NETCON 200

The future of distribution network automation

All-in-one, compact feeder RTU for
the evolving electrical grid

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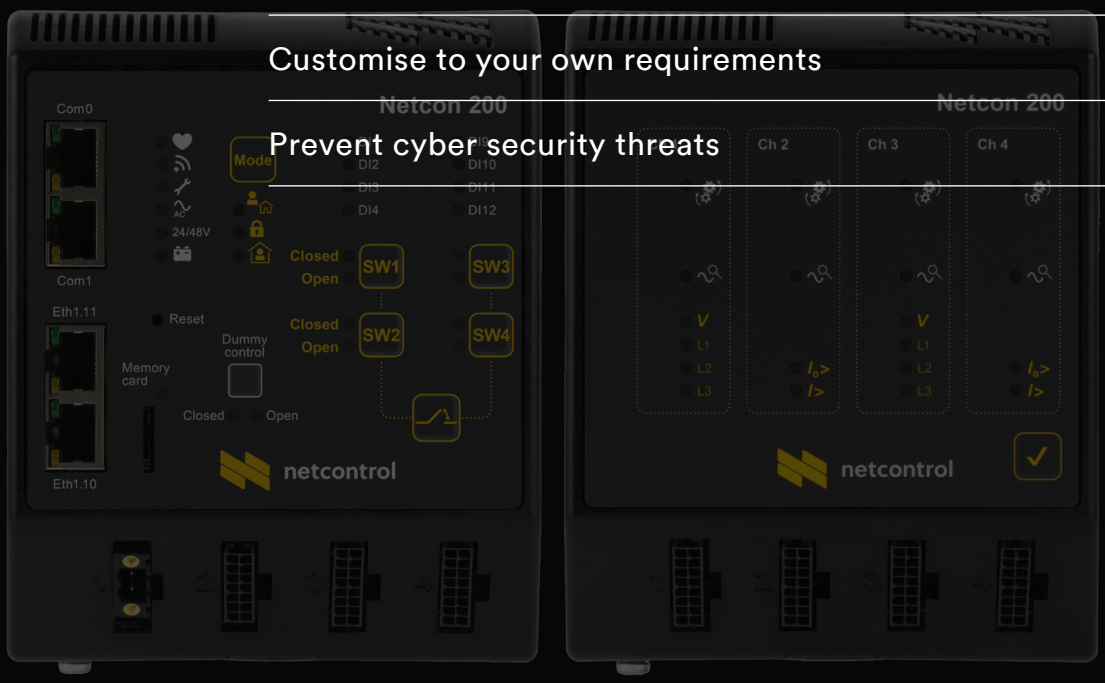
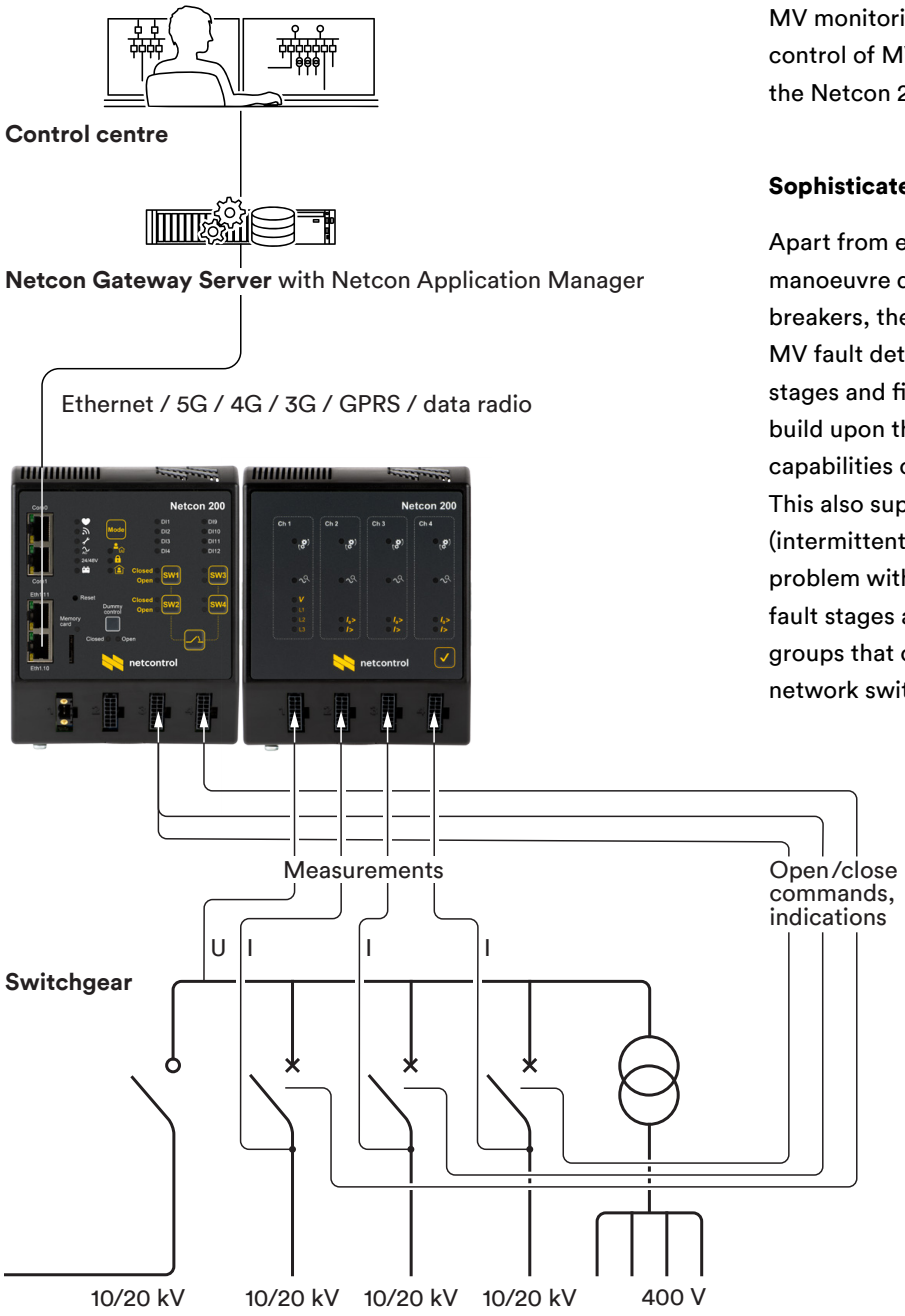
FEATURES

