

# PG Interface Card "VF1A-PG3"

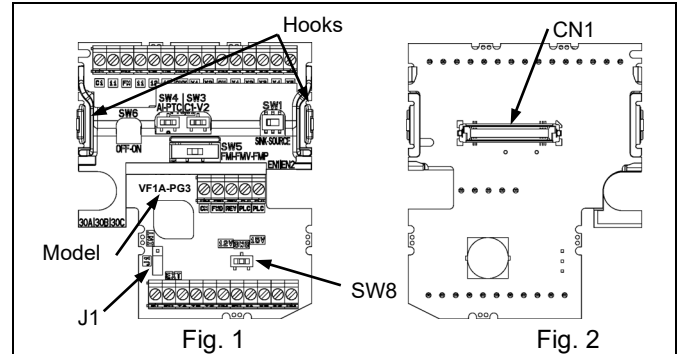
Thank you for purchasing this PG interface card "VF1A-PG3". Installing this card to your inverter enables speed control with speed sensor and pulse train input.

- Note**
- Installing this card disables pulse train inputs to the inverter's terminal [X5].
  - Remove the standard terminal board on inverter, and attach option board.

**1. Check that:**

- (1) A PG interface card is contained in the package.
- (2) The PG interface card is not damaged during transportation--no defective devices, dents or warps.
- (3) The model name "VF1A-PG3" is printed on the front of the PG interface card as shown in Figure 1.

If you suspect the product is not working properly or if you have any questions about your product, contact the shop where you bought the product or your local IDEC branch office.



**2. Installation Method**

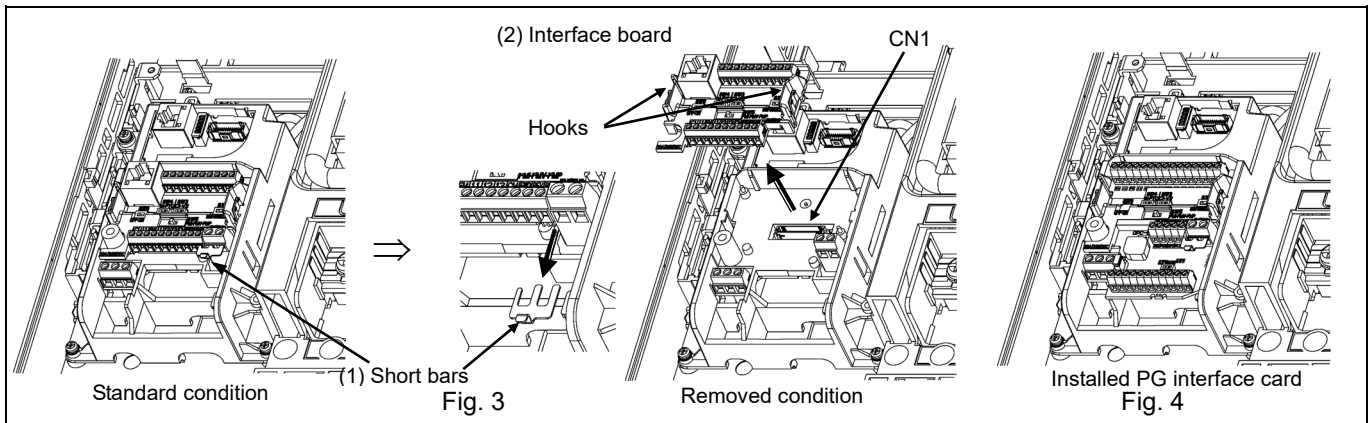
**⚠ WARNING**

Before carrying out installation and wiring, wait ten minutes or longer after turning OFF the power. Finally, ensure that the LED monitor and charge lamp have turned OFF, and use a tester to confirm that the DC relay circuit voltage across main circuit terminals P(+) to N(-) has dropped to a safe level (+25 VDC or below).

**Failure to observe this could lead to electric shock.**

In order to prevent damage resulting from static electricity, when handling the card, either take antistatic prevention measures, or hold the hooks to prevent touching the PCB directly.

