VFD68 Variable Frequency Drives Product Bulletin

LIT-12012068

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Description

The VFD68 Variable Frequency Drive provides three-phase motor speed control in a variety of HVACR applications. The VFD68 drive is designed primarily for condenser fan speed control on HVAC and refrigeration condensing units, but can also be set up to control a variety of pumps, blowers, and fans.

The VFD68 drive accepts input signals from P499 Electronic Pressure Transducers, or other devices that provide a 0–5 VDC, 0–10 VDC, or 4–20 mA signal.

The application-specific design of the VFD68 drive provides a simple interface, which makes the drive easy to understand and operate. You can quickly and easily reconfigure the VFD68 drive to control variable speed pumps in cooling and heating applications, or to control variable speed supply fans in VAV applications.

The VFD68 drive is an RS485, RTU-compliant ModBus® subordinate device and can be integrated into a ModBus network.

Figure 1: VFD68 Variable Frequency Drives



Features and Benefits

Selectable Input Types

Allow use with 0–5 VDC (ratiometric), 0–10 VDC, or 4–20 mA input signals from transducers, sensors, and controllers.

High Input Signal Selection of Two Similar Inputs (230 or 460 volt models only)

Provides fan speed control of dual circuit condensing units, based on the highest pressure circuit.

Compact Design

Provides for easy and flexible installation.

Three-Phase, 230, 460, or 575 VAC Models

Can control a wide variety of three-phase motors ranging up to 10 hp.

Simple and Advanced End-User Settings

Provide quick and simple application setup and operation, as well as advanced setup parameters for custom applications.

Application

- **Important:** Use this VFD68 Variable Frequency Drive only as an operating control. Where failure or malfunction of the VFD68 Drive could lead to personal injury or property damage to the controlled equipment or other property, additional precautions must be designed into the control system. Incorporate and maintain other devices, such as supervisory or alarm systems or safety or limit controls, intended to warn of or protect against failure or malfunction of the VFD68 Drive.
- **Important:** Utiliser ce VFD68 Variable Frequency Drive uniquement en tant que dispositif de régulation. Lorsqu'une défaillance ou un dysfonctionnement du VFD68 Drive risque de provoquer des blessures ou d'endommager l'équipement contrôlé ou un autre équipement, la conception du système de contrôle doit intégrer des dispositifs de protection supplémentaires. Veiller dans ce cas à intégrer de façon permanente d'autres dispositifs, tels que des systèmes de supervision ou d'alarme, ou des dispositifs de sécurité ou de limitation, ayant une fonction d'avertissement ou de protection en cas de défaillance ou de dysfonctionnement du VFD68 Drive.

The VFD68 drive accepts input signals from a variety of pressure transducers, temperature sensors, and low-voltage controllers to provide continuous response to changing condenser load conditions.

The VFD68 drive allows the system to:

- maintain optimum condenser head pressure
- operate in low ambient temperature conditions down to -40°C (-40°F)
- reduce short-cycling, which occurs when using On/Off fan controls
- maintain a more stable evaporator temperature
- operate more efficiently, reducing electricity cost

The VFD68 drive can also:

- help optimize compressor operation, reduce wear, and extend compressor life by stabilizing the condenser head pressures
- reduce motor repair and replacement costs by eliminating the condenser fan short-cycling
- extend refrigerated product life and provide more consistent comfort cooling by stabilizing evaporator temperatures

Operation

Depending on the model, the VFD68 drive's mode of operation is indicated by LEDs or icons on the drive's operation panel (Figure 2 or Figure 3).

PU Mode: The Parameter Units (PU) mode is manual control mode. In PU mode, the drive and motor are completely controlled using the buttons and setting dial on the drive's user interface. No external analog signals or network signals control the drive operation. The PU mode is typically used to set up, test, and troubleshoot the drive and motor operation using controlled input signal values.

EXT Mode: In the External (EXT) mode, the drive and motor are responding to a signal or signals from one or two analog input signal devices such as pressure transducers or analog controllers. This is the typical mode of operation for the drive when it is controlling a condenser fan or other three-phase HVACR motor application.