- Improve network availability
- Monitor and optimise your network
- Manage your substations centrally
- Customise to your own requirements
- Prevent cyber security threats



The future of distribution network automation

The Netcon 200 is a smart RTU for monitoring medium-voltage feeders along with the remote control of switching devices on them. Standard protocols and interfaces make its connection to other systems straightforward. Compact yet modular in structure, the Netcon 200 is easily and economically customised for and integrated into each substation.



IMPROVED MV NETWORK AVAILABILITY AND MANAGEMENT

Every distribution network operator today is aware of the tight availability requirements that societies are setting for the benefit of end customers. Since most network outages are caused by faults on the medium-voltage (MV) side, the obvious solution is MV monitoring with fault detection and the remote control of MV switching equipment. This is what the Netcon 200 was designed to provide.

Sophisticated fault detection

Apart from enabling network operators to manoeuvre disconnectors, load switches and circuit breakers, the Netcon 200 features bidirectional MV fault detection based on four overcurrent stages and five earth fault stages per feeder. These build upon the voltage and current measurement capabilities of the Netcon 200 VCCC module. This also supports the detection of transient (intermittent) earth faults, which are a common problem with aging underground cables. All the fault stages are included in feeder-specific setting groups that can be remotely swapped when the network switching state, for example, changes.

Integrated feeder protection

The Netcon 200 can also offer a separately licensed, integrated feeder protection functionality that trips the circuit breaker on a feeder when triggered by the relevant fault stages. It can thus replace the separate protection relays traditionally deployed at secondary substations. For example, three feeders can be protected by a single Netcon 200 consisting of a GWDD module and a VCCC module.

Function	ANSI number
Non-directional overcurrent protection	50/51
Directional overcurrent protection	67
Non-directional earth fault protection	50N/51N
Directional earth fault protection	67Ns
Intermittent eath fault protection	67INT
Auto-reclose	79

Thoroughly tested, the protection includes an optional auto-reclosing functionality with three shots. This means that transient faults can often be cleared with no human intervention. But the protection can still be easily controlled, according to the circumstances, through the remotely swappable setting groups.

