NETCON 100

Smart platform for distribution automation

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FEATURES

Remote and local control of switching devices

Overcurrent and earth fault indications

Integrated line protection for several circuit breakers

Electricity quality measurement

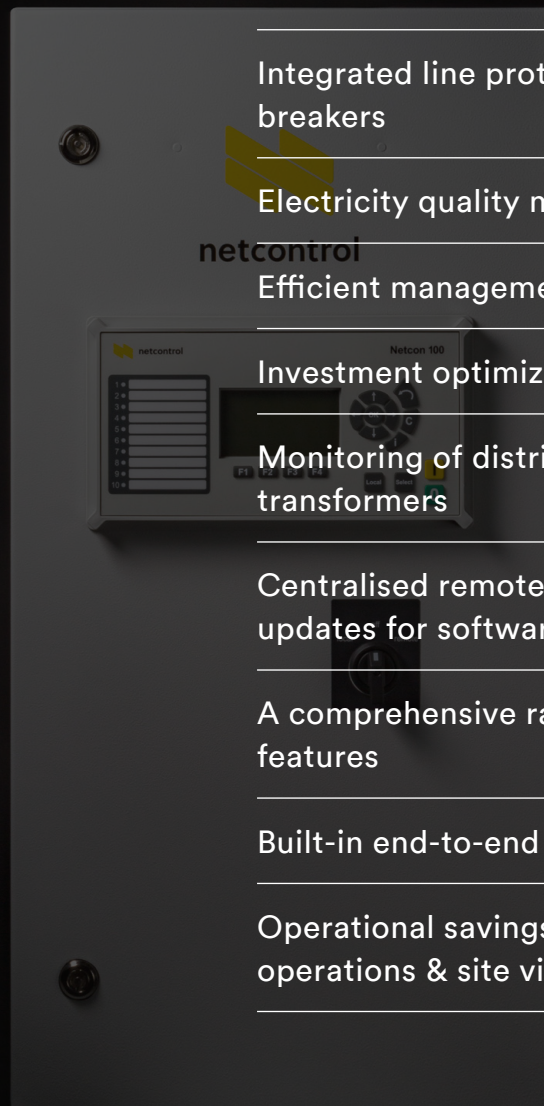Efficient management of interruptions

Investment optimization

Monitoring of distribution network and transformers

Centralised remote management and mass updates for software

A comprehensive range of data communication features

Built-in end-to-end cyber security

Operational savings through fewer manual operations & site visits

Smart platform for distribution Automation

The Netcon 100 is a smart device for the monitoring of medium- and low-voltage networks along with the remote control of medium-voltage switching devices. Standard protocols and interfaces make its connection to other systems straightforward. The Netcon 100 is compact yet modular in structure, so that it is easily and economically integrated into the substation and expanded with the needs.

IMPROVED MV NETWORK AVAILABILITY

The availability requirements for power networks are constantly increasing. Most outages in the low voltage network are caused by faults on the medium voltage side. Their average duration can thus be significantly reduced through improved fault location and the remote control of switching equipment.

Transformer optimisation

Investments in transformer and network development are usually based on power system modelling. Since this uses statistical methods based on load profiles, the actual load may differ considerably from the model estimates.

Thanks to measurements collected by the Netcon 100, you can obtain precise load data and development trends. Thus you can avoid over-cautious and premature renewal investments made just "to be on the safe side". Correspondingly, you can fend off problems caused by transformer overloading – such as damage to the transformer and shortening of its operating life – due to estimates that were too small.

ALL-IN-ONE SOLUTION

Fault detection

The intelligent fault location made possible by the Netcon 100, when combined with the DMS, shortens power outages and reduces their impact. The system detects the direction of the fault from the substation as well as (for overcurrent) the fault reactance, which correlates with the distance. Repair measures can be initiated quickly and precisely.

The Netcon 100 has four overcurrent stages and five earth fault stages. Two of the EF stages are based on admittance calculation and one is dedicated to intermittent earth faults. All the stages are included in feeder-specific setting groups that can be remotely swapped when the switching state of the network, for example, changes.