PU/EXT Mode: In PU/EXT mode, the drive responds to the connected external signal devices, and you can edit the drive setup values. The PU/EXT mode is typically used to set up your drive for initial operation, or to adjust setup parameters on an operating application.

Operation Panel on 230 VAC and 460 VAC Models

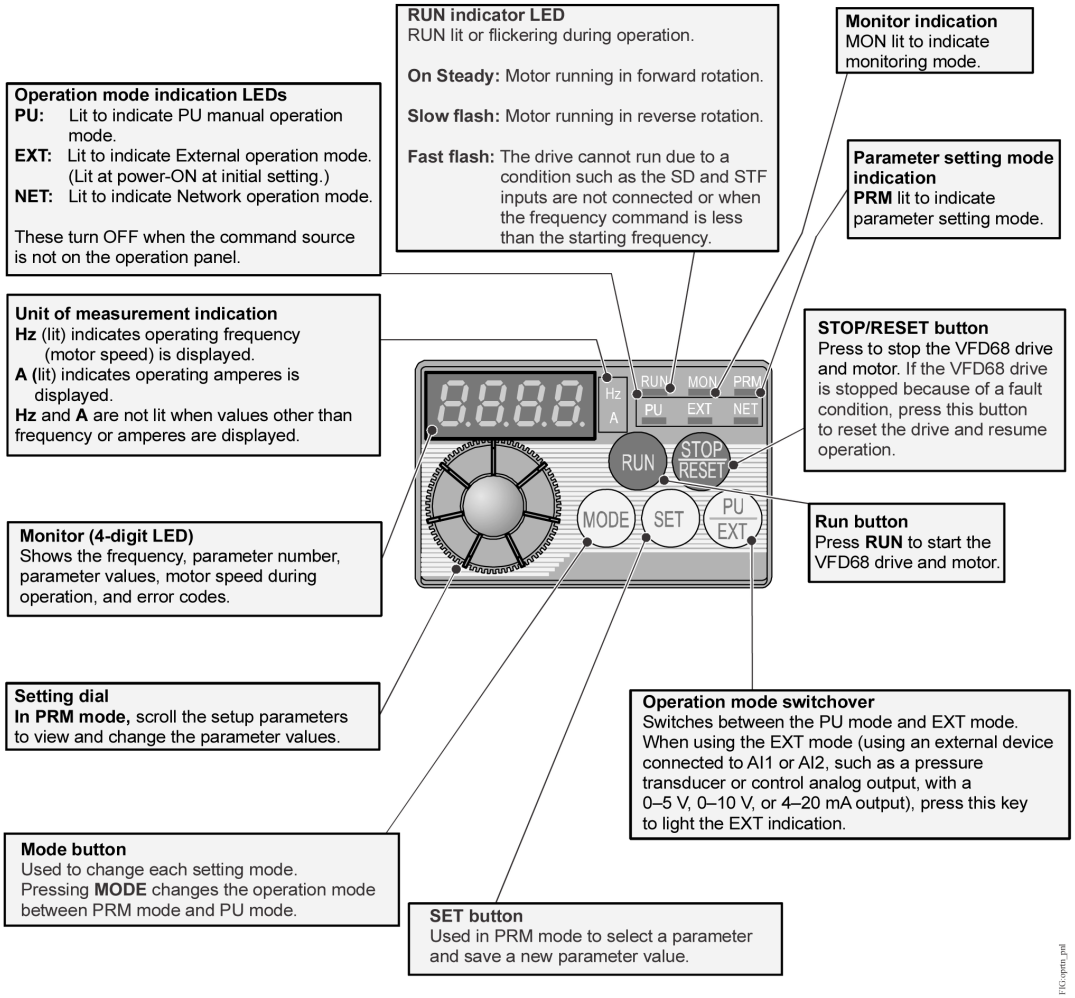
The RUN, MON, and PRM LEDs provide drive status and indicate the type of information being displayed on the operation panel (Figure 2).