Netcon 200 cabinet (right) within an RMU.

Enhanced load management

The real-time measurements provided by the Netcon 200 mean that the network switching state and therefore transformer loads can be better managed by the distribution management system (ADMS) and/or the SCADA system. This is especially useful in exceptional situations such as during maintenance or faults. The load data and development trends also enable you to avoid over-cautious and premature renewal investments made just “to be on the safe side”.

Extensive 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.

The Netcon 200 has the following power quality measurements for voltage and current:

- RMS
- Symmetrical components
- Waveforms
- Phase angle & sequence
- Harmonic components (up to 50th)
- Total harmonic distortions.

Measurements of apparent, active and reactive power and energy are also available.

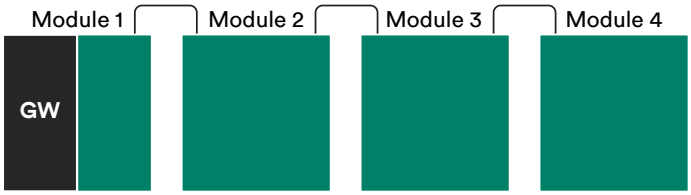
Accurate time synchronisation

Effective fault detection presupposes the precise time stamping of events. The Netcon 200 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.

Modularity in hardware and software



Hardware

The Netcon 200 modules are quite compact. Four modules can be combined in various ways according to the size of the secondary substation or disconnector station and the desired functionality. The configuration is through a user-friendly web interface with the help of ready-made templates.

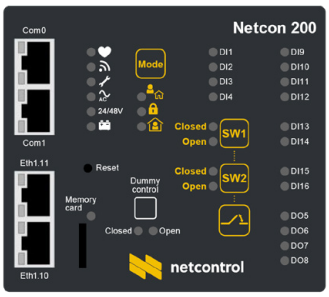
The Netcon 200 setup must always include a GWDD module because this provides essential central processing, gateway and power supply functions for the entire Netcon 200. Other modules are optional, and up to three can be included. To the right, you can see the front panels and HMIs of some of the available types.

Software

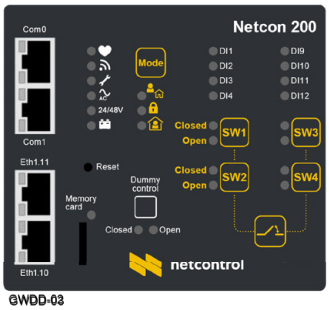
A new Netcon 200 software version and/or an expanded software licence may bring about completely new applications. These include feeder protection provided that the Netcon 200 and the substation already have the required modules and sensors or that these are added as a retrofit installation.

Programmable logic functions

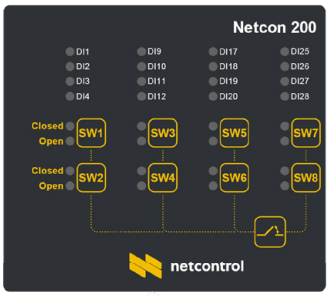
A REST-compliant application programming interface (API) supporting multiple programming languages allows users to write their own apps for the Netcon 200. These may retrieve data from the Netcon 200, monitor changes in it, send commands to it and check logs.



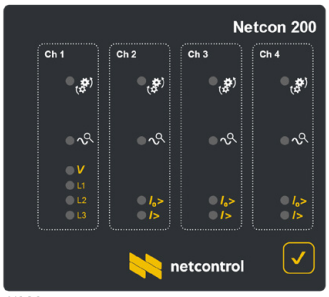
GWDD-02



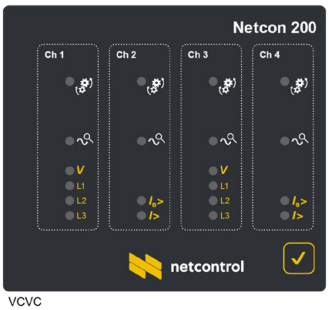
GWDD-03



DDDD



VCCC



VCVC

Modules in detail

The GWDD module is the heart of the Netcon 200. The other modules are optional, providing measurement & fault indication for MV feeders or additional digital inputs and outputs for the control and supervision of switching devices.

