Remote control and monitoring Device of Secondary Substation

In compliance with Enel GSTR001/1 e GSTR001/2

General Information

The UP2015-UP16 is remote control Peripheral Unit for secondary substations and Medium Voltage (MV) power distribution system.

Main functions of the UP2015-UP16 are:
- Remote control and Automation of 16 Secondary substation switchgears
- Permanent Fault detection
- Monitoring of Medium Voltage Power Grid.

The UP2015-UP16 allows communication between the field and the Distribution Control Centre. In particular:
- Receives and carries out commands sent by the Distribution Control Centre (Remote Control).
- Sends field collected information (remote signalling and telemetry) to the Distribution Control Centre side.

These functions guarantee Hight Level Reliability of the Electric Power Distribution system, reducing the number and the duration of power outages caused by circuit faults.
Furthermore, Remote Control permits optimization of electric power distribution system maintenance and planning policies.

The UP2015-UP16 is made of two components integrated into a metal cabinet:

- **The UE16 module** is the unit of data acquisition, monitoring, transmission, and processing; it is the field interface too. The UE8 is entirely remotely programmable by a personal computer.

- **The ACB module** includes a power supply and a battery system with a charger circuit. The ACB supplies the power to UE8, to a communication device called DCE and to motors of Switchgears connected to the UP. Two Lead-acid rechargeable batteries compose the Battery system, and the ACB monitors its functional states. The ACB is entirely programmable from a personal computer by a local communication port.

Main Features

A complete range of functions to cover all the remote control needs of Medium Voltage power grids:

- ✓ Acquisition, processing and collection of the Switchgear states.

- ✓ Managing fault-detection automation.

- ✓ Archiving of electric power distribution system data management and chronological events (fault, voltage failure, etc.) trend.

- ✓ Processing of field signals correlation for generating signs to the Distribution Control Centre.

- ✓ Validation and dispatch of commands from the Distribution Control Centre to Switchgear.

- ✓ Communication with the Distribution Control Centre technologies:
  - ○ GSM/GPRS/UMTS
  - ○ Public Switched Telephone Network (PSTN)
  - ○ Network LAN/WAN IP based

- ✓ Communication Protocols:
  - ○ IEC 60870-5-101
  - ○ IEC 60870-5-104

- ✓ Management of diagnostic of failure devices with issue of local and remote warnings.

- ✓ Monitoring of Secondary Substation temperature by dedicated sensor and managing of door opening warning.

- ✓ Power supply to the automation components of the secondary substation.

Technical Features

The UE16 Module

Input/Output Interfaces
89 Remote signals (TS):
- galvanically optocoupled digital inputs
- sampling: 10msec

32 Remote commands (TC):
- Relay output with 1 / N of the uniqueness control of the carrying out, execution policy in double safety and evaluation of the value of the output load impedance.
- nominal current: 5A
- interruption rate: 0,5A @ 110 Vcc with L/R = 40msec.

16 Telemetry (TM):
- differential analog inputs galvanically isolated
- input impedance: 50ohm
- measure range: ± 5mA e 4÷20mA
- precision: 1%FS
- resolution: 12bit

16 Digital Outputs (UD):
- open collector (source) output galvanically isolated (max current 50mA)

Communication ports
There are three communication ports:
- no. 1 Ethernet Port 10/100BaseT (available both as LAN/WAN interface and as configuration and local monitoring port)
- no. 1 serial Port V.24 (interface to external DCE device dedicated)
- no. 1 USB 2.0 device Port (configuration and local monitoring dedicated)

Power Supply
The UE16 module is powered by the main source with:
- Nominal voltage: 24Vcc ±20%

The Hardware is powered by the secondary source galvanically isolated from the main.

Visual indicators
There are three LEDs signs:
- Fatal failure
- General anomaly
- Main source presence

Connections
- Ethernet interface: RJ45 connector
- V.24 serial interface: DB25 connector with male poles
- USB local interface: B type connector
- no. 16 female connectors with 9 poles for connections to RG device
- no. 16 female connectors with 12 poles for connections to witchgears
- no. 1 female connector with 12 poles for connections to the ACB module
- no. 2 extractable terminal boards with 16 poles for connections to remote signals (TS)
- no. 2 extractable terminal boards with 16 poles for connections to Telemetry
- no. 1 extractable terminal with 4 poles for connections to temperature sensor of the substation
- no. 1 extractable terminal with 4 poles for connections to particular remote signals:
  - Door Opening
  - IMS TR Opening

Mechanical features
The module is contained in a standard rack box 19" 7U

The ACB Module

The main electric features are:

Main source voltage:
100/230 V_{AC} (-10% ÷ +20%), set up by dedicated selector.

