MAKING MODERN LIVING POSSIBLE

Selection guide
VLT® AutomationDrive FC 360

www.danfoss.cn/FC360

VLT® THE REAL DRIVE

PERFORMANCE, RELIABILITY AND *SPEED*

Increase quality and efficiency with energy efficient, user friendly control of motors from 0.37 to 75 kW.

The VLT® AutomationDrive FC 360 is a general purpose drive that provides precise and efficient motor control in a wide range of industrial applications. Built-in features help owners save space in installations, time in setup and effort in daily maintenance. The result is a powerful and versatile solution that increases process efficiency and quality in a cost-efficient package.

Designed for challenging environments

Using advanced coating and quality internal electronics protection, the FC 360 has the rugged characteristics demanded by the textile, plastics, rubber, food, beverage and building materials industries.

Maximize productivity

An easy to use control panel in English and Chinese saves valuable time in commissioning and maintaining the drive, and enables owners to maximize uptime and save energy.

The basic design profile of the VLT® AutomationDrive FC 360 reduces the number of code numbers needed for ordering, making the process easier

Built on the success of the tried and tested VLT® platform that Danfoss developed and launched in the 1960's, the VLT® AutomationDrive FC 360 shares the same technical heritage as the popular and versatile VLT® AutomationDrive FC 300 series. Developed to meet a general purpose operation profile the drive lacks the expandability of its larger sibling, but still delivers powerful performance out of the box.

Due to the fact that all Danfoss frequency converters follow the same basic design and operating principle, existing owners and users of VLT® drives will instantly feel at home when operating the VLT® AutomationDrive FC 360.

Compact design for easy installation

Delivered as standard with IP 20 protection. The compact, lightweight design helps optimize panel space as a result of side-by-side mounting with zero clearance.

Save time on setup

Easy parameter setup makes the path to energy savings both short and simple, and can be carried out with an enhanced numeric LCP or graphical control panel that supports English and Chinese. Targeted application guides walk users through the setup of a new application and ensure accuracy and precision.

HIGH RELIABILITY

Coated Printed Circuit Boards
Special high level 3C3 Printed Circuit Board (PCB) coating as standard provides higher reliability in harsh environments to prevent premature failures and downtime. The lifetime of the drive is also increased as a result of the IED61721-3-3 conformal coating.

55°C Working Temperature
VLT® AutomationDrive FC 360 is designed to operate at 45-50°C ambient temperature at full load (depending on model) and 55°C with derating. This means there is no need to install extra cooling equipment or oversize the drive, resulting in cost savings.

Efficient heat management
A unique cooling concept ensures that there is no forced air flow over the electronics. This reduces the risk of downtime, while strengthening stability in daily operation.

By preventing dust and particles from accumulating on the small internal components and legs, the risk of short circuits is significantly reduced, especially in humid environments.

COATED PCB
The VLT® AutomationDrive FC 360 is delivered with a 3C3 class coated PCB as standard to strengthen reliability.

EASY CLEANING
An easy to remove fan of the drive makes it easy to keep dust from affecting the drive's ventilation.

450 kg force at 0.6 Hz. The high torque performance of a 0.75 kW VLT® AutomationDrive FC 360 fully meets the demands for tensile testing at Samuya Technocrates in India.

Reduced Harmonics
A built-in DC choke reduces harmonics to less than 43% (ThiD) and significantly extends the lifetime of the DC capacitor.

Optimized for industrial processes

- Extruders
- Escalators
- Winders
- Material Handling
- Centrifuge separators
- Pumps
- Fans

Smart Logic Control

Smart Logic is a simple and clever way to keep the drive, motor and application working together. The smart logic controller monitors a specific event, and when it occurs, it triggers a predefined action which is monitored for 20 steps, before returning to step 1.

The Smart Logic Controller can monitor any parameter that can be defined as "true" or "false", providing users with significant freedom to tailor the control strategy to their specific needs. This includes digital commands and logic expressions, where sensor outputs can influence operation using parameters such as temperature, pressure, torque, flow, time, load, frequency, voltage, and others, combined with the operators ">", "<", "=", "and" and "or" as logical statements.

