

Selection Guide | VLT® HVAC Drive FC 131

# VLT® HVAC Drive FC 131 - **competitive and compact** to give you the upper hand in HVAC

**50%**

energy cost savings  
in energy-optimized  
HVAC systems



**VLT®**  
HVAC Drive



# Optimize your building's performance to future needs

## Energy optimization

As the world's population continues to increase, energy-optimized HVAC systems are the key to providing comfort and safety without increasing energy consumption. Even extreme climates and isolated outposts have a need for efficient HVAC operation. To give you the flexibility you need with the reliability you expect, the VLT® HVAC Drive has been enhanced to meet your needs – and more.

## Enhanced efficiency

New motor technologies are driving an increase in operating efficiency, especially in HVAC applications. To get the most out of these permanent magnet (PM) and synchronous reluctance (SynRM) motors, you need an AC drive equipped with the algorithms to most optimally control these motors.

Energy efficiency of the AC drive includes more than the drive itself. Through a combination of minimizing thermal losses, low standby power consumption and a demand-based cooling fan, the VLT® HVAC Drive operates at 98% efficiency or higher.

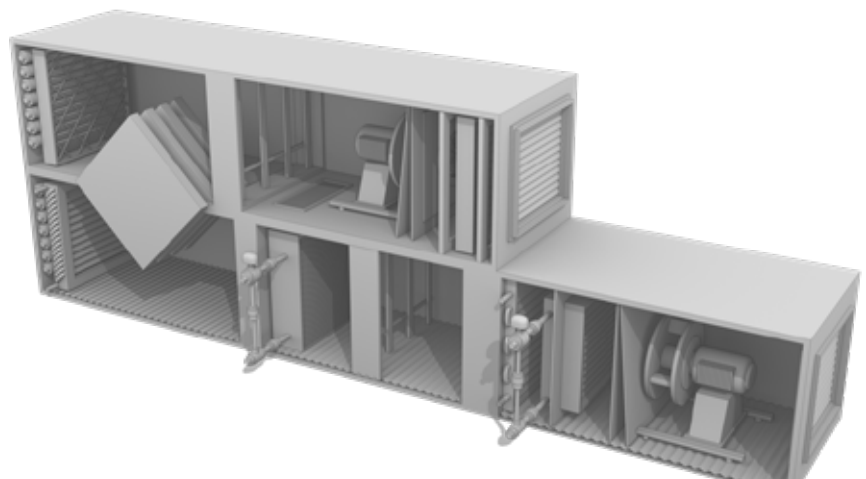
## The future of HVAC

In Danfoss, we understand the various applications in high-performance buildings and our expertise within HVAC applications ensure that the investment you make in VLT® drives provides a qualified return. State-of-the-art products and technology let us meet and shape the future of HVAC.

## Certify your building

Today, the main focus is on overall buildings performance which includes design, construction, energy efficiency, sustainability and the environmental impact of buildings in the future.

Danfoss AC drives help you to reduce the energy consumption in your building and to fulfill the highest standards set by certification standards.



Air handling units



# Essential **fan and pump installations** call for intelligent solutions

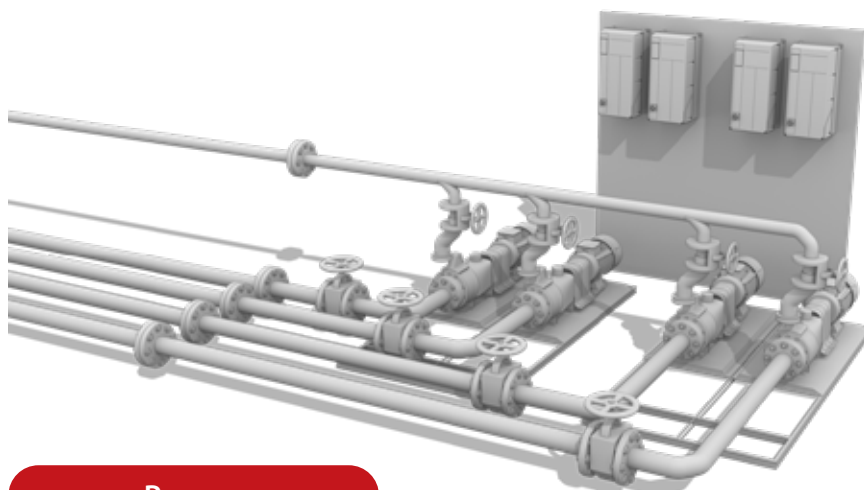
User-friendliness, distributed intelligence and reduced power consumption are all key in fan applications. The VLT® HVAC Drive FC 131 delivers on all of these parameters and is able to control a wide range of functions. These functions have been developed in close cooperation with OEMs, contractors and manufacturers around the world to tailor them to your exact needs:

## **Skip frequencies**

By pressing a few buttons on the LCP (Local Control Panel), the drive can be set to avoid frequency bands at which connected fans create resonances in the ventilation system. This reduces vibration, noises and wear on equipment.

## **Belt Monitoring**

From the speed/current, the drive can detect when the motor has lost contact to the fan and set off an alarm if the belt is broken.



## **Flying start**

The drive can detect speed and direction of a freely spinning fan or pump and “catch” it at the right speed. This feature prevents violent starts and tear on the equipment.

## **Sleep Mode**

When sleep mode is enabled, the drive automatically detects a no- or low-flow condition and stops the motor. The drive constantly monitors the situation in order to re-start the motor, when the load demand increases. This secures no interruptions in the supply, maximizes the energy savings, reduces noise and extends the lifetime of the entire system.

# Intelligence for Fire & emergency operation

## Fire and emergency

In the event of fire in a building, the Fire Emergency Mode safety feature prevents the drive from stopping to protect itself. Instead, it will continue vital fan operation to secure optimal smoke extraction or over-pressure in the stairwell to ensure occupants can more safely evacuate buildings via staircases.

Run the drive on normal operation settings, where Fire Emergency Mode will suppress alarms. Alternatively, change to special Fire Emergency Mode settings, with up to 16 different operation settings in two setup groups.

## Smoke extraction and Multi-zone Fire-mode

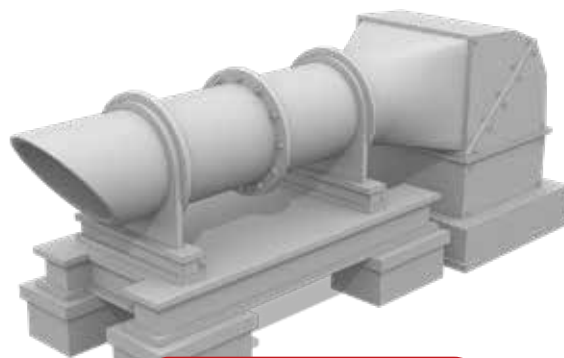
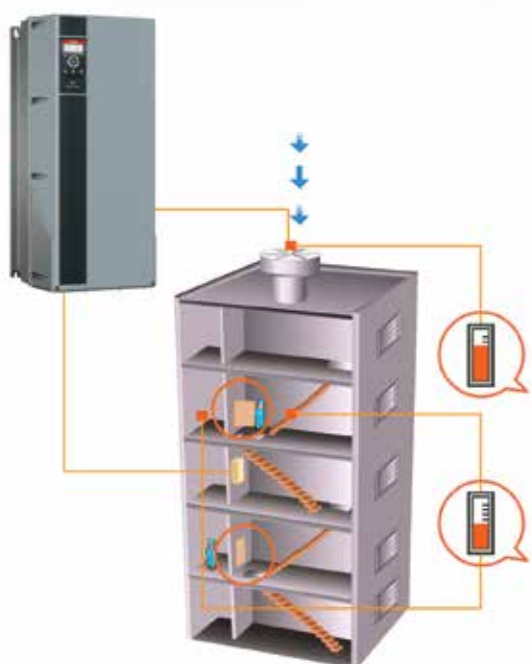
The VLT® HVAC Drive also features a Multi-zone Fire-mode function that allows for adjustable speed controls depending on the zone(s) where the fire is active. Utilizing the logic within the drive allows for a less complex and more reliable smoke extraction system that can respond to multiple zones according to need.

Multi-zone Fire-mode is based on eight setpoints in two setup menus to support forward and reverse directions, and open-loop or closed-loop control. Activate Multi-zone Fire-mode via digital input or via fieldbus.