Integrated feeder protection

The Netcon 100 also offers a separately licensed, integrated feeder protection functionality for overcurrent and earth faults that trips the circuit breaker on a feeder based on the afore-mentioned fault stages. It can thus replace the separate protection relays traditionally deployed at secondary substations.

The fault stages are provided by the FDM112 card, whereas the remote control is the responsibility of the RCM130 card. One pair of these cards can protect three feeders. With up to three pairs in one Netcon 100 system, nine feeders can be protected.
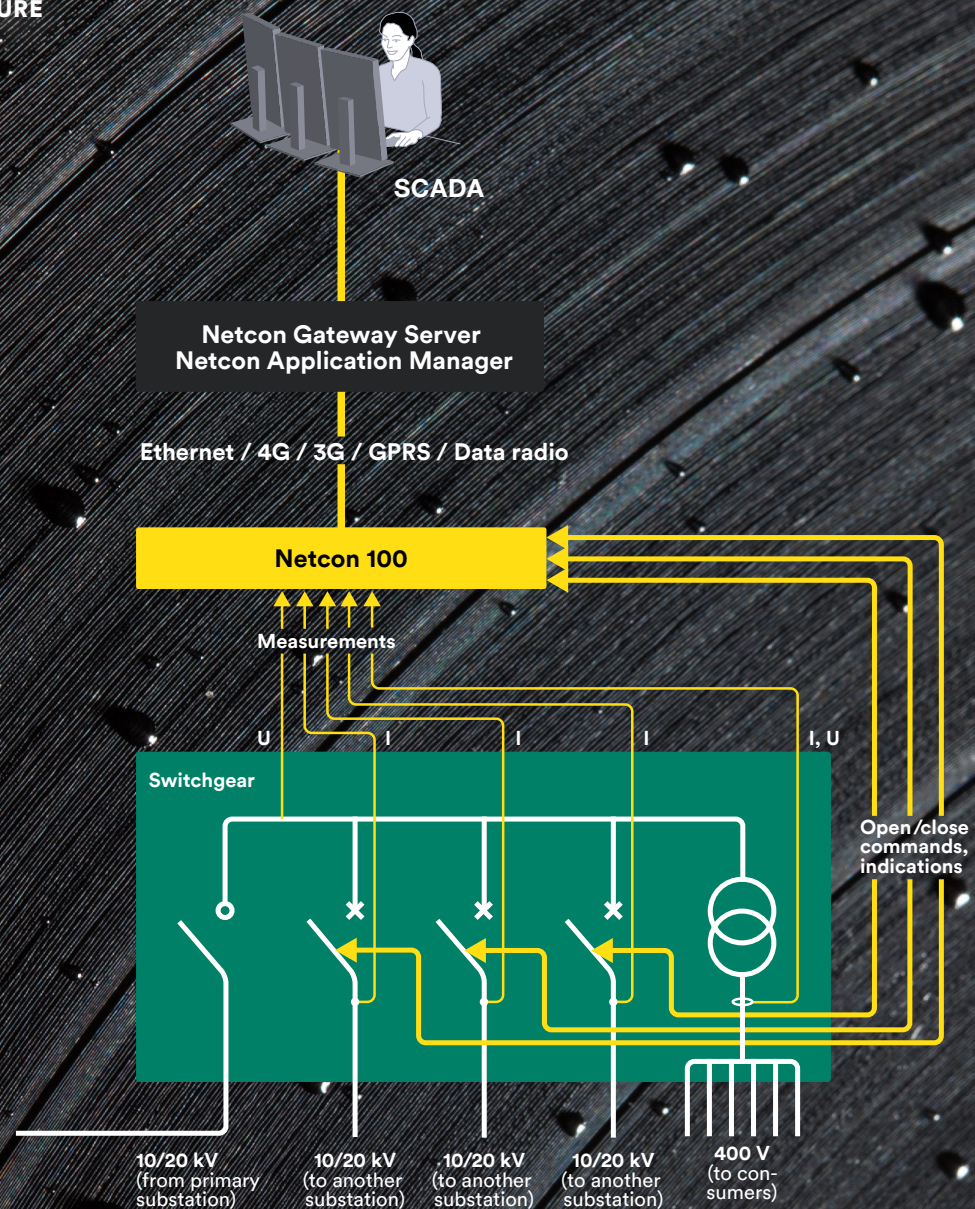
The protection inludes an optional auto-reclosing functionality with three shots. It is included in the remotely swappable setting groups.