Expand with control and feedback modules

Fieldbus communication in VLT® AutomationDrive FC 360 is integrated in the control card. In addition, the drive can be expanded with options for additional control and encoder feedback.

With the VLT® Encoder Input MCB 102 and VLT® Resolver Input MCB 103 the VLT® AutomationDrive FC 360 can receive encoder feedback from either a motor or a process.

Time saving setup VLT® Motion Control Tool MCT 10

The VLT® AutomationDrive FC 360 can be configured and monitored with Danfoss own VLT® Motion Control Tool MCT 10 software. This provides plant managers with a comprehensive overview over the system at any point in time and a high level of flexibility in configuration and monitoring.

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. The software runs under Windows and enables data exchange over a traditional RS 485 interface or fieldbus (PROFIBUS, PROFINET).

Parameter configuration is possible both online and offline, 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.

Maximise uptime

- High level 3C3 printed circuit board as standard
- Max. ambient temperature without derating: 45-50°C (depending on model).
- No forced air over electronics reduces contamination risk
- Removable fan enables fast and easy cleaning

INTEGRATED FEATURES

The VLT® AutomationDrive FC 360 is designed to provide maximum uptime and reliability in a wide range of environments.

Built-in Brake Chopper
A built-in brake chopper up to 22kW saves money and panel space.

Pulse Input as Speed Reference
VLT® AutomationDrive FC 360 offers the capability to convert pulse input as a speed reference, avoiding the need to purchase an analog signal module for PLC.

Central Winder
FC 360 supports central winder functionality, eliminating the need for a special module in the programmable logic control (PLC).

Built-in PID Controller
The built in PID controller calculates an 'error' value as the difference between a measured process variable and a desired setpoint.

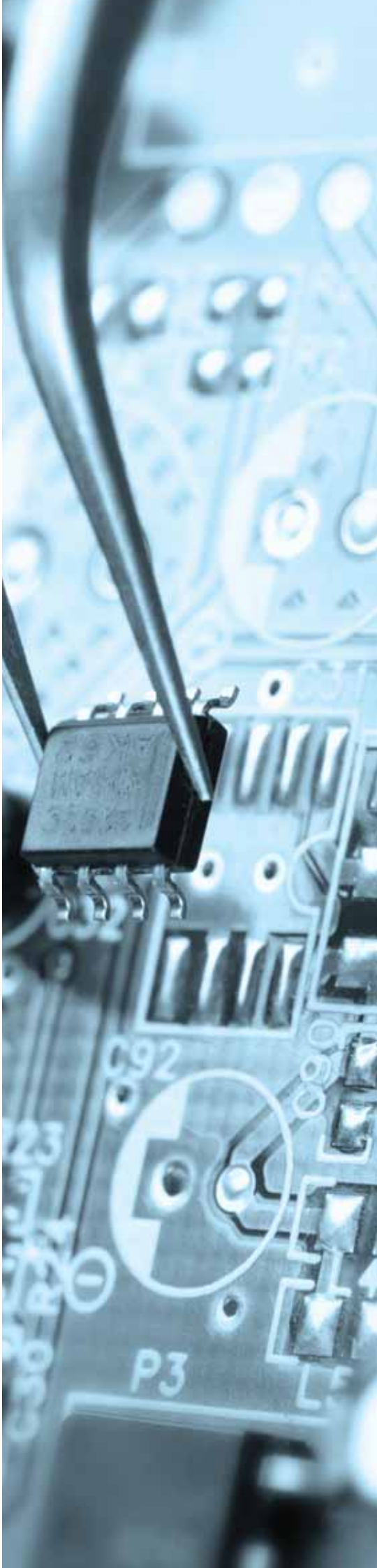
1. Designed for use in ambient temperatures up 45-50°C without derating. Max. ambient temperature 55°C
2. No forced air over PCB
3. Class C3C coated components for increased reliability in harsh environments (IEC 6072 1-3-3)
4. Removable fan
5. EMC compliant meets class C3 with limit A2 (EN 55011) as standard
6. Built-in brake chopper up to 22 kW
7. Fieldbus embedded in control card (Profibus, Profinet)
8. I/0 number and functions
   - 7DI / 2AI / 2AO / 2 DO
   - Pulse input as speed reference
   - Pulse feedback and 24V encoder feedback
   - 24V (100 mA)
   - 12V
9. Display options
   - Enhanced numeric LCP
   - Graphic LCP supports English and Chinese
   - Blind cover