NETCON GWDD

Main processor and gateway

The GWDD module contains, first of all, 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
- 1 memory card slot
- Web user interface for configuration and diagnostics (see p. 9)
- Console / data communication serial port, V.24 (RS-232/RS-485)
- Data communication serial port, V.24 (RS-232/RS-485)
- Ethernet data communication port, 10/100 BaseT
- Ethernet control port, 10/100 BaseT
- Dummy breaker control
- Remote/Local selection
  - A soft L/R switch is fitted to the GW & PSU combination and operated via its built-in HMI.
  - An external L/R switch can also be fitted which then overrides the soft switch.
- 1 Pt100/Pt1000 input for temperature

Power supply

The GWDD also handles the power supply.

- Input voltage range 20...60 VDC
- Monitoring of the battery charging and health
  - Alarms for charger failure and a low battery are displayed on the HMI and sent to the SCADA.
  - Deep-discharge protection disconnects the battery when voltage drops to a preset limit.

Digital inputs and outputs

Finally, The GWDD module offers digital inputs and digital outputs (i.e. remote-control outputs) that can be used to control and monitor 2 or 4 disconnectors or circuit breakers.

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

NETCON DDDD

The DDDD module can control and monitor 8 switching devices.

- 32 DI
- 16 DO

NETCON VCCC

MV measurement & fault detection

Each VCCC module takes care of MV fault detection, fault reactance calculation, disturbance recording and power quality measurement for 3 MV feeders.

- voltage measurement (V)
- current measurement (C)
- power and energy measurements
- 16-bit precision

For each feeder, the VCCC has four current measurement channels, so that the three phases and the residual can all be measured. Modes are also available for measuring the selected three quantities and calculating the fourth from them.

In compensated networks, the most accurate results are obtained when sensors based on the Rogowski coil technology are used to measure the residual current directly. This gives the best sensitivity to weak earth fault currents. Installation plates are also available to keep the Rogowski coils centred around the cables.

Signal adapters are available to ensure that the measurement signals always fall within the range that is accepted by the Netcon 200 interface:

- **VMA146** adapts the signals from an instrument VT in the switchgear for the V block inputs. One VMA146 is required for each V block.
- **CMA160** and **CMA167** take the signal that an instrument CT on the switchgear feeder provides and convert it to a voltage suitable for the C block inputs. One CMA160 or CMA167 is needed per feeder.
- **RCA170** can optionally be used to step down the output of Rogowski current sensors for the C block. It attenuates the signal to one tenth, allowing a larger measurement range. One RCA170 is used per feeder.

Distance to fault

The Netcon 200 also measures the fault impedance. Combined with cable information from the ADMS, the impedance makes it possible to determine the distance to a fault.

Cable fault prediction

VCCC modules have a high enough sampling frequency of the analogue measurements to detect the intermittent, high-speed transient faults that typically occur when a cable begins to fail. Alarms of such faults are sent to the SCADA according to configurable alarm limits.

NETCON VCVC

The VCVC module handles measurements and fault indication for 2 feeders that are on different switchgears.

Versatile & cyber secure communication

The Netcon 200 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. IP may be through a 5G/4G/3G/GPRS modem or 10/100 Ethernet. Connections to intelligent electronic devices (IEDs) within the substation are serial.

