ENGINEERING
TOMORROW

Danfoss Drives Fieldbus Solutions
Fast installation – easy integration

Dedicated Danfoss fieldbus hardware and software solutions save time and provide efficient control and monitoring.

20+
fieldbus technologies supported by Danfoss AC drives

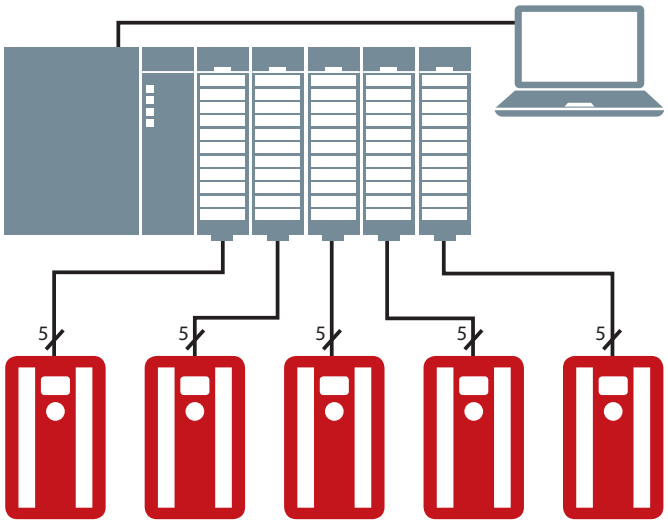
drives.danfoss.com

VLT® | VACON®

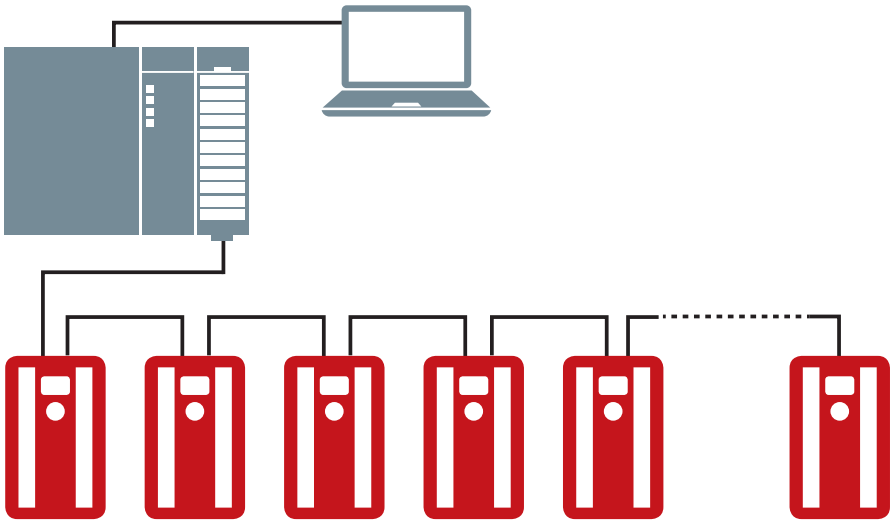
Freedom to communicate

Real time information is becoming increasingly important in industrial automation and control systems as we progress further into Industry 4.0. Immediate access to data increases transparency in production facilities, while making it possible to optimize system performance, collect and analyze system data and provide remote support around the clock from anywhere in the world.

Regardless of your application or your preferred communication protocol, both VLT® and VACON® drives have an extremely wide variety of communication protocols to select from. In this way you can ensure that the AC drive integrates seamlessly into your chosen system providing you the freedom to communicate however you see fit.



Traditional wiring. No fieldbus.



Serial fieldbus connectivity

Traditional wiring. No fieldbus.

In this system configuration, connections between the drive and PLC require one wire for each input that needs to be controlled or monitored. The advantage of such a system is that the individual components themselves are relatively inexpensive.

This, however, comes at a price, as such systems are often expensive to install and extend. Each additional device or signal requires new wiring, can require additional PLC hardware, and always requires additional PLC programming and verification. For owners this means higher capital costs and restricted flexibility. At the same time the risk of error is high as the number of I/O and wires increase.

Serial fieldbus connectivity

A classical fieldbus system only uses twisted pair connections to communicate over serial protocols. Compared to systems wired without fieldbus connections, serial fieldbus connectivity has a higher cost of components. Overall, fieldbus solutions offer several advantages: fewer cable connection points, faster commissioning and a reduced risk of faults.