* Full automatic motor adaptation (AMA) optimizes compatibility between frequency converter and motor in VVC+ mode

* Built-in Smart Logic Controller

* RFI Swtich

** Not visible on picture*



SPECIFICATIONS

(Basic unit without extensions)

Main supply (L1, L2, L3)	
Supply voltage	380–480 V -15%/+10%
Supply frequency	50/60 Hz ±5%
Displacement power factor (cos ϕ)	> 0.98
Switching on input supply L1, L2, L3	0.37-7.5 kW maximum 2 times/min. 11-75 kW maximum 1 time/min.
Harmonic disturbance	Meets EN 61000-3-12

Output data (U, V, W)	
Output voltage	0 – 100% of supply voltage
Output frequency	0-500 Hz 0-200 Hz under VVC+ Mode
Switching on output	Unlimited
Ramp times	0.05-3600 sec

Digital inputs	
Programmable digital inputs	7
Changeable to digital output	2 (Terminal 27,29)
Logic	PNP or NPN
Voltage level	0 – 24 V DC
Maximum voltage on input	28 V DC
Input resistance, Ri	Approx. 4 kΩ
Scan interval	1 ms

** 2 can be used as digital outputs*

Analog inputs	
Analogue inputs	2
Modes	Voltage or current
Voltage level	0 to +10 V (scaleable)
Current level	0/4 to 20 mA (scaleable)
Accuracy of analog inputs	Max. error 0.5% of full scale

Pulse/encoder inputs	
Programmable pulse/ encoder inputs	2/1
Voltage level	0 – 24 V DC (PNP positive logic)
Pulse input accuracy (0.1 – 1 kHz)	Max. error: 0.1% of full scale
Encoder input accuracy	4Hz-32kHz

** Utilize some of the digital inputs*

Digital outputs	
Programmable digital/pulse outputs	2
Voltage level at digital/frequency output	0 – 24 V DC
Max. output current (sink or source)	40 mA
Maximum output frequency at frequency output	4Hz to 32 kHz
Accuracy on frequency output	Max. error: 0.1% of full scale

** Utilize 2 digital inputs*

CE

Analogue output	
Programmable analogue outputs	2
Current range at analogue output	0/4 – 20 mA
Max. load to common at analogue output (clamp 30)	500 Ω
Accuracy on analogue output	Max. error: 0.8 % of full scale

Control card	
RS485 interface	Up to 115 kBaud
Max. load (10 V)	15 mA
Max. load (24 V)	100 mA