- (1) Remove the inverter unit cover to expose the interface board.
  - 📖 Refer to the inverter unit instruction manual for details on how to remove the cover.
- (2) If the inverter unit is equipped with an interface board, (1) remove the short bar, (2) hold down the hooks, and then remove the interface board. (Fig. 3) (The removed interface board is not used.)
- (3) Insert connector CN1 (Fig. 2) on the PG interface card into connector CN1 on the inverter until it clicks into place, and then fit a short bar to the PLC, EN1, and EN2 terminals.
  - 📖 Refer to the inverter unit instruction manual for details on the screw tightening torque to be applied when fitting short bars.
- (4) Wire the PG interface card.
- (5) Replace the inverter unit cover.
  - 📖 Refer to the inverter unit instruction manual for details on how to reattach the cover.



### 3. Wiring

#### ⚠ WARNING

In general, the covers of the control signal wires are not specifically designed to withstand a high voltage (i.e., reinforced insulation is not applied). Therefore, if a control signal wire comes into direct contact with a live conductor of the main circuit, the insulation of the cover might break down, which would expose the signal wire to a high voltage of the main circuit. Make sure that the control signal wires will not come into contact with live conductors of the main circuit.

**Failure to observe this precaution could cause electric shock or an accident.**

#### ⚠ CAUTION

Noise may be emitted from the inverter, motor and wires.

Take appropriate measures to prevent the nearby sensors and devices from malfunctioning due to such noise.

**An accident could occur.**

Refer to the following connection terminal allocation drawing and terminal specifications when wiring to the PG interface card.

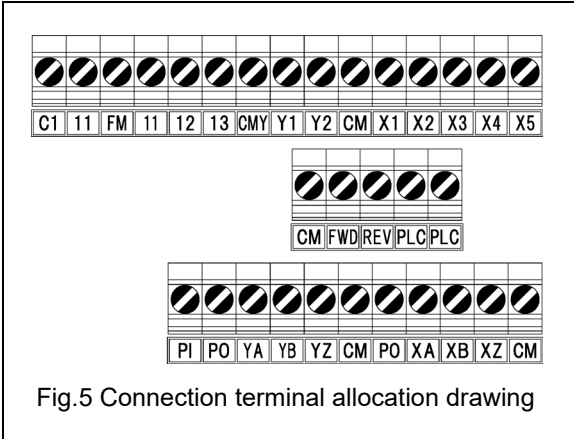


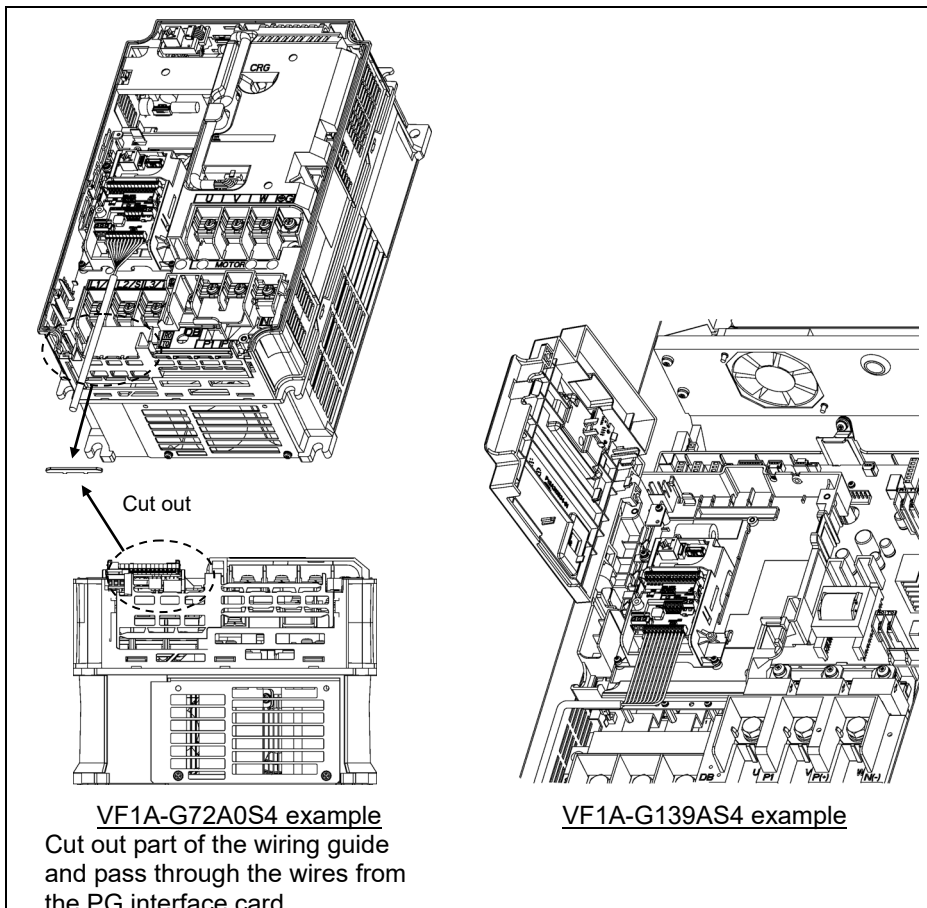
Fig.5 Connection terminal allocation drawing

