QDRIVE 3L-NPC

Medium Voltage
High Dynamics Drives

DANIELI AUTOMATION

DANIELI AUTOMATION MV QDRIVES HIGH PERFORMANCES & BIG FLEXIBILITY

Danieli Automation QDrive 3L-NPC, modular design and sturdy construction, internal arcing proof, to better meet customer's requirement. The system is designed aiming to reliable operations, with simplified maintenance due to the wheeled power modules for easy servicing, with state of the art control structure and user friendly interface.

QDrive 3L-NPC

Danieli Automation MV QDrive 3L-NPC are high performances water cooled vector controlled drives, in three level Neutral Point Clamped (NPC) topology. Active Front End (AFE) line fully regenerative converter allows optimal network impact. This solution is the perfect choice as AC/DC converters & multi-drive DC link inverters arrangement. QDrives are designed for demanding metals rolling mill applications, with Field Oriented Control (FOC) for synchronous and induction motors, developed with focus on high flexibility, operability and maintenance.

QDrive 3L-NPC meet the following requirements:
> High dynamic performances
> High power rating at low frequencies
> Line power factor = almost 1.0 (AFE version)
> Four-quadrant operation (AFE version)

The line side and motor-side converters use IGBT modules or IGCT disk power semiconductors, the converters ratings range from 4 MVA up to 30 MVA. Main applications are machines and plants in metal and in the process industry.

Main features
> Ready-to-connect cabinet unit
> Design focused on easy maintenance and quick power module replacement (wheeled power modules allow very fast substitution without any special tool or lifting device)
> Four-quadrant operation as standard configuration
> Fully-digital vector closed-loop control, for synchronous and induction motors
> High control accuracy and dynamic response
> Extremely low line harmonics spectrum (with AFE)
> Optimum interaction with automation overriding control system
> Simple and fast commissioning
> Simple operator control and monitoring
> Inbuilt Remote Teleservice
> Extremely reliable in operation and almost maintenance-free
> Interchangeable modules, usable on both AFE or INVERTER unit
> Long-life MV capacitor units

QDRIVE 3L-NPC Technical Data

Drives configuration	Single Drive unit with single AFE Single Drive unit with single DFE with braking unit Single Drive unit with double inverter and double AFE (12 p) Single Drive unit with double inverter and double DFE (12 p) Multiple Drives with single AFE Multiple Drives with double AFE (12 p) Double drive units with double inverters and AFE Other configurations upon request IGCT and IGBT modules could be used in the above configurations
Motor type	Induction or separately DC excited synchronous motor
Output reactor	Included as default for each inverter unit
Output isolator	Included as default for each inverter unit
Input power factor	Depends on cabinet arrangement & line converter configuration (AFE, DFE, 6 or 12 pulses) and network data Typical value of input displ. factor with AFE: approx 1 (AFE) or approx 0.95 (DFE)
Auxiliary voltage range	380...480 Vac 50 or 60 Hz
External cooling water operating range	10 ... 32 °C
Water cooling unit capacity & power losses to air	According to drive configuration requirements
Cabinet standard protection degree	IP32 (others upon request)
Drive switchboard cabinet rated voltage class	3.6 kV
Drive switchboard cabinet short circuit certified withstanding	31.5 kA for 1 s, 78.75 kA peak, withstanding tested according to EN62271-200
Applicable standard	IEC 60146 - IEC 61800-3/4/5 - IEC 60204-11 - EN 62271-200 - EU directives for Low Voltage and EMC

QDRIVE 3L-NPC Power Module technical data

Power module and Device type	Phase module - IGCT				Three phase inverter - IGBT		
Power module	10 MVA	11 MVA	12 MVA	15 MVA	4 MVA	4.8 MVA	7 MVA
Output voltage range	0...3300 Vac rms				0...3300 Vac rms		
Output frequency range	2...75 Hz without derating				2...90 Hz without derating		
Rated continuous current (A, rms)	1400	1500	1500	1400	480	580	800
Maximum overload output current (A, rms)	1750	1890	2000	2500	730	880	1280
Base continuous current (A, rms) to apply max overload for 60 seconds (every 600 seconds)	1360	1450	1435	1218	445	540	730