RUN LED: The LED state (on steady, flashing, or flickering) provides information regarding the drive and motor run status.

MON LED: Indicates that the monitor is displaying the drive's run status. Press **SET** to scroll through run frequency, output amperes, and output voltage.

PRM LED: Indicates that the monitor is set to display parameters and parameter values and allows you to view and edit parameter values.

Figure 2: Operation Panel for 230 VAC and 460 VAC Models



Operation Panel for 575 VAC Models

Figure 3: Operation Panel

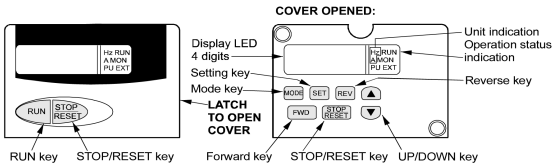


Table 1: Operation Panel Keys

Key	Description
RUN	Used to give a start rotation command.
STOP RESET	• Used to stop operation. • Used to reset the VFD68 Drive when the output stops due to activation of the protection function.
MODE	Used to select the operation mode or setting mode.
SET	Used to determine the frequency and parameter settings.
▲ ▼	• Used to increase or decrease the running frequency consecutively. Hold down the key to change the frequency. • Used to change the parameter setting consecutively, when in the setting mode. Press the key to change the parameter setting.
FWD	Used to give a forward rotation command.
REV	Used to give a reverse rotation command.
STOP RESET	• Used to stop operation. • Used to reset the VFD68 Drive when the output stops due to activation of the protection function.

Table 2: Unit Indications and Operating Status Indications

Indication	Description
Hz	Lit to indicate frequency
A	Lit to indicate the current (Amperes)
RUN	Lit to indicate drive operation Steady light = forward rotation Flickering light = reverse rotation
MON	Lit to indicate monitor display mode
PU	Lit to indicate the PU operation mode
EXT	Lit to indicate the external operation mode

Selecting a Motor

➤ **Important:** When selecting the motor, do not exceed the maximum output current rating of the VFD68 drive.

Required Motor Specifications

Motors used with the VFD68 drive must:

- be AC induction three-phase motors that are UL Recognized and CSA Certified, or equivalent
- be rated for:
  - 230 VAC, 50/60 Hz
  - 460 VAC, 50/60 Hz
  - 575 VAC, 60 Hz
- have an Inverter Rating (460 VAC motors)
- have Insulation Class F or better

The VFD68 drive is intended for use with variable speed motors that are rated for 40:1 operation.

Multiple Motors

➤ **Important:** Do not control both single-phase and three-phase motors with the same VFD68 drive.

A VFD68 drive can control multiple motors wired in parallel; however, the sum of the Full Load Amperes (FLA) ratings for the motors must not exceed the maximum output current rating of the VFD68 drive, including any de-rating due to altitude. Refer to the *VFD68 Variable Frequency Drive Technical Bulletin (Part No. 24-7664-3051)* for de-rating information.

If three-phase power is not available as supply power for the VFD68 drive, refer to the *VFD68 Variable Frequency Drive Technical Bulletin (Part No. 24-7664-3051)*.

Ordering Information

Use Figure 4 and Table 3 to select the desired model of VFD68 Drive. For example, a VFD68BGG would be rated for 230 VAC ±10% and 2 horsepower. See Table 4 through Table 6 for available production models.