Use it confidently in buildings as well as carpark and tunnel systems, where the multi-zone control and change of operation condition support secure and coordinated control of ventilation and smoke extraction systems for heightened safety of occupants.

## Intelligent HVAC features

- Special operation condition for best protection of human life: "Run to dead" suppresses drive self-protection alarms.
- Reduce fire development via standard ventilation systems or by controlling special smoke extraction systems.
- PID control maintains over-pressure in stairwells to keep them smoke-free, and to ensure people can enter the stairwell from the different floors.
- Use normal operation condition or switch to special operation setting with up to 16 different zones in two setups.
- Supports EN 12101 standard for smoke and heat control system.



Smoke extraction fans



**EC+**

concept for superior  
system efficiency

## EC+ concept

EC+ concept is based on high-efficiency PM motors combined with drives running the VVC+ control algorithm for optimal system efficiency.

An EC+ concept system normally offers higher efficiency, since axial fans consume much less energy, and generate a higher air throughput than EC fans. Furthermore, the design of these PM motors is based on the IEC standard for motor mechanical construction – making it easier to upgrade an existing system.



Learn more about  
EC+ concept



**85%**  
system efficiency

### System efficiency increase:

- Axial fans with up to 92% efficiency
- Highly-efficient PM motor with efficiency up to 95%
- The VLT® HVAC Drive operates at 98% or higher efficiency

### Advantages of the EC+ concept

- Free choice of motor technology: control a SynRM, PM or induction motor with the same AC drive
- Device installation and operation remain unchanged
- Manufacturer independence in the choice of all components
- Superior system efficiency thanks to a combination of individual components with optimum efficiency
- Retrofitting of existing systems is possible
- Wide range of rated powers for SynRM, induction and PM motors up to 90 kW.

# VLT® HVAC Drive FC 131

The VLT® HVAC Drive FC 131 is a compact and competitive drive for essential HVAC applications.

## Easy commissioning

Its quick menu wizard makes normal set-up and operation easy.

## Maintenance-free

Due to a series of self-protecting and monitoring features, the VLT® HVAC Drive FC 131 is maintenance-free, except for general cleaning. Replacement of internal fans or capacitors is normally not required during lifetime.

## Save space

Due to its ultra-compact design, the VLT® HVAC Drive FC 131 is easily mounted inside an HVAC unit or panel, reducing overall enclosure costs.

## Built-in DC coils

The standard integrated DC coils comply with EN 61000-3-12 reducing losses in mains and ensuring reliable operation in the whole grid. The DC coils increase the lifespan of the DC link capacitors and they also ensure that the drive can operate motors to their full performance. Integrated DC coils save the cost for adding external filters.

## Reduced installation costs

- Built-in HVAC functions reduce the need for other system components
- Ease of installation and set-up

## Competitive performance

- Up to 98% efficiency or higher
- Automatic energy optimization
- System diagnostics

## VLT® HVAC Drive FC 131 product range:

3 x 380 – 480 V..... 0.37 – 90 kW

## Available enclosure rating:

- IP54

## Intuitive control panel

- Full graphical display offers easy readout with clear white backlight.
- Multiple languages
- Status LEDs
- Quick menus (wizard for open loop applications, closed loop applications, and motor setup)
- Password protection
- Same parameter structure as the Danfoss VLT® FC - family drives
- Upload and download parameters (LCP copy function)

## Built-in EMC protection

The AC drive contains all the modules necessary for compliance with EMC standards without need of professional installer.

A built-in, scalable RFI filter minimizes electromagnetic interference, and the integrated DC link chokes reduce the harmonic distortion in the mains network, in accordance with IEC61000-3-12. Furthermore, they increase the lifetime of the DC link capacitors and therefore the overall efficiency of the drive.

These built-in components save cabinet space, as they are integrated in the drive from the factory. Efficient EMC mitigation also enables the use of cables with smaller cross-sections, which reduces installation costs. Integrated EMC filters meet the requirements of Residential Categories C1 and C2.