QDRIVE Optional System Components

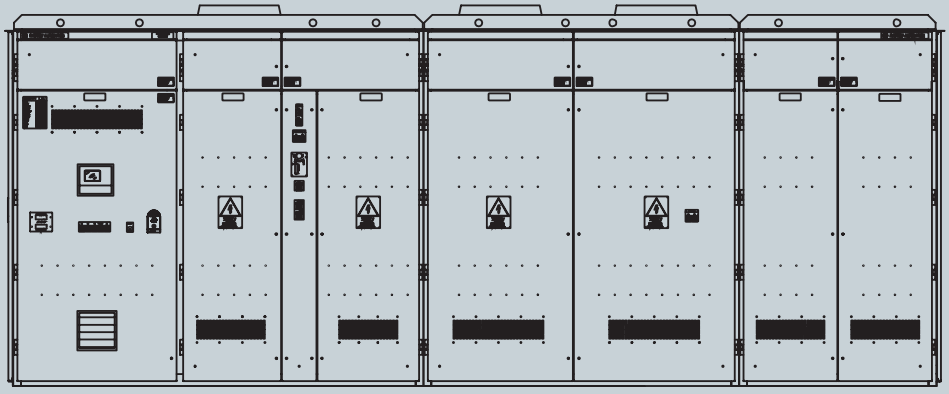
EXC	Field Exciter Cabinet for DC excited Synchronous motor
MCS	Auxiliary system motors control & starters cabinet
UPS	UPS for control unit

QDRIVE 3L-NPC

Cabinet layout

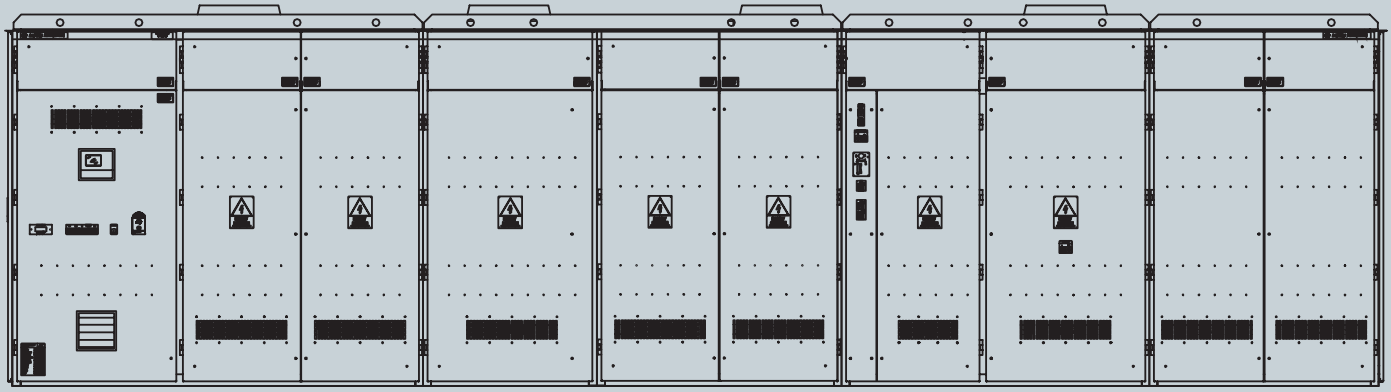
Typical single drive arrangement

IGBT VERSION



DFE TERMINAL UNIT | DFE UNIT | CROWBAR UNIT | INVERTER UNIT | INVERTER TERMINAL UNIT | COOLING WATER UNIT

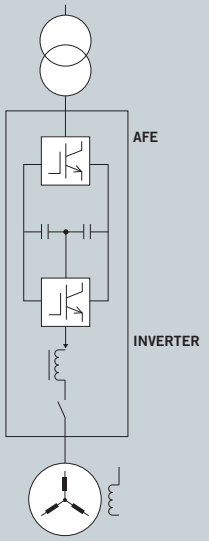
IGCT VERSION



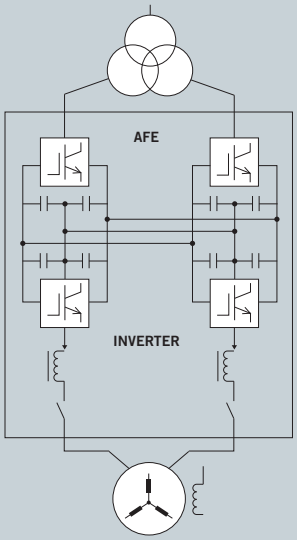
AFE TERMINAL UNIT | AFE UNIT | CAPACITOR UNIT | INVERTER UNIT | CROWBAR SECTION | INVERTER TERMINAL UNIT | COOLING WATER UNIT