Nominal frequency: 50/60Hz

Power: 150W

The secondary power sources are:
Output of battery charger and load power:
- Nominal Voltage: $24V_{DC}$ set between 23 and 28 V_{DC} also balanced according to the battery temperature
- Maximum available current (fixed): 5A ±5%

Power supply Auxiliary output:
- Nominal Voltage: 12 V_{DC}
- Maximum available current (fixed): 1 A

Whole efficiency:
≥75% ± 3%
(calculated at the maximum supplied current 5A and the nominal voltage of 24V_{DC})

Visual indicators
There are five LEDs signs:
- Main source presence
- Secondary source presence
- Secondary voltage low level
- Secondary voltage maximum level
- Battery failure

Connections and options
- USB local interface: type B connector
- no. 1 female connector with 9 poles for connection to batteries and external modem
- no. 1 female connector with 12 poles for connection to the UE8 module
- no. 1 three-poles socket for the main power supply
- no. 1 bipolar circuit breaker for IO: 2A type loads
- no. 1 Thermal magnetic circuit breaker with auxiliary contact: 20A C curve
- no. 2 fuse holders with fuses of main grid protection: 3,15AT.
- no. 1 fuse holder with fuse 20AT of battery output protection

Mechanical features
The module is contained in a standard rack box 19" 3U

EMC

Environmental conditions

Operating temperature:	-10 ÷ +55°C
Storage temperature:	-25 ÷ +70°C
Humidity:	93%

IP Grade

EN60529-1 compliant: IP30

Configuration software

UP2015-UP16 is accompanied by a configuration application program that runs under Windows ©. It allows the configuration of the UP both remotely and locally.
Local configuration must be performed with a personal computer, connected to the UP via USB 2.0 or through an Ethernet interface.
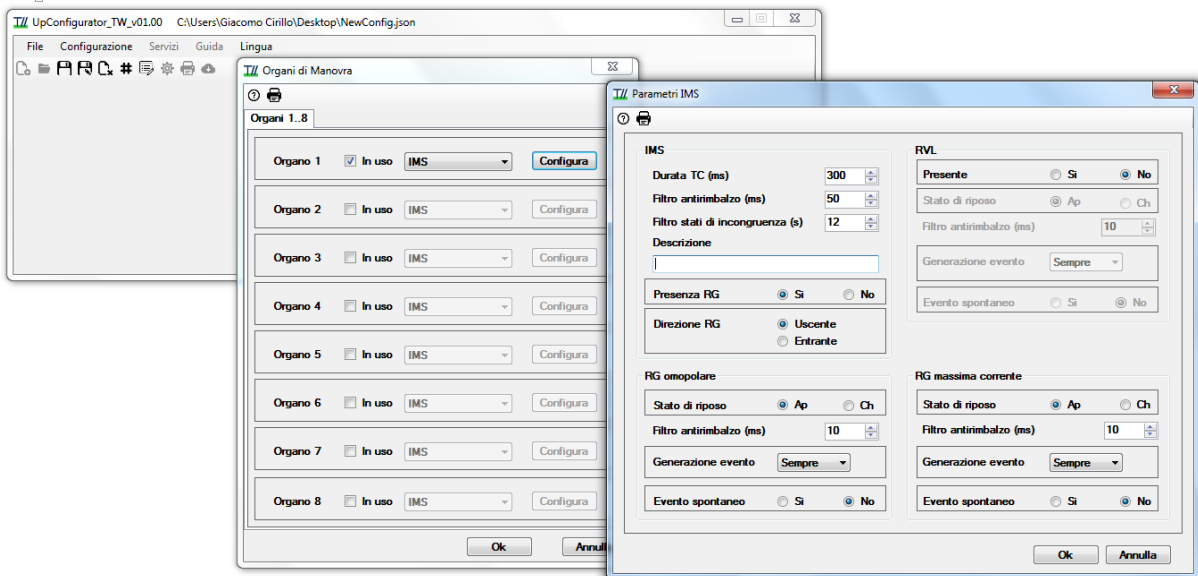The application allows to define:

- The general parameters of operation of the device
- Communication parameters
- The characteristics of the OdMs connected to the UP
- Remote Signals, Remote Measures and the Digital outputs.

Furthermore, it is a useful diagnostic and verification tool, as it allows:

- Monitoring the status of the inputs and outputs
- Monitoring, with the possibility of saving on file, the states of the automatisms, their transitions and the corresponding values assumed by the physical and logical inputs.
- Sending commands to the instantiated OdMs.

It is also possible to analyze the recordings at a later time.