The VS Series PLC Product Manual

Version: 2.1 Date: July, 2019

Preface

This manual provides information about specifications, installation methods, wiring, maintenance and safety precautions of VS series PLC. For PLC programming, please see the VS Series PLC Programming Manual.

Name of Manual	Content
VS Series PLC Product Manual (This Manual)	• Introduction to VS series PLC • Environment, wiring and installation cautions of VS series PLC • Instructions of operation, maintenance and abnormal treatment • Descriptions of Optional Devices
VS Series PLC Programming Manual	• Descriptions of VS series PLC components • Basic instructions and application instructions • Notes of programming

SAFETY PRECAUTIONS

Always read these precautions before using this product.

Before installing, operating, maintaining and repairing this PLC, be sure to read this manual and relevant books/documents carefully and work properly. Before proceeding to relevant work, be sure to fully understand the knowledge, safety information and precautions.
The safety precautions in this manual are ranked as “DANGER” and “CAUTION”.

⚠ DANGER	Incorrect handling may cause dangerous consequences and lead to casualty or severe injury of personnel.
⚠ CAUTION	Incorrect handling may cause dangerous consequences and lead to moderate or minor injury of personnel or property damage

In addition ⚠ CAUTION list out various circumstances that may lead to serious consequences.

Always abide by the safety precautions. Properly save this manual and make sure it's accessible anytime needed. Always hand it over to the end user.

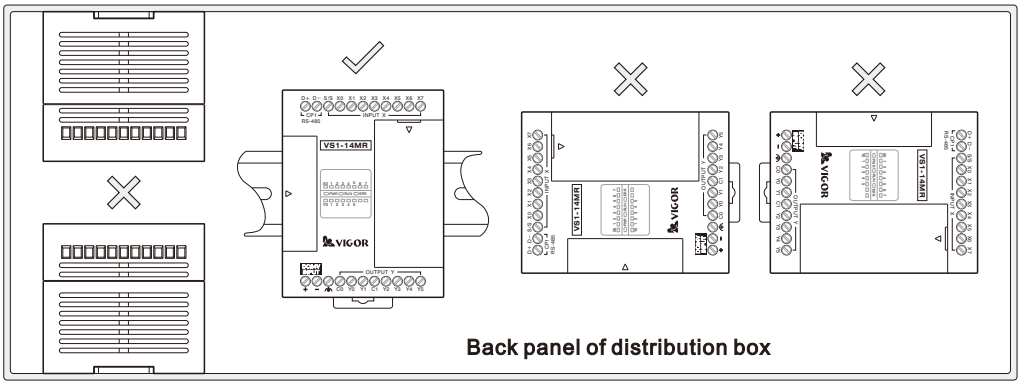
1. Design Precautions

⚠ DANGER	Ref. Page Number
• Please create an external safety circuit for PLC to ensure the system can without risk in case of abnormal power supply or PLC malfunction. • Any false operation or false output may cause accidents. • To avoid machine damage, it is required to design an external protection circuit, such as emergency stop, forward / reverse interlock, over / under limit protection, etc. for PLC. • According to the diagnostic functions such as the Watch Dog Timer (WDT), the CPU of PLC could detect the abnormal process and then stop all outputs. However, failures in the input/output control circuits are not detectable by the CPU of PLC. Thus, when failures occur in the input/output control circuits, the output may be uncontrollable, which makes the external safety circuit and safety mechanism become necessary to ensure equipment safety. • Since the malfunction of PLC output relays or transistors will fail the ON/OFF control, it is required to design an external safety circuit and safety mechanism for the output signals of major accidents to ensure risk-free operation of equipment.	17 33 49

⚠ CAUTION	Ref. Page Number
• Considering the electrical durability of output contacts of PLC relays, it is recommended to drive high current loads through external relays driven by the outputs of transistor PLC. • Considering the slow reaction and mechanical durability of output contacts of PLC relays, it is recommended to use transistor output models for applications with high-frequency movement or prompt reaction. • Do not put the wires of PLC's input and output signals to the same cable. • Do not bundle the I/O signal wires with any other power lines at the same pipeline. • Generally, for safety concern, try to limit the wire length less than 20m. • There is no fuse in the PLC output circuit. If necessary, it is recommended to properly put a fuse in the external output circuit to prevent PLC output circuit damaged by external load short circuit or malfunction.	49 54

Always read these precautions before using this product.

2. Installation Precautions

⚠ CAUTION	Ref. Page Number
● Use this product in the environment that satisfies the "1-6 General Specifications" described in this manual. ● Do not use this product in the following environments: (1) Environments with dust, fumes, conductive dust, corrosive gases, or flammable gases. (2) Environments exposed to high temperature, condensation, wind and rain, vibration or shocks. Otherwise, it will cause an electric shock, fire, false action or lead to product damage. ● When drilling holes or wiring, do not let metal debris fall into the ventilator of PLC to prevent fire, product damage or false action. ● Be sure to remove the dust-proof cover, if any, when installation work is completed, to prevent fire, product damage or false action caused by poor heat dissipation. ● Please have all the connecting lines and various expansion devices properly mounted and firmly fixed. Poor contact will lead to false action. ● To prevent poor heat dissipation, do not install this product at the bottom or top position of the distribution box or lie it down.  Back panel of distribution box ● The minimum clearance around PLC is 50mm. Try to keep the PLC away from high voltage lines or large power equipment.	47

3. Wiring Precautions

⚠ DANGER	Ref. Page Number
● Be sure to shut off all phases of external power supply before wiring to prevent an electric shock or product damage.	49

3. Wiring Precautions

⚠ CAUTION	Ref. Page Number
● Always pay special attention to connect any AC power line to the correct terminal. In case of the AC power is connected to a DC I/O terminal or a DC power input terminal, the PLC will be burned out. ● Do not wiring on the empty terminal of a PLC ⊡ , or it may damage the product. ● Please follow the Class 3 grounding standard to ground the Main Unit. Do not use a common ground that share with large power system. (Refer to the section 1-6 General Specifications) ● When drilling holes or wiring, do not let metal debris fall into the ventilator of PLC to prevent fire, product damage or false action. ● Be sure to remove the dust-proof cover, if any, when installation work is completed, to prevent fire, product damage or false action caused by poor heat dissipation. ● Use 0.3mm^2 ~ 0.5mm^2 (AWG22 ~ AWG20) single or multiple core wire. For two wires connected to one terminal, use 0.3mm^2 (AWG22) wire. It is recommended to crimp connect a single/multiple core wire to a rod terminal with insulation sleeve prior to wiring. For a single core wire, strip off the insulation and proceed to wiring. For a multiple core wire, strip off the insulation, twist strands (do not tin) and then proceed to wiring. ● Tighten the terminal screw in the torque range of 2.5N-m ~ 3.0N-m.	49 50

4. Operation and Maintenance Precautions

⚠ DANGER	Ref. Page Number
● When power is ON, do not touch the terminals to prevent an electric shock or false action. ● Always switch OFF the power before cleaning or tightening terminal screws. If the power is ON, it may cause an electric shock. ● Before change any procedure in operation, such as FORCED OUTPUT, RUN, STOP, always read this manual and relevant documents carefully and confirm the safety. False operation will cause machine damage and accidents.	57

⚠ CAUTION	Ref. Page Number
● Always switch OFF the power before installing/removing the optional unit(s). If the power is ON, the PLC and optional unit(s) may be damaged. ● Always switch OFF the power before connecting/removing lines. If the power is ON, it may cause malfunction or false action. ● Do not mount/remove or modify the casing by yourself, otherwise it may cause malfunction, false action or even a fire. ● For repair information, it is recommenced to consult the distributor or contact **VIGOR ELECTRIC CORP.** directly.	57

5. Disposal Precautions

⚠ CAUTION	Ref. Page Number
● When disposing of this product, treat it as industrial waste.	59

MEMO

Table of Contents

1. Product Profile

1-1 Primary Features

VS Series Controller Provides Comprehensive Control Application

More Effective

The VS series is base on high performance 32-bit 96 MHz processor, the overall efficiency is 10 times more then the VB or VH series PLC.

The size of project memory is enlarged from 4~16K to 16~64K Words, also the number of data registers is greatly increased.

The communication could expand up to 6 ports (USB and CP1~CP5 multi-functional ports), fully support high-level control system.

The 4 pulse out points have various positioning functions. The 8 high-speed inputs provide plenty functions such as external interrupt, hardware / software high-speed counter, pulse capture, period measurement, handwheel...

More Diverse

The VS series has the VS1 (General), VS2 (Advanced), VSM (Motion Control) and VS3 (High Performance) Main Units. The applicable coverage is from simple to complicated control.

By various Main Units, Modules, Cards, Memory Cards and the modular design to produce a complete and flexible combination.

Remarkable add-on card structure with the DIO, Communication and Special Cards to provide a superb cost-effective, space saving and flexible expansion.

Simple to construct and maintain, this VS series is the best choice of programmable logic controller.

More Fast

The new processor only takes 0.15 μs per basic instruction step, that performance is 2.5 times faster than before. Both the pulse inputs and outputs can reach 1 MHz, more powerful than similar competitor.

By superbly fast USB port to read or write the user project just spends in an instant, 16K Words less than 3 Sec. This progress far exceeds the past.

More Competitive Advantage

The **VIGOR** R&D team has accumulated decades of experience for "More diverse combination" and " The most suitable product" design concepts. Carefully selected high quality CPU to develop the excellent and stable VS series also with highly competitive price.

The VS series is close to the automation market and demand by flexible combination. Can raise product level with expandability and more competitive.

Item \ Series	VS1 General	VS2 Advanced	VSM Motion Control	VS3 High Performance
Process Time of Basic Instruction	0.17 μs/Step	0.17 μs/Step	0.17 μs/Step	0.15 μs/Step
Memory Capacity of Project	16K Words	32K Words	32K Words	64K Words
Max. Input/Output Points	128 pt. + 24 (at Exp. Cards)	256 pt. + 24 (at Exp. Cards)	256 pt. + 24 (at Exp. Cards)	512 pt. + 24 (at Exp. Cards)
Programming Port	Built-in 12Mbps high-speed Mini USB port			
Unit Built-In Comm. Port	CP1 (RS-485) provides various communication modes: Computer Link, MODBUS (Master / Slave), CPU Link, Non-protocol...			
Expandable Comm. Port	CP2~CP3 (abilities = CP1)			CP2~CP5 (abilities = CP1)
Multi-Func. High Speed In	8 points 10 kHz	8 points 50 kHz	4 points 200 kHz☆ & 4 points 50 kHz	
Pulse Output	4 points (axes) 50 kHz※	4 points (axes) 50 kHz※	4 points (axes) 200 kHz※	
Number of Special Modules	—	8	8	16
Number of Special Cards	1	3	3	3
Function of Expansion Card	EC1 ~ EC3 for the DIO, communication (RS-232, RS-485, Ethernet) or special card (e.g. Analog, Temperature, Inverter Speed Control)			
Function of Memory Card	Maintenance-free user project & large data memory card provides the best subject transplanting method for system maintain			

☆ For the VSM-28ML-D Line Driver model, its two Hardware High-Speed Counters can count 1 MHz pulses respectively.

※ Those 4 outputs are available generate 1 MHz pulses individually at the VSM-28-ML-D Line Driver model; 200 kHz at the VSM/VS3's NPN; 50 kHz at the VS1/VS2's NPN or 5 kHz at the PNP Main Unit. Not available in the relay output unit.

The VS family has the VS1 General, VS2 Advanced, VSM Motion Control and VS3 High Performance series controllers, the complete product line can satisfy various applications from basic to high-end and the combination of the best balance between cost and performance. Also, based on the concept of "the most suitable product" to enhance the competitive power and achieve the value beyond price.

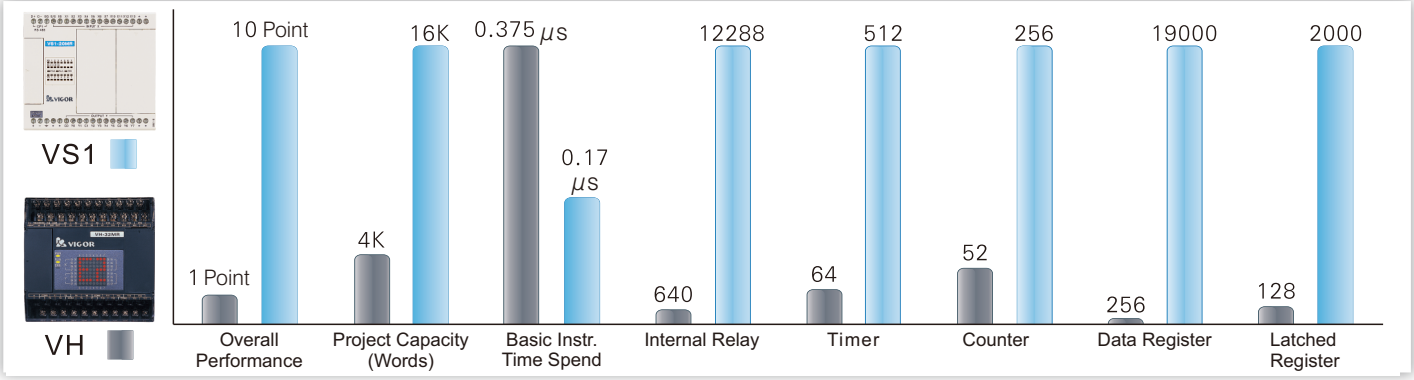
The VS1 General series is suitable for various easy auto-control systems to satisfy with simple sequence control functions, such as cargo lift, parking equipment, conveyor, shoe machinery, brick machinery, woodwork machinery, etc.

The VS2 Advanced series is suitable for general purpose auto-control systems to satisfy with analog or temperature demanded controls, such as passenger lift, rubber vulcanizer, plastic injection molding machine, metal stamping machine, packing machinery, etc.

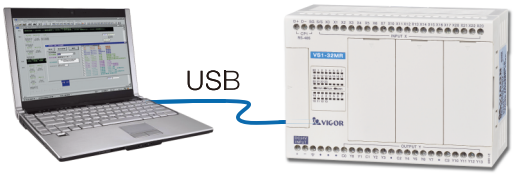
The VSM Motion Control series is a good match for various industrial machinery needing precise positioning functions by servo/stepper motors, which including labeling machine, sleeving machine, dispenser, film laminating machine, pipe bending machine, cutting machine, bar feeder, etc.

The VS3 High Performance series is the solution for various control systems of complicated sequence or large scale, that including printing machinery, automatic production line, semiconductor peripheral device, automated storage/retrieval system, electroplating control, etc.

Quantum Leap Performance, High Cost-Effectiveness, Excellent Value



Speedy Programming USB Port



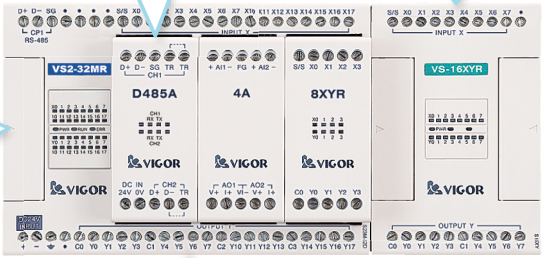
By the built-in 12Mbps USB interface, to read or write a user project can be finished in an instant (16K Words < 3 sec). This innovation also improves the monitoring efficiency, to monitor the PLC could have faster response and more components.
Using a standard Mini USB 5-Pin cable to contact to a computer directly, away from the unfriendly adapter. Furthermore, VIGOR provides the VSPC-200A noise suppression USB cable that is designed for industrial environment use, could reduce the USB communication failed.

Diverse Combination Brings Competitive Advantage

- The simple flexible add-on DIO Expansion Card can avoid waste and save space, thus to make "The most suitable product".
- A variety of communication, special function (analog, temperature, etc.) and small number DIO cards to meet expansion needs.

- Diverse 8, 16, 28 & 32-point DIO Expansion Modules provide the most satisfactory I/O expansion.
- The VS2, VSM and VS3 could join the analog input / output and temperature modules up, for accurately measure and control.

No battery required memory card for user project and large data storage; also the Real-Time Clock (RTC) function is available.



- The VS series presents the VS1 General, VS2 Advanced, VSM Motion Control & VS3 High Performance PLCs. Suitable for applications from simple to complex.
- The VS series offers flexible options: 16K~64K Word project memory, 10~512 I/O points, 2~6 Comm. ports and various special functions (analog, temp....).

Multi-Function Memory Card Provides the Best Data Transplant Mechanism

Multi-function memory card adopts no battery required Flash ROM. This card is like a PLC's hard disk to store a user project and large 655,360 Words latched data.
The appropriate user project and relevant data (such as system setting, molding parameters, event records...) are all stored in the card. If the PLC Main Unit got failed, the user can quickly move the card into a new spare unit. With the card, the maintenance work can complete by an ordinary trained worker, not necessary by a professional. It solves the problem of inconvenient maintenance if the controller fails.

Robust System Structure, Cautiously Protect Data and Intellectual Property

All the VS series takes the no battery required FLASH ROM for its user project and latched area data, that could keep away from the disaster of lost resource data. The advantage will appear in a care shortage control system.
The Memory Card stores a user project and large latched data. By an appropriate user project and relevant data could easily move the process to another PLC, to reduce the difficulty of maintenance.
The Password function would restrict the permission to read the project, and furthermore provided the Disallow to Read function.
On the other hand, the Project ID combines with the PLC ID could protect the benefit of designer advantageously.
This VS series to protect the intellectual property right is comprehensive.

More Communication Ports and Forms to Meet the Demand of Advanced System

The VS Main Unit built-in a USB programming port and a RS-485 multi-function communication port (CP1).
By expansion cards could get CP2～CP5 multi-function communication ports (Ethernet, RS-485 or RS-232 interface selectable).
Each multi-function communication port could individually appoint for the VS Computer Link, MODBUS, CPU Link, Non-protocol or other mode. The plenty ports can link with HMI, central supervisory system,distributed control system and peripherals to satisfy all kinds of applications in the control.

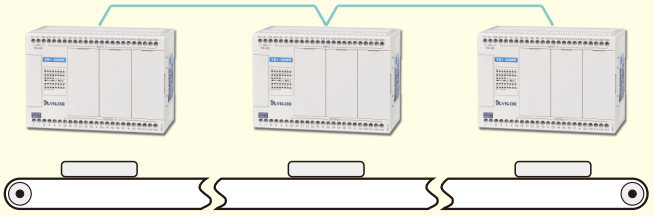
Through the MODBUS or VS protocol, the PLC will respond the request from HMI or central supervisory system.

The MODBUS Master mode could actively link with various of peripherals.

New Windows® based programming software Ladder Master S.

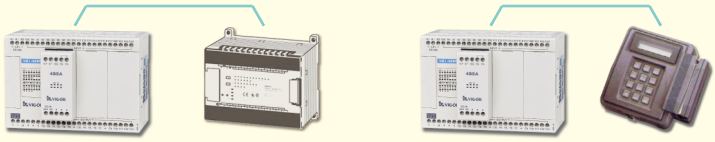
USB+CP1～CP5 communication ports

The CPU Link mode via immediate data link between multiple PLCs to exchange data then achieve the distributed control objective.



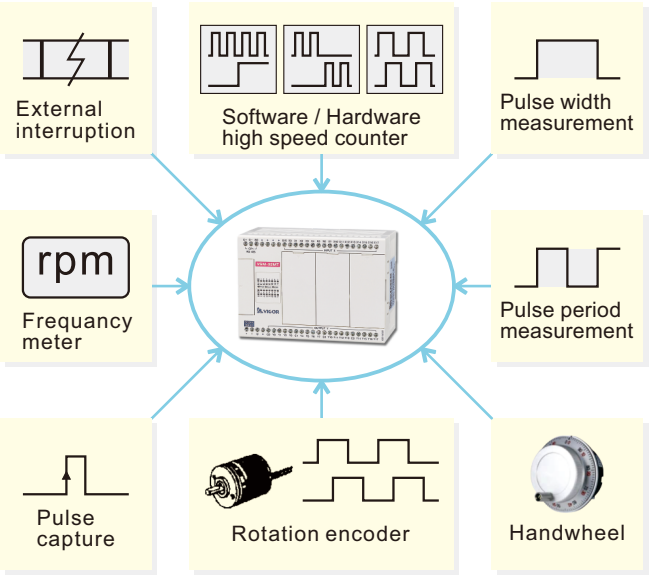
Use the VS's Computer Link mode to establish a local network.

The VS PLC series has the Non-Protocol communication, that can be linked to various peripheral in the market.



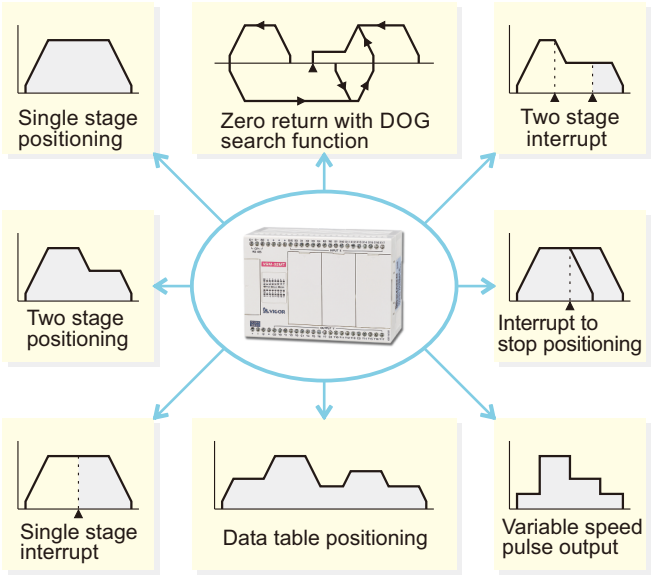
Multi-Function High Speed Input

The Main Unit has built-in 8 high-speed inputs (up to 1 MHz) for the external interrupt, pulse capture, frequency meter, pulse measurement, high speed counter, handwheel and other functions, to support various special applications. Available become 8 single-phase or 4 A/B-phase counters, besides can activate two A/B-phase hardware high speed counters HHSC1 / HHSC2 to improve the system efficiency.



Multi-Function High Speed Position Control

The VSM and VS3 series Main Unit built-in 4 high speed pulse outputs (up to 1 MHz) and various easy to use positioning instructions. Hence, can perform precision positioning control for step or servo motor drivers directly. The VSM-28ML-D is to meet the requirement of easy connection if the encoders and motor drivers are using the line driver interface.



Bitwise Operation and Bit Index Function

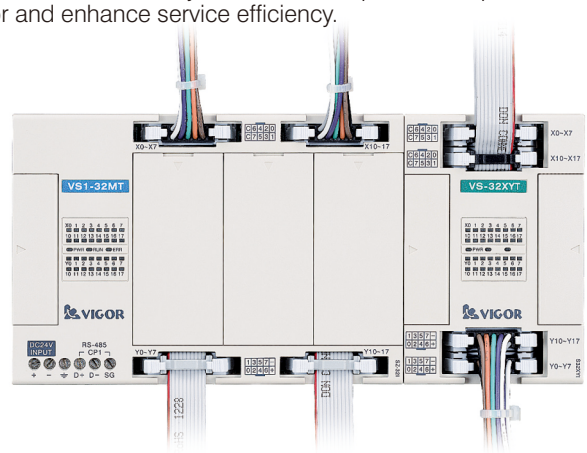
The VS series offers some advance that typically belongs to high-end PLC. The new functions provide more convenient and flexible usage for the program designer.

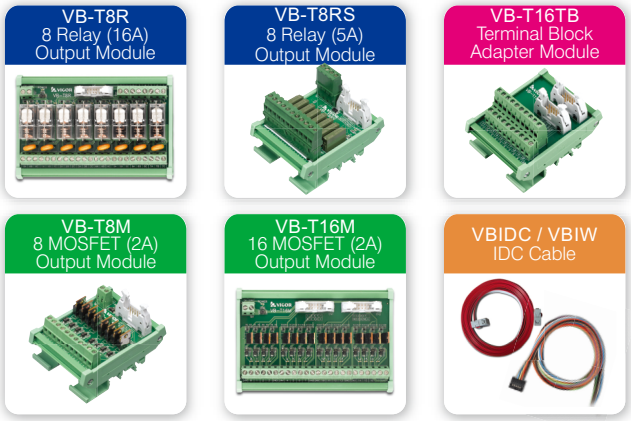
Practical and Various Special Function Expansion Card --- High Cost-Performance Ratio

2 Voltage Input & 1 Voltage Output Brief Card	4 Analog Input Card	2 Analog Output Card	2 Analog Input & 2 Analog Output Card	3 Isolated Inverter Speed Control Card	2 Thermocouple Input Card	4 Thermocouple Input Card	1 PT-100 RTD Input Card	2 PT-100 RTD Input Card

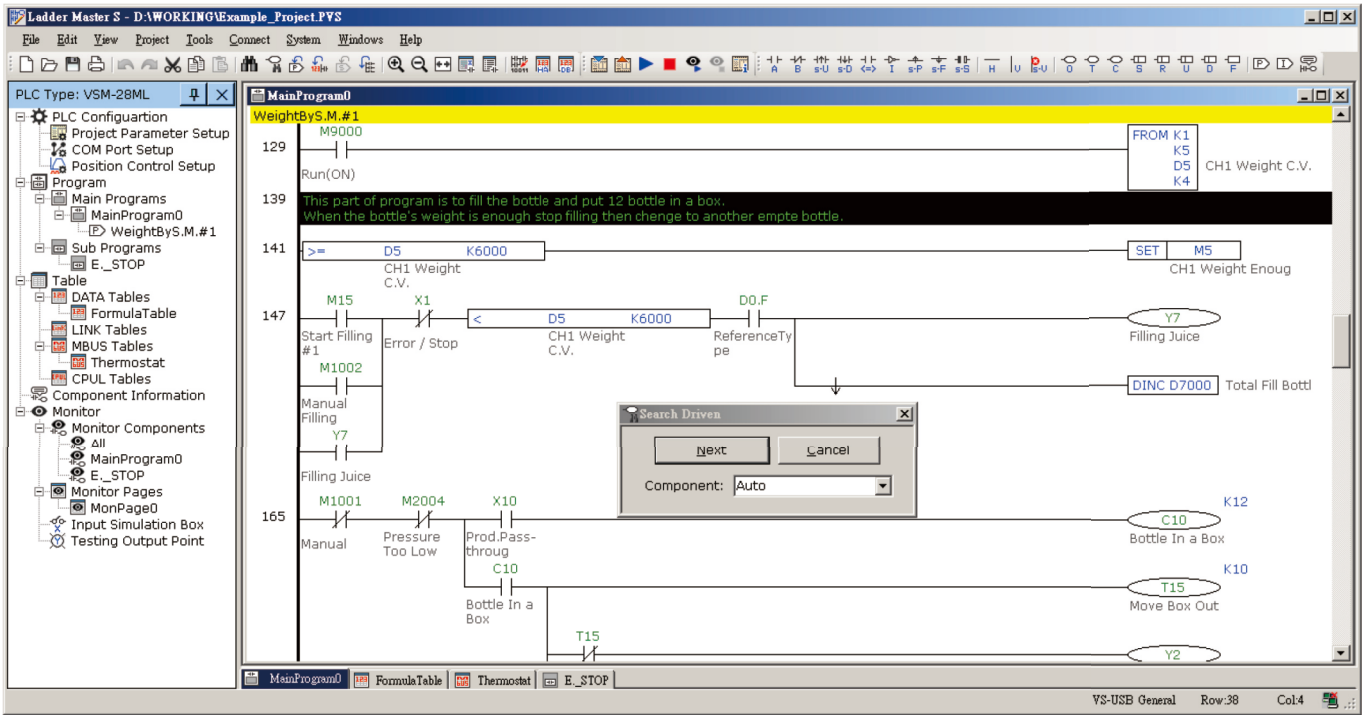
Highly Reliable Connector Models, Installation and Maintenance More Easier

To remove the unstable part (i.e., the AC power and load driving relays) out of the controlling core PLC is the most suitable structure in a control box. Which makes a safeguard mechanism, in order to build a highly reliable control system.
Using connectors join with exterior I/O devices can reduce the assembling time and wiring mistake, also improve work efficiency.
If the controller is faulty and must be repaired or replaced, the connector has the advantage to quickly exchange also could avoid error and enhance service efficiency.





All New Programming Software - Ladder Master S



1-2 System Composition

Programming Tool

WINDOWS® based Programming Software Ladder Master S

Programming Port Mini USB

Memory Card

VS-MC
VS-MCR

Memory Card Socket MC

DIO Expansion Card

VS-4XY★-EC
VS-4X-EC
VS-4Y★-EC
VS-8XY★-EC
VS-8X-EC
VS-8YT-EC
VS-8XI-EC
VS-8YTI-EC

Expansion Card Socket EC1～EC3

Communication Expansion Card

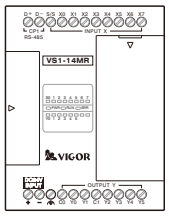
VS-485-EC
VS-485A-EC
VS-D485-EC
VS-D485A-EC
VS-D232-EC
VS-D52A-EC
VS-ENET-EC

Special Function Card

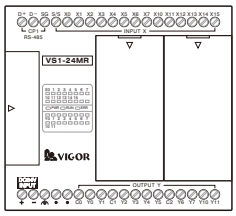
VS-3AV-EC
VS-4AD-EC
VS-2DA-EC
VS-4A-EC
VS-3ISC-EC
VS-2TC-EC
VS-4TC-EC
VS-1PT-EC
VS-2PT-EC

※ VS1 series allows one Special Function Card only

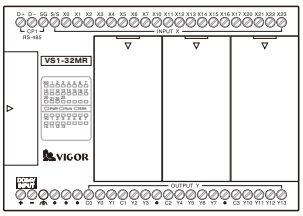
Main Unit



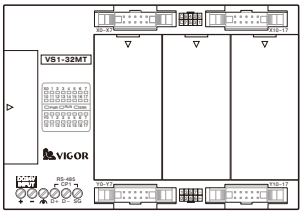
VS1-10/14M★
VSM-14MT-D



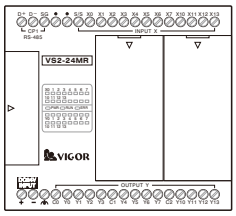
VS1-20/ 24M★



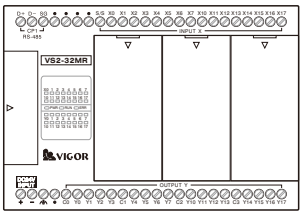
VS1-28/32M★



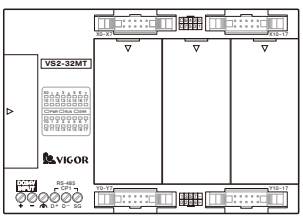
VS1-32MT-DI



VS2-24M★ / VSM-24MT



VS2-32M★ / VSM-32MT
VSM-28ML / VS3-32M★



VS2/VSM/VS3-32MT-DI

★Type of Output

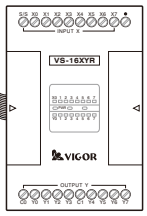
R : 2A relay output

T : 0.5A NPN transistor output; at EC card is 0.3A NPN only

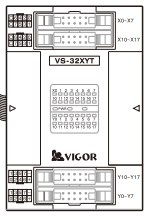
P : 0.5A PNP transistor output

Expansion Slot

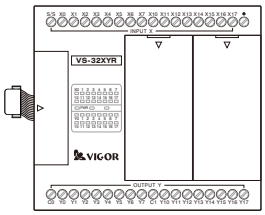
DIO Expansion Module



VS-8X VS-8XY★
VS-8Y★ VS-16XY★
VS-16X VS-16Y★
VS-PSD



VS-16X-I VS-16XYT-I
VS-16YT-I VS-32XYT-I

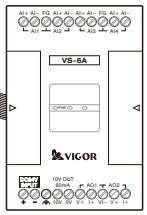


VS-28XYR VS-32XY★

DIO Expansion Card for Module

VS-E8X-EC VS-E8YT-EC

Special Module



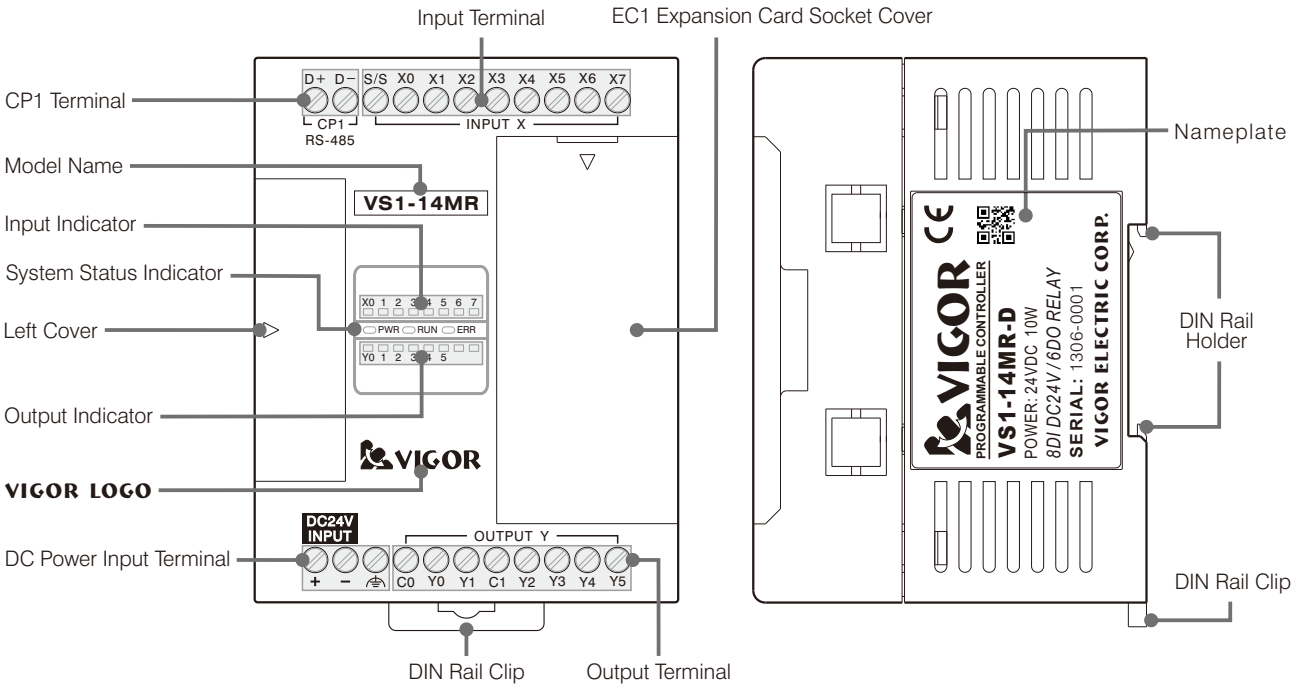
VS-4AD VS-2DA
VS-3A VS-6A
VS-4TC VS-8TC
VS-2PT VS-4PT
VS-2PG VS-4PG

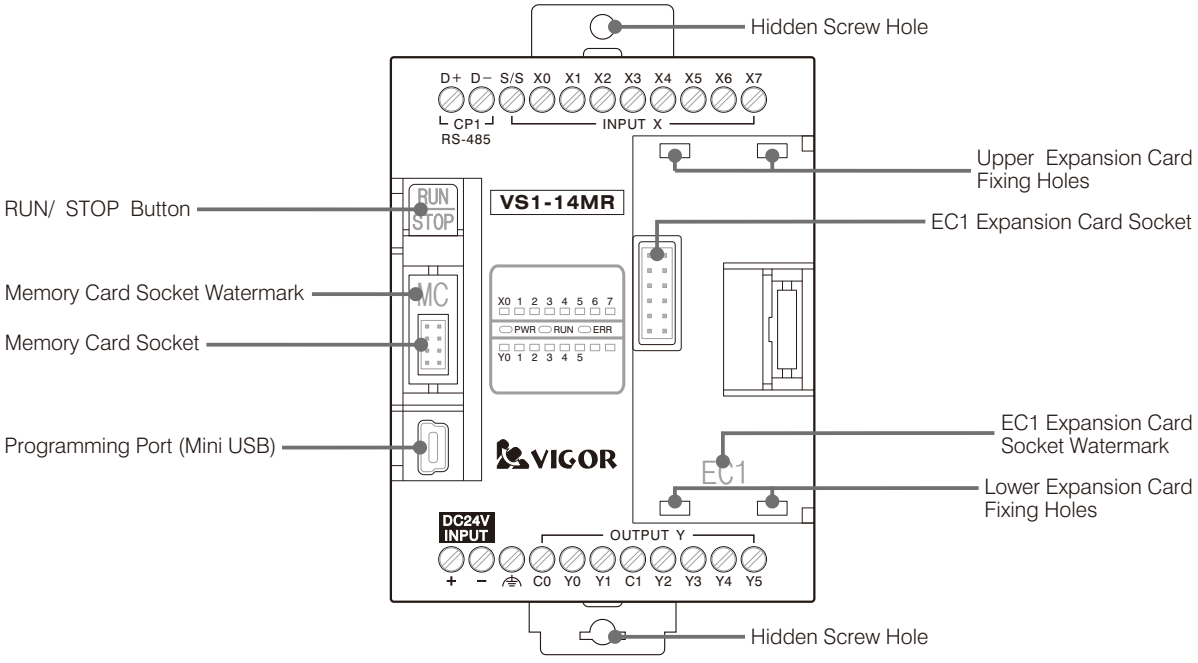
Peripheral Products

Refer to the CH 8 in this manual

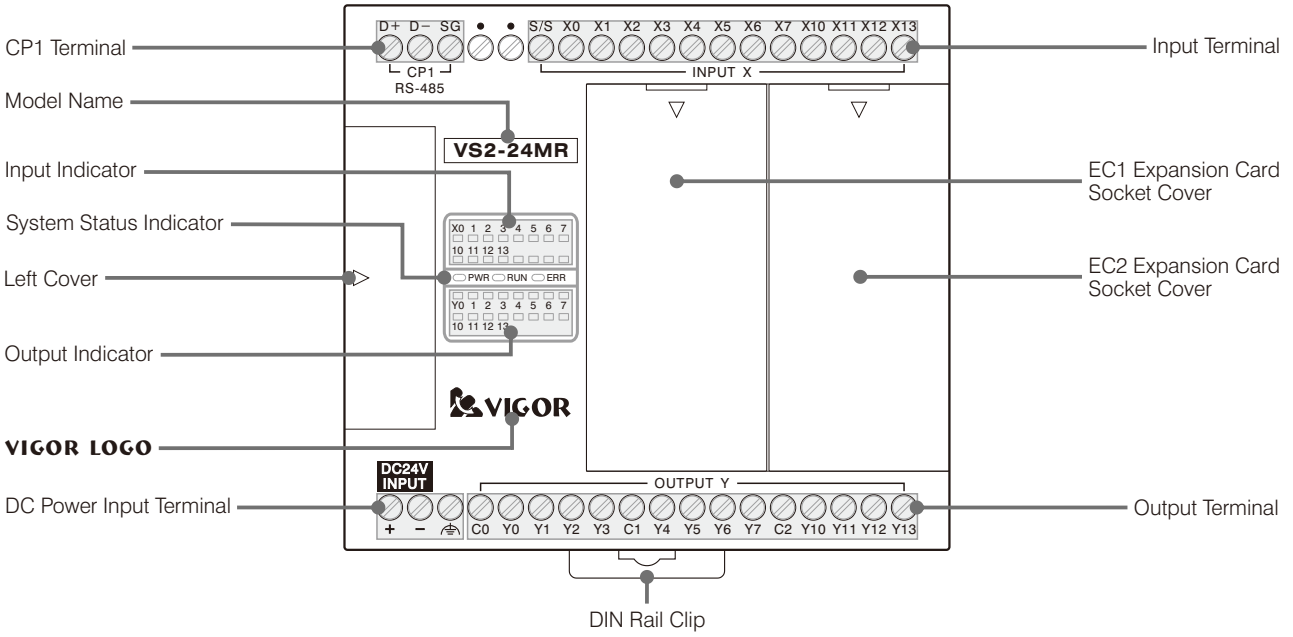
1-3 Component Designation

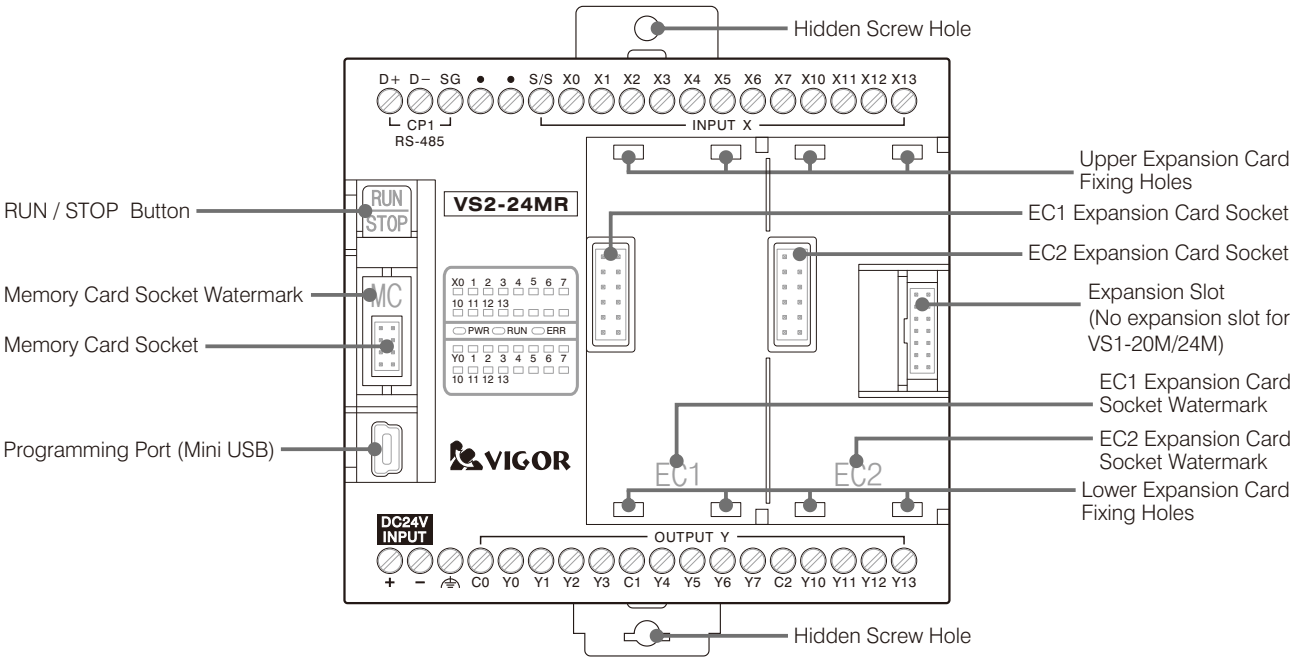
VS1-14M Main Unit (VS1-10M and VSM-14MT are similar)



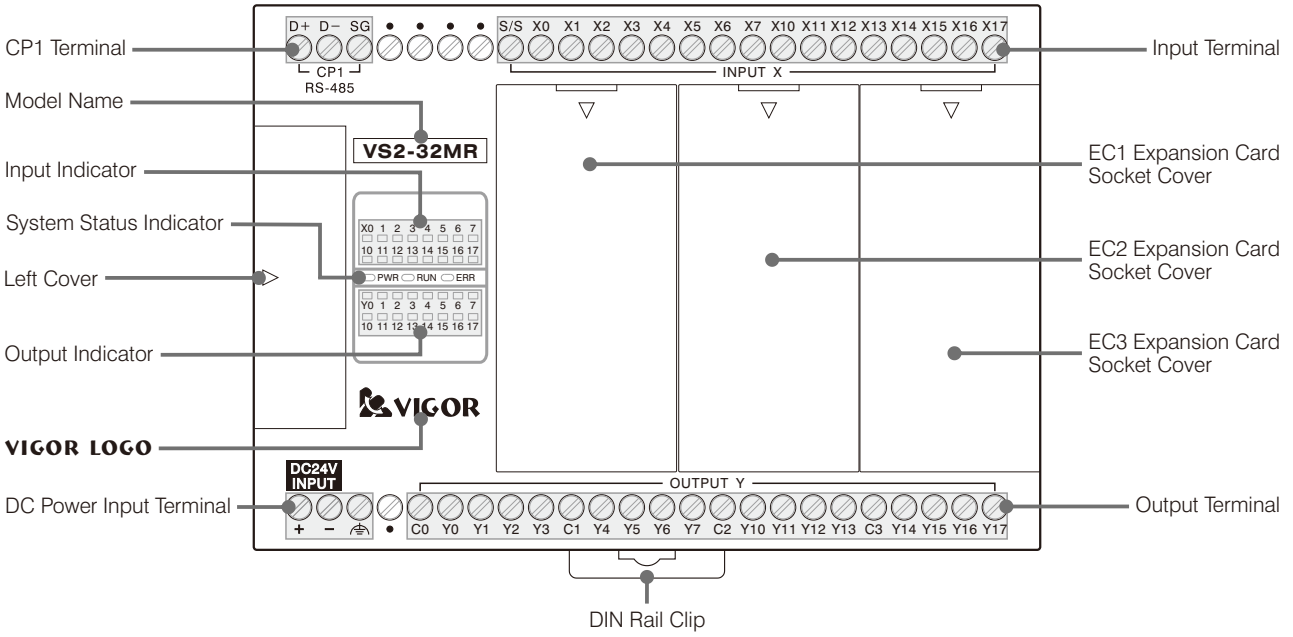


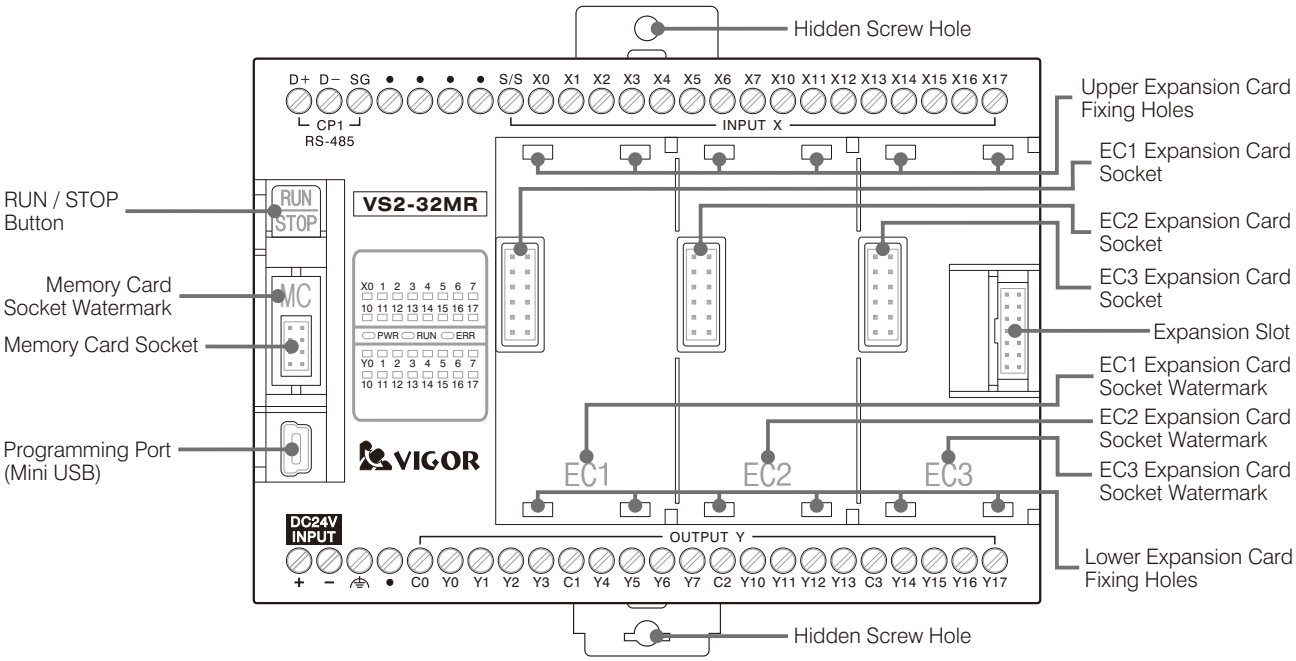
VS2-24M Main Unit (VS1-20M/24M and VSM-24MT are similar)



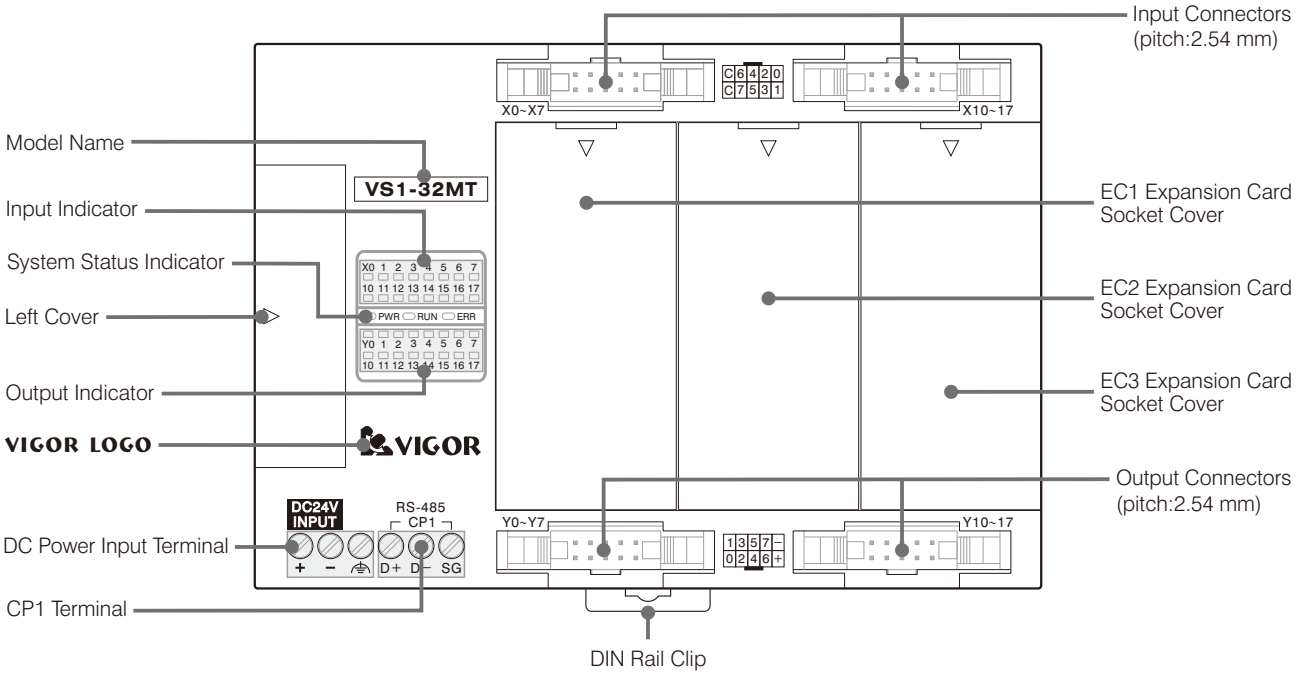


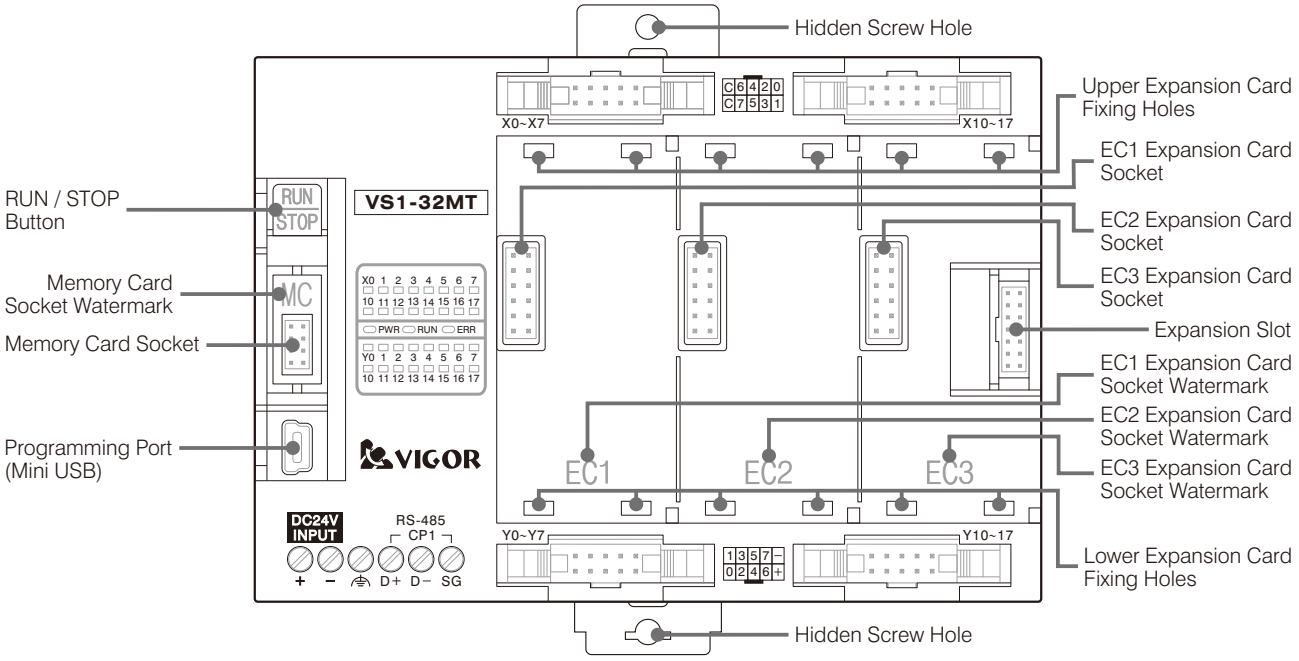
VS2-32M Main Unit (VS1-28M/32M, VSM-32M/28ML and VS3-32M are similar)





VS1-32MT-DI Main Unit (VS2-32MT-DI, VSM-32MT-DI and VS3-32MT-DI are similar)





1-4 Method of Product Named

Description of the Nameplate (it is located on the right side of the unit)

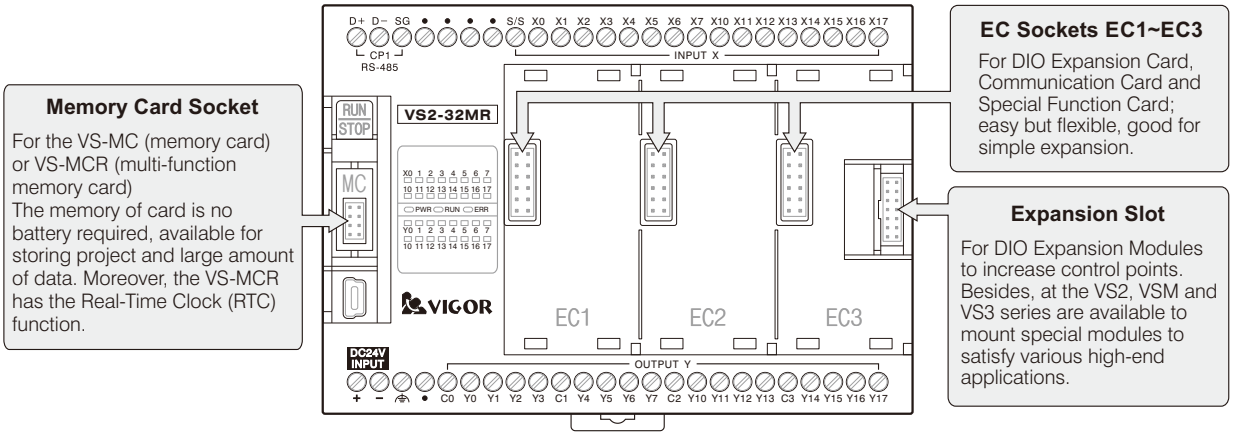
Complete Model Name of a Main Unit

VS1-□□M□-D□

- I/O Wiring Type
  - Blank: by terminal block
  - I: by IDC connector
- D: DC 24V Power Input
- Type of Output
  - R: relay output
  - T: NPN transistor output
  - P: PNP transistor output
  - L: line driver output at Y0~Y7; other outputs are NPN
- M: Main Unit
- No. of I/O Points
  - VS1 Series
    - 10: 6-point input+4-point output
    - 14: 8-point input+6-point output
    - 20: 12-point input+8-point output
    - 24: 14-point input+10-point output
    - 28: 16-point input+12-point output
    - 32: 20-point input+12-point output
    - 32(I): 16-point input+16-point output
  - VS2 Series
    - 24: 12-point input+12-point output
    - 32: 16-point input+16-point output
  - VSM Series
    - 14: 8-point input+6-point output
    - 24: 12-point input+12-point output
    - 28: 16-point input+12-point output
    - 32: 16-point input+16-point output
  - VS3 Series
    - 32: 16-point input+16-point output
- Name of Series
  - VS1 series
  - VS2 series
  - VSM series
  - VS3 series

1-5 Expansion Descriptions

VS series PLC not only provides a Main Unit with premium functions, but also flexibilities for expansion, which allows users to add equipment as needed to achieve a control system of the most suitable product.
VS series PLC offers flexibilities for 3 different expansion interfaces based on their functions, which are the Memory Card Socket, Expansion Card Socket and Expansion Slot.



1-5-1 Memory Card Socket

- All VS series Main Units have the Memory Card Socket.
- The Memory Card Socket is available for mounting a VS-MC Memory Card or VS-MCR Multi-function Memory Card.

Model Name	Specifications
VS-MC	Memory Card: 16 Mb no-battery required latched memory for storing user's project and large-size data-bank
VS-MCR	Multi-function Memory Card: 16Mb no-battery required latched memory for storing user's project and large-size data-bank; with built-in RTC function to provide the information of year, month, date, hour, minute, second and day of week

- The VS-MCR Multi-function Memory Card as a clock in the PLC, making the daily life automation become possible. For such as automatic sprinkling system, lighting control system and energy-saving control system for green buildings, etc.
- VS-MCR Multi-function Memory Card includes 16Mb no-battery latched memory and RTC. By installing this VS- MCR card, PLC will perform the function as a memory card and the above-mentioned RTC as well.
- The Memory Card could make the system maintenance easier.
  If the user stores project and relevant data in the removable VS-MC or VS-MCR memory card, even though the PLC fails, it's easy to move the whole system to another PLC. Thus, by the simple maintenance tasks can greatly increase maintenance efficiency and reduce difficult.
- Large amount of data can be stored in the Memory Card.
  VS-MC and VS-MCR memory cards have super large memory size for numerous mold parameters, enhancing machinery/equipment function level, or performing long-time data collecting. Even for the amusement facilities, such as dynamic theaters and water dance control, it provides remarkable data storage space for much more diversified and long-time control.
- The Memory Card is divided into two areas by functions of project storage and data storage.
  The project storage area occupies 1Mb memory space and is prepared by the programming tool, for to store the user program, system settings, comments and data tables.
  The data storage area has 655,360 Words of space that is named the Data Bank. It uses DBWR instruction to write data into the Data Bank, while DBRD instruction to read data out. For details, please refer to the respective instruction.
- For the descriptions of VS-MCR Multi-function Memory Card and VS-MC Memory Card, please refer to the section “7. Memory Cards”.

1-5-2 Expansion Card Sockets

In order to enhance the expansion flexibility and realize the “the most suitable product”, the VS series PLC is not only equipped with one popular PLC's module Expansion Slot, but also provided with the remarkable Expansion Card Socket interface.
The Expansion Card Socket is designed in front of the Main Unit, that could save installation width. The most important thing is by the structure of the Expansion Card could expand small-point DIO, communication port and special function to reduce the cost.

- The VS series Main Unit by different models has 1 to 3 Expansion Card Sockets.
  The VS1-10/14M or VSM-14MT Main Unit has one Expansion Card Socket EC1.
  The VS1-20/24M, VS2-24M or VSM-24MT Main Unit has two Expansion Card Sockets EC1 and EC2.
  The VS1-28/32M, VS2-32M, VSM-32MT, VSM-28ML or VS3-32M Main Unit has three Expansion Card Sockets EC1～EC3.
  The VS1 series is only available to install one special function card (but the VS-3AV-EC brief card will not occupy the quota), while other series can install up to three special function cards.
- The VS-32XYR, VS-32XYT or VS-32XYP module also equips two special I/O Extend Sockets for to install the VS-E8X-EC or VS-E8YT-EC cards, that could reduce the system space. Since, the VS-E8X-EC and VS-E8YT-EC cards are for the VS-32XYR/T/P Expansion Module only, can not be used at the Main Unit.
- Expansion Cards for the VS series Main Unit or Expansion Module are listed below:

DIO Expansion Card (DIO Card)

Model Name	Specifications
VS-4XY★-EC	DIO Expansion Card, 2 DI (DC24V), 2 DO; I/O by terminal block
VS-4X-EC	DIO Expansion Card, 4 DI (DC24V); input by terminal block
VS-4Y★-EC	DIO Expansion Card, 4 DO; output by terminal block
VS-8XY★-EC	DIO Expansion Card, 4 DI (DC24V), 4 DO; I/O by terminal block
VS-8X-EC	DIO Expansion Card, 8 DI (DC24V); input by terminal block
VS-8YT-EC	DIO Expansion Card, 8 DO (300mA NPN transistor); output by terminal block
VS-8XI-EC	DIO Expansion Card, 8 DI (DC24V); input by IDC connector
VS-8YTI-EC	DIO Expansion Card, 8 DO (100mA NPN transistor); output by IDC connector
VS-E8X-EC	DI Expansion Card for VS-32XY★ module: 8 DI DC 24V, Sink/Source selectable; input by screw-clamp terminal
VS-E8YT-EC	DO Expansion Card for VS-32XY★ module: 8 DO (DC 24V, 300mA NPN transistor); output by screw-clamp terminal

★ to indicate the selectable output type: R: 2A relay output; T: 0.3A NPN transistor output

Communication Expansion Card (CP Card)

Model Name	Specifications
VS-485-EC	RS-485 Communication Expansion Card: One non-isolated RS-485 port with TX / RX indicators; dist. 50m Max.
VS-485A-EC	RS-485 Communication Expansion Card: One isolated RS-485 port with TX / RX indicators; dist. 1000m Max.
VS-D485-EC	RS-485 Communication Expansion Card: Dual non-isolated RS-485 ports with TX / RX indicators; dist. 50m Max.
VS-D485A-EC	RS-485 Communication Expansion Card: Dual isolated RS-485 ports with TX / RX indicators; dist. 1000m Max.
VS-D232-EC	RS-232C Communication Expansion Card: Dual non-isolated RS-232 ports with TX / RX indicators; dist. 15m Max.; wiring by the RX / TX / SG terminals
VS-D52A-EC	RS-485 + RS-232C Communication Expansion Card: One isolated RS-485 port (1000m) & one non-isolated RS-232C port (15m), both with TX / RX indicators and wiring by terminals
VS-ENET-EC	Ethernet + RS-485 Communication Expansion Card: One Ethernet port (with additional non-isolated RS-485, dist. 50m) & one non-isolated RS-485 port (dist. 50m), both with TX / RX indicators

Special Function Card (SF Card)

Model Name	Specifications
VS-3AV-EC	Brief Voltage I/O Card: 2 channel (0～10V, 12-bit) inputs; 1 channel (0～10V, 10-bit) output; with a calibrated DC 10V output; non-isolated
VS-4AD-EC	Analog Input Card: 4 channel (12-bit) inputs, each channel could output either 0～10V, 4～20mA or 0～20mA; non-isolated
VS-2DA-EC	Analog Output Card: 2 channel (12-bit) outputs, each channel could input either 0～10V, 4～20mA or 0～20mA; non-isolated
VS-4A-EC	Analog I/O Card: 2 channel (12-bit) inputs + 2 channel (12-bit) outputs, each channel could input/output either 0～10V, 4～20mA or 0～20mA; non-isolated
VS-3ISC-EC	Inverter Speed Control Card: 3 channel (0.1% resolution) voltage outputs; totally isolated for each channel
VS-2TC-EC	Thermocouple Temperature Input Card: 2 channel (K, J, R, S, T, E, B or N type thermocouple, 0.2～0.3℃ resolution) inputs; non-isolated
VS-4TC-EC	Thermocouple Temperature Input Card: 4 channel (K, J, R, S, T, E, B or N type thermocouple, 0.2～0.3℃ resolution) inputs; non-isolated
VS-1PT-EC	PT-100 Temperature Input Card: 1 channel (3-wire PT-100, 0.1℃ resolution) input; non-isolated
VS-2PT-EC	PT-100 Temperature Input Card: 2 channel (3-wire PT-100, 0.1℃ resolution) inputs; non-isolated

- VS series PLC prepares 20 special relays and 20 special registers as working area for each Expansion Card Socket. For easy memory and convenient application, every special component of each Expansion Card is given a "Simple Code". The "Simple Code" will be used in the following documents.

Expansion Card Socket	Working Area		Available Expansion Card		
	Special M / D	Simple Code	DIO Card	CP Card	SF Card ✻1
EC1	M9260～M9269	EC1X0～EC1X7	○	○	○
	M9270～M9279	EC1Y0～EC1Y7			
	D9260 ～ D9279	EC1D0～EC1D19			
EC2	M9280～M9289	EC2X0～EC2X7	○	—	○
	M9290～M9299	EC2Y0～EC2Y7			
	D9280 ～ D9299	EC2D0～EC2D19			
EC3	M9300～M9309	EC3X0～EC3X7	○	○✻2	○
	M9310～M9319	EC3Y0～EC3Y7			
	D9300 ～ D9319	EC3D0～EC3D19			

✻1 Only one SF card is allowed at the VS1 series. The VS-3AV-EC brief card can work at the EC2 only, but it will not occupy the SF card quota.

✻2 A CP Card at the EC3 is only available for the VS3 series (to generate the CP4 and CP5). In addition, if it is a dual port CP card (VS-D232-EC, VS-D485-EC, VS-D485A-EC, VS-D52A-EC or VS-ENET-EC), at the EC2 socket could install the VS-3AV-EC card or not to use. Any DIO or SF Card at EC2 will cause that CP5 at EC3 ineffective.

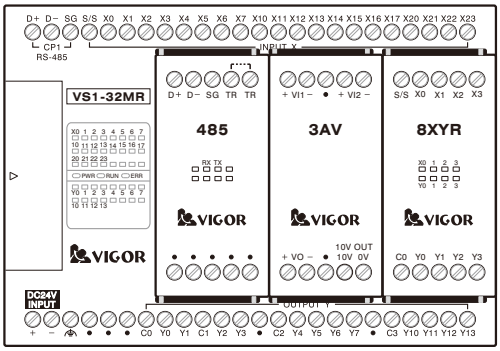
- The components X/Y of DIO Expansion Card will correspond to respectively Simple Codes at the installed Main Unit.

Expansion Card Model Name	Expansion Card Socket	DIO Card							
		X0	X1	X2	X3	Y0	Y1	Y2	Y3
VS-4XY★-EC	EC1	EC1X0	EC1X1	—	—	EC1Y0	EC1Y1	—	—
	EC2	EC2X0	EC2X1	—	—	EC2Y0	EC2Y1	—	—
	EC3	EC3X0	EC3X1	—	—	EC3Y0	EC3Y1	—	—
VS-4X-EC	EC1	EC1X0	EC1X1	EC1X2	EC1X3	—	—	—	—
	EC2	EC2X0	EC2X1	EC2X2	EC2X3	—	—	—	—
	EC3	EC3X0	EC3X1	EC3X2	EC3X3	—	—	—	—
VS-4Y★-EC	EC1	—	—	—	—	EC1Y0	EC1Y1	EC1Y2	EC1Y3
	EC2	—	—	—	—	EC2Y0	EC2Y1	EC2Y2	EC2Y3
	EC3	—	—	—	—	EC3Y0	EC3Y1	EC3Y2	EC3Y3
VS-8XY★-EC	EC1	EC1X0	EC1X1	EC1X2	EC1X3	EC1Y0	EC1Y1	EC1Y2	EC1Y3
	EC2	EC2X0	EC2X1	EC2X2	EC2X3	EC2Y0	EC2Y1	EC2Y2	EC2Y3
	EC3	EC3X0	EC3X1	EC3X2	EC3X3	EC3Y0	EC3Y1	EC3Y2	EC3Y3

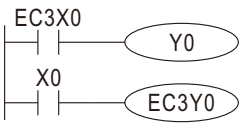
Expansion Card Model Name	Expansion Card Socket	DIO Card							
		X0	X1	X2	X3	X4	X5	X6	X7
VS-8X-EC VS-8XI-EC	EC1	EC1X0	EC1X1	EC1X2	EC1X3	EC1X4	EC1X5	EC1X6	EC1X7
	EC2	EC2X0	EC2X1	EC2X2	EC2X3	EC2X4	EC2X5	EC2X6	EC2X7
	EC3	EC3X0	EC3X1	EC3X2	EC3X3	EC3X4	EC3X5	EC3X6	EC3X7

Expansion Card Model Name	Expansion Card Socket	DIO Card							
		Y0	Y1	Y2	Y3	Y4	Y5	Y6	Y7
VS-8YT-EC VS-8YTI-EC	EC1	EC1Y0	EC1Y1	EC1Y2	EC1Y3	EC1Y4	EC1Y5	EC1Y6	EC1Y7
	EC2	EC2Y0	EC2Y1	EC2Y2	EC2Y3	EC2Y4	EC2Y5	EC2Y6	EC2Y7
	EC3	EC3Y0	EC3Y1	EC3Y2	EC3Y3	EC3Y4	EC3Y5	EC3Y6	EC3Y7

★ to indicate the selectable output type: R: 2A relay output; T: 0.3A NPN transistor output



As shown on the left, a VS-8XYR-EC is installed in the EC3 Expansion Card Socket. The X0～X3 on VS-8XYR-EC are correspond to EC3X0～EC3X3, and its Y0～Y3 are correspond to EC3Y0～EC3Y3.



The input status of X0 on VS-8XYR-EC will be output from the Y0 output point of Main Unit.

The input status of X0 in Main Unit will be output from the Y0 on VS-8XYR-EC.