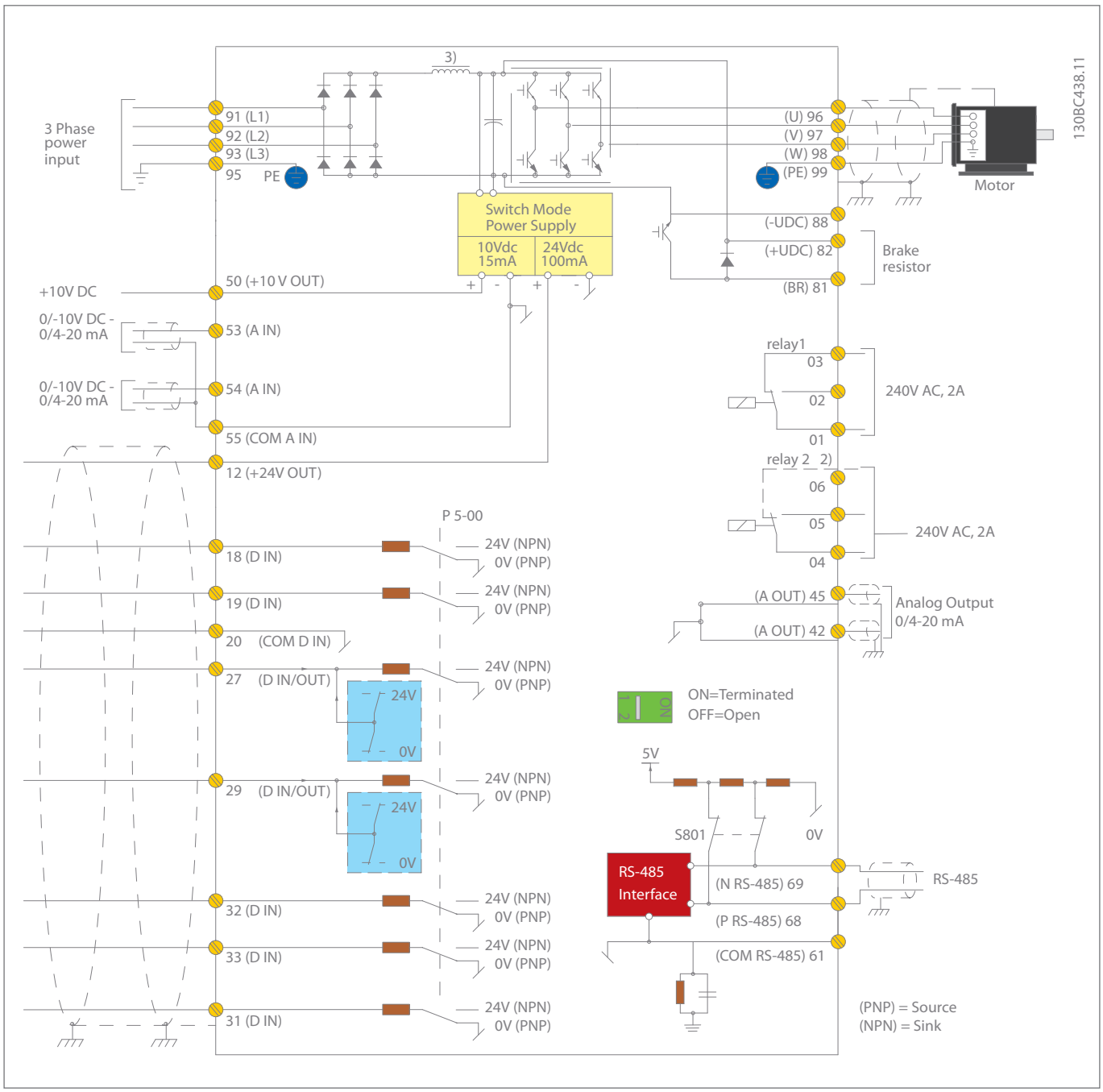
Relay output	
Programmable relay outputs	2
Max. terminal load (AC) on 1-3 (break), 1-2 (make), 4-6 (break) power card	250V AC, 3 A
Max. terminal load (AC) on 4-5 (make) power card	250V AC, 3 A
Min. terminal load on 1-3 (break), 1-2 (make), 4-6 (break), 4-5 (make) power card	250V AC, 0.2 A

Surroundings/external	
Enclosure	IP20
Vibration test	1.0 g
Max. relative humidity	5-95% (IEC 721-3-3; Class 3K3 (non-condensing) during operation
Ambient temperature	max. 55°C with derating
Galvanic isolation of all	I/O supplies according to PELV
Aggressive environment	Class 3C3

Fieldbus communication	
Standard built-in	FC Protocol Modbus RTU
Fieldbus built-in control card variants	PROFIBUS PROFINET

CONNECTION EXAMPLES

The numbers represent the terminals on the drive



[1] *Built-in braking chopper available from 0.37 - 22 kW*
[2] *Relay 2 is 2 pole for J1-J3 and 3 pole for J4-J7. Relay 2 of J4-J7 with terminal 4,5,6, same NO/NC logic as Relay 1.*
[3] *Dual DC choke in 30-75 kW*
[4] *Switch S801 (bus terminal) can be used to enable termination on the RS-485 port (terminals 68 and 69).*

The diagram shows the port terminals of the VLT® AutomationDrive FC 360.