Load management

The real-time measurements provided by the Netcon 100 also mean that the network switching state and therefore transformer loads can be better managed by the DMS and/or the SCADA system. This is especially useful in exceptional situations such as during maintenance or faults.

SCADA

Netcon Gateway Server
Netcon Application Manager

Ethernet / 4G / 3G / GPRS / Data radio

Netcon 100

Measurements

U   I   I   I   I, U

Switchgear

Open /close commands, indications

10/20 kV (from primary substation)

10/20 kV (to another substation)

10/20 kV (to another substation)

10/20 kV (to another substation)

400 V (to consumers)

Comprehensive quality measurement

Constant measurement of electricity quality and data available from the fault and disturbance recordings help utility companies forecast and reduce service-level disturbances in the network. Complaints from customers are reduced and customer satisfaction improves.

Accurate time synchronisation

Effective detection and localisation of faults presupposes the precise time stamping of events. The Netcon 100 can obtain time synchronisation e.g. from an NTP (Network Time Protocol) server or from the SCADA system via the communication protocol.

Intelligent alarms

Through Netcontrol's advanced sum alarm logic, the data supplied by individual alarm signals can be refined into comprehensive alarm information.

Safety functions

The importance of public safety is continuously growing and the official requirements are changing. The Netcon 100 has many safety features:

- Access control makes it possible to monitor whether the doors to the equipment room are open.
- Temperature measurement of the transformer and the installation room reduces the risk of fire, which is very important for transformers within buildings.

MODULARITY

Hardware

While compactly packaged, the Netcon 100 is a modular system, easily adaptable to the purpose. It is available in various assemblies according to the size of the secondary substation or disconnector station and the desired functionality.

The standard Netcon 100 assemblies come pre-installed in a cabinet with the rack(s), batteries, terminal blocks and wiring as well as any customer-specified options, such as a communication device or an HMI panel. They are easy to configure and install. The configuration is through a user-friendly web interface with the help of ready-made templates.

For OEM manufacturers, however, we also deliver rack assemblies without a cabinet.

The Netcon 100 rack has 4 or 6 card slots. The setup always includes a GW102 main processor card and a PSU152 power supply card. The other slots are for measurement and control cards, depending on the application.

Modularity makes the Netcon 100 system very easy and cost-efficient to expand. You can add card modules to an existing rack. When the first rack is full, you can add a second rack. Such expansion may involve new functionalities and/or more IO capacity.

Software

The Netcon 100 software is also modular. A new software version and/or an expanded licence may bring about completely new applications. These include feeder protection when the Netcon 100 already has the required cards and sensors.

Application interface

An application programming interface (API) allows users to write their own applications for the Netcon 100. These applications may:

- retrieve data from the Netcon 100
- monitor changes in the unit
- send commands to the unit
- check logs.

The API conforms to the REST software architecture. With its support of multiple programming languages, it is very flexible and easy to use.
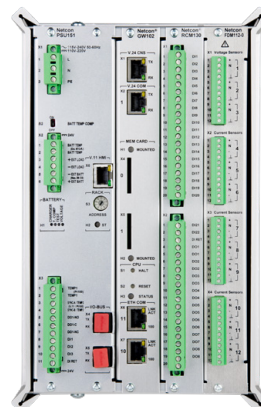
Rack4, with four card slots
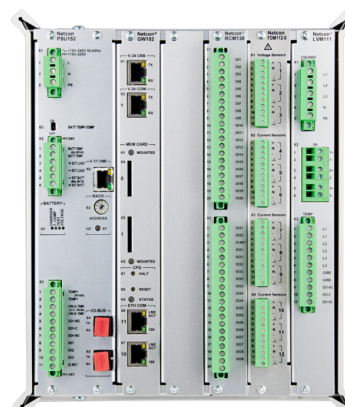
Rack6, with six slots

Card modules in detail

NETCON GW102

Main processor

The GW102 contains the system control functions; the data communication services; and measurement data recording and sum alarm functions.