Table 1 Terminal specifications

Terminal size	M2
Tightening torque (N-m)	0.19 ±10%
Recommended wire size *	AWG16 to 24
Stripped wire length (mm)	5

\* An insulated wire with allowable temperature of 105° (UL compliant product) is recommended.

**Note** In order to avoid malfunctions caused by noise, wire the PG interface card as far from the main circuit wiring as possible. Secure the PG interface card wiring inside the inverter with cable ties to ensure that there is no direct contact with live parts on the main circuit (e.g., main circuit terminal block).



## 4. Specifications

### 4-1. Specifications for pulse train inputs

Item	Specifications
PG output pulse frequency	30 kHz max. (Open collector) 100 kHz max. (Complementary)
PG pulse output circuit	Open collector circuit (Maximum cable length: 20 m) Complementary circuit (Maximum cable length: 100 m/30kHz, 20m/100kHz)
Input pulse threshold	High level $\geq 5$ VDC, Low level $\leq 2$ VDC
PG pulse input current	8 mA or less

### 4-2. Specifications of applicable PG and PG interface card

Item	Specifications
Encoder pulse resolution	20 to 3000 P/R, A, B and Z phase pulse trains in incremental format
Pulse output circuit	Open collector circuit (Maximum cable length: 20 m) Complementary circuit (Maximum cable length: 100 m/30kHz, 20m/100kHz)
Input power requirements	High level $\geq 5$ VDC, Low level $\leq 2$ VDC
Pulse output current	8 mA or less
PG power supply*	12 VDC $\pm 10\%$ , 80 mA or less, or 15 VDC $\pm 10\%$ , 60 mA or less

\* If a power level required by the PG exceeds 80mA/12V or 60mA/15V, use an external power supply.

## 5. Terminal Functions

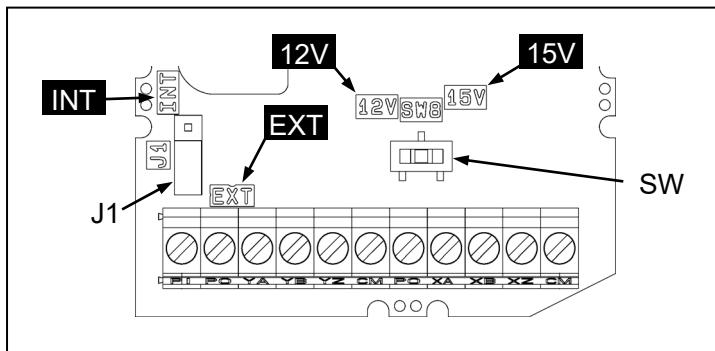
Table 2 lists terminal specifications.

Table 2 Terminal Specifications

Terminal symbol	Name	Functions
[P1]	External power input*1	Connects external power supply for the PG. +12 VDC $\pm 10\%$ or +15 VDC $\pm 10\%$ (Use the power supply which is 150 mA more than PG current consumption.)
[PO]	Power output to the PG*2	Connects the PG power input. +12 VDC $\pm 10\%$ , 80 mA, or +15 VDC $\pm 10\%$ , 60 mA
[CM]	PG power common	PG power common terminal (equipotent with [CM] terminal of the inverter)
[XA]	A phase pulse input from reference PG	Input terminal for A phase signal fed back from the reference PG
[XB]	B phase pulse input from reference PG	Input terminal for B phase signal fed back from the reference PG
[XZ]	—	Not used.
[YA]	A phase pulse input from slave PG	Input terminal for A phase signal fed back from the slave PG
[YB]	B phase pulse input from slave PG	Input terminal for B phase signal fed back from the slave PG
[YZ]	Z phase pulse input from slave PG	Input terminal for Z phase signal fed back from the slave PG


\*1 Use an external power supply if the PG current consumption exceeds 80mA/12V or 60mA/15V. When using an external power supply, turn the slide switch J1 shown below to the EXT position.

