

Inline duct fans [Fans, Pumps, Compressors]

"Inline duct fans" are installed in air ducts of straight-form.

Features of inline duct fans

"Inline duct fans" are connected directly to a shaft of motors. They don't have "V" formed belts or "V" formed pulleys. Therefore it is not necessary to maintenance these machines. Usually, the capacity range of "Inline duct fans" is small (up to 2.2kW).

Merits of inverter drives

When you don't need 100% air-flow, you can decrease motor speed of "Inline duct fans". In this case, it will save a lot of energy.

In generally,
 Airflow: proportional to motor rotation
 Load torque: proportional to the second power of motor rotation
 Energy: proportional to the third power of motor rotation

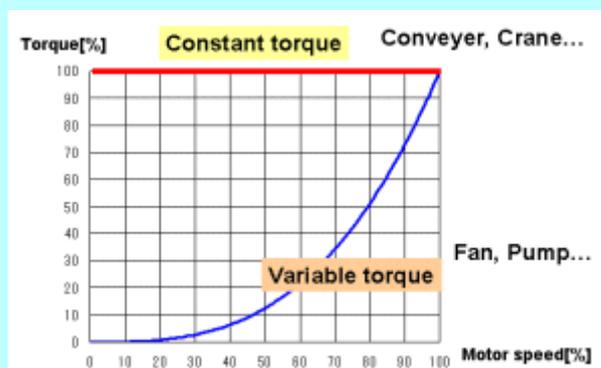
Point ex. Motor rotation is changing 1500min⁻¹ to 1350min⁻¹ (-10%).

Airflow: 90%
 Load torque: 81%
 Necessary power: 72.9%

Actual necessary power:
 72.9% / [inverter efficiency(95%)] = 77%.

Constant torque and variable torque characteristics

Point



Notices regarding the use of inverter drives

- Motor rating

The capacity range of the "Inline duct fan" is small. Sometimes, there is a 100V motor rating. In this case, please change the motor from 100V rating to 3 phase 200V rating. (The inverter is designed for 3 phase 200V or 400V motor.)

If you have only a single phase 100V power supply, please select the VF-nC3 series that has a line-up for single phase 100V input / 3 phase 200V output.

Point

VFNC3S-1001P (0.1kW)
VFNC3S-1002P (0.2kW)
VFNC3S-1004P (0.4kW)
VFNC3S-1007P (0.75kW)

- Acceleration and deceleration time

"Inline duct fans" have variable torque characteristics, and some of them have large load inertia. When you set a short acceleration/deceleration time you sometimes have the following problems:

While accelerating: Trip caused by over current

While decelerating: Trip caused by overvoltage

If you have a fixed acceleration/deceleration time please be careful with the inverter capacity selection.

- Motor capacity at high speed

Usually, you can't increase motor speed beyond its rated speed.

Ex. Change of speed to 110% will result in a load torque $110\% \times 110\% = 121\%$.

This load torque will overload the motor or inverter. In this case, you have to increase the motor and inverter capacity.

- Electromagnetic noise

The inverter is generating "electromagnetic noise".

If there are some high accuracy sensors or other sensitive equipment near the inverter drive, the inverter's noise may cause some trouble or a malfunction.

Electromagnetic noise can be avoided by installing an external noise filter or using a different wiring method.

- Harmonics

The inverter is generating "harmonics".

These harmonics sometimes cause a malfunction in other control equipment that is connected to the same power source.

Harmonics can be avoided by installing an external "reactor".

To decrease "harmonics", we recommend installing DC reactors in all our inverter models. (NOTE: 100V input models require AC reactors.)

Selection

In almost all cases, the capacity of the inverter is the same as the motor capacity. However if you have a fixed acceleration/deceleration time, the inverter capacity should be larger than the motor capacity.

