ENGINEERING
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Selection Guide | VLT® HVAC Basic Drive FC 101

A compact and competitive solution
for applications with basic needs

50%

Energy costs savings

Typically, a 20% reduction in speed will yield 50% energy savings in VT applications. Start saving in your basic applications now !

www.danfoss.com/drives

VLT® THE REAL DRIVE

Makes your buildings perform

Danfoss commitment

Danfoss' longstanding experience in applying drives in HVAC systems has enhanced our ability to design a HVAC Basic drive to the exact needs in simple mass produced applications.

Save energy and CO_2 emission

Energy savings through more than 1.5 million VLT® HVAC Drives installed worldwide are estimated at 285 million MWhrs a year. This equals the annual energy consumption of 60 million households and has an impact on the annual CO_2 emissions – a reduction of 180 million tonnes!

A wealth of knowledge

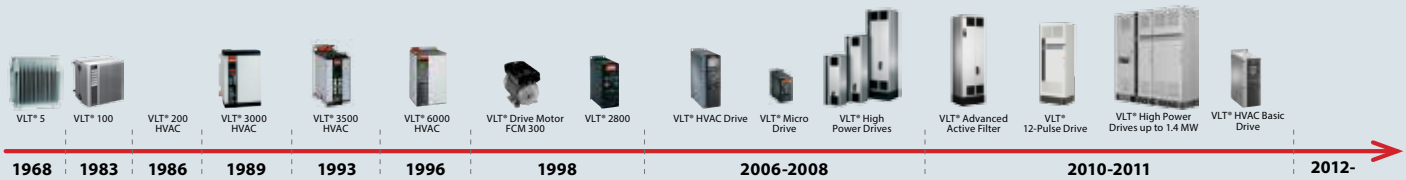
The various applications incorporated within high performance buildings are well understood by Danfoss and as global market leader we have built a wealth of knowledge and developed products and technology to ensure we meet and shape future trends in HVAC.

Danfoss HVAC application knowledge will ensure that the investment made in VLT® drives provide a qualified return.

Certify your building

Today the prime focus is on overall buildings performance which includes design, construction, efficiency, sustainability and the environmental impact of buildings in the future.
Energy efficient products form part of this overall plan. In many countries around the world the evaluation of high performance buildings falls under the banner LEED. Danfoss VLT Drives helps you to reduce the energy consumption in your building and to fulfill the highest standards set by these certification standards.

Proven HVAC experience



For simple fan and pump applications

User-friendly, distributed intelligence and reduced power consumption are beneficial for fan applications. Basic AHU functions enable the VLT® HVAC Basic Drive to control a wide range of functions. Pump-specific features developed in cooperation with OEMs, contractors and manufacturers around the world.

Fire Override Mode

Fire Override Mode prevents the VLT® HVAC Basic Drive from stopping for self-protecting reasons. In this mode it will continue vital fan operation regardless of control signals, warnings or alarms.
Fire Override Mode helps keep fire escape routes free of smoke and ensures secure and continued operation within applications such as stair-well pressurization, car park exhaust fans, smoke exhaust and essential service functions.
Fire mode is clearly indicated on the display to prevent any confusion. When set, the drive will override self protection and will continue operation despite the possibility of permanent damage in case of over-heating or overload. The vital goal is to keep the motor running even if it means self-destruction.

Skip frequencies

By pressing a few buttons on the 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

The drive can, from the speed/current, 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, maximises the energy savings, reduces noise and extends the lifetime of the entire system.

The Danfoss EC+ concept

The Danfoss EC+ concept allows PM motors with non IEC or IEC conform dimensions to be used with Danfoss VLT® frequency converters. Danfoss has integrated the necessary control algorithm in the existing VLT® converter series. This means that there are no changes for the operator. After entering the relevant motor data, the user benefits from the high motor efficiency of EC technology.