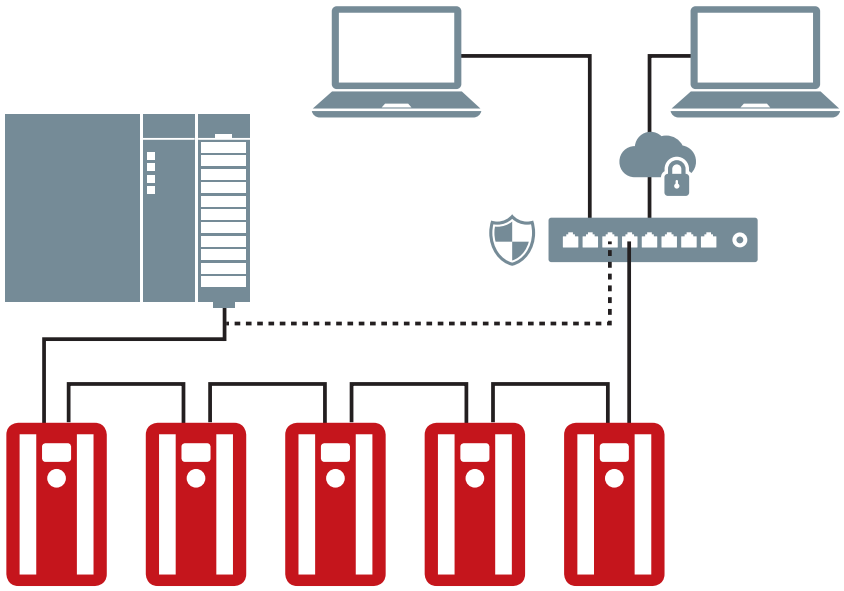
The addition of other components in the system requires programming only the new inputs into the PLC, which is both faster, safer and at significantly lower cost than a hardwired system.

Fieldbus over Ethernet

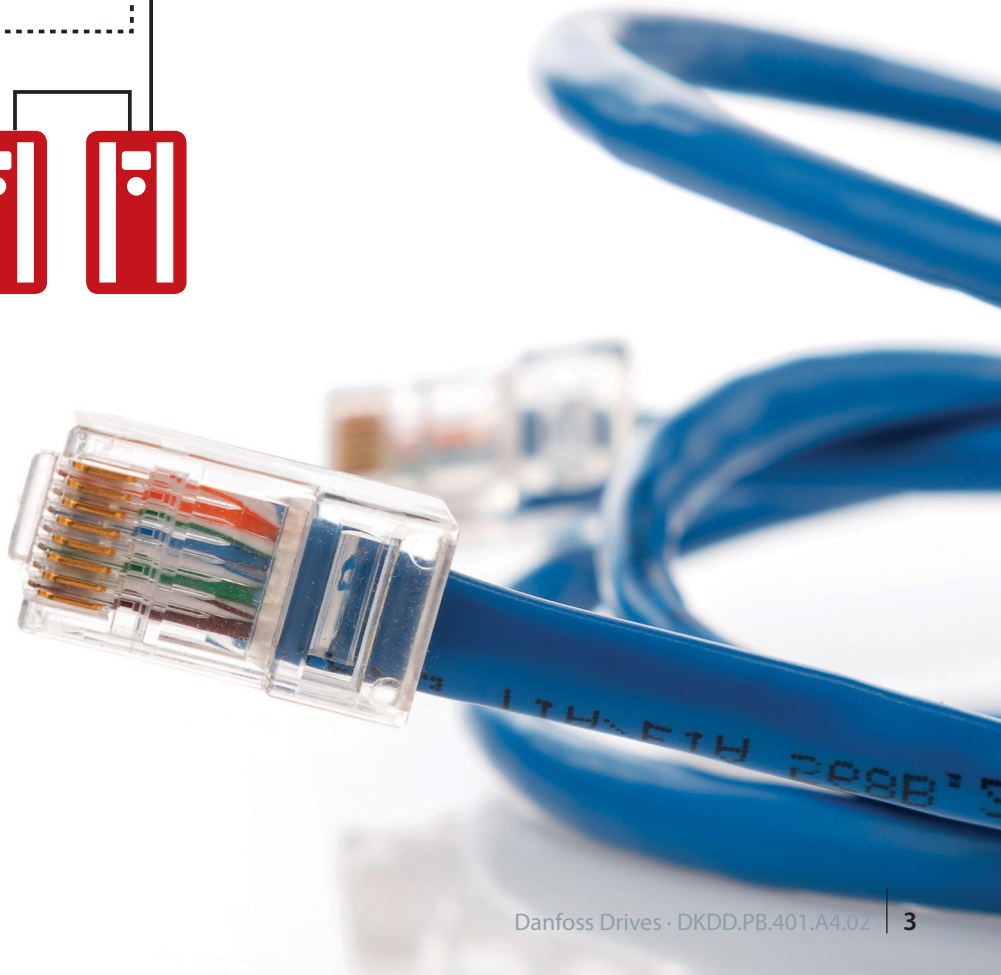
Ethernet-based systems use the speed and versatility of connectivity to improve overall system control. While component costs are slightly higher than in serial systems, large gains are made in ease of installation and a reduction of connection errors.

