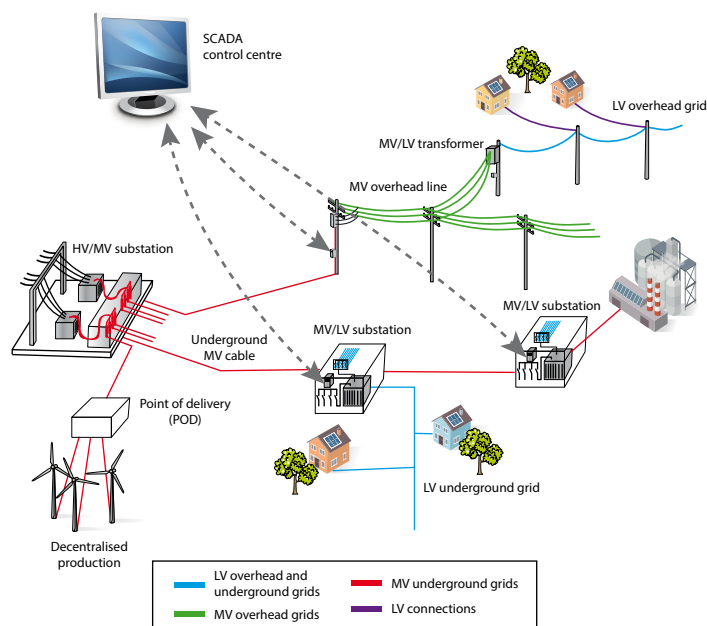


This range of Monitoring & Control cabinets marketed by Ensto is designed to perform remote and local MV breaking device monitoring and control.

Combined with MV/LV transformer station or remote-controlled overhead switches, these cabinets offer underground and overhead cable grid telecontrol tailored to the customer's needs.

### Functions provided:

- Electrical switch operation in local and remote-controlled mode
- SCADA Communications with protocol IEC, DNP
- Voltage and current measurement
- Measurement and detection of fault currents occurring on grid or on hardware
  - Amperometric detection
  - Directional detection as per HN45 S 51
  - Any other detection standard to be included
- Logging of instantaneous and averaged measurements
- Automation:
  - Opening in voltage dip (ADA function)
  - Source switching (PASA function) for controlling at least two underground networks
- Timestamping and reporting of events potentially affecting grid or cabinet



# Monitoring & Control Cabinets

## Configurations and functionality

The modular design of the Monitoring & Control range accounts for operators' needs in terms of easy use, setup, troubleshooting and maintenance.

### Operation

#### Telecontrol mode

The Monitoring & Control range includes all transmission functions for exchanging messages with the telecontrol SCADA:

- remote control,
- remote measurement,
- remote signalling,
- dated logged maintenance events (EMMD),
- time setting, etc.

#### Local control

- Use of mimic display to view local control.
- View and programming of main settings using alphanumeric display.
- Verification and programming of settings using computer equipped with:
  - an Ethernet connection,
  - a commercially available web browser such as IE, Chrome or Mozilla...



1

Overhead Monitoring & Control cabinet for  
IA2T : Air Break Switch up to 24 kV  
IA3 : SF6 Enclosed Overhead Switch up to 36 kV

2

Underground Monitoring & Control cabinet for  
MV cells

# New E-RTU 2020 cabinet

## Towards advanced new secure monitoring and control functions



With a view to meeting new requirements in the French and international markets, the new E-RTU cabinet offers advanced Monitoring and Control functions.

- › Cybersecurity standard IEC 62 351
- › Data and alarm communication redundancy
- › Large event with log, archive capacity >10,000 events
- › Quick and easy remote firmware update and configuration
- › 1 x 4-20mA or 0-10V analogue measurement input
- › 1 x PT100 temperature probe input



The E-RTU cabinet is equipped with the CPU 2020 board, providing greater computing power. It is available for sale separately, to allow you to upgrade your ITI 2012 cabinets, on our installed bases of overhead or underground networks.



CPU 2020 board



E-RTU 2020 underground cabinet



E-RTU 2020 overhead cabinet



Ensto E-RTU 2020, smart equipment for MV/LV distribution sub-stations, as well as MV overhead lines. Ensto E-RTU 2020 can be used to control underground MV networks with up to 8 channels or single channel overhead switches.

This system can also measure current and detect faults (power surges and earthing faults) for networks with impedance-earthed neutral point treatment or a neutral earthing compensator. It can be operated locally or remotely via a SCADA system using communication protocols set out in this document.