KEY PROTOCOLS

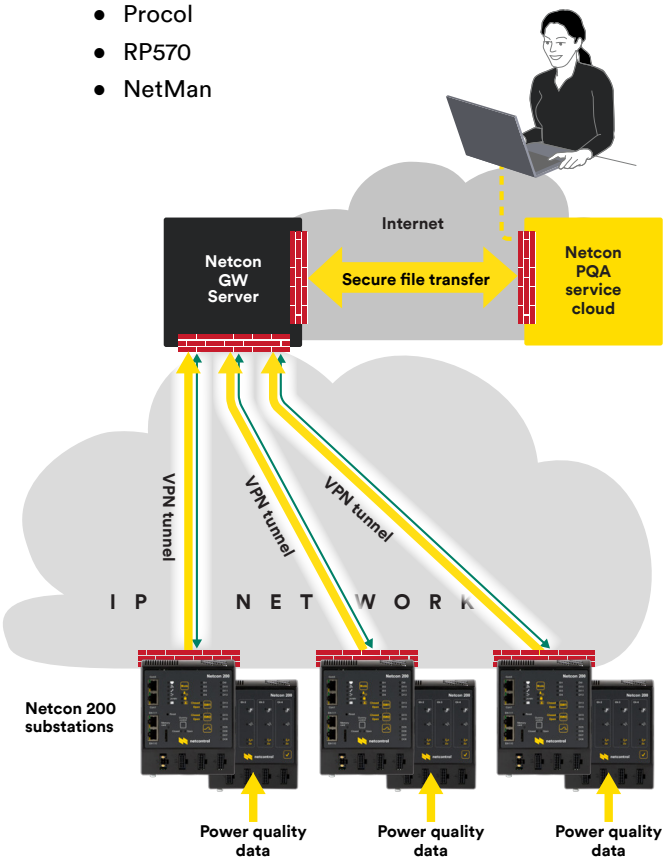
For both SCADA (slave) and IED (master) communication, the Netcon 200 supports the key communication protocols of today.

Slave (SCADA)

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

Master

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



CYBER SECURITY

- Secure Boot
- Safe file transfer with SFTP, SCP and rsync (over SSH)
- Firewall and port hardening
- OpenVPN, IPSec
- DDoS protection
- Secure IEC-104 transfer according to IEC 62351
- Role-based local and remote access control via RADIUS
- Secure maintenance connection using SSH
- Secure configuration using HTTPS and SSH
- PAM password management
- Digitally signed OS patches

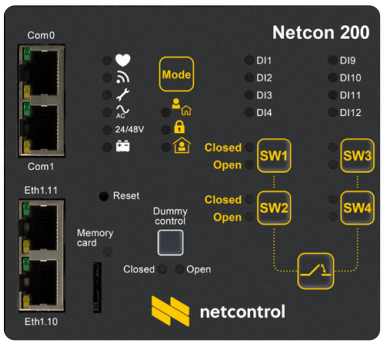
The IP communication is tightly controlled according to the Netcon Secure IP architecture. A built-in firewall passes only carefully selected traffic, such as remote-use and administrative connections. Control room connections are protected through encryption within VPN tunnels.

For uploading fault records and power quality data, the Netcon 200 uses the stardard Comtrade file format and secure FTP transmission.
The measurements are first collected to one central location, usually the master station, over secure VPN connections. (This data transfer is kept logically distinct from the telecontrol traffic.) From the master station, the data can be forwarded to the PQA service cloud by means of secure file transfer.

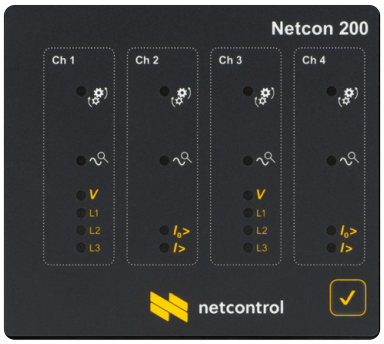
Central and local management

The Netcon 200 offers three user interfaces for configuration and management. The local front-panel HMIs and the local/remote web browser interface provide access to a single Netcon 200 unit whereas the Netcon Application Manager web server enables the central management of a large number of Netcon 200 devices.

BUILT-IN HMIs



The GWDD HMI has LEDs for disconnector or circuit breaker positions and buttons for their control, as well as a control mode button with associated LEDs (remote/none/local). There are also LEDs for system functions such as battery and communication status.