In Ethernet-based systems, the control hierarchy can be bypassed, sending messages directly to the components or through the PLC as needed. Additional drives can be connected in ring topologies, in series over dual-port solutions or directly with the network through external switches.

External access is routed through a secure firewall, enabling communication directly with the drive or with the web server built into some of the fieldbus options. Not only does this provide a high degree of flexibility during commissioning, it also provides advantages such as external monitoring and application support.



Fieldbus over Ethernet



Danfoss AC drives support all leading industry fieldbuses

Increase productivity

Fieldbus communication reduces capital costs in production plants. In addition to the initial savings achieved through the significant reduction in wiring and control boxes, fieldbus networks are easier to maintain, while providing improved systems performance.

Fieldbus configuration files for easy PLC integration

Integrating a drive into an existing bus system can be time consuming and complicated. To make this process easy and more efficient, Danfoss Drives offers fieldbus drivers and PLC examples, which can be downloaded for free from the Danfoss Drives website. After installation of these fieldbus configuration files, the remaining bus parameters can be set directly in the drive.

User friendly and fast setup

Danfoss fieldbuses can be configured via the drive's local control panel, which features a user friendly interface with support for many user languages. The drive and fieldbus can also be configured using the software tools that support each drive family.

The time saving setup procedure is identical for VLT® and VACON®.

Global fieldbus experts

Danfoss' global sales and support organization is trained in the market's many PLC systems. With in-depth knowledge about the challenges in modern production plants, they are perfectly equipped to provide advice and help so your Danfoss AC drives perform optimally.

Factory fitted or plug-and-play

Delivered with the chosen communication protocol installed from the factory, Danfoss drives are easy to integrate with PLC systems and motors regardless of manufacturer.

Danfoss fieldbus options can also be installed as a plug-and-play solution if required at a later stage if the production layout demands a new communication platform.

Fieldbus overview

Fieldbus	VLT® AutomationDrive		VLT® AQUA Drive	VLT® HVAC Drive	VLT® Refrigeration Drive	VLT® Midi Drive	VLT® Decentral Drive	VACON® 20	VACON® 20 CP	VACON® 20 X	VACON® 100	VACON® 100 FLOW	VACON® 100 X	VACON® NXP	VACON® 3000
	FC 301	FC 302	FC 202	FC 102	FC 103	FC 280	FCD 302								
PROFINET	□	□	□	□	□	□		□	□	□	□	□	□	□	□
EtherNet/IP	□	□	□	□		□		□	□	□	□	□	□	□	□
EtherCAT	□	□					□	□	□	□	□	□	□	□	□
BACnet/IP				□							■	■	■		■
Modbus TCP	□	□	□	□				□	□	□	■	■	■	□	■
POWERLINK	□	□				□	□								
PROFIBUS DP	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□
DeviceNet	□	□	□	□				□	□	□	□	□	□	□	□
CANopen	□	□				□		□	□	□	□	□	□	□	□
BACnet MS/TP				□					□	□	■	■	■	□	■
Modbus RTU	■	■	■	■	■	■	■	■	■	■	■	■	■	□	■
Metasys N2	□	□		□							■	■	■	□	■
LonWorks				□							□	□	□	□	□
AK-LonWorks					□										
ASi Bus							■		□	□	□	□	□		□
Interbus		□													
PROFISAFE		○													
VLT® 3000 PROFIBUS Converter MCA 113		□													
VLT® 5000 PROFIBUS Converter MCA 114		□													
VLT® DeviceNet Converter MCA 194		□													