- Runs the Netcon NFE communication software, which supports over 50 protocols
- 2 memory card slots
- Web user interface for configuration and diagnostics
- Console serial port, V.24 (RS-232)
- Data communication serial port, V.24 (RS-232)
- Ethernet data communication port, 10/100 BaseT
- Ethernet control port, 10/100 BaseT

NETCON PSU152

Power supply

The Netcon PSU152 handles the supply of power to the Netcon 100. Its input voltage range is 90...264 VAC, 45...65 Hz. The module has a temperature-compensated battery charger, for maximum battery life. It conditions the health of the battery and sends alarms about any problems to the SCADA.

The PSU152 includes a port for the HMI, as well as the following I/O signals for battery supervision:

- 3 digital inputs (DI), ±24 VDC
- 1 contactor output, 5 A, 250 VAC
- 2 Pt100 temperature measurement inputs.
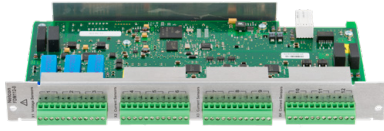
NETCON RCM130
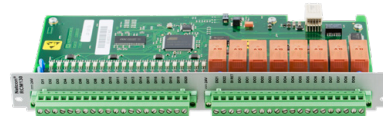
Remote control

The RCM130 is a remote control module for four disconnectors or circuit breakers.

- 22 digital inputs (DI)
- 8 contactor outputs (DO), potential-free
- Inputs and outputs can be used either in a general-purpose I/O mode or in a mode where they are constrained by built-in control logic for disconnectors and circuit breakers.

NETCON FDM112

MV measurement & fault detection

The FDM112 takes care of MV fault detection, fault reactance calculation, disturbance recording and power quality measurement for 3 feeders.

- 12 analogue inputs (AI) for current and voltage sensors, 16-bit precision
- voltage measurements
- current measurements
- power and energy measurements

The FDM112 comes in two alternative variants which differ according to the availability of MV current measurement data from the switchgear. The most accurate results are obtained when current sensors based on the Rogowski coil technology are used to measure two of the phases and the residual current (2L+N). An FDM112-0 would then be used. This setup is suited especially to networks where earth fault currents are weak. For maximum accuracy, installation plates are available to keep the Rogowski coils in their correct positions around the cables.

The FDM112-1 variant, in turn, is best suited to accept measurement data for the three phases (3L) by means of preexisting instrument current transformers (CT) in the switchgear.

Several signal adapters are available to ensure that the measurement signals always fall within the range accepted by the Netcon 100:

- **VMA146** adapts the signals provided by an instrument voltage transformer in the switchgear to the FDM112 card. One VMA146 is required for each FDM112 card.
- **ILS173** lowers the FDM112 coupling capacitance so as not to interfere with VDS indicators when a capacitive voltage sensor on the switchgear is used. One ILS173 is needed per switchgear.
- **CMA160** and **CMA167** take the signal that an instrument CT on the switchgear feeder provides and convert it to a voltage suitable for the
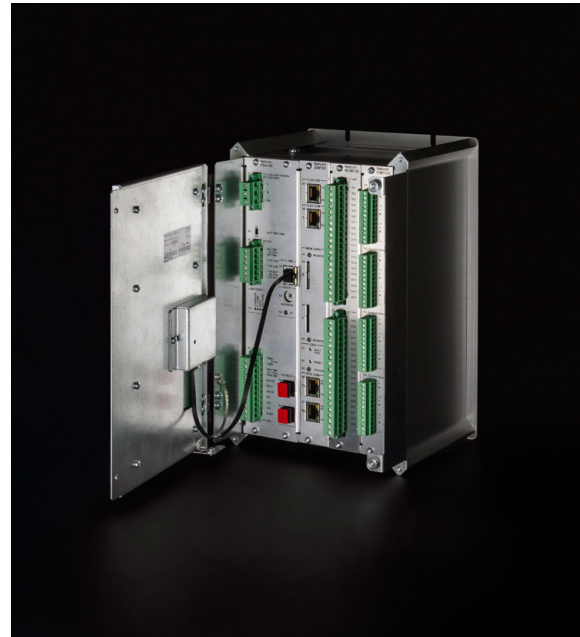
FDM112 card. One CMA160 or CMA167 is needed per feeder. The CMA160 attenuates the signal ten times more than the CMA167, giving a wider measurement range but coarser resolution. The CMA167 is therefore more suitable for networks with weak earth fault currents.