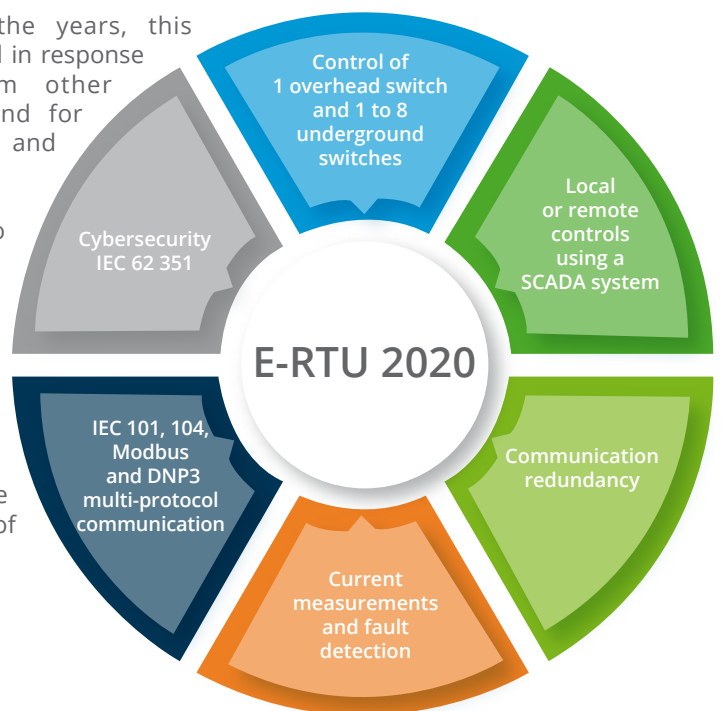
Communication with the SCADA system is protected against cyberattacks by means of a cyber-secure "Open VPN" or "IPSec" VPN tunnel. This new product has been developed to meet the new requirements of secure smart grids.

**Ensto — over 30 years' expertise in Monitoring & Control cabinets**

Our first monitoring and control cabinet was developed in 1987 for the French market and for French-speaking African

countries. Over the years, this cabinet has evolved in response to demand from other export markets and for both underground and overhead networks.

This new Ensto E-RTU 2020 cabinet meets the requirements of the majority of international standards, it offers greater flexibility and operating safety and is more efficient in terms of implementation.



# Main benefits

- › Compliance with the key communication standards IEC 60870-5-101, IEC 60870-5-104, DNP3, DNP3 IP, **communication redundancy**
- › Communication via 3G / 4G / digital radio modules / any IP communication media with Ethernet or serial connection (RS232)
- › Simultaneous cabinet configuration and communication using three independent Ethernet ports
- › **Cybersecurity**: Protection against cyberattacks with the aid of secure communication, secure tunnels (VPN, OpenVPN and IPSec) and secure hardware design
- › Reduced duration of power cuts (SAIDI)
- › Easy to upgrade: addition of extra functions
- › Flexible updates in a secure environment
- › **Retrofit**: Possibility of upgrading a previous generation ITI2012 cabinet (underground or overhead) by simply replacing the previous generation CPU board with the CPU2020 board (quotation provided for all requests)
- › Client update by staff or by Ensto Novexia's Service team (based on service quotation)



## Focus on functionality

SD card slot: allows you to save and store data on removable media

2 Ethernet ports:  
- configuration  
- extension or secondary communication

Digital Inputs and Outputs (I/O) for data reception and communication module connection

Slot for future USB port extension to add further features to the board: GPS, GSM, etc.

- Increased data processing power  
- Cybersecurity  
- Logs 10,000 events instead of 1000 for the ITI 2012  
- Increased storage capacity  
- Universal comprehension (indefinite language file addition)

Power reserve  
Time backup  
Automatic time reset (timestamping) using protocol or NTP

Ethernet port: primary communication

# Monitoring & Control Cabinet range



## Customer benefits

Compact, ergonomic solutions for quick and easy installation.

User-friendly embedded HMI interface and software for quick and easy use and configuration.