□ = optional, ■ = integrated, ○ = optional, requires additional option

PROFINET

PROFINET uniquely combines the highest performance with the highest degree of openness. The option is designed so that many of the features from the PROFIBUS can be reused, minimizing user effort to migrate PROFINET and securing the investment in a PLC program.

- Same PPO types as PROFIBUS for easy migration to PROFINET
- Support of MRP
- Support of DP-V1 Diagnostic allows easy, fast and standardized handling of warning and fault information into the PLC, improving bandwidth in the system
- Implementation in accordance with Conformance Class B

VLT® PROFINET MCA 120

Order code
130B1135 standard, dual-port
130B1235 coated, dual-port

VACON® PROFINET
VACON® NXP: Slots D, E
VACON® NXS: Slots D, E
VACON® 100: Slots D, E

Order code
OPT-CP-V coated, single-port
OPT-E9-V coated, dual-port

Order with +FBIE for VACON® 100 single-port

EtherNet/IP

Ethernet is the future standard for communication at the factory floor. EtherNet/IP is based on the newest technology available for industrial use and handles even the most demanding requirements.
EtherNet/IP™ extends commercial off-the-shelf Ethernet to the Common Industrial Protocol (CIP™) – the same upper-layer protocol and object model found in DeviceNet.

The option offers advanced features such as:
- Built-in high performance switch enabling line-topology, and eliminating the need for external switches
- DLR Ring
- Advanced switch and diagnosis functions
- Built-in web server
- E-mail client for service notification
- Unicast and Multicast communication

VLT® EtherNet/IP MCA 121

Order code
130B1119 standard, dual-port
130B1219 coated, dual-port

VACON® EtherNet/IP
VACON® NXP: Slots D, E
VACON® NXS: Slots D, E
VACON® 100: Slots D, E

Order code
OPT-CQ-V coated, single-port
OPT-E9-V coated, dual-port

Order with +FBIE for VACON® 100 single-port

EtherCAT

The EtherCAT offers connectivity to EtherCAT® based networks via the EtherCAT Protocol.

The option handles the EtherCAT line communication in full speed, and connection towards the drive with an interval down to 4 ms in both directions. This allows the option to participate in networks ranging from low performance up to servo applications.

- EoE Ethernet over EtherCAT support
- HTTP (Hypertext Transfer Protocol) for diagnosis via built-in web server
- CoE (CAN Over Ethernet) for access to drive parameters
- SMTP (Simple Mail Transfer Protocol) for e-mail notification
- TCP/IP for easy access to drive configuration data from MCT 10

VLT® EtherCAT MCA 124

Order code
130B5546 standard
130B5646 coated

VACON® EtherCAT
VACON® NXP: Slots D, E
VACON® 100: Slots D, E

Order code
OPT-EC-V coated

BACnet/IP

The BACnet/IP option optimizes the use of VLT® HVAC Drive together with building management systems (BMS) using the BACnet/IP protocol or running BACnet on Ethernet. BACnet/IP makes it easy to control or to monitor points required in typical HVAC applications, reducing overall cost of ownership.

Other features:
- COV, Change Of Value
- Read/WritePropertyMultiple
- Alarm/Warning notifications
- PID Loop object
- Segmented data transfer
- Trend Objects
- Schedule Objects

VLT® BACnet/IP MCA 125

Order code
134B1586 coated, dual-port

VACON® BACnet/IP

Order code
VACON® 100: included, single port

Modbus TCP

Modbus TCP is the first industrial Ethernet-based protocol for automation. Modbus TCP is able to handle connection intervals down to 5 ms in both directions, positioning it among the fastest performing Modbus TCP devices in the market. For master redundancy, it features hot swapping between two masters.