Advantages of the EC+ concept

- Free choice of motor technology: PM or asynchronous with the same frequency converter
- Device installation and operation remain unchanged
- Manufacturer independence in the choice of all components like fans, motors etc.
- Superior system efficiency thanks to a combination of individual components with optimum efficiency
- Retrofitting of existing systems possible
- Wide range of rated powers for standard and PM motors

VLT® HVAC Basic Drive

The VLT® HVAC Basic Drive is a competitive drive for simple applications – with basic needs.

Easy commissioning
Its Quick Menu wizzard makes normal set-up and operation easy.

Maintenance free
Due to a series of self-protecting and monitoring features, the VLT® HVAC Basic Drive 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 Basic Drive is easily mounted inside a HVAC unit or panel, reducing overall enclosure costs.

Built-in mains filters
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 reducing need for other system components
- Ease of installation and set-up

Competitive performance
- Up to 98.5% efficiency
- Automatic Energy Optimisation
- System diagnostics

VLT® HVAC Basic Drive product range:
3 x 200 – 240 V..... 0.25 – 45 kW
3 x 380 – 480 V..... 0.37 – 90 kW
3 x 525 – 600 V..... 2.2 – 90 kW

Available enclosure ratings:
- IP 20
- IP 21/UL Type 1 (separate option kit)
- IP 54

Intuitive control panel
- 2-line alphanumeric display
- 7 languages + numeric menu
- Status LED's
- Quick menus (wizard for open loop applications, closed loop applications, and motor setup)
- IP 54 when mounted in a panel front
- Password protection
- Same parameter structure as the Danfoss VLT® FC - family drives
- Removable under operation (IP20)
- Upload and download parameters (LCP copy function)

Comparision of limits EN 55011/61800-3
The built-in EMC filter makes the VLT® HVAC Basic Drive conform to the limits for category C1 and C2 according to EN 61800-3, with no additional external components needed, even with long motor cables. However, more importantly in practice is the compliance with the environmental standard EN 55011, Class B (residential) and Class A1 (industrial). This ensures reliable system operation in full compliance with all requirements for EMC in the operating environments and eliminates required product warnings and restrictions prescribed by the standard, if the drive used does not conform to category C1.

Categories according to EN 61800-3	C1	C2	C3	C4
Limits according to EN 55011	Class B	Class A1	Class A2	Exceeding class A2

IP 21/ Type 1 Kit
The IP 21/ Type 1 kit is used for installation of VLT® HVAC Basic Drives in dry environments where dripping water can occour. The enclosure kits are available for all frame sizes.
- PG 16 and PG 21 holes for cable glands

Ordering number LCP & kit
- 132B0201 (Mounting kit for LCP including fasteners, 3 m cable and gasket).
- 132B0200 (Alpha Numeric Local Control Panel - to be ordered separately for IP20 units – it is delivered as standard for IP 54 units).

LCP Panel Mounting Kit
For easy installation of the local control panel in a cabinet door.
- IP 54 (front)
- Thumb screws for tool-free installation
- Incl. 3 meters of cables in industry quality (also available separately)
- Easy to install

Ordering codes IP21/ Type 1 kit

Frame size	IP 21 kit	UL Type 1 kit	Decoupling plate
H1	132B0212	132B0222	132B0202
H2	132B0213	132B0223	132B0202
H3	132B0214	132B0224	132B0204
H4	132B0215	132B0225	132B0205
H5	132B0216	132B0226	132B0205
H6	132B0217	132B0217	132B0207
H6	132B0217	132B0227	132B0242
H7	132B0218	132B0218	132B0208
H7	132B0218	132B0218	132B0243
H8	132B0219	132B0219	132B0209

Enclosure protection options

IP 20,Type1/IP21, IP54 enclosures

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 IP 20, Type 1/IP 21 (with option) and IP 54 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 (Basic unit without extensions)

Main supply (L1, L2, L3)	
Supply voltage	200 – 240 V ±10%
Supply voltage	380 – 480 V ±10%
Supply voltage	525 – 600 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 programable
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 20/Chassis (IP 21/Type 1 optional kit) 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 up-time
– Electronic thermal motor protection against overload
– Temperature monitoring of the heatsink ensures that the frequency converter trips if the temperature reaches 95° C ± 5° C.
– The frequency converter is protected against short-circuits on motor terminals U, V, W.
– The frequency converter is protected against earth faults on motor terminals U, V, W.
– Protection against mains phase loss