- For the VS1, VS2 and VSM series PLC, the CP Card can only be installed in the EC1. Therefore, by that CP card to provide the Communication Ports CP2 and CP3. As a result, the VS1, VS2 and VSM series PLCs have three Communication Ports CP1～CP3 available.
  For VS3 series PLC, the CP Card can be installed in the EC1 and EC3, as CP2～CP3 and CP4～CP5 to be the Communication Posts respectively. Thus, VS3 series PLCs have five Communication Ports as CP1～CP5 at most.
  When the CP5 at the EC3 socket is used, the EC2 socket can only be installed with one VS-3AV-EC card or keep it empty (any other Special or I/O Card is not allowed), otherwise the CP5 will not work.
  The function of each port on the Communication Expansion Card is driven directly by system settings and program, which is not related to the working area of the I/O Expansion Card or Special Function Card.
- The VS-3AV-EC Brief Voltage I/O Card can only be installed in the EC2 Slot. It's functioned by the particular special registers, not related to the working area of the I/O Expansion Card or Special Function Card.

Register No.	Function Description
■D9030	The AD converted value of VI1 at the VS-3AV-EC, 0～10V = 0～4000
■D9031	The AD converted value of VI2 at the VS-3AV-EC, 0～10V = 0～4000
D9032	The DA digital input value for the VO at the VS-3AV-EC, 0～1000 = 0～10V

■ Represents that component is read only.

Other Special Function (SF) Cards are available to install in EC1～EC3 Expansion Card Sockets and perform by the respective working area. For details please refer to the description of the individual SF Card.

1-5-3 Expansion Slot

The VS series PLC is a powerful compact PLC system with control point ranging from 10 to 512 points. To realize the features of diversified combination and easy maintenance, the VS series PLC is designed to be modular construction.

The VS series PLC offers powerful Main Units and variable expansion modules, together constructing a powerful, diversified, complete and flexible PLC combination system. Thus, allowing users to enjoy the most satisfying, suitable and cost-effective product combination.

The modular construction is realized by the modular expansion slot interface of VS series PLC. Various functions can be expanded through this modular expansion slot. Such as the expansion of DI/DO points, processing of analog AI/AO signals and other special applications, which are achieved by the modular expansion slot to link with relevant function modules.

- Expansion Modules available for the VS series PLC are listed as follows:

DIO Expansion Module

Model Name	Specifications
VS-8X	DI Expansion Module: 8 DI (DC 24V); input by screw-clamp terminal
VS-16X	DI Expansion Module: 16 DI (DC 24V); input by screw-clamp terminal
VS-8Y★	DO Expansion Module: 8 DO ★; output by screw-clamp terminal
VS-16Y★	DO Expansion Module: 16 DO ★; output by screw-clamp terminal
VS-8XY★	DIO Expansion Module: 4 DI (DC 24V); 4 DO ★; I/O by screw-clamp terminal
VS-16XY★	DIO Expansion Module: 8 DI (DC 24V); 8 DO ★; I/O by screw-clamp terminal
VS-28XYR	DIO Expansion Module: 16 DI (DC 24V); 12 DO (2A Relay); I/O by screw-clamp terminal
VS-32XY★	DIO Expansion Module: 16 DI (DC 24V); 16 DO ★; I/O by screw-clamp terminal
VS-16X-I	DI Expansion Module: 16 DI (DC 24V); input by IDC connector
VS-16YT-I	DO Expansion Module: 16 DO (100mA NPN transistor); output by IDC connector
VS-16XYT-I	DIO Expansion Module: 8 DI (DC 24V); 8 DO (100mA NPN transistor); I/O by IDC connector
VS-32XYT-I	DIO Expansion Module: 16 DI (DC 24V); 16 DO (100mA NPN transistor); I/O by IDC connector

★ to indicate the selectable output type: R: 2A relay output; T: 0.5A NPN transistor output

Power Repeater Module

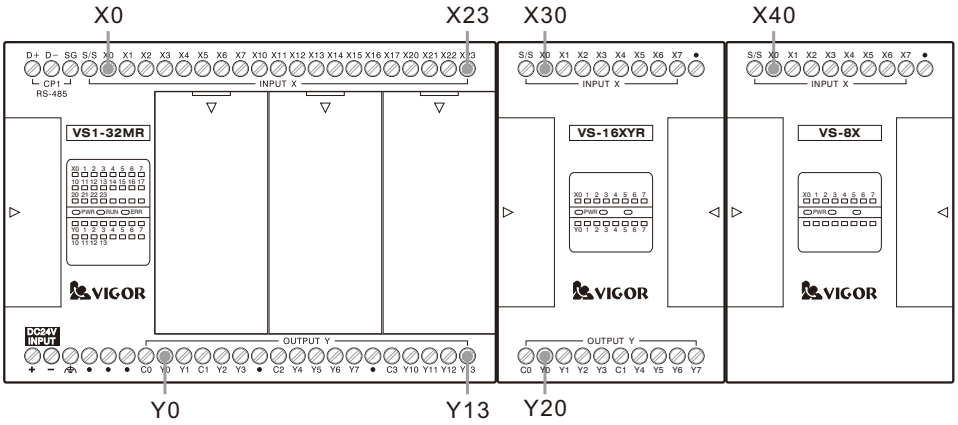
Model Name	Specifications
VS-PSD	Power Repeater Module: DC 24V power input to transfer to DC 5V 500mA + DC 12V 800mA, those inner power outputs provide for the Modules behind

Special Function Module

Model Name	Specifications
VS-4AD	Analog Input Module: 4 channel (16-bit) inputs, each channel could input either –10～+10V, 4～20mA or –20～+20mA; isolated
VS-2DA	Analog Output Module: 2 channel (16-bit) outputs, each channel could output either –10～+10V, 4～20mA or –20～+20mA; isolated
VS-3A	Analog I/O Module: 2 channel (16-bit) inputs + 1 channel (16-bit) output, each channel could input/output either –10～+10V, 4～20mA or –20～+20mA; isolated
VS-6A	Analog I/O Module: 4 channel (16-bit) inputs + 2 channel (16-bit) outputs, each channel could input/output either –10～+10V, 4～20mA or –20～+20mA; isolated
VS-4TC	Thermocouple Temperature Input Module: 4 channel thermocouple (K, J, R, S, T, E, B or N type) inputs, 0.1℃ / 0.1℉ resolution ; isolated
VS-8TC	Thermocouple Temperature Input Module: 8 channel thermocouple (K, J, R, S, T, E, B or N type) inputs, 0.1℃ / 0.1℉ resolution ; isolated
VS-2PT	PT-100 Temperature Input Module: 2 channel (3-wire PT-100) inputs, 0.1℃ / 0.1℉ resolution ; isolated
VS-4PT	PT-100 Temperature Input Module: 4 channel (3-wire PT-100) inputs, 0.1℃ / 0.1℉ resolution ; isolated
VS-2PG	Pulse Generator Module: 2 sets of 200 kHz high speed pulse outputs for 2 axes position control.
VS-4PG	Pulse Generator Module: 4 sets of 200 kHz high speed pulse outputs for 4 axes position control.

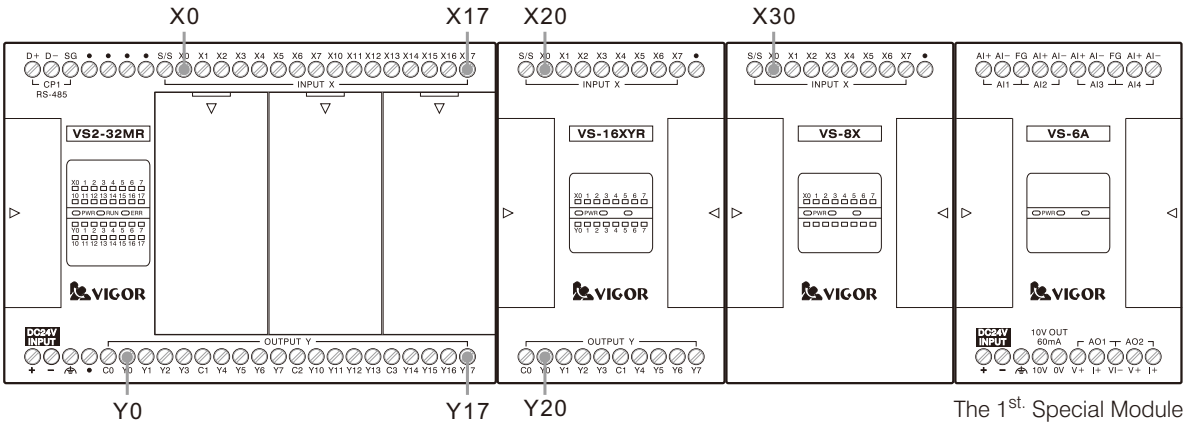
- The Main Unit has the circuit for internal power supplying but the expanded modules and cards do not have, therefor all the power is from the Main Unit. Please pay attention to the power consumption, add the VS-PSD power repeater module is required if the power is insufficient.
  For the power consumption calculations of specific expansion module or expansion card, please refer to Section "1-8 Speci cations of Power Supply".

- Notes about the Expansion Slot at the VS1 series PLC
  - VS1-10M, VS1-14M, VS1-20M or VS1-24M Main Unit is not provided with the module's Expansion Slot, so it can not connect to any expansion module.
  - VS1-28M or VS1-32M Main Unit equips a module's Expansion Slot for to connect with DIO expansion modules, but it is unable to use the special expansion module.
  - VS1 series PLC can use expansion modules to handle up to 64 input points (X0～X77) and 64 output points (Y0～Y77), total 128 I/O points.
  - VS1-28M or VS1-32MT-DI Main Unit will occupy the X0～X17 and Y0～Y17 I/O addresses, thus the beginning I/O address of the first expansion unit/module are the X20 and Y20.
  - VS1-32M Main Unit will occupy the X0～X27 and Y0～Y17 I/O addresses, thus the beginning I/O address of the first expansion unit/module are the X30 and Y20.



  - The VS-8XY expansion module will occupy 8 input and 8 output points.
  - The VS-28XYR expansion module will occupy 16 input and 16 output points, furthermore, unable to expand any module on its right side.

- Notes about the Expansion Slot at the VS2, VSM or VS3 series PLC
  - VSM-14M Main Unit is not provided with the module's Expansion Slot, so it can't connect to any expansion module.
  - VS2, VSM or VS3 Main Unit equips a module's Expansion Slot, could connect with DIO expansion modules and special modules. (excluded VSM-14M)
  - VS2 or VSM Main Unit can use expansion module's to handle up to 128 input points (X0～X177) and 128 output points (Y0～Y177), total 256 I/O points. And also available 8 special modules.
  - VS3 Main Unit can use expansion modules to handle up to 256 input points (X0～X377) and 256 output points (Y0～Y377), total 512 I/O points. And also available 16 special modules.
  - All the Special and DIO Expansion Modules are serial connected on the right side of the Main Unit, and the connection sequence is without reserved. The closest Special Module is designated as the 1st. Special Module. After that, the followed Special Module is the 2nd., and so on. But, the DIO Expansion Module will not interfere with the ranking of Special Modules.
  - VS2, VSM or VS3 Main Unit will occupy the X0～X17 and Y0～Y17 I/O address, thus the beginning I/O address of the first expansion unit/module are the X20 and Y20.



  - The VS-8XY expansion module will occupy 8 input and 8 output points.
  - The VS-28XYR expansion module will occupy 16 input and 16 output points, furthermore, unable to expand any module on its right side.

1-6 General Specifications

Design Precautions **DANGER**

- Please create an external safety circuit for PLC to ensure the system can without risk in case of abnormal power supply or PLC malfunction.
- Any false operation or false output may cause accidents.
- To avoid machine damage, it is required to design an external protection circuit, such as emergency stop, forward / reverse interlock, over / under limit protection etc. for PLC.
- According to the diagnostic functions such as the Watch Dog Timer (WDT), the CPU of PLC could detect the abnormal process and then stop all outputs. However, failures in the input/output control circuits are not detectable by the CPU of PLC. Thus, when failures occur in the input/output control circuits, the output may be uncontrollable, which makes the external safety circuit and safety mechanism become necessary to ensure equipment safety.
- Since the malfunction of PLC output relays or transistors will fail the ON/OFF control, it is required to design an external safety circuit and safety mechanism for the output signals of major accidents to ensure risk-free operation of equipment.

Item	Specifications
Ambient	Work Temperature: 0 ~ 55 ℃; Storage Temperature: –20 ~ 70℃; Humidity: 10 ~ 90% RH (at 25 ℃ / 77 ℉, non-condensation)
Vibration Tolerance	10 ~ 55 Hz with amplitude of 0.075 mm; 55 ~ 150 Hz 1G acceleration at X, Y and Z axes for 80 min. (8 min. per cycle×10 cycles)
Shock Tolerance	10 G, three times for each of X, Y and Z axes
Noise Immunity	Noise simulator: 1500 Vp-p; Pulse width: 1 μs, Frequency: 25 ~ 60Hz
Dielectric Strength	500V AC (between the ground and DC terminals); 1 min.
Insulation Resistance	> 5 MΩ ; 500V DC (between the ground and DC terminals)
Grounding	Class-3 Grounding (Forbid grounding with large power equipment)
Atmosphere	Keep away from corrosive gas and dusty environment
Atmospheric Pressure	1080 to 795 hPa (corresponding to an altitude of -1000 to 2000 m)

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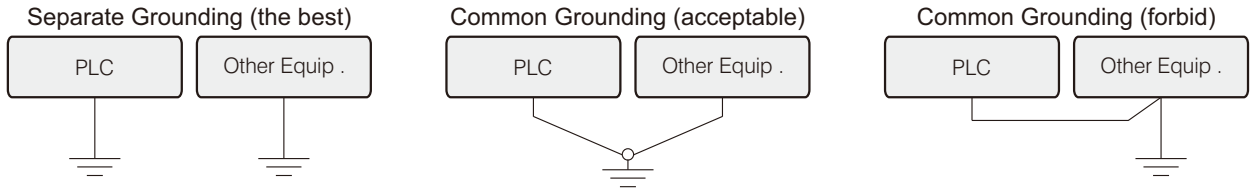


For the PLC consisting of a Main Unit and Expansion Modules, please connect all ground terminals to the Main Unit's ground terminal, and then ground the Main Unit to the earth.

1-7 Performance Specification

Item			VS1 Series	VS2 Series	VSM Series	VS3 Series
Operation Control Method			Cyclic Operation by Stored Program			
Programming Language			Ladder Diagram + Sequential Function Chart (SFC) or Ladder Diagram + Step Ladder (STL)			
I/O Control Method			Batch Processing			
Process Time	Basic Instruction		0.17 μs			0.15 μs
	Application Instruction		A few μs ~ Hundreds of μs			
Number of Instructions	Basic Instruction		29			
	SFC Instruction		2			
	STL Instruction		2			
	Application Instruction		169	171	171	209
Project Memory Capacity (Flash ROM)			The project at the memory is including the parameter area, user program, pointers, tables and comments.			
			16k Words	32k Words	32k Words	64k Words
Max. Input/Output Points			128 points + 24 at Expansion Card	256 points + 24 at Expansion Card	256 points + 24 at Expansion Card	512 points + 24 at Expansion Card
Digital Input / Output	External Input (X)		64 points: X0 ~ X77	128 points: X0 ~ X177	128 points: X0 ~ X177	256 points: X0 ~ X377
	External Output (Y)		64 points: Y0 ~ Y77	128 points: Y0 ~ Y177	128 points: Y0 ~ Y177	256 points: Y0 ~ Y377
Internal Relay	Auxiliary Relay (M)	General	6192 points: M0 ~ M1999, M4000 ~ M8191			
		Latched	2000 points: M2000 ~ M3999			
		Special	512 points: M9000 ~ M9511			
	Step Relay (S)	Initial	10 points: S0 ~ S9			
		General	3086 points: S10 ~ S499, S1500 ~ S4095			
		Latched	900 points: S500 ~ S899, S1000 ~ S1499			
		Annunciator	100 points: S900 ~ S999 (Latched)			
Timer (T)	100ms		200 points: T0 ~ T199 (Timer range: 0.1 ~ 3,276.7 sec.)			
	10ms		46 points: T200 ~ T245 (Timer range: 0.01 ~ 327.67 sec.)			
	1ms (Retentive)		4 points: T246 ~ T249 (Timer range: 0.001 ~ 32.767 sec.)			
	100ms (Retentive)		6 points: T250 ~ T255 (Timer range: 0.1 ~ 3,276.7 sec.)			
	1ms		256 points: T256 ~ T511 (Timer range: 0.001 ~ 32.767 sec.)			
Counter (C)	16-bit Up	General	100 points: C0 ~ C99 (Range: 0 ~ 32,767)			
		Latched	100 points: C100 ~ C199 (Range: 0 ~ 32,767)			
	32-bit Up / Down	General	20 points: C200 ~ C219 (Range: –2,147,483,648 ~ 2,147,483,647)			
		Latched	15 points: C220 ~ C234 (Range: –2,147,483,648 ~ 2,147,483,647)			
Software High Speed Counter (C)	32-bit Up / Down, Latched	1-Phase	11 points: C235 ~ C245 (Range: –2,147,483,648 ~ 2,147,483,647)			
		2-Phase	5 points: C246 ~ C250 (Range: –2,147,483,648 ~ 2,147,483,647)			
		A / B Phase	5 points: C251 ~ C255 (Range: –2,147,483,648 ~ 2,147,483,647)			
Hardware High Speed Counter			2 points: HHSC1 ~ HHSC2 (Range: –2,147,483,648 ~ 2,147,483,647)			
Data Register	General (D)		7000 points: D0 ~ D6999			
	Latched (D)		2000 points: D7000 ~ D8999			
	Special (SD)		512 points: D9000 ~ D9511			
	Index Register (V / Z)		16 points: V0 ~ V7, Z0 ~ Z7			
	Extension Register (R)		10000 points: R0 ~ R9999			24000 points: R0~23999
Pointer	Mark Pointer		1024 points: Each pointer can be named by P0 ~ P1023 or 16 characters			
	Branch Pointer (P)		1024 points: P0 ~ P1023			
	Table Nickname		32 points: Each table can be named by Q0 ~ Q31 or 16 characters			
	Table Code (Q)		32 points: Q0 ~ Q31			
	Interrupt Pointer (I)		21 points: 8 pt. for external interrupt, 3 pt. for timer interrupt, 10 pt. for high speed counter interrupt			
	Nest Pointer (N)		8 points: N0 ~ N7			

Item			VS1 Series	VS2 Series	VSM Series	VS3 Series
Range of Constant	Decimal (K)	16-bit	K–32,768 ~ K32,767			
		32-bit	K–2,147,483,648 ~ K2,147,483,647			
	Hexadecimal (H)	16-bit	H0 ~ HFFFF			
		32-bit	H0 ~ HFFFFFFFF			
	Real No. (E)	32-bit	E–3. 402 + 38 ~ E3. 402 + 38, decimal or exponent notation			
Comm. Function	Main Unit Built-in Comm. Port	Programming	12Mbps high-speed Mini USB communication port			
		Multi-Func.	CP1 (RS-485) is available for the Computer Link, MODBUS, CPU Link, Non-Protocol, etc.			
	Expanded Multi-Func. Port		CP2 ~ CP3 (at the EC1)			
			—	—	—	CP4 ~ CP5 (at the EC3)
Multi-Function High Speed Input	Input Response Frequency		10kHz × 8 points	50kHz × 8 points	200kHz × 4 points☆ 50kHz × 4 points	200kHz × 4 points 50kHz × 4 points
	Input Response Time Adj.		8 points: X0 ~ X7 (0~60ms)			
	External Interrupt Input		8 points: X0 ~ X7 (with delay function)			
	Pulse Capture Input		8 points: X0 ~ X7			
	Pulse Measurement Input		4 points: X0, X1, X3, X4 (with width period measurement function)			
	Frequency Meter Input		8 points: X0 ~ X7			
	Software High Speed Counter		Support 1, 2 or AB phase counting mode, 1-phase 8 points or 2/AB phase 4 sets max.			
	Hardware High Speed Counter		2 sets: HHSC1 and HHSC2. Support U, U/D+DIR, U+D, AB×1, AB×2 or AB×4 operating mode			
	Electronic Handwheel		Cooperate with high speed pulse output to control positioning			
High Speed Pulse Output			4 points 50kHz (4-axis positioning control)	4 points 50kHz (4-axis positioning control)	4 points 200kHz (4-axis positioning control) ☆	
Real Time Clock (Optional)			By installing VS-MCR Multi-Function Memory Card to indicate year, month, date, hour, min., sec. & week			
Expansion Memory (Optional)			By installing a VS-MCR/VS-MC card to expand no-battery required 16Mb latched memory for user's project and 655,360 Words data-bank			
Special Module	Number of Special Module Available		—	8	8	16
	Type of Special Module		—	Analog I/O Module, Temperature Input Module, etc.		
Expansion Card	Expansion Card Socket at Unit		10/14M Main Unit (EC1), 20/24M Main Unit (EC1~EC2), 28/32M Main Unit (EC1~EC3)			
	Type of Expansion Card		DI/DO, communication or special function card (AI, AO, temperature input, inverter speed control, etc.)			
	Number of Special Card Available		1 (VS-3AV-EC won't occupy)	3	3	3

☆ At the VSM-28ML model, the 4 line driver input points for the HHSC1 & HHSC2 can individually count 1 MHz pulses; also, the 4 line driver output points can individually generate 1MHz pulses.

1-7-1 VS1 Series Performance Specification

Item			10M	14M	20M	24M	28M	32M	32MT-I
Operation Control Method			Cyclic Operation by Stored Program						
Programming Language			Ladder Diagram + Sequential Function Chart (SFC) or Ladder Diagram + Step Ladder (STL)						
I/O Control Method			Batch Processing						
Process Time	Basic Instruction		0.17 μs						
	Application Instruction		A few μs ~ Hundreds of μs						
Number of Instructions	Basic Instruction		29						
	SFC Instruction		2						
	STL Instruction		2						
	Application Instruction		169						
Project Memory Capacity (Flash ROM)			16K Words (The project at the memory is including the parameter area, user program, pointers, tables and comments.)						
Main Unit Built-in I/O	Number of Input Points		6 points X0 ~ X5	8 points X0 ~ X7	12 points X0 ~ X13	14 points X0 ~ X15	16 points X0 ~ X17	20 points X0 ~ X23	16 points X0 ~ X17
	Number of Output Points		4 points Y0 ~ Y3	6 points Y0 ~ Y5	8 points Y0 ~ Y7	10 points Y0 ~ Y11	12 points Y0 ~ Y13	12 points Y0 ~ Y13	16 points Y0 ~ Y17
Expandable I/O Points			Expansion Card 8 points		Expansion Card 16 points		X20~X77 (32M is X30~X77), Y20~Y77 and Expansion Card 24 points		
Digital Input / Output	External Input (X)		X0 ~ X5	X0 ~ X7	X0 ~ X13	X0 ~ X15	X0 ~ X77		
	External Output (Y)		Y0 ~ Y3	Y0 ~ Y5	Y0 ~ Y7	Y0 ~ Y11	Y0 ~ Y77		
Internal Relay	Auxiliary Relay (M)	General	6192 points: M0 ~ M1999, M4000 ~ M8191						
		Latched	2000 points: M2000 ~ M3999						
		Special	512 points: M9000 ~ M9511						
	Step Relay (S)	Initial	10 points: S0 ~ S9						
		General	3086 points: S10 ~ S499, S1500 ~ S4096						
		Latched	900 points: S500 ~ S899, S1000 ~ S1499						
		Annunciator	100 points: S900 ~ S999 (Latched)						
Timer (T)	100ms		200 points: T0 ~ T199 (Timer range: 0.1 ~ 3,276.7 sec.)						
	10ms		46 points: T200 ~ T245 (Timer range: 0.01 ~ 327.67 sec.)						
	1ms (Retentive)		4 points: T246 ~ T249 (Timer range: 0.001 ~ 32.767 sec.)						
	100ms (Retentive)		6 points: T250 ~ T255 (Timer range: 0.1 ~ 3,276.7 sec.)						
	1ms		256 points: T256 ~ T511 (Timer range: 0.001 ~ 32.767 sec.)						
Counter (C)	16-bit Up	General	100 points: C0 ~ C99 (Range: 0 ~ 32,767)						
		Latched	100 points: C100 ~ C199 (Range: 0 ~ 32,767)						
	32-bit Up/Down	General	20 points: C200 ~ C219 (Range: –2,147,483,648 ~ 2,147,483,647)						
		Latched	15 points: C220 ~ C234 (Range: –2,147,483,648 ~ 2,147,483,647)						
Software High Speed Counter (C)	32-bit Up/Down, Latched	1-Phase	11 points: C235 ~ C245 (Range: –2,147,483,648 ~ 2,147,483,647)						
		2-Phase	5 points: C246 ~ C250 (Range: –2,147,483,648 ~ 2,147,483,647)						
		A/B Phase	5 points: C251 ~ C255 (Range: –2,147,483,648 ~ 2,147,483,647)						
Hardware High Speed Counter			2 points: HHSC1 ~ HHSC2 (Range: –2,147,483,648 ~ 2,147,483,647)						
Data Register	General (D)		7000 points: D0 ~ D6999						
	Latched (D)		2000 points: D7000 ~ D8999						
	Special (SD)		512 points: D9000 ~ D9255						
	Index Register (V / Z)		16 points: V0 ~ V7, Z0 ~ Z7						
	Extension Register (R)		10,000 points: R0 ~ R9999						
Pointer	Mark Pointer		1024 points: Each pointer can be named by P0 ~ P1023 or 16 characters						
	Branch Pointer (P)		1024 points: P0 ~ P1023						
	Table Nickname		32 points: Each table can be named by Q0 ~ Q31 or 16 characters						
	Table Code (Q)		32 points: Q0 ~ Q31						
	Interrupt Pointer (I)		21 points: 8 for external interrupt, 3 for timing interrupt and 10 for High Speed Counter interrupt						
	Nest Pointer (N)		8 points: N0 ~ N7						

Item			10M	14M	20M	24M	28M	32M	32MT-I
Range of Constant	Decimal (K)	16-bit	K –32,768 ~ K32,767						
		32-bit	K –2,147,483,648 ~ K2,147,483,647						
	Hexadecimal (H)	16-bit	H0 ~ HFFFF						
		32-bit	H0 ~ HFFFFFFFF						
	Real No. (E)	32-bit	E–3. 402 + 38 ~ E3. 402 + 38, decimal or exponent notation						
Comm. Function	Main Unit Built-in Comm. Port	Prog. Port	12Mbps high-speed Mini USB communication port						
		Multi-Func.	CP1 (RS-485) for the Computer Link, MODBUS, CPU Link or Non-protocol						
	Expanded Multi-Func. Port		CP2 & CP3: At the communication card of EC1, usable functions are equal to the CP1						
Multi-Function High Speed Input	Input Response Frequency		10kHz × 8 points						
	Input Response Time Adj.		8 points: X0 ~ X7 (0 ~ 60ms)						
	External Interrupt Input		8 points: X0 ~ X7 (with delay function)						
	Pulse Capture Input		8 points: X0 ~ X7						
	Pulse Measurement Input		4 points: X0, X1, X3, X4 (with width period measurement function)						
	Frequency Meter Input		8 points: X0 ~ X7						
	Software High Speed Counter		Support 1, 2 or AB phase counting mode, 1-phase 8 points or 2/AB phase 4 sets max.						
	Hardware High Speed Counter		2 sets: HHSC1 and HHSC2. Support U, U/D+DIR, U+D, AB×1, AB×2 or AB×4 operating mode						
	Electronic Handwheel		Cooperate with high speed pulse output to control positioning						
High Speed Pulse Output			4 points 50kHz at Y0 ~ Y3. For 4-axis simple positioning control, support 6 positioning instructions						
Real Time Clock (Optional)			By installing VS-MCR Multi-Function Memory Card to indicate year, month, date, hour, min., sec. & week						
Expansion Memory (Optional)			By installing a VS-MCR/VS-MC card to expand no-battery required 16Mb latched memory for user's project and 655,360 Words data-bank						
Expansion Card	No. of Expansion Card Socket at Unit		1 (allow one special card)		2 (allow one special card)		3 (allow one special card)		
	Type of Expansion Card		DI/DO, communication or special function card (AI, AO, temperature input, inverter speed control, etc.)						
	Number of Special Card Available		1 (the VS-3AV-EC brief card will not occupy this available number of special card)						

1-7-2 VS2 Series Performance Specification

Item			VS2-24M	VS2-32M
Operation Control Method			Cyclic Operation by Stored Program	
Programming Language			Ladder Diagram + Sequential Function Chart (SFC) or Ladder Diagram + Step Ladder (STL)	
I/O Control Method			Batch Processing	
Process Time	Basic Instruction		0.17 μs	
	Application Instruction		A few μs ~ Hundreds of μs	
Number of Instructions	Basic Instruction		29	
	SFC Instruction		2	
	Step Ladder Instruction		2	
	Application Instruction		171	
Project Memory Capacity (Flash ROM)			32K Words (The project at the memory is including the parameter area, user program, pointers, tables and comments.)	
Main Unit Built-in I / O	Number of Input Points		12 points: X0 ~ X13	16 points: X0 ~ X17
	Number of Output Points		12 points: Y0 ~ Y13	16 points: Y0 ~ Y17
Expandable I/O Points			X20~X177, Y20~Y177 & Expansion Card 16 points	X20~X177, Y20~Y177 & Expansion Card 24 points
Digital Input / Output	External Input (X)		128 points: X0 ~ X177	
	External Output (Y)		128 points: Y0 ~ Y177	
Internal Relay	Auxiliary Relay (M)	General	6192 points: M0 ~ M1999, M4000 ~ M8191	
		Latched	2000 points: M2000 ~ M3999	
		Special	512 points: M9000 ~ M9511	
	Step Relay (S)	Initial	10 points: S0 ~ S9	
		General	3086 points: S10 ~ S499, S1500 ~ S4096	
		Latched	900 points: S500 ~ S899, S1000 ~ S1499	
		Annunciator	100 points: S900 ~ S999 (Latched)	
Timer (T)	100ms		200 points: T0 ~ T199 (Timer range: 0.1 ~ 3,276.7 sec.)	
	10ms		46 points: T200 ~ T245 (Timer range: 0.01 ~ 327.67 sec.)	
	1ms (Retentive)		4 points: T246 ~ T249 (Timer range: 0.001 ~ 32.767 sec.)	
	100ms (Retentive)		6 points: T250 ~ T255 (Timer range: 0.1 ~ 3,276.7 sec.)	
	1ms		256 points: T256 ~ T511 (Timer range: 0.001 ~ 32.767 sec.)	
Counter (C)	16-bit Up	General	100 points: C0 ~ C99 (Range: 0 ~ 32,767)	
		Latched	100 points: C100 ~ C199 (Range: 0 ~ 32,767)	
	32-bit Up/Down	General	20 points: C200 ~ C219 (Range: –2,147,483,648 ~ 2,147,483,647)	
		Latched	15 points: C220 ~ C234 (Range: –2,147,483,648 ~ 2,147,483,647)	
Software High Speed Counter (C)	32-bit Up/Down, Latched	1-Phase	11 points: C235 ~ C245 (Range: –2,147,483,648 ~ 2,147,483,647)	
		2-Phase	5 points: C246 ~ C250 (Range: –2,147,483,648 ~ 2,147,483,647)	
		A/B Phase	5 points: C251 ~ C255 (Range: –2,147,483,648 ~ 2,147,483,647)	
Hardware High Speed Counter			2 points: HHSC1 ~ HHSC2 (Range: –2,147,483,648 ~ 2,147,483,647)	
Data Register	General (D)		7000 points: D0 ~ D6999	
	Latched (D)		2000 points: D7000 ~ D8999	
	Special (SD)		512 points: D9000 ~ D9255	
	Index Register (V / Z)		16 points: V0 ~ V7, Z0 ~ Z7	
	Extension Register (R)		10,000 points: R0 ~ R9999	
Pointer	Mark Pointer		1024 points: consisting of 8 Chinese characters or 16 letter/numbers	
	Branch Pointer (P)		1024 points: P0 ~ P1023	
	Table Nickname		32 points: consisting of 8 Chinese characters or 16 letters/numbers	
	Table Code (Q)		32 points: Q0 ~ Q31	
	Interrupt Pointer (I)		21 points: 8 for external interrupt, 3 for timer interrupt, 10 for high speed counter interrupt	
	Nest Pointer (N)		8 points: N0 ~ N7	

Item			VS2-24M	VS2-32M
Range of Constant	Decimal (K)	16-bit	K–32,768 ~ K32,767	
		32-bit	K–2,147,483,648 ~ K2,147,483,647	
	Hexadecimal (H)	16-bit	H0 ~ HFFFF	
		32-bit	H0 ~ HFFFFFFFF	
	Real No. (E)	32-bit	E−3. 402 + 38 ~ E3. 402 + 38, decimal or exponent notation	
Comm. Function	Main Unit Built-in Comm. Port	Prog. Port	12Mbps high-speed Mini USB portComm. Function	
		Multi-Func.	CP1 (RS-485) is available for computer link, MODBUS, CPU Link, Non-Protocol, etc.	
	Expanded Multi-Func. Port		CP2 & CP3: At the communication card of EC1, usable functions are equal to the CP1	
Multi-Function High Speed Input	Input Response Frequency		50kHz × 8 points	
	Input Response Time Adj.		8 points: X0 ~ X7 (0~60ms)	
	External Interrupt Input		8 points: X0 ~ X7 (with delay function)	
	Pulse Capture Input		8 points: X0 ~ X7	
	Pulse Measurement Input		4 points: X0, X1, X3, X4 (with width/cycle distance measurement function)	
	Frequency Meter Input		8 points: X0 ~ X7	
	Software High Speed Counter		Support 1, 2 or A/B phase counting mode, 1-phase 8 points or A/B phase 4 pairs max.	
	Hardware High Speed Counter		2 pairs support U, U/D+DIR, U+D, AB*1, AB*2 and AB*4 operating modes	
	Electronic Handwheel		Cooperate with high speed pulse output to control positioning	
High Speed Pulse Output			4 points 50kHz at Y0 ~ Y3. For 4-axis simple positioning control, support 17 positioning instructions	
Real Time Clock (Optional)			By installing VS-MCR Multi-function Memory Card to indicate year, month, date, hour, min., sec. & week	
Expansion Memory (Optional)			By installing a VS-MCR/VS-MC card to expand no-battery required 16Mb latched memory for user's project and 655,360 Words data-bank	
Expansion Card	No. of Expansion Card Socket at Unit		2 (EC1 ~ EC2)	3 (EC1 ~ EC3)
	Type of Expansion Card		DIO Card, Comm. Card, SF Card (Analog I/O, Temperature Input, Inverter Speed Control, etc.)	
Special Module	Number of Special Module Available		8	
	Type of Special Module		Analog I/O Module, Temperature Input Module, etc.	

1-7-3 VSM Series Performance Specification

Item			VSM-14MT	VSM-24MT	VSM-32MT	VSM-28ML
Operation Control Method			Cyclic Operation by Stored Program			
Programming Language			Ladder Diagram + Sequential Function Chart (SFC) or Ladder Diagram + Step Ladder (STL)			
I/O Control Method			Batch Processing			
Process Time	Basic Instruction		0.17 μs			
	Application Instruction		A few μs ~ Hundreds of μs			
Number of Instructions	Basic Instruction		29			
	SFC Instruction		2			
	Step Ladder Instruction		2			
	Application Instruction		171			
Project Memory Capacity (Flash ROM)			32K Words (containing properties, programs, program pointers, form storage and comments)			
Main Unit Built-in I / O	Number of Input Points		8 points: X0 ~ X7	12 points: X0 ~ X13	16 points: X0 ~ X17	16 points: X0 ~ X17
	Number of Output Points		6 points: Y0 ~ Y5	12 points: Y0 ~ Y13	16 points: Y0 ~ Y17	12 points: Y0 ~ Y13
Expandable I/O Points			Expansion Card 8 points	X20 ~ X177, Y20 ~ Y177 and Expansion Card 16 points	X20 ~ X177, Y20 ~ Y177 and Expansion Card 24 points	
Digital Input / Output	External Input (X)		8 points: X0 ~ X7	128 points: X0 ~ X177		
	External Output (Y)		6 points: Y0 ~ Y5	128 points: Y0 ~ Y177		
Internal Relay	Auxiliary Relay (M)	General	6192 points: M0 ~ M1999, M4000 ~ M8191			
		Latched	2000 points: M2000 ~ M3999			
		Special	512 points: M9000 ~ M9511			
	Step Relay (S)	Initial	10 points: S0 ~ S9			
		General	3086 points: S10 ~ S499, S1500 ~ S4096			
		Latched	900 points: S500 ~ S899, S1000 ~ S1499			
		Annunciator	100 points: S900 ~ S999 (Latched)			
Timer (T)	100ms		200 points: T0 ~ T199 (Timer range: 0.1 ~ 3,276.7 sec.)			
	10ms		46 points: T200 ~ T245 (Timer range: 0.01 ~ 327.67 sec.)			
	1ms (Retentive)		4 points: T246 ~ T249 (Timer range: 0.001 ~ 32.767 sec.)			
	100ms (Retentive)		6 points: T250 ~ T255 (Timer range: 0.1 ~ 3,276.7 sec.)			
	1ms		256 points: T256 ~ T511 (Timer range: 0.001 ~ 32.767 sec.)			
Counter (C)	16-bit Up	General	100 points: C0 ~ C99 (Range: 0 ~ 32,767)			
		Latched	100 points: C100 ~ C199 (Range: 0 ~ 32,767)			
	32-bit Up/Down	General	20 points: C200 ~ C219 (Range: –2,147,483,648 ~ 2,147,483,647)			
		Latched	15 points: C220 ~ C234 (Range: –2,147,483,648 ~ 2,147,483,647)			
Software High Speed Counter (C)	32-bit Up/Down, Latched	1-Phase	11 points: C235 ~ C245 (Range: –2,147,483,648 ~ 2,147,483,647)			
		2-Phase	5 points: C246 ~ C250 (Range: –2,147,483,648 ~ 2,147,483,647)			
		A/B Phase	5 points: C251 ~ C255 (Range: –2,147,483,648 ~ 2,147,483,647)			
Hardware High Speed Counter			2 points: HHSC1 ~ HHSC2 (Range: –2,147,483,648 ~ 2,147,483,647)			
Data Register	General (D)		7000 points: D0 ~ D6999			
	Latched (D)		2000 points: D7000 ~ D8999			
	Special (SD)		512 points: D9000 ~ D9255			
	Index Register (V / Z)		16 points: V0 ~ V7, Z0 ~ Z7			
	Extension Register (R)		10,000 points: R0 ~ R9999			
Pointer	Mark Pointer		1024 points: consisting of 8 Chinese characters or 16 letter/numbers			
	Branch Pointer (P)		1024 points: P0 ~ P1023			
	Table Nickname		32 points: consisting of 8 Chinese characters or 16 letters/numbers			
	Table Code (Q)		32 points: Q0 ~ Q31			
	Interrupt Pointer (I)		8 for external interrupt, 3 for timer interrupt, 10 for high speed counter interrupt			
	Nest Pointer (N)		8 points: N0 ~ N7			

Item			VSM-14MT	VSM-24MT	VSM-32MT	VSM-28ML
Range of Constant	Decimal (K)	16-bit	K–32,768 ~ K32,767			
		32-bit	K–2,147,483,648 ~ K2,147,483,647			
	Hexadecimal (H)	16-bit	H0 ~ HFFFF			
		32-bit	H0 ~ HFFFFFFFF			
	Real No. (E)	32-bit	E−3. 402 + 38 ~ E3. 402 + 38, decimal or exponent notation			
Comm. Function	Main Unit Built-in Comm. Port	Prog. Port	12Mbps high-speed Mini USB portComm. Function			
		Multi-Func.	CP1 (RS-485) is available for computer link, MODBUS, CPU Link, Non-Protocol, etc.			
	Expanded Multi-Func. Port		CP2 & CP3: At the communication card of EC1, usable functions are equal to the CP1			
Multi-Function High Speed Input	Input Response Frequency		200kHz × 4 points 50kHz × 4 points	200kHz × 4 points 50kHz × 4 points	200kHz × 4 points 50kHz × 4 points	1MHz × 4 points ☆ 50kHz × 4 points
	Input Response Time Adj.		8 points: X0 ~ X7 (0~60ms)			
	External Interrupt Input		8 points: X0 ~ X7 (with delay function)			
	Pulse Capture Input		8 points: X0 ~ X7			
	Pulse Measurement Input		4 points: X0, X1, X3, X4 (with width/cycle distance measurement function)			
	Frequency Meter Input		8 points: X0 ~ X7			
	Software High Speed Counter		Support 1, 2 or A/B phase counting mode, 1-phase 8 points or A/B phase 4 pairs max.			
	Hardware High Speed Counter		2 pairs support U, U/D+DIR, U+D, AB*1, AB*2 and AB*4 operating modes			
	Electronic Handwheel		Cooperate with high speed pulse output to control positioning			
High Speed Pulse Output			4 points Y0 ~ Y3, 4-axis positioning control, support 17 positioning control instructions			
			200kHz × 4 points	200kHz × 4 points	200kHz × 4 points	1MHz × 4 points ☆
Real Time Clock (Optional)			By installing VS-MCR Multi-function Memory Card to indicate year, month, date, hour, min., sec. & week			
Expansion Memory (Optional)			By installing a VS-MCR/VS-MC card to expand no-battery required 16Mb latched memory for user's project and 655,360 Words data-bank			
Expansion Card	No. of Expansion Card Socket at Unit		1 (EC1)	2 (EC1 ~ EC2)	3 (EC1 ~ EC3)	3 (EC1 ~ EC3)
	Type of Expansion Card		DIO Card, Comm. Card, SF Card (Analog I/O, Temperature Input, Inverter Speed Control, etc.)			
Special Module	Number of Special Module Available		8			
	Type of Special Module		Analog I/O Module, Temperature Input Module, etc.			

☆ At the VSM-28ML model, the 4 line driver input points for the HHSC1 & HHSC2 can individually count 1 MHz pulses; also, the 4 line driver output points can individually generate 1MHz pulses.

1-7-4 VS3 Series Performance Specification

Item			VS3-32M
Operation Control Method			Cyclic Operation by Stored Program
Programming Language			Ladder Diagram + Sequential Function Chart (SFC) or Step Ladder (STL)
I/O Control Method			Batch Processing
Process Time	Basic Instruction		0.15 μs
	Application Instruction		A few μs ~ Hundreds of μs
Number of Instructions	Basic Instruction		29
	SFC Instruction		2
	Step Ladder Instruction		2
	Application Instruction		209
Project Memory Capacity (Flash ROM)			64K Words (The project at the memory is including the parameter area, user program, pointers, tables and comments.)
Main Unit Built-in I / O	Number of Input Points		16 points: X0 ~ X17
	Number of Output Points		16 points: Y0 ~ Y17
Expandable I/O Points			X20 ~ X377, Y20 ~ Y377 & Expansion Card 24 points
Digital Input / Output	External Input (X)		256 points: X0 ~ X377
	External Output (Y)		256 points: Y0 ~ Y377
Internal Relay	Auxiliary Relay (M)	General	6192 points: M0 ~ M1999, M4000 ~ M8191
		Latched	2000 points: M2000 ~ M3999
		Special	512 points: M9000 ~ M9511
	Step Relay (S)	Initial	10 points: S0 ~ S9
		General	3086 points: S10 ~ S499, S1500 ~ S4096
		Latched	900 points: S500 ~ S899, S1000 ~ S1499
		Annunciator	100 points: S900 ~ S999 (Latched)
Timer (T)	100ms		200 points: T0 ~ T199 (Timer range: 0.1 ~ 3,276.7 sec.)
	10ms		46 points: T200 ~ T245 (Timer range: 0.01 ~ 327.67 sec.)
	1ms (Retentive)		4 points: T246 ~ T249 (Timer range: 0.001 ~ 32.767 sec.)
	100ms (Retentive)		6 points: T250 ~ T255 (Timer range: 0.1 ~ 3,276.7 sec.)
	1ms		256 points: T256 ~ T511 (Timer range: 0.001 ~ 32.767 sec.)
Counter (C)	16-bit Up	General	100 points: C0 ~ C99 (Range: 0 ~ 32,767)
		Latched	100 points: C100 ~ C199 (Range: 0 ~ 32,767)
	32-bit Up/Down	General	20 points: C200 ~ C219 (Range: –2,147,483,648 ~ 2,147,483,647)
		Latched	15 points: C220 ~ C234 (Range: –2,147,483,648 ~ 2,147,483,647)
Software High Speed Counter (C)	32-bit Up/Down, Latched	1-Phase	11 points: C235 ~ C245 (Range: –2,147,483,648 ~ 2,147,483,647)
		2-Phase	5 points: C246 ~ C250 (Range: –2,147,483,648 ~ 2,147,483,647)
		A/B Phase	5 points: C251 ~ C255 (Range: –2,147,483,648 ~ 2,147,483,647)
Hardware High Speed Counter			2 points: HHSC1 ~ HHSC2 (Range: –2,147,483,648 ~ 2,147,483,647)
Data Register	General (D)		7000 points: D0 ~ D6999
	Latched (D)		2000 points: D7000 ~ D8999
	Special (SD)		512 points: D9000 ~ D9255
	Index Register (V / Z)		16 points: V0 ~ V7, Z0 ~ Z7
	Extension Register (R)		24,000 points: R0 ~ R23999
Pointer	Mark Pointer		1024 points: consisting of 8 Chinese characters or 16 letter/numbers
	Branch Pointer (P)		1024 points: P0 ~ P1023
	Table Nickname		32 points: consisting of 8 Chinese characters or 16 letters/numbers
	Table Code (Q)		32 points: Q0 ~ Q31
	Interrupt Pointer (I)		21 points: 8 for external interrupt, 3 for timer interrupt, 10 for high speed counter interrupt
	Nest Pointer (N)		8 points: N0 ~ N7

Item			VS3-32M
Range of Constant	Decimal (K)	16-bit	K–32,768 ~ K32,767
		32-bit	K–2,147,483,648 ~ K2,147,483,647
	Hexadecimal (H)	16-bit	H0 ~ HFFFF
		32-bit	H0 ~ HFFFFFFFF
	Real No. (E)	32-bit	E–3. 402 + 38 ~ E3. 402 + 38, decimal or exponent notation
Comm. Function	Main Unit Built-in Comm. Port	Prog. Port	12Mbps high-speed Mini USB portComm. Function
		Multi-Func.	CP1 (RS-485) is available for computer link, MODBUS, CPU Link, Non-Protocol, etc.
	Expanded Multi-Func. Port		CP2 & CP3: At the communication card of EC1, usable functions are equal to the CP1
			CP4 & CP5: At the communication card of EC3, usable functions are equal to the CP1
Multi-Function High Speed Input	Input Response Frequency		200kHz × 4 points + 50kHz × 4 points
	Input Response Time Adj.		8 points: X0 ~ X7 (0~60ms)
	External Interrupt Input		8 points: X0 ~ X7 (with delay function)
	Pulse Capture Input		8 points: X0 ~ X7
	Pulse Measurement Input		4 points: X0, X1, X3, X4 (with width/cycle distance measurement function)
	Frequency Meter Input		8 points: X0 ~ X7
	Software High Speed Counter		Support 1, 2 or A/B phase counting mode, 1-phase 8 points or A/B phase 4 pairs max.
	Hardware High Speed Counter		2 pairs support U, U/D+DIR, U+D, AB*1, AB*2 and AB*4 operating modes
	Electronic Handwheel		Cooperate with high speed pulse output to control positioning
High Speed Pulse Output			4 points 200kHz at Y0 ~ Y3. For 4-axis positioning control, support 17 positioning instructions
Real Time Clock (Optional)			By installing VS-MCR Multi-function Memory Card to indicate year, month, date, hour, min., sec. & week
Expansion Memory (Optional)			By installing a VS-MCR/VS-MC card to expand no-battery required 16Mb latched memory for user's project and 655,360 Words data-bank
Expansion Card	No. of Expansion Card Socket at Unit		3 (EC1 ~ EC3)
	Type of Expansion Card		DIO Card, Comm. Card, SF Card (Analog I/O, Temperature Input, Inverter Speed Control, etc.)
Special Module	Number of Special Module Available		16
	Type of Special Module		Analog I/O Module, Temperature Input Module, etc.

1-8 Power Specification

Item	VS1-10 / 14M and VSM-14M	VS1-20 / 24M	VS1-28 / 32M, VS2, VSM and VS3
Power Requirement	DC24V –15%/+20%	DC24V –15%/+20%	DC24V –15%/+20%
Input Power Interrupt	Period < 1ms with no affect	Period < 1ms with no affect	Period < 1ms with no affect
Power Consumption	10W	12W	15W
Inner Power Support	DC5V 100mA	DC5V 150mA	DC5V 450mA
	DC12V 450mA	DC12V 450mA	DC12V 450mA

- Power consumption of individual equipment should be noted and fully supplied when planning a PLC system.
- Each DI signal input point of VS series PLC consumes about 5.3mA@DC24V (including Main Unit, Expansion Module and Expansion Card); except input points X0~X7 of VS1 series Main Unit as about 7mA@DC24V each. Users can calculate the power consumption of input points accordingly.
- The VS series PLC Main Unit has inner power support as shown in the above table. The Main Unit has the circuit for internal power supplying but the expanded module or card does not have, thus all the power is from the Main Unit. Please pay attention to the power consumption, add the VS-PSD power repeater module is required if the power is insufficient. The VS-PSD module can provide DC5V 500mA + DC12V 800mA to support the requirement behind.

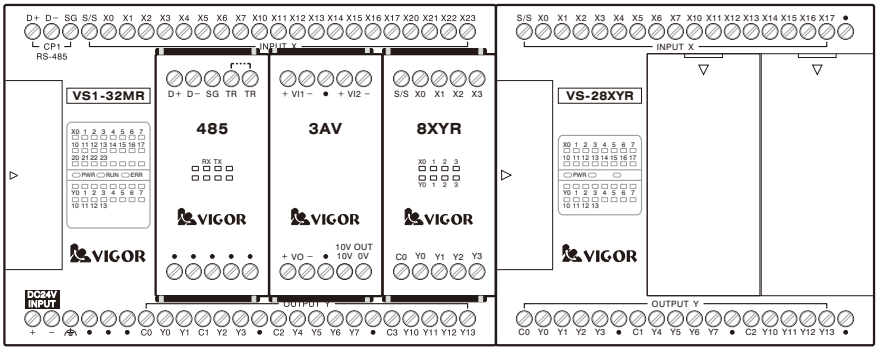
Model Name	Power Consumption	
	DC5V	DC12V
VS1-10MR-D	50mA	75mA
VS1-10MT-D	50mA	0
VS1-10MP-D	50mA	20mA
VS1-14MR-D	50mA	105mA
VS1-14MT-D	50mA	0
VS1-14MP-D	50mA	25mA
VS1-20MR-D	50mA	140mA
VS1-20MT-D	50mA	0
VS1-20MP-D	50mA	32mA
VS1-24MR-D	50mA	175mA
VS1-24MT-D	50mA	0
VS1-24MP-D	50mA	40mA
VS1-28MR-D	50mA	200mA
VS1-28MT-D	50mA	0
VS1-28MP-D	50mA	50mA
VS1-32MR-D	50mA	200mA
VS1-32MT-D	50mA	0
VS1-32MP-D	50mA	50mA
VS1-32MT-DI	50mA	0
VS2-24MR-D	130mA	120mA
VS2-24MT-D	130mA	0
VS2-24MP-D	130mA	50mA
VS2-32MR-D	130mA	160mA
VS2-32MT-D	130mA	0
VS2-32MP-D	130mA	70mA
VS2-32MT-DI	130mA	0
VSM-14MT-D	90mA	0
VSM-24MT-D	90mA	0
VSM-32MT-D	90mA	0
VSM-28ML-D	90mA	0
VSM-32MT-DI	90mA	0
VS3-32MR-D	90mA	160mA
VS3-32MT-D	90mA	0

Model Name	Power Consumption	
	DC5V	DC12V
VS3-32MP-D	90mA	70mA
VS3-32MT-DI	90mA	0
VS-8XYR	15mA	40mA
VS-8XYT	20mA	0
VS-8XYP	15mA	20mA
VS-8X	10mA	0
VS-8YR	20mA	80mA
VS-8YT	30mA	0
VS-8YP	20mA	35mA
VS-16XYR	25mA	80mA
VS-16XYT	35mA	0
VS-16XYP	25mA	35mA
VS-16X	20mA	0
VS-16YR	35mA	160mA
VS-16YT	55mA	0
VS-16YP	35mA	65mA
VS-28XYR	45mA	200mA
VS-32XYR	50mA	160mA
VS-32XYT	70mA	0
VS-32XYP	50mA	65mA
VS-16XYT-I	25mA	0
VS-16X-I	20mA	0
VS-16YT-I	30mA	0
VS-32XYT-I	45mA	0
VS-4AD	15mA	0
VS-2DA	15mA	0
VS-3A / 6A	15mA	0
VS-4TC / 8TC	15mA	0
VS-2PT / 4PT	15mA	0
VS-2PG	110mA	0
VS-4PG	140mA	0

Model Name	Power Consumption	
	DC5V	DC12V
VS-4XYR-EC	0	20mA
VS-4XYT-EC	0	10mA
VS-4X-EC	0	0
VS-4YR-EC	0	40mA
VS-4YT-EC	0	20mA
VS-8XYR-EC	0	40mA
VS-8XYT-EC	0	20mA
VS-8X-EC	0	0
VS-8YT-EC	0	0
VS-8XI-EC	0	0
VS-8YTI-EC	0	0
VS-E8X-EC	10mA	0
VS-E8YT-EC	25mA	0
VS-485-EC	50mA	0
VS-485A-EC	0	0
VS-D485-EC	100mA	0
VS-D485A-EC	0	0
VS-D232-EC	25mA	0
VS-D52A-EC	25mA	0
VS-ENET-EC	200mA	0
VS-3AV-EC	0	25mA
VS-4AD-EC	12mA	10mA
VS-2DA-EC	15mA	60mA
VS-4A-EC	20mA	60mA
VS-3ISC-EC	10mA	0
VS-2TC-EC	7mA	0
VS-4TC-EC	7mA	0
VS-1PT-EC	15mA	0
VS-2PT-EC	22mA	0
VS-MC	0	0
VS-MCR	0	0

- Examples

Example 1: For the VS1-32MR-D Main Unit, its EC1 is installed a VS-485-EC Communication Card, EC2 has a VS-3AV-EC Brief Voltage I/O Card, EC3 has a VS-8XYR-EC DIO Card and a VS-28XYR Expansion Module on the right side, as shown in the following diagram.



From the Power Specification table,

the inner power support of VS1-32MR-D Main Unit is known as DC5V 450mA, DC12V 450mA.

From the Power Consumption table,

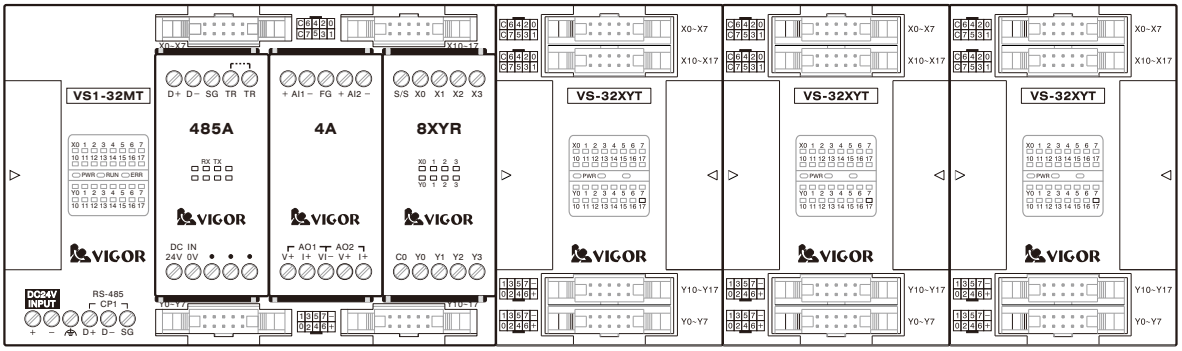
the power consumption of VS1-32MR-D Main Unit is known as DC5V 50mA, DC12V 200mA;
the power consumption of VS-485-EC Communication Card is known as DC5V 50mA, DC12V 0mA;
the power consumption of VS-3AV-EC Special Card is known as DC5V 0mA, DC12V 25mA;
the power consumption of VS-8XYR-EC DIO Card is known as DC5V 0mA, DC12V 40mA;
the power consumption of VS-28XYR Expansion Module is known as DC5V 45mA, DC12V 200mA;

total consumption of DC5V is 50+50+45=145 mA less than the rated supply of DC5V (450mA);

total consumption of DC12V is 200+25+40+200=465 mA, slightly larger than the rated supply of DC12V (450mA).

The calculated DC12V power consumption is larger than its rated power supply and the inner DC12V power in the VS PLC system is mostly taken to drive coils of output relays. Based on the specifications, that is required to add a VS-PSD Power Repeater before the VS-28XYR. In this example, the total power consumed to drive relays is (200+40+200=440mA). Considering to the practical situation, that is unlikely to drive all relays simultaneously in an operating PLC. Thus, the system designer should consider an extra Power Repeater if it is necessary.

Example 2: For the VS1-32MT-DI Main Unit, its EC1 is installed a VS-485A-EC Communication Card, EC2 has a VS-4A-EC Special Card, EC3 has a VS-8XYR-EC DIO Card and three VS-32XYT-I Expansion Modules on the right side, as shown in the following diagram.



From the Power Specification table,

the inner power support of VS1-32MT-DI Main Unit is known as DC5V 450mA, DC12V 450mA.

From the Power Consumption table,

the inner power support of VS1-32MT-DI Main Unit is known as DC5V 450mA, DC12V 450mA.
the power consumption of VS-485A-EC Communication Card is known as DC5V 0mA, DC12V 0mA;
the power consumption of VS-4A-EC Special Card is known as DC5V 20mA, DC12V 60mA;
the power consumption of VS-8XYR-EC DIO Card is known as DC5V 0mA, DC12V 40mA;
the power consumption of VS-32XYT-I Expansion Module is DC5V 45mA, DC12V 0mA;

total consumption of DC5V is 50+20+(45×3)=205 mA,less than the rated supply of DC5V (450mA);

total consumption of DC12V is 60+40=100 mA, less than the rated supply of DC12V (450mA).

As a result, the calculated power consumption at the DC5V and DC12V are both less than the output capability of respective rated supply in the Main Unit. The system is ensured to operate safely in this Example 2.

There is a conclusion from two power consumption examples above, the transistor output model is far less than the relay output model.

By taking the advantages of the transistor output, it's possible to design a succinct PLC system. At the same time, put those high-failure relays outside of the PLC can improve the reliability of the system and easy to maintain.

1-9 Input Specification

The VS series PLC gets various external switches and the ON/OFF status of sensors through its input points that became the conditions of logic process. To prevent noise interference and switch bouncing problems, there is always an approximate 10 ms filter added on each input. Since inputs X0~X7 have been designated as multi-function inputs to perform various high speed functions, the time of filter at these 8 inputs is adjustable.

The bidirectional inputs at the VS series PLC are designed to receive the sensor signals from either NPN or PNP transistor outputs.

1-9-1 Input Specification Tables

VS1 and VS2 Series Input Specification Table

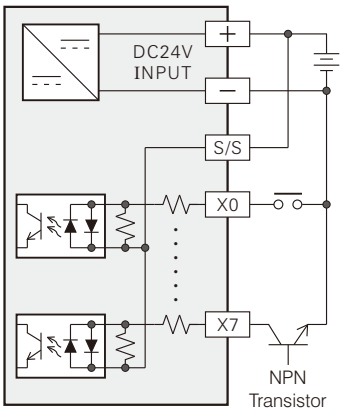
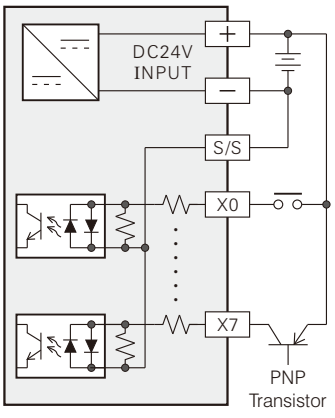
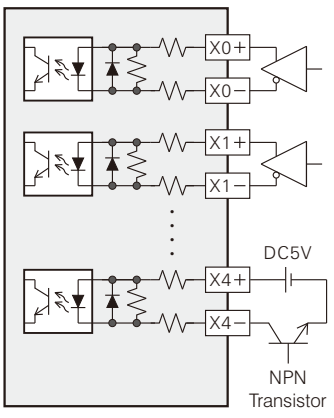
Item	X0~X7 at VS1	X0~X7 at VS2	X10 and After
Input Type	Sinking or Sourcing either	Sinking or Sourcing either	Sinking or Sourcing either
Input Activating Voltage	DC24V ± 15%	DC24V ± 15%	DC24V ± 15%
Input Signal Current	7mA/DC24V	5.3mA/DC24V	5.3mA/DC24V
Input ON Current	Above 4.5mA	Above 3.5mA	Above 3.5mA
Input OFF Current	Below 1.5mA	Below 1.5mA	Below 1.5mA
Input Resistance	3.3kΩ approx.	4.3kΩ approx.	4.3kΩ approx.
Input Response Time	10 ms approx. (0~60 ms adjustable)	10 ms approx. (0~60 ms adjustable)	10 ms approx.
Input Signal Type	Dry contact or NPN/PNP transistor		
Isolation Method	Photocoupler Isolation	Photocoupler Isolation	Photocoupler Isolation
Max. Counting Freq.	10 kHz	50 kHz	50 Hz approximately
Input Indicator	When a photocoupler's input is activated, the related input indicator will display ON		

VSM and VS3 Series Input Specification Table

Item	X0,1,3,4 at VSM-28ML	X0, X1, X3 and X4	X2, X5, X6 and X7	X10 and After
Input Type	Line Driver	Sinking or Sourcing either		
Input Activating Voltage	DC3~5.5V	DC24V ± 15%	DC24V ± 15%	DC24V ± 15%
Input Signal Current	8.8 mA / DC5V; 3.8 mA / DC3V	5.3mA/DC24V	5.3mA/DC24V	5.3mA/DC24V
Input ON Current	Above 3.8mA	Above 3.5mA	Above 3.5mA	Above 3.5mA
Input OFF Current	Below 1.5mA	Below 1.5mA	Below 1.5mA	Below 1.5mA
Input Resistance	400 Ω approx.	3.3 kΩ approx.	4.3 kΩ approx.	4.3 kΩ approx.
Input Response Time	10 ms approx. (0~60 ms adjustable)			10ms. approximately
Input Signal Type	Line Driver or NPN transistor	Dry contact or NPN/PNP transistor		
Isolation Method	Photocoupler Isolation	Photocoupler Isolation	Photocoupler Isolation	Photocoupler Isolation
Max. Counting Freq.	1 MHz	200 kHz	50 kHz	50 Hz approx.
Input Indicator	When a photocoupler's input is activated, the related input indicator will display ON			

※ The input points in those two above tables all meet the EN 61131-2 type 3 standard.

Input Circuit and Wiring Diagram

Sinking Input	Sourcing Input	Line Driver Input
		

1-9-2 Description of Multi-Function Input Points X0~X7

Functions available by input points X0～X7 are listed as follows:

Function	External Input Points								Remark
	X0	X1	X2	X3	X4	X5	X6	X7	
Common Input	Use D9020 to adjust filter time as 0～60ms								
Frequency Meter	Use the SPD instruction to perform the speed detection function								
Software High Speed Counter	Become the input of the C235～C255 1-phase/2-phase/AB phase counter, hereby could make the IHC0～IHC7 interrupt								
External Interruption	IX0P/F	IX1P/F	IX2P/F	IX3P/F	IX4P/F	IX5P/F	IX6P/F	IX7P/F	
Pulse Capture	M9170	M9171	M9172	M9173	M9174	M9175	M9176	M9177	
Hardware High Speed Counter	HHSC1, to make the HHC1 interrupt		—	HHSC2, to make the IHHC2 interrupt		—	—	—	
Pulse Measurement	Width / Period measurement		—	Width / Period measurement		—	—	—	
Positioning Control	Can be the input points of the positioning control's DOG, PG0, INT signals or for the handwheel								

- For each function description, please refer to the “VS Series PLC Programming Manual”.
- Common Input is available to work with other advanced functions
- When one of the X0～X7 performs a mentioned advanced function above, this input point is not reusable with another function. However, External Interrupt could cooperate with Pulse Measurement function. (For details, please see the specific function description.)
- When a mentioned advanced function above performs, the filter time of this input point will be automatically adjusted to 0 ms (deviates form D9020). To prevent noise interference, input points X0～X7 are also mounted with hardware RC filters.
  Thus, the filter time of 0 ms is not true 0 ms. In addition, the response time of input points X0～X7 varies depending on the series of VS1, VS2, VSM or VS3.
  When filter time is adjusted to 0 ms, the minimum ON or OFF signal width of each input point is listed as follows.

Series	External Input Points							
	X0	X1	X2	X3	X4	X5	X6	X7
VS1	50μs	50μs	50μs	50μs	50μs	50μs	50μs	50μs
VS2	10μs	10μs	10μs	10μs	10μs	10μs	10μs	10μs
VSM	2.5μs	2.5μs	10μs	2.5μs	2.5μs	10μs	10μs	10μs
VSM-28ML	0.5μs	0.5μs	10μs	0.5μs	0.5μs	10μs	10μs	10μs
VS3	2.5μs	2.5μs	10μs	2.5μs	2.5μs	10μs	10μs	10μs

- When a multi-function input point is performing an advanced function, the reaction speed of the point should be very fast. On the other hand, the consequence is relatively sensitive (higher frequency means more sensitive), which makes the input vulnerability to noise interference. Therefore, it's necessary to pay special attention to the external wiring. Keep away from interference sources, or even use isolation cables.

- When the inputs X0～X7 are applied to do software high speed counting, two operation modes are selectable. Please specify either one in the Project Parameter Setup of programming software.

SHSC Mode 1:

Input	1-Phase Counter											2-Phase Counter					AB-PhaseCounter				
	C235	C236	C237	C238	C239	C240	C241	C242	C243	C244	C245	C246	C247	C248	C249	C250	C251	C252	C253	C254	C255
X0	U/D						U/D			U/D		U	U		U		A	A		A	
X1		U/D					R			R		D	D		D		B	B		B	
X2			U/D					U/D			U/D		R		R			R		R	
X3				U/D				R			R			U		U			A		A
X4					U/D				U/D					D		D			B		B
X5						U/D			R					R		R			R		R
X6										S					S					S	
X7											S					S					S

SHSC Mode 2:

Input	1-Phase Counter											2-Phase Counter					AB-PhaseCounter				
	C235	C236	C237	C238	C239	C240	C241	C242	C243	C244	C245	C246	C247	C248	C249	C250	C251	C252	C253	C254	C255
X0	U/D								U/D			U				U	A				A
X1		U/D							R			D				D	B				B
X2			U/D							U/D				U		R			A		R
X3				U/D						R			U					A			
X4					U/D						U/D		D					B			
X5						U/D					R			D					B		
X6							U/D								U					A	
X7								U/D							D					B	

U: Up count input D: Down count input A: A-phase input B: B-phase input

U/D: Up/Down count pulse input R: Built-in Reset input S: Built-in Start-up input

- When high speed input is applied to do hardware high speed counting, its operation mode depends on the content value of the special register.

Register ID	Instruction of Function
D9224	HHSC1 counting mode selection. "0" is to disable the HHSC1; "1"～"6" represent different modes.
D9225	HHSC2 counting mode selection. "0" is to disable the HHSC2; "1"～"6" represent different modes.

Table of HHSC Working Modes

Hardware High-Speed Counter No.	Input Point	HHSC Working Modes					
		1-Phase		2-Phase	AB-Phase ×1	AB-Phase ×2	AB-Phase ×4
		1	2	3	4	5	6
HHSC1	X0	U	U/D	U	A	A	A
	X1		DIR	D	B	B	B
HHSC2	X3	U	U/D	U	A	A	A
	X4		DIR	D	B	B	B

U: Up count input D: Down count input A: A-Phase input B: B-Phase count input

U/D: Up/Down count pulse input DIR: Up/Down directional selector input

1-10 Output Specification

Design Precautions ⚠ **DANGER**

- To avoid machine damage, it is required to design an external protection circuit, such as emergency stop, forward / reverse interlock, over / under limit protection etc. for PLC.
- Since the malfunction of PLC output relays or transistors will fail the ON/OFF control, it is required to design an external safety circuit and safety mechanism for the output signals of major accidents to ensure risk-free operation of equipment.

The output relay contacts of VS series PLC can directly drive external loads. By transmitting operation results to external devices through output relays, PLC drives various loads, such as motors, electromagnetic valves, electromagnetic contactors, etc. and virtually performs control.
For various load needs, the VS series PLC provides different output types such as relay, NPN transistor and PNP transistor. To prevent noise interference, the relay's internal and external circuits are machinery separated by magnetic coupling between coils and contacts; besides, transistor outputs are isolated by photocouplers.