Other features:
- Dual Master PLC connection for redundancy in dual port options (MCA 122 only)

VLT® Modbus TCP MCA 122

Order code
130B1196 standard, dual-port
130B1296 coated, dual-port

VACON® Modbus TCP
VACON® NXP: Slots D, E
VACON® NXS: Slots D, E
VACON® 100: Slots D, E

Order code
OPT-CI-V coated, single-port
OPT-E9-V coated, dual-port

VACON® 100: included, single port

POWERLINK

POWERLINK represents the second generation of fieldbus. The high bit rate of industrial Ethernet can now be used to make the full power of IT technologies used in the automation world available for the factory world.

POWERLINK provides high performance real-time and time synchronization features. Due to its CANopen-based communication models, network management and device description model, it offers much more than just a fast communication network.

The perfect solution for:
- Dynamic motion control applications
- Material handling
- Synchronization and positioning applications

Order code
130B1489 standard, dual-port
130B1490 coated, dual-port

PROFIBUS DP

Operating the AC drive via a fieldbus enables you to reduce the cost of your system, communicate faster and more efficiently and benefit from an easier user interface.

Other features:
- Wide compatibility, a high level of availability, support for all major PLC vendors, and compatibility with future versions
- Fast, efficient communication, transparent installation, advanced diagnosis and parameterization and auto-configuration of process data via GSD-file
- Acyclic parameterization using PROFIBUS DP-V1, PROFIdrive or Danfoss FC (MCA101 only) profile state machines, PROFIBUS DP-V1, Master Class 1 and 2

VLT® PROFIBUS DP MCA 101

Order code
130B1100 standard
130B1200 coated

VACON® PROFIBUS DP
VACON® NXP: Slots D, E
VACON® NXS: Slots D, E
VACON® 100: Slots D, E

Order code
OPT-C3-V coated, terminals, DP-V0
OPT-C5-V coated, D9 connector, DP-V0
OPT-E3-V coated, terminals*, DP-V1
OPT-E5-V coated, D9 connector*, DP-V1

DeviceNet

DeviceNet offers robust, efficient data handling thanks to advanced Producer/Consumer technology.

- Support of ODVA's AC drive profile supported via I/O instance 20/70 and 21/71 secures compatibility to existing systems
- Benefit from ODVA's strong conformance testing policies, which ensure that products are interoperable

VLT® DeviceNet MCA 104

Order code
130B1102 standard
130B1202 coated

VACON® DeviceNet
VACON® NXP: Slots D, E
VACON® NXS: Slots D, E
VACON® 100: Slots D, E

Order code
OPT-C7-V coated
OPT-E7-V coated

CANopen

High flexibility and low cost are two of the "cornerstones" for CANopen.

The CANopen option is fully equipped with both high-priority access to control and status of the drive (PDO Communication) and access all parameters through acyclic data (SDO Communication).

For interoperability, the option has implemented the DSP402 AC drive Profile. These features all guarantees standardized handling, interoperability and low cost.

VLT® CANopen MCA 105

Order code
130B1103 standard
130B1205 coated

VACON® CANopen
VACON® NXP: Slots D, E
VACON® NXS: Slots D, E
VACON® 100: Slots D, E

Order code
OPT-C6 standard
OPT-C6-V coated
OPT-E6-V coated

BACnet MS/TP

The BACnet protocol is an international protocol that efficiently integrates all parts of building automation equipment from the actuator level to the building management system.

Via the BACnet option, it is possible to read all analog and digital inputs and control all analog and digital outputs of the VLT® HVAC Drive and VACON® NXS.

All inputs and outputs can be operated independently of the functions of the drive, and thus work as remote I/O:

Other features:
- COV (Change of Value)
- Synchronization of RTC from BACnet
- Read/write property multiple
- Alarm/warning handling

VLT® BACnet MCA 109

Order code
130B1144 standard
130B1244 coated

VACON® BACnet MS/TP
VACON® NXS: Slots D, E

Order code
OPT-CJ-V coated

VACON® 100: included

Modbus RTU

Modbus RTU gives the possibility to easily upgrade the hardware structure of an industrial network, without the need for large changes in the software. A device can also communicate with several Modbus nodes at once, even if they are connected with different interface types, without the need to use a different protocol for every connection.