Powers and currents

200 – 240 VAC

Enclosure 200 – 240 VAC	IP 20/Chassis		H1				H2	H3	H4		H5
			PK25	PK37	PK75	P1K5	P2K2	P3K7	P5K5	P7K5	P11K
Typical Shaft Output		[kW]	0.25	0.37	0.75	1.5	2.2	3.7	5.5	7.5	11
		[HP]	0.33	0.5	1	2	3	5	7.5	10	15
Output Current (3 x 200 – 240 V)	Continuous	[A]	1.5	2.2	4.2	6.8	9.6	15.2	22	28	42
	Intermittent	[A]	1.7	2.4	4.6	7.5	10.6	16.7	24.2	30.8	46.2
Max. cable size Mains, motor		[mm²] ([AWG])	4/10						16/6		
Max. Input Current (3 x 200 – 240 V)	Continuous	[A]	1.1	1.6	2.8	5.6	8.8/7.2	14.1/12	21/18	28.3/24	41/38.2
	Intermittent		1.2	1.8	3.1	6.2	9.5/7.9	15.5/13.2	23.1/19.8	31.1/26.4	45.1/42
Environment											
Estimated power loss at rated max. load, best case		[W]	12	15	21	48	80	97	182	230	369
typically			14	18	26	60	182	120	204	268	386
Weight		[kg]	2.0			2.1	3.4	4.5	7.9		9.5
Efficiency [%], best case			97.0	97.3	98.0	97.6	97.1	97.9	97.3	97.5	97.2
typically			96.5	96.8	97.6	97.0	96.3	97.4	97	97.1	

Enclosure 200 – 240 VAC	IP 20/Chassis		H6	H7		H8		
			P15K	P18K	P22K	P30K	P37K	P45K
Typical Shaft Output		[kW]	15.0	18.5	22.0	30.0	37.0	45.0
		[HP]	20.0	25.0	30.0	40.0	50.0	60.0
Output Current (3 x 200 – 240 V)	Continuous	[A]	59.4	74.8	88.0	115.0	143.0	170.0
	Intermittent	[A]	65.3	82.3	96.8	126.5	157.3	187.0
Max. cable size Mains, motor		[mm²] ([AWG])	35/2		50/1		95/0	120/(4/0)
Max. Input Current (3 x 200 – 240 V)	Continuous	[A]	52.7	65.0	76.0	103.7	127.9	153.0
	Intermittent		58.0	71.5	83.7	114.1	140.7	168.3
Environment								
Estimated power loss at rated max. load, best case		[W]	512	658	804	1015	1459	1350
typically			-	-	-	-	-	-
Weight		[kg]	24.5		36.0		51.0	
Efficiency [%], best case			97.0	96.9	96.8	97.0	96.5	97.3
typically			-	-	-	-	-	-

380 – 480 VAC

Enclosure 380-480 VAC	IP 20/Chassis		H1			H2			H3	
	IP 54		NA	I2					I3	
			PK37	PK75	P1K5	P2K2	P3K0	P4K0	P5K5	P7K5
Typical Shaft Output		[kW]	0.37	0.75	1.5	2.2	3	4	5.5	7.5
		[HP]	0.5	1	2	3	4	5	7.5	10
Output Current (3 x 380-440 V)	Continuous	[A]	1.2	2.2	3.7	5.3	7.2	9.1	12	15.5
	Intermittent [1 min. max]		1.3	2.4	4.1	5.8	7.9	9.9	13.2	17.1
Output Current (3 x 440-480 V)	Continuous	[A]	1.1	2.1	3.4	4.8	6.3	8.2	11	14
	Intermittent [1 min. max]		1.2	2.3	3.7	5.3	6.9	9.0	12.1	15.4
Max. cable size Mains, motor	IP 20	[mm²] ([AWG])	4/10							
	IP 54									
Max. Input Current (3 x 380-440 V)	Continuous	[A]	1.2	2.1	3.5	4.7	6.3	8.3	11.2	15.1
	Intermittent [1 min. max]		1.3	2.3	3.9	5.2	6.9	9.1	12.3	16.6
Max. Input Current (3 x 440-480 V)	Continuous	[A]	1.0	1.8	2.9	3.9	5.3	6.8	9.4	12.6
	Intermittent [1 min. max]		1.1	2	3.2	4.3	5.8	7.5	10.3	13.9
Environment										
Estimated power loss at rated max. load		[W]	13	21	46	46	66	95	104	159
Weight	IP 20	[kg]	2.0		2.1	3.3		3.4	4.3	4.5
	IP 54					5.3			7.2	
Efficiency [%]			97.8	98.0	97.7	98.3	98.2	98.0	98.4	98.2