- **RCA170** can optionally be used to step down the output of Rogowski current sensors for the FDM112-1 card. It attenuates the signal to one tenth, allowing a larger measurement range. At the same time, it makes the measurement resolution coarser. One RCA170 is used per feeder.

NETCON LVM111

LV monitoring

The LVM111 is for the monitoring of the LV network. It includes electricity quality measurement as well as fault a disturbance recorder.

- 3-phase voltage and current measurements, 230/400 V, 5 A
- 4 Pt100 temperature inputs
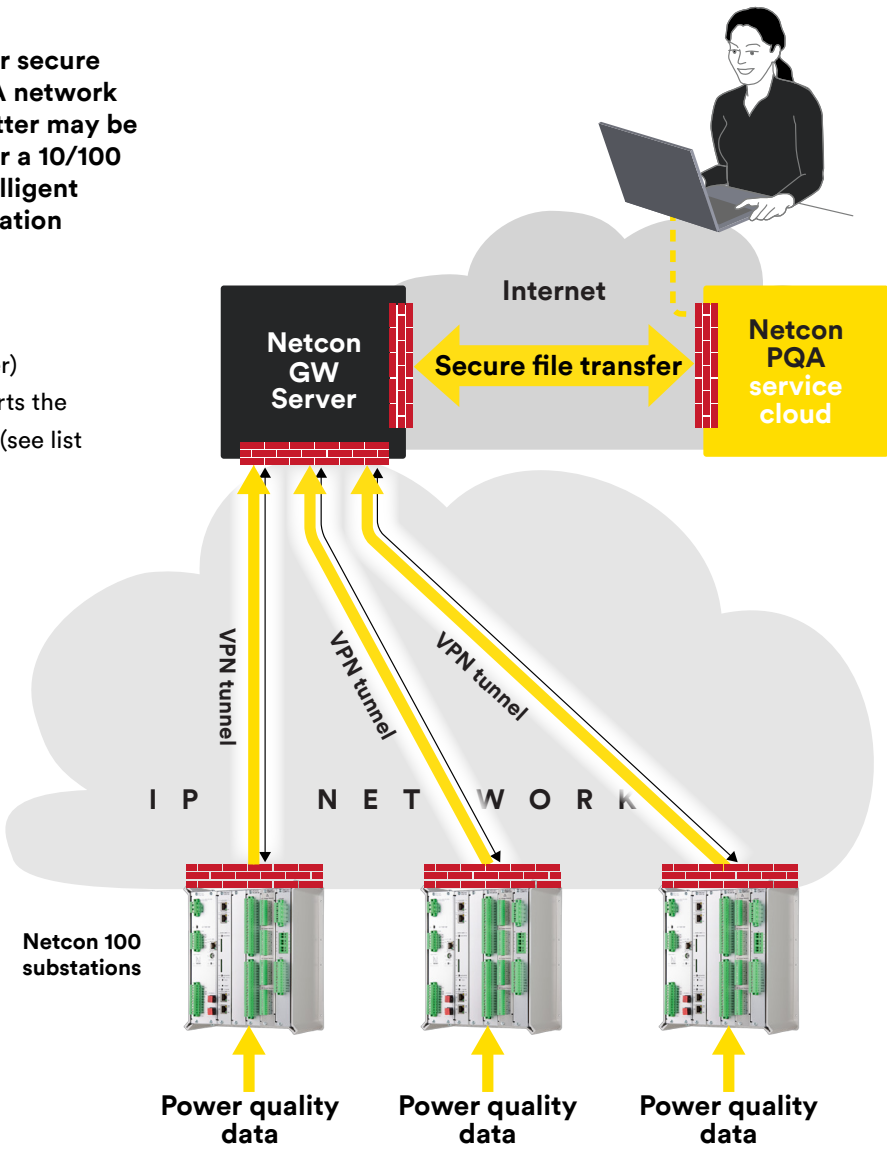- transformer cooling fan control output.