- Included as standard in VLT® AC Drives
- Included as standard in VACON® 20 family AC Drives
- Included as standard in VACON® 100 family AC drives
- Included as standard in VACON® 3000 Medium Voltage AC drives

VACON®
VACON® NXP: Slots D, E
VACON® NXS: Slots D, E

Order code
OPT-C2 uncoated, terminals
OPT-C2-V coated, terminals
OPT-C8 coated, D9 connector
OPT-C8-V coated, D9 connector

Metasys N2

The Metasys N2 communications protocol is used by Johnson Controls and others to connect terminal unit controllers to supervisory controllers. It is open to any manufacturer and based upon a simple ASCII protocol widely used in the process control industry.

Data is partitioned into common HVAC control objects, such as analogue input, analogue output, binary input and binary output. Messaging supports the reading, writing and overriding of these points.

VLT®

Order code
VLT® HVAC Drive: included

VACON®
VACON® NXS: Slots D, E

Order code
OPT-C2 uncoated, terminals
OPT-C2-V coated, terminals
OPT-C8 coated, D9 connector
OPT-C8-V coated, D9 connector

VACON® 100: included

LonWorks

LonWorks is a fieldbus system developed for building automation. It enables communication between individual units in the same system (peer-to-peer) and thus supports decentralizing of control.

- No need for main station (master-follower)
- Supports echelon free-topology interface
- Supports embedded I/O and I/O options
- Sensor signals can quickly be moved to another controller via bus cables
- Certified as compliant with LonMark ver. 3.4 specifications (VLT® LonWorks MCA 108 only)

VLT® LonWorks MCA 108

Order code
130B1106 standard
130B1206 coated

VACON® LonWorks
VACON® NXS: Slots D, E
VACON® 100: Slots D, E

Order code
OPT-C4-V coated

AK-LonWorks

VLT® AK-LonWorks MCA 107 is a complete electronic refrigeration and control system for monitoring and controlling refrigeration plants.

Connecting this drive to a Danfoss ADAP-KOOL® Lon network is a simple process that needs only a network address.

VLT® AK-LonWorks MCA 107

Order code
130B1169 standard
130B1269 coated

ASi Bus

The Actuator sensor Interface (AS-Interface or AS-i) is an economical system for the lower automation level. It is not a universal Fieldbus for all areas of automation. The AS-Interface is optimized to network binary sensors and actuators to the higher control level.

VLT®

Order code
FCD 302: included

VACON®

Order code
OPT-BK-V coated

Interbus

For communication on the remote bus, the Interbus system provides two different types of communication: Process Data and PCP (Peripherals Communication Protocol). The Process Data is cyclic communication to devices with high priority such as digital and analogue I/O or control words and references to AC drives. PCP communication is used for communications which do not require high speed and typically only are activated on request from the user-written program.

VLT® Interbus MCA 110

Order code
130B1211 coated

VLT® Web Server

Several options within the VLT® portfolio offer the capability to connect to the AC drives via a built-in web server.

- Remote diagnosis and reading out basic drive parameters
- Email notification can be configured to send an email message to one or more recipients when certain alarms or warnings occur, or are cleared

VLT® options with web server support:
VLT® Modbus TCP MCA 122
VLT® Ethernet/IP MCA 121
VLT® BACnet/IP MCA 125

PROFISAFE

PROFISAFE is a functional safety communication protocol that utilizes the PROFINET protocol in safety applications.

With the VLT® AutomationDrive FC 302, users can command the STO function over PROFISAFE.

VLT®

Requires PROFINET and MCB 152 option

VLT® PROFIBUS Converter MCA 113

The VLT® PROFIBUS Converter MCA 113 is a special version of the PROFIBUS options that emulates the VLT® 3000 commands in the VLT® AutomationDrive.

The VLT® 3000 can be replaced by the VLT® AutomationDrive, or an existing system can be expanded without costly change of the PLC program.

Order code
130B1245 coated

VLT® PROFIBUS Converter MCA 114

The VLT® PROFIBUS Converter MCA 114 is a special version of the PROFIBUS options that emulates the VLT® 5000 commands in the VLT® AutomationDrive.

The VLT® 5000 can be replaced by the VLT® AutomationDrive, or an existing system can be expanded without costly change of the PLC program.

The option supports DPV1.