\*2 Turn the internal switch (SW8) to the proper position according to the PG power requirement. The factory default position is "12V."



**Note** To move a switch slider, use a tool with a narrow tip (e.g., tweezers). Be careful not to touch other electronic parts, etc. If the slider is in an ambiguous position, the circuit is unclear whether it is turned ON or OFF and the digital input remains in an undefined state. Be sure to place the slider so that it contacts either side of the switch.

## 6. Drive Control

 For details of PG interface functions available, refer to the inverter User's Manual.

### 6-1. Pulse train input

This function gives a frequency command to the inverter in pulse train format. Three types of formats are available--pulse train sign/pulse train input, run forward/run reverse pulse train, and 90 degree phase shifted A/B pulse trains. Use [XA] and [XB] terminals for the pulse train frequency command input.

#### 6-1-1. Pulse train input format

Table 3 lists pulse train input formats and operations of this option card.

Table 3 Pulse Train Input Format and Operations

Pulse input format	Operations*
Pulse train sign/pulse train input	Gives the speed command to the inverter, following the pulse input frequency on the [XB] terminal. Switching the terminal [XA] ON/OFF determines polarity of the speed command.
Run forward/run reverse pulse train	Gives the run forward speed command to the inverter, following the pulse input frequency on the [XB] terminal, if any. Gives the run reverse speed command to the inverter, following the pulse input frequency on the [XA] terminal, if any.
90 degree phase shifted A/B pulse trains	Gives the run forward or run reverse speed command to the inverter, following 90 degree phase shift and frequency information of two pulse inputs on [XA] and [XB] terminals.

\* Actual rotation direction of the motor is specified by a combination of the pulse input command polarity and **FWD/REV** command in the inverter.

#### 6-1-2. Connection diagram examples

Figure 6 shows the connection diagram example for pulse train input.

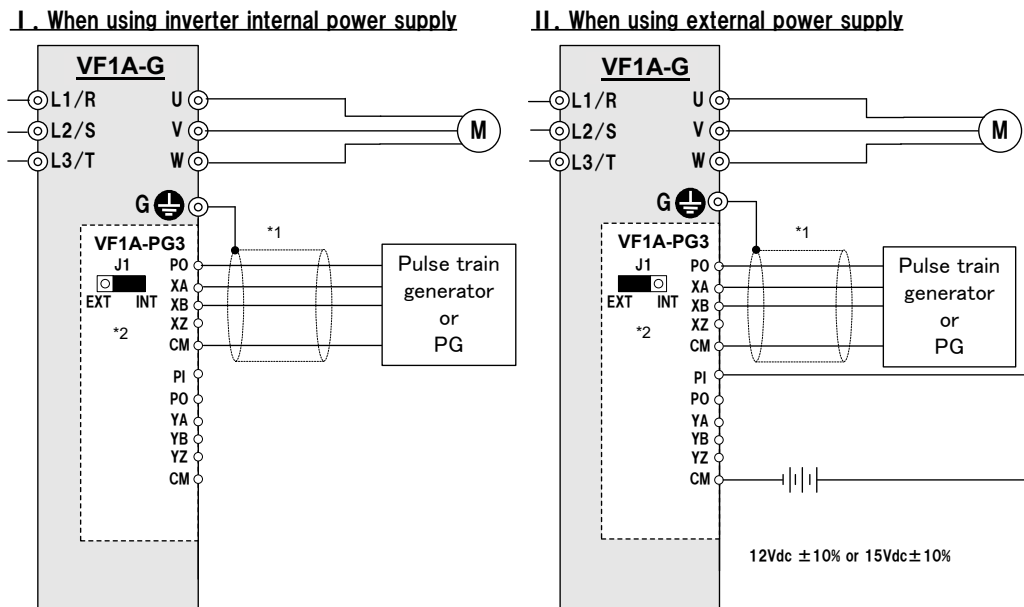


Figure 6 Connection Diagrams for Pulse Train Input

\*1 For wiring between the encoder and the inverter, use a shielded cable. Basically, the shielded layer should be grounded. If any malfunction occurs due to noise, however, connecting the shielded layer to the terminal [CM] may reduce the problem. If the wiring between the encoder and the inverter is long, interference of A- and B-phases may cause encoder signal malfunctions, resulting in abnormal noise or torque pulsation. In such a case, minimizing the wiring length (by reviewing the wiring route) or using a cable with a smaller stray capacitance may reduce the problem.