Please confirm your motor's rated current.
[Motor's rated current] x 1.05 < [Inverter's rated current]

Point When you connect several motors to one inverter, please confirm the following:
[Total motor's rated current] x 1.1 < [Inverter's rated current]

In this case, the electric thermal function in the inverter can't protect all motors. Please install an external thermal relay for each motor.

Application samples

In case of "Inline duct fan", it is usually installed following operation methods:

- RUN and STOP operations by remote controls.
- Preset speed operations.

Preset speed operations

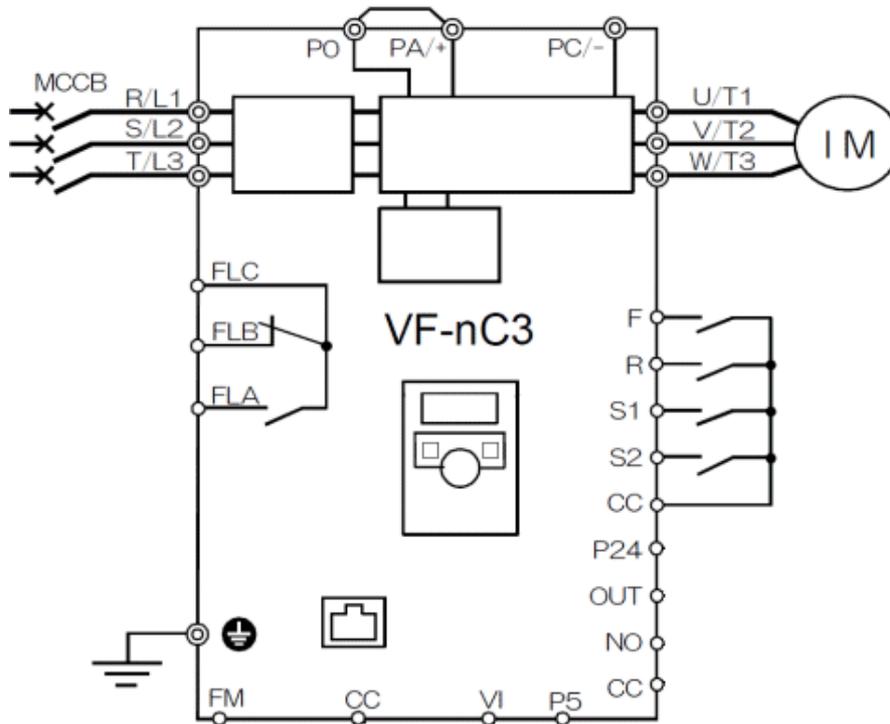
Preset speed (low, model, high) operations are necessary to connect like as the following table on the VF-nC3 series.

F	S1	S2	R	Operating frequency
0	-	-	-	Set by an internal potentiometer
0	0	-	-	20 Hz (Preset speed 1)
0	-	0	-	40 Hz (Preset speed 2)
0	-	-	0	60 Hz (Preset speed 4)

* "0" means that the signal turns on.

* The function of "R" terminal is necessary to change "Reverse operation" to "Preset speed command 3".

Connection diagram of the VF-nC3



Setting table for the VF-nC3

The following table shows settings of "remote control" and "preset speed operation" for TOSVERT VF-nC3.

And we recommend to set function of "auto-restart control" for "power failure".