Order code
130B1246 coated

VLT® DeviceNet Converter MCA 194

The VLT® DeviceNet Converter MCA 194 emulates VLT® 5000 commands in the VLT® AutomationDrive.

This means that a VLT® 5000 drive can be replaced by the VLT® AutomationDrive, or a system can be expanded without costly change of the PLC program.

The option emulates I/O instances and explicit messages of a VLT® 5000.

Order code
130B5601 coated

Engineering and setup for VLT® and VACON®

VLT® Motion Control Tool MCT 10

VLT® drives can all be configured and monitored with VLT® MCT 10. This provides plant managers with a comprehensive overview over the system at any point in time, adding a new level of flexibility in configuration, monitoring and troubleshooting.

MCT 10 is a Windows based engineering tool with a clearly structured interface that provides an instant overview of all the drives in a system of any size.

Parameter configuration is possible both online on a connected drive and offline in the tool itself, and the software can be configured to link to the system's electrical diagrams or operating manuals. This helps to reduce the risk of incorrect configuration while offering fast access to troubleshooting.

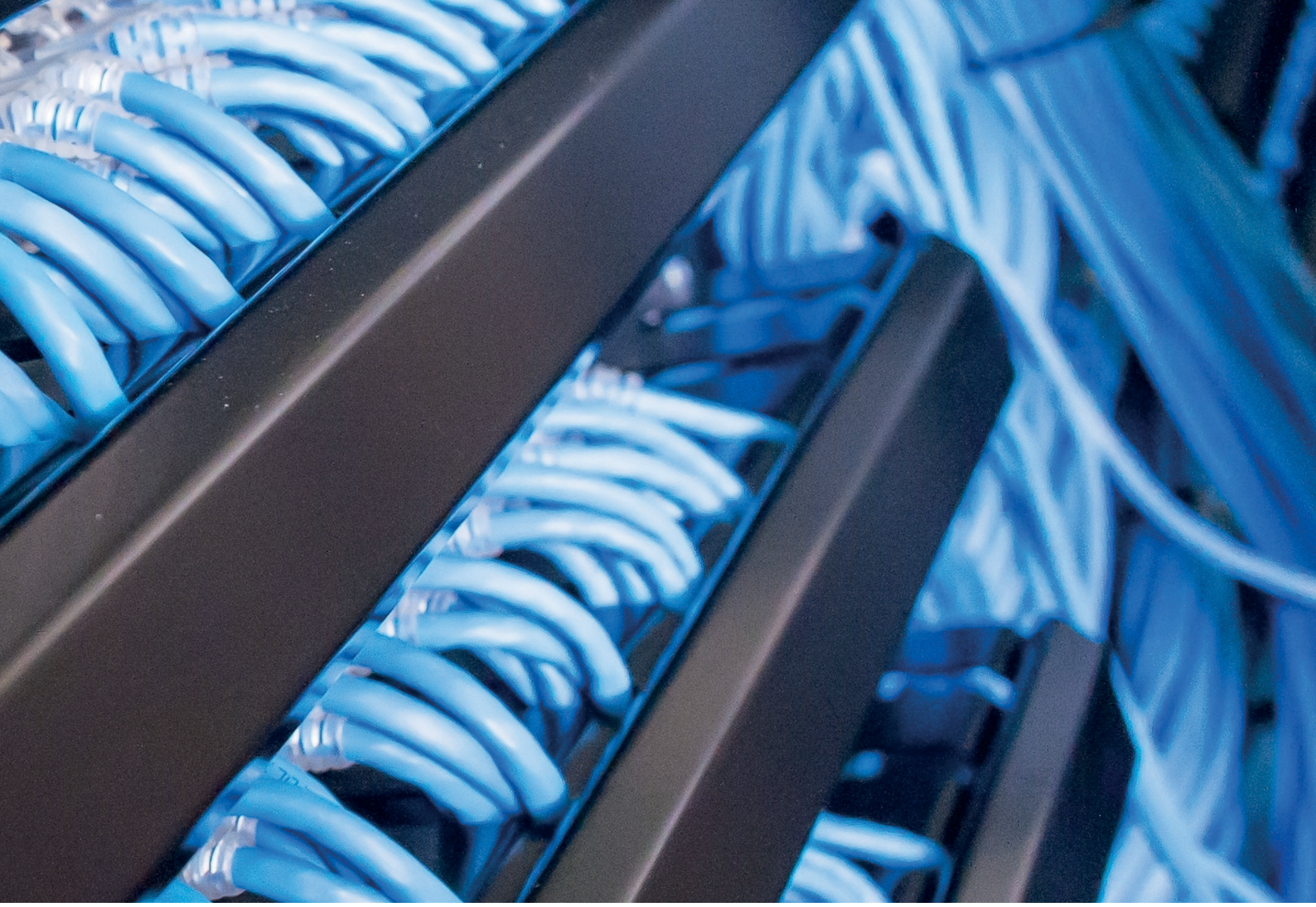
VACON® NCTools

VACON® NXP drives and its options can be configured and monitored with VACON® NCDrive, VACON® NCLoad and VACON® NCIPConfig. Additionally, updating application software and firmware for both the drive and the fieldbus options can be done in the field over the built-in RS-232 connection.

VACON® Live and VACON® Loader

VACON® 20 and VACON 100® family drives and their options can be configured and monitored with VACON® Live. Additionally, updating application software and firmware for both the drive and the fieldbus options can be done with VACON® Loader in the field over the built-in RS-485 connection behind the keypad using an RS485-to-USB converter cable for the VACON® 100 product family or with the MCA kit for VACON ®20.

Order code
Cable Only: VACON-CAB-USB-RS485
MCA Kit: VACON-MCAA-KIT



Easy communication

Besides a single point to point connections, both VLT® MCT 10 and VACON® Live are able to connect to several drives in a single serial network, such as through existing PROFIBUS networks. Additionally, connections through Ethernet based technologies allow for simultaneous connection to all of the drives connected on the host network.