Figure 4: VFD68 Drive Model

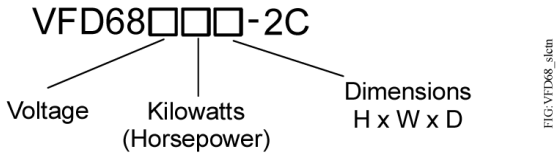


Table 3: VFD68 Drive Model Information

	Voltage	kW (Horsepower)	Dimensions, H x W x D, mm (in.)
B	200–240 VAC, 50/60 Hz	0.1 (1/8)	128 x 68 x 81 (5 x 2-11/16 x 3-3/16)
C	400–480 VAC, 50/60 Hz	0.2 (1/4)	128 x 68 x 113 (5 x 2-11/16 x 4-7/16)
D	575 VAC, 50 Hz	0.4 (1/2)	128 x 68 x 133 (5 x 2-11/16 x 5-1/4)
F		0.75 (1)	128 x 108 x 130 (5 x 4-1/4 x 5-1/8)
G		1.5 (2)	128 x 108 x 136 (5 x 4-1/4 x 5-5/16)
H		2.2 (3)	128 x 108 x 156 (5 x 4-1/4 x 6-1/8)
J		3.7 (5)	128 x 108 x 166 (5 x 4-1/4 x 6-1/2)
K		5.5 (7-1/2)	128 x 170 x 142 (5 x 6-11/16 x 5-5/8)
L		7.5 (10)	150 x 220 x 155 (5-15/16 x 8-11/16 x 6-1/8)
M		11 (15)	150 x 140 x 136 (5-15/16 x 5-1/2 x 5-5/16)
N		15 (20)	150 x 220 x 148 (5-15/16 x 8-11/16 x 5-13/16)
P			260 x 220 x 190 (10-1/4 x 8-11/16 x 7-1/2)

➤ **Important:** Frequently starting and stopping the VFD shortens the lifespan of the VFD68 drive. In applications where the drive will start or stop frequently, select a VFD which has an output current rating that is 1.5 to 2 times greater than the FLA current rating of the three-phase motor.

Selection Charts

Table 4: 230 VAC ±10% Production Models

Product Code Number	Description
VFD68BBB-2C	VFD68 Drive; 0.1 kw (1/8 hp); 128 x 68 x 81 mm (5 x 2-11/16 x 3-3/16 in.)
VFD68BCB-2C	VFD68 Drive; 0.2 kw (1/4 hp); 128 x 68 x 81 mm (5 x 2-11/16 x 3-3/16 in.)
VFD68BDC-2C	VFD68 Drive; 0.4 kw (1/2 hp); 128 x 68 x 113 mm (5 x 2-11/16 x 4-7/16 in.)
VFD68BFD-2C	VFD68 Drive; 0.75 kw (1 hp); 128 x 68 x 133 mm (5 x 2-11/16 x 5-1/4 in.)
VFD68BGG-2C	VFD68 Drive; 0.5 kw (2 hp); 128 x 108 x 136 mm (5 x 4-1/4 x 5-5/16 in.)
VFD68BHG-2C	VFD68 Drive; 2.2 kw (3 hp); 128 x 108 x 136 mm (5 x 4-1/4 x 5-5/16 in.)
VFD68BJK-2C	VFD68 Drive; 3.7 kw (5 hp); 128 x 170 x 142 mm (5 x 6-11/16 x 5-5/8 in.)
VFD68BKL-2C	VFD68 Drive; 5.5 kw (7-1/2 hp); 150 x 220 x 155 mm (5-15/16 x 8-11/16 x 6-1/8 in.)
VFD68BLL-2C	VFD68 Drive; 7.5 kw (10 hp); 150 x 220 x 155 mm (5-15/16 x 8-11/16 x 6-1/8 in.)
VFD68BMP-2C	VFD68 Drive; 11 kw (15 hp); 260 x 220 x 190 (10-1/4 x 8-11/16 x 7-1/2)
VFD68BNP-2C	VFD68 Drive; 15 kw (20 hp); 260 x 220 x 190 (10-1/4 x 8-11/16 x 7-1/2)