QDRIVE 3L-NPC

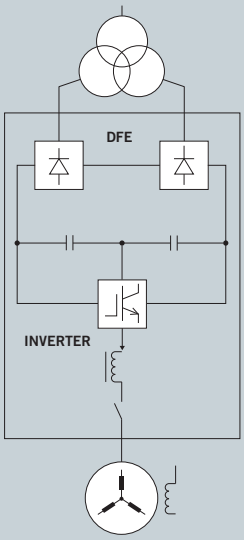
Power part configurations & control architecture



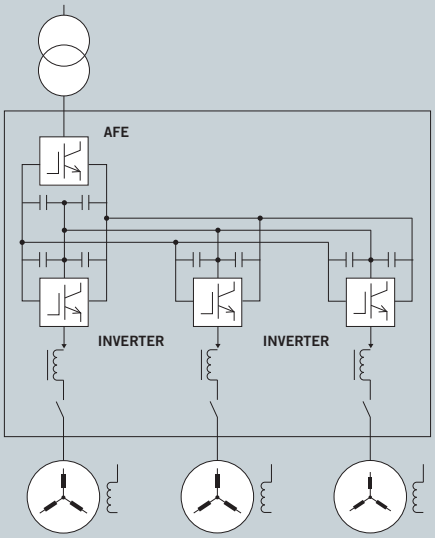
Single Unit arrangement with Active Front End (AFE)



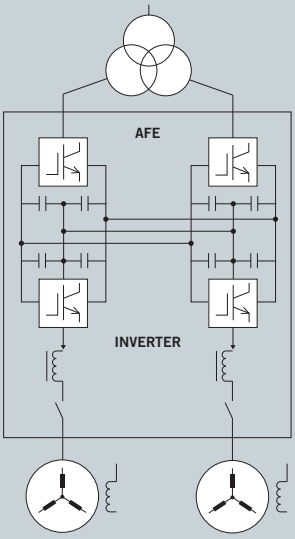
Double Unit arrangement with Active Front End (AFE)



Single Unit arrangement with Diode Front End (DFE)