\*2 When using the inverter internal power supply, turn the slide switch J1 on the PG interface card to the INT position; when using an external power supply, to the EXT position.

6-2. Speed control (Vector control with speed sensor)

The inverter detects the motor's rotational speed from PG feedback signals, decomposes the motor drive current into the exciting and torque current components, and controls each of components in vector. The vector control enables speed control with high accuracy and high response.

 For settings and adjustments of the vector control, refer to inverter User's Manual.

6-2-1. Control specifications

Table 4 lists the specifications of vector control with speed sensor.

Table 4 Specifications of Speed Control

Item	Specifications	Remarks	
Control specifications *1	Maximum output frequency	25 to 200 Hz *2	1024 P/R operation
	Speed control range	Minimum speed : Base speed = 1 : 1500 (For 4-pole motors: 1 to 1500 r/min)	
	Speed control accuracy	Analog setting: $\pm 0.2\%$ or less of maximum frequency (at $25 \pm 10^\circ\text{C}$ ) Digital setting: $\pm 0.01\%$ or less of maximum frequency (at $-10$ to $+50^\circ\text{C}$ )	

\*1 Specified values of the motor controllability will greatly vary depending on the pulse resolution, P/R (Pulses/Revolution). The recommended P/R is 1024 or more.

\*2 If the output frequency exceeds 200 Hz, the inverter trips with the alarm 0s.

6-2-2. Connection diagram examples

Figure 7 shows the connection diagram example for speed control.

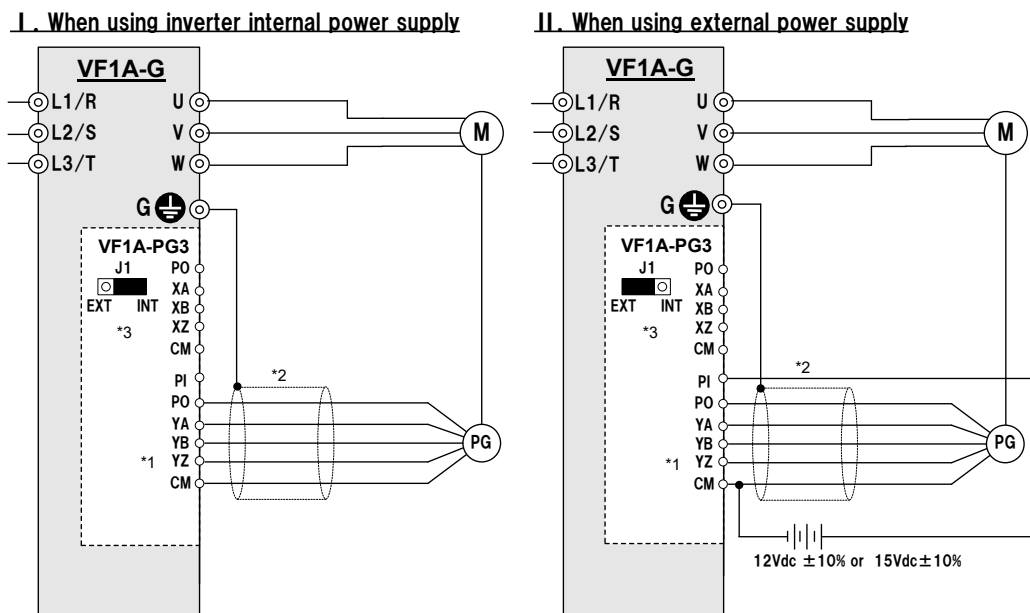


Figure 7 Connection Diagrams for Speed Control

\*1 The terminal [YZ] is not used for control. If the PG issues Z phase outputs, there is no need to connect the PG wire to this terminal.

\*2 For wiring between the PG and the inverter, use a shielded cable. Basically, the shielded layer should be grounded. If any malfunction occurs due to noise, however, connecting the shielded layer to the terminal [CM] may reduce the problem. If the wiring between the PG and the inverter is long, interference of A- and B-phases may cause PG signal malfunctions, resulting in abnormal noise or torque pulsation. In such a case, minimizing the wiring length (by reviewing the wiring route) or using a cable with a smaller stray capacitance may reduce the problem.

\*3 When using the inverter internal power supply, turn the slide switch J1 on the PG interface card to the INT position; when using an external power supply, to the EXT position.

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