Versatile & cyber secure Communication

The Netcon 100 has comprehensive data communication features, built to be cyber secure from end to end. It is linked to the SCADA network either serially or by IP connection. The latter may be through a built-in 4G/3G/GPRS modem or a 10/100 Ethernet connection. Connections to intelligent electronic devices (IEDs) within the substation are serial.

For both SCADA (slave) and IED (master) communication, the Netcon 100 supports the key communication protocols of today (see list below).

The IP communication is based on the Netcon Secure IP architecture, which enables the utility network administrator to tightly control everything that happens within the network. A built-in firewall passes only carefully selected traffic, such as remote-use and administrative connections. Control room connections are protected through encryption within VPN tunnels.

For uploading fault records and power quality data, the Netcon 100 uses the stardard Comtrade file format and secure FTP transmission. The

Internet

Netcon GW Server

Secure file transfer

Netcon PQA service cloud

VPN tunnel

VPN tunnel

VPN tunnel

I P   N E T W O R K

Netcon 100 substations

Power quality data　　**Power quality data**　　**Power quality data**

measurements are first collected to one central location, usually the master station, over secure VPN connections. (This data transfer is kept logically distinct from all telecontrol traffic; see diagram.) From there the data can be forwarded to a PQA service cloud by means of secure file transfer.

SUPPORTED PROTOCOLS

Slave (SCADA)

- IEC 60870-5-101
- IEC 60870-5-104 slave with support for redundancy groups
- DNP3
- Procol
- RP570
- NetMan

Master

- IEC 60870-5-101
- IEC 60870-5-103
- Modbus RTU
- SPACOM

Central and local management

The Netcon 100 offers three user interfaces for configuration and management. The local HMI panel and the local/remote web browser interface provide access to a single Netcon 100 unit, whereas the Netcon Application Manager program enables the central management of a large number of Netcon 100 units.