VLT® Motion Control Tool MCT 10 supports:

- VLT® PROFIBUS DP-V1 MCA 101
- VLT® PROFIBUS Converter MCA 114
- VLT® PROFINET MCA 120
- VLT® EtherNet/IP MCA 121
- VLT® Modbus TCP MCA 122
- VLT® POWERLINK MCA 123
- FC RS485 Protocol
- USB port on FC 102/FC 103/ FC 202/ FC 301/FC 302/FCD 302

VACON® NCTools and VACON® Live support:

- VACON® OPT-C7/E7 DeviceNet
- VACON® OPT-C2/C8 and OPT-E2/E8 RS-485
- VACON® OPT-C3/C5 and OPT-E3/E5 PROFIBUS DP
- VACON® OPT-C6/E6 CANopen
- VACON® OPT-EC EtherCAT
- VACON® OPT-E9 Dual Port Ethernet

ENGINEERING
TOMORROW

A better tomorrow is **driven by drives**

Danfoss Drives is a world leader in variable speed control of electric motors.
We offer you unparalleled competitive edge through quality, application-optimized products and a comprehensive range of product lifecycle services.

You can rely on us to share your goals. Striving for the best possible performance in your applications is our focus. We achieve this by providing the innovative products and application know-how required to optimize efficiency, enhance usability, and reduce complexity.

From supplying individual drive components to planning and delivering complete drive systems; our experts are ready to support you all the way.

You will find it easy to do business with us. Online, and locally in more than 50 countries, our experts are never far away, reacting fast when you need them.

You gain the benefit of decades of experience, since 1968. Our low voltage and medium voltage AC drives are used with all major motor brands and technologies in power sizes from small to large.

VACON® drives combine innovation and high durability for the sustainable industries of tomorrow.

For long lifetime, top performance, and full-throttle process throughput, equip your demanding process industries and marine applications with VACON® single or system drives.

- Marine and Offshore
- Oil and Gas
- Metals
- Mining and Minerals
- Pulp and Paper
- Energy
- Elevators and Escalators
- Chemical
- Other heavy-duty industries

VLT® drives play a key role in rapid urbanization through an uninterrupted cold chain, fresh food supply, building comfort, clean water and environmental protection.

Outmaneuvering other precision drives, they excel, with remarkable fit, functionality and diverse connectivity.

- Food and Beverage
- Water and Wastewater
- HVAC
- Refrigeration
- Material Handling
- Textile

VLT® | VACON®

DKDD.PB.401.A4.02