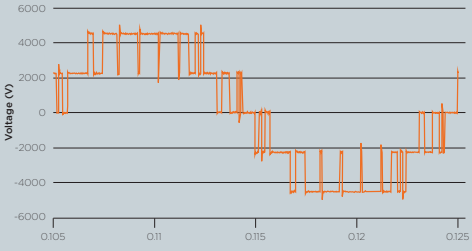


Single unit arrangement with single AFE and multiple inverters



Double unit arrangement with double AFE and multiple inverters

Phase current waveform

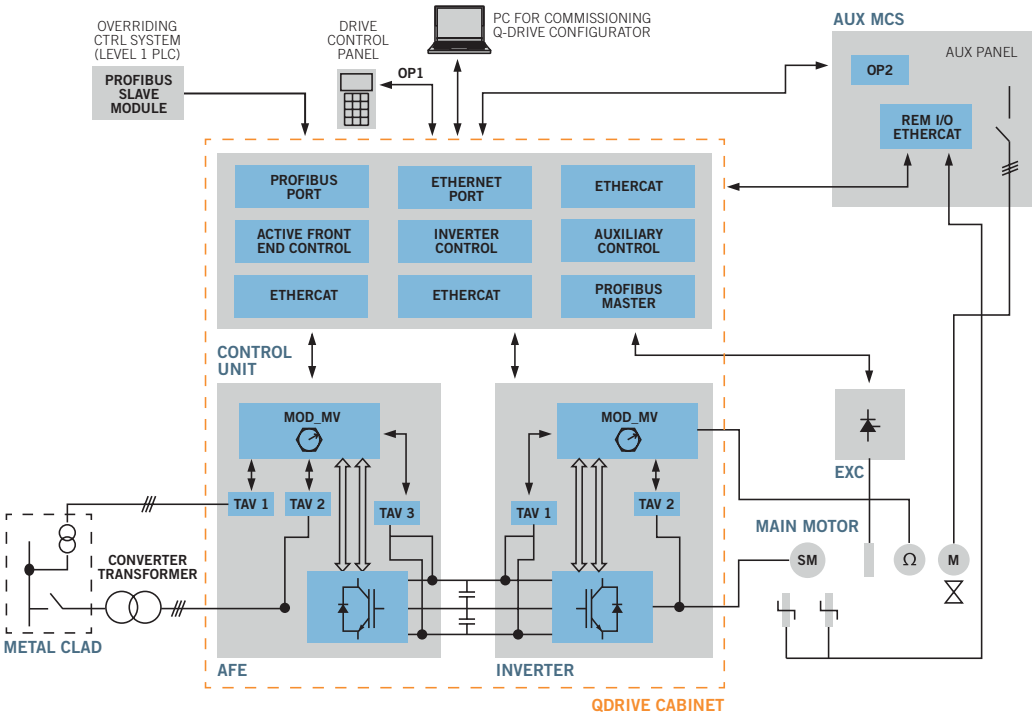


Phase to phase voltage waveform

Control architecture
The control structure is based on a powerful, state-of-the-art Danieli Automation Process Automation Controller (DA-PAC), that communicates with power part (modulator boards) with Ethercat optical fiber hi-speed link to ensure control trouble-free operation in the worst EMI environment.
The control unit handles the drive system and its auxiliary system, monitoring the transformer, the converter power part and the motor, for safe operation and troubleshooting.
The control system software is written in CoDeSys, a powerful IDE IEC – 61131-3 compliant, that is an industrial standard for automation and real-time fast control system.
The controller could be interfaced with any overriding control system using any type of fieldbus.

The powerful multi-core processing unit Process Automation Controller allows also the implementation of the logics and sequences needed for the control of the Auxiliary Systems.

The controller is equipped with remote access facility to allow remote teleservice, fast troubleshooting and effective system monitoring, via internet world's wide web.

