ENGINEERING
TOMORROW

Selection Guide | VLT® HVAC Basic Drive FC 101

A compact and competitive solution for standard applications

50%

energy cost saving is typical for 20% reduction in speed in VT applications such as fans and pumps

danfossdrives.com | VLT®

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 experts with HVAC application knowledge support you in making an efficient system design and investing wisely for documented returns.

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

Ideal for simple fans, pumps, and compressors

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.

No load / Broken Belt warning

Many fan applications are still operated by a belt. This function monitors whether the belt is still in use, has ceased operation due to wear and tear. The built-in maintenance program helps you to ensure belt inspection at regular intervals.

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

In situations with low or no flow, the drive enters sleep mode to conserve energy. When the pressure falls below the pre-defined setpoint, the drive starts automatically. Compared to continuous operation this method reduces energy costs and equipment wear and tear, extending the lifetime of the application.

Sensorless pump control

Eliminate the need for external pressure transmitters, using this drive. The drive delivers sensorless pump control, meaning no external pressure transmitter is required.

Constant torque for air compressors

The drive has a dedicated constant torque mode for air compressor applications.

Quiet operation

Direct control of the cooling fan ensures that the drive operates as quietly as possible. The cooling fan adjusts precisely to the load, for optimum efficiency and energy savings.

Simple timer function

There is no need for an external timer, since you can use the integrated timer in the drive. This simple timer function is useful for testing the motor, for example in Fire Mode applications.

Use the motor of your choice

VLT® HVAC Basic Drive FC 101 is equally compatible with induction and permanent magnet (PM) motors for the full power range. There is no need to change out motor type when retrofitting the drive.

More robust when power is unstable

Voltage dips or power interruptions in the grid cause huge problems in your systems. It is reassuring to know that integrated power loss ride-through capability in the drive ensures more stable and robust operation.

Voltage sag immunity

With Semi 47 certification, you can be sure that this drive is performs robustly, whatever the quality of the power supply.

Improved power factor with VLT® Advanced Harmonic Filter AHF 010

Are you using VLT® Advanced Harmonic Filter AHF 010 to mitigate harmonics? Use the relay output on the drive to control this passive harmonic filter, to achieve a higher power factor at zero load or partial load.

VLT® HVAC Basic Drive

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

Easy commissioning

The Quick Menu wizard makes it easy to set up and operate the drive.
In situations where there is no mains power, use the VLT® Mains-Free Interface tool. It gives you an easy way to configure drives on the production line, and saves time and effort for installation and service technicians.

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)
- VLT® Control Panel LCP 32 makes it easier to program the drive, with a choice of five languages in the display.

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

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 122° F.

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.

Easy-to-use HMI

VLT® Control Panel LCP 32
Once you know one VLT® drive, you know them all. You get the same look and feel, with no need for extra training.

VLT® Control Panel LCP 32 offers you an easily readable graphical display with clear white backlight. It is pluggable with a range of time-saving functions:

- LCP copy function
- 5 languages and numeric programming if language is not supported
- Quick menus. There are set-up wizards for open loop applications, closed loop applications, and motor setup
- Alarm/warning
- Convenient commissioning and troubleshooting

Freedom to change settings prior to installation

VLT® Mains-free Interface

Did you know you can change the settings of the FC 101 drive with no connection to mains power supply? Just connect to a PC using the VLT® Mains-free Interface.

The VLT® Mains-free Interface connects to the PC via a USB 2.0 interface.
A Mini-B USB connector is located at the front, and a standard drive connector is located on the back.
Both the VLT® Mains-free Interface and the drive get a supply of current from the USB ports on the PC.

For drive enclosure sizes H1–H5 and I2–I4:

The required current is within the standard capability of a single USB port. Use a single USB type A connector.

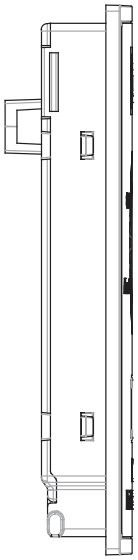
For drive enclosure sizes H6–H10 and I6–I8:

More than 500 mA current is required (500 mA is the maximum standard current a USB port can deliver).

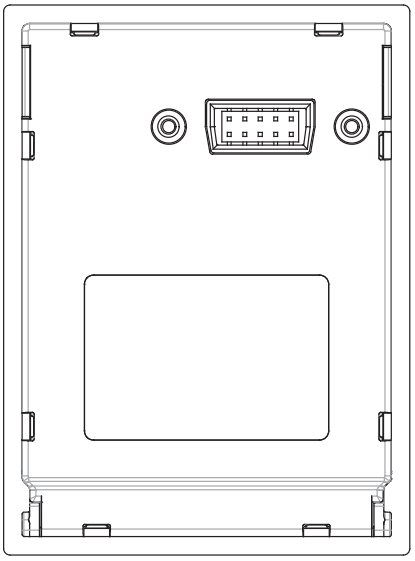
Connect to the PC using a double USB type A cable.

The drive obtains the required current via both of the USB ports. The second USB port is marked "Auxiliary power only".