1-10-1 Output Specification Tables

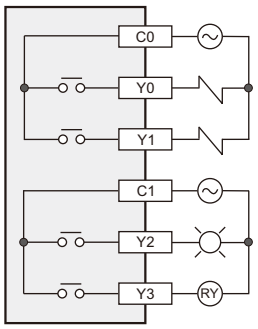
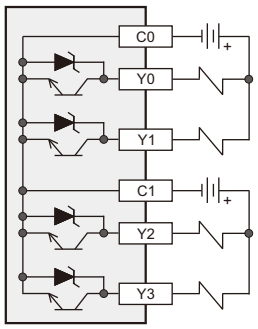
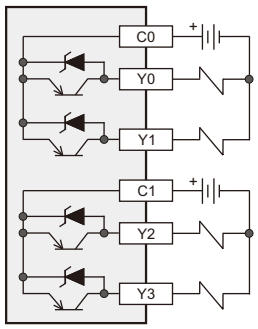
VS1 and VS2 Series Output Specification Table

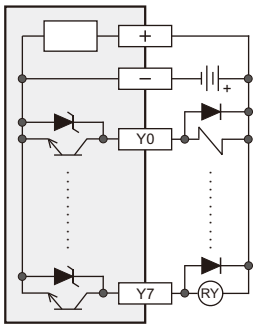
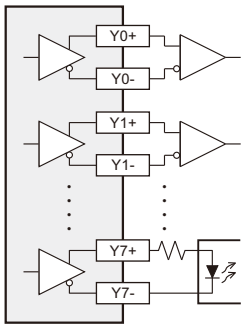
Item		Specification			
		Screw-Clamp Terminal Block Type			IDC Connector Type
Output Type		Relay Output	NPN Transistor Output	PNP Transistor Output	NPN Transistor Output
Switch Voltage		AC: < 250V; DC: < 30V	DC5V~30V		DC5V~30V
Rated Current	Resistive Load	2A / 1 point, 8A / 4 points / COM	0.5A / 1 point, 0.8A / 4 points / COM		0.1A / 1 point, 0.5A / 8 points / COM
	Inductive Load	80VA	12W / DC24V		2.4W / DC24V
	Lamp Load	100W	1.5W / DC24V		—
Open Circuit Leakage		—	<0.1mA / DC30V		<0.1mA / DC30V
Response Time	Y0~Y3	OFF→ON: 10ms approx.	OFF→ON: <10 μs ON→OFF: <10 μs	OFF→ON: <100 μs ON→OFF: <100 μs	OFF→ON: <10 μs ON→OFF: <10 μs
	Others	ON→OFF: 10ms approx.	OFF→ON: <100 μs ON→OFF: <100 μs		OFF→ON: <100 μs ON→OFF: <100 μs
Isolation Method		Machinery Isolation (Relay)	Photocoupler Isolation		Photocoupler Isolation
Output Indicator		When the actual output point is activated, the related output indicator will display ON			

VSM and VS3 Series Output Specification Table

Item		Specification			
		Screw-ClampTerminal Block Type			IDC Connector Type
Output Type		Relay Output	NPN Transistor Output	Line Driver Output	NPN Transistor Output
Switch Voltage		AC: < 250V; DC: <30V	DC5V~30V	—	DC5V~30V
Rated Current	Resistive Load	2A / 1 point, 8A / 4 points / COM	0.5A / 1 point, 0.8A / 4 points / COM	20mA	0.1A / 1 point, 0.5A / 8 points / COM
	Inductive Load	80VA	12W/DC24V		2.4W / DC24V
	Lamp Load	100W	1.5W/DC24V		—
Open Circuit Leakage		—	<0.1mA / DC30V	—	<0.1mA / DC30V
Response Time	Y0~Y3	OFF → ON: 10ms approx. ON → OFF: 10ms approx.	OFF→ON: <2.5 μs ON→OFF: <2.5 μs	OFF→ON: <0.5 μs ON→OFF: <0.5 μs	OFF→ON: <2.5 μs ON→OFF: <2.5 μs
	Others Y		OFF→ON: <100 μs ON→OFF: <100 μs	OFF→ON: <100 μs ON→OFF: <100 μs	OFF→ON: <100 μs ON→OFF: <100 μs
Isolation Method		Machinery Isolation (Relay)	Photocoupler Isolation	Magnetic-coupler Isolation	Photocoupler Isolation
Output Indicator		When the actual output point is activated, the related output indicator will display ON			

Output Circuit and Wiring Diagram

Relay Output	NPN Transistor Output	PNP Transistor Output
		

IDC Model NPN Transistor	Line Driver Output
	

1-10-2 Statement of Multi-Function Output Point Y0 ~ Y3

Common output does not fully meet certain applications due to delays. For relay output, the output delay is approx. 10ms; for standard transistor output, approx. 1ms. Thus, for the quick output response at the transistor model, its Y0 ~ Y3 are designated as multi-function output points.
Functions of these 4 output points are listed as follows.

Function Category	External Output Point				Remark
	Y0	Y1	Y2	Y3	
Common Output	Can use at the relay, NPN transistor or PNP transistor output types.				
Pulse Output	Use the PLSY and PLSR instructions to output pulse strings for control step or servo motor drivers				
PWM Output	Use PWM instruction to output PWM signals				
Positioning Control	Use positioning instructions to generate positioning pulses for step or servo motor drivers, that could perform precise positioning control.				

- Among the mentioned function categories above, the relay model only available for the Common Output; all other function categories need to use a transistor model.
- For each category and function description, please refer to the “VS Series PLC Programming Manual”.
- When one of the Y0~Y3 is performing a function category above, this point is only one category available. Not allow to use two or more function categories at a point.
- Frequencies output by Y0~Y3 of VS1, VS2, VSM and VS3 are different as listed below:

Series	External Output Point			
	Y0	Y1	Y2	Y3
VS1	50kHz	50kHz	50kHz	50kHz
VS2	50kHz	50kHz	50kHz	50kHz
VSM	200kHz	200kHz	200kHz	200kHz
VSM-28ML	1MHz	1MHz	1MHz	1MHz
VS3	200kHz	200kHz	200kHz	200kHz

1-11 Instruction Table

Basic Instruction Table

Mnemonic	Function	Devices	PLC Type			
			VS1	VS2	VSM	VS3
LD	Initial logical operation contact type NO (Normally Open)	X,Y,M,S,T,C,D.b,R.b	○	○	○	○
LDI	Initial logical operation contact type NC (Normally Closed)	X,Y,M,S,T,C,D.b,R.b	○	○	○	○
LDP	Initial logical operation Rising edge pulse	X,Y,M,S,T,C,D.b,R.b	○	○	○	○
LDF	Initial logical operation Falling edge pulse	X,Y,M,S,T,C,D.b,R.b	○	○	○	○
AND	Serial connection of NO (Normally Open) contact	X,Y,M,S,T,C,D.b,R.b	○	○	○	○
ANI	Serial connection of NC (Normally Closed) contact	X,Y,M,S,T,C,D.b,R.b	○	○	○	○
ANDP	Serial connection of Rising edge pulse	X,Y,M,S,T,C,D.b,R.b	○	○	○	○
ANDF	Serial connection of Falling edge pulse	X,Y,M,S,T,C,D.b,R.b	○	○	○	○
OR	Parallel connection of NO (Normally Open) contact	X,Y,M,S,T,C,D.b,R.b	○	○	○	○
ORI	Parallel connection of NC (Normally Closed) contact	X,Y,M,S,T,C,D.b,R.b	○	○	○	○
ORP	Parallel connection of Rising edge pulse	X,Y,M,S,T,C,D.b,R.b	○	○	○	○
ORF	Parallel connection of Falling edge pulse	X,Y,M,S,T,C,D.b,R.b	○	○	○	○
ANB	Series connection of multiple parallel circuit blocks	—	○	○	○	○
ORB	Parallel connection of multiple contact circuit blocks	—	○	○	○	○
MPS	Store the current result of the internal PLC operations	—	○	○	○	○
MRD	Read the current result of the internal PLC operations	—	○	○	○	○
MPP	Pop (recall and remove) the currently stored result	—	○	○	○	○
INV	Invert the current result of the internal PLC operations	—	○	○	○	○
MEP	Conversion of operation result to Rising edge pulse	—	○	○	○	○
MEF	Conversion of operation result to Falling edge pulse	—	○	○	○	○
OUT	Final logical operation type coil drive	Y,M,S,T,C,D.b,R.b	○	○	○	○
SET	Sets component permanently “ON”	Y,M,S,D.b,R.b	○	○	○	○
RST	Resets component permanently “OFF”	Y,M,S,D.b,R.b,T,C,D,R,V,Z	○	○	○	○
PLS	Rising edge pulse	Y,M(excluding special M coil)	○	○	○	○
PLF	Falling edge pulse	Y,M(excluding special M coil)	○	○	○	○
MC	Denotes the start of a master control block	N0 ~ N7	○	○	○	○
MCR	Denotes the end of a master control block	N0 ~ N7	○	○	○	○
END	Force the current program scan to end	—	○	○	○	○
NOP	No operation or null step	—	○	○	○	○

STL Instruction Table

Mnemonic	Function	Devices	PLC Type			
			VS1	VS2	VSM	VS3
STL	Step ladder starts	S	○	○	○	○
RET	Return to standard ladder, end of the step ladder	—	○	○	○	○

SFC Instruction Table

Mnemonic	Function	Devices	PLC Type			
			VS1	VS2	VSM	VS3
SFC	Define SFC program block	16 letters max. (the name of this SFC program block)	○	○	○	○
TRAN	State transfer	—	○	○	○	○

Application Instruction Table (I)

FNC No.	Mnemonic			Brief Function Introduction	Series			
					VS1	VS2	VSM	VS3
Program Flow Instructions								
00		CJ	P	Conditional Jump	○	○	○	○
01		CALL	P	Call Subroutine	○	○	○	○
02		SRET		Subroutine Return	○	○	○	○
03		IRET		Interrupt Return	○	○	○	○
04		EI		Enable Interrupt	○	○	○	○
05		DI		Disable Interrupt	○	○	○	○
06		FEND		First End	○	○	○	○
07		WDT	P	Watch Dog Timer Refresh	○	○	○	○
08		FOR		Start of a FOR-NEXT Loop	○	○	○	○
09		NEXT		End of a FOR-NEXT Loop	○	○	○	○
Comparsion Instructions								
10	D	CMP	P	Compare	○	○	○	○
11	D	ZCP	P	Zone Compare	○	○	○	○
224	D	LD=		Load In-line Compare (S1) = (S2)	○	○	○	○
225	D	LD>		Load when (S1) > (S2)	○	○	○	○
226	D	LD<		Load when (S1) < (S2)	○	○	○	○
228	D	LD<>		Load when (S1) ≠ (S2)	○	○	○	○
229	D	LD<=		Load when (S1) ≤ (S2)	○	○	○	○
230	D	LD>=		Load when (S1) ≥ (S2)	○	○	○	○
232	D	AND=		AND when (S1) = (S2)	○	○	○	○
233	D	AND>		AND when (S1) > (S2)	○	○	○	○
234	D	AND<		AND when (S1) < (S2)	○	○	○	○
236	D	AND<>		AND when (S1) ≠ (S2)	○	○	○	○
237	D	AND<=		AND when (S1) ≤ (S2)	○	○	○	○
238	D	AND>=		AND when (S1) ≥ (S2)	○	○	○	○
240	D	OR=		OR when (S1) = (S2)	○	○	○	○
241	D	OR>		OR when (S1) > (S2)	○	○	○	○
242	D	OR<		OR when (S1) < (S2)	○	○	○	○
244	D	OR<>		OR when (S1) ≠ (S2)	○	○	○	○
245	D	OR<=		OR when (S1) ≤ (S2)	○	○	○	○
246	D	OR>=		OR when (S1) ≥ (S2)	○	○	○	○
Move Instructions								
12	D	MOV	P	Move	○	○	○	○
13		SMOV	P	Shift Move	○	○	○	○
14	D	CML	P	Complement	○	○	○	○
15		BMOV	P	n → n Block Move	○	○	○	○
16	D	FMOV	P	1 → n Fill Move	○	○	○	○
17	D	XCH	P	Exchange	○	○	○	○
Code Convert Instructions								
18	D	BCD	P	Convert BIN to BCD	○	○	○	○
19	D	BIN	P	Convert BCD to BIN	○	○	○	○
170	D	GRY	P	Convert BIN to Gray Code	○	○	○	○
171	D	GBIN	P	Convert Gray Code to BIN	○	○	○	○
260	D	DABIN	P	Convert Decimal ASCII String to BIN Number				○
261	D	BINDA	P	Convert BIN Number to Decimal ASCII String				○
Arithmetic Insructions								
20	D	ADD	P	Addition (S1) + (S2) → (D)	○	○	○	○
21	D	SUB	P	Subtraction (S1) – (S2) → (D)	○	○	○	○

Application Instruction Table (II)

FNC No.	Mnemonic			Brief Function Introduction	Series			
					VS1	VS2	VSM	VS3
Arithmetic Insructions								
22	D	MUL	P	Multiplication (S1) × (S2) → (D + 1,D)	○	○	○	○
23	D	DIV	P	Division (S1) ÷ (S2) → (D),(D + 1)	○	○	○	○
24	D	INC	P	Increment (D) + 1 → (D)	○	○	○	○
25	D	DEC	P	Decrement (D) – 1 → (D)	○	○	○	○
29	D	NEG	P	Negation ($\overline{D}$) + 1 → (D)	○	○	○	○
45	D	MEAN	P	Mean	○	○	○	○
48	D	SQR	P	Square Root	○	○	○	○
Logical Operation Instructions								
26	D	WAND	P	Logic Word AND	○	○	○	○
27	D	WOR	P	Logic Word OR	○	○	○	○
28	D	WXOR	P	Logic Word Exclusive OR	○	○	○	○
44	D	BON	P	Check Specified Bit Status	○	○	○	○
Rotary Instructions								
30	D	ROR	P	Rotation Right	○	○	○	○
31	D	ROL	P	Rotation Left	○	○	○	○
32	D	RCR	P	Rotation Right with Carry	○	○	○	○
33	D	RCL	P	Rotation Left with Carry	○	○	○	○
Shift Instructions								
34		SFTR	P	Bit Shift Right	○	○	○	○
35		SFTL	P	Bit Shift Left	○	○	○	○
36		WSFR	P	Word Shift Right	○	○	○	○
37		WSFL	P	Word Shift Left	○	○	○	○
213		SFR	P	Shift n Bit Right in 16-bit Word Data with Carry				○
214		SFL	P	Shift n Bit Left in 16-bit Word Data with Carry				○
Table Shift Instructions								
38		SFWR	P	Shift Register Write (FIFO Write)	○	○	○	○
39		SFRD	P	Shift Register Read (FIFO Read)	○	○	○	○
210		FDEL	P	Delete Data from Specific Location of Table				○
211		FINS	P	Insert Data into Specific Location of Table				○
212		POP	P	Shift the Last Register Read (FIFO Last Read)				○
Data Operation Instructions								
40		ZRST	P	Zone Reset	○	○	○	○
41		DECO	P	Decode	○	○	○	○
42		ENCO	P	Encode	○	○	○	○
43	D	SUM	P	The Sum of Active Bits	○	○	○	○
61	D	SER	P	Search a Data Stack	○	○	○	○
69		SORT		Sort Tabulated Data	○	○	○	○
140	D	WSUM	P	Sum of Word Data				○
141		WTOB	P	Split Word to Byte				○
142		BTOW	P	Combine Byte to Word				○
143		UNI	P	Combine 4-bit Nibble to Word				○
144		DIS	P	Separate Word to 4-bit Nibble				○
147	D	SWAP	P	Swap High / Low Byte	○	○	○	○
148	D	SORT2		Sort Tabulated Data 2	○	○	○	○
Floating Point Arithmetic Instructions								
49	D	FLT	P	BIN Integer → BIN Floating Point Format	○	○	○	○
110	D	ECMP	P	Compare Two BIN Floating Point Numbers	○	○	○	○
111	D	EZCP	P	Compare a BIN Float No. to BIN Float Zone	○	○	○	○

Application Instruction Table (III)

FNC No.	Mnemonic			Brief Function Introduction	Series			
					VS1	VS2	VSM	VS3
Floating Point Arithmetic Instructions								
112	D	EMOV	P	Move Floating Point Data	○	○	○	○
116	D	ESTR	P	Convert BIN Floating Point to Character String				○
117	D	EVAL	P	Convert Character String to BIN Floating Point				○
118	D	EBCD	P	Convert BIN to DEC Floating Point Format	○	○	○	○
119	D	EBIN	P	Convert DEC to BIN Floating Point Format	○	○	○	○
120	D	EADD	P	BIN Floating Point Addition	○	○	○	○
121	D	ESUB	P	BIN Floating Point Subtraction	○	○	○	○
122	D	EMUL	P	BIN Floating Point Multiplication	○	○	○	○
123	D	EDIV	P	BIN Floating Point Division	○	○	○	○
124	D	EXP	P	BIN Floating Point Number Exponent	○	○	○	○
125	D	LOGE	P	BIN Floating Point Nature Logarithm	○	○	○	○
126	D	LOG10	P	BIN Floating Point Common Logarithm	○	○	○	○
127	D	ESQR	P	BIN Floating Point Square Root	○	○	○	○
128	D	ENEG	P	BIN Floating Point Negation	○	○	○	○
129	D	INT	P	BIN Floating Point → BIN Integer Format	○	○	○	○
130	D	SIN	P	Calculate Sine	○	○	○	○
131	D	COS	P	Calculate Cosine	○	○	○	○
132	D	TAN	P	Calculate Tangent	○	○	○	○
133	D	ASIN	P	Calculate Arc Sine	○	○	○	○
134	D	ACOS	P	Calculate Arc Cosine	○	○	○	○
135	D	ATAN	P	Calculate Arc Tangent	○	○	○	○
136	D	RAD	P	Convert Angle From Degrees to Radians	○	○	○	○
137	D	DEG	P	Convert Angle From Radians to Degrees	○	○	○	○
High Speed Processing Instructions								
50		REF	P	I/O Refresh	○	○	○	○
51		REFF	P	I/O Refresh and Filter Adjust	○	○	○	○
52		MTR		Input Matrix	○	○	○	○
53	D	HSCS		Software High Speed Counter Set	○	○	○	○
54	D	HSCR		Software High Speed Counter Reset	○	○	○	○
55	D	HSZ		Software High Speed Counter Zone Compare	○	○	○	○
56	D	SPD		Speed Detection	○	○	○	○
57	D	PLSY		Pulse Y Output	○	○	○	○
58		PWM		Pulse Width Modulation	○	○	○	○
59	D	PLSR		Pulse Ramp	○	○	○	○
189	D	HHCMV	P	Hardware High Speed Counter Data Move	○	○	○	○
280	D	HSCT		Software High Speed Counter Table Compare	○	○	○	○
Handy Instructions								
62	D	ABSD		Absolute Drum Sequencer	○	○	○	○
63		INCD		Incremental Drum Sequencer	○	○	○	○
64		TTMR		Teaching Timer	○	○	○	○
65		STMR		Special Timer	○	○	○	○
66		ALT	P	Alternate State	○	○	○	○
67		RAMP		Ramp Variable Value	○	○	○	○
88		PID		PID Control Loop	○	○	○	○
90		DBRD	P	Read Data From Data Bank	○	○	○	○
91		DBWR	P	Write Data Into Data Bank	○	○	○	○
92		TPID		Temperature PID Control	○	○	○	○
93		DTRD	P	Read Data From Data Table	○	○	○	○

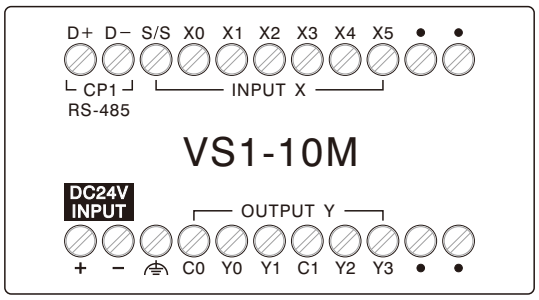
Application Instruction Table (IV)

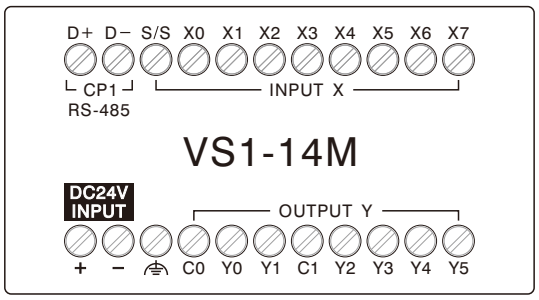
FNC No.	Mnemonic			Brief Function Introduction	Series			
					VS1	VS2	VSM	VS3
Handy Instructions								
102		ZPUSH	P	Batch Store of All Index Register				○
103		ZPOP	P	Batch Recover of All Index Register				○
256	D	LIMIT	P	Limit Control				○
257	D	BAND	P	Dead Band Control				○
258	D	ZONE	P	Zone Shift Control				○
259	D	SCL	P	Scaling	○	○	○	○
269	D	SCL2	P	Scaling 2	○	○	○	○
External Setting and Display Instructions								
70	D	TKY		Ten Key Input	○	○	○	○
71	D	HKY		Hexadecimal Key Input	○	○	○	○
72		DSW		Digital Switch (Thumbwheel) Input	○	○	○	○
73		SEGD	P	Seven Segment Decoder	○	○	○	○
74		SEGL		Seven Segment with Latch	○	○	○	○
76		ASC		Convert Letters to ASCII Code	○	○	○	○
77		PR		Print ASCII Code	○	○	○	○
78	D	FROM	P	Read From Special Module		○	○	○
79	D	TO	P	Write To Special Module		○	○	○
Serial Port Communication Instructions								
80		RS		Receive/Send Communication	○	○	○	○
81	D	PRUN	P	Parallel Run (Octal Mode)	○	○	○	○
82		ASCI	P	Convert HEX to ASCII	○	○	○	○
83		HEX	P	Convert ASCII to HEX	○	○	○	○
84		CCD	P	Check Code	○	○	○	○
87		CPUL		CPU Link Communication	○	○	○	○
89		LINK		Easy Link Communication	○	○	○	○
149		MBUS		MODBUS Communication	○	○	○	○
Real-Time Clock Instructions								
160		TCMP	P	Time Compare	○	○	○	○
161		TZCP	P	Time Zone Compare	○	○	○	○
162		TADD	P	Time Addition	○	○	○	○
163		TSUB	P	Time Subtraction	○	○	○	○
164	D	HTOS	P	Convert Hour to Second	○	○	○	○
165	D	STOH	P	Convert Second to Hour	○	○	○	○
166		TRD	P	Read RTC Data	○	○	○	○
167		TWR	P	Set RTC Data	○	○	○	○
Timer Instructions								
169	D	HOUR		Hour Meter	○	○	○	○
176		TFT		Timer (10 ms.)	○	○	○	○
177		TFH		Timer (100 ms.)	○	○	○	○
178		TFK		Timer (1 s.)	○	○	○	○
Data Process Insructions								
192	D	BK+	P	Block Data Subtraction				○
193	D	BK−	P	Block Data Subtraction				○
194	D	BKCMP=	P	Block Data Compare (S1) = (S2)				○
195	D	BKCMP>	P	Block Data Compare (S1) > (S2)				○
196	D	BKCMP<	P	Block Data Compare (S1) < (S2)				○
197	D	BKCMP<>	P	Block Data Compare (S1) ≠ (S2)				○
198	D	BKCMP<=	P	Block Data Compare (S1) ≤ (S2)				○

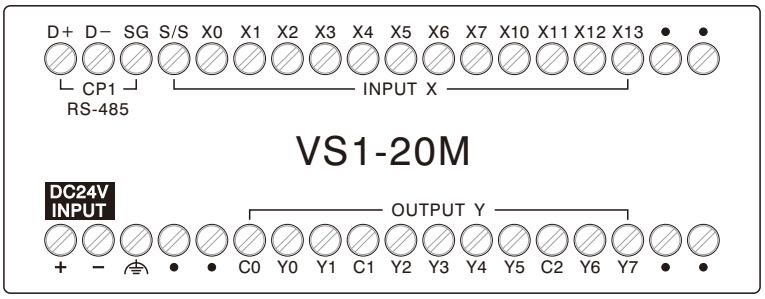
Application Instruction Table (V)

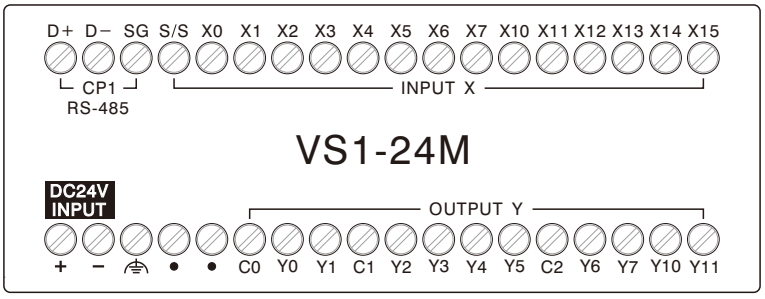
FNC No.	Mnemonic			Brief Function Introduction	Series			
					VS1	VS2	VSM	VS3
Data Process Insructions								
199	D	BKCMP＞＝	P	Block Data Compare (S1) ≥ (S2)				○
Character String Control Instructions								
200	D	STR	P	BIN to Character String Conversion				○
201	D	VAL	P	Character String to BIN Conversion				○
202		$+	P	Join Up Two Character Strings				○
203		LEN	P	Character String Length Detection				○
204		RIGHT	P	Read Character from the Right of String				○
205		LEFT	P	Read Character from the Left of String				○
206		MIDR	P	Read Character from Specific Place of String				○
207		MIDW	P	Write Character to Specific Place of String				○
208		INSTR	P	Search Character String from another String				○
209		$ MOV	P	Transfer Character String				○
Positioning Instructions								
300	D	ZRN		Zero Return	○	○	○	○
301	D	JOGF		Jog Forward	○	○	○	○
302	D	JOGR		Jog Reverse	○	○	○	○
303	D	DRVR		Drive to Relative Position	○	○	○	○
304	D	DRVA		Drive to Absolute Position	○	○	○	○
305	D	DV2R		Drive to Relative Position by 2 Stages	○	○	○	○
306	D	DV2A		Drive to Absolute Position by 2 Stages	○	○	○	○
307	D	DVIT		Interrupt Constant Quantity Positioning	○	○	○	○
308	D	DV2I		2 Stages Interrupt Constant Quantity Position	○	○	○	○
309	D	DVSR		IngInterrupt to Stop or Drive to Relative Position	○	○	○	○
310	D	DVSA		Interrupt to Stop or Drive to Absolute Position	○	○	○	○
311	D	PLSV		Variable Speed Pulse Output	○	○	○	○
312		DTBL		Data Table Positioning	○	○	○	○
313	D	ABS		Absolute Current Value Read	○	○	○	○
314		MPG		Handwheel Positioning	○	○	○	○
315	D	LIR		Relatively Linear Interpolation	○	○	○	○
316	D	LIA		Absolutely Linear Interpolation	○	○	○	○
Other Instructions								
46		ANS		Timed Annunciator Set	○	○	○	○
47		ANR	P	Annunciator Reset	○	○	○	○
184		RND	P	Generate Random Number	○	○	○	○
186		DUTY		Timing Pulse Generation				○
188		CRC	P	Cyclic Redundancy Check - 16	○	○	○	○

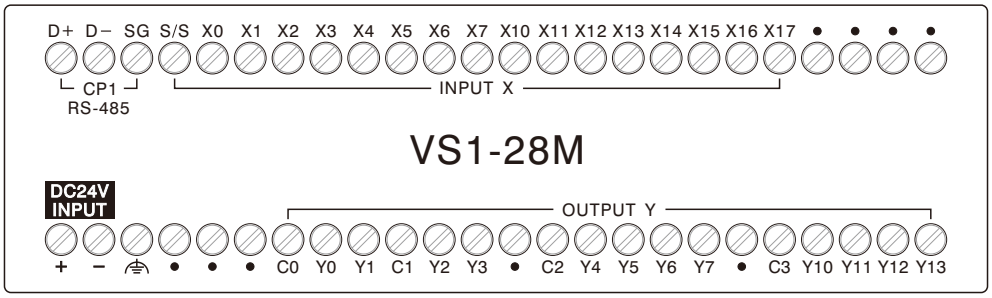
1-12 Terminal Layouts

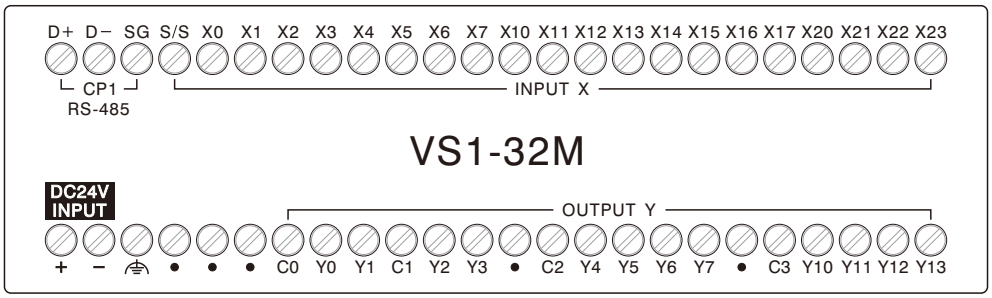


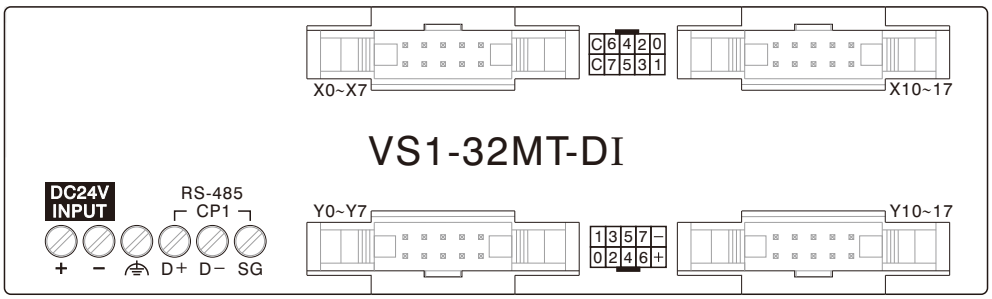


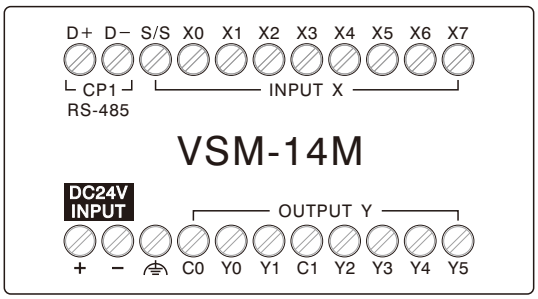


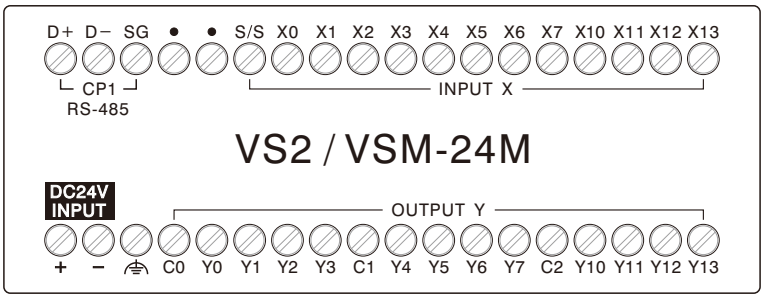


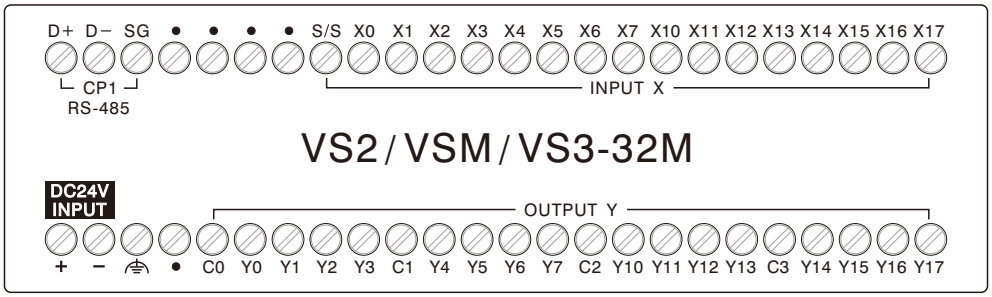


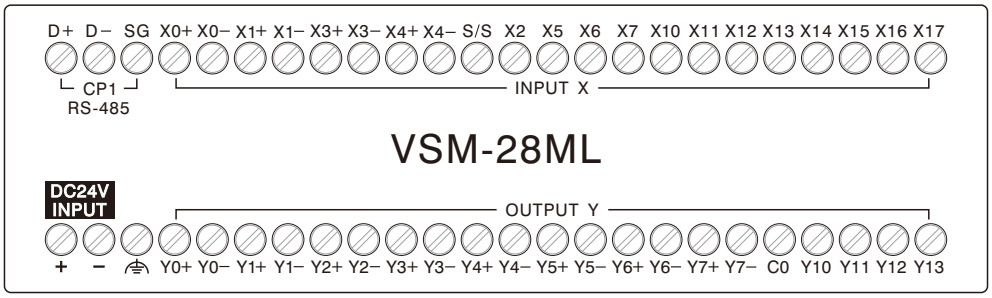


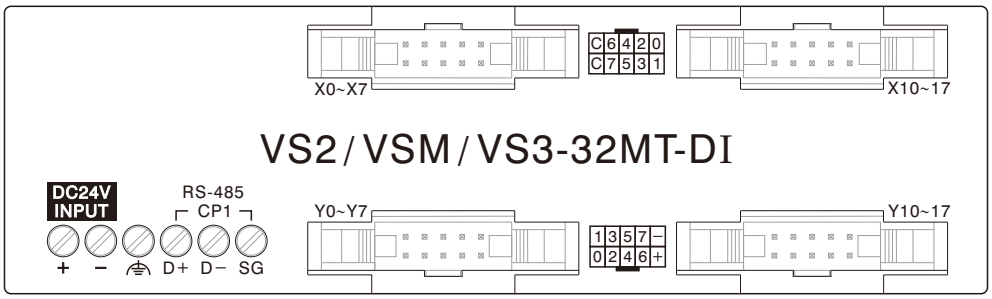



D+ D− S/S X0 X1 X2 X3 X4 X5 X6 X7
CP1
RS-485
INPUT X
VSM-14M
DC24V INPUT
OUTPUT Y
+ − C0 Y0 Y1 C1 Y2 Y3 Y4 Y5


D+ D− SG S/S X0 X1 X2 X3 X4 X5 X6 X7 X10 X11 X12 X13
CP1
RS-485
INPUT X
VS2 / VSM-24M
DC24V INPUT
OUTPUT Y
+ − C0 Y0 Y1 Y2 Y3 C1 Y4 Y5 Y6 Y7 C2 Y10 Y11 Y12 Y13


D+ D− SG S/S X0 X1 X2 X3 X4 X5 X6 X7 X10 X11 X12 X13 X14 X15 X16 X17
CP1
RS-485
INPUT X
VS2 / VSM / VS3-32M
DC24V INPUT
OUTPUT Y
+ − C0 Y0 Y1 Y2 Y3 C1 Y4 Y5 Y6 Y7 C2 Y10 Y11 Y12 Y13 C3 Y14 Y15 Y16 Y17


D+ D− SG X0+ X0− X1+ X1− X3+ X3− X4+ X4− S/S X2 X5 X6 X7 X10 X11 X12 X13 X14 X15 X16 X17
CP1
RS-485
INPUT X
VSM-28ML
DC24V INPUT
OUTPUT Y
+ − Y0+ Y0− Y1+ Y1− Y2+ Y2− Y3+ Y3− Y4+ Y4− Y5+ Y5− Y6+ Y6− Y7+ Y7− C0 Y10 Y11 Y12 Y13


C6 4 2 0
C7 5 3 1
X0~X7
X10~17
VS2 / VSM / VS3-32MT-DI
DC24V INPUT
RS-485
CP1
+ − D+ D− SG
Y0~Y7
Y10~17
1 3 5 7 −
0 2 4 6 +

1-13 Product List

Item	Model Name	Main Specification
VS1 Series Main Unit	VS1-10M★-D	VS1 Main Unit: 6 DI (DC 24V, X0~X5 10 kHz); 4 DO ★; 16K words project memory; 1 Expansion Card socket; I/O by screw-clamp terminal
	VS1-14M★-D	VS1 Main Unit: 8 DI (DC 24V, X0~X7 10 kHz); 6 DO ★; 16K words project memory; 1 Expansion Card socket; I/O by screw-clamp terminal
	VS1-20M★-D	VS1 Main Unit: 12 DI (DC 24V, X0~X7 10 kHz); 8 DO ★; 16K words project memory; 2 Expansion Card sockets; I/O by screw-clamp terminal
	VS1-24M★-D	Vs1 Main Unit: 14 DI (DC 24V, X0~X7 10 kHz); 10 DO ★; 16K words project memory; 2 Expansion Card sockets; I/O by screw-clamp terminal
	VS1-28M★-D	VS1 Main Unit: 16 DI (DC 24V, X0~X7 10 kHz); 12 DO ★; 16K words project memory; 3 Expansion Card sockets; DIO Expansion Module available; I/O by screw-clamp terminal
	VS1-32M★-D	VS1 Main Unit: 20 DI (DC 24V, X0~X7 10 kHz); 12 DO ★; 16K words project memory; 3 Expansion Card sockets; DIO Expansion Module available; I/O by screw-clamp terminal
	VS1-32MT-DI	VS1 Main Unit: 16 DI (DC 24V, X0~X7 10 kHz); 16 DO (100mA NPN transistor, Y0~Y3 50 kHz); 16K words project memory; 3 Expansion Card sockets; DIO Expansion Module available; I/O by IDC connector
VS2 Series Main Unit	VS2-24M★-D	VS2 Main Unit: 12 DI (DC 24V, X0~X7 50 kHz); 12 DO ★; 32K words project memory; 2 Expansion Card sockets; DIO Expansion & 8 Special Modules available; I/O by screw-clamp terminal
	VS2-32M★-D	VS2 Main Unit: 16 DI (DC 24V, X0~X7 50 kHz); 16 DO ★; 32K words project memory; 3 Expansion Card sockets; DIO Expansion & 8 Special Modules available; I/O by screw-clamp terminal
	VS2-32MT-DI	VS2 Main Unit: 16 DI (DC 24V, X0~X7 50 kHz); 16 DO (100mA NPN transistor, Y0~Y3 50 kHz); 32K words project memory; 3 EC sockets; DIO Expansion & 8 Special Modules available; I/O by IDC connector
VSM Series Main Unit	VSM-14MT-D	VSM Main Unit: 8 DI (DC 24V, 4×200 kHz + 4×50 kHz); 6 DO (500mA NPN transistor, Y0~Y3 200 kHz); 32K words project memory; 1 Expansion Card socket; I/O by screw-clamp terminal
	VSM-24MT-D	VSM Main Unit: 12 DI (DC 24V, 4×200 kHz + 4×50 kHz); 12 DO (500mA NPN transistor, Y0~Y3 200 kHz); 32K words project memory; 2 Expansion Card sockets; DIO Expansion & 8 Special Modules available; I/O by screw-clamp terminal
	VSM-32MT-D	VSM Main Unit: 16 DI (DC 24V, 4×200 kHz + 4×50 kHz); 16 DO (500mA NPN transistor, Y0~Y3 200 kHz); 32K words project memory; 3 Expansion Card sockets; DIO Expansion & 8 Special Modules available; I/O by screw-clamp terminal
	VSM-28ML-D	VSM Main Unit: 4 Line Driver DI (for 2 hardware counters up to 1 MHz) + 12 DI (DC 24V, 4×50 kHz & 8 normal); 8 Line Driver DO (4 × 1 MHz & 4 normal) + 4 DO (500mA NPN transistor); 32K words project memory; 3 Expansion Card sockets; DIO Expansion & 8 Special Modules available; I/O by screw-clamp terminal
	VSM-32MT-DI	VSM Main Unit: 16 DI (DC 24V, 4×200 kHz + 4×50 kHz); 16 DO (100mA NPN transistor, Y0~Y3 200 kHz); 32K words project memory; 3 Expansion Card sockets; DIO Expansion & 8 Special Modules available; I/O by IDC connector
VS3 Series Main Unit	VS3-32M★-D	VS3 Main Unit: 16 DI (DC 24V, 4×200 kHz + 4×50 kHz); 16 DO ★(Y0~Y3 200 kHz at NPN transistor model); 64K words project memory; 3 Expansion Card sockets; DIO Expansion & 16 Special Modules available; I/O by screw-clamp terminal
	VS3-32MT-DI	VS3 Main Unit: 16 DI (DC 24V, 4×200 kHz + 4×50 kHz); 16 DO (100mA NPN transistor, Y0~Y3 200 kHz); 64K words project memory; 3 EC sockets; DIO Expansion &16 Special Modules available; I/O by IDC connector
DIO Expansion Module	VS-8X	DI Expansion Module: 8 DI (DC 24V); input by screw-clamp terminal
	VS-16X	DI Expansion Module: 16 DI (DC 24V); input by screw-clamp terminal
	VS-8Y★	DO Expansion Module: 8 DO ★; output by screw-clamp terminal
	VS-16Y★	DO Expansion Module: 16 DO ★; output by screw-clamp terminal
	VS-8XY★	DIO Expansion Module: 4 DI (DC 24V); 4 DO ★; I/O by screw-clamp terminal
	VS-16XY★	DIO Expansion Module: 8 DI (DC 24V); 8 DO ★; I/O by screw-clamp terminal
	VS-28XYR	DIO Expansion Module: 16 DI (DC 24V); 12 DO (2A Relay); I/O by screw-clamp terminal
	VS-32XY★	DIO Expansion Module: 16 DI (DC 24V); 16 DO ★; I/O by screw-clamp terminal
	VS-16X-I	DI Expansion Module: 16 DI (DC 24V); input by IDC connector
	VS-16YT-I	DO Expansion Module: 16 DO (100mA NPN transistor); output by IDC connector
	VS-16XYT-I	DIO Expansion Module: 8 DI (DC 24V); 8 DO (100mA NPN transistor); I/O by IDC connector
	VS-32XYT-I	DIO Expansion Module: 16 DI (DC 24V); 16 DO (100mA NPN transistor); I/O by IDC connector
Power Module	VS-PSD	Power Repeater Module: DC 24V power input to transfer to DC 5V 500mA + DC 12V 800mA, those inner power outputs provide for the Modules behind
Special Function Module	VS-4AD	Analog Input Module: 4 channel (16-bit) inputs, each channel could input either –10~+10V, 4~20mA or –20~+20mA; isolated
	VS-2DA	Analog Output Module: 2 channel (16-bit) outputs, each channel could output either –10~10V, 4~20mA or –20~+20mA; isolated
	VS-3A	Analog I/O Module: 2 channel (16-bit) inputs + 1 channel (16-bit) output, each channel could input/output either –10~+10V, 4~20mA or –20~+20mA; isolated
	VS-6A	Analog I/O Module: 4 channel (16-bit) inputs + 2 channel (16-bit) outputs, each channel could input/output either –10~+10V, 4~20mA or –20~+20mA; isolated
	VS-4TC	Thermocouple Temperature Input Module: 4 channel thermocouple (K, J, R, S, T, E, B or N type) inputs, 0.1℃ / 0.1℉ resolution ; isolated
	VS-8TC	Thermocouple Temperature Input Module: 8 channel thermocouple (K, J, R, S, T, E, B or N type) inputs, 0.1℃ / 0.1℉ resolution ; isolated
	VS-2PT	PT-100 Temperature Input Module: 2 channel (3-wire PT-100) inputs, 0.1℃ / 0.1℉ resolution ; isolated
	VS-4PT	PT-100 Temperature Input Module: 4 channel (3-wire PT-100) inputs, 0.1℃ / 0.1℉ resolution ; isolated
	VS-2PG	Pulse Generator Module: 2 sets of 200 kHz high speed pulse outputs for 2 axes position control.
	VS-4PG	Pulse Generator Module: 4 sets of 200 kHz high speed pulse outputs for 4 axes position control.

Item	Model Name	Main Specification
DIO Expansion Card	VS-4X-EC	DI Expansion Card: 4 DI (DC 24V); output by screw-clamp terminal
	VS-8X-EC	DI Expansion Card: 8 DI (DC 24V); input by screw-clamp terminal
	VS-4Y★-EC	DO Expansion Card: 4 DO ★; output by screw-clamp terminal
	VS-8YT-EC	DO Expansion Card: 8 DO (DC 24V, 300mA NPN transistor); output by screw-clamp terminal
	VS-4XY★-EC	DIO Expansion Card: 2 DI (DC 24V); 2 DO ★; I/O by screw-clamp terminal
	VS-8XY★-EC	DIO Expansion Card: 4 DI (DC 24V); 4 DO ★; I/O by screw-clamp terminal
	VS-8XI-EC	DI Expansion Card: 8 DI (DC 24V); input by IDC connector
	VS-8YTI-EC	DO Expansion Card: 8 DO (DC 24V, 100mA NPN transistor); output by IDC connector
	VS-E8X-EC	DI Expansion Card for VS-32XY★ module: 8 DI DC 24V, Sink/Source selectable; input by screw-clamp terminal
	VS-E8YT-EC	DO Expansion Card for VS-32XY★ module: 8 DO (DC 24V, 0.3A NPN transistor); output by screw-clamp terminal
Comm. Expansion Card	VS-485-EC	RS-485 Communication Expansion Card: One non-isolated RS-485 port with TX / RX indicators; dist. 50m Max.
	VS-485A-EC	RS-485 Communication Expansion Card: One isolated RS-485 port with TX / RX indicators; dist. 1000m Max.
	VS-D485-EC	RS-485 Communication Expansion Card: Dual non-isolated RS-485 ports with TX / RX indicators; dist. 50m Max.
	VS-D485A-EC	RS-485 Communication Expansion Card: Dual isolated RS-485 ports with TX / RX indicators; dist. 1000m Max.
	VS-D232-EC	RS-232C Communication Expansion Card: Dual non-isolated RS-232 ports with TX / RX indicators; dist. 15m Max.; wiring by the RX / TX / SG terminals
	VS-D52A-EC	RS-485 + RS-232C Communication Expansion Card: One isolated RS-485 port (1000m) & one non-isolated RS-232C port (15m), both with TX / RX indicators and wiring by terminals
	VS-ENET-EC	Ethernet + RS-485 Communication Expansion Card: One Ethernet port (with additional non-isolated RS-485, dist. 50m) & one non-isolated RS-485 port (dist. 50m), both with TX / RX indicators
Special Function Card	VS-3AV-EC	Brief Voltage I/O Card: 2 channel (0~10V, 12-bit) inputs; 1 channel (0~10V, 10-bit) output; with a calibrated DC 10V output; non-isolated
	VS-4AD-EC	Analog Input Card: 4 channel (12-bit) inputs, each channel could output either 0~10V, 4~20mA or 0~20mA; non-isolated
	VS-2DA-EC	Analog Output Card: 2 channel (12-bit) outputs, each channel could input either 0~10V, 4~20mA or 0~20mA; non-isolated
	VS-4A-EC	Analog I/O Card: 2 channel (12-bit) inputs + 2 channel (12-bit) outputs, each channel could input/output either 0~10V, 4~20mA or 0~20mA; non-isolated
	VS-3ISC-EC	Inverter Speed Control Card: 3 channel (0.1% resolution) voltage outputs; totally isolated for each channel
	VS-2TC-EC	Thermocouple Temperature Input Card: 2 channel (K, J, R, S, T, E, B or N type thermocouple, 0.2~0.3℃ resolution) inputs; non-isolated
	VS-4TC-EC	Thermocouple Temperature Input Card: 4 channel (K, J, R, S, T, E, B or N type thermocouple, 0.2~0.3℃ resolution) inputs; non-isolated
	VS-1PT-EC	PT-100 Temperature Input Card: 1 channel (3-wire PT-100, 0.1℃ resolution) input; non-isolated
	VS-2PT-EC	PT-100 Temperature Input Card: 2 channel (3-wire PT-100, 0.1℃ resolution) inputs; non-isolated
Memory Card	VS-MC	Memory Card: No battery required 16Mb Flash ROM for user's project and data-bank (655,360 Words) storage
	VS-MCR	Multi-Function Memory Card: 16Mb Flash ROM for user's project and data-bank (655,360 Words) storage; with the Real Time Clock (RTC) function
Connection Cable	VSPC-200A	USB Communication Cable: Between the PLC's Mini USB Programming Port and a computer's A-type USB; length: 200 cm
	VSEC-□□□	Extension Cable: For the Expansion Slot of the VS series; length□□□:50/100 cm
IDC Connector Related Accessory	VB-T8R	8 Relays Output Module: 16A 1c contact relays; with varistors and relay sockets
	VB-T8RS	8 Relays Output Module: 5A 1a contact relays; with 5mm removable screw-clamp terminals
	VB-T8M	8 MOSFETs Output Module: 2A current source MOSFETs; with flyback diodes
	VB-T16M	16 MOSFETs Output Module: 2A current source MOSFETs; with flyback diodes
	VB-T16TB	16 Points Adapted Board: Transfer between the IDC connectors and screw-clamp terminals
	VBIDC-□□□	IDC Ribbon Cable: Assembled with two 10-pin female connectors; length□□□:50/100/150/200/250/300 cm
	VBIW-□□□	IDC Dispersed Wires: An IDC female connector with 10 rainbow 22 AWG wire; length□□□:50/100/200/300 cm
	VBIDC-FC100	10-pin Ribbon Cable: Flat, Grey, 28 AWG; length: 100 foot
	VBIDC-FC250	10-pin Ribbon Cable: Flat, Grey, 28 AWG; length: 250 foot
	VBIDC-HD20	10-pin IDC Connector: Female connector with strain relief, Grey, 20 pcs.
	VBIDC-HD100	10-pin IDC Connector: Female connector with strain relief, Grey, 100 pcs.
	VB-HT214	A crimping tool of IDC ribbon cable

★ Selectable output:

R: 2A Relay;

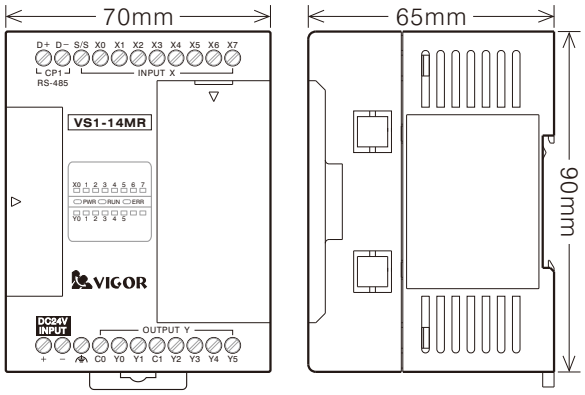
T: 0.5A NPN transistor (EC cards are 0.3A); at Y0~3 could generate purse (VS1/2: 50kHz; VSM/3: 200 kHz);

P: 0.5A PNP transistor, at Y0~3 could generate 1kHz purse

All Main Unit, Special Module and IDC's module are required DC 24V -15% / +20% power input

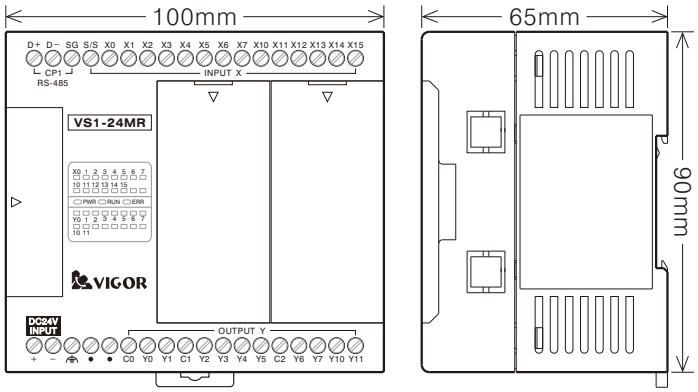
1-14 Product Dimension and Weight

- VS1-10M/VS1-14M/VSM-14MT Main Unit



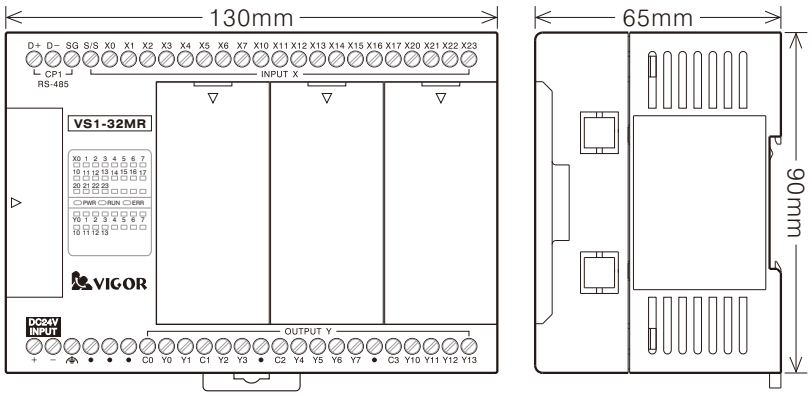
Model Name	N.W. / G.W. (g)
VS1-10MR-D	160/230
VS1-10MT-D	145/215
VS1-10MP-D	145/215
VS1-14MR-D	170/240
VS1-14MT-D	145/215
VS1-14MP-D	150/220
VSM-14MT-D	145/215

- VS1-20M/VS1-24M/VS2-24M/VSM-24MT Main Unit



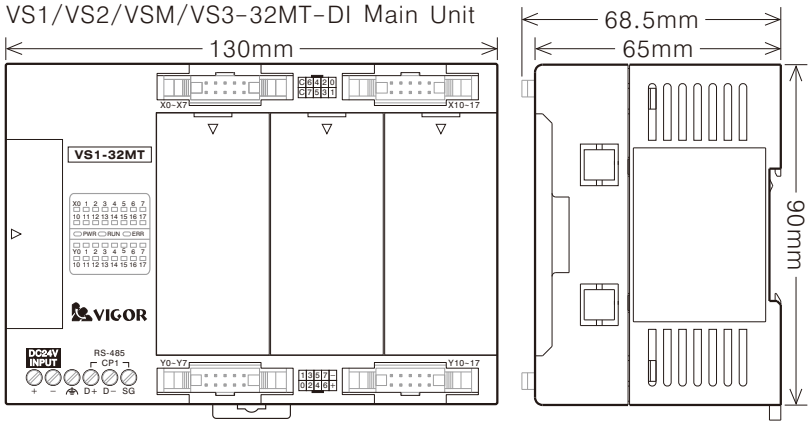
Model Name	N.W. / G.W. (g)
VS1-20MR-D	230/320
VS1-20MT-D	200/290
VS1-20MP-D	205/295
VS1-24MR-D	240/330
VS1-24MT-D	200/290
VS1-24MP-D	210/300
VS2-24MR-D	240/330
VS2-24MT-D	210/300
VS2-24MP-D	215/305
VSM-24MT-D	205/295

- VS1-28/32M, VS2-32M, VSM -32MT/28M L, VS3-32M Main Unit



Model Name	N.W. / G.W. (g)
VS1-28MR-D	315/405
VS1-28MT-D	270/360
VS1-28MP-D	295/385
VS1-32MR-D	315/405
VS1-32MT-D	270/360
VS1-32MP-D	295/385
VS2-32MR-D	315/405
VS2-32MT-D	270/360
VS2-32MP-D	305/395
VSM-32MT-D	270/360
VSM-28ML-D	270/360
VS3-32MR-D	310/400
VS3-32MT-D	275/365
VS3-32MP-D	300/390

- VS1/VS2/VSM/VS3-32MT-DI Main Unit



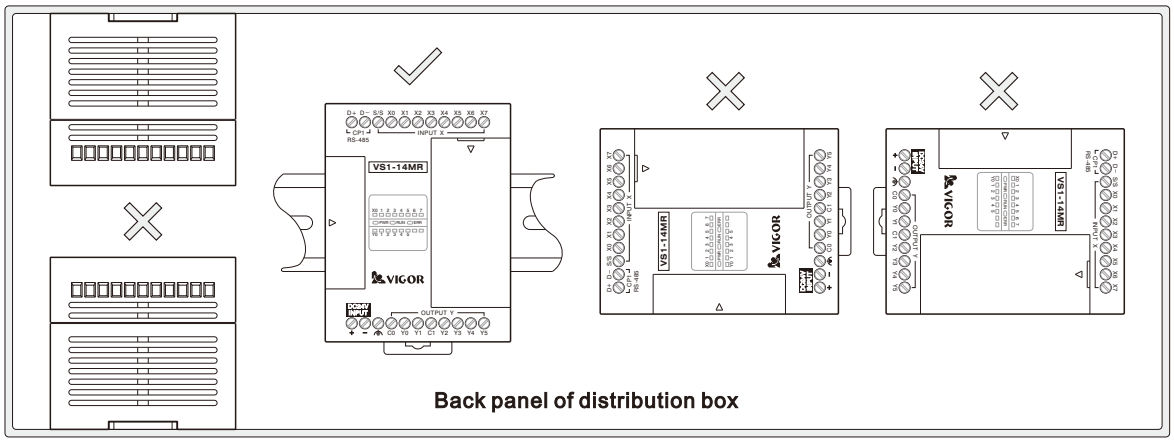
Model Name	N.W. / G.W. (g)
VS1-32MT-DI	225/315
VS2-32MT-DI	225/315
VSM-32MT-DI	220/310
VS3-32MT-DI	220/310

MEMO

2. Installation

Installation Precautions ⚠ **CAUTION**

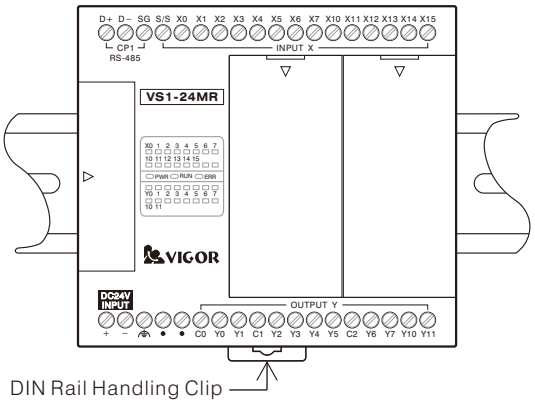
- Use this product in the environment that satisfies the “1-6 General Specifications” described in this manual.
- Do not use this product in the following environments:
  (1) Environments with dust, fumes, conductive dust, corrosive gases, or flammable gases;
  (2) Environments exposed to high temperature, condensation, wind and rain, vibration or shocks.
  Otherwise it will cause an electric shock, fire, false action or lead to product damage.
- When drilling holes or wiring, do not let metal debris fall into the ventilator of PLC to prevent fire, product damage or false action.
- Be sure to remove the dust-proof cover, if any, when installation work is completed, to prevent fire, product damage or false action caused by poor heat dissipation.
- Please have all the connecting lines and various expansion devices properly mounted and firmly fixed.
  Poor contact will lead to false action.
- To prevent poor heat dissipation, do not install this product at the bottom or top position of the distribution box or lie it down.



- The minimum clearance around PLC is 50mm. Try to keep the PLC away from high voltage lines or large power equipment.

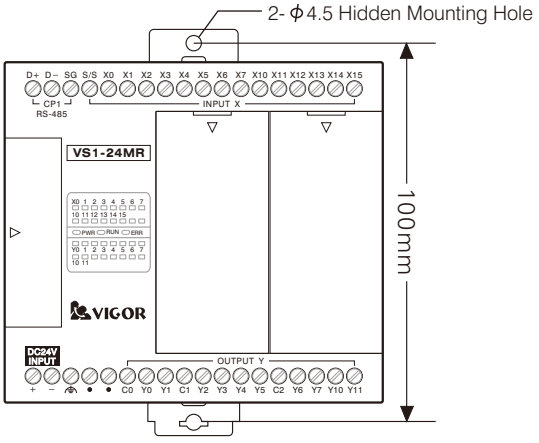
2 -1 Installation Guide

- DIN Rail Installation Guide



Directly mount PLC on the 35mm DIN Rail.
Could pull the clip down to remove it.

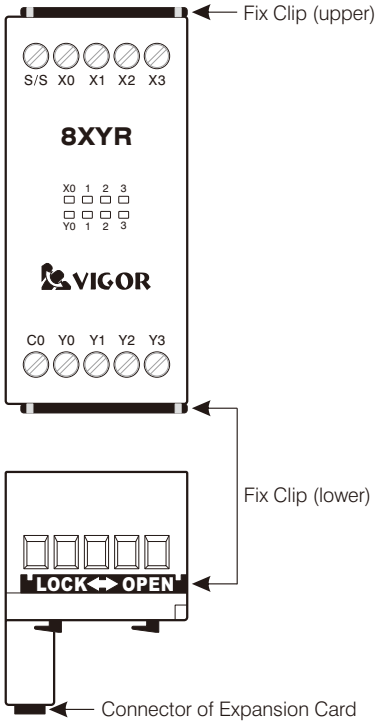
- Direct Installation



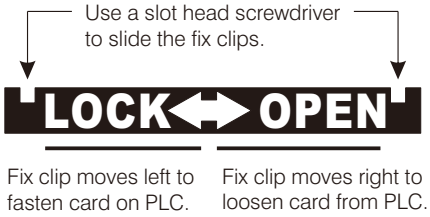
Push out the hidden mounting holes (at 100mm distance) from the bottom of PLC. Use screws to fix the unit firmly.

- For any expansion module, please follow the same guide to sequentially install it on the right side of PLC Main Unit. After that, connect the module's left flat cable to the Expansion Slot of its left unit/module then properly close all the covers.

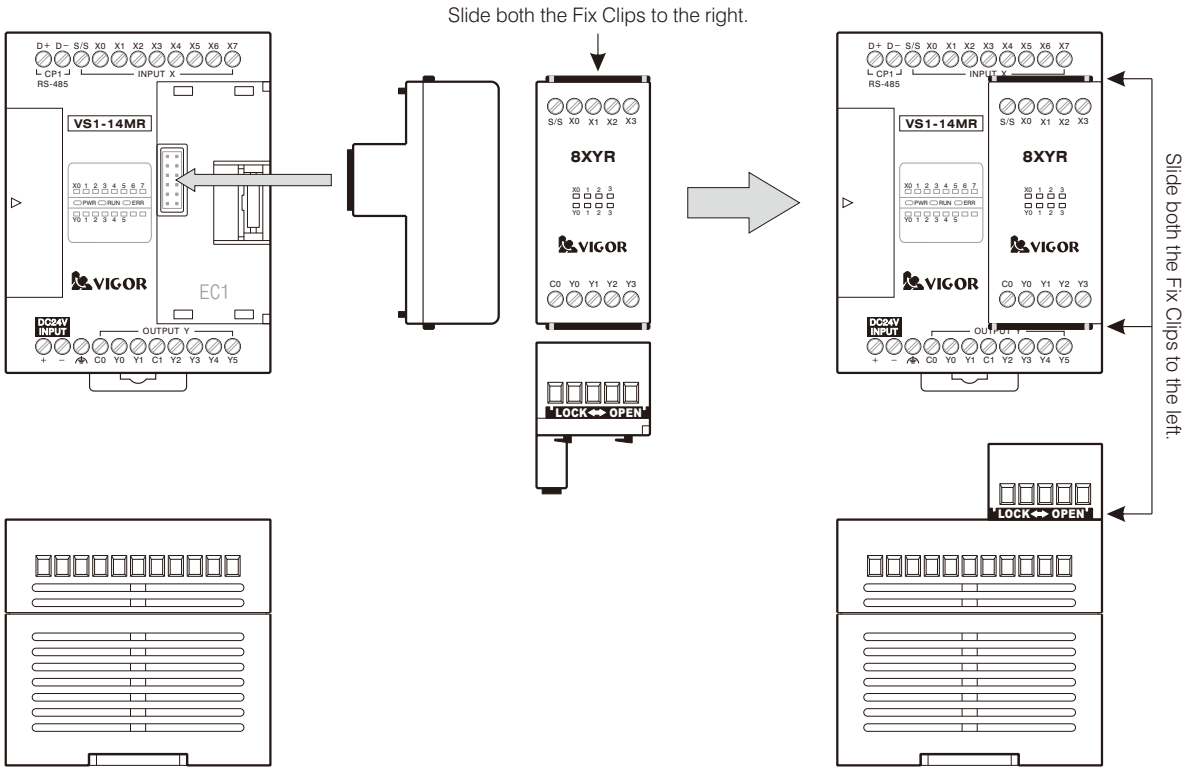
2-2 Expansion Card Installation Guide



- Every VS series Expansion Card has 2 black fix clips (upper & lower), those have symbols and grooves.



- To install an expansion card, firstly, slide both the fix clips to the right, and insert the card to EC Socket on the Main Unit, then slide the fix clips to the left to fix the card.
- To remove an expansion card from the Main Unit, must slide both the fix clips to the right first, then pull the card from the Main Unit out.



3. External Wiring

Design Precautions ⚠ **DANGER**

- Please create an external safety circuit for PLC to ensure the system can without risk in case of abnormal power supply or PLC malfunction.
- Any false operation or false output may cause accidents.
- To avoid machine damage, it is required to design an external protection circuit, such as emergency stop, forward / reverse interlock, over / under limit protection etc. for PLC.
- According to the diagnostic functions such as the Watch Dog Timer (WDT), the CPU of PLC could detect the abnormal process and then stop all outputs. However, failures in the input/output control circuits are not detectable by the CPU of PLC. Thus, when failures occur in the input/output control circuits, the output may be uncontrollable, which makes the external safety circuit and safety mechanism become necessary to ensure equipment safety.
- Since the malfunction of PLC output relays or transistors will fail the ON/OFF control, it is required to design an external safety circuit and safety mechanism for the output signals of major accidents to ensure risk-free operation of equipment.

Design Precautions ⚠ **CAUTION**

- Considering the electrical durability of output contacts of PLC relays, it is recommended to drive high current loads through external relays driven by the outputs of transistor PLC.
- Considering the slow reaction and mechanical durability of output contacts of PLC relays, it is recommended to use transistor output models for applications with high-frequency movement or prompt reaction.
- Do not put the wires of PLC's input and output signals to the same cable.
- Do not bundle the I/O signal wires with any other power lines at the same pipeline.
- Generally, for safety concern, try to limit the wire length less than 20m.
- There is no fuse in the PLC output circuit. If necessary, it is recommended to properly put a fuse in the external output circuit to prevent PLC output circuit damaged by external load short circuit or malfunction.

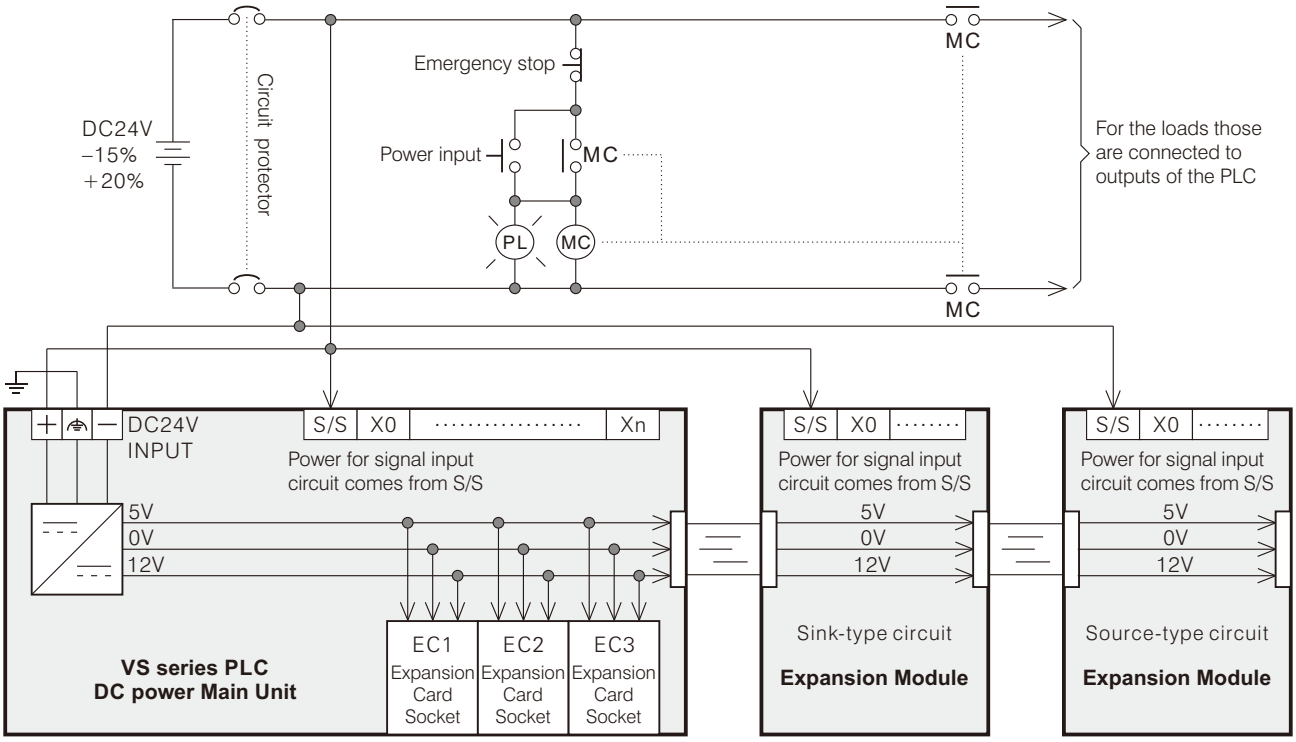
Wiring Precautions ⚠ **DANGER**

- Be sure to shut off all phases of external power supply before wiring to prevent an electric shock or product damage.

Wiring Precautions ⚠ **CAUTION**

- Always pay special attention to connect AC power supply to the correct terminal. In case the AC power supply is connected to a DC I/O terminal or a DC power supply terminal, PLC will be burned out.
- Do not wiring on the empty terminal of a PLC ⊡, or it may damage the product.
- Please follow the Class 3 grounding standard to ground the Main Unit. Do not use a common ground that share with large power system. (Refer to the section 1-6 General Specifications)
- When drilling holes or wiring, do not let metal debris fall into the ventilator of PLC to prevent fire, product damage or false action.
- Be sure to remove the dust-proof cover, if any, when installation work is completed, to prevent fire, product damage or false action caused by poor heat dissipation.
- Use 0.3mm^2 ~ 0.5mm^2 (AWG22 ~ AWG20) single or multiple core wire. For two wires connected to one terminal, use 0.3mm^2 (AWG22) wire.
  It is recommended to crimp connect a single/multiple core wire to a rod terminal with insulation sleeve prior to wiring. For a single core wire, strip off the insulation and proceed to wiring. For a multiple core wire, strip off the insulation, twist strands (do not tin) and then proceed to wiring.
- Tighten the terminal screw in the torque range of 2.5N-m ~ 3.0N-m.

3-1 Wiring of Power Supply



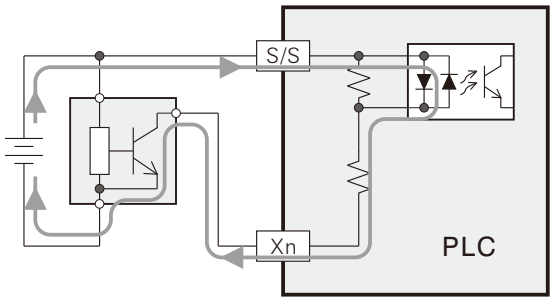
CAUTION

- Connect a DC24V –15%/+20% power source to DC24V INPUT terminals at the Main Unit. Recommend to use a regulated power supply.
- Do not use undefined terminal for external wiring or extension.