Table 5: 460 VAC ±10% Production Models

Product Code Number	Description
VFD68CDF-2C	VFD68 Drive; 0.4 kw (1/2 hp); 128 x 108 x 130 mm (5 x 4-1/4 x 5-1/8 in.)
VFD68CFF-2C	VFD68 Drive; 0.75 kw (1 hp); 128 x 108 x 130 mm (5 x 4-1/4 x 5-1/8 in.)
VFD68CGG-2C	VFD68 Drive; 1.5 kw (2 hp); 128 x 108 x 136 mm (5 x 4-1/4 x 5-5/16 in.)
VFD68CHH-2C	VFD68 Drive; 2.2 kw (3 hp); 128 x 108 x 156 mm (5 x 4-1/4 x 6-1/8 in.)
VFD68CJJ-2C	VFD68 Drive; 3.7 kw (5 hp); 128 x 108 x 166 mm (5 x 4-1/4 x 6-1/2 in.)
VFD68CKL-2C	VFD68 Drive; 5.5 kw (7-1/2 hp); 150 x 220 x 155 mm (5-15/16 x 8-11/16 x 6-1/8 in.)
VFD68CLL-2C	VFD68 Drive; 7.5 kw (10 hp); 150 x 220 x 155 mm (5-15/16 x 8-11/16 x 6-1/8 in.)
VFD68CMP-2C	VFD68 Drive; 11 kw (15 hp); 260 x 220 x 190 (10-1/4 x 8-11/16 x 7-1/2)
VFD68CNP-2C	VFD68 Drive; 15 kw (20 hp); 260 x 220 x 190 (10-1/4 x 8-11/16 x 7-1/2)

Table 6: 575 VAC +5/-10% Production Models

Product Code Number	Description
VFD68DFM-2C	VFD68 Drive; 0.75 kw (1 hp); 150 x 140 x 136 mm (5-15/16 x 5-1/2 x 5-5/16 in.)
VFD68DGM-2C	VFD68 Drive;1.5 kw (2 hp); 150 x 140 x 136 mm (5-15/16 x 5-1/2 x 5-5/16 in.)
VFD68DHM-2C	VFD68 Drive; 2.2 kw (3 hp); 150 x 140 x 136 mm (5-15/16 x 5-1/2 x 5-5/16 in.)
VFD68DJN-2C	VFD68 Drive; 3.7 kw (5 hp); 150 x 220 x 148 mm (5-15/16 x 8-11/16 x 5-13/16 in.)
VFD68DKN-2C	VFD68 Drive; 5.5 kw (7-1/2 hp); 150 x 220 x 148 mm (5-15/16 x 8-11/16 x 5-13/16 in.)
VFD68DLN-2C	VFD68 Drive; 7.5 kw (10 hp); 150 x 220 x 148 mm (5-15/16 x 8-11/16 x 5-13/16 in.)

Table 7: Transducer Kits and Wire Harnesses

Product Code Number	Description	Accessory Information
P499RAPS100K P499RCPS100K	Electronic Pressure Transducer (-10 to 100 psis [sealed for wet and freeze/thaw applications] Range) and WHA-PKD3-200C Wire Harness	• Product code numbers ending in K are P499 kit models that include a P499 Pressure Transducer model and a WHA-PKD3-200C (2 m [6-1/2 ft]) Wire Harness. To order a single P499 Pressure Transducer model (without a WHA-PKD3-200C Wire Harness), replace the K with a C at the end of the P499 product code number. • P499RxP type models are 0.5 to 4.5 VDC ratiometric pressure transducers with Packard style electrical connections. • P499RAP type models have a 1/8 in. 27 NPT external thread (Style 49) pressure connection. • P499RCP type models have a 1/4 in. SAE 45° flare internal thread (7/16-20 UNF) with depressor (Style 47) pressure connection. • Refer to the *P499 Series Electronic Pressure Transducers Product/Technical Bulletin (LIT-12011190)* for more information on P499 Pressure Transducer models and the associated wire harnesses.
P499RAPS102K P499RCPS102K	Electronic Pressure Transducer (0 to 200 psis [sealed for wet and freeze/thaw applications] Range) and WHA-PKD3-200C Wire Harness	
P499RAP-101K P499RCP-101K	Electronic Pressure Transducer (0 to 100 psig Range) and WHA-PKD3-200C Wire Harness	
P499RAP-102C	Electronic Pressure Transducer (0 to 200 psig Range)	
P499RAP-105K P499RCP-105K	Electronic Pressure Transducer (0 to 500 psig Range) and WHA-PKD3-200C Wire Harness	
P499RAP-107K P499RCP-107K	Electronic Pressure Transducer (0 to 750 psig Range) and WHA-PKD3-200C Wire Harness	
WHA-PKD3-00C	Wire Harness, 2 m (6-1/2 ft)	
WHA-PKD3-400C	Wire Harness, 4 m (13 ft)	
WHA-PKD3-400C	Wire Harness, 6 m (19-5/8 ft)	