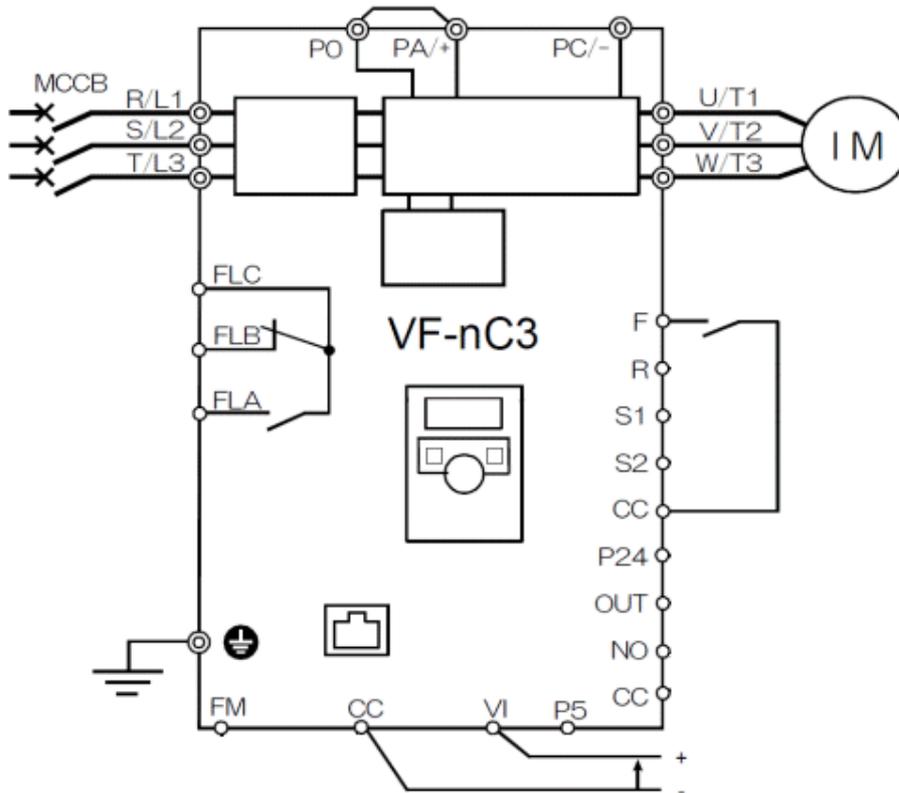
Title	Function	Setting range	Recommended setting
C00d	Command mode selection	0: Remote, 1: Local	0
Sr1	Preset speed frequency 1	Low limit frequency[LL] ~ Upper limit frequency[UL]	20 Hz
Sr2	Preset speed frequency 2	Low limit frequency[LL] ~ Upper limit frequency[UL]	40 Hz
Sr4	Preset speed frequency 4	Low limit frequency[LL] ~ Upper limit frequency[UL]	60 Hz
F112	Input terminal function (R)	0 to 201	14
F301	Auto-restart control selection	0 to 4	1

Application samples (2)

Remote control by 4-20mA analog signal

By receiving a 4-20mA analog signal from an external controller, the inverter controls airflow as best.

Connection diagram of the VF-nC3



Setting table for the VF-nC3

Title	Function	Setting range	Recommended setting
<i>Cn0d</i>	Command mode selection	0: Remote, 1: Local	0
<i>Fn0d</i>	Frequency setting mode selection	0: Terminal board, 1: Setting dial 1, 2: Setting dial 2, etc.	0
<i>F109</i>	Analog input/logic input function selection	0 to 2	1
<i>F201</i>	VI reference point 1 setting	0 to 100%	20 %
<i>F204</i>	VI reference point 2 frequency	0 to 400Hz	60 Hz

🌐 Process control(PID control) by a temperature sensor

The output frequency of the inverter is automatically controlled by a sensor signal. It will be a constant temperature control.

The inverter compares two signal and it controls that the feedback signal is into target temperature.

- Target temperature: Inverter's operating frequency
- Feedback signal: From a temperature sensor

ex.

Specifications of a temperature sensor:

4mA = 0 degreeC, 20mA = 50 degreeC

Point

Target temperature:

20Hz operation frequency

= $20 \text{ Hz} / 60 \text{ Hz} \times 50 \text{ degreeC} = 16.7 \text{ degreeC}$