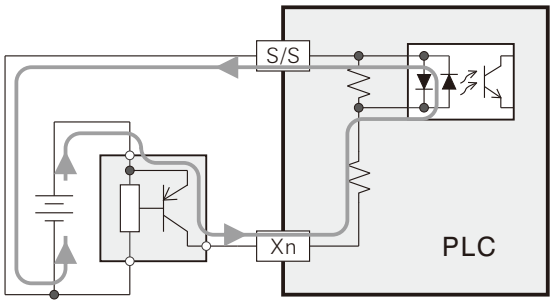
3-2 Input Wiring

The input point circuit of VS series PLC is bidirectional. It can be used either as a Sink-type circuit (S/S terminal joint to the positive of DC24V) for connecting with the NPN transistor sensors, or as a Source-type circuit (S/S terminal joint to the negative of DC24V) for connecting with the PNP transistor sensors.

- Sink-type Circuit

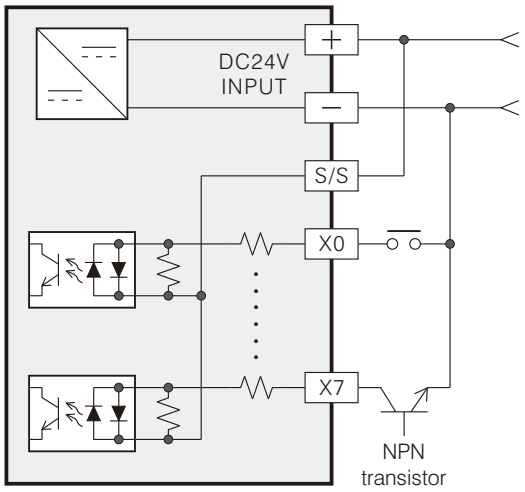


- Source-type Circuit

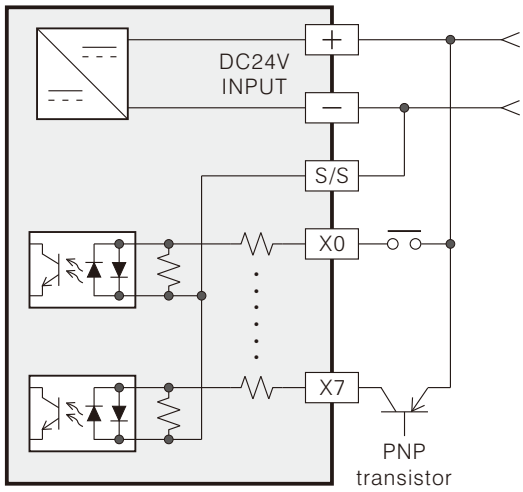


3-2-1 Input Circuit Configuration

Sink-type Circuit

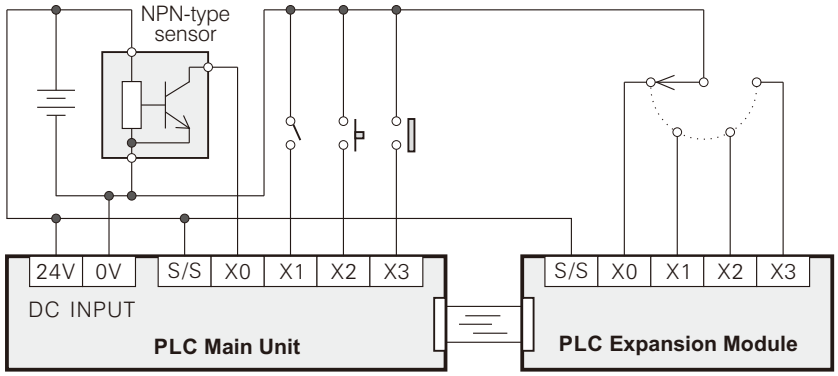


Source-type Circuit

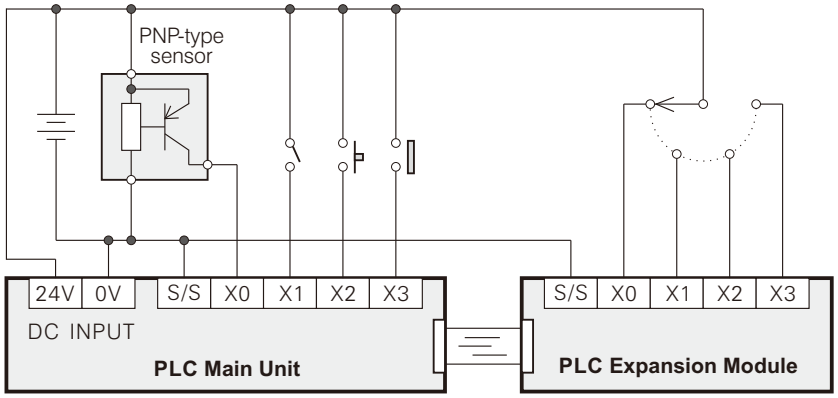


3-2-2 Input Wiring Diagram

- Wiring example of NPN-type sensor as an input device



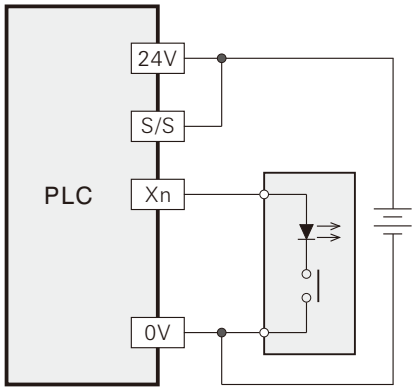
- Wiring example of PNP-type sensor as an input device



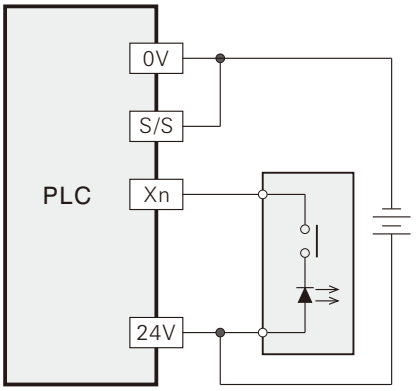
3-2-3 Input Wiring Precaution

- The current of an input point is required 5~7mA/ DC24V. Please select a switch which is particularly for the tiny current signal.
  A power purpose large current switch may have uncertainly connection, then cause signal lost.
- As shown below, when a diode is serial-connected in the input circuit, the total voltage drop should less than 4V. Therefore, the reed switch with serial-connected LED can be applied at most 2 pieces.

Sink-type Circuit



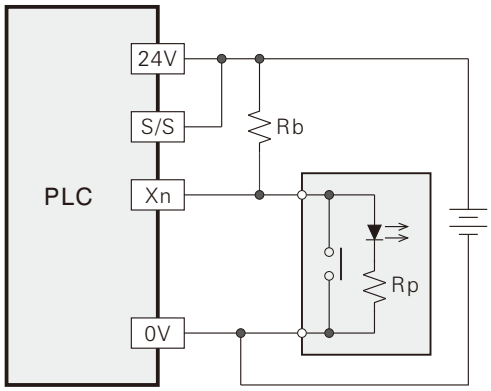
Source-type Circuit



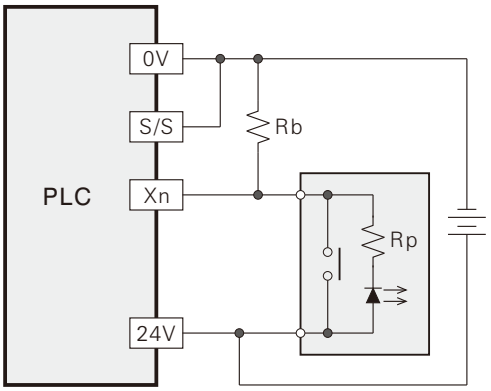
- As shown below, when parallel-connected resistor Rp is in the input circuit, the Rp should be 15kΩ or higher. Please install a shunt resistor Rb if the Rp <15kΩ.

$$\text{Equation: } Rb \leqq \frac{4 \times Rp}{15 - Rp} (k\Omega)$$

Sink-type Circuit



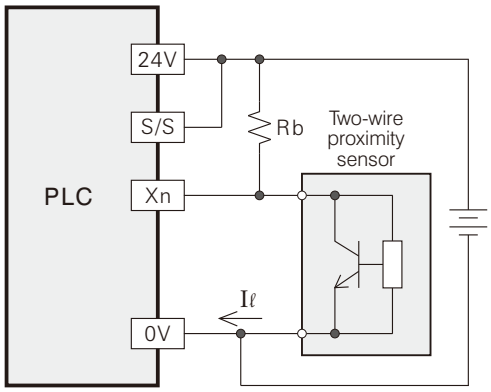
Source-type Circuit



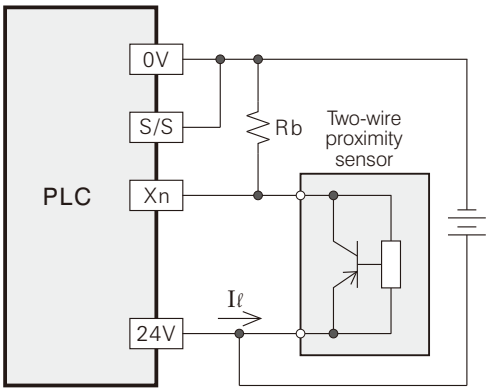
- As show below, if a two-wire proximity sensor is applied and its OFF-state leakage current is larger than 1.5mA, please install a shunt resistor Rb.

$$\text{Equation: } Rb \leqq \frac{6}{If \times (\text{OFF-state leakage current}) - 1.5} (k\Omega)$$

Sink-type Circuit



Source-type Circuit

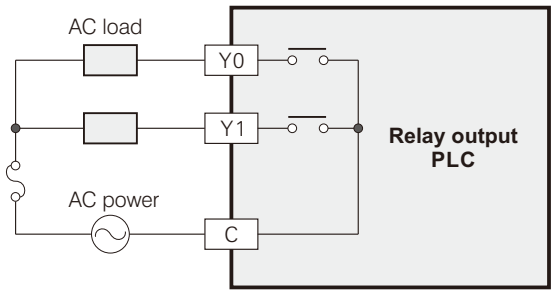


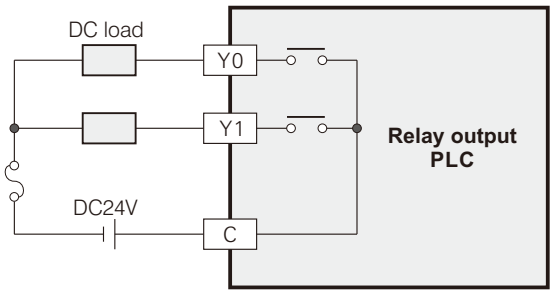
3-3 Output Wiring

The VS series PLC provides relay output and transistor output models for selection.
The relay output model could be used to drive AC or DC loads. That has simple and intuitive characteristic, but its response is slower and the number of connecting times is limited.
The transistor output model could be used to drive the DC loads only. Furthermore, based on the load required, the output may choose the Sink-type (NPN transistor) or Source-type (PNP transistor). However, that has the advantage of faster response and without the limitation number of times being connected. Also, the IDC connector model (NPN transistor) is also available in the VS series PLC, it could easily connect to the relay amplify module, this combination creates a stable, reliable and easy-maintenance control system.

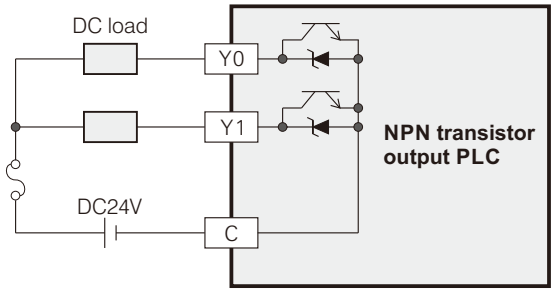
3-3-1 Output Circuit Configuration

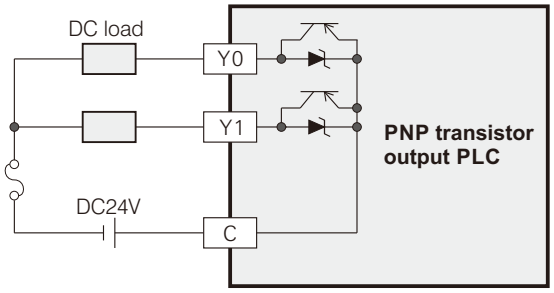
- Relay Output



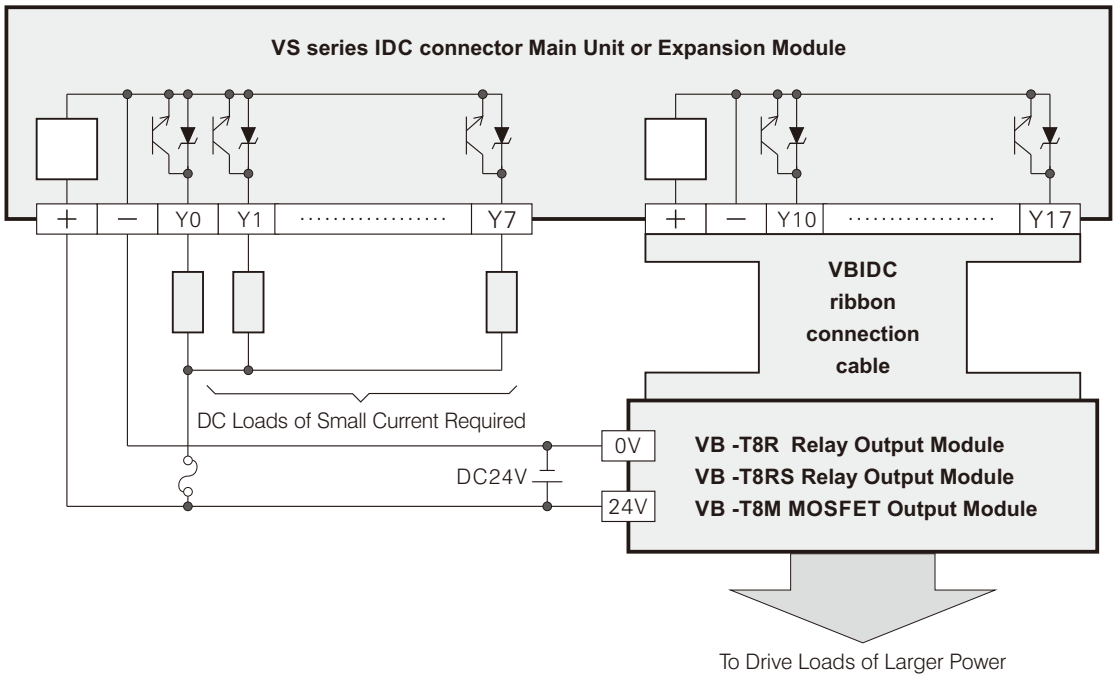


- Transistor Output





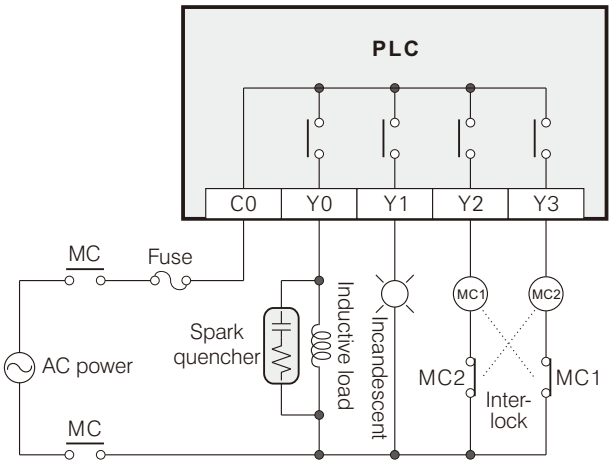
- IDC Connector Model (NPN Transistor Output)

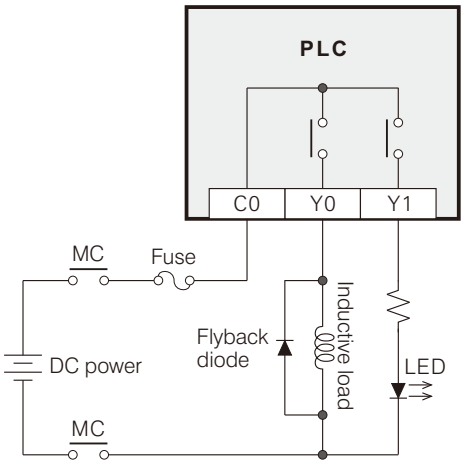


※ At the IDC model's Main Unit or Expansion Module, input DC24V power to the + and - pins in the IDC output connector is required. Besides, input DC24V to the 0V and 24V pins at the VS-8YTI-EC card is required.

3-3-2 Output Wiring Diagram

- Relay output wiring examples

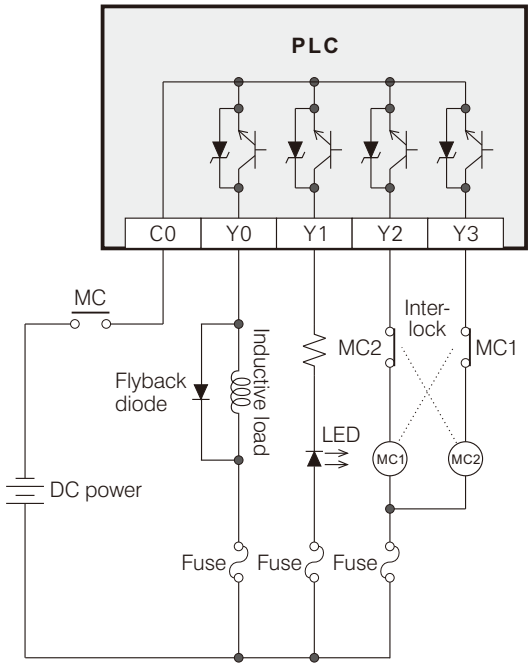




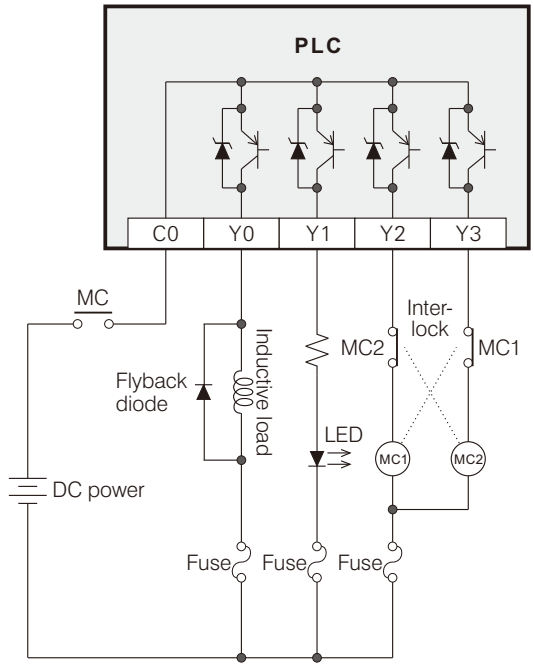
CAUTION

There is no fuse in the PLC's output circuit. Please install an external fuse to prevent inner circuit burned out that due to the short circuit of load.
Allowable fuse for a single point COM circuit is 2~3A approx.
Allowable fuse for a 4-point common COM circuit is 5~10A approx.

- NPN transistor output wiring example



- PNP transistor output wiring example

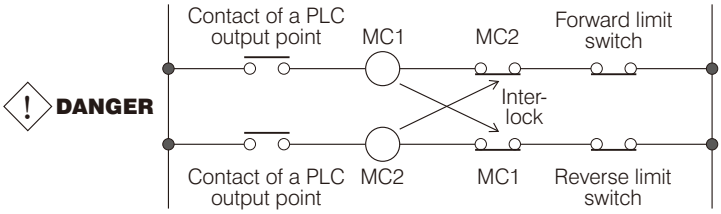


CAUTION

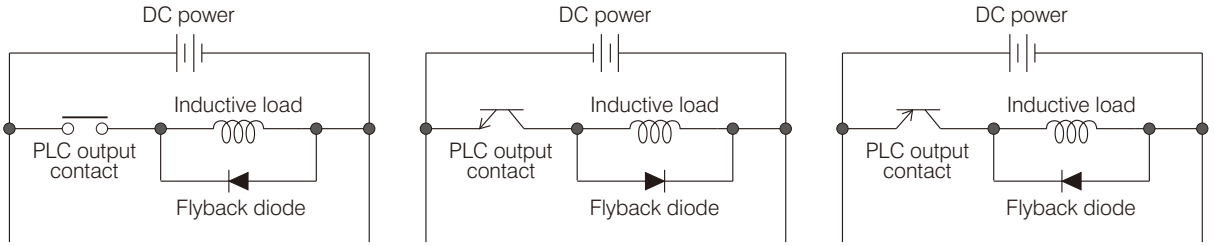
1. Please use a regulated power supply to drive loads.
2. There is no fuse in the PLC's output circuit. Please install an external fuse to prevent inner circuit burned out that due to the short circuit of load.

3-3-3 Output Wiring Precaution

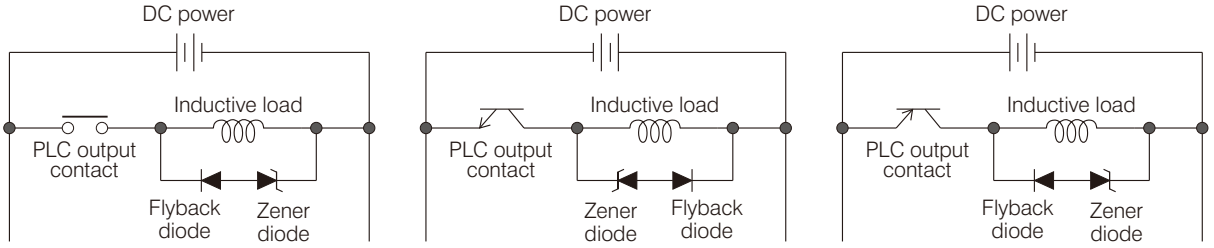
- As a forward-reverse control system, the contactors must not to close at the same time. Thus, it is required to have interlock control for this type of loads. That is necessary at inside the PLC program and outside the real circuit, respectively.
  As shown right.



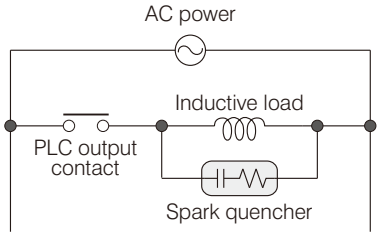
- To drive a capacitive load, its constantly working current and the inrush current should be noticed. The inrush current of a capacitive load is extremely large which is enough to burn out the PLC output transistor or melt the contact of the output relay. Thus, it is recommended to use an additional amplify relay with higher TV rating to drive a capacitive load. The TV rating indicates the allowable inrush current of a relay. Please refer to the specification of the external relay for details.
- As shown below, please correctly parallel connect a flyback diode to both terminals of a DC inductive load. Otherwise, the lifespan of relay contact will be shortened; for a transistor output, the transistor might be burned down. When selecting a flyback diode, its reverse voltage V_R is required to be at least 5~10 times of supply voltage, and the forward current I_F is larger than the load current.



For a larger power required load or quick ON/OFF swap, please add a Zener diode of V_Z=9V, 5W.



- As shown to the right, please parallel connect a spark quencher (spark killer) to both terminals of the AC inductive load, that enhance contact durability of the relay. Furthermore, could minimize the radiation noise then prevent electromagnetic interference to other equipments.
  A spark quencher consists of a capacitor and resistor, connected in series (0.1 μF+120Ω). User can make this device or to get it from the market.

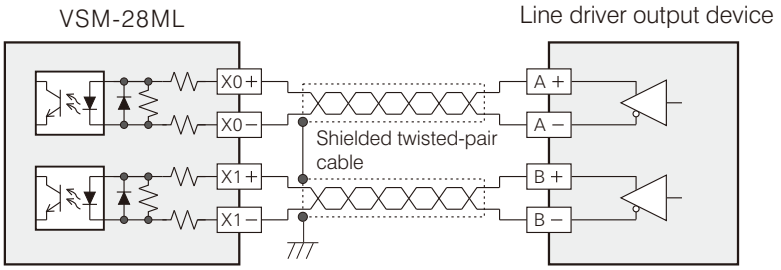


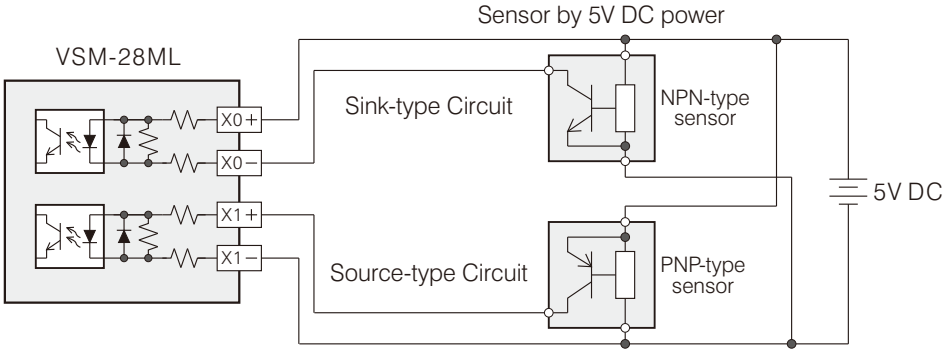
- The service life of the output relay at the VS series PLC is about 200,000 times if it works under rated standard (AC250V 2A, for the resistive load). Usually smaller load current has longer service life, but the load with lower power factor (COS ϕ , for a resistive load its COS ϕ =1) will cause service life shorter.
  It is necessary to calculate the proper service life of a relay in the PLC when designing a control system. The best design is to directly drive the load by a transistor output, or use an amplifying relay to drive the load.

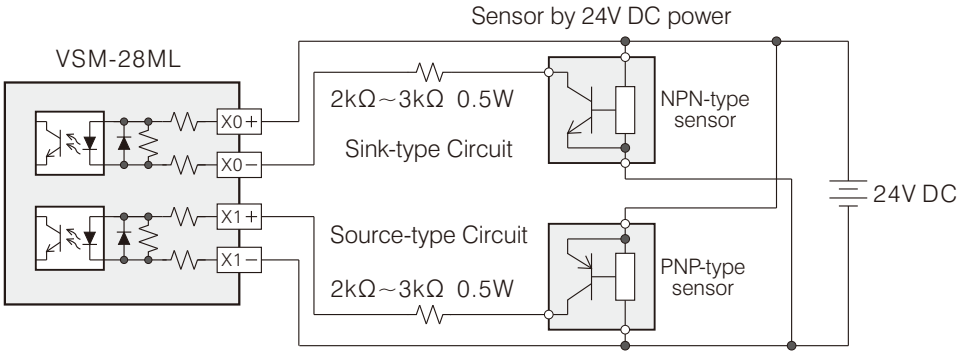
3-3-4 VSM-28ML I/O Wiring

The VSM-28ML-D is specially designed to connect with the line driver interface devices.
At this Main Unit, its external inputs X0, X1, X3 and X4 are specially for differential inputs (available to connect with line driver interface), also the wiring method of other inputs X2 and X5～X17 is equal to a general Main Unit. So, please refer to the section "3-2 Input Wiring" for details about ordinary inputs. Only the differential input is introduced here.
In addition, its Y0～Y7 are the line driver and Y10～Y13 are NPN transistor outputs. The external wiring method of outputs Y10～Y13 is equal to the Main Unit of general NPN transistor output model. So, please refer to the section "3-3 Output Wiring" for details about Y10～Y13. Only the line driver output is introduced here.

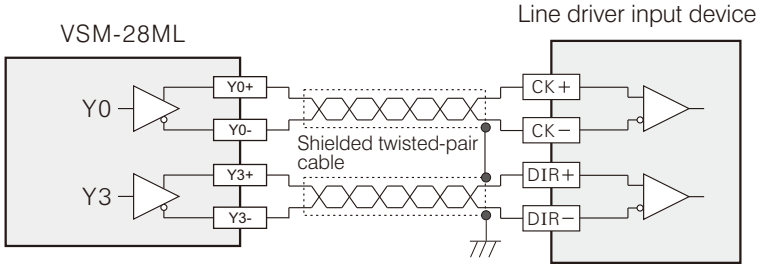
- **External Wiring Diagram of Differential Input**

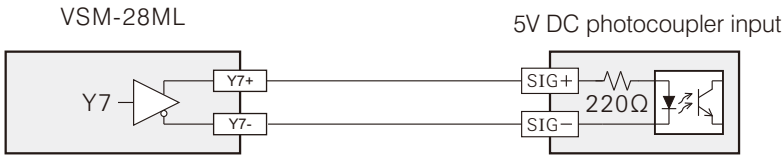






- **External Wiring Diagram of Line Driver Output**





4. Test Run, Malfunction Check & Maintenance

Operation & Maintenance Precautions ⚠ **DANGER**

- When power is ON, do not touch the terminals to prevent an electric shock or false action.
- Always switch OFF the power before cleaning or tightening terminal screws. If the power is ON, it may cause an electric shock.
- Before change any procedure in operation, such as FORCED OUTPUT, RUN, STOP, always read this manual and relevant documents carefully and confirm the safety. False operation will cause machine damage and accidents.

Operation & Maintenance Precautions ⚠ **CAUTION**

- Always switch OFF the power before installing/removing any peripheral. If the power is ON, the PLC and peripheral devices may be damaged.
- Always switch OFF the power before connecting/removing wires. If the power is ON, it may cause malfunction or false action.
- Do not mount/remove or modify the casing by yourself, otherwise it may cause malfunction, false action or even a fire.
- For repair, it is recommenced to consult the supplier, distributor or contact **VIGOR ELECTRIC CORP.** directly.

4-1 Test Run

Pre-check, Before Turning ON the Power

False connection on power terminals, short circuit the DC input to a higher voltage source or between outputs etc. will damage PLC seriously. It is important to ensure power and input/output wirings correct before power is ON.

Check the User Program When Power is ON and PLC is STOP

Use programming tool to read out the user program to ensure correct writing. Use program checking function to ensure program circuit and syntax correct.

RUN / STOP of PLC

There is a RUN/STOP button on the Main Unit of PLC. When PLC power turns OFF→ON, the PLC will recall its RUN/STOP status from the previous status of the last time power OFF. After that, the RUN/STOP status will be controllable by RUN/STOP button and programming tool.

Operation Test When Power is ON and PLC is at the RUN Status

Whenever PLC power turns OFF → ON, CPU will do self-diagnosis.
If everything is normal, the PLC is ready for the operation (RUN LED ON).

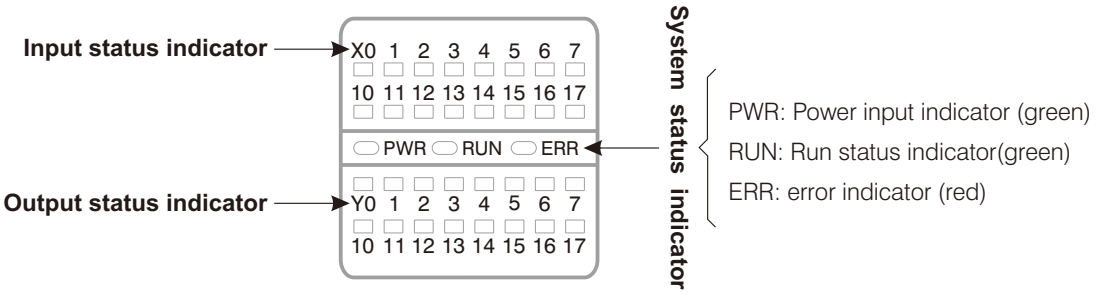
If the program is not correct (errors on syntax, circuit or Check Sum), ERR LED blinks and PLC stops. Please try to reload the program.

Frequent interruptions will make the WDT (Watch Dog Timer) effective, that causes the PLC stops and the ERR LED blinking. Please try to minimize the times of interruption.

If the scan time of program takes a long period, the WDT (Watch Dog Timer) will effect that causes the PLC stops and the ERR LED blinking. Please try to change the time setting of WDT or revise the program.

4-2 Malfunction Check

When PLC does not run well, please firstly check if power voltage, PLC terminal screws, connecting cables and I/O devices function normally; then check LED indicators on PLC. These indicators help to identify whether the problems are from PLC or external devices.



- PWR: Power input indicator (green)
  When sending power to the Main Unit, its PWR indicator on the panel should ON. If it does not turn ON, please carefully check power circuit and wiring, also ensure that the voltage supplied between the power input terminals is correct. If everything is normal, that is suggested to return this unit for repair.

- RUN: Run status indicator(green)
  When PLC runs normally, the RUN indicator on the panel is ON. If PLC stops, the RUN indicator is OFF.

- ERR: Error indicator (red)
  When PLC malfunctions, the ERR indicator on the panel is blinking or ON.

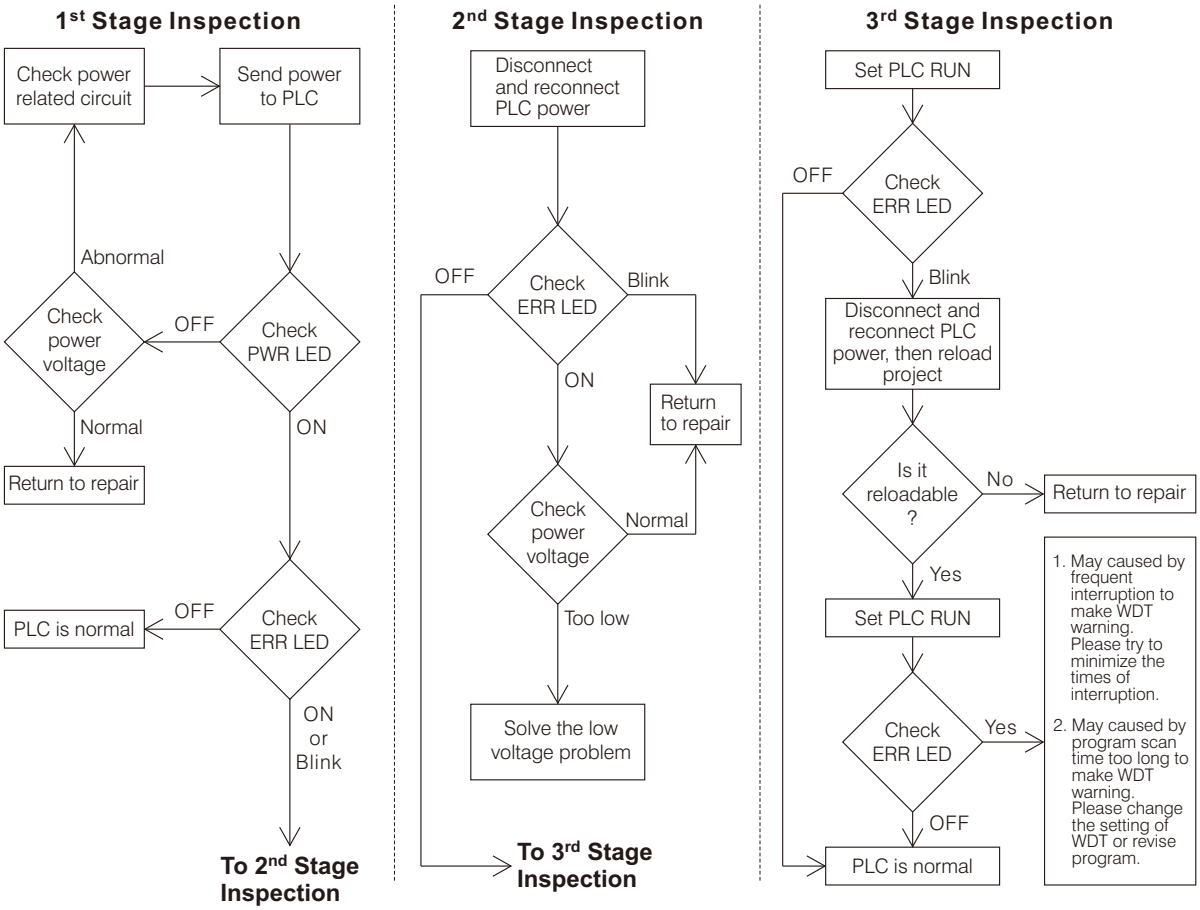
  <ERR indicator blinking>
  Due to the PLC's user program had been changed by improper use, circuit damage, abnormal noise, foreign conductive objects, etc., that will cause the ERR indicator starts blinking, PLC stop and all outputs turn OFF. In this case, please recheck its program from the unit and ensure there's no intense noise or foreign conductive objects.

  <ERR indicator continuously ON>
  When the protective WDT function is effective or CPU is out of control or PLC circuit damage or abnormal ambient noise interference, either one of the previous situation will cause the ERR indicator turns ON, PLC stops and all outputs turn OFF. In this case, please firstly disconnect PLC power supply; then connect it. If PLC turns normal, make a distance from the intense noise source and grounded properly. If the ERR indicator is still on, the PLC may malfunction. That is suggested to return it for repair.

- Input X status indicator
  (1) If the input indicator does not fit with the ideal status, please firstly check the status of the external input switch is correct.
  (2) The switch may easily be in bad contact because of excessive current or grease intrusion.
  (3) When the input switch includes a parallel-connected LED circuit, it may happen that the input signal of PLC is ON while the switch is OFF.
  (4) For the photoelectric switch, its sensitivity may change by dust hanging, which leads it to detect abnormal or unstable.
  (5) If the ON or OFF period input from the switch is shorter than PLC scan time, PLC may not be able to identify input status correctly.
  (6) If the DC24V power for PLC input signal is over-consumed or short circuit, the PLC input will not function well.
  (7) If the voltage into the input circuit is over rated value, the input circuit will be damaged.

- Output Y status indicator
  (1) If the load device does not work as the output LED indicates, please firstly check the external load device functioning well.
  (2) Overloading, short circuit of load or inrush current by capacitive load that may lead to PLC's relay output contact melted or transistor output short circuit and burned down.
  (3) PLC output contact moving too frequently may lead to relay contact in bad contact.

- For further inspection, please see the following flow chart of error inspection.



4-3 Maintenance

Disposal Precautions	⚠ CAUTION
● When disposing of this product, treat it as industrial waste.	

- There are no consumable parts in the transistor output PLC model. Replacing parts is usually not required.
- For the relay output PLC model, its relays are consumables that due to the electrical and mechanical durability of contacts.
  Please do periodic checks if the output relay works frequently or applied to drive a large load.
- Periodically check the followings:
  (1) If the temperature of PLC is abnormally rising due to other heating elements or sunshine.
  (2) If there's any dust or conductive dust falling into PLC.
  (3) If there's any other abnormal conditions, such as loose connection or unfastened terminal.

MEMO

5. Expansion Module

On the right side of the VS series PLC with a module's Expansion Slot, which is ready for performing multiple and complete system expansion functions. It could be used for DIO expansion modules to increase control points, thus to satisfy the demands of bigger control for additional external status observation or driving extra loads. Moreover, at the VS2, VSM and VS3 series it could connect with diversified special modules, those are able to perform special controls such as position inspection, speed control, temperature control, etc., for presenting a complicated and high-level control system.

Expandable Modules for the VS Series PLC

Item	Model Name	Main Specification
DIO Expansion Module	VS-8X	DI Expansion Module: 8 DI (DC 24V); input by screw-clamp terminal
	VS-16X	DI Expansion Module: 16 DI (DC 24V); input by screw-clamp terminal
	VS-8Y★	DO Expansion Module: 8 DO ★; output by screw-clamp terminal
	VS-16Y★	DO Expansion Module: 16 DO ★; output by screw-clamp terminal
	VS-8XY★	DIO Expansion Module: 4 DI (DC 24V); 4 DO ★; I/O by screw-clamp terminal
	VS-16XY★	DIO Expansion Module: 8 DI (DC 24V); 8 DO ★; I/O by screw-clamp terminal
	VS-28XYR	DIO Expansion Module: 16 DI (DC 24V); 12 DO (2A Relay); I/O by screw-clamp terminal
	VS-32XY★	DIO Expansion Module: 16 DI (DC 24V); 16 DO ★; I/O by screw-clamp terminal
	VS-16X-I	DI Expansion Module: 16 DI (DC 24V); input by IDC connector
	VS-16YT-I	DO Expansion Module: 16 DO (100mA NPN transistor); output by IDC connector
	VS-16XYT-I	DIO Expansion Module: 8 DI (DC 24V); 8 DO (100mA NPN transistor); I/O by IDC connector
	VS-32XYT-I	DIO Expansion Module: 16 DI (DC 24V); 16 DO (100mA NPN transistor); I/O by IDC connector
Power Module	VS-PSD	Power Repeater Module: DC 24V power input to transfer to DC 5V 500mA + DC 12V 800mA, those inner power outputs provide for the Modules behind
Special Function Module	VS-4AD	Analog Input Module: 4 channel (16-bit) inputs, each channel could input either –10～+10V, 4～20mA or –20～+20mA; isolated
	VS-2DA	Analog Output Module: 2 channel (16-bit) outputs, each channel could output either –10～10V, 4～20mA or –20～+20mA; isolated
	VS-3A	Analog I/O Module: 2 channel (16-bit) inputs + 1 channel (16-bit) output, each channel could input/output either –10～+10V, 4～20mA or –20～+20mA; isolated
	VS-6A	Analog I/O Module: 4 channel (16-bit) inputs + 2 channel (16-bit) outputs, each channel could input/output either –10～+10V, 4～20mA or –20～+20mA; isolated
	VS-4TC	Thermocouple Temperature Input Module: 4 channel thermocouple (K, J, R, S, T, E, B or N type) inputs, 0.1℃ / 0.1℉ resolution ; isolated
	VS-8TC	Thermocouple Temperature Input Module: 8 channel thermocouple (K, J, R, S, T, E, B or N type) inputs, 0.1℃ / 0.1℉ resolution ; isolated
	VS-2PT	PT-100 Temperature Input Module: 2 channel (3-wire PT-100) inputs, 0.1℃ / 0.1℉ resolution ; isolated
	VS-4PT	PT-100 Temperature Input Module: 4 channel (3-wire PT-100) inputs, 0.1℃ / 0.1℉ resolution ; isolated
	VS-2PG	Pulse Generator Module: 2 sets of 200 kHz high speed pulse outputs for 2 axes position control
	VS-4PG	Pulse Generator Module: 4 sets of 200 kHz high speed pulse outputs for 4 axes position control

★ Selectable output:

R: 2A Relay

T: 500mA NPN transistor

P: 500mA PNP transistor

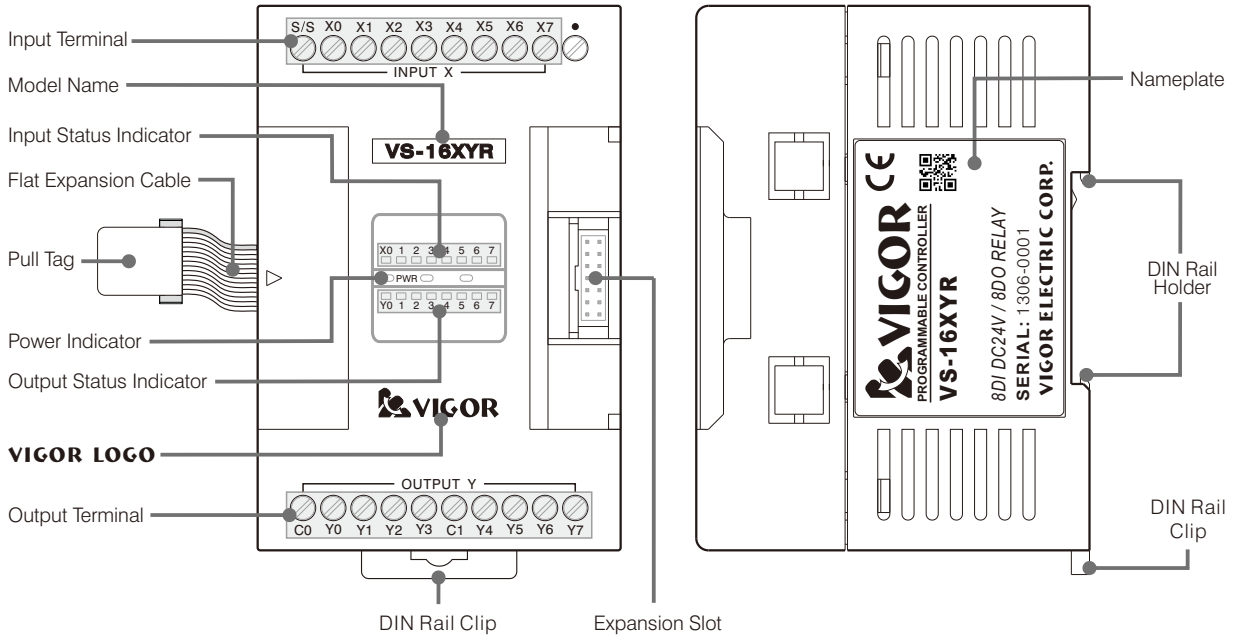
All Main Unit, Special Module and IDC's module are required DC 24V -15% / +20% power input

5-1 Digital Input & Output (DIO) Expansion Module

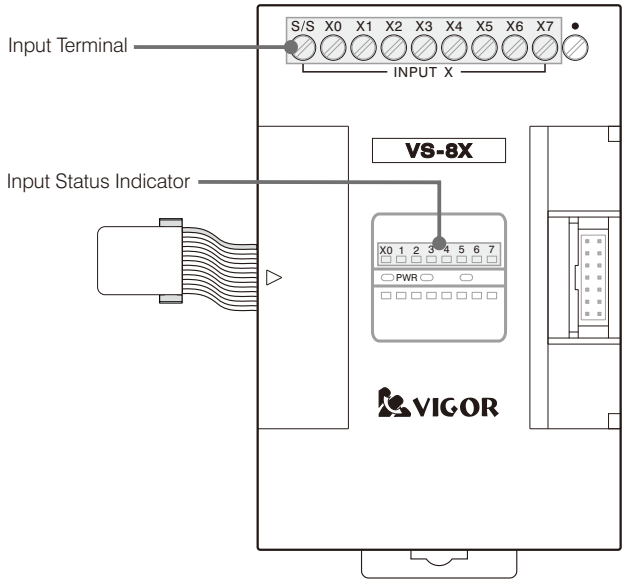
The VS series PLC offers complete DIO Expansion Modules, ranging from 8 points to 32 points for selection. Various output types are including the relay, NPN transistor and PNP transistor, suitable for different kind of loads. Furthermore, the I/O connection additionally presents the terminal block or IDC connector, the options can make a better planning at the control panel.

5-1-1 Component Designation

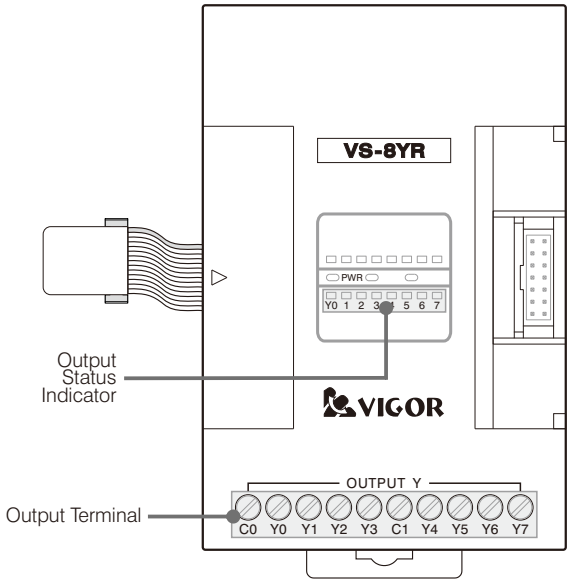
- VS-16XY / VS-16X / VS-16Y / VS-8XY Modules



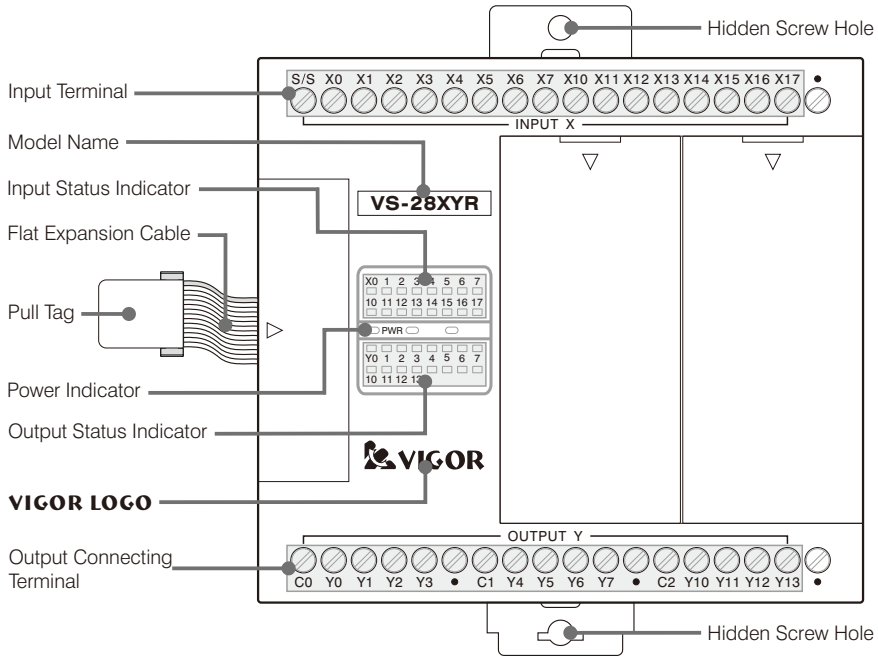
- VS-8X Module



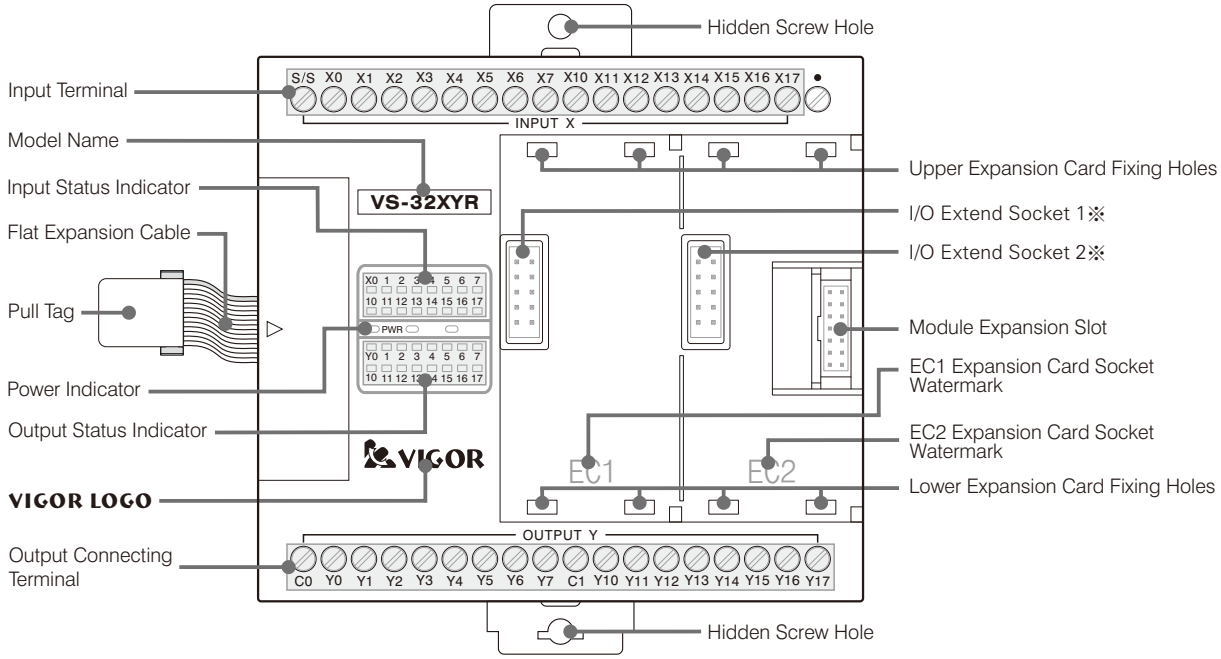
- VS-8Y Modules



● VS-28XYR Module

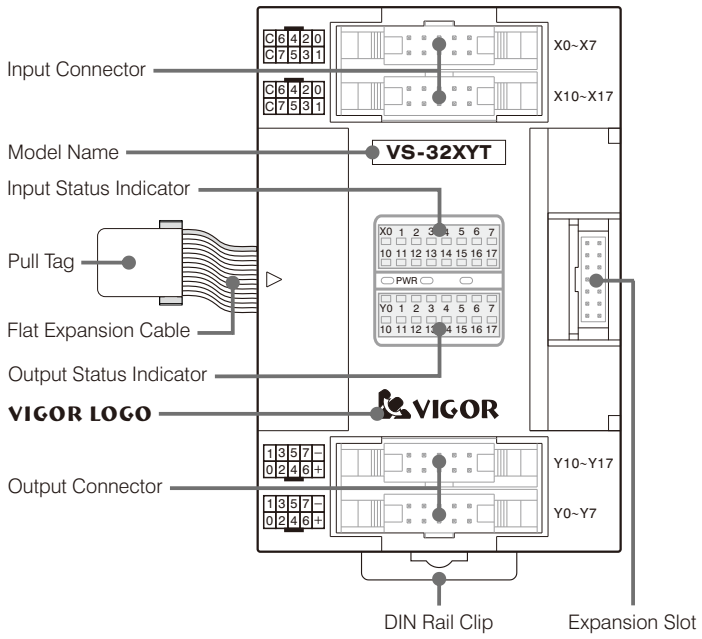


● VS-32XY Modules

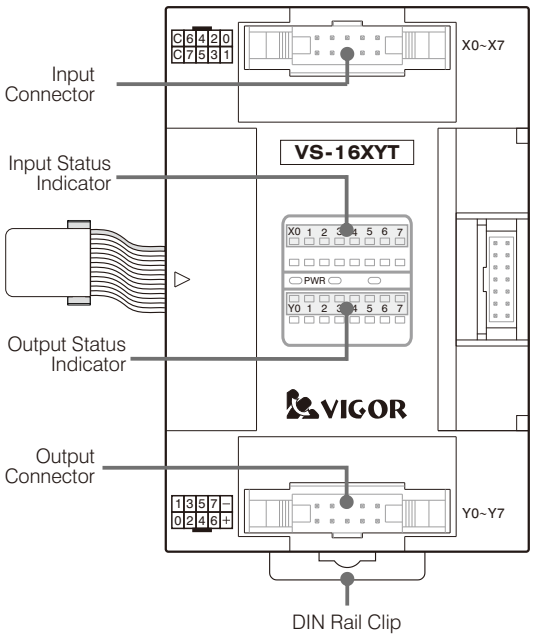


※ The I/O Extend Socket 1 and 2 are for the VS-E8X-EC or VS-E8YT-EC card only.

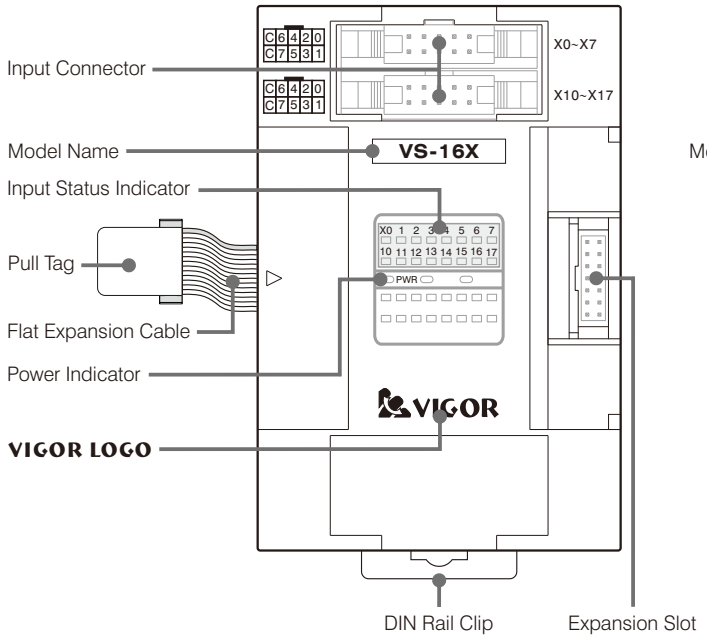
● VS-32XYT-I Module



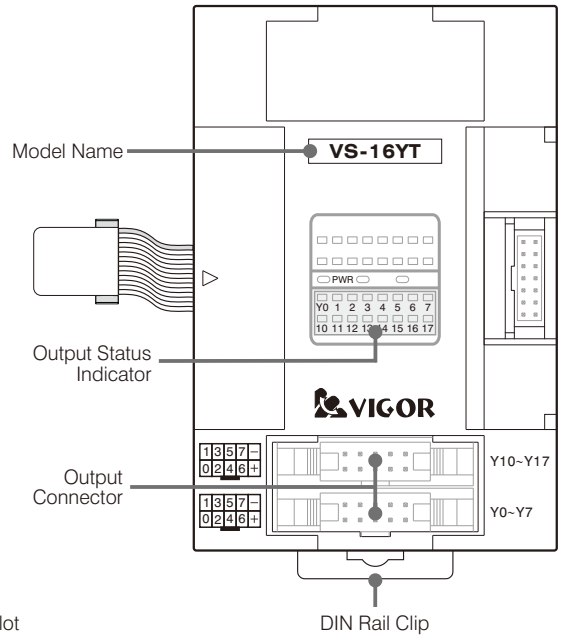
● VS-16XYT-I Module



● VS-16X-I Module



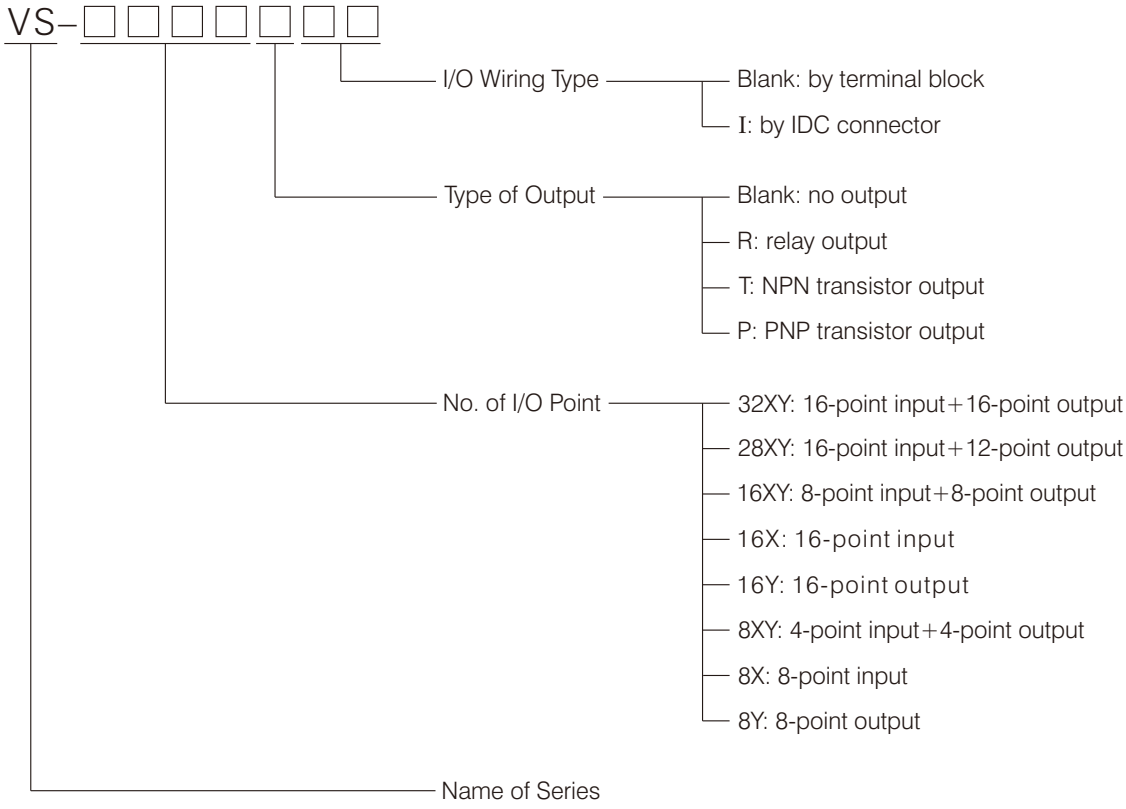
● VS-16YT-I Module



5-1-2 Method of Product Named

- Description of the Nameplate (it is located on the right side of the unit)

- Complete Model Name of a Digital I/O Unit



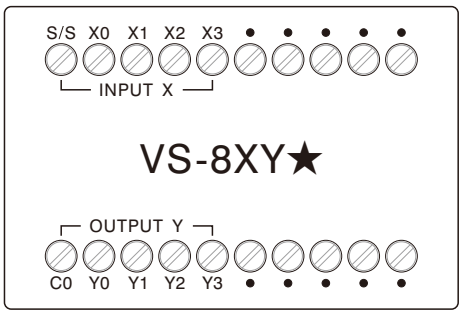
5-1-3 Specifications

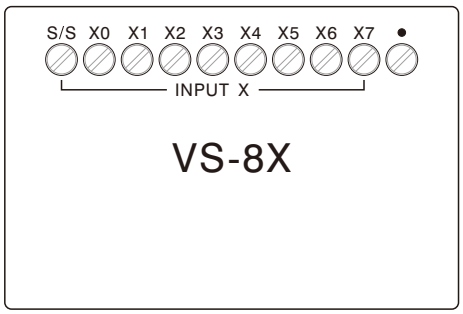
Model Name	Specifications
VS-8XYR	4 points Sink / Source selectable DC24V input, 4 points 2A relay output, I/O by terminal block
VS-8XYT	4 points Sink / Source selectable DC24V input, 4 points 0.5A NPN transistor output, I/O by terminal block
VS-8XYP	4 points Sink / Source selectable DC24V input, 4 points 0.5A PNP transistor output, I/O by terminal block
VS-8X	8 points Sink / Source selectable DC24V input, input by terminal block
VS-8YR	8 points 2A relay output, output by terminal block
VS-8YT	8 points 0.5A NPN transistor output, output by terminal block
VS-8YP	8 points 0.5A PNP transistor output, output by terminal block
VS-16XYR	8 points Sink / Source selectable DC24V input, 8 points 2A relay output, I/O by terminal block
VS-16XYT	8 points Sink / Source selectable DC24V input, 8 points 0.5A NPN transistor output, I/O by terminal block
VS-16XYP	8 points Sink / Source selectable DC24V input, 8 points 0.5A PNP transistor output, I/O by terminal block
VS-16X	16 points Sink / Source selectable DC24V input, input by terminal block
VS-16YR	16 points 2A relay output, output by terminal block
VS-16YT	16 points 0.5A NPN transistor output, output by terminal block
VS-16YP	16 points 0.5A PNP transistor output, output by terminal block
VS-28XYR	16 points Sink / Source selectable DC24V input, 12 points 2A relay output, I/O by terminal block
VS-32XYR	16 points Sink / Source selectable DC24V input, 16 points 2A relay output, I/O by terminal block
VS-32XYT	16 points Sink / Source selectable DC24V input, 16 points 0.5A NPN transistor output, I/O by terminal block
VS-32XYP	16 points Sink / Source selectable DC24V input, 16 points 0.5A PNP transistor output, I/O by terminal block
VS-16XYT-I	8 points Sink / Source selectable DC24V input, 8 points 0.1A NPN transistor output, I/O by IDC connector
VS-16X-I	16 points Sink / Source selectable DC24V input, input by IDC connector
VS-16YT-I	16 points 0.1A NPN transistor output, output by IDC connector
VS-32XYT-I	16 points Sink / Source selectable DC24V input, 16 points 0.1A NPN transistor output, I/O by IDC connector

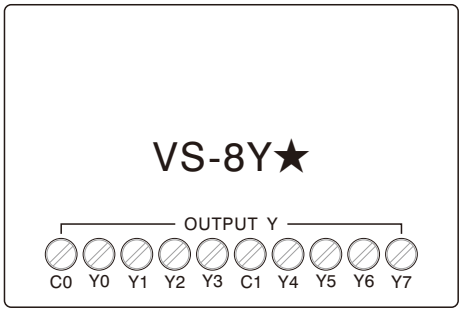
Item	Input Specification
Type of Input	Sink / Source selectable
External Power	DC24V ± 15%
Input Signal Current	5.3mA / DC24V (EN61131-2, type3)
Input ON Current	3.5mA Min. (EN61131-2, type3)
Input OFF Current	1.5mA Max. (EN61131-2, type3)
Input Resistance	4.3kΩ approx.
Input Response Time	10ms approx.
Input Signal Type	Dry contact / NPN open collector transistor / PNP open collector transistor
Isolation Method	Photocoupler isolation
Input Status Indicator	Once the input photocoupler is enabled, LED indicator on the panel is ON.

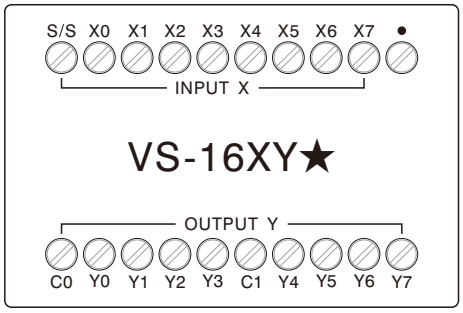
Item		Output Specification			
		Models Connected by Terminal Block			Models Connected by IDC
Type of Output		Relay output	NPN transistor output	PNP transistor output	NPN transistor output
Load Voltage		AC250V/DC30V Max.	DC5V~30V		DC5V~30V
Max. Load	Resistive Load	2A / 1 point 8A / 4 points per COM 8A / 8 points per COM	0.5A / 1 point 0.8A / 4 points per COM 1.6A / 8 points per COM		0.1A / 1 point 0.5A / 8 points per COM
	Inductive Load	80VA	12W / DC24V		2.4W / DC24V
	Lamp Load	100W	1.5W / DC24V		—
Open Circuit Leakage Current		—	0.1mA Max. / DC30V		0.1mA Max. / DC30V
Response Time		OFF→ON: 10ms approx. ON→OFF: 10ms approx.	OFF→ON: 100 μs Max. ON→OFF: 100 μs Max.		OFF→ON: 100 μs Max. ON→OFF: 100 μs Max.
Isolation Method		Mechanical isolation	Photocoupler isolation		Photocoupler isolation
Output Status Indicator		Once the output device is enabled, LED indicator on the panel is ON.			