The numbers indicated refer to the terminal numbers of the drives. Users can set the mode of the analogue inputs 53 and 54 by setting software parameters.

The FC 360 features a RS485 interface as standard. The RS485 terminations are integrated in the drive (S801).

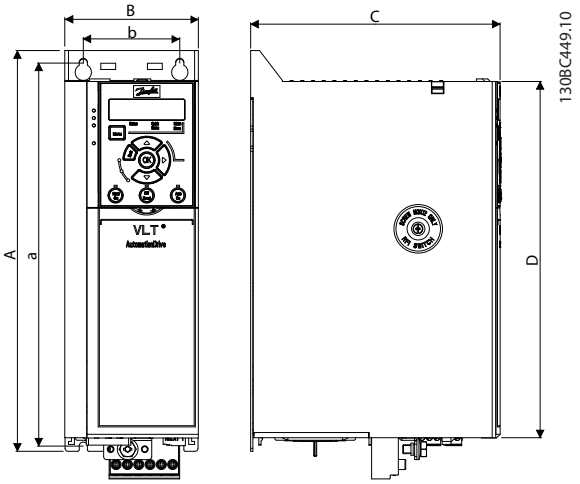
PROFIBUS DP or PROFINET can be specified by configuring different control cassettes when ordering.

To switch from NPN to PNP logic for the digital signals, use parameter 5-00.

POWER, CURRENTS AND ENCLOSURES

T4 380 – 480 V (High overload)					T4 380 – 480 V (Normal overload)				
		Amp.					Amp.		
FC 360	kW	380-439V	440-480V	IP 20 /Chassis	FC 360	kW	380-439V	440-480V	IP 20/Chassis
HK37	0.37	1.2	1.1	J1					
HK55	0.55	1.7	1.6						
HK75	0.75	2.2	2.1						
H1K1	1.1	3.0	2.8						
H1K5	1.5	3.7	3.4						
H2K2	2.2	5.3	4.8						
H3K0	3.0	7.2	6.3	J2					
H4K0	4.0	9.0	8.2						
H5K5	5.5	12	11						
H7K5	7.5	15.5	14	J3					
H11K	11	23	21	J4	Q11K	11	23	21	J4
H15K	15	31	27		Q15K	15	31	27	
H18K	18	37	34	J5	Q18K	18	37	34	J5
H22K	22	42.5	40		Q22K	22	42.5	40	

Dimensions [mm]

Frame size 380-480 V	J1	J2	J3	J4	J5
Power size [kW]	0.37-2.2	3.0-5.5	7.5	11-15	18.5-22
Dimensions [mm]					
Height A	210	272.5	272.5	317.5	410
Width B	75	90	115	133	150
Depth C (with option B)	168 (181)	168 (181)	168 (181)	245 (258)	245 (258)
Mounting holes					
a	198	260	260	297.5	390
b	60	70	90	105	120
Mounting screw	M4	M5	M5	M6	M6

ORDERING TYPE CODE FOR VLT® AutomationDrive FC 360

[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]	[13]	[14]
FC-360	–	–	–	–	–	–	–	–	–	X	– SXX X	– X	–	–

[1] Application

360	VLT® AutomationDrive FC 360

[2] Power Size

HK37	*See ratings data on page 11 for power ratings*
HK55	
HK75	
H1K1	
H1K5	
H2K2	
H3K0	
H4K0	
H5K5	
H7K5	
H11K/ Q11K	
H15K/ Q15K	
H18K/ Q18K	
H22K/ Q22K	

[3] AC Line Voltage

T4	3 x 380/480 V AC *(High overload)*
	3 x 380/480 V AC *(Normal overload)*

[4] Enclosure

For cabinet mounting:

E20	IP 20/Chassis

[5] RFI Filter (EN 55011)

H2	RFI-Filter class A2

[6] Braking

X	No brake IGBT
B	Built-in brake IGBT

** 0.37-22kW built-in; 30-75kW not*

[7] Display (Local Control Panel)