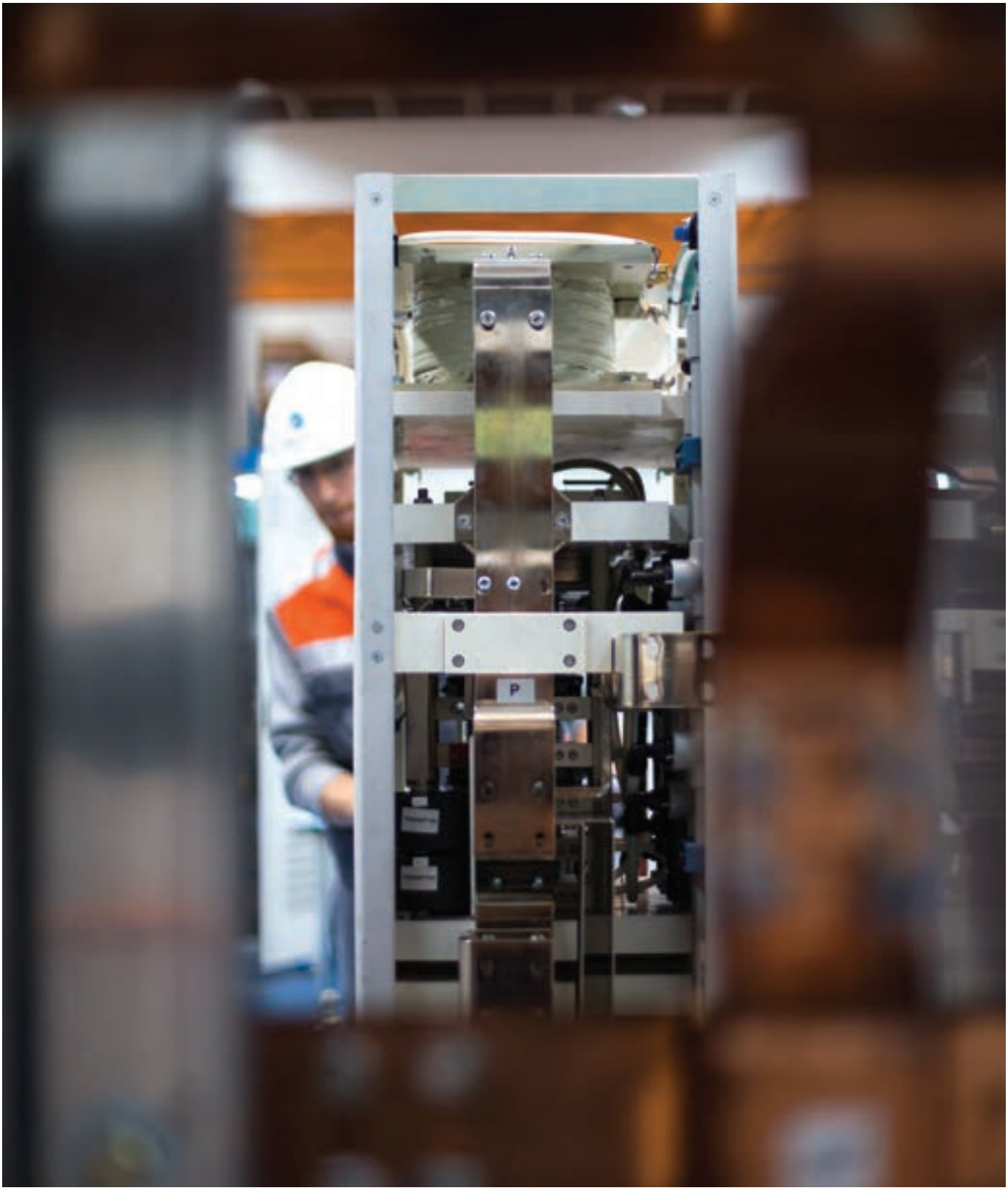


QDRIVE 3L-NPC control architecture

QDRIVE 3L-NPC

Maintenance

Simple and fast maintenance is a key factor for reliable equipments. The design of the power modules, realized with wheeled frames, allows a fast and easy replacement in about 30 minutes. Moreover, special tools or lifting device are not necessary for modules substitution.
Anyhow, maintenance trolley and power module handling frame are included in the supply.

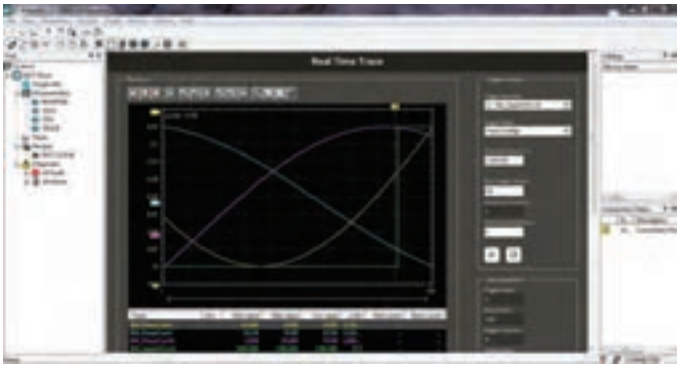

A
P

MV Drive system supervision

OP Operator Panels

- > Operator panel
- > Drive system supervisor panels
- > PC commissioning tools

Converters Operator Panel (OP) and Drive system supervisor panel
The MV drive system is equipped with two operator panels (colour touch panels), one for AFE and Inverter parametrization (OP1, located on the control unit door), while the other is for the complete drive system monitoring and it is normally located on auxiliary MCS cabinet door (OP2). Through the panels it is possible to perform extensive drives units and systems components parametrization, monitoring, servicing and troubleshooting.