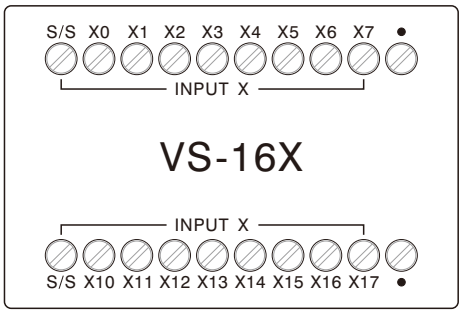
5-1-4 Terminal Layout

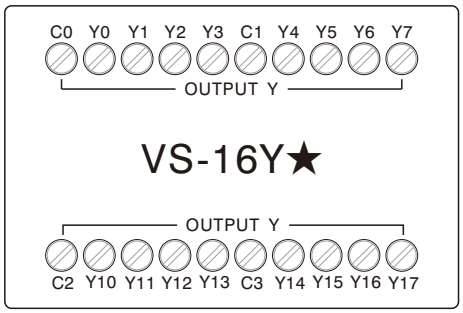


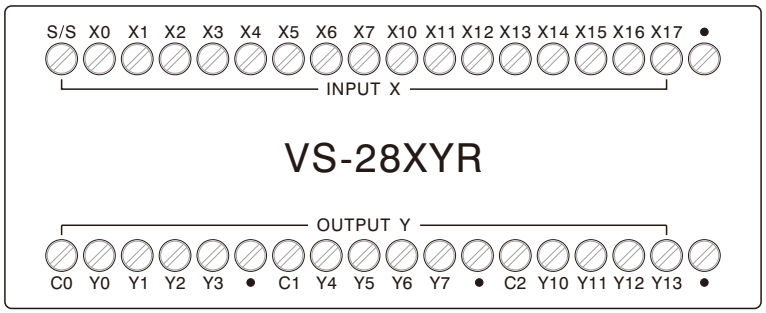


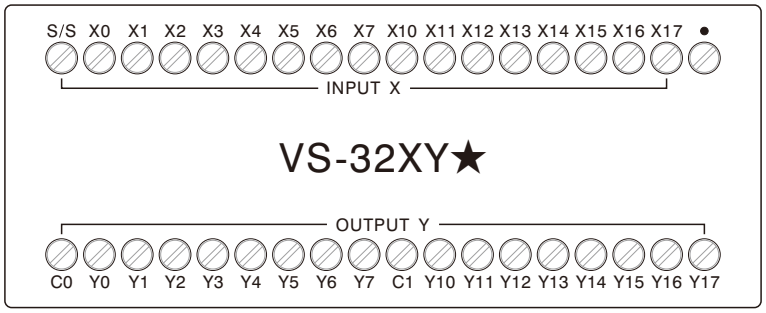


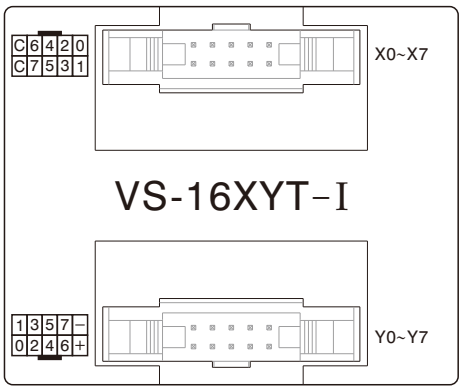


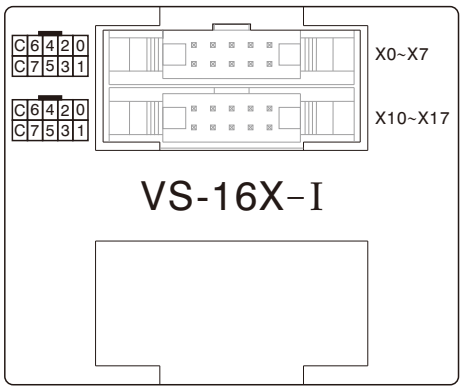


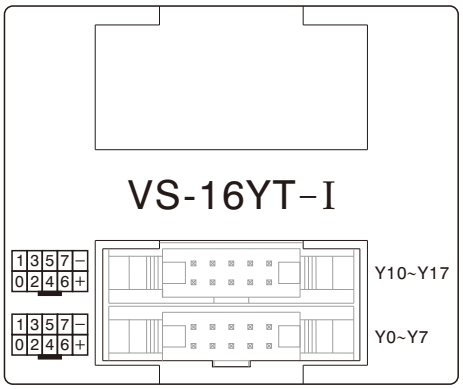


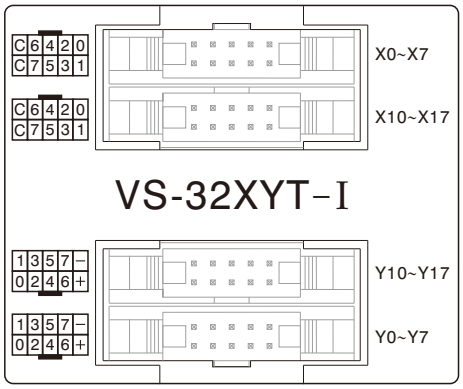





C 6 4 2 0
C 7 5 3 1
X0~X7
VS-16XYT-I
1 3 5 7 –
0 2 4 6 +
Y0~Y7

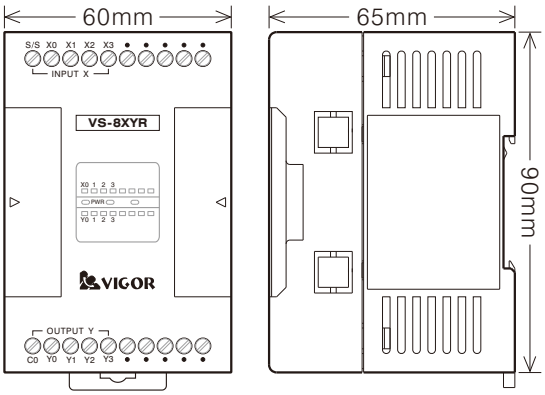

C 6 4 2 0
C 7 5 3 1
X0~X7
C 6 4 2 0
C 7 5 3 1
X10~X17
VS-16X-I


VS-16YT-I
1 3 5 7 –
0 2 4 6 +
Y10~Y17
1 3 5 7 –
0 2 4 6 +
Y0~Y7


C 6 4 2 0
C 7 5 3 1
X0~X7
C 6 4 2 0
C 7 5 3 1
X10~X17
VS-32XYT-I
1 3 5 7 –
0 2 4 6 +
Y10~Y17
1 3 5 7 –
0 2 4 6 +
Y0~Y7

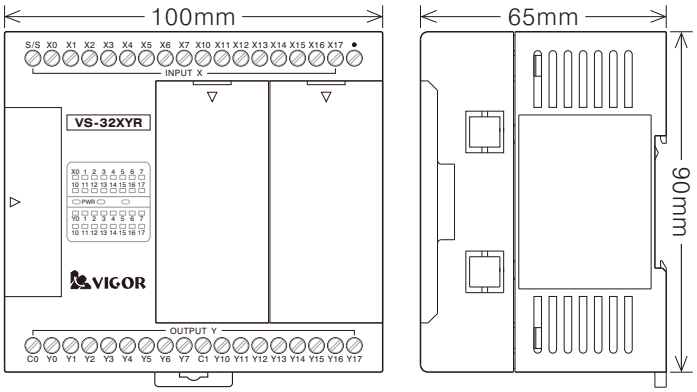
5-1-5 Product Dimension and Weight

- VS-8XY/VS-8X/VS-8Y/VS-16XY/VS-16X/VS-16Y Modules



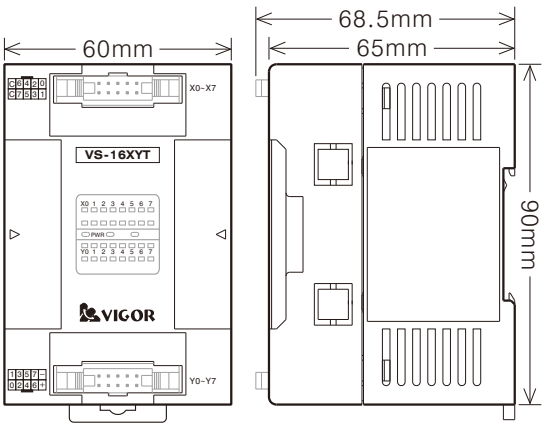
Model Name	N.W. / G.W. (g)
VS-8XYR	130/200
VS-8XYT	120/190
VS-8XYP	130/200
VS-8X	105/175
VS-8YR	125/195
VS-8YT	105/175
VS-8YP	120/190
VS-16XYR	145/215
VS-16XYT	120/190
VS-16XYP	130/200
VS-16X	120/190
VS-16YR	165/235
VS-16YT	125/195
VS-16YP	140/210

- VS-28XYR/VS-32XY Modules



Model Name	N.W. / G.W. (g)
VS-28XYR	240/330
VS-32XYR	235/325
VS-32XYT	195/285
VS-32XYP	210/300

- VS-16XYT-I/VS-16X-I/VS-16YT-I/VS-32XYT-I Modules

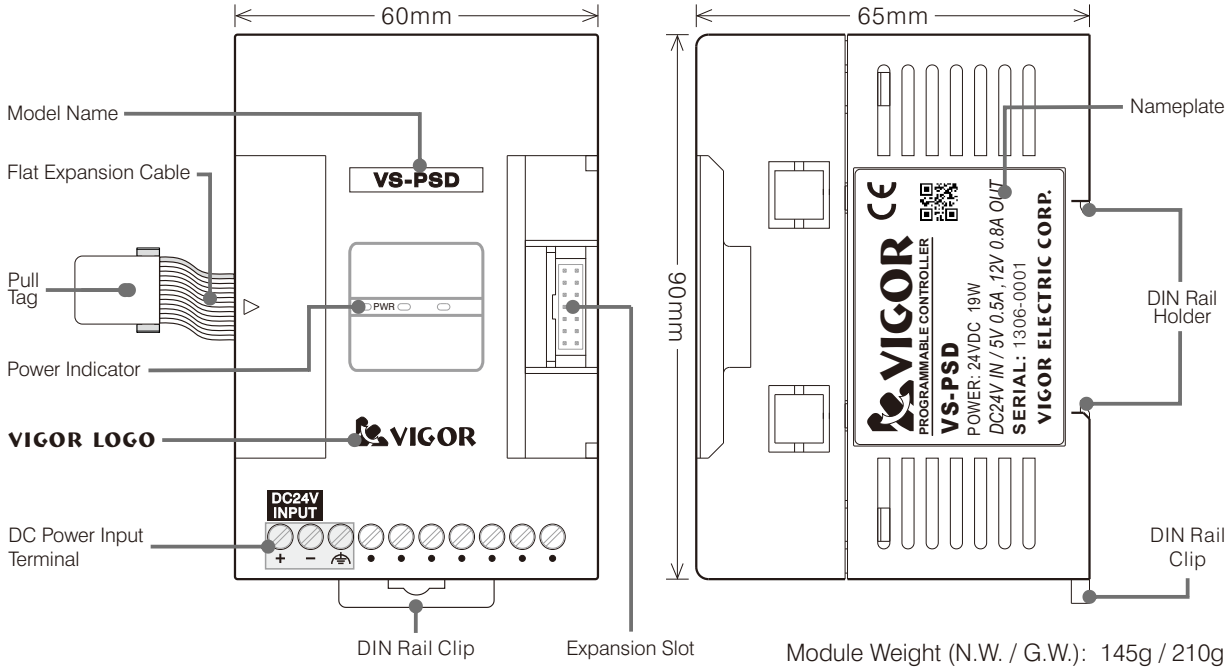


Model Name	N.W. / G.W. (g)
VS-16XYT-I	105/175
VS-16X-I	105/175
VS-16YT-I	105/175
VS-32XYT-I	115/185

5-2 VS-PSD Power Repeater Module

The Main Unit of VS series PLC may be expanded with numbers of expansion modules and expansion card which consume the power of 5V/12V supplied by Main Unit. When the total power consumption of Main Unit and expansions is more than that is supplied, a power repeater module is required to supply sufficient power for further expansions. For the individual power consumption and calculation, please refer to Section “1-8 Power Specification”.

- Product Exterior



Module Weight (N.W. / G.W.): 145g / 210g

- Product Specification

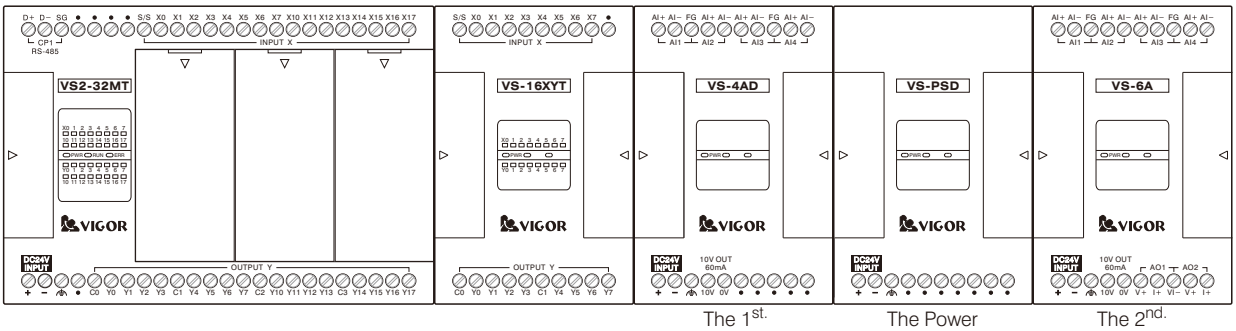
Item	Specifications
Power Requirement	DC24V +20%/−15%
Power Frequency	—
Input Power Interrupt	Period < 1ms with no affect
Fuse Capability	5A
Power Consumption	19W
Inner Power Support	PLC internal use DC5V 500mA
	PLC internal use DC12V 800mA

5-3 Special Function Module

The VS series PLC offers various Special Function Models, such as analog input/output and temperature input. The following is the list of selectable special models.

Item	Model Name	Specifications
Special Function Module	VS-4AD	Analog Input Module: 4 channel (16-bit) inputs, each channel could input either –10～+10V, 4～20mA or –20～+20mA; isolated; with an accurate calibration DC 10V output
	VS-2DA	Analog Output Module: 2 channel (16-bit) outputs, each channel could output either –10～+10V, 4～20mA or –20～+20mA; isolated
	VS-3A	Analog I/O Module: 2 channel (16-bit) inputs + 1 channel (16-bit) output, each channel could input/output either –10～+10V, 4～20mA or –20～+20mA; isolated; with an accurate calibration DC 10V output
	VS-6A	Analog I/O Module: 4 channel (16-bit) inputs + 2 channel (16-bit) outputs, each channel could input/output either –10～+10V, 4～20mA or -20～+20mA; isolated; with an accurate calibration DC 10V output
	VS-4TC	Thermocouple Temperature Input Module: 4 channel thermocouple (K, J, R, S, T, E, B or N type) inputs, 0.1℃ / 0.1℉ resolution ; isolated
	VS-8TC	Thermocouple Temperature Input Module: 8 channel thermocouple (K, J, R, S, T, E, B or N type) inputs, 0.1℃ / 0.1℉ resolution ; isolated
	VS-2PT	PT-100 Temperature Input Module: 2 channel (3-wire PT-100) inputs, 0.1℃ / 0.1℉ resolution ; isolated
	VS-4PT	PT-100 Temperature Input Module: 4 channel (3-wire PT-100) inputs, 0.1℃ / 0.1℉ resolution ; isolated
	VS-2PG	Pulse Generator Module: 2 sets of 200 kHz high speed pulse outputs for 2 axes position control
	VS-4PG	Pulse Generator Module: 4 sets of 200 kHz high speed pulse outputs for 4 axes position control

All the Special and DIO Expansion Modules are serial connected on the right side of the Main Unit. The connecting sequence is without reserve. The closest Special Module is designated as the 1st. Special Module. Then on its right side, the following Special Module is the 2nd., and so on. But, the DIO Expansion Module or Power Module will not interfere to the ranking. Please pay attention to the power consumption, appropriately add the VS-PSD power repeater module is required as the picture below if the power is insufficient.



There are some Buffer Memories (BFM) built-in at every Special Function Module to store the related data.
The VS series Main Unit uses the FROM/TO instruction to read/write the data in the module's BFM thus can achieve the purpose of data transfer across each other. The FROM instruction is used to read BFMs data from the designated special module. The TO instruction is used to write data into the designated BFMs at the special module. For detailed information about the FROM and TO instructions, please refer to the following pages.

Furthermore, can directly use the addressing operation to easily access the data in the special module's BFM.

Operand	Device																	
	X	Y	M	S	D.b	R.b	KnX	KnY	KnM	KnS	T	C	D,R	V,Z	UnG	K,H	E	"$"
S1							●	●	●	●	●	●	●	○	●	●		
S2							●	●	●	●	●	●	●	○	●	●		
D		●	●	●	○	○												

Above is the example table of Operand devices for an instruction. The device type of UnG at the table is to indicate the BFM at a Special Module could be used by the instruction directly. Thus, if the operand U1G3 is used in an instruction, that means to access the data at the BFM #3 of the 1st. Special Module.

Since the Ladder Master S programming software can not get the real time status from a BFM of Special Module, it is unavailable to monitor the data of operand at the UnG that is used in the instruction.

The program line below is to equally compare the data in the BFM #30 of the 1st. Special Module with the constant value K201, and the comparison result is used to drive the coil of M0.
If the content value of U1G30 is equal to K201, the M0 will be turned ON. Due to the monitor mode of the Ladder Master S that could not get the value from the U1G30, the in-line comparison symbol in the ladder diagram will not show the ON result; but, the real output of the program line will not be affected by the display.

The program line below is to move the value H1100 into the BFM #0 of the 2nd. Special Module.

FNC 78	DFROMP (m1) (m2) (D) (n)	Read FROM a Special Module	1	2	M	3
				○	○	○

Operand	Device																	
	X	Y	M	S	D.b	R.b	KnX	KnY	KnM	KnS	T	C	D,R	V,Z	UnG	K,H	E	"$"
m1													○			○		
m2													○			○		
D								●	●	●	●	●	●	○				
n													○			○		

• For the VS2 or VSM series, m1 = 1~8; for the VS3 series, m1 = 1~16 • m2 = 0~32,767

• The 16-bit instruction, D occupies n components • The 32-bit instruction, D occupies (2×n) components • n = 1~32,767

m1: the position number of the specified special module
m2: the initial number of the BFMs to be read
D : the initial device of storage space for reading up BFMs
n : the number of BFMs to be read from the special module

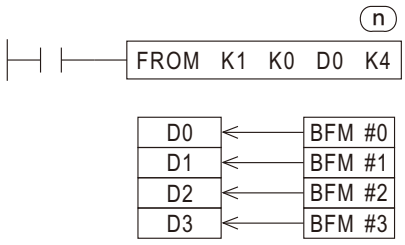
- The Main Unit of the VS series PLC uses this instruction to read BFMs data of the Special Module.
- Since the (m1) = K2, (m2) = K5, (n) = K4 and when X20 = "ON", 4 word data at the BFM #5 ~ BFM #8 in the specified No. 2 Special Module will be read and store into D0~D3.
- The (m1) is to appoint a Special Module, the available number is from K1 to K16. For the Main Unit, K1 represents to access the closest Special Module, and so on.
- When X20 is "OFF", the instruction will not be performed but the data which had read previously will still remain.

The BFM Number (m2)

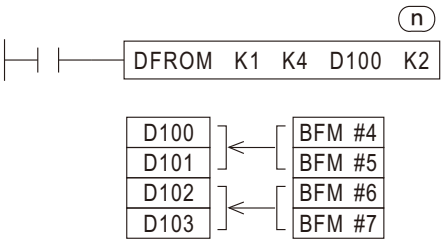
- The VS series Special Module has the components of BFMs (Buffer Memory) which are used to store the setting values and various operation statuses about the module. Each BFM is a 16-bit space. The different type of special module has a different number of BFM registers. The ID number of BFM registers is coded in a decimal method, such as #0, #1,…. #9, #10,….
- If a Main Unit is through the BFM to manage the module, this module is called the Special Module.

The Number of Data Groups (n) to be Transferred

- The 16-bit instruction



- The 32-bit instruction



- The number of the data groups to be transferred is determined by the (n). (n) = 4 in the 16-bit instruction has the same meaning with (n) = 2 in the 32-bit instruction.

- The related special device for this instruction:

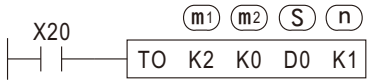
Relay ID No.	Description
M9028	Preventing to operate the FROM/TO repeatedly. When M9028 is "OFF", disallows interrupt during FROM/TO is in operation. When M9028 is "ON", FROM/TO in an interrupt subroutine is ineffective.

FNC 79	DTOP (m1) (m2) (S) (n)	Write TO a Special Module	1	2	M	3
				○	○	○

Operand	Device																	
	X	Y	M	S	D.b	R.b	KnX	KnY	KnM	KnS	T	C	D,R	V,Z	UnG	K,H	E	"$"
m1													○			○		
m2													○			○		
S							●	●	●	●	●	●	●	○				
n													○			○		

• For the VS2 or VSM series, m1 = 1~8; for the VS3 series, m1 = 1~16 • m2 = 0~32,767

• The 16-bit instruction, S occupies n components • The 32-bit instruction, S occupies (2×n) components • n = 1~32,767



m1: the position number of the specified special module
m2: the initial number of the BFMs to be written
S : the initial device of the data source storage space
n : the number of BFMs to be written to the special module

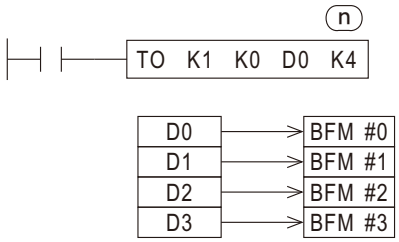
- The Main Unit of the VS series PLC uses this instruction to write data into BFMs at the Special Module.
- Since the (m1) = K2, (m2) = K0, (n) = K1 and when X20 = "ON", an 1 word data at the D0 of the Main Unit will be written into specified No. 2 Special Module's BFM #0.
- The (m1) is to appoint a Special Module, the available number is from K1 to K16. For the Main Unit, K1 represents to access the closest Special Module, and so on.
- When X20 is "OFF", the instruction will not be performed but the BFMs' data which had written previously will still remain.

The BFM Number (m2)

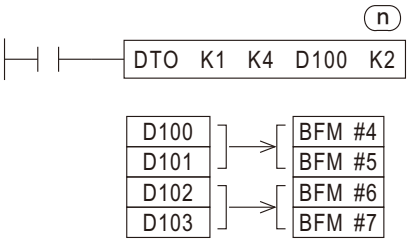
- The VS series Special Module has the components of BFMs (Buffer Memory) which are used to store the setting values and various operation statuses about the module. Each BFM is a 16-bit space. The different type of special module has a different number of BFM registers. The ID number of BFM registers is coded in a decimal method, such as #0, #1,…. #9, #10,….
- If a Main Unit is through the BFM to manage the module, this module is called the Special Module.

The Number of Data Groups (n) to be Transferred

- The 16-bit instruction



- The 32-bit instruction



- The number of the data groups to be transferred is determined by the (n). (n) = 4 in the 16-bit instruction has the same meaning with (n) = 2 in the 32-bit instruction.

- The related special device for this instruction:

Relay ID No.	Description
M9028	Preventing to operate the FROM/TO repeatedly. When M9028 is "OFF", disallows interrupt during FROM/TO is in operation. When M9028 is "ON", FROM/TO in an interrupt subroutine is ineffective.

5-3-1 VS-4AD Analog Input Module

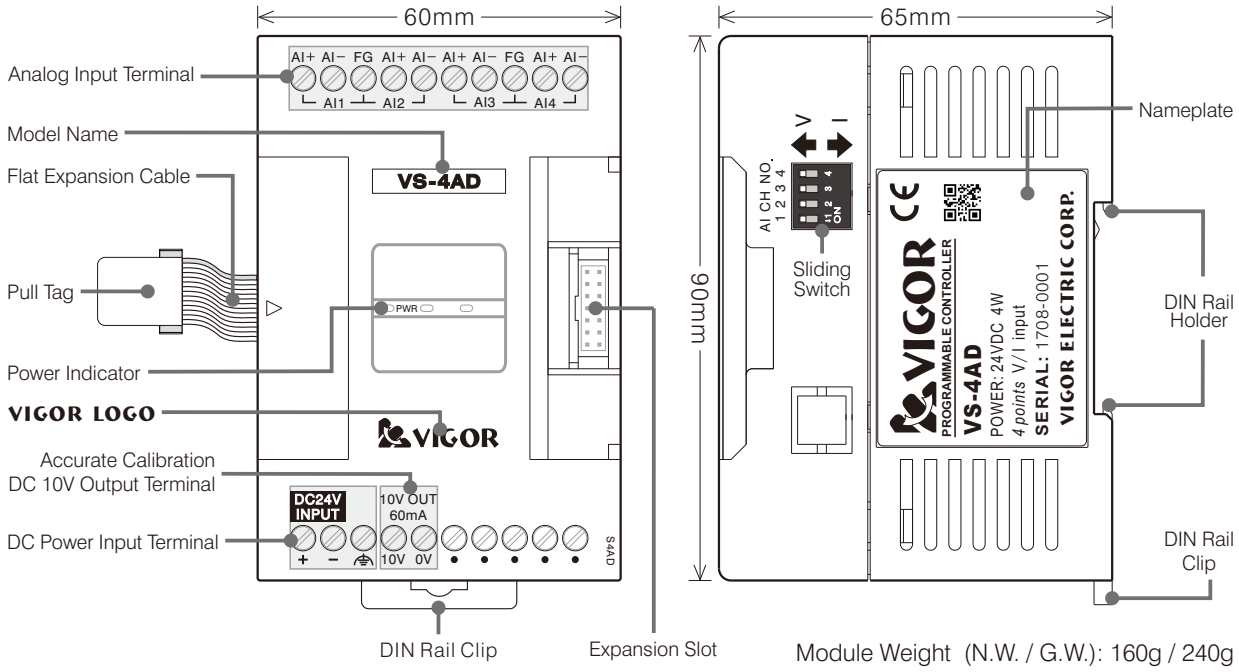
The VS-4AD Analog Input Module has 4 analog input channels and one accurate calibrated DC 10V output.

This module can convert external analog inputs of voltage or current signals to 16-bit digital values. When the FROM instruction is executed, the VS Main Unit reads out AD conversion data from the VS-4AD module and stores that to registers. Thus, it provides the reference data for digital monitoring or controls.

This module provides an accurate calibration DC 10V voltage output to connect with variable resistor or position transducer easily.

The VS-4AD Analog Input Module requires a DC 24V external power input for the isolated DC to DC regulated power to provide its AD converter. Also, between the PLC inner circuit and the analog inputs are isolated by the Magnetic-coupler thus the module can get a stable analog to digital conversion. Please read following instructions before use.

- Product Exterior



Module Weight (N.W. / G.W.): 160g / 240g

- Product Specification

Analog Input Specification

Item	Voltage Input Spec.	Current Input Spec.	
	The voltage or current input switch is located on the module's right side also the operation mode BFM is required to set.		
Analog Input Range	−10V～+10V	4～20mA	−20mA～+20mA
Converted Value	−32000～+32000 / −10000～+10000	0～16000	−16000～+16000 / −20000～+20000
Input Resistance	200kΩ	250Ω	250Ω
Max. Resolution	0.3125mV	1.25μA	1.25μA
Overall Accuracy	• Ambient temp. 25 ±5℃ is ±0.3% full scale (±60mV) • Ambient temp. 0～55℃ is ±0.5% full scale (±100mV)	• Ambient temp. 25 ±5℃ is ±120μA • Ambient temp. 0～55℃ is ±200μA	• Ambient temp. 25 ±5℃ is ±0.3% full scale (±120μA) • Ambient temp. 0～55℃ is ±0.5% full scale (±200μA)
Max. Input Range	−15V～+15V	−32mA～+32mA	−32mA～+32mA
Conversion Curve Diagram	Mode 0 / Mode 1 −10V～+10V voltage input Converted digital value Mode 0: +32000 Mode 1: +10000 Voltage input −10V 0 +10V Mode 0: −32000 Mode 1: −10000	Mode 2 4mA～20mA current input Converted digital value +16000 Current input −12mA 0 4mA +20mA −4000 −16000	Mode 3 / Mode 4 −20mA～+20mA current input Converted digital value Mode 3: +16000 Mode 4: +20000 Current input −20mA 0 +20mA Mode 3: −16000 Mode 4: −20000

Basic Specification

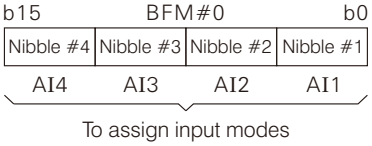
Item	Specification
Response Time	0.8ms
Accurate Calibration Voltage Output	DC 10V ± 0.5%, 60mA (Max.)
Isolation Method	The external DC 24V input through an isolated DC/DC power to provide AD convert circuit; Magnetic-coupler isolation between PLC and analog circuit; no isolation between input channels
Power Consumption	DC 24V ± 20%, 140mA (Max.) from external + DC 5V 15mA from PLC's inner power

- Definition of Buffer Memory BFM in the VS-4AD Module

The VS-4AD module uses the BFM to communicate with the VS Main Unit for the parameter setting and converted value access.

BFM No.	Component Description	
#0	To assign the analog input modes of AI1~AI4. When the power is turned from OFF to ON, the default value is H0000.	
#1	To set the average times of AI1.	When the power is turned from OFF to ON, the default value is 10. The available range is 1~32,767, otherwise it is equivalent to 10.
#2	To set the average times of AI2.	
#3	To set the average times of AI3.	
#4	To set the average times of AI4.	
#5	Converted digital value of AI1 (the average times is designated by BFM #1).	
#6	Converted digital value of AI2 (the average times is designated by BFM #2).	
#7	Converted digital value of AI3 (the average times is designated by BFM #3).	
#8	Converted digital value of AI4 (the average times is designated by BFM #4).	
#30	Identification code: VS-4AD = K201 (can use the FROM instruction to check whether the place is this module or not)	
#31	The version number of this module. (the content value □□ indicates Ver. □.□)	

BFM#0 To appoint the modes of analog inputs: (the sliding switch should also consistent with the modes)



Value of Nibble	Analog Input Mode	
0	–10V~+10V voltage input	Converted digital value: −32000~+32000
1		Converted digital value: −10000~+10000
2	4mA~20mA current input	Converted digital value: 0~+16000
3	–20mA~+20mA current input	Converted digital value: −16000~+16000
4		Converted digital value: −20000~+20000
Other	Disabled	

Example: If the BFM #0 of a VS-4AD is set to be H5420, then

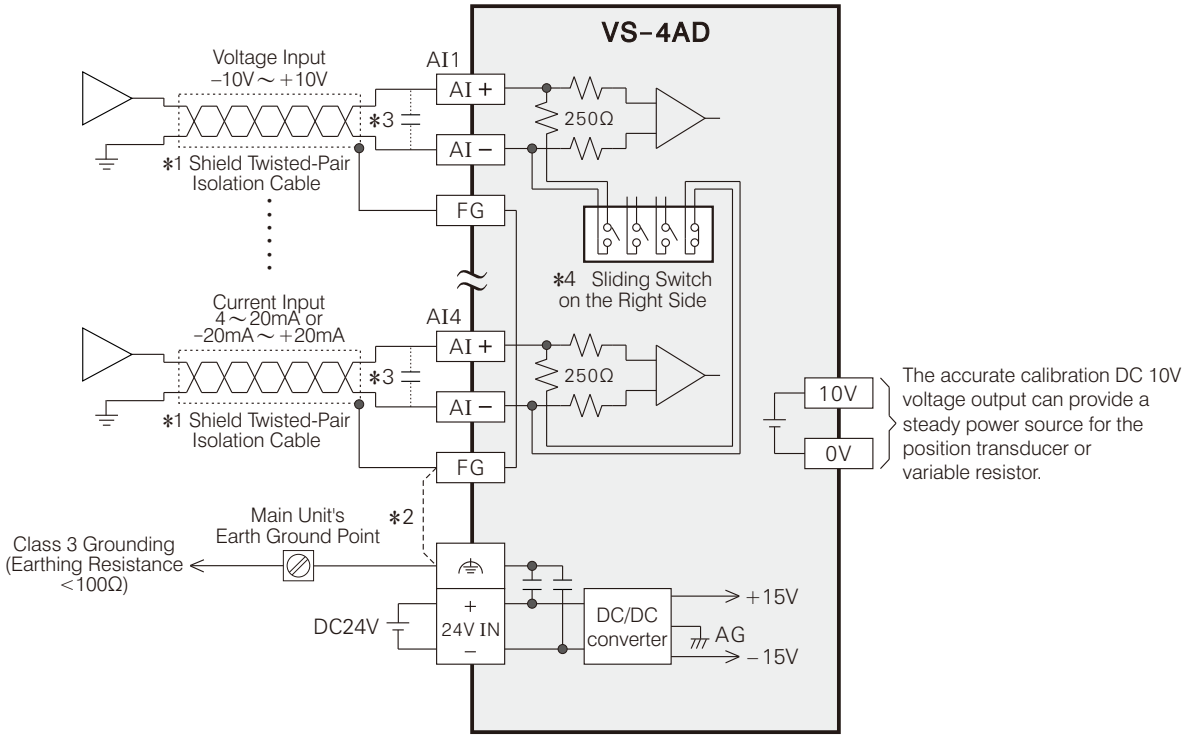
AI1: For –10V~+10V voltage input, that will be converted to the value –32,000~+32,000 at this mode.

AI2: For 4mA~20mA current input, that will be converted to the value 0~+16,000 at this mode.

AI3: For –20mA~+20mA current input, that will be converted to the value –20,000~+20,000 at this mode.

AI4: Disabled

● External Wiring

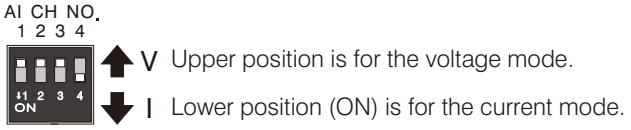


∗1: Please use the Shield Twisted-Pair isolation cable for every analog input channel. Must keep the signal cable away from any power line (including the power of motor, valve or contactor) to prevent external interference or module damage.

∗2: Please connect the end of cable shield to the FG terminal. If the noise is huge, should connect the FG to the ⏚ terminal at the Main Unit.

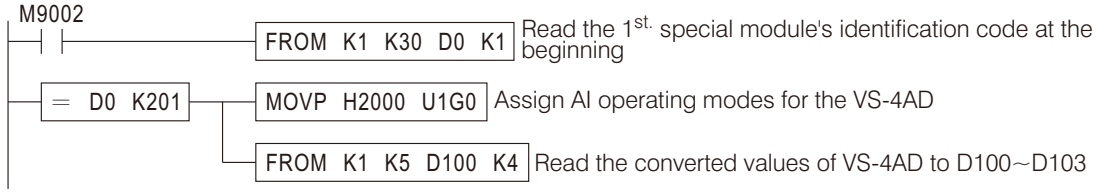
∗3: If the reading value of voltage/current signal is fluctuating or with electrically induced noise on the external wiring, please parallel connect a smoothing capacitor (0.1 μF～0.47 μF, 25V) between the input terminals.

∗4: To set the operating modes of AI1～AI4, two things MUST be done:
1. Assign the relative nibbles of the BFM #0.
2. Adjust the sliding switches on the right side of the module.



● Example Program

The VS-4AD is installed next to the Main Unit and became the 1st. special module.
Its AI1～AI3 are used for -10V～10V inputs, AI4 is used for 4～20mA input. Input converted values of AI1～AI4 are sequentially stored at D100～D103.



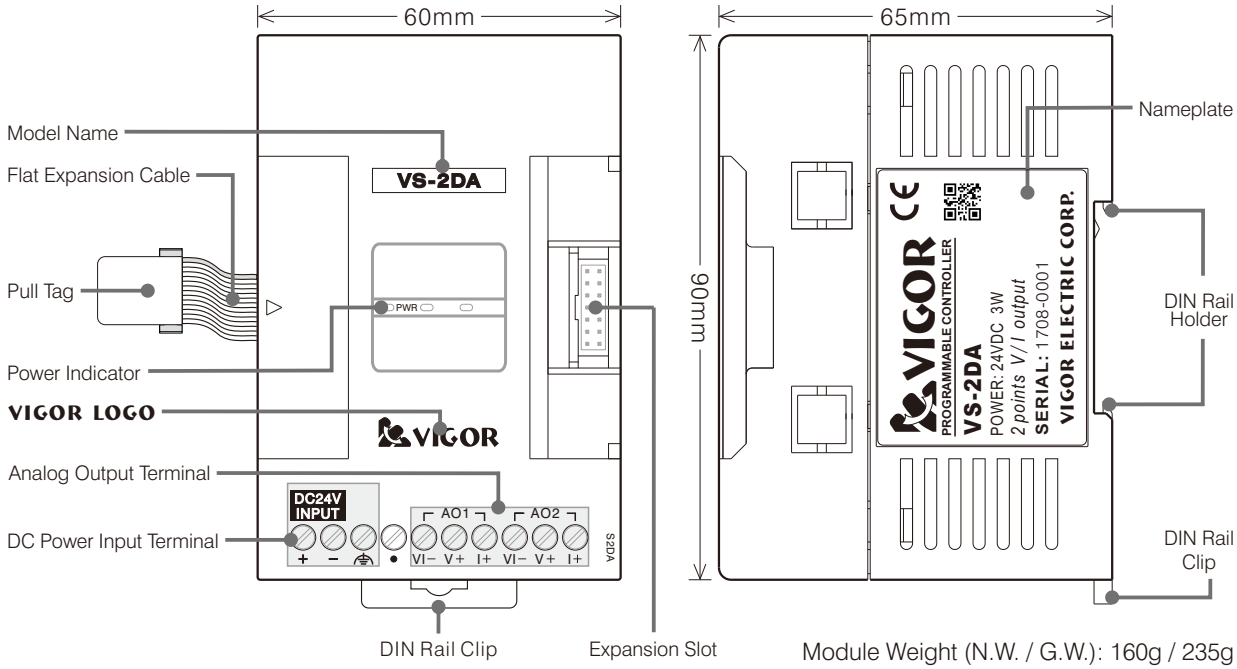
5-3-2 VS-2DA Analog Output Module

The VS-2DA Analog Output Module has 2 analog output channels.

The module can use 16-bit digital set values to generate 2 channels of external voltage or current signal outputs. When the TO instruction is executed, the VS Main Unit copies DA source data to the respective memory at the VS-2DA then the module's DA circuit converts the data to analog outputs for external loads.

The VS-2DA Analog Output Module requires a DC 24V external power input for the isolated DC to DC regulated power to provide its DA converters. Also, between the PLC inner circuit and the analog outputs are isolated by the Magnetic-coupler thus the module can get a stable digital to analog conversion. Please read following instructions before use.

- Product Exterior



Module Weight (N.W. / G.W.): 160g / 235g

- Product Specification

Analog Input Specification

Item	Voltage Output Spec.	Current Output Spec.	
Analog Output Range	−10V～+10V	4～20mA	−20mA～+20mA
Digital Set Range	−32000～+32000 / −10000～+10000	0～32000	−32000～+32000 / −20000～+20000
Load Resistance	500Ω～1MΩ	500Ω	500Ω
Max. Resolution	0.3125mV	0.625μA	0.625μA
Overall Accuracy	• Ambient temp. 25 ±5℃ is ±0.3% full scale (±60mV) • Ambient temp. 0～55℃ is ±0.5% full scale (±100mV)	• Ambient temp. 25 ±5℃ is ±120μA • Ambient temp. 0～55℃ is ±200μA	• Ambient temp. 25 ±5℃ is ±0.3% full scale (±120μA) • Ambient temp. 0～55℃ is ±0.5% full scale (±200μA)
Conversion Curve Diagram	Mode 0 / Mode 1 −10V～+10V voltage output Converted voltage output +10V Mode 0:−32000 Mode 1:−10000 Digital set value 0 Mode 0:+32000 Mode 1:+10000 −10V	Mode 2 4mA～20m Acurrent output 20mA Converted current output 4mA 0mA 0 Digital set value 32000	Mode 3 / Mode 4 −20mA～+20m Acurrent output Converted current output +20mA Mode 3:−32000 Mode 4:−20000 Digital set value 0 Mode 3:+32000 Mode 4:+20000 −20mA

Basic Specification

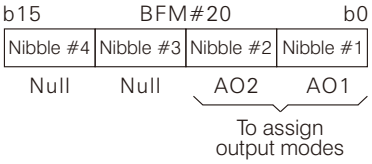
Item	Specification
Response Time	0.1ms
Isolation Method	The external DC 24V input through an isolated DC/DC power to provide DA convert circuit; Magnetic-coupler isolation between PLC and analog circuit; no isolation between output channels
Power Consumption	DC 24V ± 20%, 90mA (Max.) from external + DC 5V 15mA from PLC's inner power

- Definition of Buffer Memory BFM in the VS-2DA Module

The VS-2DA module uses the BFM to communicate with the VS Main Unit for the parameter setting and set value access.

BFM No.	Component Description	
#20	To assign the analog output modes of AO1~AO2. When the power is turned from OFF to ON, the default value is H00.	
#21	The digital set value of AO1.	When the power is turned from OFF to ON, the default value is 0.
#22	The digital set value of AO2.	
#23	To assign the holding modes of AO1~AO2. When the power is turned from OFF to ON, the default value is H00.	
#30	Identification code: VS-2DA = K202 (can use the FROM instruction to check whether the place is this module or not)	
#31	The version number of this module. (the content value □□ indicates Ver. □.□)	

BFM#20 To appoint the modes of analog outputs:



Value of Nibble	Analog Output Mode	
0	–10V~+10V voltage output	Digital set value: –32000~+32000
1		Digital set value: –10000~+10000
2	4mA~20mA current output	Digital set value: 0~+32000
3	–20mA~+20mA current output	Digital set value: –32000~+32000
4		Digital set value: –20000~+20000
Other	Disabled	

Example: If the BFM #20 of a VS-2DA is set to be H20, then

AO1: For –10V~+10V voltage output, that will use the digital set value –32,000~+32,000 at this mode.

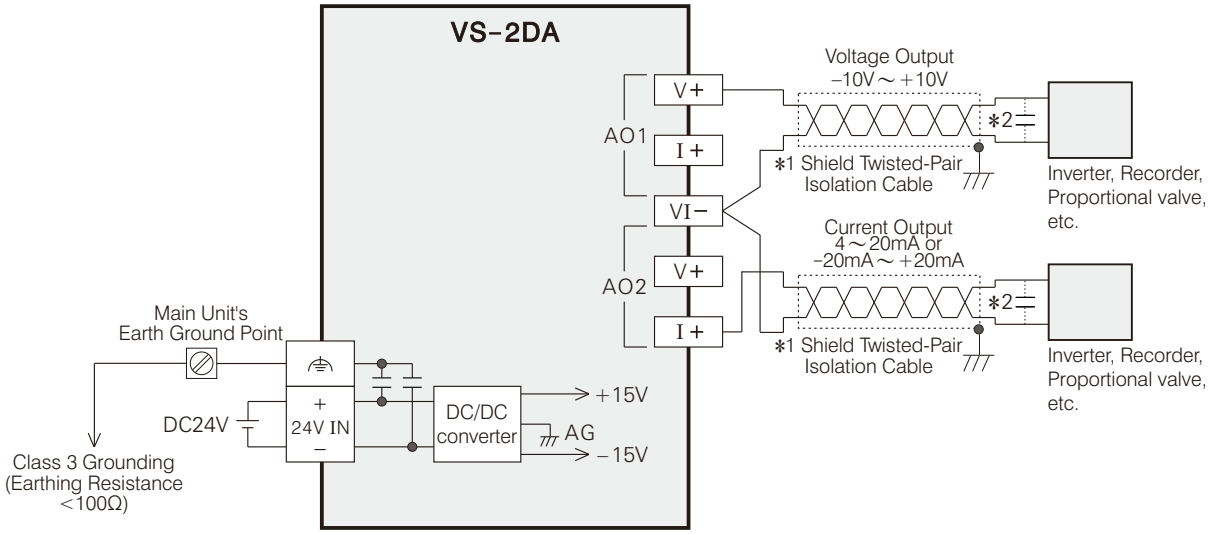
AO2: For 4mA~20mA current output, that will use the digital set value 0~+32,000 at this mode.

BFM#23 To appoint the output holding mode: (for the PLC status turns from RUN to STOP)

If the value in the nibble = 0, the channel will keep the last output, even PLC is STOP.

If the value in the nibble ≠ 0, the channel will change its digital set value = 0 at STOP.

● External Wiring



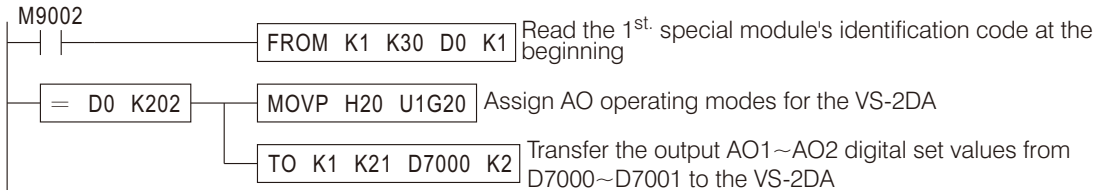
∗1: Please use the Shield Twisted-Pair isolation cable for every analog output channel and ground the cable's shield (class 3 grounding, grounding resistance < 100Ω). Must keep the signal cable away from any power line (including the power of motor, valve or contactor) to prevent external interference or module damage.

∗2: If the reading value of voltage/current signal is fluctuating or with electrically induced noise on the external wiring, please parallel connect a smoothing capacitor (0.1 μF～0.47 μF, 25V) between the input terminals.

∗3: For every analog output channel, either voltage or current output can be used but not both at the same time.

● Example Program

The VS-2DA is installed next to the Main Unit and became the 1st. special module.
Its AO1 is used for -10V～10V output, AO2 is used for 4～20mA output. Output digital set values of AO1～AO2 are sequentially stored at D7000～D7001.



5-3-3 VS-3A Analog I/O Module

The VS-3A Analog I/O Module has 2 analog input and 1 analog output channels, also equips one accurate calibrated DC 10V output.

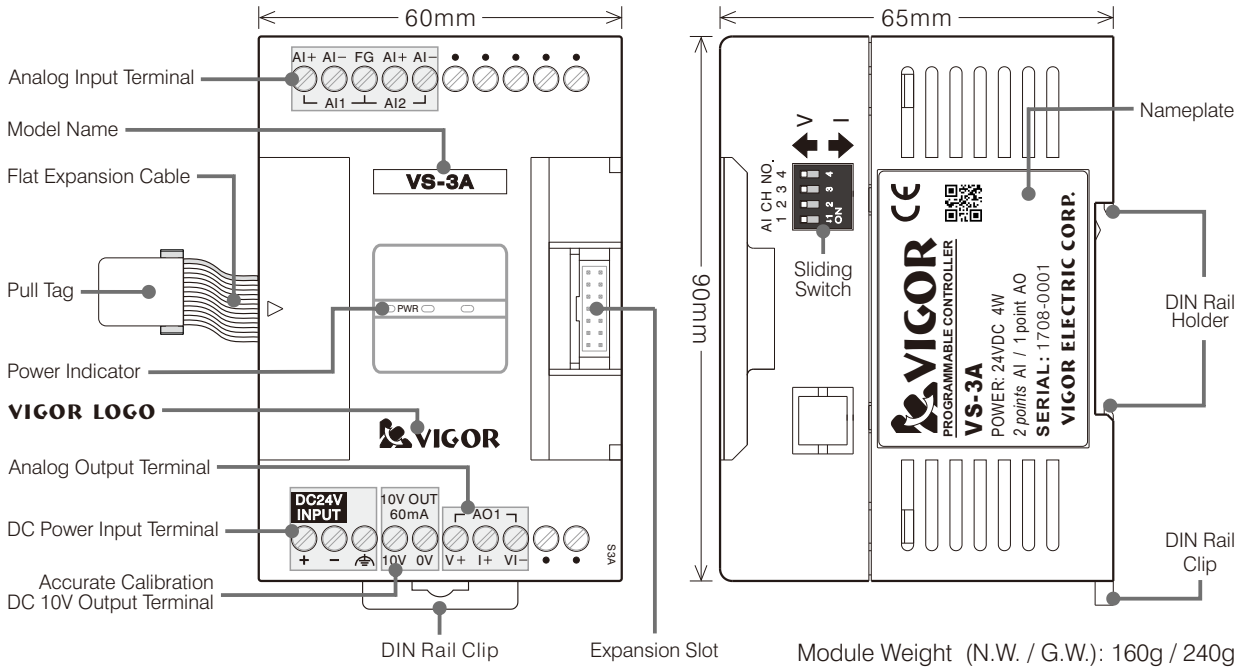
This module can convert external analog inputs of voltage or current signals to 16-bit digital values. When the FROM instruction is executed, the VS Main Unit reads out AD conversion data from the VS-3A module and stores that to registers. Thus, it provides the reference data for digital monitoring or controls.

This module provides an accurate calibration DC 10V voltage output to connect with variable resistor or position transducer easily.

Also, the module can use 16-bit digital set value to generate one channel of external voltage or current signal output. When the TO instruction is executed, the VS Main Unit copies DA source data to the respective memory at the VS-3A then the module's DA circuit converts the data to analog output for external load.

The VS-3A Analog I/O Module requires a DC 24V external power input for the isolated DC to DC regulated power to provide its AD and DA converters. Also, between the PLC inner circuit and the analog I/O are isolated by the Magnetic-coupler thus the module can get a stable AD / DA conversion. Please read following instructions before use.

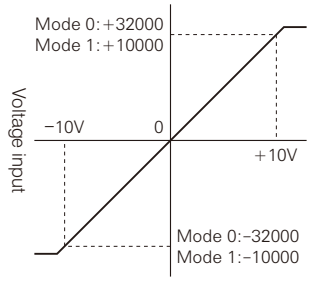
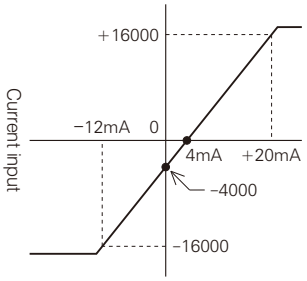
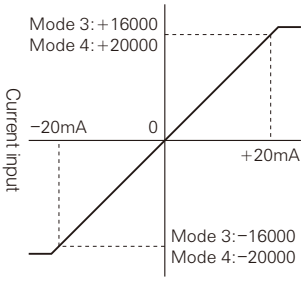
- Product Exterior



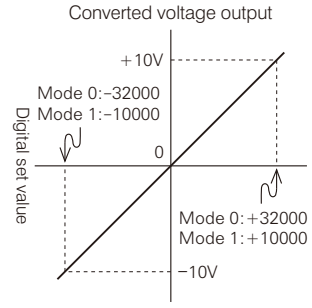
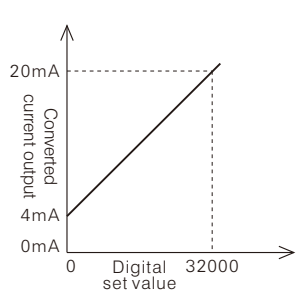
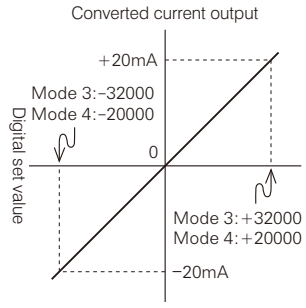
Module Weight (N.W. / G.W.): 160g / 240g

- Product Specification

Analog Input Specification

Item	Voltage Input Spec.	Current Input Spec.	
	The voltage or current input switch is located on the module's right side also the operation mode BFM is required to set.		
Analog Input Range	−10V～+10V	4～20mA	−20mA～+20mA
Converted Value	−32000～+32000 / −10000～+10000	0～16000	−16000～+16000 / −20000～+20000
Input Resistance	200kΩ	250Ω	250Ω
Max. Resolution	0.3125mV	1.25μA	1.25μA
Overall Accuracy	• Ambient temp. 25 ±5℃ is ±0.3% full scale (±60mV) • Ambient temp. 0～55℃ is ±0.5% full scale (±100mV)	• Ambient temp. 25 ±5℃ is ±120μA • Ambient temp. 0～55℃ is ±200μA	• Ambient temp. 25 ±5℃ is ±0.3% full scale (±120μA) • Ambient temp. 0～55℃ is ±0.5% full scale (±200μA)
Max. Input Range	−15V～+15V	−32mA～+32mA	−32mA～+32mA
Conversion Curve Diagram	Mode 0 / Mode 1 −10V～+10V voltage input 	Mode 2 4mA～20mA current input 	Mode 3 / Mode 4 −20mA～+20mA current input 

Analog output Specification

Item	Voltage Output Spec.	Current Output Spec.	
Analog Output Range	−10V～+10V	4～20mA	−20mA～+20mA
Digital Set Range	−32000～+32000 / −10000～+10000	0～32000	−32000～+32000 / −20000～+20000
Load Resistance	500Ω～1MΩ	500Ω	500Ω
Max. Resolution	0.3125mV	0.625μA	0.625μA
Overall Accuracy	• Ambient temp. 25 ±5℃ is ±0.3% full scale (±60mV) • Ambient temp. 0～55℃ is ±0.5% full scale (±100mV)	• Ambient temp. 25 ±5℃ is ±120μA • Ambient temp. 0～55℃ is ±200μA	• Ambient temp. 25 ±5℃ is ±0.3% full scale (±120μA) • Ambient temp. 0～55℃ is ±0.5% full scale (±200μA)
Conversion Curve Diagram	Mode 0 / Mode 1 −10V～+10V voltage output 	Mode 2 4mA～20m Acurrent output 	Mode 3 / Mode 4 −20mA～+20m Acurrent output 

Basic Specification

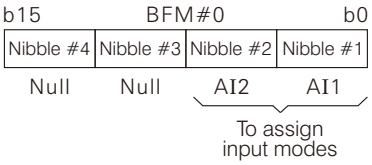
Item	Specification
Response Time	0.8ms
Accurate Calibration Voltage Output	DC 10V ± 0.5%, 60mA (Max.)
Isolation Method	The external DC 24V input through an isolated DC/DC power to provide AD & DA convert circuits; Magnetic-coupler isolation between PLC and analog circuits; no isolation between AI / AO channels
Power Consumption	DC 24V ± 20%, 160mA (Max.) from external + DC 5V 15mA from PLC's inner power

- Definition of Buffer Memory BFM in the VS-3A Module

The VS-3A module uses the BFMs to communicate with the VS Main Unit for the parameter setting, converted and set values access.

BFM No.	Component Description	
#0	To assign the analog input modes of AI1~AI2. When the power is turned from OFF to ON, the default value is H00.	
#1	To set the average times of AI1.	When the power is turned from OFF to ON, the default value is 10. The available range is 1~32,767, otherwise it is equivalent to 10.
#2	To set the average times of AI2.	
#5	Converted digital value of AI1 (the average times is designated by BFM #1).	
#6	Converted digital value of AI2 (the average times is designated by BFM #2).	
#20	To assign the analog output mode of AO1. When the power is turned from OFF to ON, the default value is H0.	
#21	The digital set value of AO1.	When the power is turned from OFF to ON, the default value is 0.
#23	To assign the holding mode of AO1. When the power is turned from OFF to ON, the default value is H0.	
#30	Identification code: VS-3A = K203 (can use the FROM instruction to check whether the place is this module or not)	
#31	The version number of this module. (the content value □□ indicates Ver. □.□)	

BFM#0 To appoint the modes of analog inputs: (the sliding switch should also consistent with the modes)



Value of Nibble	Analog Input Mode	
0	–10V~+10V voltage input	Converted digital value: –32000~+32000
1		Converted digital value: –10000~+10000
2	4mA~20mA current input	Converted digital value: 0~+16000
3	–20mA~+20mA current input	Converted digital value: –16000~+16000
4		Converted digital value: –20000~+20000
Other	Disabled	

Example: If the BFM #0 of a VS-3A is set to be H20, then

AI1: For –10V~+10V voltage input, that will be converted to the value –32,000~+32,000 at this mode.

AI2: For 4mA~20mA current input, that will be converted to the value 0~+16,000 at this mode.

BFM#20 To appoint the mode of analog output:

Value of Nibble	Analog Output Mode	
0	–10V~+10V voltage output	Digital set value: –32000~+32000
1		Digital set value: –10000~+10000
2	4mA~20mA current output	Digital set value: 0~+32000
3	–20mA~+20mA current output	Digital set value: –32000~+32000
4		Digital set value: –20000~+20000
Other	Disabled	

Example: If the BFM #20 of a VS-3A is set to be H2, then

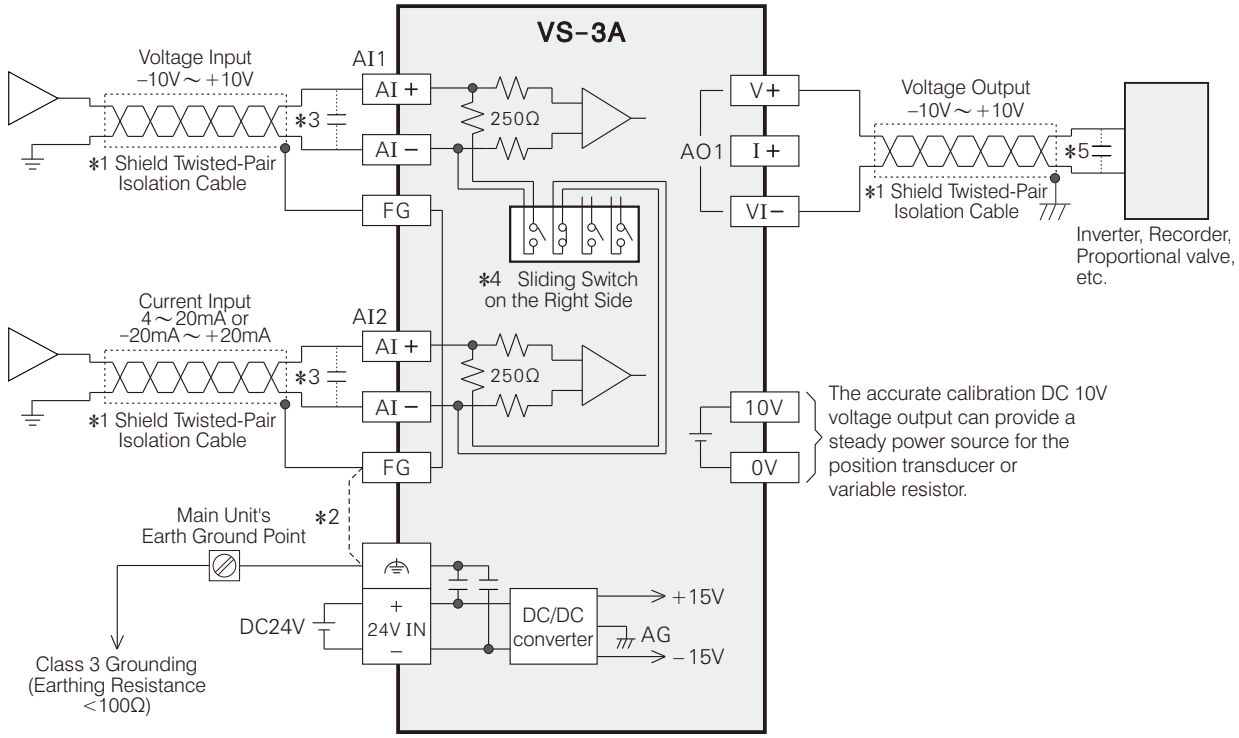
AO1: For 4mA~20mA current output, that will use the digital set value 0~+32,000 at this mode.

BFM#23 To appoint the output holding mode: (for the PLC status turns from RUN to STOP)

If the value in the nibble = 0, the channel will keep the last output, even PLC is STOP.

If the value in the nibble ≠ 0, the channel will change its digital set value = 0 at STOP.

● External Wiring



∗1: Please use the Shield Twisted-Pair isolation cable for every analog input/output channel. Must keep the signal cable away from any power line (including the power of motor, valve or contactor) to prevent external interference or module damage.

∗2: Please connect the end of cable shield to the FG terminal. If the noise is huge, should connect the FG to the ⏚ terminal at the Main Unit.

∗3: If the reading value of voltage/current signal is fluctuating or with electrically induced noise on the external wiring, please parallel connect a smoothing capacitor (0.1 μF～0.47 μF, 25V) between the input terminals.

∗4: To set the operating modes of AI1～AI2, two things MUST be done:
1. Assign the relative nibbles of the BFM #0.
2. Adjust the sliding switches on the right side of the module.

V Upper position is for the voltage mode.

I Lower position (ON) is for the current mode.

∗5: If the reading value of voltage/current signal is fluctuating or with electrically induced noise on the external wiring, please parallel connect a smoothing capacitor (0.1 μF～0.47 μF, 25V) between the input terminals.

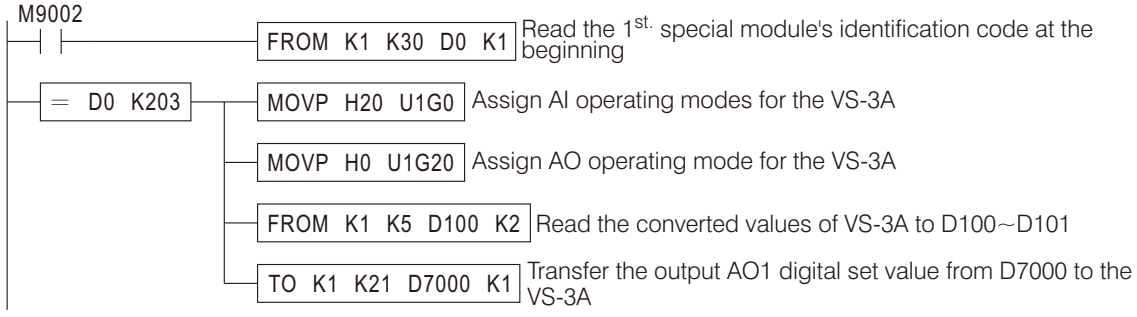
∗6: For every analog output channel, either voltage or current output can be used but not both at the same time.

● Example Program

The VS-3A is installed next to the Main Unit and became the 1st. special module.

Its AI1 is used for –10V～10V input, AI2 is used for 4～20mA input. Input converted values of AI1～AI2 are sequentially stored at D100～D101.

Its AO1 is used for –10V～10V output. The output digital set value of AO1 is stored at D7000.



5-3-4 VS-6A Analog I/O Module

The VS-6A Analog I/O Module has 4 analog input and 2 analog output channels, also equips one accurate calibrated DC 10V output.

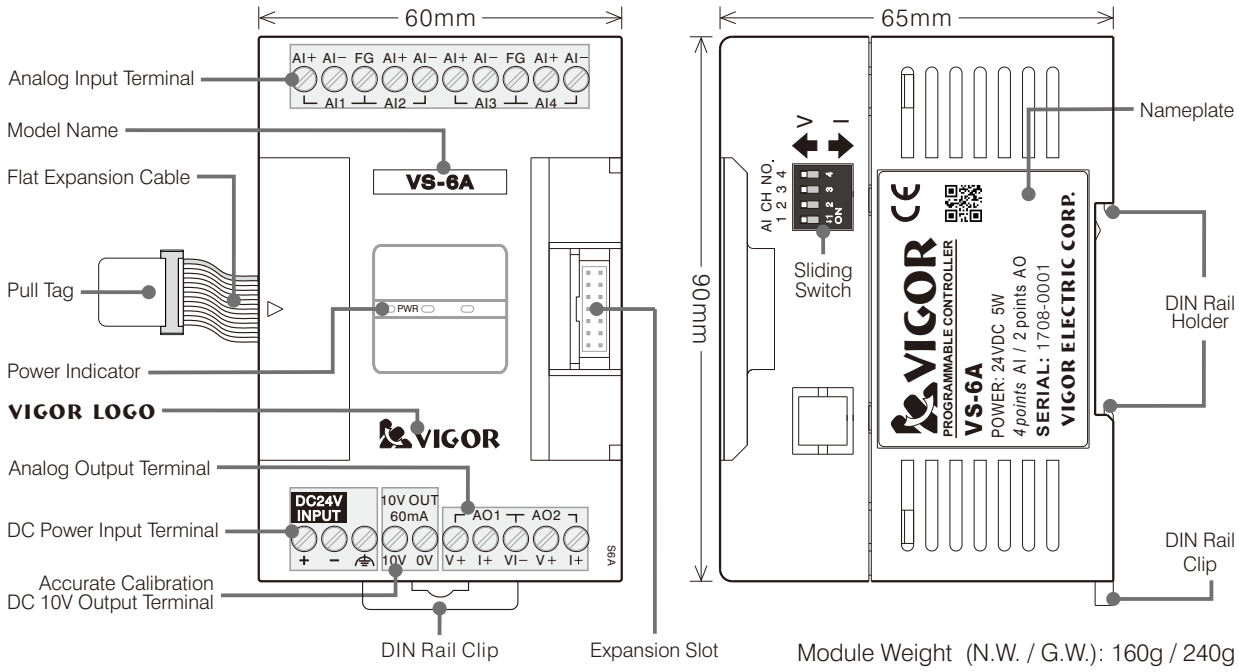
This module can convert external analog inputs of voltage or current signals to 16-bit digital values. When the FROM instruction is executed, the VS Main Unit reads out AD conversion data from the VS-6A module and stores that to registers. Thus, it provides the reference data for digital monitoring or controls.

This module provides an accurate calibration DC 10V voltage output to connect with variable resistor or position transducer easily.

Also, the module can use 16-bit digital set values to generate 2 channels of external voltage or current signal outputs. When the TO instruction is executed, the VS Main Unit copies DA source data to the respective memory at the VS-6A then the module's DA circuit converts the data to analog outputs for external loads.

The VS-6A Analog I/O Module requires a DC 24V external power input for the isolated DC to DC regulated power to provide its AD and DA converters. Also, between the PLC inner circuit and the analog I/O are isolated by the Magnetic-coupler thus the module can get a stable AD / DA conversion. Please read following instructions before use.

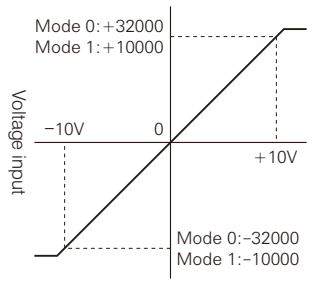
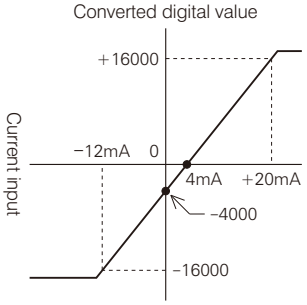
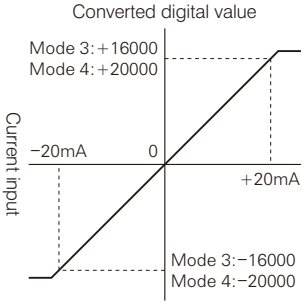
- Product Exterior



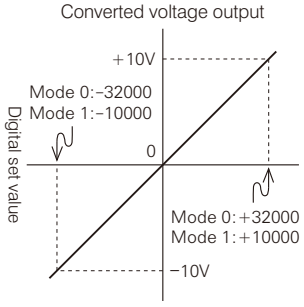
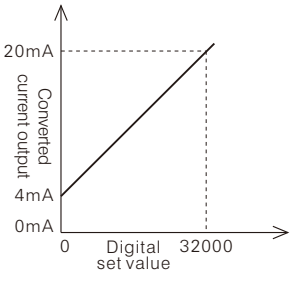
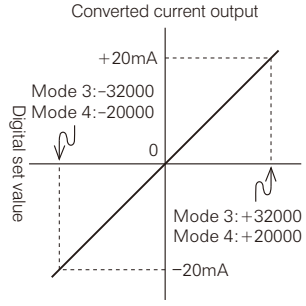
Module Weight (N.W. / G.W.): 160g / 240g

- Product Specification

Analog Input Specification

Item	Voltage Input Spec.	Current Input Spec.	
	The voltage or current input switch is located on the module's right side also the operation mode BFM is required to set.		
Analog Input Range	−10V～+10V	4～20mA	−20mA～+20mA
Converted Value	−32000～+32000 / −10000～+10000	0～16000	−16000～+16000 / −20000～+20000
Input Resistance	200kΩ	250Ω	250Ω
Max. Resolution	0.3125mV	1.25μA	1.25μA
Overall Accuracy	• Ambient temp. 25 ±5℃ is ±0.3% full scale (±60mV) • Ambient temp. 0～55℃ is ±0.5% full scale (±100mV)	• Ambient temp. 25 ±5℃ is ±120μA • Ambient temp. 0～55℃ is ±200μA	• Ambient temp. 25 ±5℃ is ±0.3% full scale (±120μA) • Ambient temp. 0～55℃ is ±0.5% full scale (±200μA)
Max. Input Range	−15V～+15V	−32mA～+32mA	−32mA～+32mA
Conversion Curve Diagram	Mode 0 / Mode 1 −10V～+10V voltage input 	Mode 2 4mA～20mA current input 	Mode 3 / Mode 4 −20mA～+20mA current input 

Analog output Specification

Item	Voltage Output Spec.	Current Output Spec.	
Analog Output Range	−10V～+10V	4～20mA	−20mA～+20mA
Digital Set Range	−32000～+32000 / −10000～+10000	0～32000	−32000～+32000 / −20000～+20000
Load Resistance	500Ω～1MΩ	500Ω	500Ω
Max. Resolution	0.3125mV	0.625μA	0.625μA
Overall Accuracy	• Ambient temp. 25 ±5℃ is ±0.3% full scale (±60mV) • Ambient temp. 0～55℃ is ±0.5% full scale (±100mV)	• Ambient temp. 25 ±5℃ is ±120μA • Ambient temp. 0～55℃ is ±200μA	• Ambient temp. 25 ±5℃ is ±0.3% full scale (±120μA) • Ambient temp. 0～55℃ is ±0.5% full scale (±200μA)
Conversion Curve Diagram	Mode 0 / Mode 1 −10V～+10V voltage output 	Mode 2 4mA～20m Acurrent output 	Mode 3 / Mode 4 −20mA～+20mA Acurrent output 

Basic Specification

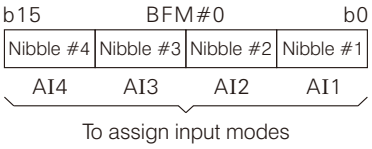
Item	Specification
Response Time	1.2 ms
Accurate Calibration Voltage Output	DC 10V ± 0.5%, 60mA (Max.)
Isolation Method	The external DC 24V input through an isolated DC/DC power to provide AD & DA convert circuits; Magnetic-coupler isolation between PLC and analog circuits; no isolation between AI / AO channels
Power Consumption	DC 24V ± 20%, 210mA (Max.) from external + DC 5V 15mA from PLC's inner power

- Definition of Buffer Memory BFM in the VS-6A Module

The VS-6A module uses the BFMs to communicate with the VS Main Unit for the parameter setting, converted and set values access.

BFM No.	Component Description	
#0	To assign the analog input modes of AI1~AI4. When the power is turned from OFF to ON, the default value is H0000.	
#1	To set the average times of AI1.	When the power is turned from OFF to ON, the default value is 10. The available range is 1~32,767, otherwise it is equivalent to 10.
#2	To set the average times of AI2.	
#3	To set the average times of AI3.	
#4	To set the average times of AI4.	
#5	Converted digital value of AI1 (the average times is designated by BFM #1).	
#6	Converted digital value of AI2 (the average times is designated by BFM #2).	
#7	Converted digital value of AI3 (the average times is designated by BFM #3).	
#8	Converted digital value of AI4 (the average times is designated by BFM #4).	
#20	To assign the analog output modes of AO1~AO2. When the power is turned from OFF to ON, the default value is H00.	
#21	The digital set value of AO1.	When the power is turned from OFF to ON, the default value is 0.
#21	The digital set value of AO2.	
#23	To assign the holding modes of AO1~AO2. When the power is turned from OFF to ON, the default value is H00.	
#30	Identification code: VS-6A = K204 (can use the FROM instruction to check whether the place is this module or not)	
#31	The version number of this module. (the content value □□ indicates Ver. □.□)	

BFM#0 To appoint the modes of analog inputs: (the sliding switch should also consistent with the modes)

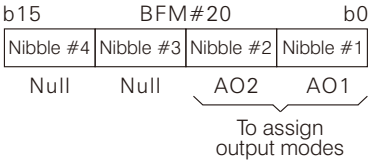


Value of Nibble	Analog Input Mode	
0	−10V~+10V voltage input	Converted digital value: –32000~+32000
1		Converted digital value: –10000~+10000
2	4mA~20mA current input	Converted digital value: 0~+16000
3	−20mA~+20mA current input	Converted digital value: –16000~+16000
4		Converted digital value: –20000~+20000
Other	Disabled	

Example: If the BFM #0 of a VS-6A is set to be H5420, then

AI1: For −10V~+10V voltage input, that will be converted to the value –32,000~+32,000 at this mode.
AI2: For 4mA~20mA current input, that will be converted to the value 0~+16,000 at this mode.
AI3: For −20mA~+20mA current input, that will be converted to the value –32,000~+32,000 at this mode.
AI4: Disabled

BFM#20 To appoint the mode of analog output:



Value of Nibble	Analog Output Mode	
0	−10V~+10V voltage output	Digital set value: −32000~+32000
1		Digital set value:−10000~+10000
2	4mA~20mA current output	Digital set value: 0~+32000
3	−20mA~+20mA current output	Digital set value: −32000~+32000
4		Digital set value: −20000~+20000
Other	Disabled	

Example: If the BFM #20 of a VS-6A is set to be H20, then

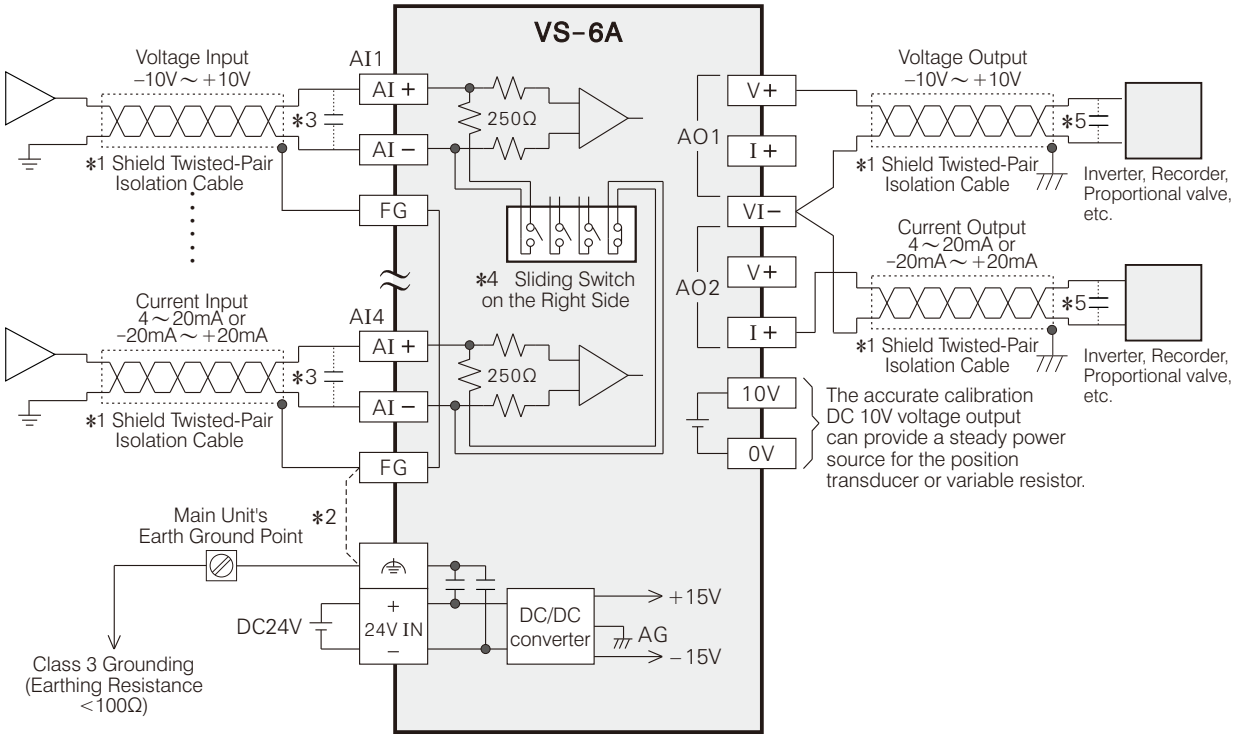
AO1: For −10V~+10V voltage output, that will use the digital set value −32,000~+32,000 at this mode.
AO2: For 4mA~20mA current output, that will use the digital set value 0~+32,000 at this mode.