X	No LCP, blind cover

** Following accessories available: NLCP, GLCP and blind cover*

[8] Conformal Coating (IEC 721-3-3)

C	Conformal coating on all PCBs

[9] Mains Input

D	Load sharing terminals

[10] Cable

X	Standard Cable Entry

[13] Fieldbus embedded in control cassette

AX	No fieldbus option
A0	PROFIBUS
AL	PROFINET

[14] B Option (Application)

BX	No application option

** VLT® Encoder Input MCB102 and VLT® Resolver Input MCB 103 available as accessories*

Please note that not all combinations are possible. Find help for configuring your drive with the online configurator at driveconfig.danfoss.com

Based on your selection, Danfoss manufactures the desired VLT® AutomationDrive FC 360 to your specification. You will receive a fully assembled frequency converter, tested under full load conditions.

380 – 480 VAC

Enclosure		IP20	J1						J2			J3
		HO	HK37	HK55	HK75	H1K1	H1K5	H2K2	H3K0	H4K0	H5K5	H7K5
Typical Shaft Output		[kW]	0.37	0.55	0.75	1.1	1.5	2.2	3.0	4.0	5.5	7.5
Typical Shaft Output at 460 V		[HP]	0.5	0.75	1.0	1.5	2.0	3.0	4.0	5.5	7.5	10.0
Output Current (3 x 380 – 440 V)	Continuous	[A]	1.2	1.7	2.2	3.0	3.7	5.3	7.2	9.0	12	15.5
Output Current (3 x 441 – 480 V)	Continuous	[A]	1.1	1.6	2.1	3	3.4	4.8	6.3	8.2	11	14
	Intermittent	[A]	1.9	2.7	3.5	4.8	5.9	8.5	11.5	14.4	19.2	24.8
Output Power (400 V AC)	Continuous	[kVA]	0.8	1.2	1.5	2.1	2.6	3.7	5.0	6.2	8.3	10.7
Output Power (460 V AC)	Continuous	[kVA]	0.9	1.3	1.8	2.5	2.8	4.0	5.2	6.8	9.2	11.6
Max. cable size (Mains, motor, brake and load sharing)		[mm²] ([AWG])	4 mm²									
Max. Input Current (3 x 380 – 440 V)	Continuous	[A]	1.2	1.6	2.1	2.6	3.5	4.7	6.3	8.3	11.2	15.1
Max. Input Current (3 x 441 – 480 V)	Continuous	[A]	1.0	1.2	1.8	2.0	2.9	3.9	4.3	6.8	9.4	12.6
	Intermittent	[A]	1.9	2.6	3.4	4.2	5.6	7.5	10.1	13.3	17.9	24.2
Max. pre-fuses		[A]	10						25			32
Environment												
Estimated power loss at rated max. load		[W]						52.4			113.9	150.8
Weight												
IP 20		[kg]	2.3	2.3	2.3	2.3	2.3	2.5	3.6	3.6	3.6	4.1
Efficiency								97,6%			97,9%	98%

Enclosure		IP20	J4		J5		IP20	J4		J5	
		HO	H11K	H15K	H18K	H22K	NO	Q11K	Q15K	Q18K	Q22K
Typical Shaft Output		[kW]	11	15	18	22		11	15	18	22
Typical Shaft Output at 460 V		[HP]	15	20	25	30		15	20	25	30
Output Current (3 x 380 – 440 V)	Continuous	[A]	23	31	37	42.5		23	31	37	42.5
Output Current (3 x 441 – 480 V)	Continuous	[A]	21	27	34	40		21	27	34	40
	Intermittent	[A]	34.5	46.5	55.5	63.8		25.3	34.1	40.7	46.8
Output Power (400 V AC)	Continuous	[kVA]	15.9	21.5	25.6	29.5					
Output Power (460 V AC)	Continuous	[kVA]	17.5	22.5	28.3	33.3					
6Max. cable size (Mains, motor, brake)		[mm²] ([AWG])	16 mm²					16 mm²			
Max. Input Current (3 x 380 – 440 V)	Continuous	[A]	22.1	29.9	35.2	41.5					
Max. Input Current (3 x 441 – 480 V)	Continuous	[A]	18.4	24.7	29.3	34.6					
	Intermittent	[A]	33.2	44.9	52.8	62.3					
Max. pre-fuses		[A]	50		80						
Environment											
Estimated power loss at rated max. load		[W]		331.5		457.7					
Weight											
IP 20		[kg]	9.4	9.5	12.3	12.5		9.4	9.5	12.3	12.5
Efficiency				97.8%		97.9%					

OPTIONS AND ACCESSORIES

VLT® Control Panel LCP 21

The numerical control panel offers an excellent MMI interface to the drive.