Powerful PC commissioning tool for AFE & inverter
The drive control unit could be easily interfaced to a PC, using Ethernet with a simple patch cable.
Danieli Automation has developed a powerful software tool application - QDrive Configuration Tool - that allows drive parametrisation, tuning, accurate and fast signal tracing, saving-retrieving drives parameters and advanced troubleshooting.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DRIVE STATUS
EMERGENCY
DIAGNOSTIC
ETHERNET

Auxiliaries cabinets

> EXC

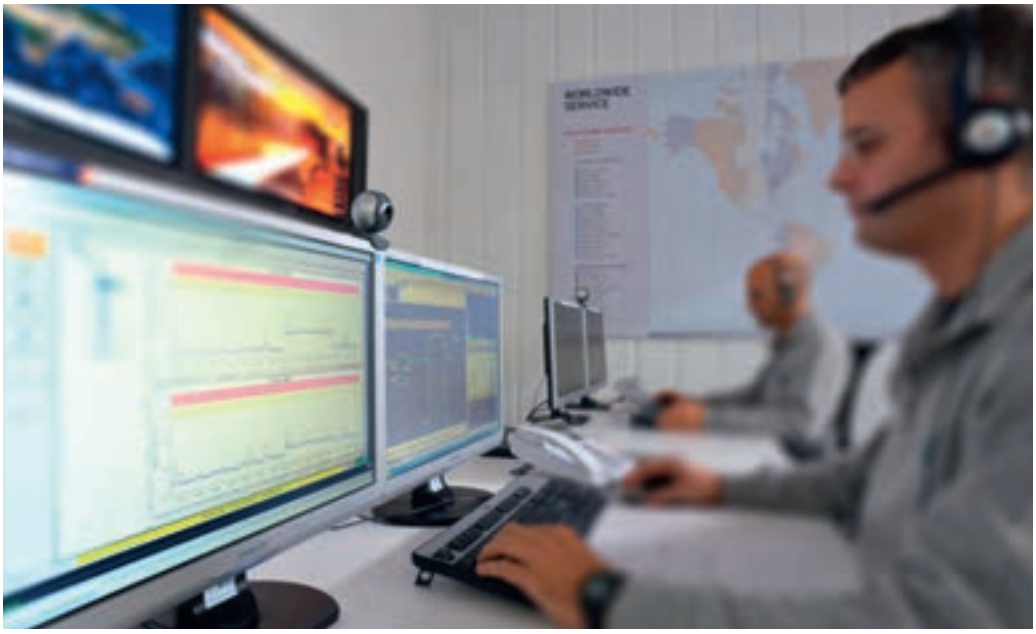
> AUX MCS

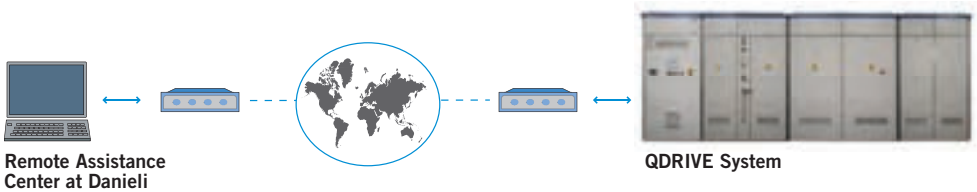
Auxiliary cabinets designed for QDrive are based on the well-proven Danieli Automation low-voltage power switchboards standard design.

EXC - Field Exciter converter cabinet for synchronous motor DC excitation
The unit includes market-type LV AC/DC compact converter with protection crowbar.
The cabinet has incoming line circuit breaker and it is controlled from QDrive Control unit through Internal Profibus network.

AUX_MCS - Auxiliary system motors control starter cabinet
This unit includes all the needed power starters and feeders for the MV drive system, UPS for control unit and Drive system supervision panel (OP2).
All contained in a DA standard cabinet type.

Remote Teleservice





Remote Assistance Center at Danieli Headquarters

QDRIVE System

Danieli Automation provides Remote Teleservice, a flexible and effective service solution to reduce assistance costs and optimize intervention time.
The Teleservice is designed to allow the connection of QDrive control unit with the remote assistance stations located at Danieli headquarters in Italy, to allow the troubleshooting and monitoring of the QDrive system.
Teleservice assures a remote non-stop service and a reliable support for a quick solution of unexpected malfunctions, with the following benefits:
> Immediate intervention of a specialist at any time.
> Limits or avoids the specialist's travelling time and costs.
> Increase the power of the internal team by accessing a virtually unlimited remote resource for problem solving.

Fields of application

- > Fast finishing blocks
- > Flat product rolling mill stands
- > Flat product large coilers
- > Large fans and compressors
- > Reversible stands for bloom and slab mills
- > Large shears
- > Pipe piercing mills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