BFM#23 To appoint the output holding mode: (for the PLC status turns from RUN to STOP)

If the value in the nibble = 0, the channel will keep the last output, even PLC is STOP.

If the value in the nibble ≠ 0, the channel will change its digital set value = 0 at STOP.

● External Wiring

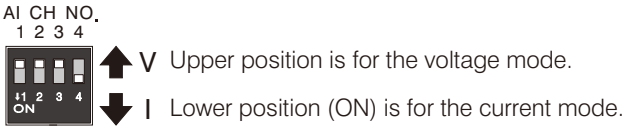


∗1: Please use the Shield Twisted-Pair isolation cable for every analog input/output channel. Must keep the signal cable away from any power line (including the power of motor, valve or contactor) to prevent external interference or module damage.

∗2: Please connect the end of cable shield to the FG terminal. If the noise is huge, should connect the FG to the ⏚ terminal at the Main Unit.

∗3: If the reading value of voltage/current signal is fluctuating or with electrically induced noise on the external wiring, please parallel connect a smoothing capacitor (0.1 μF～0.47 μF, 25V) between the input terminals.

∗4: To set the operating modes of AI1～AI4, two things MUST be done:
1. Assign the relative nibbles of the BFM #0.
2. Adjust the sliding switches on the right side of the module.



∗5: If the reading value of voltage/current signal is fluctuating or with electrically induced noise on the external wiring, please parallel connect a smoothing capacitor (0.1 μF～0.47 μF, 25V) between the input terminals.

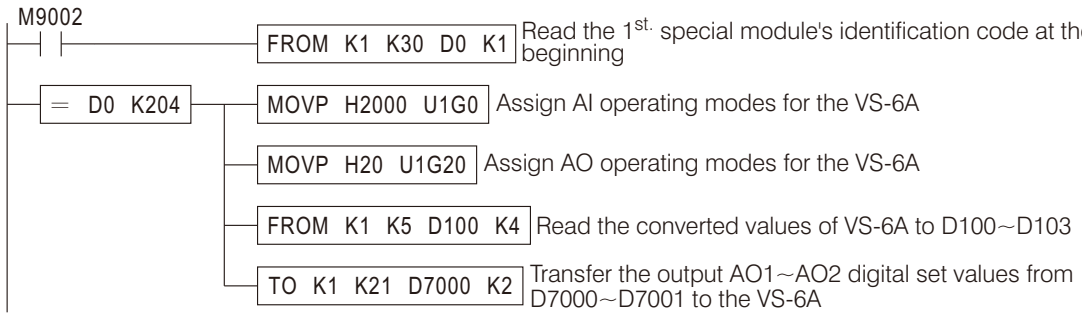
∗6: For every analog output channel, either voltage or current output can be used but not both at the same time.

● Example Program

The VS-6A is installed next to the Main Unit and became the 1st. special module.

Its AI1～AI3 are used for -10V～10V inputs, AI4 is used for 4～20mA input. Input converted values of AI1～AI4 are sequentially stored at D100～D103.

Its AO1 is used for -10V～10V output, AO2 is used for 4～20mA output. Output digital set values of AO1～AO2 are sequentially stored at D7000～D7001.



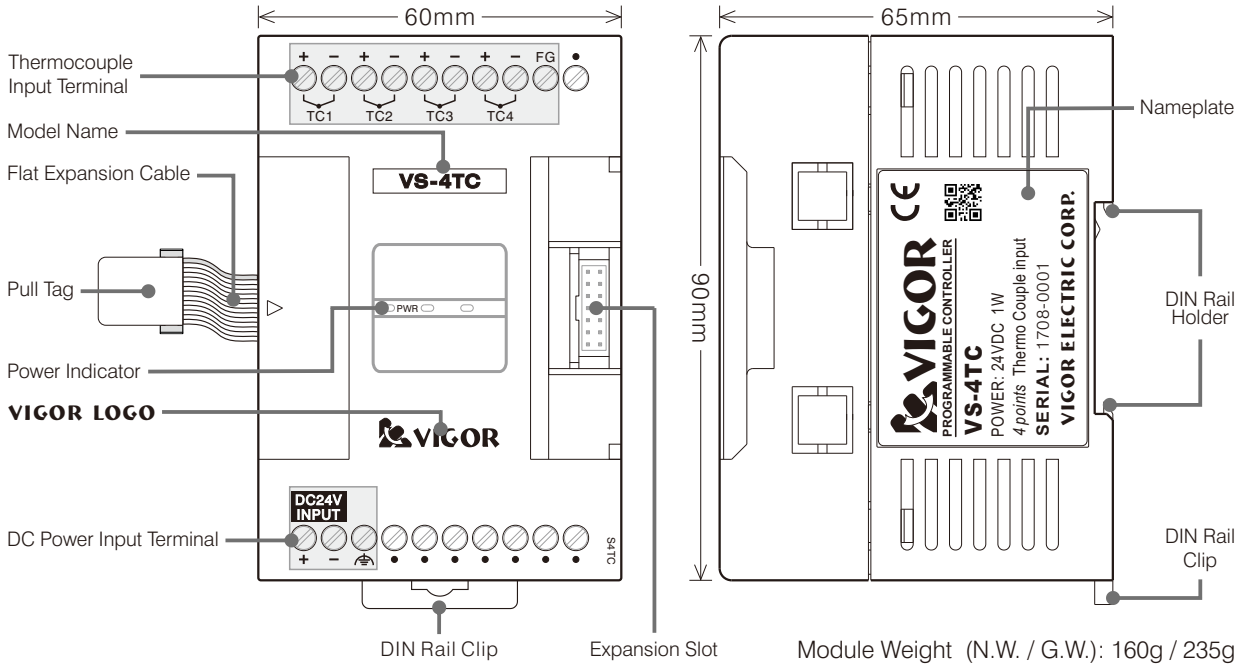
5-3-5 VS-4TC Thermocouple Temperature Input Module

The VS-4TC Thermocouple Temperature Input Module can receive external 4 channels of thermocouple (TC) signals and convert those into digital temperature values. When the FROM instruction is executed, the VS Main Unit reads out temperature data from the VS-4TC module and stores that into registers. Thus, it provides the reference data for digital monitoring and related controls.

Since the conversion circuit for those input channels is not divided, the isolated (ungrounded) thermocouple sensors and reducing interference are required.

The VS-4TC Thermocouple Temperature Input Module requires a DC 24V external power input for the isolated DC to DC regulated power to provide its temperature converter. Also, between the PLC inner circuit and the converter are isolated by the Magnetic-coupler thus the module can get a stable temperature conversion. Please read following instructions before use.

- Product Exterior



Module Weight (N.W. / G.W.): 160g / 235g

- Product Specification

Temperature Input Specification

Item		Specification
Sensor Type		K, J, R, S, T, E, B or N type isolated (ungrounded) thermocouple
Measurable Range	K	–200 ℃ ~ 1200 ℃ (–328 ℉ ~ 2192 ℉)
	J	–160 ℃ ~ 1200 ℃ (–256 ℉ ~ 2192 ℉)
	R	0 ℃ ~ 1768 ℃ (32 ℉ ~ 3214.4 ℉)
	S	0 ℃ ~ 1768 ℃ (32 ℉ ~ 3214.4 ℉)
	T	–220 ℃ ~ 400 ℃ (–364 ℉ ~ 752 ℉)
	E	–220 ℃ ~ 1000 ℃ (–364 ℉ ~ 1832 ℉)
	B	300 ℃ ~ 1800 ℃ (572 ℉ ~ 3272 ℉)
	N	–200 ℃ ~ 1300 ℃ (–328 ℉ ~ 2372 ℉)
Converted Value		The measurement results are indicated by the unit of 0.1 ℃ or 0.1 ℉
Resolution		0.1 ℃ (0.1 ℉)
Overall Accuracy		±0.5 % (full scale.) ±1 ℃
Response Time		500 ms

Basic Specification

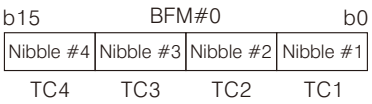
Item	Specification
Isolation Method	The external DC 24V input through an isolated DC/DC power to provide temperature convert circuits; Magnetic-coupler isolation between PLC and temperature converters; No isolation between input channels (ungrounded thermocouple is required)
Power Consumption	DC 24V ± 20%, 30mA (Max.) from external + DC 5V 15mA from PLC's inner power

- Definition of Buffer Memory BFM in the VS-4TC Module

The VS-4TC module uses the BFMs to communicate with the VS Main Unit for the parameter setting and converted value access.

BFM No.	Component Description
#0	To assign the thermocouple types for TC1～TC4. When the power is turned from OFF to ON, the default value is H0000.
#2	To assign the scale of temperature measurement. 0: ℃; 1: ℉; other values: ℃. When the power is turned from OFF to ON, the default value is 0.
#3	To set the average times of TC1. When the power is turned from OFF to ON, the default value is 1. The available range is 1～32,767, otherwise it is equivalent to 1.
#4	To set the average times of TC2.
#5	To set the average times of TC3.
#6	To set the average times of TC4.
#11	Converted temperature value of TC1, with unit as 0.1 ℃ or 0.1 ℉.
#12	Converted temperature value of TC2, with unit as 0.1 ℃ or 0.1 ℉.
#13	Converted temperature value of TC3, with unit as 0.1 ℃ or 0.1 ℉.
#14	Converted temperature value of TC4, with unit as 0.1 ℃ or 0.1 ℉.
#29	Status and error flag.
#30	Identification code: VS-4TC = K205 (can use the FROM instruction to check whether the place is this module or not)
#31	The version number of this module. (the content value □□ indicates Ver. □.□)

BFM #0 To appoint the types of thermocouples:

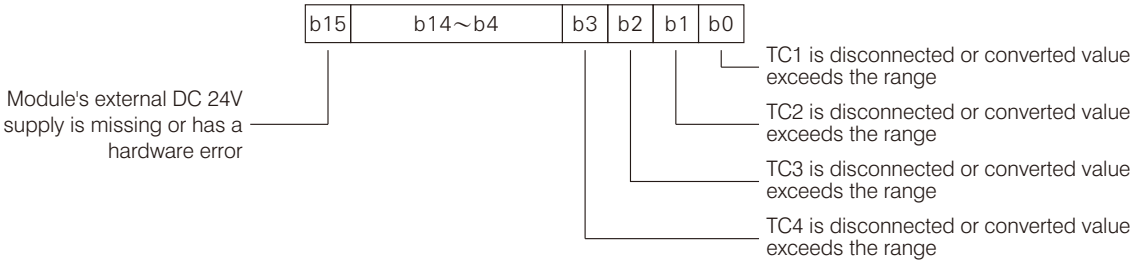


Value of Nibble	0	1	2	3	4	5	6	7
Thermocouple Type	K	J	R	S	T	E	B	N

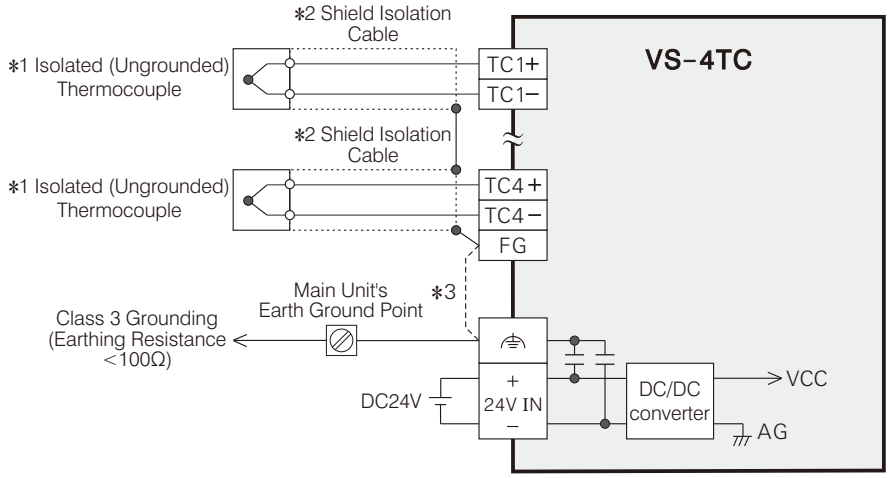
If Value of Nibble is not 0～7, the channel is disabled.

Example: If the BFM #0 of a VS-4TC is set to be H8100, then
TC1 & TC2: K Type thermocouple input;
TC3: J Type thermocouple input; TC4: disabled.

BFM #29 Status and Error Flag: (0: normal; 1: error)



- External Wiring



∗1: Always use isolated (ungrounded) thermocouple sensor.

∗2: Please use the shield isolation cable for every temperature input. Must keep the signal cable away from any power line (including the power of motor, valve or contactor) to prevent external interference or module damage.

∗3: Please connect the end of cable shield to the FG terminal. If the noise is huge, should connect the FG to the ⏚ terminal at the Main Unit.

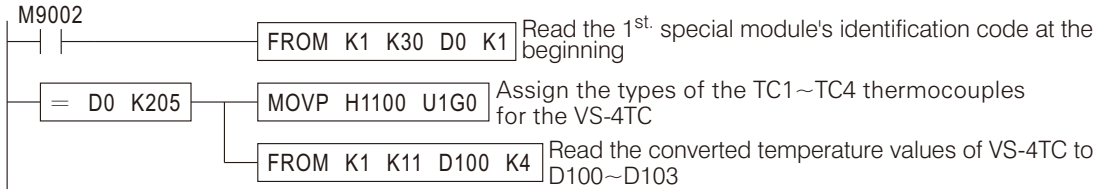
∗4: Please use appropriate compensating cables for thermocouple extension.

- Example Program

The VS-4TC is installed next to the Main Unit and became the 1st. special module.

Its TC1～TC2 are used for K type thermocouples, TC3～TC4 are used for J type thermocouples.

Temperature converted values of TC1～TC4 are sequentially stored at D100～D103.



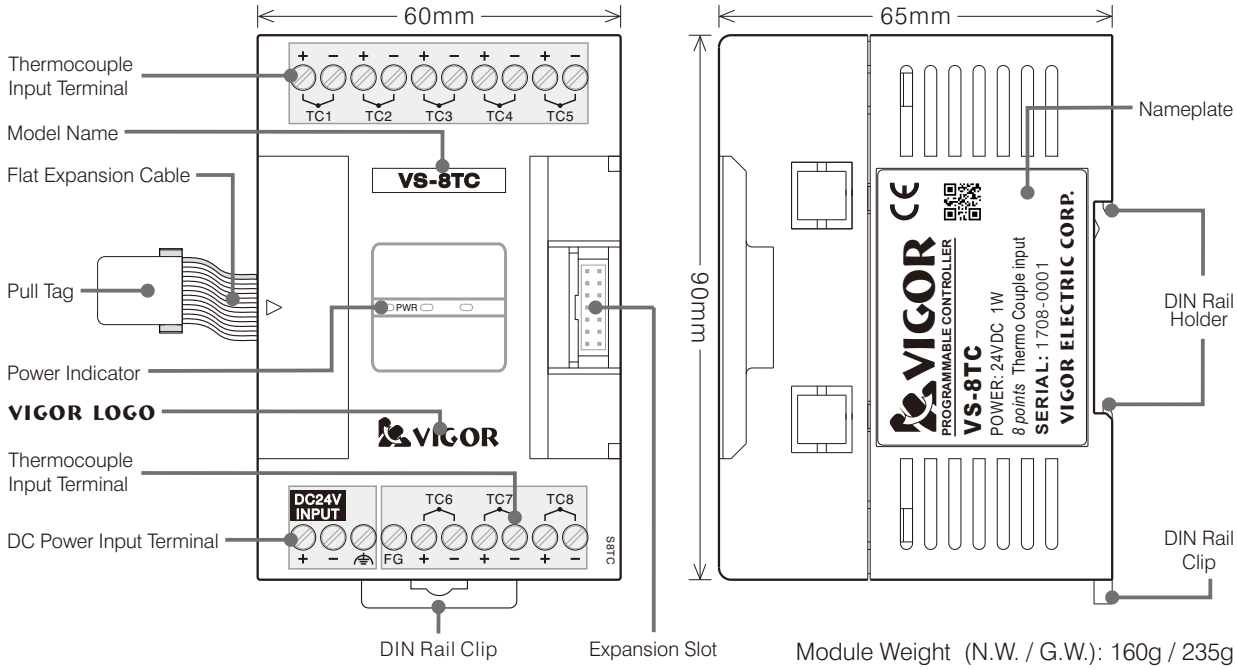
5-3-6 VS-8TC Thermocouple Temperature Input Module

The VS-8TC Thermocouple Temperature Input Module can receive external 8 channels of thermocouple (TC) signals and convert those into digital temperature values. When the FROM instruction is executed, the VS Main Unit reads out temperature data from the VS-8TC module and stores that into registers. Thus, it provides the reference data for digital monitoring and related controls.

Since the conversion circuit for those input channels is not divided, the isolated (ungrounded) thermocouple sensors and reducing interference are required.

The VS-8TC Thermocouple Temperature Input Module requires a DC 24V external power input for the isolated DC to DC regulated power to provide its temperature converter. Also, between the PLC inner circuit and the converter are isolated by the Magnetic-coupler thus the module can get a stable temperature conversion. Please read following instructions before use.

- Product Exterior



Module Weight (N.W. / G.W.): 160g / 235g

- Product Specification

Temperature Input Specification

Item		Specification
Sensor Type		K, J, R, S, T, E, B or N type isolated (ungrounded) thermocouple
Measurable Range	K	–200 ℃ ~ 1200 ℃ (–328 ℉ ~ 2192 ℉)
	J	–160 ℃ ~ 1200 ℃ (–256 ℉ ~ 2192 ℉)
	R	0 ℃ ~ 1768 ℃ (32 ℉ ~ 3214.4 ℉)
	S	0 ℃ ~ 1768 ℃ (32 ℉ ~ 3214.4 ℉)
	T	–220 ℃ ~ 400 ℃ (–364 ℉ ~ 752 ℉)
	E	–220 ℃ ~ 1000 ℃ (–364 ℉ ~ 1832 ℉)
	B	300 ℃ ~ 1800 ℃ (572 ℉ ~ 3272 ℉)
	N	–200 ℃ ~ 1300 ℃ (–328 ℉ ~ 2372 ℉)
Converted Value		The measurement results are indicated by the unit of 0.1 ℃ or 0.1 ℉
Resolution		0.1 ℃ (0.1 ℉)
Overall Accuracy		±0.5 % (full scale.) ±1 ℃
Response Time		500 ms

Basic Specification

Item	Specification
Isolation Method	The external DC 24V input through an isolated DC/DC power to provide temperature convert circuits; Magnetic-coupler isolation between PLC and temperature converters; No isolation between input channels (ungrounded thermocouple is required)
Power Consumption	DC 24V ± 20%, 30mA (Max.) from external + DC 5V 15mA from PLC's inner power

- Definition of Buffer Memory BFM in the VS-8TC Module

The VS-8TC module uses the BFM to communicate with the VS Main Unit for the parameter setting and converted value access.

BFM No.	Component Description
#0	To assign the thermocouple types for TC1～TC4. When the power is turned from OFF to ON, the default value is H0000.
#1	To assign the thermocouple types of TC5～TC8. When the power is turned from OFF to ON, the default value is H0000.
#2	To assign the scale of temperature measurement. 0: ℃ ; 1: ℉ ; other values: ℃ . When the power is turned from OFF to ON, the default value is 0.
#3	To set the average times of TC1. When the power is turned from OFF to ON, the default value is 1. The available range is 1～32,767, otherwise it is equivalent to 1.
#4	To set the average times of TC2.
#5	To set the average times of TC3.
#6	To set the average times of TC4.
#7	To set the average times of TC5.
#8	To set the average times of TC6.
#9	To set the average times of TC7.
#10	To set the average times of TC8.
#11	Converted temperature value of TC1, with unit as 0.1 ℃ or 0.1 ℉.
#12	Converted temperature value of TC2, with unit as 0.1 ℃ or 0.1 ℉.
#13	Converted temperature value of TC3, with unit as 0.1 ℃ or 0.1 ℉.
#14	Converted temperature value of TC4, with unit as 0.1 ℃ or 0.1 ℉.
#15	Converted temperature value of TC5, with unit as 0.1 ℃ or 0.1 ℉.
#16	Converted temperature value of TC6, with unit as 0.1 ℃ or 0.1 ℉.
#17	Converted temperature value of TC7, with unit as 0.1 ℃ or 0.1 ℉.
#18	Converted temperature value of TC8, with unit as 0.1 ℃ or 0.1 ℉.
#29	Status and error flag.
#30	Identification code: VS-8TC = K206 (can use the FROM instruction to check whether the place is this module or not)
#31	The version number of this module. (the content value □□ indicates Ver. □.□)

BFM #0 & BFM #1 To appoint the types of thermocouples:

b15			BFM#0	b0
Nibble #4	Nibble #3	Nibble #2	Nibble #1	
TC4	TC3	TC2	TC1	

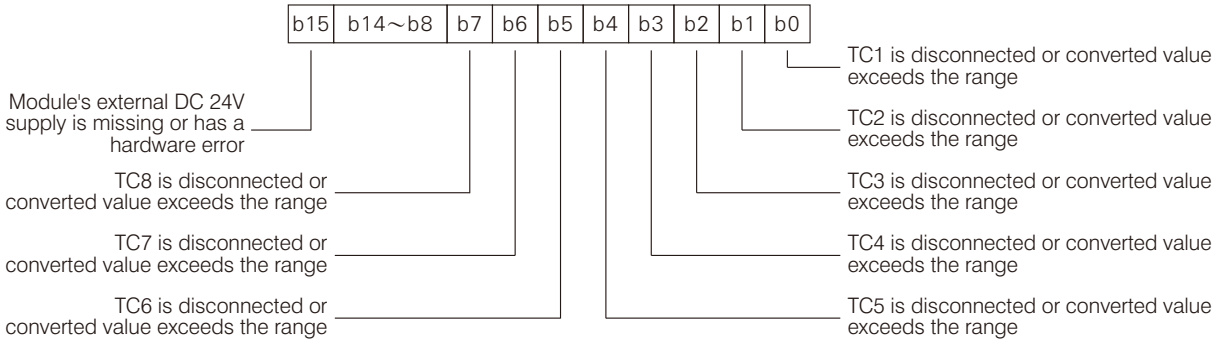
Value of Nibble	0	1	2	3	4	5	6	7
Thermocouple Type	K	J	R	S	T	E	B	N

If Value of Nibble is not 0～7, the channel is disabled.

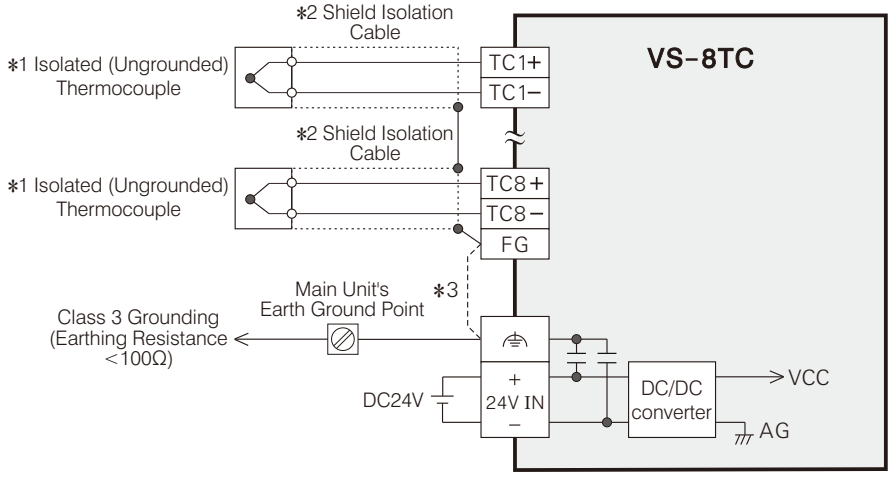
b15			BFM#1	b0
Nibble #4	Nibble #3	Nibble #2	Nibble #1	
TC8	TC7	TC6	TC5	

Example: If the BFM #0 of a VS-8TC is set to be H8100, then
TC1 & TC2: K Type thermocouple input;
TC3: J Type thermocouple input; TC4: disabled.

BFM #29 Status and Error Flag: (0: normal; 1: error)



● External Wiring



∗1: Always use isolated (ungrounded) thermocouple sensor.

∗2: Please use the shield isolation cable for every temperature input. Must keep the signal cable away from any power line (including the power of motor, valve or contactor) to prevent external interference or module damage.

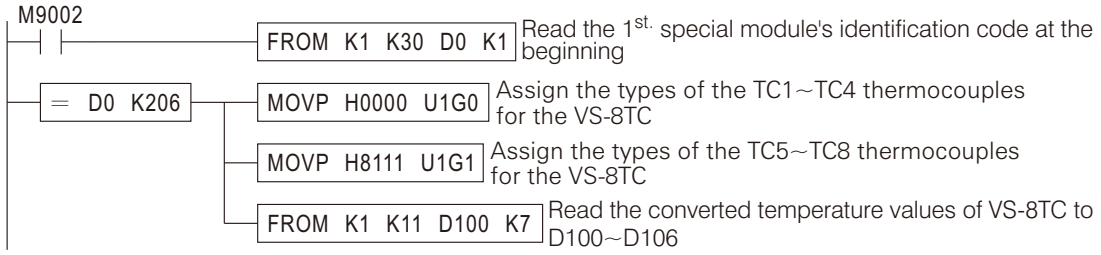
∗3: Please connect the end of cable shield to the FG terminal. If the noise is huge, should connect the FG to the ⏚ terminal at the Main Unit.

∗4: Please use appropriate compensating cables for thermocouple extension.

● Example Program

The VS-8TC is installed next to the Main Unit and became the 1st. special module.

Its TC1～TC4 are used for K type thermocouples, TC5～TC7 are used for J type thermocouples, TC8 is disabled. Temperature converted values of TC1～TC7 are sequentially stored at D100～D106.

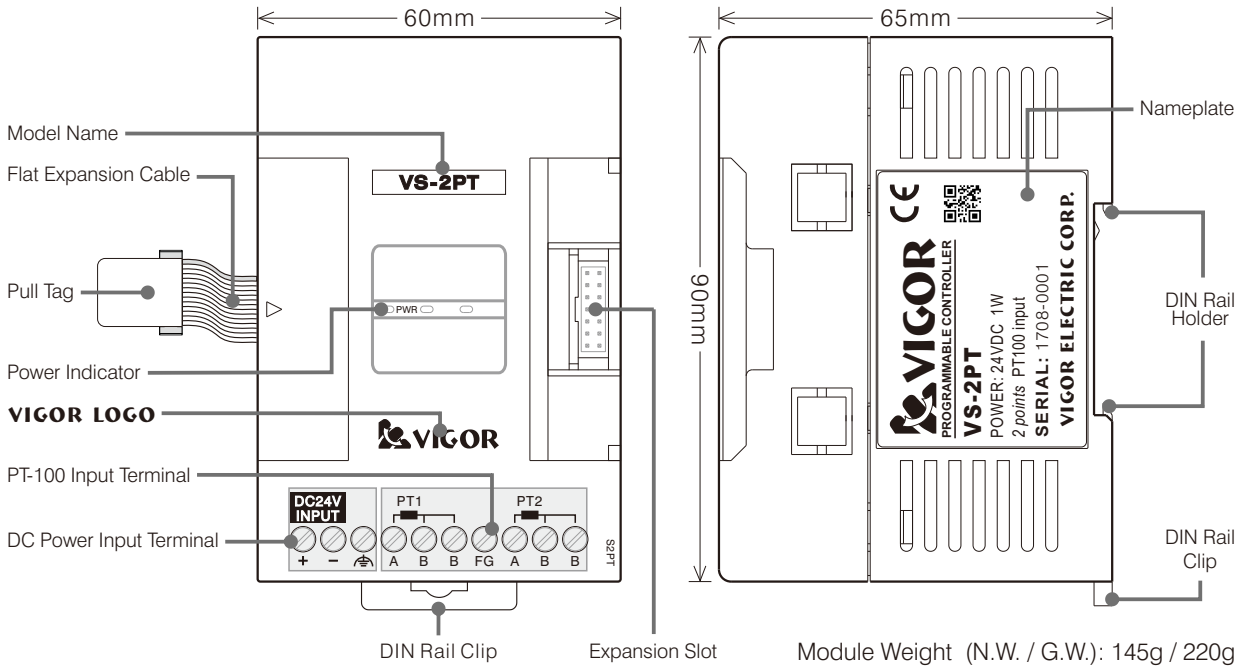


5-3-7 VS-2PT PT-100 Temperature Input Module

The VS-2PT PT-100 Temperature Input Module can receive external 2 channels of platinum resistance thermometer RTD signals and convert those into digital temperature values. When the FROM instruction is executed, the VS Main Unit reads out temperature data from the VS-2PT module and stores that into registers. Thus, it provides the reference data for digital monitoring and related controls.

The VS-2PT PT-100 Temperature Input Module requires a DC 24V external power input for the isolated DC to DC regulated power to provide its temperature converter. Also, between the PLC inner circuit and the converter are isolated by the Magnetic-coupler thus the module can get a stable temperature conversion. Please read following instructions before use.

- Product Exterior



Module Weight (N.W. / G.W.): 145g / 220g

- Product Specification

Temperature Input Specification

Item	Specification
Sensor Type	PT-100, Platinum resistance thermometer (RTD), 3-Wire, 100 Ω @ 0 ℃, 3850 PPM/℃
Measurable Range	–200 ℃ ~ 850 ℃ (–328 ℉ ~ 1562 ℉)
Converted Value	The measurement results are indicated by the unit of 0.1 ℃ or 0.1 ℉
Resolution	0.1 ℃ (0.1 ℉)
Overall Accuracy	Ambient temp. 25 ±5℃ is ±0.5% full scale; Ambient temp. 0~55℃ is ±1% full scale
Response Time	300 ms

Basic Specification

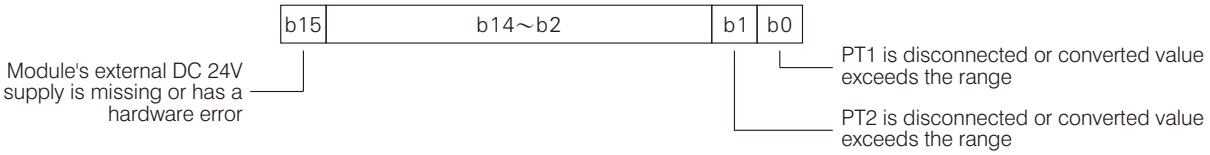
Item	Specification
Isolation Method	The external DC 24V input through an isolated DC/DC power to provide temperature convert circuits; Magnetic-coupler isolation between PLC and temperature converters; No isolation between input channels
Power Consumption	DC 24V ± 20%, 30mA (Max.) from external + DC 5V 15mA from PLC's inner power

- Definition of Buffer Memory BFM in the VS-2PT Module

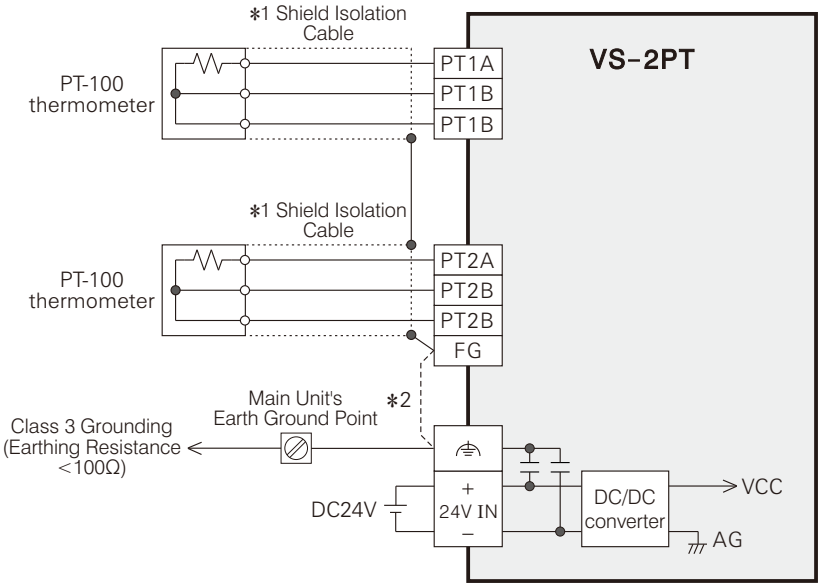
The VS-2PT module uses the BFM to communicate with the VS Main Unit for the parameter setting and converted value access.

BFM No.	Component Description	
#2	To assign the scale of temperature measurement. 0: ℃ ; 1: ℉ ; other values: ℃ . When the power is turned from OFF to ON, the default value is 0.	
#3	To set the average times of PT1.	When the power is turned from OFF to ON, the default value is 1. The available range is 1～32,767, otherwise it is equivalent to 1.
#4	To set the average times of PT2.	
#11	Converted temperature value of PT1, with unit as 0.1 ℃ or 0.1 ℉.	
#12	Converted temperature value of PT2, with unit as 0.1 ℃ or 0.1 ℉.	
#29	Status and error flag.	
#30	Identification code: VS-2PT = K207 (can use the FROM instruction to check whether the place is this module or not)	
#31	The version number of this module. (the content value □□ indicates Ver. □.□)	

BFM #29 Status and Error Flag: (0: normal; 1: error)



- External Wiring

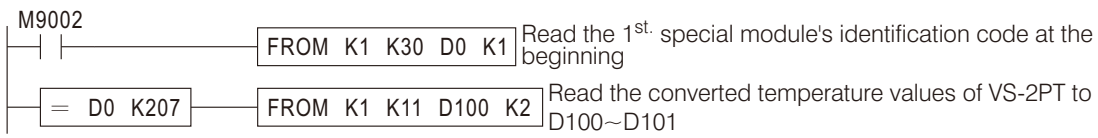


∗1: Please use the shield isolation cable for every temperature input. Must keep the signal cable away from any power line (including the power of motor, valve or contactor) to prevent external interference or module damage.

∗2: Please connect the end of cable shield to the FG terminal. If the noise is huge, should connect the FG to the ⏚ terminal at the Main Unit.

- Example Program

The VS-2PT is installed next to the Main Unit and became the 1st. special module.
Its temperature converted values of PT1～PT2 are sequentially stored at D100～D101.

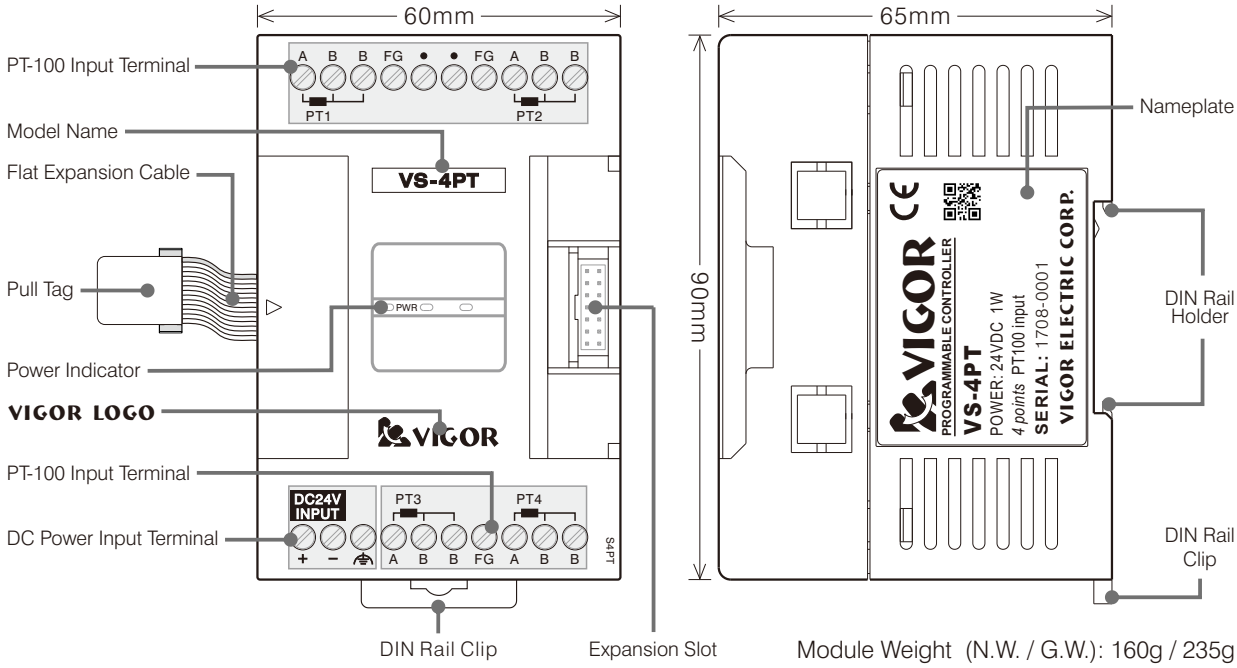


5-3-8 VS-4PT PT-100 Temperature Input Module

The VS-4PT PT-100 Temperature Input Module can receive external 4 channels of platinum resistance thermometer RTD signals and convert those into digital temperature values. When the FROM instruction is executed, the VS Main Unit reads out temperature data from the VS-4PT module and stores that into registers. Thus, it provides the reference data for digital monitoring and related controls.

The VS-4PT PT-100 Temperature Input Module requires a DC 24V external power input for the isolated DC to DC regulated power to provide its temperature converter. Also, between the PLC inner circuit and the converter are isolated by the Magnetic-coupler thus the module can get a stable temperature conversion. Please read following instructions before use.

- Product Exterior



Module Weight (N.W. / G.W.): 160g / 235g

- Product Specification

Temperature Input Specification

Item	Specification
Sensor Type	PT-100, Platinum resistance thermometer (RTD), 3-Wire, 100 Ω @ 0 ℃, 3850 PPM/℃
Measurable Range	–200 ℃ ~ 850 ℃ (–328 ℉ ~ 1562 ℉)
Converted Value	The measurement results are indicated by the unit of 0.1 ℃ or 0.1 ℉
Resolution	0.1 ℃ (0.1 ℉)
Overall Accuracy	Ambient temp. 25 ±5℃ is ±0.5% full scale; Ambient temp. 0~55℃ is ±1% full scale
Response Time	300 ms

Basic Specification

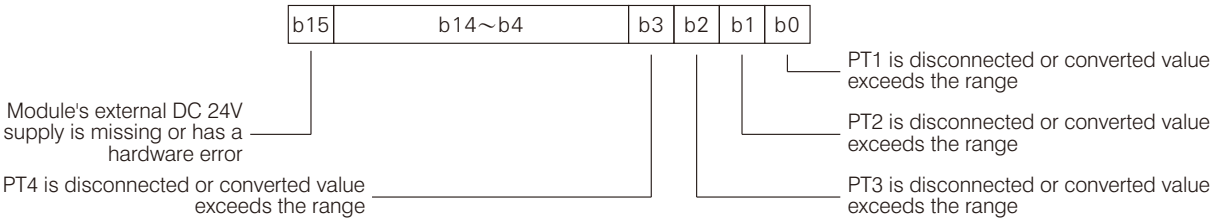
Item	Specification
Isolation Method	The external DC 24V input through an isolated DC/DC power to provide temperature convert circuits; Magnetic-coupler isolation between PLC and temperature converters; No isolation between input channels
Power Consumption	DC 24V ± 20%, 30mA (Max.) from external + DC 5V 15mA from PLC's inner power

- Definition of Buffer Memory BFM in the VS-4PT Module

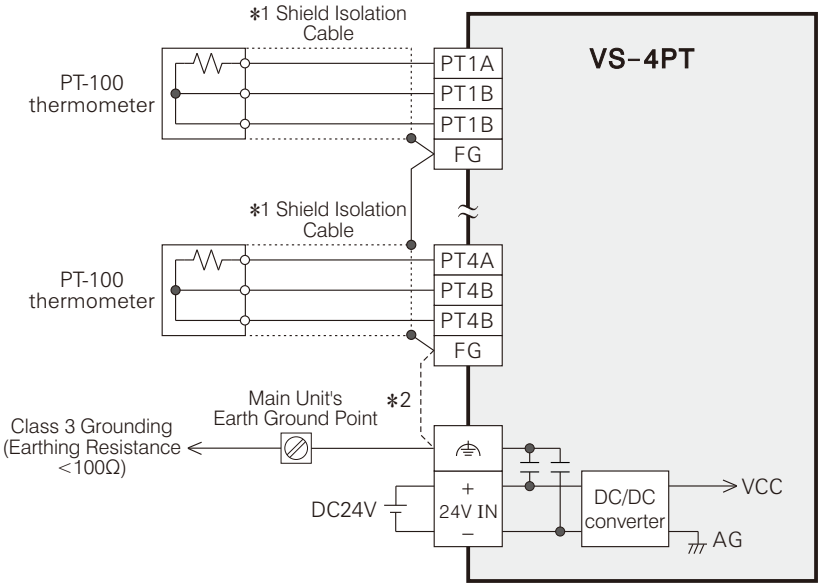
The VS-4PT module uses the BFM to communicate with the VS Main Unit for the parameter setting and converted value access.

BFM No.	Component Description	
#2	To assign the scale of temperature measurement. 0: ℃ ; 1: ℉ ; other values: ℃ . When the power is turned from OFF to ON, the default value is 0.	
#3	To set the average times of PT1.	When the power is turned from OFF to ON, the default value is 1. The available range is 1～32,767, otherwise it is equivalent to 1.
#4	To set the average times of PT2.	
#5	To set the average times of PT3.	
#6	To set the average times of PT4.	
#11	Converted temperature value of PT1, with unit as 0.1 ℃ or 0.1 ℉.	
#12	Converted temperature value of PT2, with unit as 0.1 ℃ or 0.1 ℉.	
#13	Converted temperature value of PT3, with unit as 0.1 ℃ or 0.1 ℉.	
#14	Converted temperature value of PT4, with unit as 0.1 ℃ or 0.1 ℉.	
#29	Status and error flag.	
#30	Identification code: VS-4PT = K208 (can use the FROM instruction to check whether the place is this module or not)	
#31	The version number of this module. (the content value □□ indicates Ver. □.□)	

BFM #29 Status and Error Flag: (0: normal; 1: error)



- External Wiring

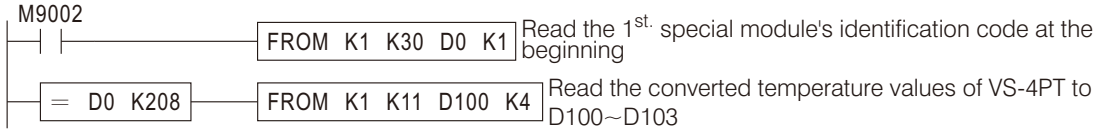


∗1: Please use the shield isolation cable for every temperature input. Must keep the signal cable away from any power line (including the power of motor, valve or contactor) to prevent external interference or module damage.

∗2: Please connect the end of cable shield to the FG terminal. If the noise is huge, should connect the FG to the ⏚ terminal at the Main Unit.

- Example Program

The VS-4PT is installed next to the Main Unit and became the 1st. special module.
Its temperature converted values of PT1～PT4 are sequentially stored at D100～D103.



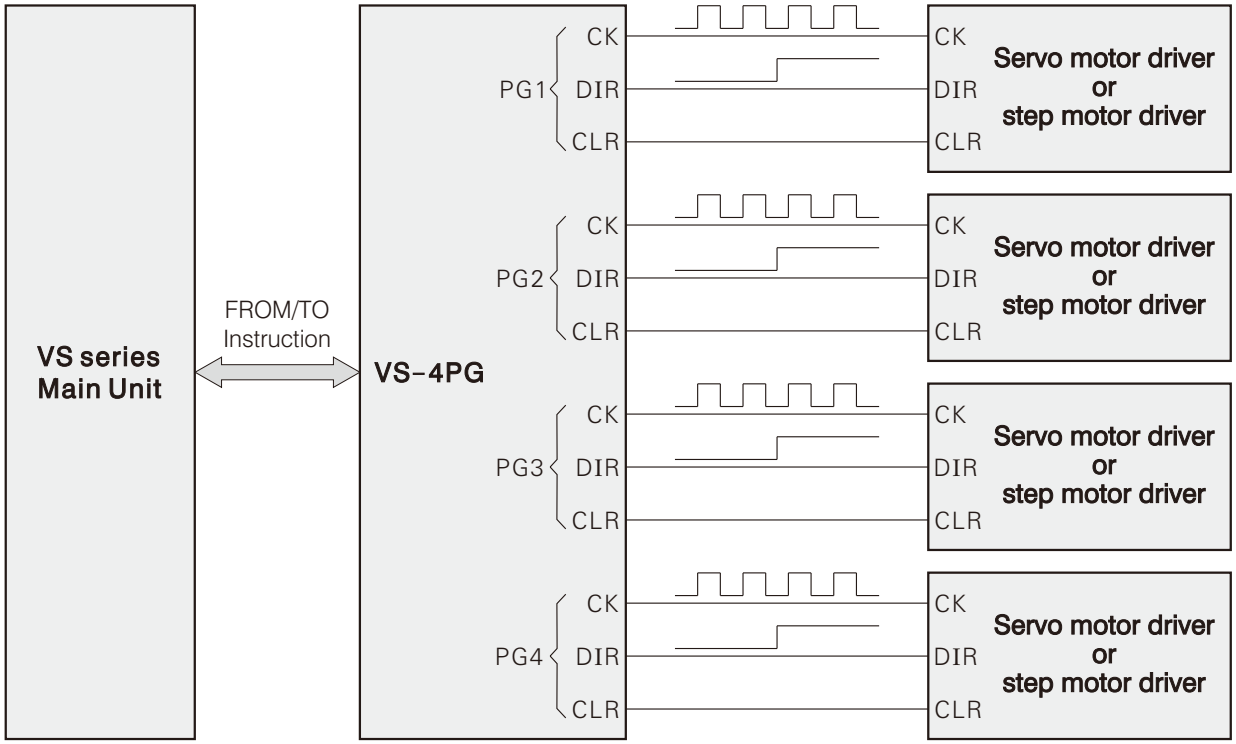
5-3-9 VS-2PG/VS-4PG Pulse Generator Module

The VS-2PG pulse generator module provides 2 sets of 200 kHz high speed pulse outputs for 2 axes position control.

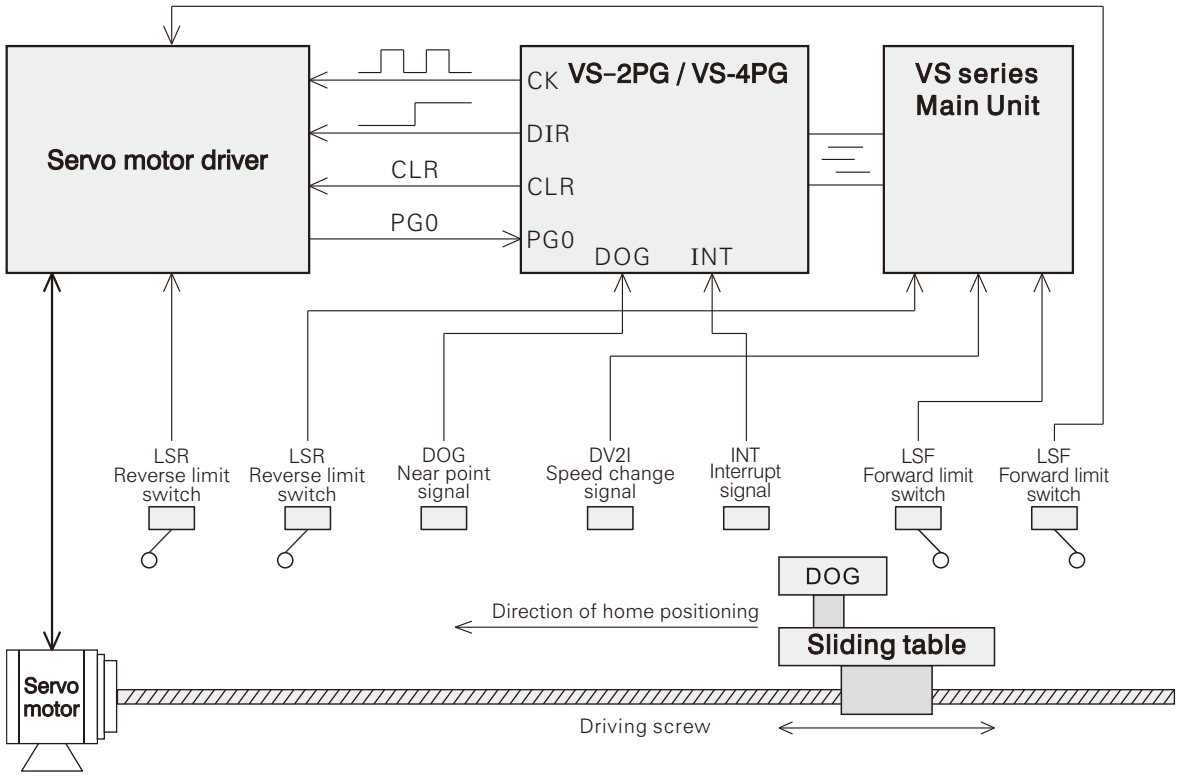
The VS-4PG pulse generator module provides 4 sets of 200 kHz high speed pulse outputs for 4 axes position control.

Each high speed output set can be used to control a step or servo motor driver for the positioning. In addition, this module provides various positioning functions such as the Home positioning (zero return), Jog, Drive to set position, 2-stage positioning, Interrupt constant quantity positioning, 2-stage interrupt constant quantity positioning, Interrupt to stop, Variable speed pulse output, Handwheel positioning and Two axes linear interpolation positioning. With those functions, to complete the complex positioning control is easy.

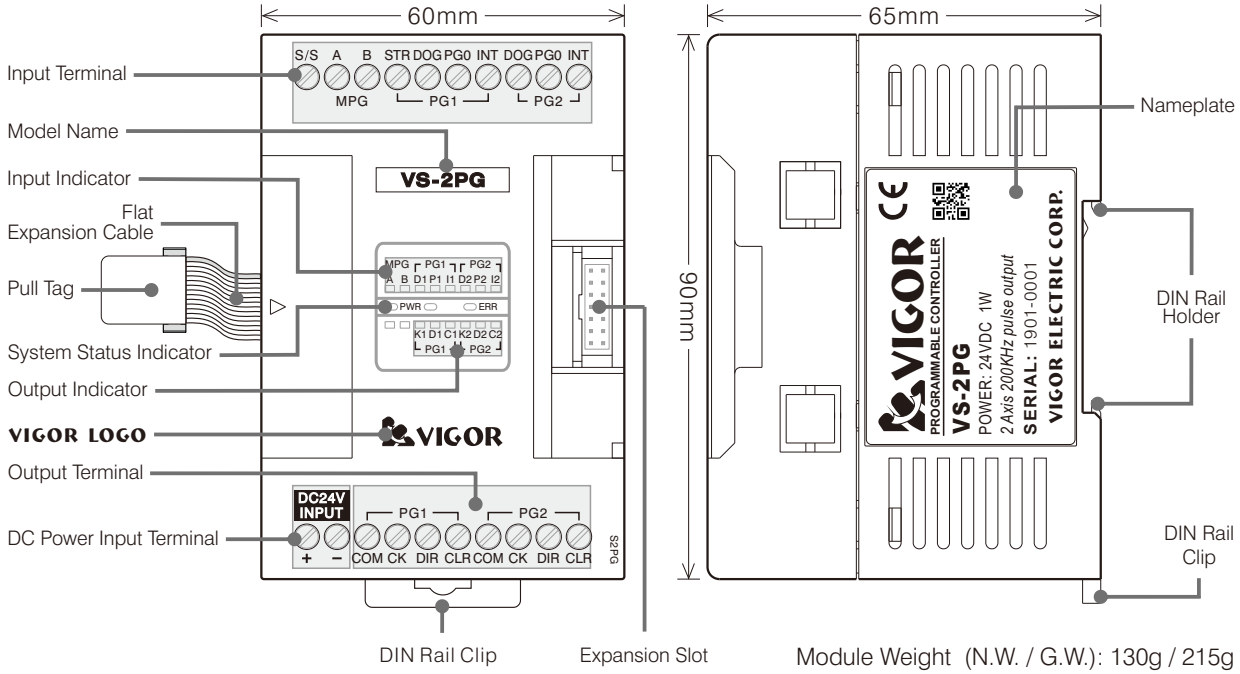
About the positioning control method for each axis at the module is "Pulse train + Direction signal". Please read following instructions before use.



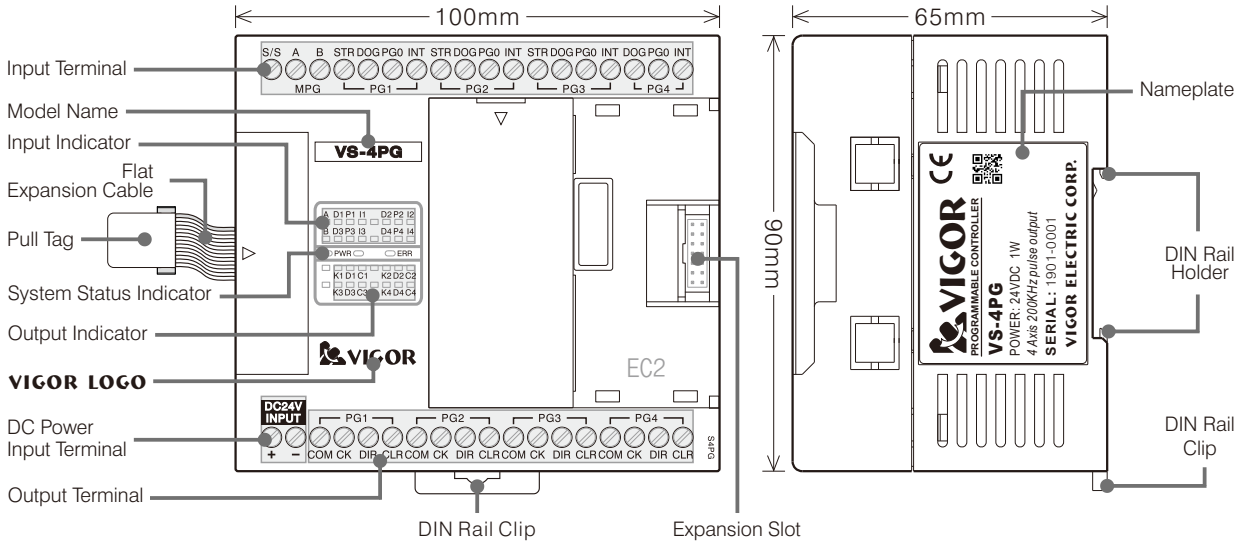
Below is the brief configuration of a general positioning control system about the module.



- Product Exterior



Module Weight (N.W. / G.W.): 130g / 215g



Module Weight (N.W. / G.W.): 200g / 305g

- Product Specification

Input Specification

Item	A	B	STR	DOG	PG0	INT
Input Type	Sinking or Sourcing either (all the input signals should use the same type)					
Input Activating Voltage	DC24V ± 15%					
Input Signal Current	5.3mA/DC24V					
Input ON Current	> 3.5mA	> 3.5mA	> 3.5mA	> 3.5mA	> 3.5mA	> 3.5mA
Input OFF Current	< 1.5mA	< 1.5mA	< 1.5mA	< 1.5mA	< 1.5mA	< 1.5mA
Input Resistance	4.3kΩ approx.	4.3kΩ approx.	4.3kΩ approx.	4.3kΩ approx.	4.3kΩ approx.	4.3kΩ approx.
Input Response Time	—	—	<200μs	<1ms	<1ms	10μs
BFM Response Time	10ms	10ms	10ms	10ms	10ms	10ms
Input Signal Type	Dry contact or NPN / PNP transistor					
Isolation Method	Photocoupler Isolation					
Max. Counting Freq.	50kHz	50kHz	—	—	—	—
Input Indicator	Activated input causes its indicator ON		—	Activated input causes its indicator ON		

Output Specification

Item	CK	DIR	CLR
Output Type	MOSFET Output	MOSFET Output	NPN Transistor Output
Switch Voltage	DC5V～30V	DC5V～30V	DC5V～30V
Rated Current	0.3A	0.3A	0.3A
Open Circuit Leakage	—	—	< 0.1mA/DC30V
Response Time	200kHz	< 2.5μs	ON 100ms approximately
Isolation Method	Magnetic-coupler Isolation	Magnetic-coupler Isolation	Photocoupler Isolation
Output Indicator	Activated output causes its indicator ON	Activated output causes its indicator ON	Activated output causes its indicator ON

Basic Specification

Item	Specification	
Number of Axes	The VS-2PG has 2 axes (PG1～PG2); the VS-4PG has 4 axes (PG1～PG4), each axis is independent. The PG1 & PG2 or PG3 & PG4 can be paired for the two axes linear interpolation	
Command of Speed	• The VS Main Unit uses the specific BFM to deliver the setting of positioning speed • The range of positioning speed is 1Hz ~ 200kHz • The unit of speed can use Hz, cm/min, 10 deg/min or inch/min	
Command of Position	• The VS Main Unit uses the specific BFM to deliver the setting of positioning target • Supports 32-bit position data value for the positioning • The unit of position can use Pulse, μm, mdeg or 10^{-4} inch • Can use the 10^0,10^1,10^2 or 10^3multiply rate for the position data	
Positioning Control	The positioning procedure is prepared by the PLC's user program, then via the FROM / TO instruction to transfer data between the Main Unit and this module	
Power Consumption	VS-2PG	DC 24V ± 20%, 20mA (Max.) from external + DC 5V 110mA from PLC's inner power
	VS-4PG	DC 24V ± 20%, 20mA (Max.) from external + DC 5V 140mA from PLC's inner power

● Definition of Buffer Memory BFM in the VS-2PG/4PG Module

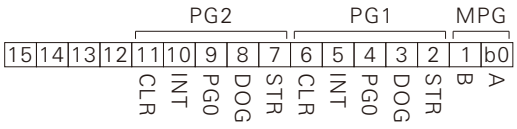
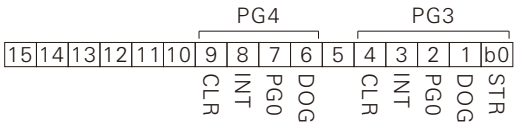
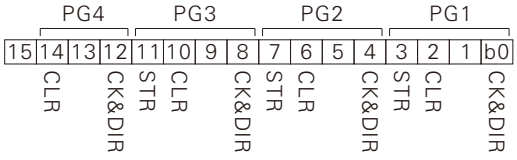
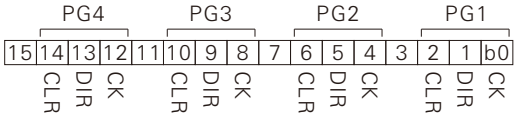
The VS-2PG / VS-4PG module uses the BFM to communicate with the VS Main Unit for the parameter setting and value access. The VS-2PG provides PG1 and PG2, the VS-4PG provides PG1～PG4.

At the list below, a number with the "■" symbol means it is a read only BFM.

The BFM#0～31 are shared by all axes.
The BFM#100～137 are specifically for the operation of PG1, the BFM#200～237 are for the PG2, the BFM#300～337 are for the PG3 and the BFM#400～437 are for the PG4.

Since the definitions of BFMs for each axis are equal, at the list below only shows the BFMs of PG1.

The BFM#150～163 are specifically for the linear interpolation operation at the paired PG1 and PG2.
The BFM#350～363 are specifically for the linear interpolation operation at the paired PG3 and PG4.
Since the definitions of BFMs for each linear interpolation group are equal, at the list below only shows the BFMs for the paired PG1 and PG2.

BFM #	Title	Component Description	Default Value	Unit
1,0	MPG's Input Current Position	32-bit data	0	Pulse
■ 2	MPG's Input Frequency	16-bit data	0	Hz
3	MPG's Gear Ratio Numerator	1～32,767; over the range will be regarded as 1. MPG's output pulses=Input pulses×Numerator/Denominator	1	—
4	MPG's Gear Ratio Denominator		1	—
5	MPG's Response Delay Time	1～500ms; over the range will be regarded as 5ms.	5	ms
■ 6	MPG's Handwheel Input Status	b0=Input from the MPG is forward (current value increase) b1=Input from the MPG is backward (current value decrease)	H0000	—
■ 20	PG1 and PG2 Terminal Status	 The input terminals' status showing at this BFM will have 10ms time integration delay. That could avoid the interfering noise when it is used for the ordinary purpose input.	H0000	—
■ 21	PG3 and PG4 Terminal Status	 The input terminals' status showing at this BFM will have 10ms time integration delay. That could avoid the interfering noise when it is used for the ordinary purpose input.	H0000	—
22	STR, CK, DIR and CLR Terminal Function Select	 STR: 0 : for the PG use; 1: not for the PG use. When the STR is for the ordinary purpose input, should assign it not for the PG use. CK, DIR, CLR: 0: for the PG use; 1: operated by the BFM#23. When the CK, DIR or CLR is for the ordinary purpose output, should assign it not for the PG use.	H0000	—
23	CK, DIR and CLR Status Force Command		H0000	—
■ 30	Identification code	VS-2PG:K209 VS-4PG:K210 Can use the FROM instruction to check whether the place is this module or not	209 210	—
■ 31	Version	Firmware version (the content value □□ indicates Ver. □.□)	10	—

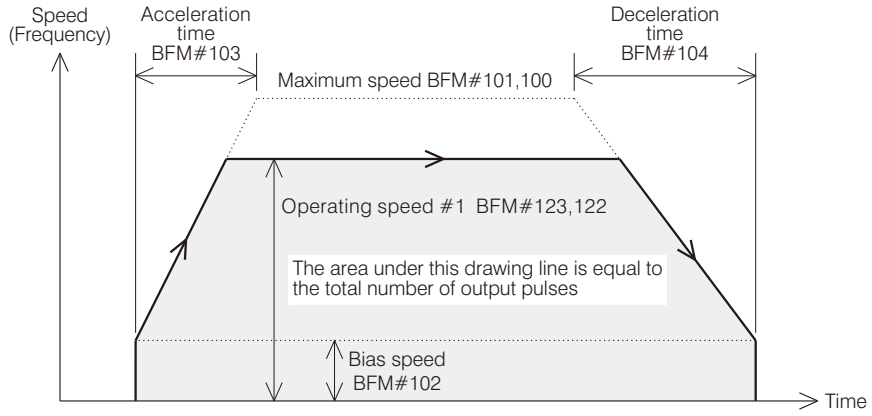
※ The range of a 32-bit data is –2,147,483,648～2,147,483,647.
The range of a 16-bit data is –32,768～32,767.

<table>
<tr><th>BFM #</th><th>Title</th><th>Component Description</th><th>Default Value</th><th>Unit</th></tr>
<tr><td>101,100</td><td>Maximum Speed</td><td>Convert this speed for pulse output it must between 10～200kHz; over the range will be regarded as 200kHz.</td><td>200,000</td><td>User-defined</td></tr>
<tr><td>102</td><td>Bias Speed</td><td>Convert for the real pulse output it must between 1～200kHz; over the range will be regarded as 0.</td><td>0</td><td>User-defined</td></tr>
<tr><td>103</td><td>Acceleration Time</td><td rowspan="2">0～32,000ms
If < 0, will be regarded as 0; if > 32,000, will as 32,000.</td><td>100</td><td>ms</td></tr>
<tr><td>104</td><td>Deceleration Time</td><td>100</td><td>ms</td></tr>
<tr><td>106,105</td><td>JOG Operating Speed</td><td>Convert for the real pulse output it must between 1～200kHz</td><td>10,000</td><td>User-defined</td></tr>
<tr><td>107</td><td>JOG Start Delay Time</td><td>1～32,767ms; over the range will be regarded as 1ms.</td><td>300</td><td>ms</td></tr>
<tr><td>109,108</td><td>Home Positioning Speed</td><td>Convert for the real pulse output it must between 1～200kHz</td><td>200,000</td><td>User-defined</td></tr>
<tr><td>110</td><td>Home Positioning Creep Speed</td><td>Convert for the real pulse output it must between 1～30kHz</td><td>1,000</td><td>User-defined</td></tr>
<tr><td>111</td><td>Input No. of PG0 after DOG</td><td>1～32,767; over the range will be regarded as 1.</td><td>1</td><td>Pulse</td></tr>
<tr><td>113,112</td><td>Preset Value of Home Position</td><td>Convert this position to the unit of pulse it must fit 32-bit data</td><td>0</td><td>User-defined</td></tr>
<tr><td>114</td><td>Speed Multiple Ratio</td><td>0.1～3,000.0%; over the range will be regarded as 100.0%.</td><td>1,000</td><td>×0.1%</td></tr>
<tr><td>115</td><td>Parameter Setting</td><td>b1,b0=Operating unit
<table>
<tr><th rowspan="2">b1</th><th rowspan="2">b0</th><th rowspan="2">Item</th><th colspan="2">Unit</th></tr>
<tr><th>Position</th><th>Speed</th></tr>
<tr><td>0</td><td>0</td><td>Motor system</td><td>Pulse</td><td>Hz</td></tr>
<tr><td>0</td><td>1</td><td>Machine system</td><td rowspan="2">• μm
• mdeg
• 10^{-4}inch</td><td>• cm/min
• 10 deg/min
• inch/min</td></tr>
<tr><td>1</td><td>X</td><td>Combined system</td><td>Hz</td></tr>
</table>
b3,b2=Multiple rate of position data
b3b2=00:X1
b3b2=01:X10
b3b2=10:X100
b3b2=11:X1,000
b4=Rotational direction
b4=0: Increase present value when forward;
b4=1: Increase present value when backward
b5=Home return direction
b5=0: By the direction of present value decreasing;
b5=1: By the direction of present value increasing
b8～b6=Home return mode
<table>
<tr><th>b8</th><th>b7</th><th>b6</th><th>Home return mode</th></tr>
<tr><td>0</td><td>0</td><td>0</td><td>DOG Rear End home positioning</td></tr>
<tr><td>0</td><td>0</td><td>1</td><td>DOG Front End home positioning</td></tr>
<tr><td>0</td><td>1</td><td>0</td><td>DOG Rear End with PG0 count home positioning</td></tr>
<tr><td>0</td><td>1</td><td>1</td><td>DOG Front End with PG0 count home positioning</td></tr>
<tr><td>1</td><td>X</td><td>X</td><td>Data-set type home return</td></tr>
</table>
b9=STR input type b9=0: N/O contact; b9=1: N/C contact
b10=DOG input type b10=0: N/O contact; b10=1: N/C contact
b11=PG0 input type b11=0: N/O contact; b11=1: N/C contact
b12=INT input type b12=0: N/O contact; b12=1: N/C contact</td><td>H0000</td><td>—</td></tr>
<tr><td>117,116</td><td>Pulse Per Revolution of Motor</td><td>1～999,999; over the range will be regarded as 2,000.</td><td>2,000</td><td>Pulse</td></tr>
<tr><td>119,118</td><td>Distance Per Rev. of Motor</td><td>1～999,999; over the range will be regarded as 2,000.</td><td>2,000</td><td>User-defined</td></tr>
<tr><td>121,120</td><td>Target Position #1</td><td>Convert this position to the unit of pulse it must fit 32-bit data</td><td>0</td><td>User-defined</td></tr>
<tr><td>123,122</td><td>Operation Speed #1</td><td>Convert for the real pulse output it must between 1～200kHz
(For the PLSV, the +/– sign of speed is forward/reverse control)</td><td>200,000</td><td>User-defined</td></tr>
<tr><td>125,124</td><td>Target Position #2</td><td>Convert this position to the unit of pulse it must fit 32-bit data</td><td>0</td><td>User-defined</td></tr>
<tr><td>127,126</td><td>Operation Speed #2</td><td>Convert for the real pulse output it must between 1～200kHz</td><td>50,000</td><td>User-defined</td></tr>
</table>

BFM #	Title	Component Description	Default Value	Unit
128	System Command	b0=Error reset, will reset at the rising edge b1=Stop, will gradually slow down and then stop b2=LSF forward limit switch, level detection b3=LSR reverse limit switch, level detection b4=Absolute/Relative positioning b4=0: Absolute positioning; b4=1: Relative positioning b5=Start command, will begin at the rising edge b6=Speed change signal of the DV2I positioning	H0000	—
129	Operation Command	b0=ZRN Home Positioning (Zero Return) b1=JOGF, Jog Forward b2=JOGR, Jog Reverse b3=DRV, Drive to Set Position b4=DRV2, Drive to Set Position by 2 Stages b5=DVIT, Interrupt Constant Quantity Positioning b6=DV2I, 2 Stages Interrupt Constant Quantity Positioning b7=DVS, Interrupt to Stop or Drive to Set Position b8=PLSV, Variable Speed Pulse Output b9=MPG, Handwheel Positioning b10=LI, Linear Interpolation Positioning	H0000	—
■ 131,130	Current Speed	32-bit data	0	User-defined
133,132	Current Location	32-bit data	0	User-defined
135,134	Current Location	32-bit data For input the servo's position, the data is read from the Main Unit's ABS instruction.	0	Pulse
■ 136	Status Information	b0=READY/BUSY 0:READY for a new instruction; 1:BUSY b1=Moving forward b2=Moving backward b3=The home positioning completed flag b4=The Current Location at the BFM#133, 132 is exceeded b5=The error flag. Also, the BFM#137 shows the error code. b6=The positioning completed flag	H0000	—
■ 137	Error Code	K0=No error K□□□ 1=Setting value is exceeded □□□ shows the number of incorrect BFM K□□□ 2=Setting value is overflow □□□ shows the number of incorrect BFM K3=More than one operation command is given K4=The LSF or LSR is activated at its watching operation Use the JOGF, JOGR or MPG instruction could relieve the limit switch and clear this error code.	0	—

BFM #	Title	Component Description		Default Value	Unit
150	Linear Interpolation's Composite Initial Speed	Convert for the real pulse output it must between 0~30kHz; over the range will be regarded as 0.		0	User-defined
152,151	Linear Interpolation's Composite Operating Speed	Convert for the real pulse output it must between 10~200kHz; over the range will be regarded as 200kHz.		200,000	User-defined
153	Linear Interpolation's Acceleration/Deceleration Time	0~32,000ms If < 0, will be regarded as 0; if > 32,000, will as 32,000.		100	ms
155,154	Linear Interpolation's Target of X-axis	Convert this position to the unit of pulse it must fit 32-bit data		0	User-defined
157,156	Linear Interpolation's Target of Y-axis	Convert this position to the unit of pulse it must fit 32-bit data		0	User-defined
■ 158	Linear Interpolation's X-axis Bias Speed	16-bit data	Result storage area, those are produced by the interpolation instruction	0	User-defined
■ 160,159	Linear Interpolation's X-axis Operating Speed	32-bit data		0	User-defined
■ 161	Linear Interpolation's Y-axis Bias Speed	16-bit data		0	User-defined
■ 163,162	Linear Interpolation's Y-axis Operating Speed	32-bit data		0	User-defined

Since the operational definitions of each axis at this module are the same, at the list below only shows the BFMs of PG1. However, all the PG2 related BFMs are 2□□ (2 at the hundreds digit), all the PG3 related BFMs are 3□□(3 at the hundreds digit) and all the PG4 related BFMs are 4□□ (4 at the hundreds digit).