## Models available

### Underground applications

(Cabinets installed in MV/LV stations)

- ITI-1S : cabinet consisting of 1 non-upgradeable channel
- ITI / PASA-2S/4S : cabinet consisting of 1 to 4 channels
- ITI / PASA-8S : cabinet consisting of 1 to 8 channels
- ITI PASA-H : cabinet consisting of 1 to 4 channels, dimensionally adapted to fit above switches
- E-RTU-S : cabinet consisting of 1 to 8 channels

### Overhead applications

(Pole-mounted cabinets)

- ITI-1A : cabinet consisting of 1 channel, suitable for remote-controlled overhead switches
- ITI-1A -50°C : cabinet consisting of 1 channel, suitable for remote-controlled overhead switches. This cabinet includes internal insulation enabling operation under severe weather conditions (snow, ice)
- E-RTU-A : cabinet consisting of 1 channel

### Model under development:

- EMIS



ITI-1S



ITI / PASA-2S/4S



E-RTU-S



ITI / PASA-H



ITI / PASA-8S



ITI-1A or E-RTU-A



ITI-1A -50°C



EMIS

UNDER DEVELOPMENT

# E-RTU 2020 cabinet

## Main characteristics

|                                 |   | Overhead E-RTU   | Vertical underground E-RTU   | Horizontal underground E-RTU                                     |
|---------------------------------|---|--|--|--|
| Number of channels              |   | 1  | 1 to 8   | 1 to 4   |
| Operating conditions            | Operating temperature                                     | -50°C to +55°C   | -15°C to +55°C   | -15°C to +55°C   |
|                                 | Storage temperature                                       | -50°C to +55°C   | -25°C to +55°C   | -25°C to +55°C   |
|                                 | 24-hr relative humidity                                   | < 95%  | < 95%  | < 95%  |
| Mechanical characteristics      | Dimensions (H x L x D)                                    | 625 x 310 x 340 mm   | <ul style="list-style-type: none"> <li>• 650 x 310 x 330 mm (1 to 4 channels)</li> <li>• 650 x 600 x 330 mm (5 to 8 channels)</li> </ul>   | 220 x 800 x 350 mm   |
|                                 | Weight (with battery)                                     | 40 kg  | <ul style="list-style-type: none"> <li>• 38 kg (1 to 4 channels)</li> <li>• 40 kg (5 to 8 channels)</li> </ul>   | 35 kg (1 to 4 channels)  |
|                                 | Protection rating   | IP35   | IP2XC  | IP2XC  |
|                                 | Material grade 304/316                                    | Stainless steel cabinet  | Galvanised sheet cabinet   | Galvanised sheet cabinet   |
|                                 | Mounting  | Pole mounting  | <ul style="list-style-type: none"> <li>• Wall mounting with M10 screw on centre distances of 250 x 630 mm (1 to 4 channels)</li> <li>• Wall mounting with M10 screw on centre distances of 560 x 630 mm (5 to 8 channels)</li> </ul> | Wall mounting with M10 screw on centre distances of 200 x 775 mm |
| Power supply                    | LV power supply   | 150 Vac to 270 Vac (with no wiring modification), 100 VA, 50 Hz - 60 Hz<br>Fuse protection gF 10.3 x 38, rating 2A   |  |  |
|                                 | Power supply unit   | Single sealed lead battery 12 V - 38 Ah  |  |  |
|                                 |   | Charger 13.8 V, 3.6A ,with temperature compensation, 4A fuse protection  |  |  |
|                                 |   | Converter 12 V/48 V, 7 A, with 6.3 A fuse protection   |  |  |
| Communication                   | DNP3 and DNP 3 IP   | On GSM or xG media, Digital radio, IP router   |  |  |
|                                 | IEC101 protocol   | On GSM media, Digital radio, RS232   |  |  |
|                                 | IEC104 protocol   | On xG media, IP router   |  |  |
|                                 | Modbus IP and RTU   | TCP / UDP / RS232  |  |  |
|                                 | IEC61850 protocol   | Under development  |  |  |
|                                 | Redundancy (Scada or Multi-com media)                     | Communication redundancy to SCADA, all protocols   |  |  |
| Protection against cyberattacks | As per IEC 62351 standards                                | <ul style="list-style-type: none"> <li>• IEC 62351 - 3 = TLS encryption</li> <li>• IEC 62351 - 5 = Authentication</li> <li>• IEC 62351 - 8 = User roles</li> </ul> |  |  |
|                                 | VPN tunnels   | Open VPN / IPsec   |  |  |
|                                 | Services  | HTTPS server, Firewall, Enrolment, Vlan  |  |  |
| Interface Connection            | Inputs / Outputs  | 10 digital inputs  |  |  |
|                                 |   | <ul style="list-style-type: none"> <li>• 1 External indicator light (single- or two-coloured) output</li> <li>• 3 x 250V 10 A relayed outputs</li> </ul>           | <ul style="list-style-type: none"> <li>• 1 x 250V 10 A relayed output (Reserved for PASA)</li> <li>• 1 External indicator light (single- or two-coloured) output</li> <li>• 3 x 250V 10 A relayed outputs</li> </ul>                 |  |
| Fault detection                 |   | Amperometric   |  |  |
|                                 |   | Directional  |  |  |
| Measurements                    | Phase current   | 500/1 open-style toroid sensors compliant with the NF EN 60044-1 standard  |  |  |
|                                 |   | Power 1.5 VA, Class 3  |  |  |
|                                 |   | MV current measurement per channel: Instantaneous current, 10 min averaged current, max current (non-fault)  |  |  |
|                                 |   | Local and remote display   |  |  |
|                                 | MV voltage  | MV voltage measurement based on 10 min averaged LV   |  |  |
|                                 |   | Local and remote display   |  |  |
|                                 | Cabinet temperature                                       | Cabinet temperature measurement<br>Local and remote display  |  |  |
|                                 | External temperature (PT100)                              | Transformer or station temperature measurement   |  |  |
| 4-20mA or 0-10V measurements    | Standard sensor measurement (pressure, water level, etc.) |  |  |  |
|                                 | All measurements can be viewed locally or remotely        |  |  |  |
| Automation                      |   | ADA (opening on voltage dip)   |  |  |
|                                 | Secure closing (with or without striker)                  | PASA (automatic power source switching)  |  |  |
| Configuration                   |   | Via PC with commercially available web browser and standard Ethernet cable   |  |  |
| Events                          |   | Storage of 10,000 events, precision 10 ms  |  |  |