- Status messages
- Quick menu for easy commissioning
- Parameter setting and adjusting
- Hand-operated start/stop function or Automatic mode select
- Reset function

Ordering number: 132B0255

VLT® Brake Resistors MCE 101

Energy generated during braking is absorbed by the resistors, protecting electrical components from heating up. Danfoss brake resistors are optimized for the FC-series and general versions for horizontal and vertical applications are available.

- Enclosure protection as IP20 and up to IP65
- Build-in thermo switch
- Versions for vertical and horizontal mounting
- UL-recognized – only types for vertical mounting

VLT® Encoder Input MCB 102

A universal option for connection of encoder feedback from either a motor or a process. Feedback for asynchronous or brushless servo (Permanent Magnet) motors.

Encoder module supports:

- Incremental encoders
- SinCos encoders as Hyperface®
- Power supply for encoders
- RS422 interface
- Connection to all standard 5 V incremental encoders
- Spring-loaded connection

VLT® Resolver Input MCB 103

Supports resolver feedback for asynchronous or brushless servo (Permanent Magnet) motors.

- Primary Voltage.....2 – 8 Vrms
- Primary Frequency.....2.0 kHz – 15 kHz
- Primary current max.....50 mA rms
- Secondary input voltage.....4 Vrms
- Spring loaded connection

Other accessories

VLT® Blind Cover
Ordering number: 132B0262

VLT® Numeric LCP IP55 Mounting Kits
Ordering number: 132B0102

VLT® Decoupling for frame size J1
Ordering number: 132B0258

VLT® Decoupling for frame size J2&J3
Ordering number: 132B0259

VLT® Decoupling for frame size J4&J5
Ordering number: 132B0260

What VLT® is all about

Danfoss VLT Drives is the world leader among dedicated drives providers – and still gaining market share.

Environmentally responsible

VLT® products are manufactured with respect for the safety and well-being of people and the environment.

All frequency converter factories are certified according to ISO 14001 and ISO 9001 standards.

All activities are planned and performed taking into account the individual employee, the work environment and the external environment. Production takes place with a minimum of noise, smoke or other pollution and environmentally safe disposal of the products is pre-prepared.

UN Global Compact

Danfoss has signed the UN Global Compact on social and environmental responsibility and our companies act responsibly towards local societies.

Impact on energy savings

One year's energy savings from our annual production of VLT® drives will save the energy equivalent to the energy production from a major power plant. Better process control at the same time improves product quality and reduces waste and wear on equipment.

Dedicated to drives

Dedication has been a key word since 1968, when Danfoss introduced the world's first mass produced variable speed drive for AC motors – and named it VLT®.

Twenty five hundred employees develop, manufacture, sell and service drives and soft starters in more than one hundred countries, focused only on drives and soft starters.

Intelligent and innovative

Developers at Danfoss VLT Drives have fully adopted modular principles in development as well as design, production and configuration.

Tomorrow's features are developed in parallel using dedicated technology platforms. This allows the development of all elements to take place in parallel, at the same time reducing time to market and ensuring that customers always enjoy the benefits of the latest features.

Rely on the experts

We take responsibility for every element of our products. The fact that we develop and produce our own features, hardware, software, power modules, printed circuit boards, and accessories is your guarantee of reliable products.

Local backup – globally

VLT® motor controllers are operating in applications all over the world and Danfoss VLT Drives' experts located in more than 100 countries are ready to support our customers with application advice and service wherever they may be.

Danfoss VLT Drives experts don't stop until the customer's drive challenges are solved.

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