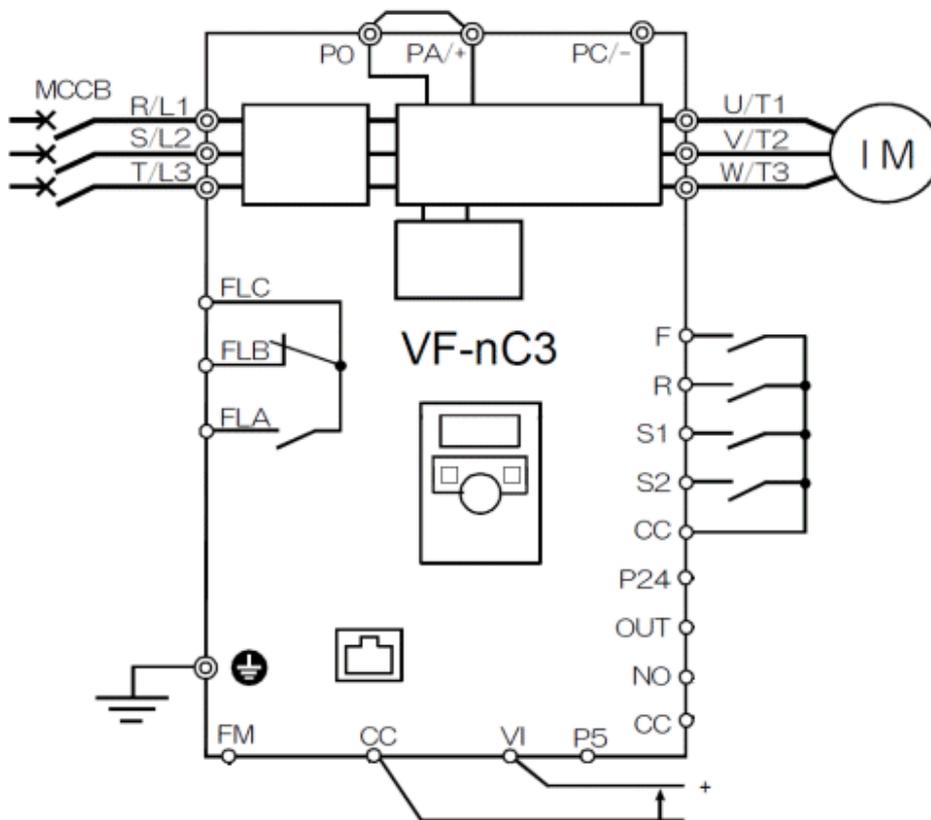
40Hz operation frequency

= $40 \text{ Hz} / 60 \text{ Hz} \times 50 \text{ degreeC} = 33.3 \text{ degreeC}$

60Hz operation frequency

= $60 \text{ Hz} / 60 \text{ Hz} \times 50 \text{ degreeC} = 50 \text{ degreeC}$

🌐 Connection diagram of the VF-nC3



 Setting table for the VF-nC3

Title	Function	Setting range	Recommended setting
<i>C00d</i>	Command mode selection	0: Remote, 1: Local	0
<i>UL</i>	Upper limit frequency	0.5 ~ Maximum frequency[FH]	60
<i>Sr1</i>	Preset speed frequency 1	Low limit frequency[LL] ~ Upper limit frequency[UL]	20 Hz
<i>Sr2</i>	Preset speed frequency 2	Low limit frequency[LL] ~ Upper limit frequency[UL]	40 Hz
<i>Sr4</i>	Preset speed frequency 4	Low limit frequency[LL] ~ Upper limit frequency[UL]	60 Hz
<i>F112</i>	Input terminal function (R)	0 to 201	14
<i>F109</i>	Analog input/logic input function selection	0 to 2	1
<i>F201</i>	VI reference point 1 setting	0 to 100%	20 %
<i>F204</i>	VI reference point 2 frequency	0 to 400Hz	60 Hz
<i>F350</i>	PID control	0: Disabled, 1: Enabled	1
<i>F352</i>	Proportional (P) gain	0.01-100.0	Depends on application
<i>F353</i>	Integral (I) gain	0.01-100.0	Depends on application
<i>F355</i>	Differential gain	0.00-2.55	Depends on application