# The ITI Range

## Main characteristics

|                            |  | Overhead ITI  | Vertical underground ITI   | Horizontal underground ITI                                       |
|----------------------------|--|---|--|--|
| Number of channels         |  | 1   | 1 to 8   | 1 to 4   |
| Operating conditions       | Operating temperature  | -50°C to +55°C  | -15°C to +55°C   | -15°C to +55°C   |
|                            | Storage temperature  | -50°C to +55°C  | -25°C to +55°C   | -25°C to +55°C   |
|                            | 24-hr relative humidity  | < 95%   | < 95%  | < 95%  |
| Mechanical characteristics | Dimensions (H x L x D)   | 625 x 310 x 340 mm  | <ul style="list-style-type: none"> <li>650 x 310 x 330 mm (1 to 4 channels)</li> <li>650 x 600 x 330 mm (5 to 8 channels)</li> </ul>   | 220 x 800 x 350 mm   |
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| Power supply               | LV power supply  | 150 Vac to 270 Vac (with no wiring modification), 100 VA, 50 Hz - 60 Hz                                     |  |  |
|                            |  | Fuse protection gF 10.3 x 38, rating 2A   |  |  |
|                            | Power supply unit  | Single sealed lead battery 12 V - 38 Ah   |  |  |
|                            |  | Charger 13.8 V, 3.6A ,with temperature compensation, 4A fuse protection                                     |  |  |
|                            |  | Converter 12 V/48 V, 7 A, with 6.3 A fuse protection  |  |  |
| Communication              | HNZ protocol   | PSTN - Speed 300-600-1200 Baud or Radio - Speed 200-600-1200 Baud   |  |  |
|                            | DNP3 and DNP 3 IP  | On GSM or xG media, Digital radio, IP router  |  |  |
|                            | IEC101 protocol  | On GSM media, Digital radio   |  |  |
|                            | IEC104 protocol  | On xG media, IP router  |  |  |
| Fault detection            |  | Amperometric  |  |  |
|                            |  | Directional   |  |  |
| Measurement                | Phase current  | 500/1 open-style toroid sensors compliant with the NF EN 600044-1 standard                                  |  |  |
|                            |  | Power 1.5 VA, Class 3   |  |  |
|                            |  | MV current measurement per channel: Instantaneous current, 10 min averaged current, max current (non-fault) |  |  |
|                            |  | Local and remote display  |  |  |
|                            | MV voltage   | MV voltage measurement based on 10 min averaged LV  |  |  |
|                            | Local and remote display   |   |  |  |
| Temperature                | Cabinet temperature measurement  |   |  |  |
|                            | Local and remote display   |   |  |  |
| Automation                 | ADA (opening on voltage dip)   |   |  |  |
|                            | PASA (automatic power source switching)                                    |   |  |  |
| Configuration              | Via PC with commercially available web browser and standard Ethernet cable |   |  |  |
| Events                     | Storage of 1000 events, precision 10 ms                                    |   |  |  |