### High-end graphical display

The enhanced LCP is included in all drives and comes with a four-line graphical display with white backlight securing superior readability and overview. It has a high-end HMI interface that allows for seamless interaction, offering you all the functionality needed to commission and operate your drive. Soft and responsive touch buttons make the LCP very easy to operate. The LCP is pluggable and can be plugged in and out while connected to a power supply. Use the copy-paste function for easy setup of your next drive.



## Enclosure protection

### IP54 enclosure

The robust enclosure protects the drive against corrosion even in harsh environments. The installation volume and/or the mounting surfaces are minimized. The functional sections nevertheless fulfil the highest requirements even for applications with ambient temperatures up to 50°C.

### Compact design

Optimized efficiency and intelligent cooling technology ensure compact and service-friendly design. Supplementary equipment such as EMC filters and harmonics suppression are integrated into the ultra-compact enclosure.

### Save installation time

The IP54 series is designed for easy accessibility and time-saving installation. Mechanical fastening points are easy to access from the front even with automatic tools. All terminals are sufficiently dimensioned and clearly marked behind a plate. Accessories for bonding screened cables are included making compact enclosures easier to install.



# Specifications

## VLT® HVAC Drive FC 131 without extensions

### Main supply (L1, L2, L3)

Supply voltage	380 – 480 V ±10%
Supply frequency	50/60 Hz
Displacement power factor (cos φ)	> 0.98 (near unity)
Switching on input supply L1, L2, L3	1–2 times/min.
Harmonic disturbance	Meets EN 61000-3-12

### Output data (U, V, W)

Output voltage	0 – 100% of supply voltage
Output frequency	0 – 400 Hz
Switching on output	Unlimited
Ramp-up and -down times	1 – 3600 sec.

### Digital inputs

Programmable digital inputs	4
Logic	PNP or NPN programmable
Voltage level	0 – 24 V DC
Maximum voltage on input	28 V DC
Input resistance, Ri	Approx. 4 kΩ

### Analog inputs

Analog 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

### Analog output

Programmable analog outputs	2
Current range at analog output	0/4 – 20 mA
Max. load to common at analog output (terminal 30)	500 Ω
Accuracy on analog output	Max. error: 1% of full scale

Analog outputs can be used as digital outputs

### Control card

RS485 interface	Up to 115 kBaud
Max. load (10 V)	25 mA
Max. load (24 V)	80 mA

### Relay output

Programmable relay outputs	2
Max. terminal load (AC) on 1-3 (break), 1-2 (make)	240 VAC, 2 A and 400 VAC, 2 A

### Surroundings/external

Enclosure	IP 54
Vibration test	1.14 g
Max. relative humidity	5% – 95% (IEC 721-3-3; Class 3K3 (non-condensing) during operation)
Ambient temperature	up to 50°C
Galvanic isolation of all	I/O supplies according to PELV
Aggressive environment	Designed for coated/uncoated 3C3/3C2 (IEC 60721-3-3)

### Fieldbus communication

Standard built-in:	BACnet Modbus RTU N2 Metasys FLN Apogee FC Protocol
--------------------	---

### Protection mode for longest possible uptime

- Electronic thermal motor protection against overload
- Temperature monitoring of the heatsink ensures that the AC drive trips if the temperature reaches 95°C ± 5°C.
- The AC drive is protected against short-circuits on motor terminals U, V, W.
- The AC drive is protected against earth faults on motor terminals U, V, W.
- Protection against mains phase loss