LOCAL HMI

Two kinds of HMI panels are available for local control. The HMI127 is a very comprehensive and versatile option. Besides allowing the control of disconnectors and/or circuit breakers and indicating faults, it can show single line diagrams of the switchgear, real-time displays of measurements and other signals, and numerous other information. Twenty different kinds of displays can be configured for display on the LCD. The left side of the panel has ten LEDs for configurable alarms, which can be acknowledged from the OK button.
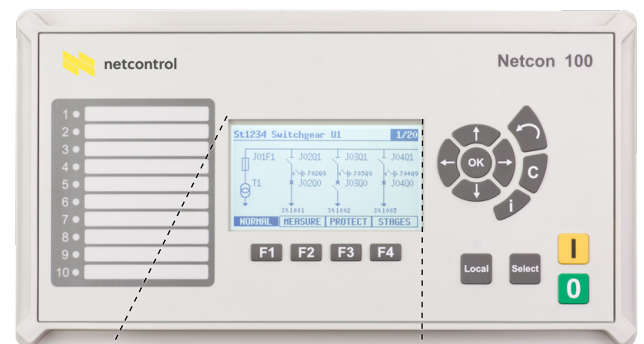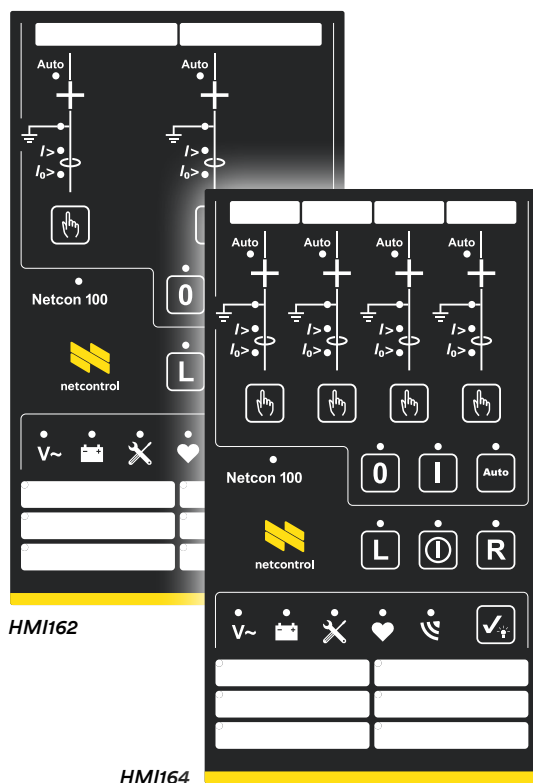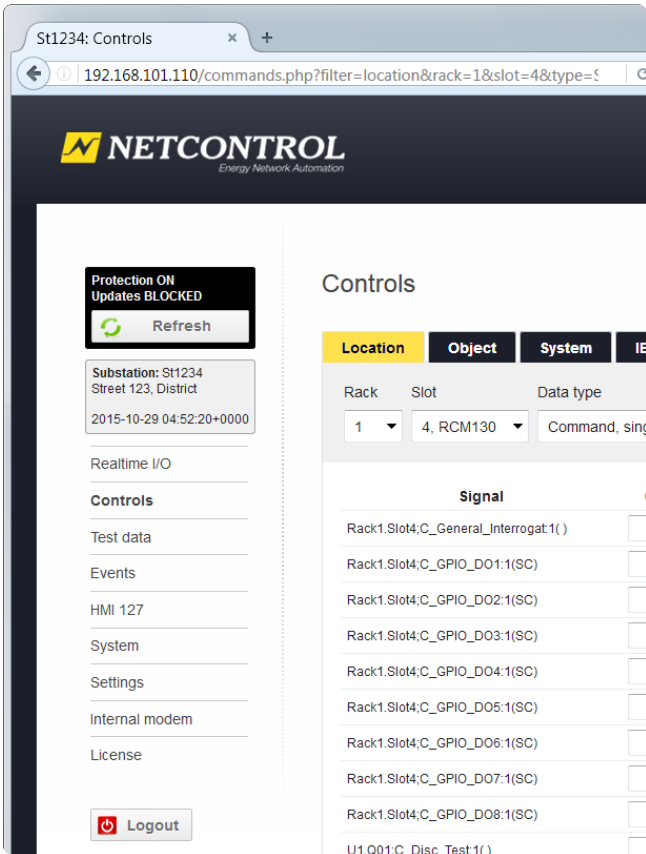

HMI127
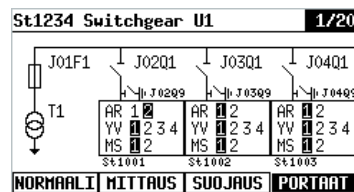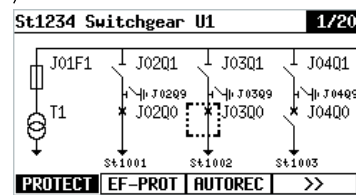
HMI162

HMI164

The HMI16x panels represent a simpler approach to local control. The HMI162 is for two and the HMI164 for four feeders. Both have LEDs for the indication of disconnector or circuit breaker positions and for earthing and faults. Both panels allow the control of disconnector or CB and the acknowledgement of alarms. The configurable alarms include alarms for the Netcon 100 itself, such as battery and communication status.

WebGUI is arranged into pages and tabs. It has three permission levels. User can, for example, browse the IO signals and view logs; Operator can also as operate switches for testing purposes. Only Administrator, however, can change the Netcon 100 configuration.

When the system includes an HMI panel, this too is configured through WebGUI.

NETCON APPLICATION MANAGER

The Netcon Application Manager program makes it possible to manage the software versions and configurations, and to see the hardware setups, of Netcon 100 substations remotely, over a network connection.

The user interface is based an a web browser. The program reduces the overall cost of the system through savings in time and resources.