# General ITI and E-RTU cabinet functionality

## Transmission characteristics

### By radio or dedicated lines (ITI product)

- HN266513 simplified master-master procedure, variable or short frame, without INIT
- Speed: 200 baud recommendation R38 A - channel C3 (1560Hz) or C5 (2520Hz), 600/1200 baud - recommendation V23

### By switched network (ITI product)

- HN266513 simplified master-master procedure, variable or short frame, with INIT
- Speed: 300 baud - recommendation V21, 600/1200 baud - recommendation V22
- Standard converter board (>10kV)
- Decimal or MF numbering

### By GSM, GPRS, Digital radio, IP router

- Protocols: IEC 101, IEC 104, Modbus, DNP3, DNP3 IP

## Fault current detection and measurements

As standard, Monitoring & Control cabinets contain current acquisition modules and a voltage acquisition module. Fault detectors can be configured for amperometric or directional fault detection on-site using a PC.

## Amperometric detection

- Configurable single-phase fault thresholds (e.g. 20A - 40A - 80A - 160A - 240A or others)
- Configurable multi-phase fault thresholds (e.g. 500A - 750A - 1200A - 1600A or others)
- Configurable double fault thresholds (e.g. 250A - 450A - 700A - 1200A or others)

## Directional detection

- 2 single-phase fault thresholds: preset 1 and preset 2
- 1 multi-phase fault threshold: 500A
- 1 double fault threshold: 250A

## Remote measurements

The MV line current measurement functions, and the internal settings (12V, 48V voltage, temperatures, etc.) are available to view locally on the display or configuration PC or via telecontrol.

## EEMD (Dated Logged Maintenance Events) function

This event logging function is available to locally view or report to the telecontrol PC events arising on the cabinet or the grid (logging of up to 10,000 events depending on version).

## ADA (Alarmed Decentralised Automation) function

This opening on voltage dip function is included in the standard cabinet software, regardless of the selected neutral system.

Opening on voltage dip possible in the first or second reclosing cycle.

## PASA (Automatic Power Source Switching) function

This function is used to switch one or more normal operating sources to one or more backup sources if there is no voltage on the normal sources. This function is not available if the cabinet only controls a single MV network, as in the case of the ITI-1S.

This switching is available under certain conditions such as:

- absence of voltage on all active source switches and voltage presence on at least one non-neutralised backup source switch
- no external locking order or MT fault locking order
- authorised switching direction

## Configuration

This is performed with a computer equipped with: an Ethernet connection, Java programming language (ITI product) and a web browser such as IE, Chrome or Mozilla, etc.

The embedded software on the CPU board enables:

- configuration of transmission settings for PSTN, Radio, dedicated lines, PC No., PA No., transmission speed, etc.
- configuration of fault detection settings: amperometric, directional, single-phase, polyphase, double fault thresholds, etc..
- ADA and PASA automation system configuration
- HN2 protocol analysis
- Download of pre-defined configuration
- EEMD view / backup
- CPU board update

## Electrical characteristics

- auxiliary power supply of 150 Vac to 230 Vac
- outputs 12 Vdc and 48 Vdc
- single maintenance-free sealed lead battery
- periodic battery status check with local signalling and/or remote alarm



# Tailored support

## Customer service packages



Because we prioritise electrical distribution grid availability and efficiency, Ensto, with over 30 years' experience designing and manufacturing Monitoring & Control cabinets, offers a range of service packages or tailored services to extend Monitoring & Control cabinet service life and performance in installed bases.



For each type of Monitoring & Control cabinet, Ensto offers:

- A list of recommended replacement parts, (electronic boards, etc.)
- Supplied technical installation, configuration and maintenance instructions,
- Electronic board repairs on installed cabinets,
- Software updates,
- An Ensto expert hotline to help with troubleshooting issues and answering queries from our customers.

The service level can be raised at any time during the Monitoring & Control warranty period, with:

- An extended warranty,
- A technical training package,
- On-site/off-site product training to help our customers train their teams on Monitoring & Control cabinet features, installation, configuration, and maintenance procedures.





# ENSTO

Ensto Novexia SAS  
210, rue Léon Jouhaux - BP 10446  
FR - 69656 Villefranche-sur-Saône cedex, France  
Tel: +33 (0)4 74 65 61 61  
Fax: +33 (0)4 74 62 96 57  
Email: [infos.novexia@ensto.com](mailto:infos.novexia@ensto.com)

[ensto.com](http://ensto.com)