BFM #101, 100 Maximum Speed

As shown in the diagram, this value confines the highest limit of the positioning control speed at a certain axis. If its operation speed exceeds the limit of the maximum speed during the action of any positioning control instruction, the instruction will be operated according to the maximum speed.
The highest output frequency of this module is 200 kHz. The acceptable value range is from 1 to 200 k (Hz).
Any value less than 1 or more than 200 k is regarded as 200 kHz. The default value is 200 kHz.

BFM #102 Bias Speed

As shown in the diagram, this value confines the lowest limit of the positioning control speed at a certain axis. If its operation speed is less than the bias speed during the action of any positioning control instruction, the instruction will be operated according to the bias speed. The main purpose is to avoid the low-frequency resonance area of a step motor. Thus, it is usually set to be 0 for a servo motor.
The acceptable value range is from 0 to 30 k (Hz). Any value less than 0 or more than 30 k is regarded as 0 Hz.
The default value is 0 Hz.

BFM #103 Acceleration Time

As shown in the diagram, the acceleration time refers to the time it takes for speeding up from the bias speed to the maximum speed (not the operating speed).
The acceptable value range is from 0 to 32,000 (ms). Any value less than 0 is regarded as 0 ms; more than 32,000 is regarded as 32,000 ms. The default value is 100 ms.

BFM #104 Deceleration Time

As shown in the diagram, the deceleration time refers to the time it takes for slowing down from the maximum speed (not the operating speed) to the bias speed.
The acceptable value range is from 0 to 32,000 (ms). Any value less than 0 is regarded as 0 ms; more than 32,000 is regarded as 32,000 ms. The default value is 100 ms.

BFM #106, 105 JOG Operating Speed

When the JOGF or JOGR instruction is activated, it will use this operating speed to generate pulse string, also could change this content value to modify the output speed.
The real operating speed = JOG operating speed (BFM#106, 105) × Speed multiple ratio (BFM#114)

BFM #107 JOG Start Delay Time

When the JOGF or JOGR instruction is activated, a few pulses (just equal to one unit of the position) will be generated at the beginning. Then, after the start delay time is reached, the pulses will be generated continuously.

BFM #109, 108 Home Positioning Speed
BFM #110 Home Positioning Creep Speed

At the beginning of the home return instruction is activated, it will use the faster home positioning speed and the setting of home return direction to drive the motor close to the home point quickly. Then after the near point (DOG) is reached, will slow down to the home return creep speed for the accurately return.
During this instruction is in operation, to change any parameter above will be regarded as invalid. Which is different from other positioning instructions and should pay attention to this.
The real home positioning speed=Home positioning speed (BFM#109, 108)×Speed multiple ratio (BFM#114)
The real home positioning creep speed=Home positioning creep speed (BFM#110)×Speed multiple ratio (BFM#114)

BFM #111 Input Number of PG0 after DOG for the Home Positioning

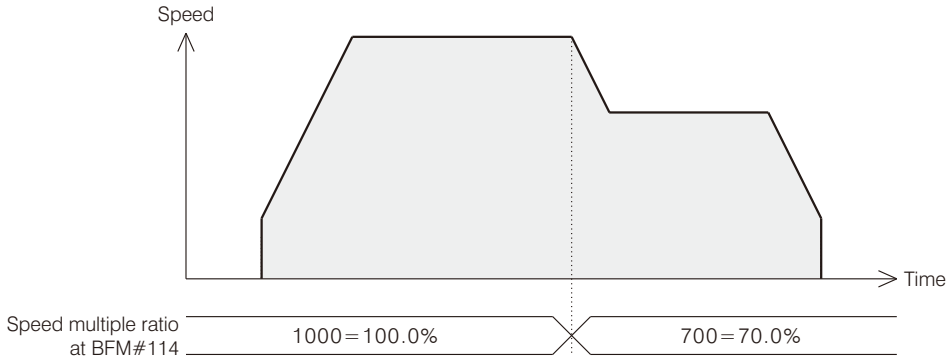
If the “DOG Rear End with PG0 count home positioning” or the “DOG Front End with PG0 count home positioning” return mode is selected, to set up this input number of PG0 after DOG for the home positioning is required.

BFM #113, 112 Preset Value of the Home Position

When the return action is completed, this preset value will be duplicated into the current location (BFM#133, 132).

BFM #114 Speed Multiple Ratio

This ratio can be used to change the real operation speed during the positioning, the default value is 1,000 (100.0%).



It will affect to the reaction about all the JOG operating speed (BFM#106, 105), home positioning speed (BFM#109, 108), home positioning creep speed (BFM#110) and operation speed (BFM#123, 122 and BFM#127, 126). During the home positioning is executed, to change this ratio is useless; but for other positioning functions, this ratio can modify the real operating speed instantly.
The acceptable value range is from 1 to 30,000 (Unit: 0.1%), therefore the speed multiple ratio is 0.1%~3,000.0%.

BFM #117, 116 Pulse Per Revolution of Motor (Pr: Pulse rate)
BFM #119, 118 Distance Per Revolution of Motor (Fr: Feed rate)

If the operating unit (at the BFM#115 b1 & b0) is using the machine system or combined system, the pulse per revolution of motor and the distance per revolution of motor must be set, these two informations are necessary to convert the pulse number and speed of the real output.

BFM #115 Parameter Setting

This parameter includes the setting about the operating unit, multiple rate of position data, rotational direction, home return direction, home return mode and external input type. Below are the descriptions for each item.

- BFM#115 b1 & b0 are to set the operating unit
  The control method of the positioning module is using the high speed pulse string signal to the motor's driver. Therefore, the control fundamental unit of speed is the frequency (Hz) and the unit of position is the number of pulses (PLS).However, to describe the control through the unit of the machine system is more similar to the real application. Thus, the module provides the unit setting function for the user to select then via this unit conversion could let the user finish the control job by familiar unit.

b1	b0	Item	Unit	
			Position	Speed
0	0	Motor system	Pulse	Hz
0	1	Machine system	• μm • mdeg • 10^{-4}inch	• cm/min • 10 deg/min • inch/min
1	X	Combined system		Hz

Unit of the position —— At the positioning control, this unit is related to the preset value of home position (BFM#113, 112), target position (BFM#121, 120 / BFM#125, 124) & current location.

Unit of speed —— At the positioning control, this unit is related to the maximum speed (BFM#101, 100), bias speed (BFM#102), JOG operating speed (BFM#106, 105), home positioning speed (BFM#109, 108), home positioning creep speed (BFM#110), operation speed (BFM#123, 122 / BFM#127, 126) & current speed (BFM#131, 130).

Below is an example of unit conversion, its unit of the position is by (μm) and the speed is by (cm/min).

Assume at this machine, the pulse per revolution of motor Pr=10000 (Pulse/REV) and the distance per revolution of motor Fr=1000 (μm/REV). As a result, Pr / Fr = 10000 (Pulse/REV) ÷ 1000 (μm/REV) =10 (Pulse/μm)
That means, to make this machine move one user-define unit (which is 1 μm) should send out 10 pulses.

Also, to convert the maximum speed by way of the unit of user-defined (cm/min) is using the calculation below.

The maximum speed by the user-defined unit =

$$\text{The maximum speed by frequency} \div Pr \times Fr \div 10^4 \frac{\mu m}{cm} \times 60 \frac{sec}{min}$$

$$= 200 \times 10^3 \frac{Pulse}{sec} \div 10^4 \frac{Pulse}{REV} \times 10^3 \frac{\mu m}{REV} \div 10^4 \frac{\mu m}{cm} \times 60 \frac{sec}{min}$$

$$= 20 \frac{REV}{sec} \times 10^3 \frac{\mu m}{REV} \div 10^4 \frac{\mu m}{cm} \times 60 \frac{sec}{min}$$

$$= 2 \times 10^4 \frac{\mu m}{sec} \div 10^4 \frac{\mu m}{cm} \times 60 \frac{sec}{min} \quad = 2 \frac{cm}{sec} \times 60 \frac{sec}{min} = 120 \frac{cm}{min}$$

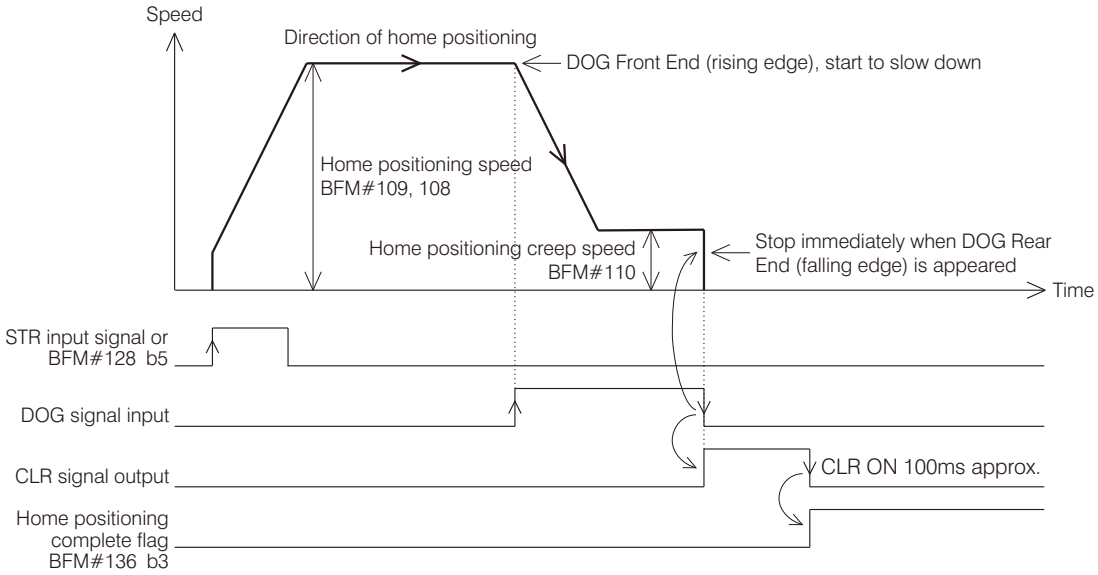
- BFM#115 b3 & b2 are to set multiple rate of position data
  All the data about the preset value of home position (BFM#113, 112), target position #1 (BFM#123, 122), target position #2 (BFM#125, 124) and current location (BFM#133, 132) will be multiplied by this rate.

- BFM#115 b4 is to set the rotational direction
  Users can select the direction control pattern: “Increase present value when forward” or “Increase present value when backward”. That will affect to the direction output of the positioning control. The default is “Increase present value when forward”.
  If the “Increase present value when forward” is selected and the positioning instruction decides to increase its present value, then the direction control point will turn “ON” to drive the motor moving forward.
  If the “Increase present value when backward” is selected and the positioning instruction decides to increase its present value, then the direction control point will turn “OFF” to drive the motor moving backward.

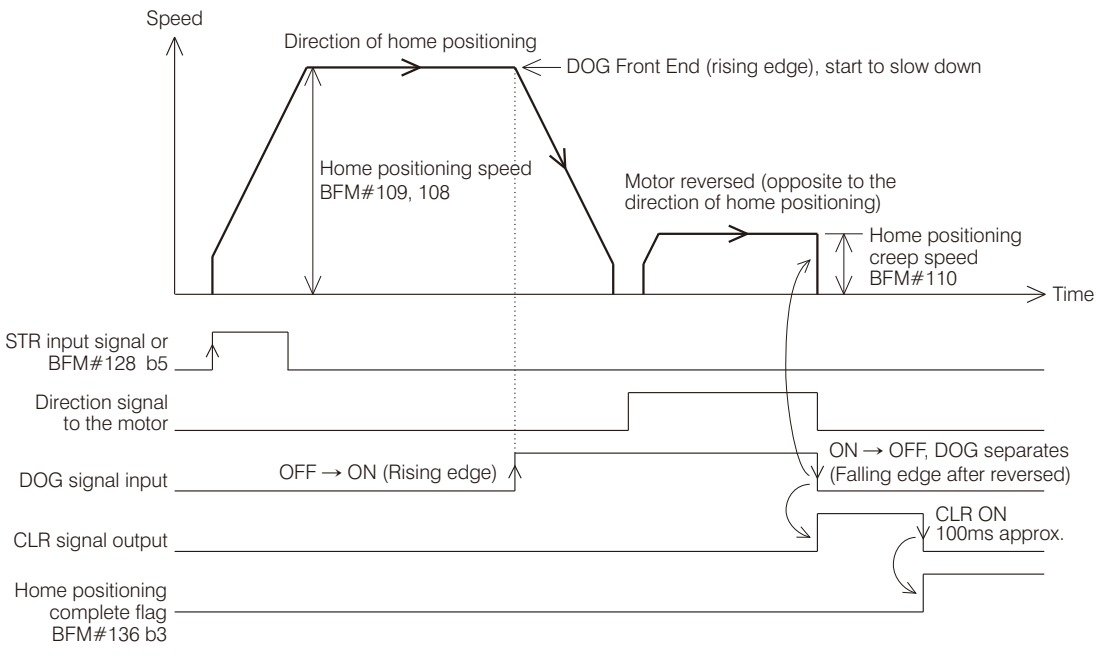
- BFM#115 b8~b6 are to set home return mode
  This module provides a variety of return modes when the home positioning is used, which will be explained one by one below.

b8	b7	b6	**Home Return Mode**
0	0	0	DOG Rear End home positioning
0	0	1	DOG Front End home positioning
0	1	0	DOG Rear End with PG0 count home positioning
0	1	1	DOG Front End with PG0 count home positioning
1	X	X	Data-set type home return

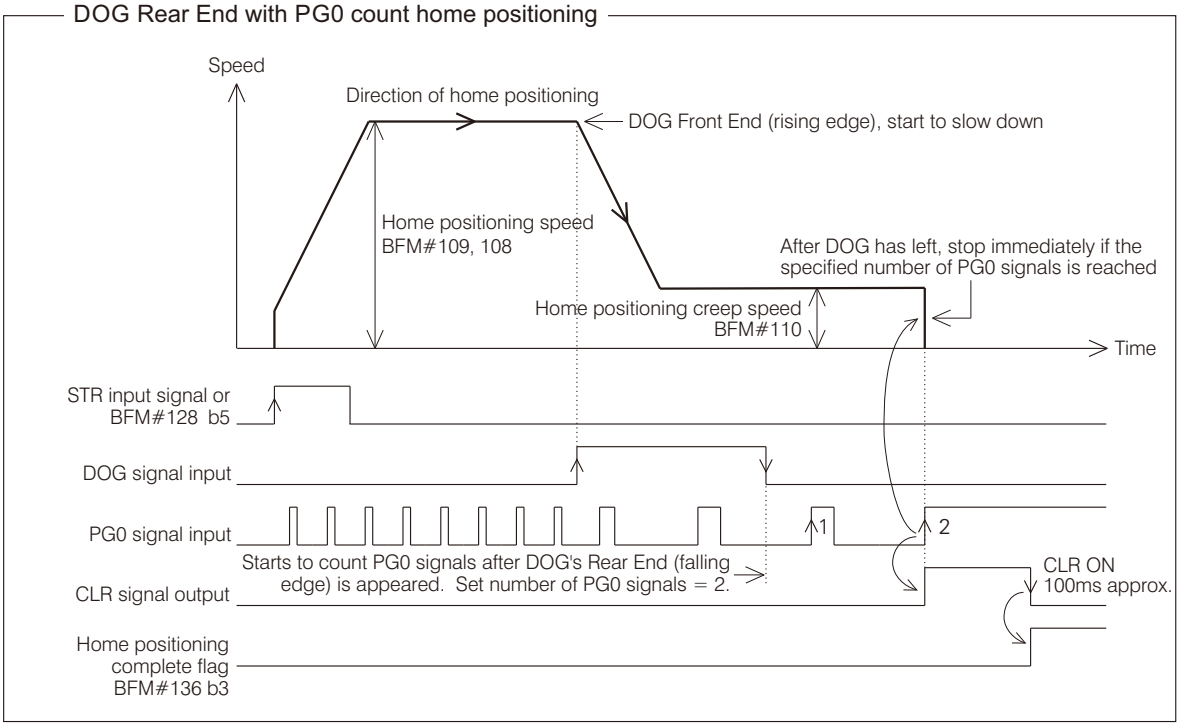
DOG Rear End home positioning



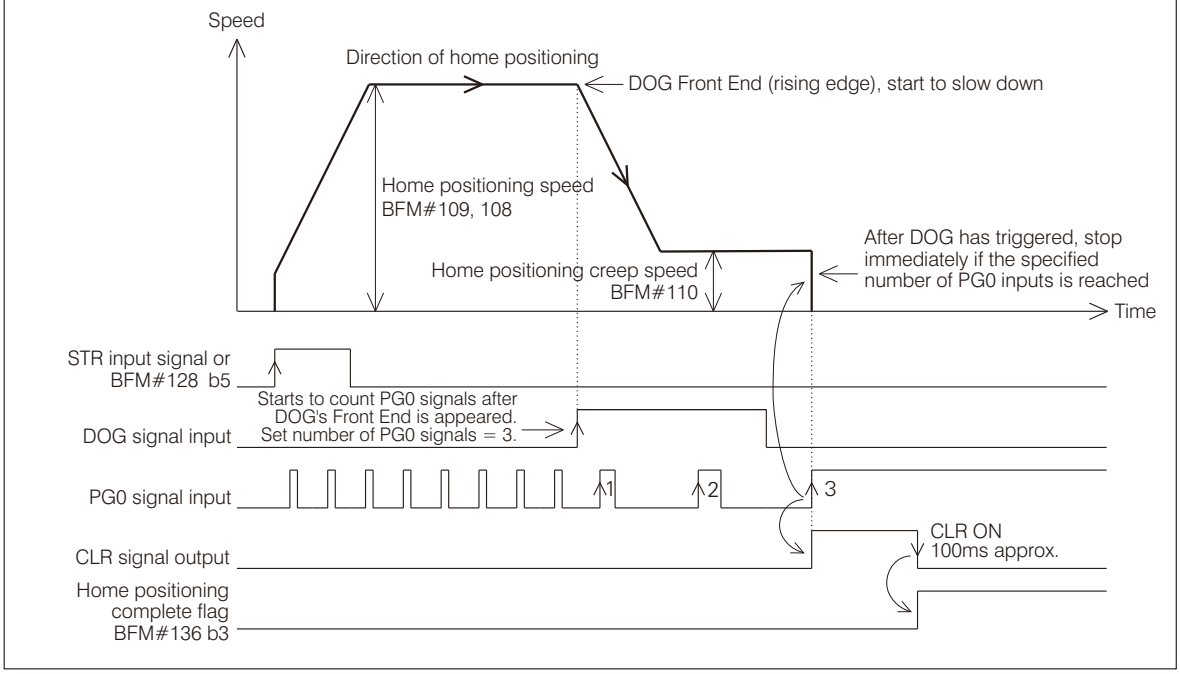
DOG Front End home positioning



DOG Rear End with PG0 count home positioning



DOG Front End with PG0 count home positioning

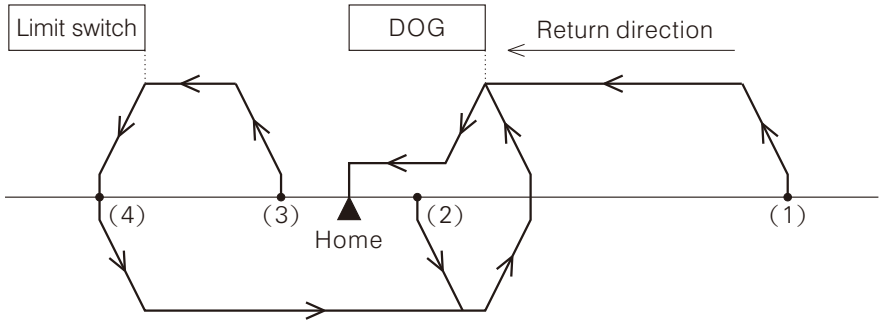


Data-set type home return

This mode will not generate pulse to control the motor. When the function is operated, it will load the preset value of the home position at BFM#113, 112 into the current position at BFM#133, 132 then turn the CLR signal “ON” about 100ms and set the home positioning complete flag BFM#136 b3 “ON”.

Dog search home positioning

When the positioning system has installed with limit switches to provide the limiter signals for the module, that will provide the automatic DOG search capability for the home positioning. (the examples are using the DOG Rear End home positioning)



The diagram above illustrates the different actions from the starting points (1)~(4) to complete the home positioning.

(1) At the starting point, which DOG is located on the right of the DOG switch:
The home positioning is moving the sliding table by the home positioning speed and the direction of home positioning.
Until the Front End of the DOG is reached, the speed decreases to the creep speed, then to finish the home positioning.

(2) At the starting point, which DOG is driving the DOG switch “ON”:
The home positioning at the beginning moves the sliding table by the home positioning speed and the opposite direction of home positioning for to make the Front End of the DOG separate (the signal turns from “ON” to “OFF”) then it will slow down and then stop. Next, it moves the table by the home positioning speed and the direction of home positioning.
Until the Front End of the DOG is reached, the speed decreases to the creep speed, then to finish the home positioning.

(3) At the starting point, which DOG is located on the left of the DOG switch:
The home positioning moves the sliding table by the home positioning speed and the direction of home positioning.
When the limit switch is reached, it will slow down and then stop. Next, moves the sliding table by the home positioning speed and the opposite direction of home positioning for to search the DOG. When the Front End of the DOG is separated (the signal turns from “ON” to “OFF”), it will slow down and then stop. Furthermore, it uses the home positioning speed and the direction of home positioning to move the table again. Until the Front End of the DOG is reached, the speed decreases to the creep speed, then to finish the home positioning.

(4) At the starting point, which DOG is driving the limit switch “ON”:
The home positioning moves the sliding table by the home positioning speed and the opposite direction of home positioning for to search the DOG. When the Front End of the DOG is separated (the signal turns from “ON” to “OFF”), it will slow down and then stop. Furthermore, it uses the home positioning speed and the direction of home positioning to move the table again. Until the Front End of the DOG is reached, the speed decreases to the creep speed, then to finish the home positioning.

BFM #121, 120 Target Position #1
BFM #125, 124 Target Position #2

When the DRV (drive to set position, BFM#129 b3), DRV2 (drive to set position by 2 stages, BFM#129 b4), DVIT (interrupt constant quantity positioning, BFM#129 b5), DV2I (2 stages interrupt constant quantity positioning, BFM#129 b6) or DVS (interrupt to stop or drive to set position, BFM#129 b7) instruction is activated, that will use the target position(s) to control the movement. During the instruction is in operation, to change the target will be regarded as invalid.

If it is appointed to the absolute positioning (BFM#128 b4=0),

The real distance to be moved = |Target position−Current location (BFM#133, 132)| × Multiple rate of position data

If it is appointed to the relative positioning (BFM#128 b4=1),
The real distance to be moved = Target position × Multiple rate of position data

※ The multiple rate of position data is determined by the BFM#115 b2 and b3.

BFM #123, 122 Operation Speed #1
BFM #127, 126 Operation Speed #2

When the DRV (drive to set position, BFM#129 b3), DRV2 (drive to set position by 2 stages, BFM#129 b4), DVIT (interrupt constant quantity positioning, BFM#129 b5), DV2I (2 stages interrupt constant quantity positioning, BFM#129 b6), DVS (interrupt to stop or drive to set position, BFM#129 b7) or PLSV (variable speed pulse output, BFM#129 b8) instruction is activated, that will use the operation speed(s) to control the movement. During the instruction is in operation, to change this setting could modify the real output speed.

The real operating speed = Operation speed × Speed multiple ratio (BFM#114)

BFM #128 System Command

This system command includes the error reset, stop command, LSF forward limit switch, LSR reverse limit switch, absolute or relative positioning, start command and speed change signal.

- BFM#128 b0 is the command to reset the error
  When a positioning error occurs, to drive the BFM#128 b0 from OFF to ON could reset the error code and flag.

- BFM#128 b1 is the command to stop the pulse output
  When the BFM#128 b1 is ON, the pulse output will gradually slow down then stop. This stop command is effective to any operation.

- BFM#128 b2 is the LSF forward limit switch signal for the module
  When the LSF limit switch is active, it will limit the forward action to slow down and stop. Furthermore, any new forward operation will be ignored.
  At this moment, only the JOGR or the MPG's reverse movement can be used to release the switch.

- BFM#128 b3 is the LSR reverse limit switch signal for the module
  When the LSR limit switch is active, it will limit the reverse action to slow down and stop. Furthermore, any new reverse operation will be ignored.
  At this moment, only the JOGF or the MPG's forward movement can be used to release the switch.

- BFM#128 b4 is the selective bit for the absolute or relative positioning
  Before a positioning operation starts, should use this bit to appoint that is by the absolute positioning (b4=0) or relative positioning (b4=1).

  The real move distance at the absolute positioning =
  |Target position−Current location (BFM#133, 132)| ×Multiple rate of position data
  The real move distance at the relative positioning = Target position × Multiple rate of position data
  ※ The multiple rate of position data is determined by the BFM#115 b2 and b3.

- BFM#128 b5 is the positioning start command
  After an operation command is selected at the BFM129, should trigger this start command bit from OFF to ON (or use the STR input) then the positioning will start.
  However, the JOGF, JOGR, PLSV or MPG function just need to turn ON its related operation command bit, not necessary to trigger this start command.

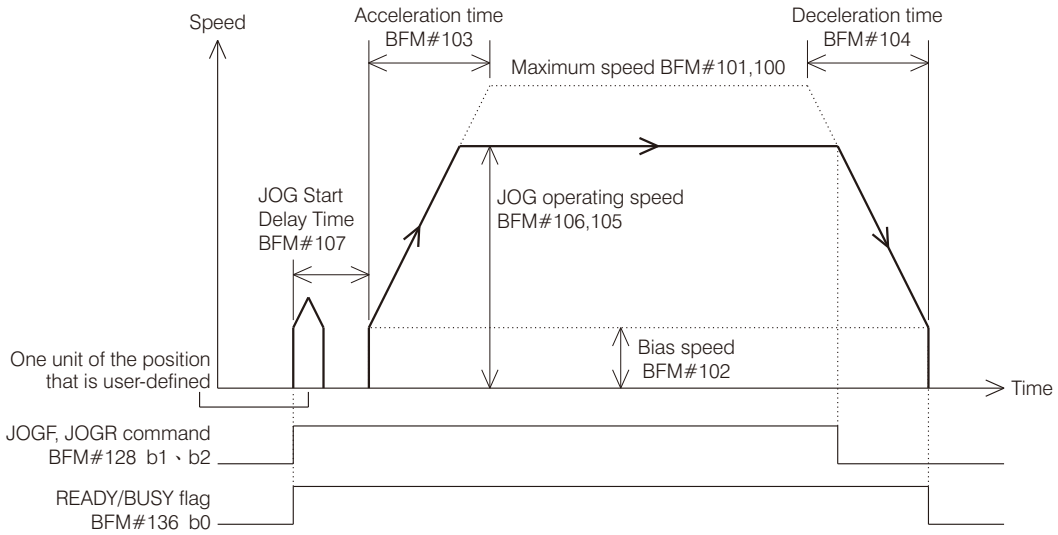
- BFM#128 b6 is the speed change signal of the DV2I positioning
  When the DV2I positioning is started and this BFM#128 b6 turns from OFF to ON, its operation speed will change from #1 to #2.

BFM#129 Operation Command

This module provides various positioning functions, below are the descriptions for each function. However, for each axis, only one function can be used at the same time, otherwise that will cause an operational error.

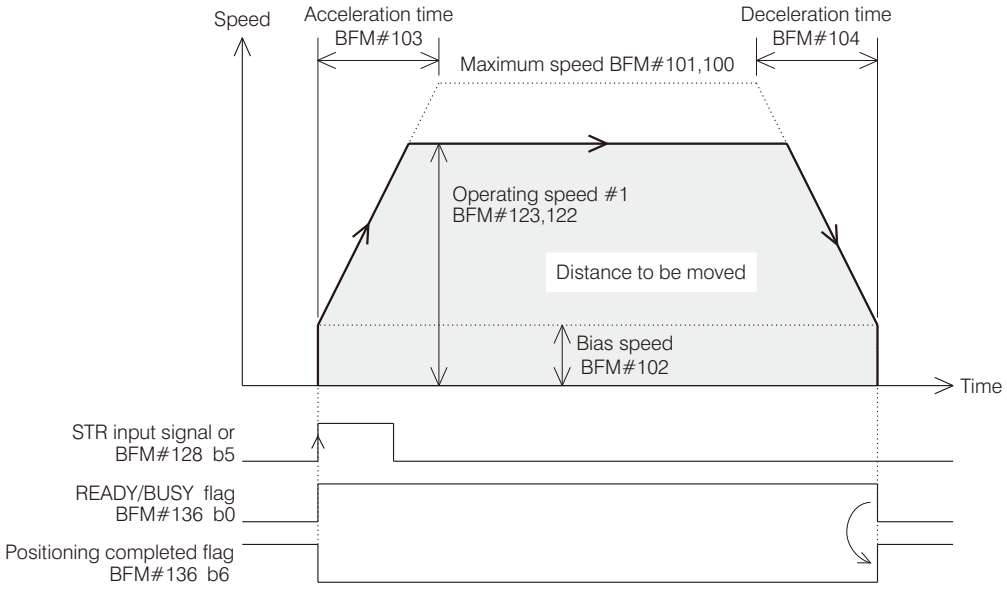
- BFM#129 b0 is the command of ZRN (home positioning, zero return)
  To execute the home return function, the return mode at BFM#115 b8~b6 should be allocated before this function starts. Then, turn the operation command BFM#129 b0 ON to choose the function. At last, trigger the start signal from OFF to ON.
  This module provides 5 different home return modes, please refer to the previous pages about the BFM#115 b8~b6.

• BFM#129 b1 is the command of JOGF (jog forward)
BFM#129 b2 is the command of JOGR (jog reverse)



When the axis is for to use the JOGF (BFM#129 b1 = ON) or JOGR (BFM#129 b2 = ON) function, its output pulse string will be executed as above. During the operation, could change the value of BFM#106, 105 or BFM#114 to modify the real operating speed.
If the period of this command ON is less than the start delay time at BFM#107 or the time needed for one unit of the position, the axis will generate the particular number of pulses that is equal to one unit of the position.
If the period of this command ON is longer than the start delay time at BFM#107, as the diagram above shows, it will generate the particular number of pulses that is equal to one unit of the position first. After the start delay time is reached, it begins to generate pulses continually.
The JOGF function could manage the direction and generate pulses to control the motor moving forward.
The JOGR function could manage the direction and generate pulses to control the motor moving reverse.

• BFM#129 b3 is the command of DRV (single-speed positioning, drive to set position)

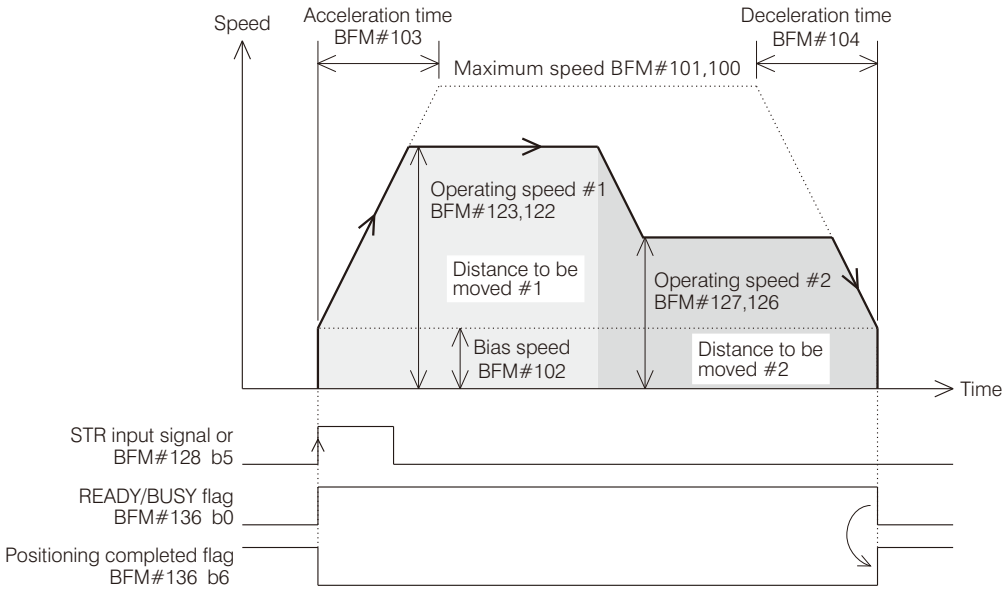


When the axis is for to use the DRV (BFM#129 b3 = ON) function and the start signal is turned from OFF to ON, its output pulse string will be executed as above.

If it is appointed to the absolute positioning (BFM#128 b4=0),
Distance to be moved = |Target position #1 (BFM#121, 120)− Current location (BFM#133, 132) at start|

If it is appointed to the relative positioning (BFM#128 b4=1),
Distance to be moved = Target position #1 (BFM#121, 120)

• BFM#129 b4 is the command of DRV2 (drive to set position by 2 stages)



When the axis is for to use the DRV2 (BFM#129 b4 = ON) function and the start signal is turned from OFF to ON, its output pulse string will be executed as above.

If it is appointed to the absolute positioning (BFM#128 b4=0),

Distance to be moved #1 = |Target position #1 (BFM#121, 120) − Current location (BFM#133, 132) at start|

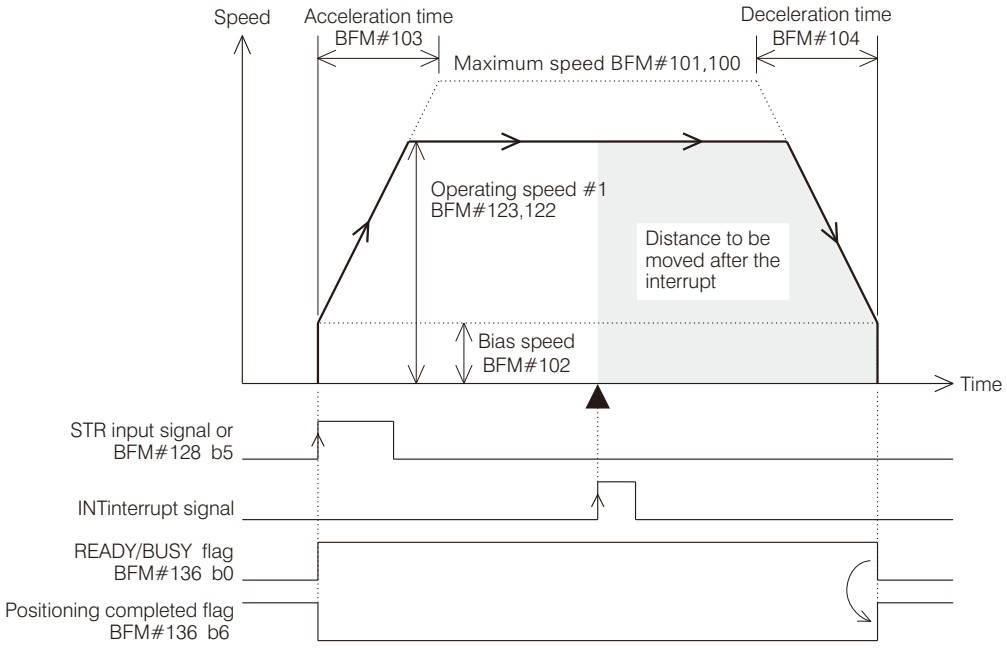
Distance to be moved #2 = |Target position #2 (BFM#125, 124) − Target position #1 (BFM#121, 120)|

If it is appointed to the relative positioning (BFM#128 b4=1),

Distance to be moved #1 = Target position #1 (BFM#121, 120)

Distance to be moved #2 = Target position #2 (BFM#125, 124)

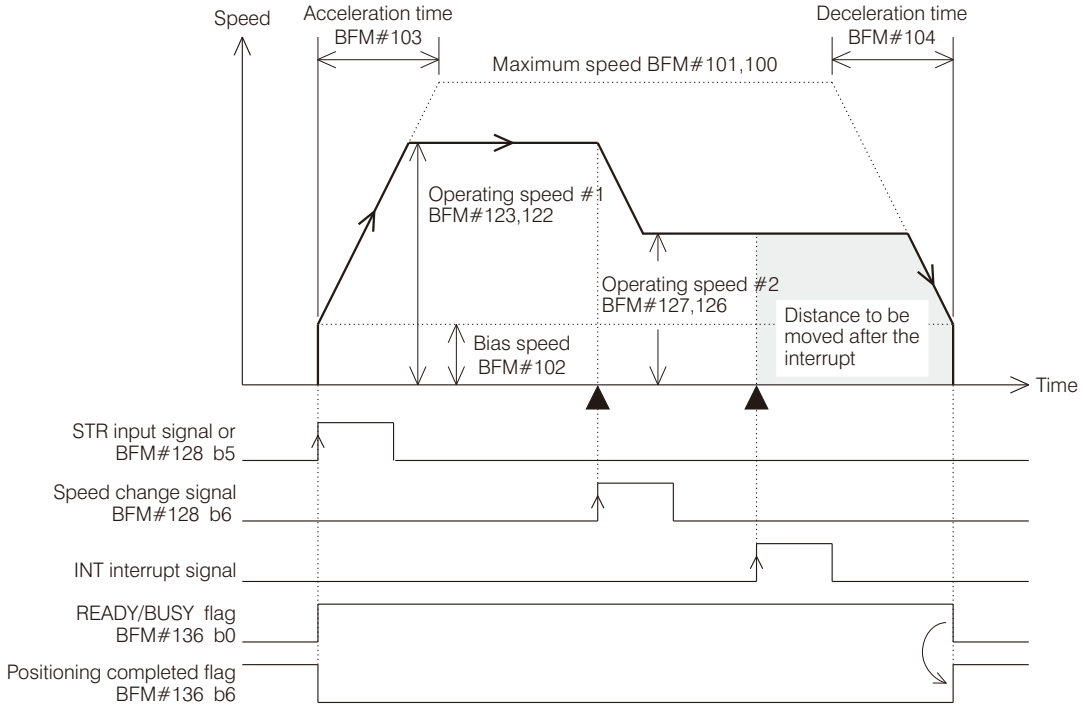
• BFM#129 b5 is the command of DVIT (interrupt constant quantity positioning)



When the axis is for to use the DVIT (BFM#129 b5 = ON) function and the start signal is turned from OFF to ON, its output pulse string will be executed as above.

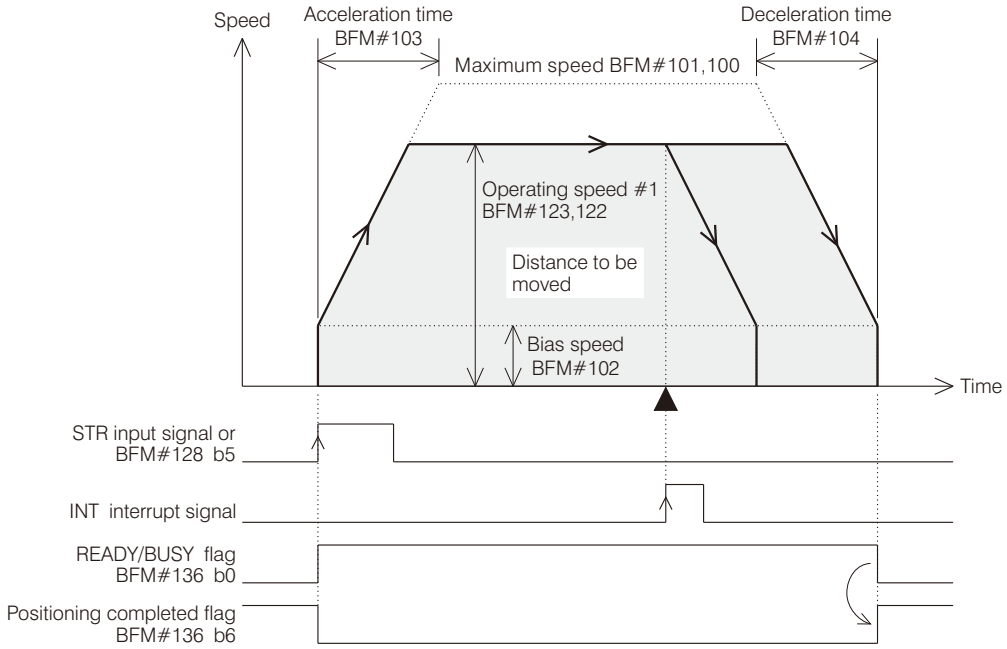
Distance to be moved after the interrupt = Target position #1 (BFM#121, 120)

• BFM#129 b6 is the command of DV2I (2 stages interrupt constant quantity positioning)



When the axis is for to use the DV2I (BFM#129 b6 = ON) function and the start signal is turned from OFF to ON, its output pulse string will be executed as above.
Distance to be moved after the interrupt = Target position #1 (BFM#121, 120)

• BFM#129 b7 is the command of DVS (interrupt to stop or drive to set position)

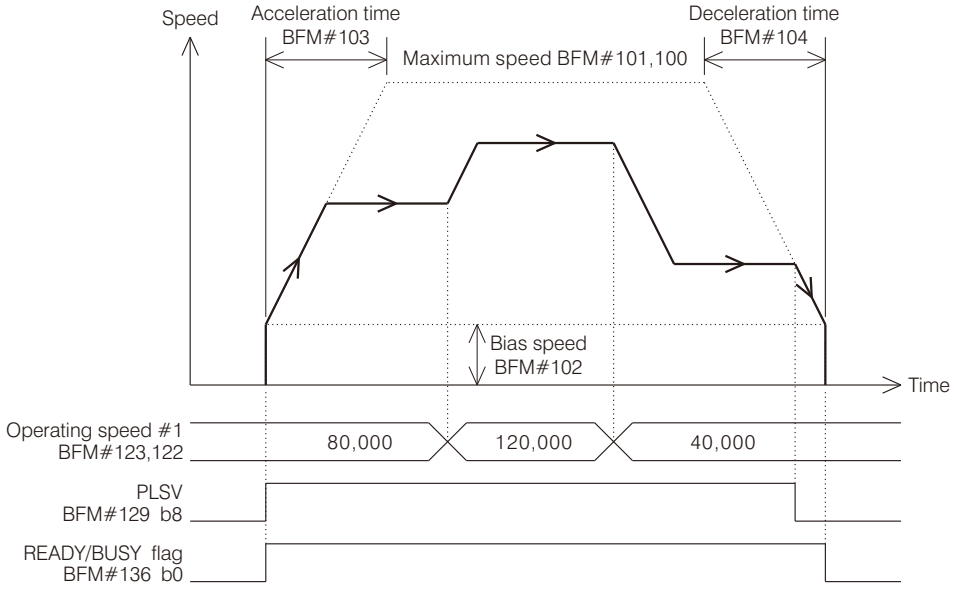


When the axis is for to use the DVS (BFM#129 b7 = ON) function and the start signal is turned from OFF to ON, its output pulse string will be executed as above.
However, the INT interrupt signal is triggered (OFF → ON) during the axis generating pulses, it will immediately slow down then stop (ignore the original target).

If it is appointed to the absolute positioning (BFM#128 b4=0),
Distance to be moved = |Target position #1 (BFM#121, 120) − Current location (BFM#133, 132) at start|

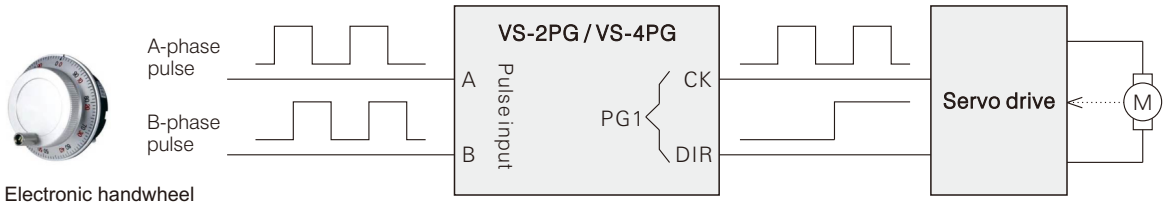
If it is appointed to the relative positioning (BFM#128 b4=1),
Distance to be moved = Target position #1 (BFM#121, 120)

• BFM#129 b8 is the command of PLSV (variable speed pulse output)



When the axis is for to use the PLSV (BFM#129 b8 = ON) function, it will use the value of operating speed #1 (BFM#123, 122) to generate pulses. Give a positive operating speed will have a forward movement; on the other hand, a negative operating speed will move backward.
While the BFM#129 b8 turns OFF, it will slow down then stop. During the operation, could change the value of BFM#123, 122 to modify the operating speed.

• BFM#129 b9 is the command of MPG (handwheel positioning)
The parameters about the MPG function are stored at the BFM#3~5.

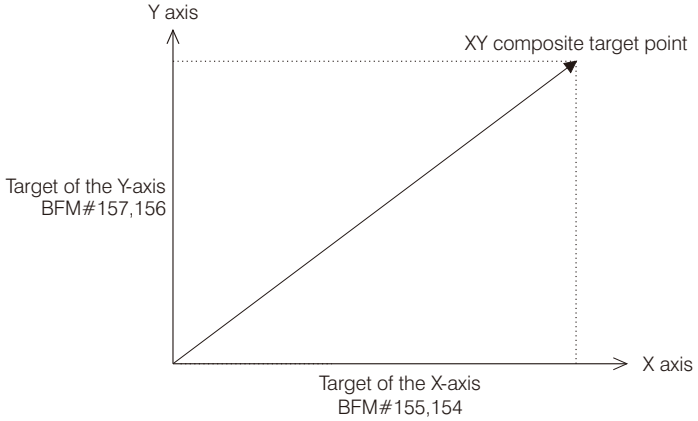


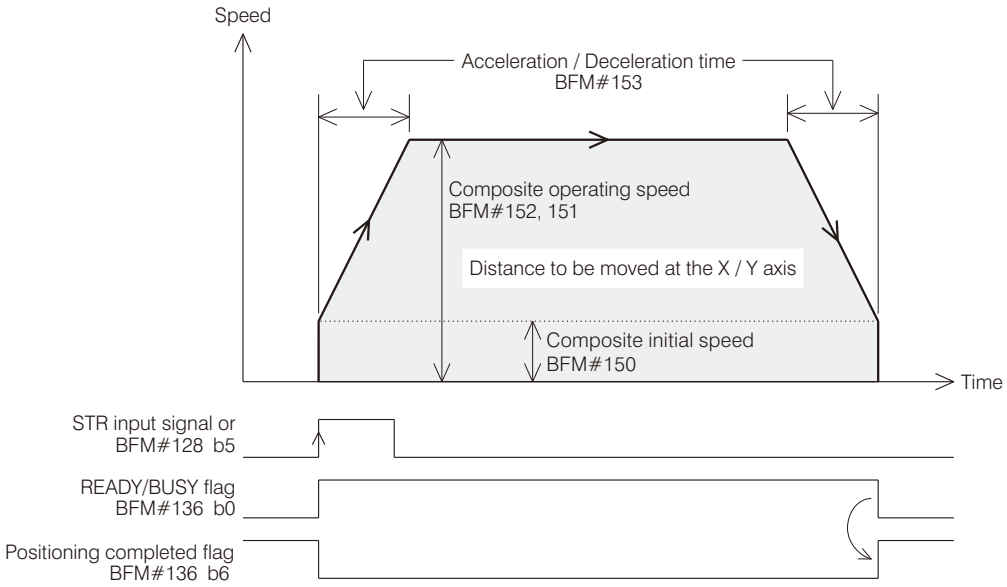
When the axis is for to use the MPG (BFM#129 b9 = ON) function, it is controlled by the input points from the external handwheel.
Above is a electronic handwheel generate the A/B phase pulse signal and connect with the A/B input terminals at the module.
The module will get the speed and quantity from input pulses when the handwheel rotates, then multiply by the electronic gear ratio to generate the proportional pulses.

$$\text{MPG's output pulses} = \text{Input A/B phase pulses} \times \frac{\text{Gear ratio numerator(BFM\#3)}}{\text{Gear ratio denominator(BFM\#4)}}$$

The MPG's response delay time at the BFM#5 is the interval period between the pulses input and output. If this set value is too small, that may cause the mechanical vibration. Usually, the longer delay time will have a smoother move.
If more than one axis use this handwheel function at a same time, those activated axes will follow the handwheel to generate pulses simultaneously.

• BFM#129 b10 is the command of LI (linear interpolation positioning)
The linear interpolation positioning function will combine the PG1 (X axis) and PG2 (Y axis) together to complete it.
The parameters are using the BFM#150~BFM#163.





When the paired axes are for to use the LI (BFM#129 b10 = ON) function and the start signal is turned from OFF to ON, their output pulse strings will be executed as above.

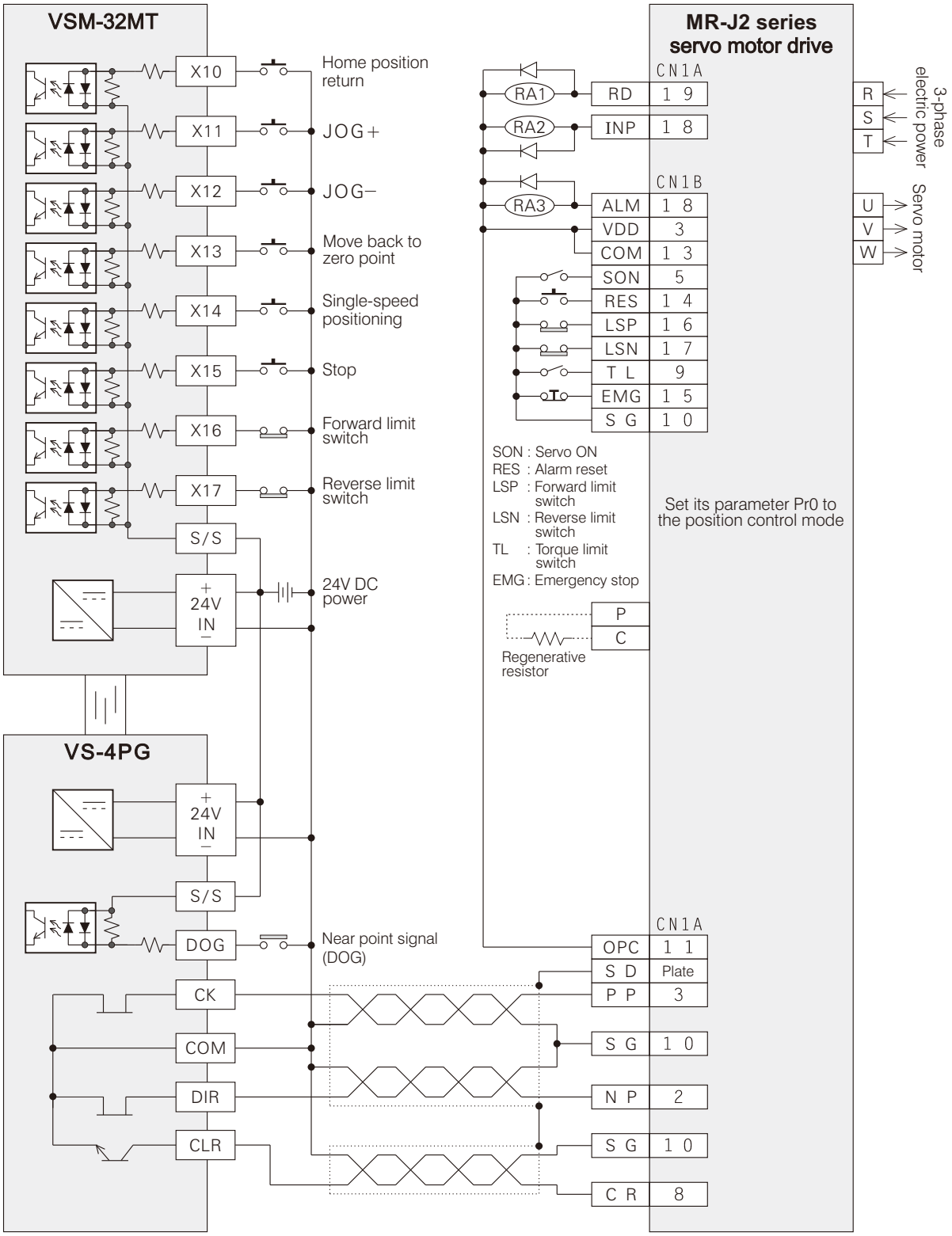
If it is appointed to the absolute positioning (BFM#128 b4=0),

Distance to be moved at the X / Y axis = |Target of the X / Y axis − Current location of the X / Y axis at start|

If it is appointed to the relative positioning (BFM#128 b4=1),
Distance to be moved at the X / Y axis = Target of the X / Y axis

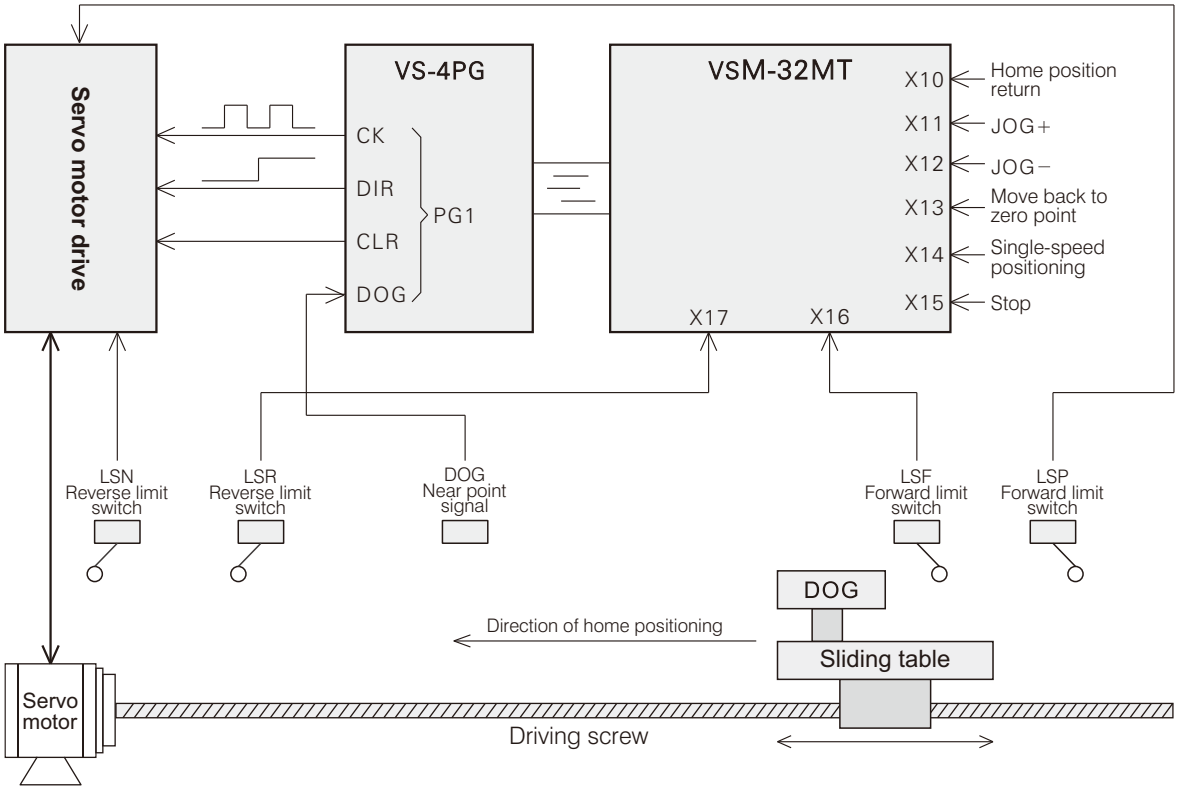
● External Wiring

The wiring example between the VSM Main Unit, VS-4PG Module & Mitsubishi servo drive (MR-J2)



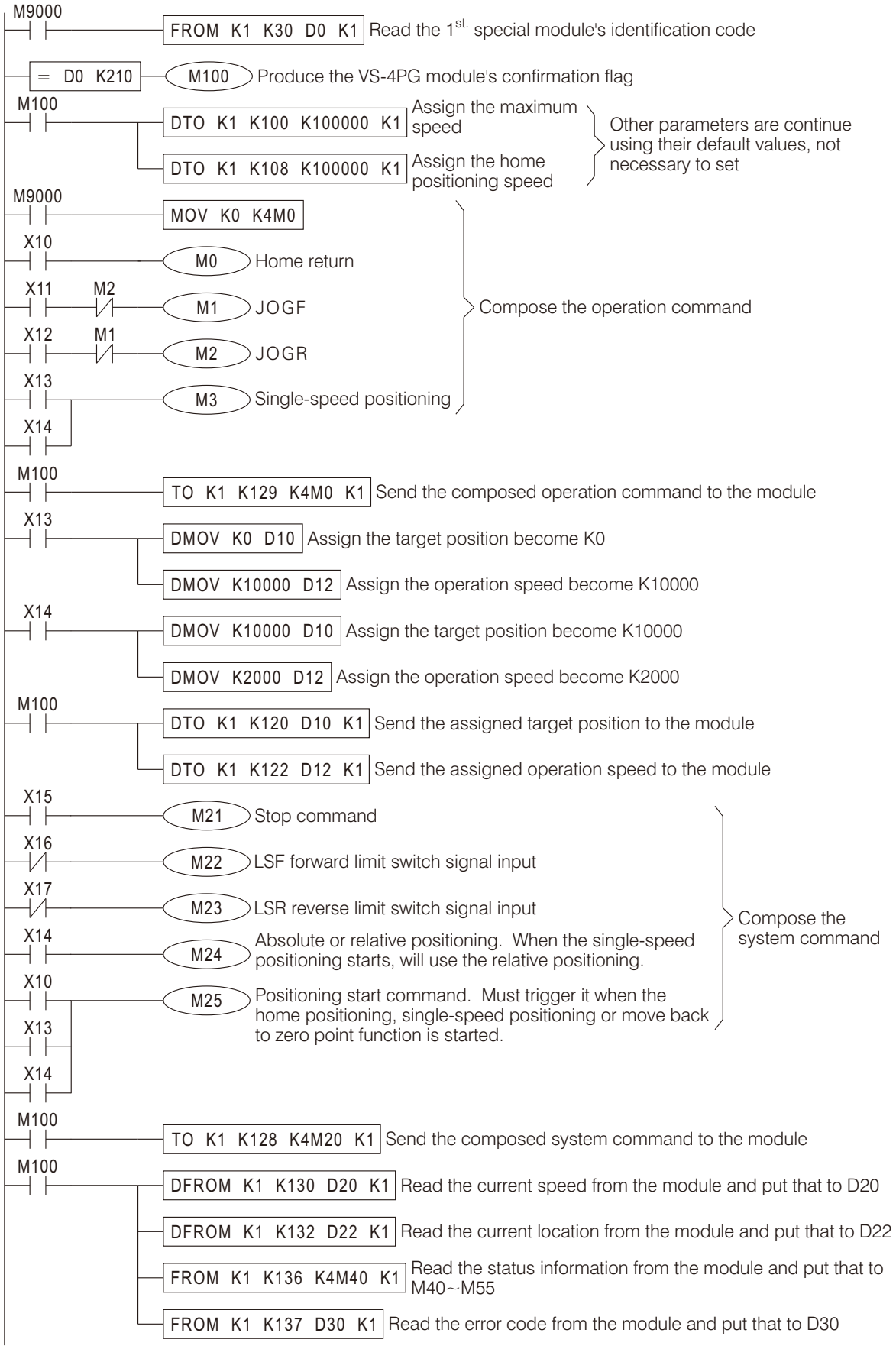
- Example Program

This example carries out the home position return, JOG+, JOG- and single-speed positioning functions. The brief diagram of the system is shown below.



The descriptions of components which are used in the example.

Component	Description
X10	Home position return button
X11	JOG+ button
X12	JOG − button
X13	Move back to zero point button
X14	Single-speed positioning button
X15	Stop button
X16	Forward limit switch (LSF), N/C contact
X17	Reverse limit switch (LSR), N/C contact
M0	ZRN, home return command
M1	JOGF, jog forward command
M2	JOGR, jog reverse command
M3	DRV, single-speed positioning command
M4～M15	Reserved for future use
M20	Reserved for future use
M21	Stop command
M22	LSF forward limit
M23	LSR reverse limit
M24	By the absolute or relative positioning
M25	Positioning start command
M26～M35	Reserved for future use
M40～M55	Status information
D11, D10	Target position
D13, D12	Operation speed
D21, D20	Current speed
D23, D22	Current location
D30	Error code


M9000
FROM K1 K30 D0 K1
Read the 1st. special module's identification code
= D0 K210
M100
Produce the VS-4PG module's confirmation flag
M100
DTO K1 K100 K100000 K1
Assign the maximum speed
DTO K1 K108 K100000 K1
Assign the home positioning speed
Other parameters are continue using their default values, not necessary to set
M9000
MOV K0 K4M0
X10
M0
Home return
X11
M2
M1
JOGF
X12
M1
M2
JOGR
X13
M3
Single-speed positioning
Compose the operation command
X14
M100
TO K1 K129 K4M0 K1
Send the composed operation command to the module
X13
DMOV K0 D10
Assign the target position become K0
DMOV K10000 D12
Assign the operation speed become K10000
X14
DMOV K10000 D10
Assign the target position become K10000
DMOV K2000 D12
Assign the operation speed become K2000
M100
DTO K1 K120 D10 K1
Send the assigned target position to the module
DTO K1 K122 D12 K1
Send the assigned operation speed to the module
X15
M21
Stop command
X16
M22
LSF forward limit switch signal input
X17
M23
LSR reverse limit switch signal input
X14
M24
Absolute or relative positioning. When the single-speed positioning starts, will use the relative positioning.
X10
M25
Positioning start command. Must trigger it when the home positioning, single-speed positioning or move back to zero point function is started.
X13
X14
Compose the system command
M100
TO K1 K128 K4M20 K1
Send the composed system command to the module
M100
DFROM K1 K130 D20 K1
Read the current speed from the module and put that to D20
DFROM K1 K132 D22 K1
Read the current location from the module and put that to D22
FROM K1 K136 K4M40 K1
Read the status information from the module and put that to M40~M55
FROM K1 K137 D30 K1
Read the error code from the module and put that to D30

MEMO

6. Expansion Card

The Expansion Card Sockets are designed for flexible expansions, on the upper side of the VS series PLC. Which are available to install DIO expansion cards to increase a small number of control points in a cost effective way. Also can install the communication port (CP) expansion card to expand communication capabilities for linking with external accessories of communication control. In addition, the special function (SF) expansion card is capable to perform various special controls, such as position inspection, speed control, temperature control, etc. to present a complicated, high-level control system.

In addition, there are two special I/O Extend Sockets in the VS-32XY module for the VS-E8X-EC or VS-E8YT-EC cards (other cards are not allowed), which could reduce the system space. On the other hand, the VS-E8X-EC and VS-E8YT-EC cards are particularly for the VS-32XY Expansion Module only, can not be used at the Main Unit.

The list of Expansion Cards for the VS series PLC

Item	Model Name	Main Specification
DIO Expansion Card	VS-4X-EC	DI Expansion Card: 4 DI (DC 24V); output by screw-clamp terminal
	VS-8X-EC	DI Expansion Card: 8 DI (DC 24V); input by screw-clamp terminal
	VS-4Y★-EC	DO Expansion Card: 4 DO ★; output by screw-clamp terminal
	VS-8YT-EC	DO Expansion Card: 8 DO (DC 24V, 100mA NPN transistor); output by screw-clamp terminal
	VS-4XY★-EC	DIO Expansion Card: 2 DI (DC 24V); 2 DO ★; I/O by screw-clamp terminal
	VS-8XY★-EC	DIO Expansion Card: 4 DI (DC 24V); 4 DO ★; I/O by screw-clamp terminal
	VS-8XI-EC	DI Expansion Card: 8 DI (DC 24V); input by IDC connector
	VS-8YTI-EC	DO Expansion Card: 8 DO (DC 24V, 100mA NPN transistor); output by IDC connector
	VS-E8X-EC	DI Expansion Card for VS-32XY★ module: 8 DI DC 24V, Sink/Source selectable; input by screw-clamp terminal
	VS-E8YT-EC	DO Expansion Card for VS-32XY★ module: 8 DO (DC 24V, 300mA NPN transistor); output by screw-clamp terminal
Comm. Expansion Card	VS-485-EC	RS-485 Communication Expansion Card: One non-isolated RS-485 port with TX / RX indicators; dist. 50m Max.
	VS-485A-EC	RS-485 Communication Expansion Card: One isolated RS-485 port with TX / RX indicators; dist. 1000m Max.
	VS-D485-EC	RS-485 Communication Expansion Card: Dual non-isolated RS-485 ports with TX / RX indicators; dist. 50m Max.
	VS-D485A-EC	RS-485 Communication Expansion Card: Dual isolated RS-485 ports with TX / RX indicators; dist. 1000m Max.
	VS-D232-EC	RS-232C Communication Expansion Card: Dual non-isolated RS-232 ports with TX / RX indicators; dist. 15m Max.; wiring by the RX / TX / SG terminals
	VS-D52A-EC	RS-485 + RS-232C Communication Expansion Card: One isolated RS-485 port (1000m) & one non-isolated RS-232C port (15m), both with TX / RX indicators and wiring by terminals
	VS-ENET-EC	Ethernet + RS-485 Communication Expansion Card: One Ethernet port (with additional non-isolated RS-485, dist. 50m) & one non-isolated RS-485 port (dist. 50m), both with TX / RX indicators
Special Function Card	VS-3AV-EC	Brief Voltage I/O Card: 2 channel (0~10V, 12-bit) inputs; 1 channel (0~10V, 10-bit) output; with a calibrated DC 10V output; non-isolated
	VS-4AD-EC	Analog Input Card: 4 channel (12-bit) inputs, each channel could output either 0~10V, 4~20mA or 0~20mA; non-isolated
	VS-2DA-EC	Analog Output Card: 2 channel (12-bit) outputs, each channel could input either 0~10V, 4~20mA or 0~20mA; non-isolated
	VS-4A-EC	Analog I/O Card: 2 channel (12-bit) inputs + 2 channel (12-bit) outputs, each channel could input/output either 0~10V, 4~20mA or 0~20mA; non-isolated
	VS-3ISC-EC	Inverter Speed Control Card: 3 channel (0.1% resolution) voltage outputs; totally isolated for each channel
	VS-2TC-EC	Thermocouple Temperature Input Card: 2 channel (K, J, R, S, T, E, B or N type thermocouple, 0.2~0.3℃ resolution) inputs; non-isolated
	VS-4TC-EC	Thermocouple Temperature Input Card: 4 channel (K, J, R, S, T, E, B or N type thermocouple, 0.2~0.3℃ resolution) inputs; non-isolated
	VS-1PT-EC	PT-100 Temperature Input Card: 1 channel (3-wire PT-100, 0.1℃ resolution) input; non-isolated
	VS-2PT-EC	PT-100 Temperature Input Card: 2 channel (3-wire PT-100, 0.1℃ resolution) inputs; non-isolated

★ Selectable output:

R: 2A Relay;

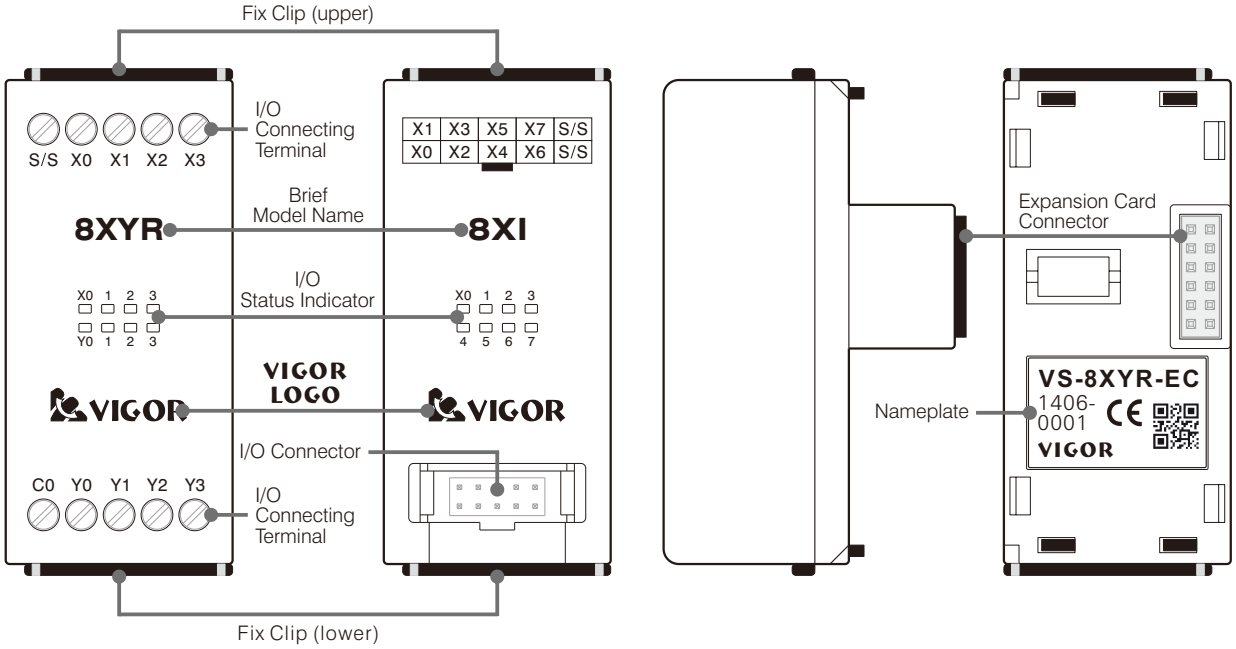
T: 300mA NPN transistor

The VS-8YTI-EC card requires a DC 24V -15% / +20% power input

6-1 Digital Input & Output (DIO) Expansion Card

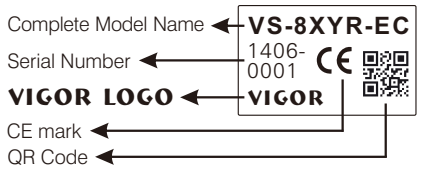
The VS series PLC offers various DIO Expansion Cards ranging from 4 points to 8 points for selection.
Output provides the relay and NPN transistor output types to meet different loads of driving. Also, the wiring type can choose either the terminal block or IDC connector.
For allocated component numbers of I/O points on DIO Expansion Cards, please refer to the section "1-5-2 Expansion Card Socket".