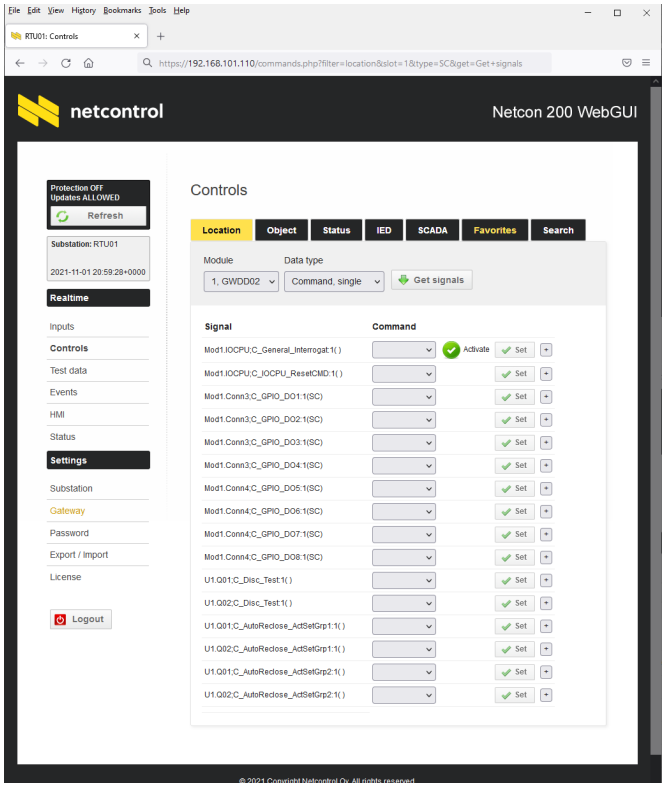
The VCCC HMI has LEDs for data aquisition, for power quality issues, for the presence of voltage in the three phases and for overcurrent and residual current. Some of the indications are alarms and can be acknowledged with a button at the bottom right.

WEBGUI

WebGUI is a comprehensive browser-based interface for configuring a Netcon 200 unit and viewing its IO and system signals (with some options for control as well). It runs on the GWDD module and the user connects to it over IP, either locally or through a secure remote connection.

The configuration is organised into a straight-forward process guided by a wizard. However, individual settings can be changed whenever necessary.

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 200 configuration.



NETCONTROL'S OWN HANDS-ON TRAINING COURSES

While designed to be easy to use, the Netcon 200 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 200 modules
- the HMI panel
- the web browser interface
- the product documentation.

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

- configure the modules, including the collection of history data, the fault detection and line protection functions as well as disturbance recorders
- set up the Netcon 200 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 200 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 200 substations.

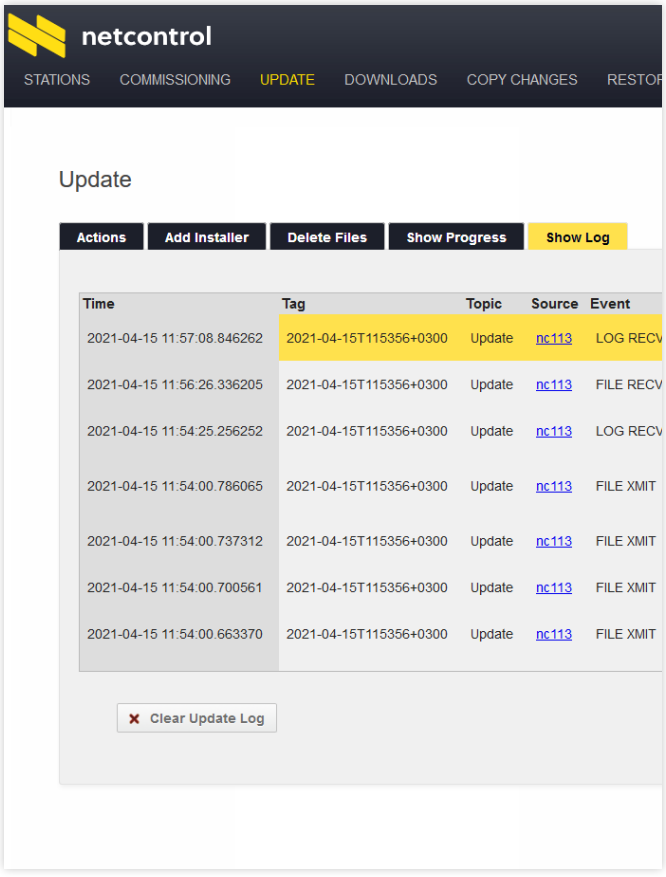
NETCON APPLICATION MANAGER

The Netcon Application Manager program makes it possible to manage the software versions and configurations, and to see the hardware setups, of Netcon 200 substations remotely, over a network connection.