Application Manager enables the user to:

- group Netcon 100 substations for easier version and configuration management
- monitor remotely that all the substations have the correct software versions and configuration files
- back up and restore Netcon 100 configurations remotely
- plan, execute and verify remote software updates and configuration changes for a single, multiple or all Netcon 100 substations at a time
- ensure that communication with all the substations is working.

WEBGUI

WebGUI is a comprehensive web-based interface for configuring a Netcon 100 unit and observing its IO and system signals (with some options for control as well). It connects to the GW102 card over IP, either locally or through a secure remote connection.

The configuration is organised into a straight-forward process guided by a wizard. However, the user can always change individual settings when necessary.

Key technical data

Operating temperature
−40...+40 °C for cabinet, −40...+55 °C for rack

Transport temperature
−40...+70 °C

Relative humidity
< 96 %

Cabinet enclosure class
IP54*

Applicable EMC standards
IEC 60255-26
IEC 61000-6-4
IEC/TS 61000-6-5

Rack dimensions (W × H × D)
Rack6: 240 × 282 × 135 mm
Rack4: 180 × 282 × 135 mm

*Outdoor cabinets have class IP44 because of ventilation.

Cabinet dimensions (W × H × D)

Indoor cabinets
S4830: 400 × 800 × 300 mm
S5530: 500 × 500 × 300 mm
M61230: 600 × 1200 × 300 mm

Outdoor cabinet
S5825O: 500 × 800 × 250 mm

HANDS-ON TRAINING COURSES

While designed to be easy to use, the Netcon 100 is a sophisticated product. Your personnel will be best introduced to it during Netcontrol's own three-day training course.

Guided by our professional instructors, the participants will be introduced to:

- the Netcon 100 card modules
- the HMI panel
- the web browser interface
- the product documentation.

Through hands-on exercises, the participants will learn to:

- configure the card modules, including the collection of history data, the fault detection and line protection functions as well as disturbance recorders
- set up the Netcon 100 interfaces with the communication network and with the SCADA and power quality analysis systems
- configure the Sum Alarm and Signal Mirror functions

- test the configuration using the functions built into WebGUI
- restart the Netcon 100 substation
- make a backup of the configuration and recover from it.

Our courses are arranged by agreement and only include a maximum of 4 participants plus the instructor(s). No one will remain just a spectator. The training course is a smart investment into your personnel and your smart Netcon 100 substations.

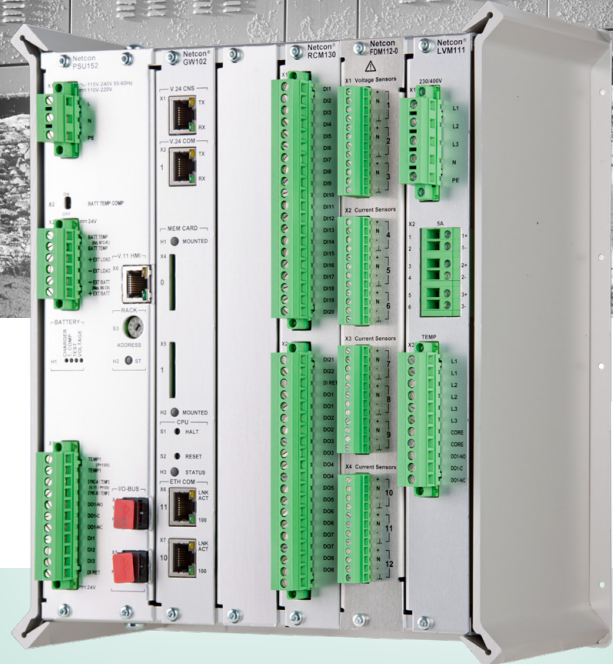## NETCON 100 BENEFITS

Compact, integrated solution

- Savings in implementation and installation costs

Reduces average duration of interruptions

- Built-in fault management applications

Future-proof platform for a long life cycle

- Centralised maintenance saves costs
- New applications by mass software upgrade
- Modular hardware for new applications

Flexible and cyber secure connectivity

- Built-in VPN and firewall
- Support for multiple networks and protocols

Versatile delivery options

- Ready made cabinet for retrofit installations
- Integration into new secondary substations at the factory