# Powers and currents

## 380 – 480 VAC

Enclosure 380-480 VAC	IP 54		I2				I3			
			PK75	P1K5	P2K2	P3K0	P4K0	P5K5	P7K5	
Typical Shaft Output		[kW]	0.75	1.5	2.2	3	4	5.5	7.5	
		[HP]	1	2	3	4	5	7.5	10	
Output Current (3 x 380-440 V)	Continuous	[A]	2.2	3.7	5.3	7.2	9.1	12	15.5	
	Intermittent [1 min. max]		2.4	4.1	5.8	7.9	9.9	13.2	17.1	
Output Current (3 x 440-480 V)	Continuous	[A]	2.1	3.4	4.8	6.3	8.2	11	14	
	Intermittent [1 min. max]		2.3	3.7	5.3	6.9	9.0	12.1	15.4	
Max. cable size Mains, motor	IP 54	[mm <sup>2</sup> ] (AWG)				4/10				
Max. Input Current (3 x 380-440 V)	Continuous	[A]	2.1	3.5	4.7	6.3	8.3	11.2	15.1	
	Intermittent [1 min. max]		2.3	3.9	5.2	6.9	9.1	12.3	16.6	
Max. Input Current (3 x 440-480 V)	Continuous	[A]	1.8	2.9	3.9	5.3	6.8	9.4	12.6	
	Intermittent [1 min. max]		2	3.2	4.3	5.8	7.5	10.3	13.9	
Estimated power loss at rated max. load		[W]	21	46	46	66	95	104	159	
Weight	IP 54	[kg]	5.3				7.2			
Efficiency		[%]	98.0	97.7	98.3	98.2	98.0	98.4	98.2	

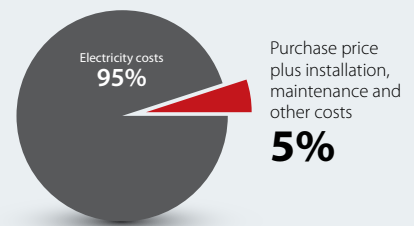
Enclosure 380-480 VAC	IP 54		I4			I6			I7		I8	
			P11K	P15K	P18K	P22K	P30K	P37K	P45K	P55K	P75K	P90K
Typical Shaft Output		[kW]	11	15	18	22	30	37	45	55	75	90
		[HP]	15	20	25	30	40	50	60	75	100	125
Output Current (3 x 380-440 V)	Continuous	[A]	23	31	37	42.5	61	73	90	106	147	177
	Intermittent [1 min. max]		25.3	34	40.7	46.8	67.1	80.3	99	116	161	194
Output Current (3 x 440-480 V)	Continuous	[A]	21	27	34	40	52	65	80	105	130	160
	Intermittent [1 min. max]		23.1	29.7	37.4	44	57.2	71.5	88	115	143	176
Max. cable size Mains, motor	IP 54	[mm <sup>2</sup> ] (AWG)	10/7			35/2			50/1		95/(3/0) 120/(4/0)	
Max. Input Current (3 x 380-440 V)	Continuous	[A]	22.1	29.9	35.2	41.5	57	70	84	103	140	166
	Intermittent [1 min. max]		24.3	32.9	38.7	45.7	62.7	77	92.4	113	154	182
Max. Input Current (3 x 440-480 V)	Continuous	[A]	18.4	24.7	29.3	34.6	49-46	61-57	73-68	89-83	121-113	143-133
	Intermittent [1 min. max]		20.2	27.2	32.2	38.1	54-50	67-62	80-74	98-91	133-124	157-146
Weight	IP 54	[kg]	13.8			27			45		65	
Efficiency		[%]	98.1	98.0	98.1	98.1	97.8	97.9	97.1	98.3	98.3	98.3

## Small investment – big returns

New energy efficiency regulations focus on ways to reduce energy consumption and CO<sub>2</sub> emissions. To meet these new standards, adding an AC drive is a necessity. Over the lifetime of an AC drive, energy cost is the dominating economical factor, but savings can be found in other associated costs.

Selecting the VLT® HVAC Drive provides the lowest total cost of ownership. Installation and commissioning take less time, and operating efficiency is higher than for other comparable drives.

Total cost of ownership is mainly defined by the operational cost. Therefore operational costs are the most important factor in selecting a new drive.





# 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

Any information, including, but not limited to information on selection of product, its application or use, product design, weight, dimensions, capacity or any other technical data in product manuals, catalogues descriptions, advertisements, etc. and whether made available in writing, orally, electronically, online or via download, shall be considered informative, and is only binding if and to the extent, explicit reference is made in a quotation or order confirmation. Danfoss cannot accept any responsibility for possible errors in catalogues, brochures, videos and other material. Danfoss reserves the right to alter its products without notice. This also applies to products ordered but not delivered provided that such alterations can be made without changes to form, fit or function of the product. All trademarks in this material are property of Danfoss A/S or Danfoss group companies. Danfoss and the Danfoss logo are trademarks of Danfoss A/S. All rights reserved.