VFD68 Variable Frequency Drive technical specifications

Table 8: VFD68 Variable Frequency Drive

Specification	Description
Input Power Voltage/Frequency	230 VAC, 50 HZ (208/230 VAC, 60 Hz); 400 VAC, 50 Hz (460 VAC, 60 Hz); 575 VAC, 50 Hz; Continuous Duty
Output Voltage/Frequency	230 VAC, 50 HZ (208/230 VAC, 60 Hz); 400 VAC, 50 Hz (460 VAC, 60 Hz); 575 VAC, 50 Hz; Continuous Duty
Input Devices	Johnson Controls/PENN® P499 Electronic Pressure Transducers
PWM Carrier Frequency	Adjustable 0.7 to 15 kHz
Motor Requirements	Three-phase NEMA Design B motors required; Inverter-rated motors recommended
Overload Capacity	150% of ampere rating for 1 minute
Start/Stop	Use STF input to start or stop the motor
Ambient Conditions	Storage: -40 to 65°C (-40 to 149°F), 0 to 95% RH noncondensing
	Operating: -40 to 50°C (-40 to 122°F), 0 to 95% RH noncondensing
	Altitude: 1,000 m (3,300 ft) Maximum without derating
Enclosures	UL Type 1 (NEMA) Fan Cooled (230 VAC 1 hp and lower models do not have a fan)
Maximum High Voltage Wire Length	Up to 100 m (328 ft) between the VFD68 drive and the motor (using the appropriate wire gauge)
Compliance	North America: cULus Listed, UL 508C, CSA-C22.2 No. 14, File E244421; Industry Canada (IC) Compliant to Canadian ICES-003, Class B limits
CE	Europe: CE Mark - Johnson Controls declares that this product is in compliance with the essential requirements and other relevant provisions of the EMC Directive and the Low Voltage Directive.

Table 8: VFD68 Variable Frequency Drive

Specification	Description
	Australia: Regulatory Compliance Mark (RCM)
Dimensions (H x W x D)	Minimum: 128 x 68 x 81 mm (5 x 2-11/16 x 3-3/16 in.) Maximum: 260 x 220 x 190 mm (10-1/4 x 8-11/16 x 7-1/2 in.)
Shipping Weight	**230 VAC ±10% Production Models:** VFD68BBB, VFD68BCB: 0.5 kg (1.1 lb) VFD68BDC: 0.8 kg (1.8 lb) VFD68BFD: 1.0 kg (2.2 lb) VFD68BGG, VFD68BHG: 1.4 kg (3.1 lb) VFD68BJK: 1.8 kg (4.0 lb) VFD68BKL, VFD68BLL: 3.6 kg (8.0 lb) VFD68BMP, VFD68BNP: 6.5 kg (14.3 lb) **460 VAC ±10% Production Models:** VFD68CDF, VFD68CFF: 1.3 kg (2.9 lb) VFD68CGG: 1.4 kg (3.1 lb) VFD68CHH, VFD68CJJ: 1.5 kg (3.3 lb) VFD68CKL, VFD68CLL: 3.3 kg (7.3 lb) VFD68CMP, VFD68CNP: 6.5 kg (14.3 lb) **575 VAC +5/-10% Production Models:** VFD68DFM: 1.8 kg (3.96 lb) VFD68DGM, VFD68DHM: 2.0 kg (4.41 lb) VFD68DJN, VFD68DKN, VFD68DLN: 3.8 kg (8.38 lb)

North American emissions compliance

United States

This equipment has been tested and found to comply with the limits for a Class A digital device pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when this equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area may cause harmful interference, in which case the users will be required to correct the interference at their own expense.

Canada

This Class (A) digital apparatus meets all the requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numérique de la Classe (A) respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

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