Enclosure 380-480 VAC	IP 20/Chassis		H4		H5		H6		H7			H8
	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 20	[mm²] ([AWG])	16/6				35/2			50/1	95/0	120/250
	IP 54		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
Environment												
Weight	IP 20	[kg]	7.9		9.5		24.5			36		51
	IP 54		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

525 – 600 VAC

Enclosure 525 – 600 VAC	IP 20/Chassis		H9				H10		H6	
			P2K2	P3K0	P5K5	P7K5	P11K	P15K	P22K	P30K
Typical Shaft Output		[kW]	2.2	3.0	5.5	7.5	11.0	15.0	22.0	30.0
		[HP]	3.0	4.0	7.5	10.0	15.0	20.0	30.0	40.0
Output Current (3 x 525 – 550 V)	Continuous	[A]	4.1	5.2	9.5	11.5	19.0	23.0	36.0	43.0
	Intermittent		4.5	5.7	10.5	12.7	20.9	25.3	39.6	47.3
Output Current (3 x 551 – 600 V)	Continuous	[A]	3.9	4.9	9.0	11.0	18.0	22.0	34.0	41.0
	Intermittent		4.3	5.4	9.9	12.1	19.8	24.2	37.4	45.1
Max. cable size Mains, motor		[mm²] ([AWG])	4/10				10/8		35/2	
Max. Input Current (3 x 525 – 550 V)	Continuous	[A]	3.7	5.1	8.7	11.9	16.5	22.5	33.1	45.1
	Intermittent		4.1	5.6	9.6	13.1	18.2	24.8	36.4	49.6
Max. Input Current (3 x 551 – 600 V)	Continuous	[A]	3.5	4.8	8.3	11.4	15.7	21.4	31.5	42.9
	Intermittent		3.9	5.3	9.2	12.5	17.3	23.6	34.6	47.2
Environment										
Estimated power loss at rated max. load		[W]	8.4	112.0	178.0	239.0	360.0	503.0	607.0	820.0
Weight		[kg]	6.6				11.5		24.5	
Efficiency [%]			97.0						97.5	

Enclosure 525 – 600 VAC	IP 20/Chassis		H7		H8	
			P45K	P55K	P75K	P90K
Typical Shaft Output		[kW]	45.0	55.0	75.0	90.0
		[HP]	60.0	70.0	100.0	125.0
Output Current (3 x 525 – 550 V)	Continuous	[A]	65.0	87.0	105.0	137.0
	Intermittent		71.5	95.7	115.5	150.7
Output Current (3 x 551 – 600 V)	Continuous	[A]	62.0	83.0	100.0	131.0
	Intermittent		68.2	91.3	110.0	144.1
Max. cable size Mains, motor		[mm²] ([AWG])	50/1		95/0	120/ (4/0)
Max. Input Current (3 x 525 – 550 V)	Continuous	[A]	66.5	81.3	109.0	130.9
	Intermittent		73.1	89.4	119.9	143.9
Max. Input Current (3 x 551 – 600 V)	Continuous	[A]	63.3	77.4	103.8	124.5
	Intermittent		69.6	85.1	114.2	137.0
Environment						
Estimated power loss at rated max. load		[W]	972.0	1182.0	1281.0	1437.0
Weight		[kg]	36.0		51.0	
Efficiency [%]			98.0		98.4	98.5

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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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