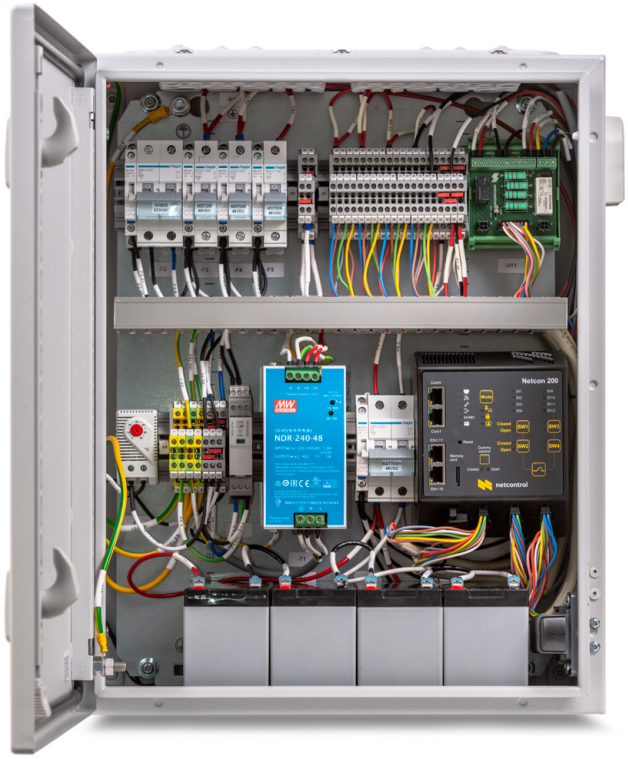
The program reduces the overall cost of the system through savings in time and resources.

Application Manager enables the user to:

- group Netcon 200 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 200 configurations remotely
- plan, execute and verify remote software updates and configuration changes for a single, multiple or all Netcon 200 substations at a time
- ensure that communication with all the substations is working.



Technical specifications



NETCON 200 MECHANICAL & ENVIRONMENTAL SPECIFICATIONS

Enclosure dimensions (W × H × D)	115 × 140 × 75 mm
Enclosure protection class	IP30
Operating temperature	–40...+70°C*
Transport temperature	–40...+70 °C
Relative humidity	< 96%

*Operation beyond +40°C may affect measurement accuracy. Continuous operation beyond +55°C may lead to degradation in MTBF.

STANDARDS FULFILLED

EMC standards	
IEC 61000-6-4	RF Emission (CISPR 22)
IEC 61000-6-2	Immunity for industrial environments
IEC 61000-6-5	Immunity for power station and substation environments
IEC 60255-25	Electromagnetic emission tests for measuring relays and protection equipment
IEC 60255-26	Electromagnetic compatibility requirements for measuring relays and protection equipment
EN 55022	Emission, conducted and radiated
IEC 61000-4-2	Electrostatic discharge immunity
IEC 61000-4-3	RF Electromagnetic field immunity
IEC 61000-4-4	Electrical fast transient/burst immunity
IEC 61000-4-5	Surge immunity
IEC 61000-4-6	RF Conducted immunity
IEC 61000-4-8	Power frequency magnetic field immunity
IEC 61000-4-16	Mains frequency voltage immunity
IEC 61000-4-17	Immunity to ripple on DC supply
IEC 61000-4-18	Damped oscillatory wave immunity
IEC 61000-4-29	Immunity to dips and interruptions on DC power input port

The future of distribution network automation

REAP THE NETCON 200 BENEFITS

Improve network availability

- Remote and local control of feeder switching devices
- Bidirectional fault detection
- Detection of transient cable faults
- Automatic fault-triggered tripping for feeder protection
- Alternatively, automatic network reconfiguration in response to MV faults

Monitor and optimise your network

- Accurate MV and LV power quality measurements
- Transformer monitoring for optimisation of renewal investments
- Automatic disturbance recordings for fault analysis, revealing weak spots

Manage your substations centrally

- Remote configuration
- Continuous remote management with software updates

Customise to your own requirements

- Single platform for reliability and ease of installation
- Compact, cost-effective design with battery management
- Modular build to suit the requirements of each substation
- REST-compliant API for user-created automation routines

Prevent cyber security threats

- Port hardening, internal firewall and multiple VPN tunnels
- Secured SCADA communications in compliance with IEC 62351