Front view



Side view



Back view

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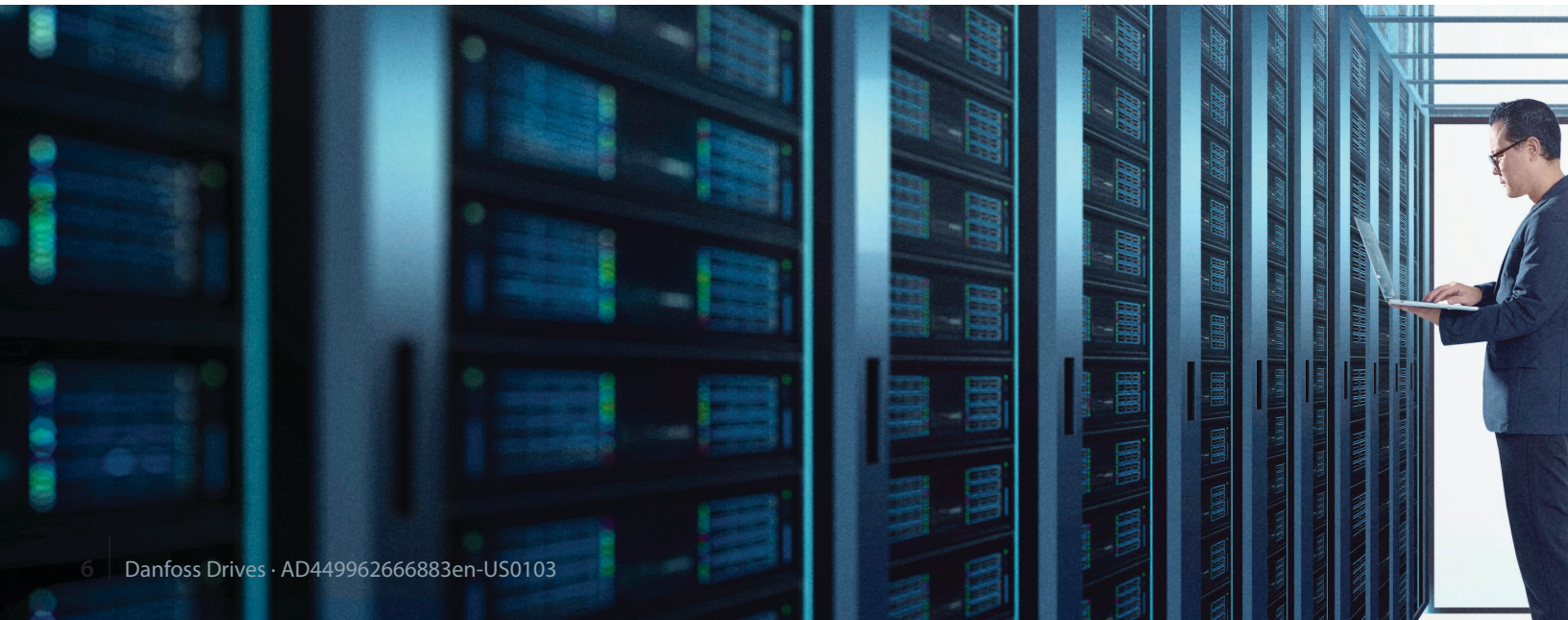


Technical data

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 122° F
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 203° F ± 9° F.
- 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

Compliance

Semi 47 certified for voltage sag immunity compliance

Electrical data - H and I enclosures

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
Weight		[kg]	24.5		36.0		51.0	
Efficiency [%], best case			97.0	96.9	96.8	97.0	96.5	97.3

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

Accessories

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

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
- ncl. 3 meters of cables in industry quality (also available separately)
- Easy to install

Ordering number LCP & kit

- 132B0201 (Mounting kit for LCPi ncluding fasteners, 3 m cable and gasket).
- 132B0200 Alpha-numeric VLT® Control Panel LCP 31 - to be ordered separately for IP20 units – it is delivered as standard for IP 54 units).

- 132B9221
  VLT® Control Panel LCP 32
  Graphical local control panel with choice of 5 languages: English, Chinese, French, German, or Spanish

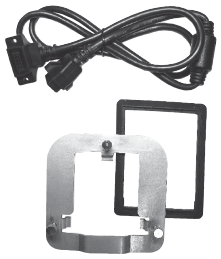
- 132B0203
  FC 101 LCP RJ 45 Plug Converter
  This plug converter enables you to easily extend the cable for remote mounting. Minimum order quantity is 12 sets (1 box).

VLT® Mains-Free Interface

- 132B9222
  Use this USB 2.0 based programming interface for PC programming of the drives, with no need for mains power.
  Set parameters and flash firmware.
  Use this interface together with VLT® Motion Control Tool MCT 10.

Ordering codes IP21/ Type 1 kit

Enclosure	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



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Minimize energy usage while maximizing comfort levels with VLT® HVAC Basic Drive

The VLT® HVAC Basic Drive is installed on a broad range of heating, ventilation and air conditioning applications in new and existing buildings and infrastructural systems all over the world.

VLT® drives enhance air quality and indoor comfort levels, improve control and save energy, ensure better asset protection, reduce maintenance costs and increase reliability.

The daily load variation in HVAC facilities is considerable. Variable speed control of electrical motors has proved to be one of the most effective cost-reducing measures available.

VLT® drive delivers reliable, low-energy ventilation for 40 years

Learn how the compact VLT® HVAC Basic Drive FC 101 was installed in an industrial kitchen. It replaced a VLT® 5 drive, to reduce electricity consumption by 390 MWh each year.

Read the case story

Discover more case stories for the HVAC industry here: **https://www.danfoss.com/en-us/markets/#/**

Follow us and learn more about AC drives