6-1-1 Component Designation

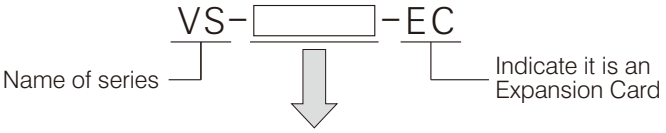


6-1-2 Method of Product Named

- Description of the Nameplate



- Complete Model Name About a Digital I/O Expansion Card



4XYR	2 points DC24V input, 2 points 2A relay output
4XYT	2 points DC24V input, 2 points 0.3A NPN transistor output
4X	4 points DC24V input
4YR	4 points 2A relay output
4YT	4 points 0.3A NPN transistor output
8XYR	4 points DC24V input, 4 points 2A relay output
8XYT	4 points DC24V input, 4 points 0.3A NPN transistor output
8X	8 points DC24V input
8YT	8 points 0.3A NPN transistor output
8XI	8 points DC24V input
8YTI	8 points 0.1A NPN transistor output
E8X	8 points DC24V input; for the VS-32XYR/T/P only
E8YT	8 points 0.3A NPN transistor output; for the VS-32XYR/T/P only

6-1-3 Specification

- Basic Specification

Model Name	Basic Specification
VS-4XYR-EC	2 inputs (DC 24V trigger, Sink / Source selectable); 2 relay (2A) outputs; I/O by screw-clamp terminal
VS-4XYT-EC	2 inputs (DC 24V, Sink / Source selectable); 2 NPN transistor (0.3A) outputs; I/O by screw-clamp terminal
VS-4X-EC	4 inputs (DC 24V trigger, Sink / Source selectable); input by screw-clamp terminal
VS-4YR-EC	4 relay (2A) outputs; output by screw-clamp terminal
VS-4YT-EC	4 NPN transistor (0.3A) outputs; output by screw-clamp terminal
VS-8XYR-EC	4 inputs (DC 24V trigger, Sink / Source selectable); 4 relay (2A) outputs; I/O by screw-clamp terminal
VS-8XYT-EC	4 inputs (DC 24V, Sink / Source selectable); 4 NPN transistor (0.3A) outputs; I/O by screw-clamp terminal
VS-8X-EC	8 inputs (by 2 groups × 4 points, DC 24V trigger, Sink / Source selectable); input by screw-clamp terminal
VS-8YT-EC	8 NPN transistor (by 2 groups × 4 points, 0.3A each) outputs; output by screw-clamp terminal
VS-8XI-EC	8 inputs (DC 24V trigger Sink / Source selectable); input by 10P brief IDC connector
VS-8YTI-EC	8 NPN transistor (0.1A) outputs; output by 10P brief IDC connector; DC 24V power input is required
VS-E8X-EC	8 inputs (by 2 groups × 4 points, DC 24V trigger, Sink / Source selectable); input by screw-clamp terminal; for the VS-32XYR/T/P only
VS-E8YT-EC	8 NPN transistor outputs (by 2 groups × 4 points, 0.3A each); output by screw-clamp terminal; for the VS-32XYR/T/P only

- Input Specification

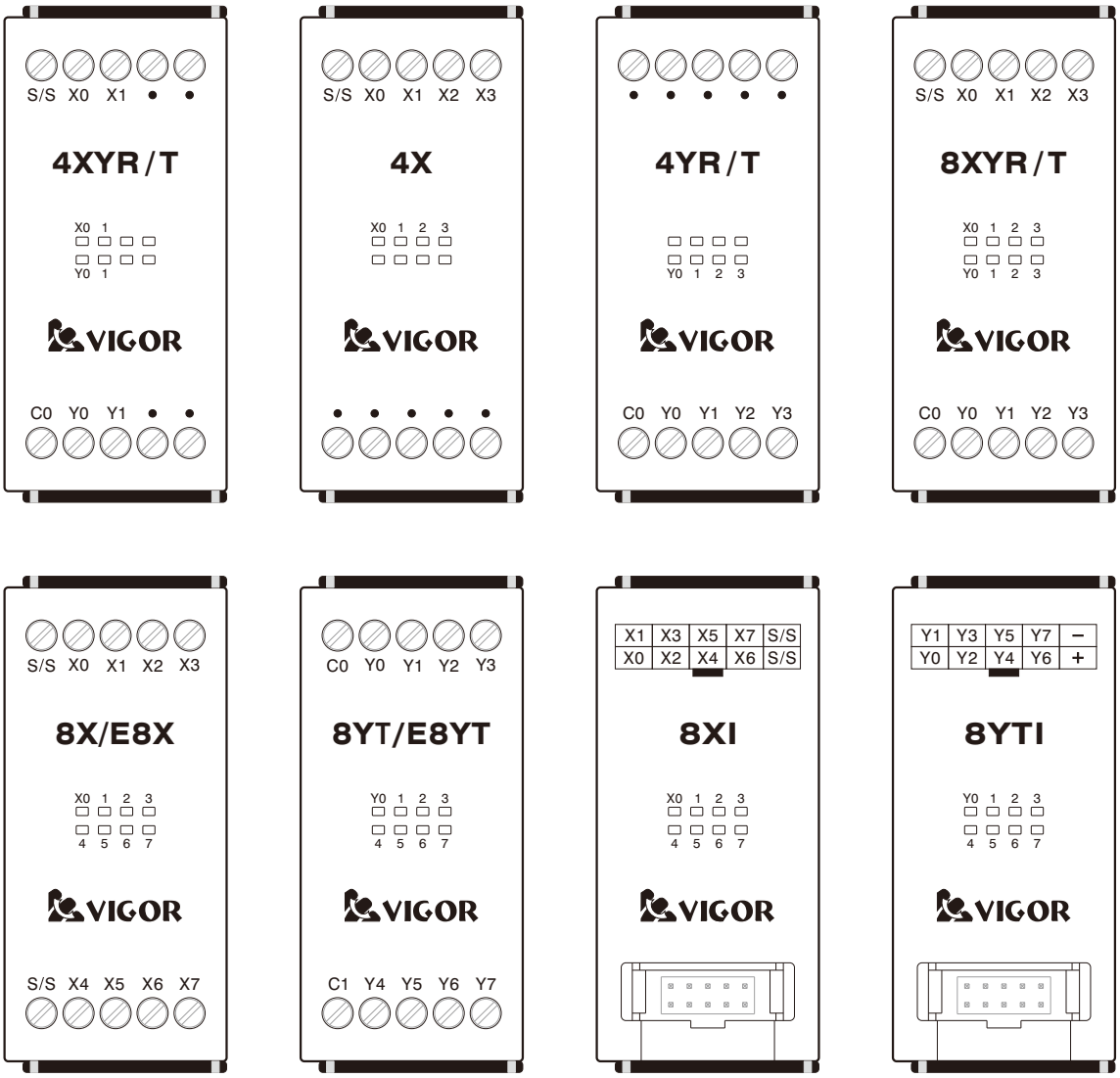
Item	Input Specification
Input Type	Sink / Source selectable
Input Activating Voltage	DC24V ± 15%
Input Signal Current	5.3mA / DC24V
Input ON Definition	Above 3.5mA
Input OFF Definition	Below 1.5mA
Input Resistance	4.3kΩ Approx.
Input Response Time	10ms Approx.
Input Signal Type	Dry contact or NPN / PNP transistor
Isolation Method	Photocoupler isolation
Input Indicator	When a photocoupler's input is activated, the related input indicator will display ON

- Output Specification

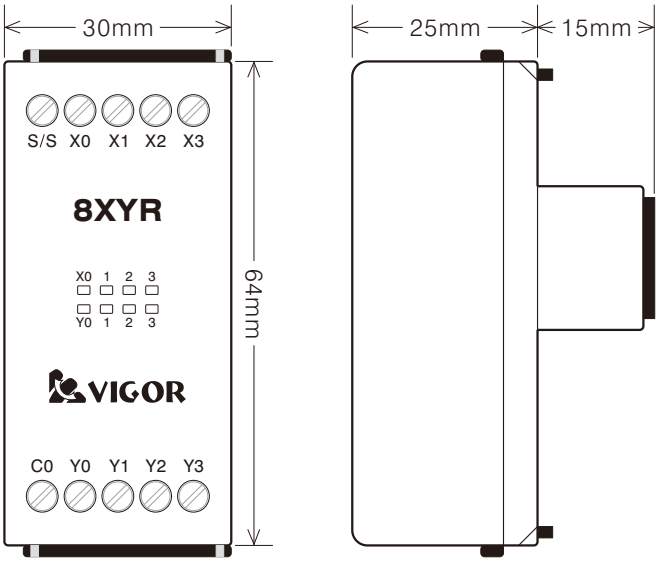
Item		Output Specification		
		Screw-ClampTerminal Block Type		IDC Connector Type ※
Type of Output		Relay output	NPN transistor output	NPN transistor output
Switch Voltage		AC250V/DC30V Max.	DC5V~30V	DC5V~30V
Rated Current	Resistive Load	2A / 1 point 8A / 4 points per COM	0.3A / 1 point 0.8A / 4 points per COM	0.1A / 1 point 0.5A / 8 points per COM
	Inductive Load	80VA	7.2W / DC24V	2.4W / DC24V
	Lamp Load	100W	1W / DC24V	—
Open Circuit Leakage		—	0.1mA Max. / DC30V	0.1mA Max. / DC30V
Response Time		OFF→ON: 10ms Approx. ON→OFF: 10ms Approx.	OFF→ON: 100μs Max. ON→OFF: 100μs Max.	OFF→ON: 100μs Max. ON→OFF: 100μs Max.
Isolation Method		Machinery isolation	Photocoupler isolation	Photocoupler isolation
Output Indicator		When the actual output point is activated, the related output indicator will display ON		

※ The VS-8YTI-EC card requires a DC 24V -15% / +20% power input

6-1-4 Terminal Layout



6-1-5 Product Dimension and Weight



Model Name	N.W. / G.W. (g)
VS-4XYR-EC	45/80
VS-4XYT-EC	45/80
VS-4X-EC	40/75
VS-4YR-EC	50/85
VS-4YT-EC	45/80
VS-8XYR-EC	55/90
VS-8XYT-EC	45/80
VS-8X-EC	40/75
VS-8YT-EC	40/75
VS-8XI-EC	30/65
VS-8YTI-EC	30/65
VS-E8X-EC	40/75
VS-E8YT-EC	40/75

6-2 Communication Port (CP) Expansion Card

The VS series PLC Main Unit has a built-in USB-interface (mini USB connector) programming communication port to link and communicate with programming software.
The VS series PLC Main Unit also has a built-in RS-485 interface CP1 multi-function communication port, supporting various types of communication applications. Therefore, linking with plenty of external equipments is satisfiable via this port. If more communication ports are required, the extra Communication Expansion (CP) card is available to get more communication ports. In addition, the expanded communication ports are all multi-functional and able to perform the applications from numerous communication modes.

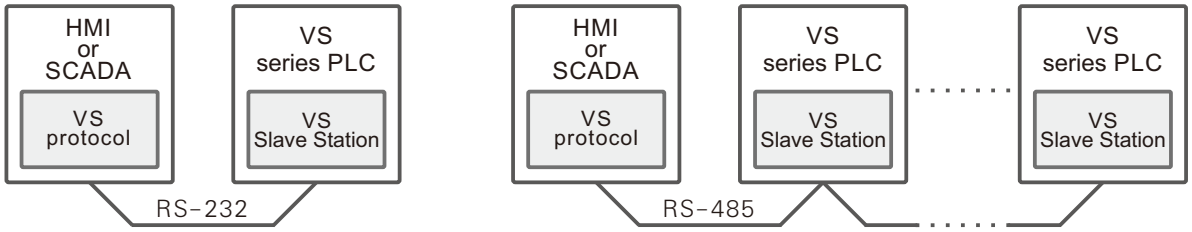
The VS series PLC Main Unit not only has a built-in CP1 communication port, but also the EC1 Expansion Card Socket is available to install a communication expansion card. Thus, by the EC1 socket, the VS1, VS2 and VSM could have the CP2 and CP3. Moreover, the VS3 can use its EC1 and EC3 to expand CP2~CP5. However, if the CP5 at a VS3 PLC is required, its EC2 socket may install a VS-3AV-EC card or not to use; any DIO or SF Card at EC2 will cause the CP5 at EC3 ineffective.

A communication port at CP card is not related to the working area of DIO expansion or SF card, to operate the port is directly by the installed setting and program.

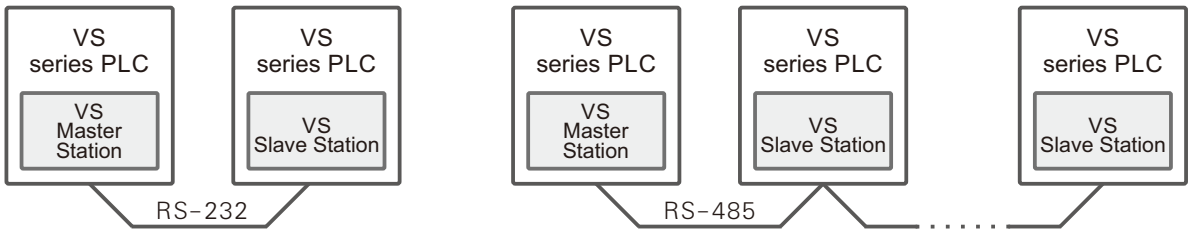
Model Name	Specifications
VS-485-EC	RS-485 Communication Expansion Card: One non-isolated RS-485 port with TX / RX indicators; dist. 50m Max.
VS-485A-EC	RS-485 Communication Expansion Card: One isolated RS-485 port with TX / RX indicators; dist. 1000m Max.
VS-D485-EC	RS-485 Communication Expansion Card: Dual non-isolated RS-485 ports with TX / RX indicators; dist. 50m Max.
VS-D485A-EC	RS-485 Communication Expansion Card: Dual isolated RS-485 ports with TX / RX indicators; dist. 1000m Max.
VS-D232-EC	RS-232C Communication Expansion Card: Dual non-isolated RS-232 ports with TX / RX indicators; dist. 15m Max.; wiring by the RX / TX / SG terminals
VS-D52A-EC	RS-485 + RS-232C Communication Expansion Card: One isolated RS-485 port (1000m) & one non-isolated RS-232C port (15m), both with TX / RX indicators and wiring by terminals
VS-ENET-EC	Ethernet + RS-485 Communication Expansion Card: One Ethernet port (with additional non-isolated RS-485, dist. 50m) & one non-isolated RS-485 port (dist. 50m), both with TX / RX indicators

Numerous of communication application supported modes at the VS series PLC are briefly listed as follows.
(For detailed application modes, please refer to the "VS Series PLC Programming Manual".)

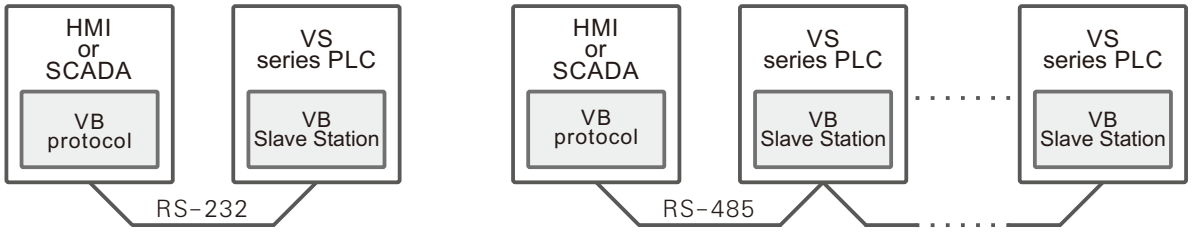
- VS Computer Link Slave (VS Slave Station)
  When the communication port of VS series PLC is executing the application type as "VS Computer Link Slave", HMI or SCADA is able to access data in the VS series PLC(s) via the "VS Computer Link protocol" (VS protocol).



- VS Computer Link Master (VS Master Station)
  When the communication port of VS series PLC is executing the application type as "VS Computer Link Master", it works with LINK instruction and communication table to execute communication procedure. This Master Station links and communicates with VS Slave Station(s) via the "VS Computer Link protocol" (VS protocol).

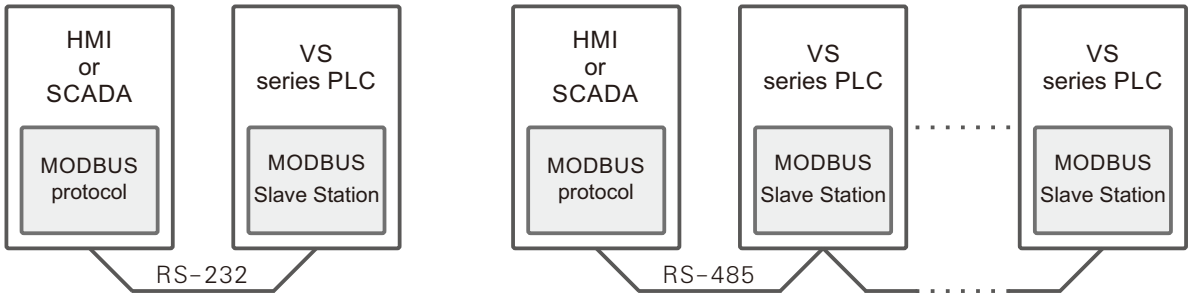


- VB Computer Link Slave (VB Slave Station)
  When the communication port of VS series PLC is executing the application type as "VB Computer Link Slave", HMI or SCADA is able to access data in the VS series PLC(s) via the "VB Computer Link protocol" (VB protocol).



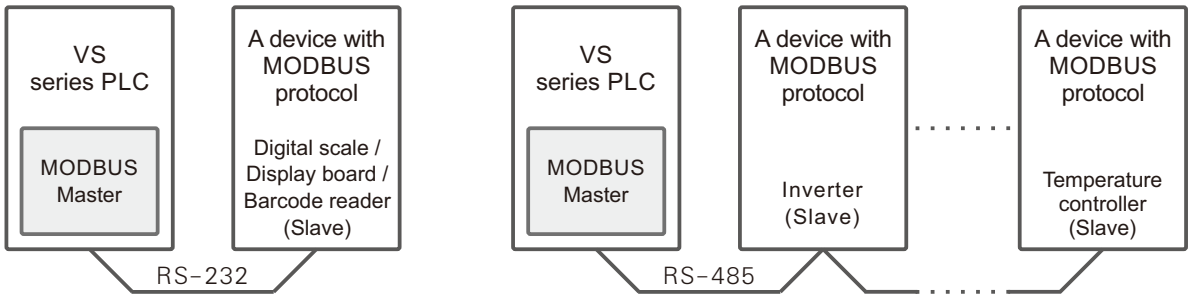
- MODBUS Slave

  When the communication port of VS series PLC is executing the application type as “MODBUS Slave”, HMI or SCADA is able to access data in the VS series PLC(s) via the “MODBUS protocol”.



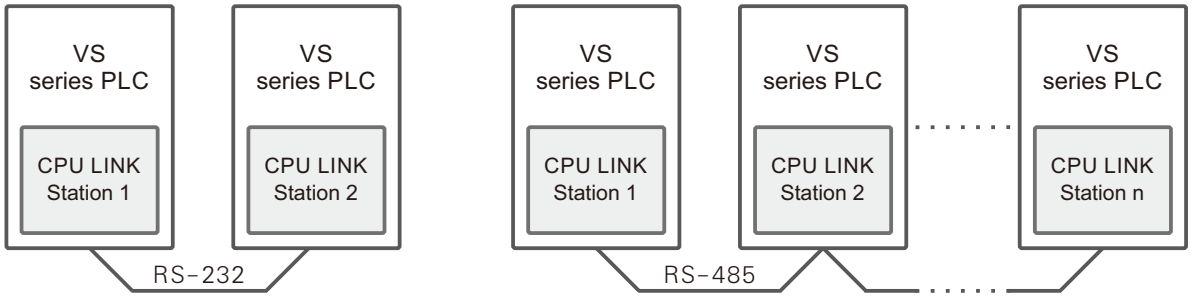
- MODBUS Master

  When the communication port of VS series PLC is executing the application type as “MODBUS Master”, it works with the MBUS instruction and MBUS communication table to execute communication procedure. This Master station can communicate with various peripheral equipments those all use the MODBUS protocol (such as the inverter, temperature controller, power meter, etc.) via the standard “MODBUS protocol”.



- CPU Link

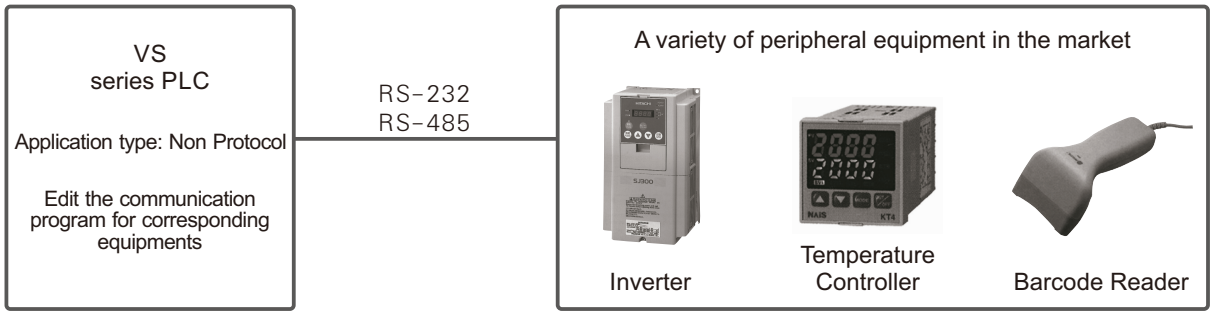
  In order to achieve distributed control, VS series PLCs use this type of application to have real-time data sharing among PLCs. When the connected VS series PLCs are executing this type of application, one of them should use the CPUL instruction and CPUL communication table to have real-time data sharing via the dedicated communication protocol.



- Non Protocol Communication

  When the communication port of VS series PLC is executing the application type as “Non Protocol”, non standardization communication protocol is executed at this port. The customized communication process needs to be completed by PLC's program, through the RS instruction to make receiving and sending communication operation thus communication task is completed.

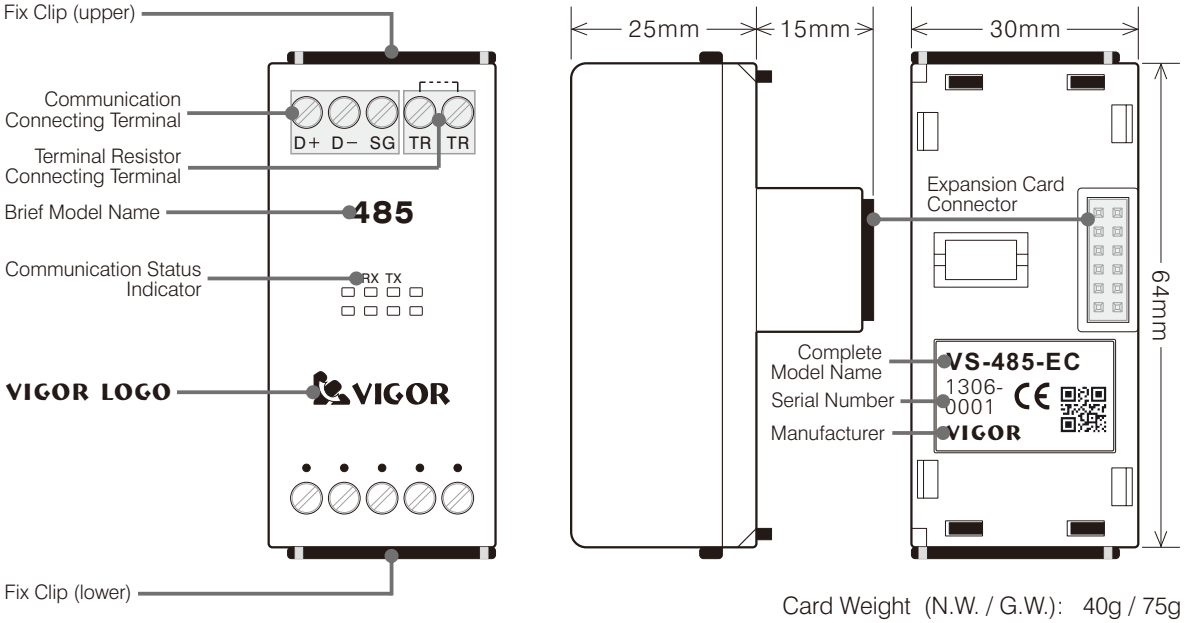
  This type of application is usually used to link with other peripherals in market, such as temperature controller, inverter, barcode reader, etc.



6-2-1 VS-485-EC Communication Expansion Card

The VS-485-EC Communication Expansion Card offers one set of non-isolated RS-485 port. By way of the parameter setting and well planned program at the VS series PLC Main Unit, the port can perform one of various communication functions.

- Product Exterior



Card Weight (N.W. / G.W.): 40g / 75g

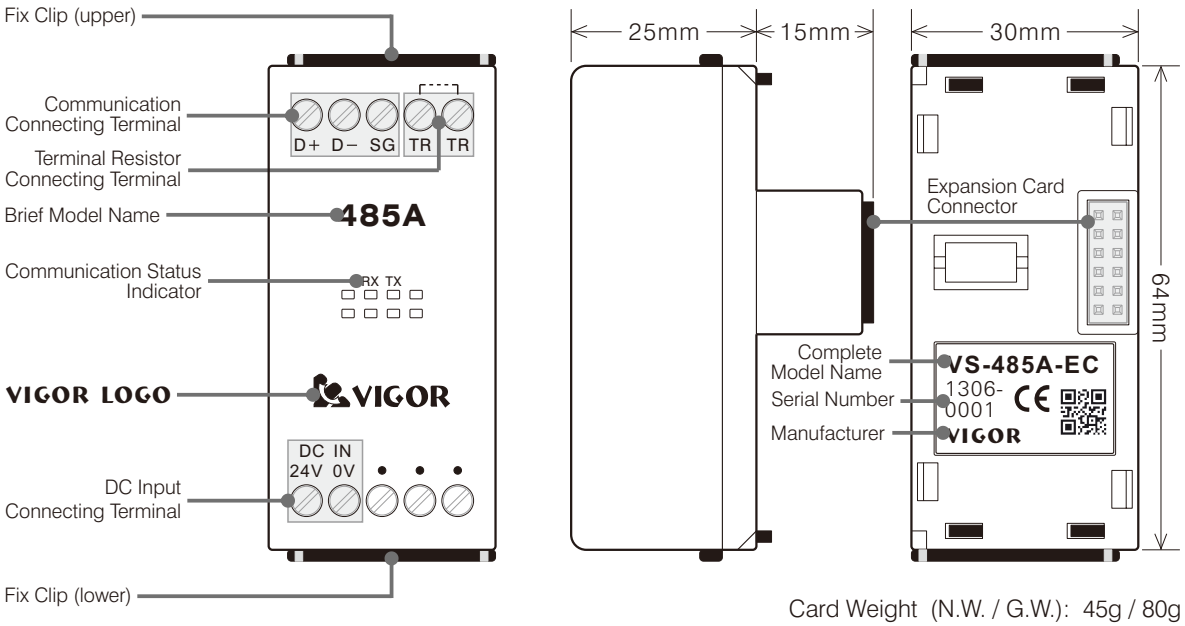
- Product Specification

Item	Specification
Communication Interface	RS−485
Isolation Method	No isolation
Communication Indicator	TX (transmitting) and RX (receiving)
Max. Communication Distance	50 M
Communication Method	Half-duplex
Baud Rate	By the setting of installed project (115,200 bps. Max.)
Power Consumption	DC5V 50mA (from PLC Main Unit)
Wiring Method	Fixed 5mm Screw-Clamp Terminal Block
Terminal Resistor	120Ω, enabled when two TR terminals are short-connected
Parameter Configuration	By the installed project (via the “COM Port setting” page in the programming software)

6-2-2 VS-485A-EC Communication Expansion Card

The VS-485A-EC Communication Expansion Card offers one set of isolated RS-485 port. By way of the parameter setting and well planned program at the VS series PLC Main Unit, the port can perform one of various communication functions.

- Product Exterior



Card Weight (N.W. / G.W.): 45g / 80g

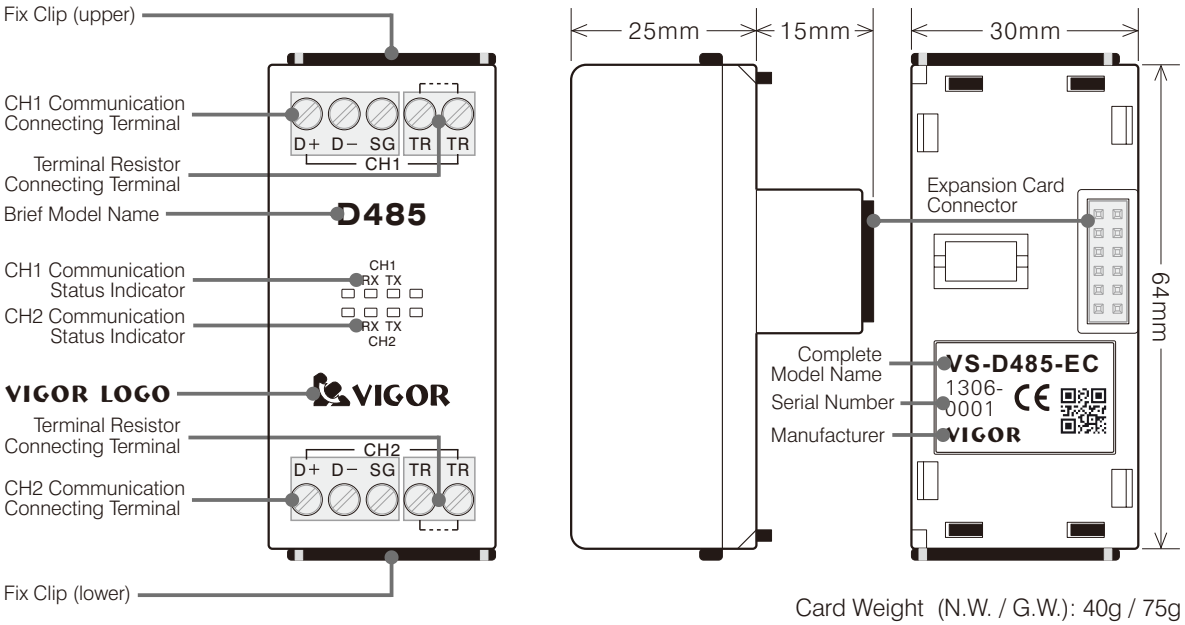
- Product Specification

Item	Specification
Communication Interface	RS−485
Isolation Method	PLC internal circuit and external driving circuit are isolated by a magnetic coupler
Communication Indicator	TX (transmitting) and RX (receiving)
Max. Communication Distance	1000 M
Communication Method	Half-duplex
Baud Rate	By the setting of installed project (115,200 bps. Max.)
Power Consumption	DC24V 25mA from the DC input terminal
Wiring Method	Fixed 5mm Screw-Clamp Terminal Block
Terminal Resistor	120Ω, enabled when two TR terminals are short-connected
Parameter Configuration	By the installed project (via the “COM Port setting” page in the programming software)

6-2-3 VS-D485-EC Communication Expansion Card

The VS-D485-EC Communication Expansion Card offers two sets of non-isolated RS-485 port. By way of the parameter setting and well planned program at the VS series PLC Main Unit, each port can separately perform one of various communication functions.

- Product Exterior



Card Weight (N.W. / G.W.): 40g / 75g

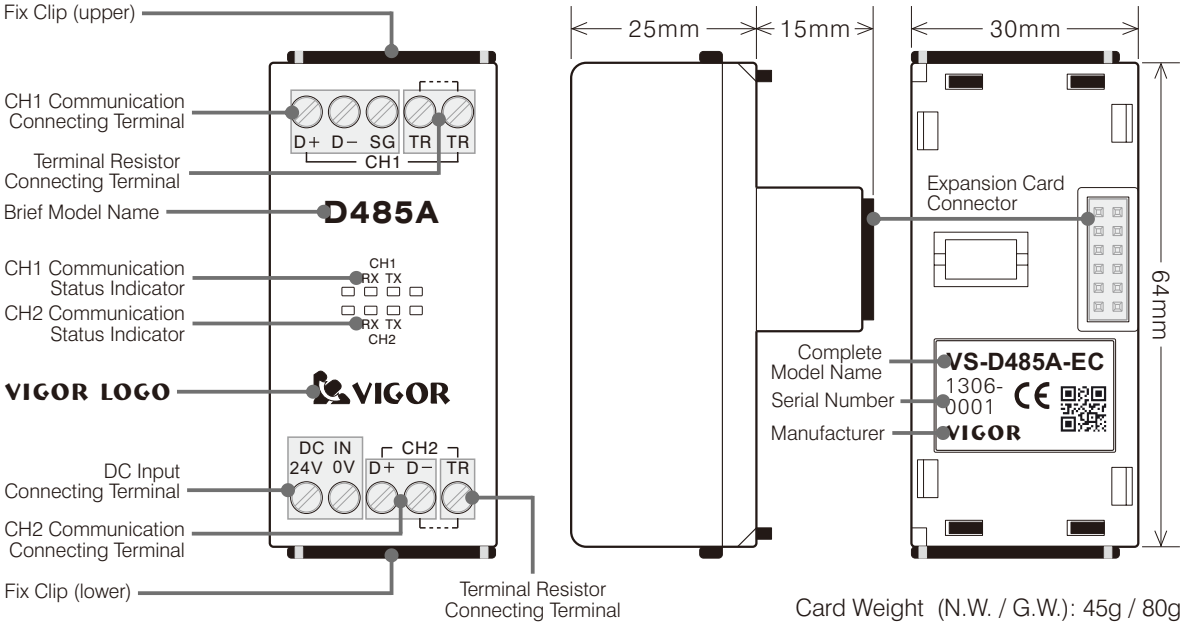
- Product Specification

Item	Specification	
	CH1	CH2
Communication Interface	RS-485	RS-485
Isolation Method	No isolation	No isolation
Communication Indicator	TX (transmitting) and RX (receiving)	TX (transmitting) and RX (receiving)
Max. Communication Distance	50 M	50 M
Communication Method	Half-duplex	Half-duplex
Baud Rate	By the setting of installed project (115,200 bps. Max.)	
Power Consumption	DC5V 100mA (from PLC Main Unit)	
Wiring Method	Fixed 5mm Screw-Clamp Terminal Block	Fixed 5mm Screw-Clamp Terminal Block
Terminal Resistor	120Ω, enabled when two TR terminals are short-connected	
Parameter Configuration	By the installed project (via the “COM Port setting” page in the programming software)	

6-2-4 VS-D485A-EC Communication Expansion Card

The VS-D485A-EC Communication Expansion Card offers two sets of isolated RS-485 port. By way of the parameter setting and well planned program at the VS series PLC Main Unit, each port can separately perform one of various communication functions.

- Product Exterior



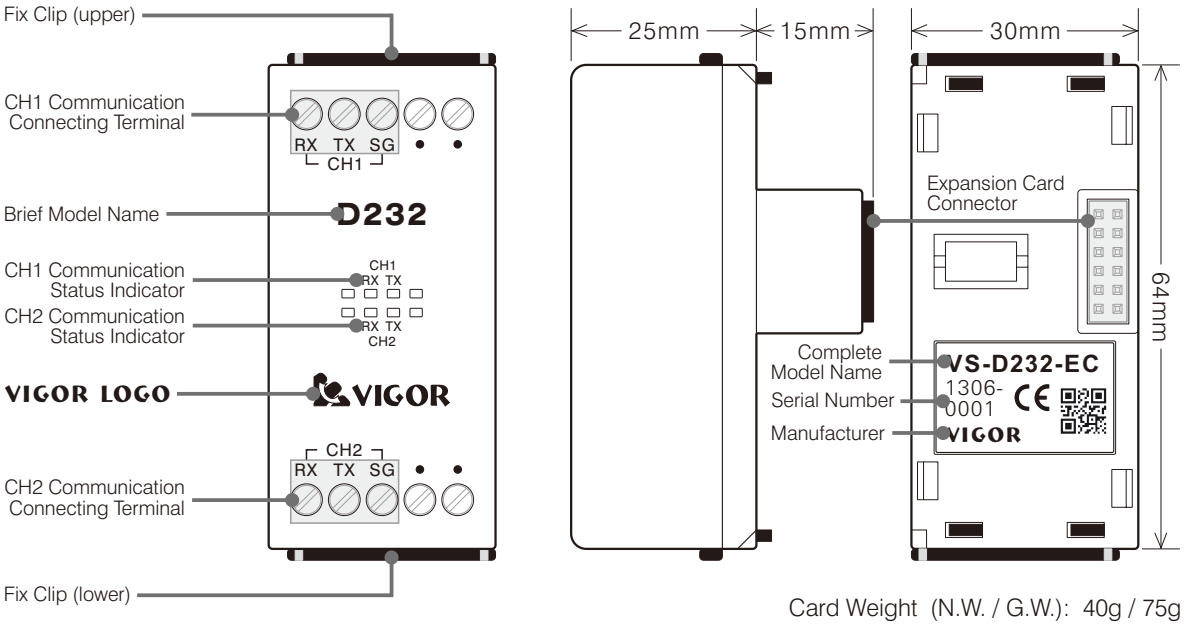
- Product Specification

Item	Specification	
	CH1	CH2
Communication Interface	RS-485	RS-485
Isolation Method	PLC internal circuit and external driving circuit are isolated by a magnetic coupler; no isolation between two channels	
Communication Indicator	TX (transmitting) and RX (receiving)	TX (transmitting) and RX (receiving)
Max. Communication Distance	1000 M	1000 M
Communication Method	Half-duplex	Half-duplex
Baud Rate	By the setting of installed project (115,200 bps. Max.)	
Power Consumption	DC 24 V 50m A from the DC input terminal	
Wiring Method	Fixed 5mm Screw-Clamp Terminal Block	Fixed 5mm Screw-Clamp Terminal Block
Terminal Resistor	120Ω, enabled when two TR terminals are short-connected	120Ω, enabled when the D- and TR terminals are short-connected
Parameter Configuration	By the installed project (via the “COM Port setting” page in the programming software)	

6-2-5 VS-D232-EC Communication Expansion Card

The VS-D232-EC Communication Expansion Card offers two sets of non-isolated RS-232C port. By way of the parameter setting and well planned program at the VS series PLC Main Unit, each port can separately perform one of various communication functions.

- Product Exterior



Card Weight (N.W. / G.W.): 40g / 75g

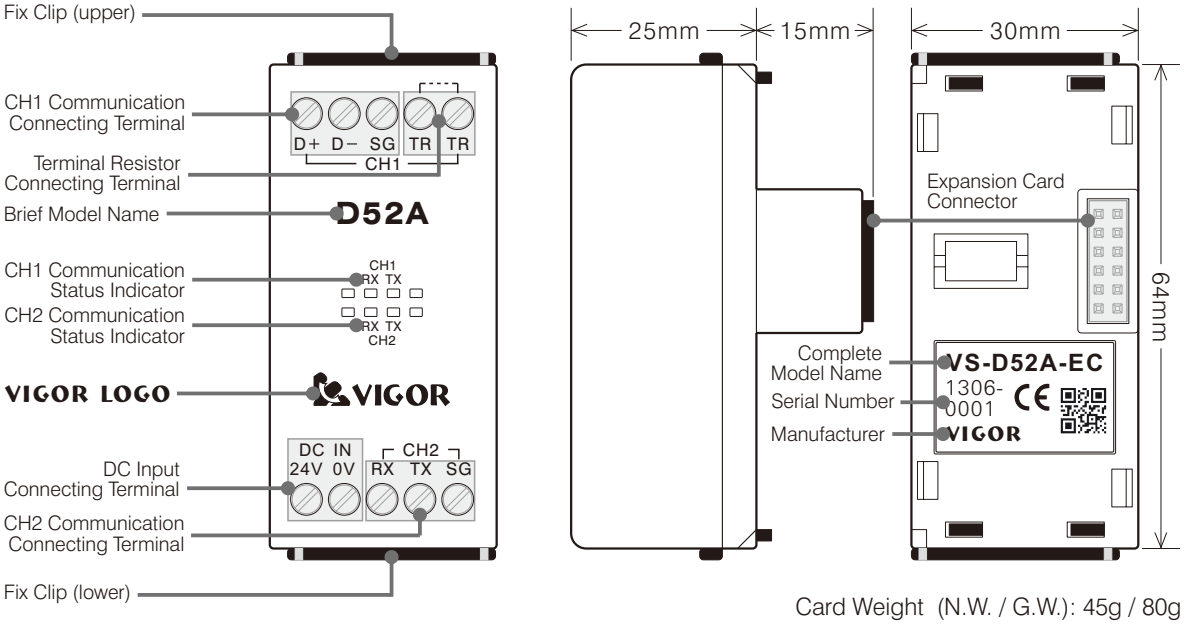
- Product Specification

Item	Specification	
	CH1	CH2
Communication Interface	RS-232C	RS-232C
Isolation Method	No isolation	No isolation
Communication Indicator	TX (transmitting) and RX (receiving)	TX (transmitting) and RX (receiving)
Max. Communication	15 M	15 M
Communication Method	Half-duplex	Half-duplex
Baud Rate	By the setting of installed project (115,200 bps. Max.)	
Power Consumption	DC5V 25mA (from PLC Main Unit)	
Wiring Method	Fixed 5mm Screw-Clamp Terminal Block	Fixed 5mm Screw-Clamp Terminal Block
Parameter Configuration	By the installed project (via the “COM Port setting” page in the programming software)	

6-2-6 VS-D52A-EC Communication Expansion Card

The VS-D52A-EC Communication Expansion Card offers one isolated RS-485 port and one non-isolated RS-232C port. By way of the parameter setting and well planned program at the VS series PLC Main Unit, each port can separately perform one of various communication functions.

- Product Exterior



Card Weight (N.W. / G.W.): 45g / 80g

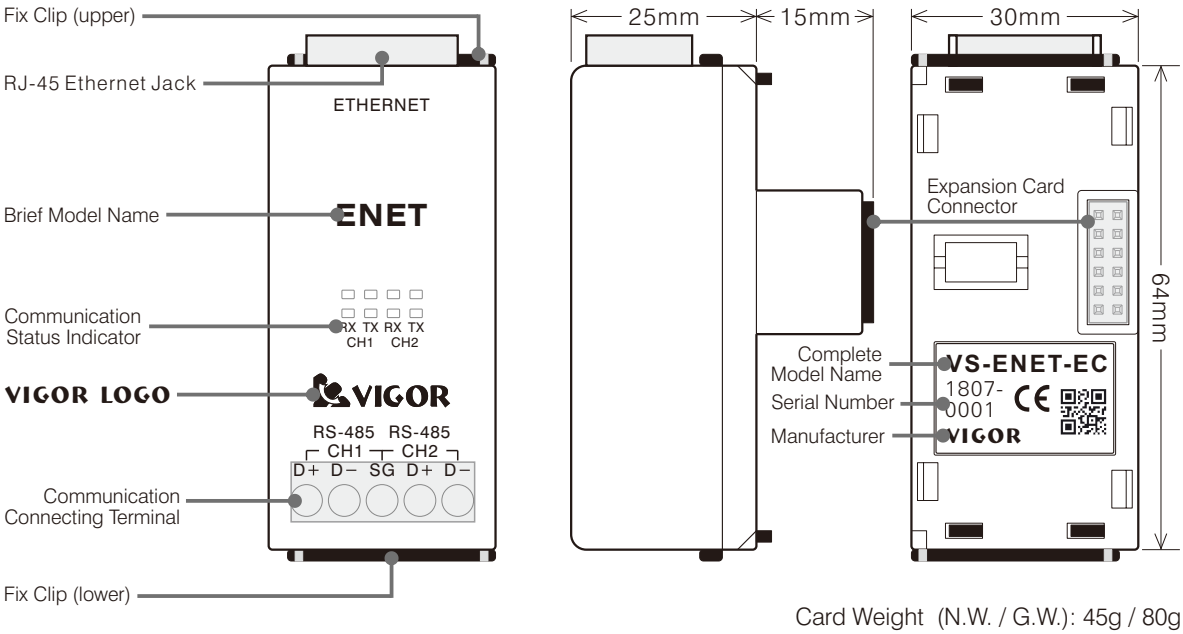
- Product Specification

Item	Specification	
	CH1	CH2
Communication Interface	RS-485	RS-232C
Isolation Method	PLC internal circuit and external driving circuit are isolated by a magnetic coupler	No isolation
Communication Indicator	TX (transmitting) and RX (receiving)	TX (transmitting) and RX (receiving)
Max. Communication Distance	1000 M	15 M
Communication Method	Half-duplex	Half-duplex
Baud Rate	By the setting of installed project (115,200 bps. Max.)	
Power Consumption	DC24V 50mA (from the DC input terminal) + DC5V 25mA (from PLC Main Unit)	
Wiring Method	Fixed 5mm Screw-Clamp Terminal Block	Fixed 5mm Screw-Clamp Terminal Block
Terminal Resistor	120Ω, enabled when two TR terminals are short-connected	—
Parameter Configuration	By the installed project (via the “COM Port setting” page in the programming software)	

6-2-7 VS-ENET-EC Communication Expansion Card

The VS-ENET-EC Communication Expansion Card is a dual port card. It offers one Ethernet port (with an additional non-isolated RS-485 interface) and one non-isolated RS-485 port.
By way of the parameter setting and well planned program at the VS series PLC Main Unit, each port can separately perform one of various communication functions.

- Product Exterior



Card Weight (N.W. / G.W.): 45g / 80g

- Product Specification

Item	Specification about the Ethernet
Physical Transport Layer	10BASE-T / 100BASE-TX
Transport Protocol	TCP (Client / Server), UDP (Client / Server)
Application Protocol	Transparent or conversion MODBUS TCP to MODBUS RTU
Connected Serial Port	CH1
IP Address Allocation	Automatic by DHCP server or Static (manual) allocation
Unique Identifier	The media access control address (MAC address) is used
Comm. Parameter Modify	Use the specific configuration software
Status Indicator	LINK (green, ON when physical link is established); Data (yellow, blink when data is transferring)
Interface	Ethernet RJ-45 jack

Item	Specification about Serial Communication Ports	
	CH1	CH2
Communication Interface	RS-485	RS-485
Isolation Method	No isolation	No isolation
Communication Indicator	TX (transmitting) and RX (receiving)	TX (transmitting) and RX (receiving)
Max. Communication	50 M	50 M
Communication Method	Half-duplex	Half-duplex
Baud Rate	By the setting of installed project (115,200 bps. Max.)	
Power Consumption	Ethernet DC5V 100mA + RS-485 ports DC5V 100mA (total is 200mA from PLC Main Unit)	
Wiring Method	Fixed 5mm Screw-Clamp Terminal Block	Fixed 5mm Screw-Clamp Terminal Block
Parameter Configuration	By the installed project (via the “COM Port setting” page in the programming software)	

6-3 Special Function (SF) Expansion Card

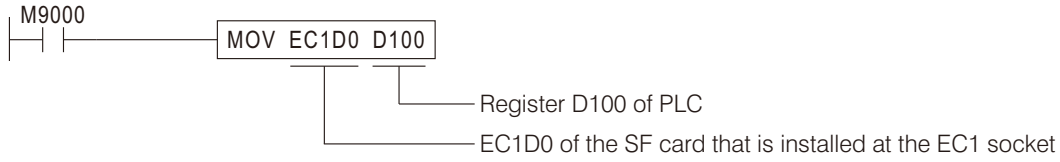
The VS series PLC offers various Special Function Expansion Cards, such as analog input/output, temperature input, inverter speed control, etc. The following is the list of selectable SF card.

Model Name	Specifications
VS-3AV-EC	Brief Voltage I/O Card: 2 channel (0～10V, 12-bit) inputs; 1 channel (0～10V, 10-bit) output; with a calibrated DC 10V output; non-isolated
VS-4AD-EC	Analog Input Card: 4 channel (12-bit) inputs, each channel could output either 0～10V, 4～20mA or 0～20mA; non-isolated
VS-2DA-EC	Analog Output Card: 2 channel (12-bit) outputs, each channel could input either 0～10V, 4～20mA or 0～20mA; non-isolated
VS-4A-EC	Analog I/O Card: 2 channel (12-bit) inputs + 2 channel (12-bit) outputs, each channel could input/output either 0～10V, 4～20mA or 0～20mA; non-isolated
VS-3ISC-EC	Inverter Speed Control Card: 3 channel (0.1% resolution) voltage outputs; totally isolated for each channel
VS-2TC-EC	Thermocouple Temperature Input Card: 2 channel (K, J, R, S, T, E, B or N type thermocouple) inputs, 0.2～0.3℃ resolution
VS-4TC-EC	Thermocouple Temperature Input Card: 4 channel (K, J, R, S, T, E, B or N type thermocouple) inputs, 0.2～0.3℃ resolution
VS-1PT-EC	PT-100 Temperature Input Card: 1 channel (3-wire PT-100) input, 0.1℃ resolution non-isolated
VS-2PT-EC	PT-100 Temperature Input Card: 2 channel (3-wire PT-100) inputs, 0.1℃ resolution non-isolated

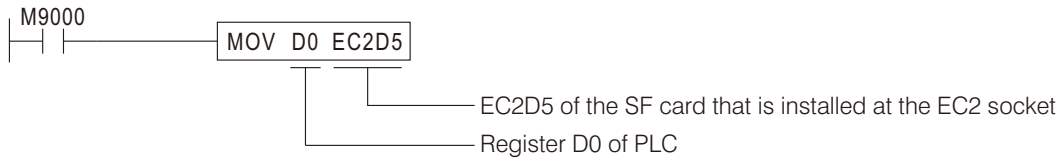
For convenience, every EC1～EC3 expansion card socket at a VS series PLC will possess 20 special registers that is the working area of the installed expansion card. When a special card is installed in the socket, the PLC can access related data for the respective device on the card through its working area.
For easy memorize and convenient application, every special register of each Special Expansion Card is given a “Simple Code”. The “Simple Code” will be used in the following documents.

Expansion Card Socket	Expansion Card Working Area	
	Simple Code	Special Register
EC1	EC1D0～EC1D19	D9260～D9279
EC2	EC2D0～EC2D19	D9280～D9299
EC3	EC3D0～EC3D19	D9300～D9319

The instruction diagram below will move the content value from the EC1D0 of special card to the register D100 of PLC. (that card is installed at the EC1 socket)



The instruction diagram below will move the content value from the register D0 of PLC to the EC2D5 of special card. (that card is installed at the EC2 socket)



6-3-1 VS-3AV-EC Brief Voltage I/O Expansion Card

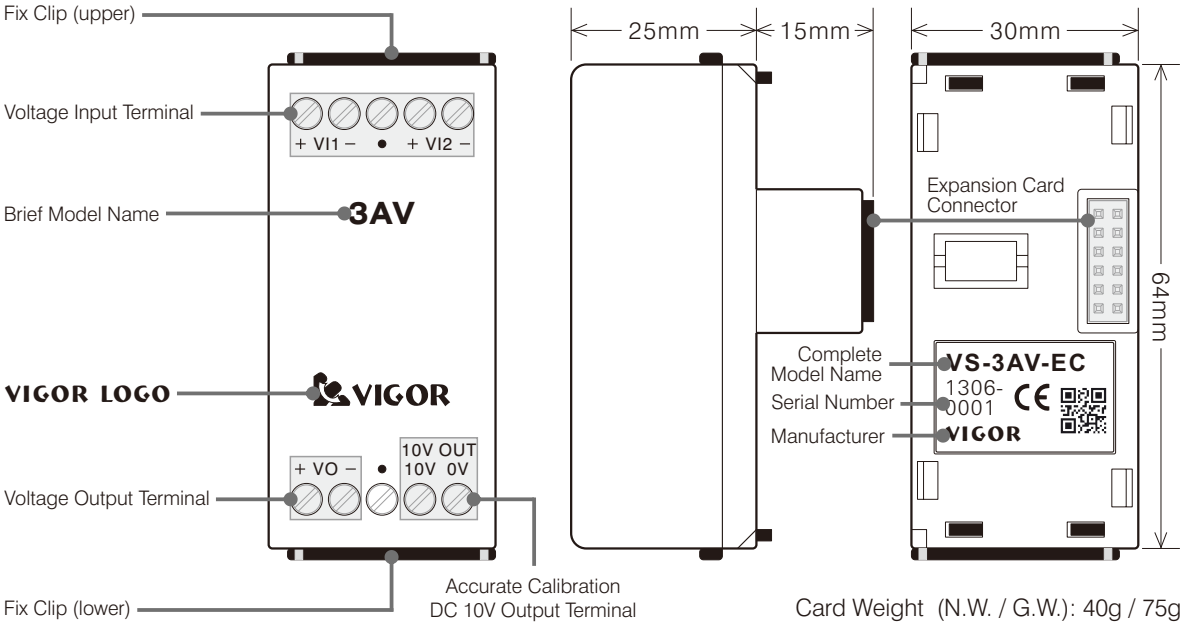
The VS-3AV-EC Brief Voltage I/O Expansion Card offers non-isolated 2 channels 0～10V input and 1 channel 0～10V output. In addition, it provides an accurate calibration DC 10V voltage output to connect with variable resistor or position potentiometer easily.

This VS-3AV-EC brief card is to perform by using the built-in analog I/O circuit in the Main Unit's CPU. Thus, it could achieve low-cost but relatively simple analog I/O function.

Application notes of the VS-3AV-EC expansion card:

1. This expansion card can ONLY be installed at the EC2 expansion socket of the VS series PLC.
2. The VS series PLC Main Unit operates this expansion card through 3 specific special registers that instead of expansion card working area. Its operation method is different from other SF cards and required special attention.
3. The length of external wiring should be as short as possible and kept away from interference sources.
4. If this expansion card does not function normally that due to strong external interference or unqualified equipment matching quality, please replace it with proper VS series PLC special module.

- Product Exterior



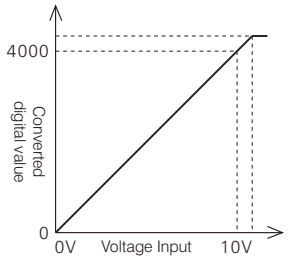
Card Weight (N.W. / G.W.): 40g / 75g

- Product Specification

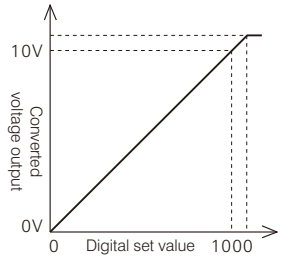
Basic Specification

Item	Specification
Power Consumption	DC12V 25mA (from PLC Main Unit)
Accurate Calibration Voltage Output	DC10V ± 1%, 10mA (Max.)

Voltage Input Specification

Item	Specification	Conversion Curve Diagram
Voltage Input Range	0～10V	
Converted Value	0～4000	
Input Resistance	56kΩ	
Resolution	2.5mV	
Overall Accuracy	± 2% Overall Max.	
Response Time	Renew converted digital values every Scan Time	
Isolation Method	No isolation	

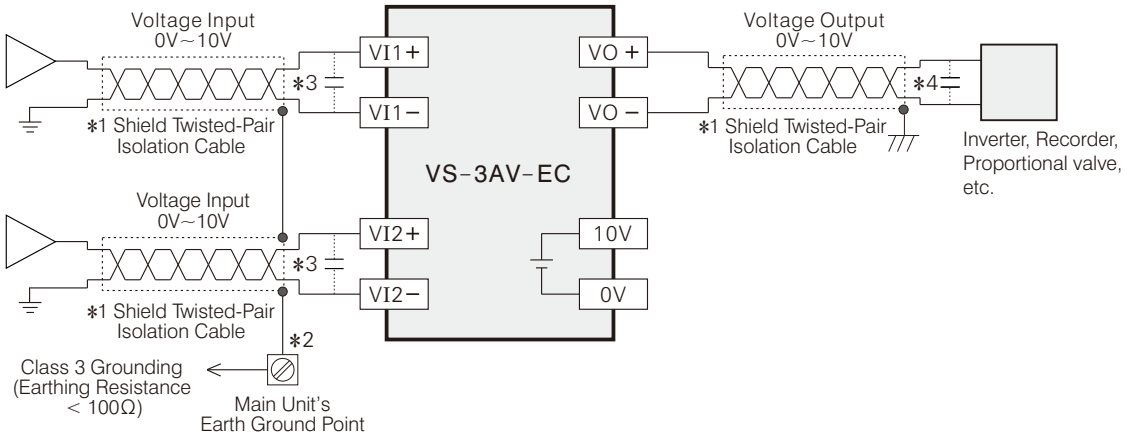
Voltage Output Specification

Item	Specification	Conversion Curve Diagram
Voltage Output Range	0~10V	
Source Digital Range	0~1000	
External Load Resistance	1kΩ~1MΩ	
Resolution	10mV	
Overall Accuracy	± 2% Overall Max.	
Response Time	Renew output every Scan Time	
Isolation Method	No isolation	

- Special Register related to VS-3AV-EC (The Simple Code EC2Dn is useless) ■Means it's a read only component.

Register ID No.	Component Description
■D9030	The AD converted value of VI1 at the VS-3AV-EC, 0~10V = 0~4000
■D9031	The AD converted value of VI2 at the VS-3AV-EC, 0~10V = 0~4000
D9032	The DA digital set value for the VO at the VS-3AV-EC, 0~1000 = 0~10V

- External Wiring



∗1: Please use the Shield Twisted-Pair isolation cable for every analog input or output channel. Must keep the signal cable away from any power line (including the power of motor, valve or contactor) to prevent external interference or card damage.

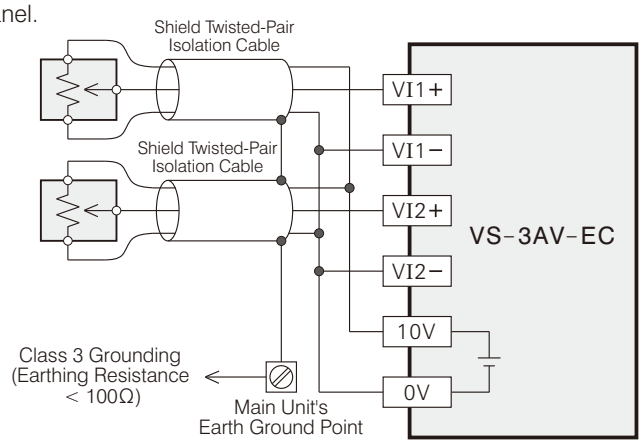
∗2: First, please connect the end of the covering layer of shielded cables. Then, connect that end to the earth ground point of Main Unit. After that, make use of class 3 grounding for the point.

∗3: If the reading value of voltage signal is fluctuating or with electrically induced noise on the external wiring, please parallel connect a smoothing capacitor (0.1 μF~0.47 μF, 25V) between the input terminals.

∗4: If the reading value of voltage signal is fluctuating or with electrically induced noise on the external wiring, please parallel connect a smoothing capacitor (0.1 μF~0.47 μF, 25V) between the input terminals.

- Usage Example of Product

A typical application of this expansion card is to create an interface by connecting the analog input and accurate calibration DC 10V voltage output on the VS-3AV-EC expansion card to a variable resistor on the surface of operation panel.

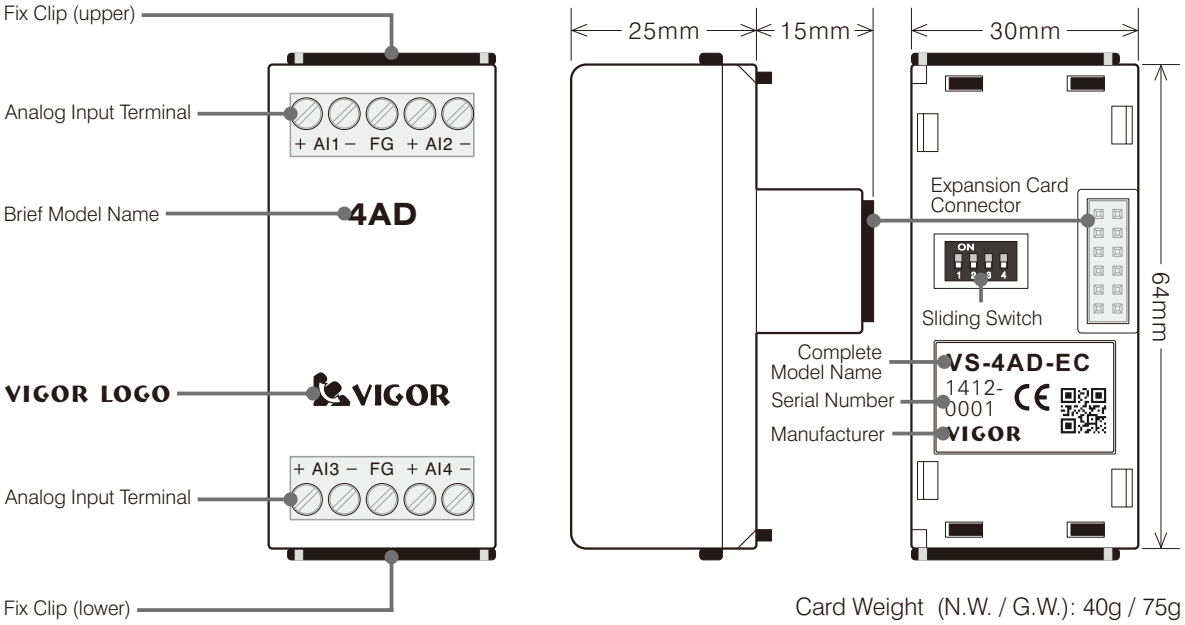


6-3-2 VS-4AD-EC Analog Input Expansion Card

The VS-4AD-EC Analog Input Expansion Card can receive 4 channels of external voltage or current signal inputs then convert the analog signals to 12-bit digital values. When the END instruction is executed, the VS Main Unit reads out AD conversion data from the VS-4AD-EC card and stores the values to respective EC card registers. Thus, it provides the reference data for digital monitoring or control.

The VS-4AD-EC Analog Input Expansion Card is non-isolated. Please read following instructions before use.

- Product Exterior



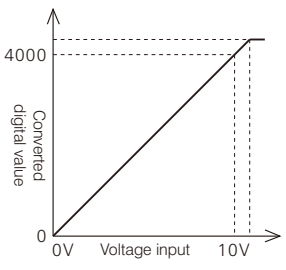
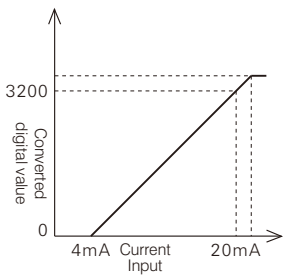
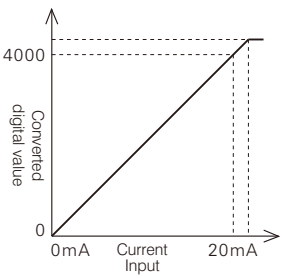
Card Weight (N.W. / G.W.): 40g / 75g

- Product Specification

Basic Specification

Item	Specification
Power Consumption	DC5V 12mA, DC12V 10mA (both from PLC Main Unit)

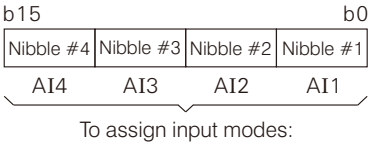
Analog Input Specification

Item	Voltage Input Spec.	Current Input Spec.	
	The voltage or current input switch is located on the card's bottom also the operation mode special register is required to set.		
Analog Input Range	0~10V	4~20mA	0~20mA
Converted Value	0~4000	0~3200	0~4000
Input Resistance	200kΩ	250Ω	250Ω
Max. Resolution	2.5mV	5μA	5μA
Overall Accuracy	± 1% Overall Max.		
Response Time	1.2 ms × (the No. of enabled AI CHs); the AI values will be renewed at the END instruction		
Isolation Method	No isolation between PLC and inputs; no isolation between input channels		
Max. Input Range	−0.5V~+12V	−2mA~+30mA	−2mA~+30mA
Conversion Curve Diagram			

- EC Card Register (Simple Code) related to VS-4AD-EC

EC1	EC2	EC3	Component Description
EC1D0	EC2D0	EC3D0	To assign the analog input modes of AI1～AI4.
EC1D1	EC2D1	EC3D1	Converted digital value of AI1, 0～4000 or 0～3200.
EC1D2	EC2D2	EC3D2	Converted digital value of AI2, 0～4000 or 0～3200.
EC1D3	EC2D3	EC3D3	Converted digital value of AI3, 0～4000 or 0～3200.
EC1D4	EC2D4	EC3D4	Converted digital value of AI4, 0～4000 or 0～3200.
EC1D18	EC2D18	EC3D18	Identification code: K101 (If code = K240, means connecting error between Main Unit and card)
EC1D19	EC2D19	EC3D19	The version number of this card. (the content value □□ indicates Ver. □.□)

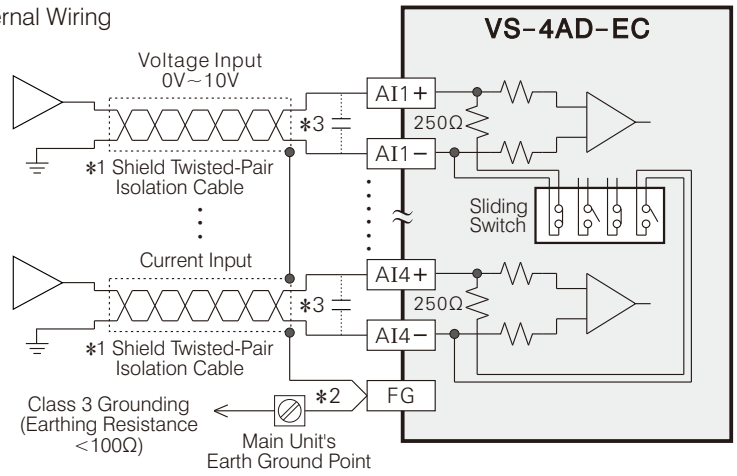
To appoint the modes of analog inputs: (the sliding switch should also consistent with the modes)



If the nibble = 0, the channel is assigned for (0～10V) voltage input.
If the nibble = 1, the channel is assigned for (4～20mA) current input.
If the nibble = 2, the channel is assigned for (0～20mA) current input.
If the nibble is any number other than 0, 1 or 2, the channel is disabled.

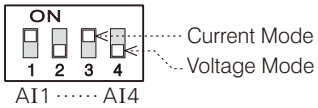
Example: If VS- 4AD- EC is installed in EC1, and EC1D0 is set to be H3210, then
AI1: voltage input (0～10V) AI2: current input (4～20mA) AI3: current input (0～20mA) AI4: disabled

- External Wiring



※ Please note on setting AI1～AI4 as either voltage or current input:
1. Set EC card register based on the operating modes of AI1～AI4.
2. Based on the operating modes of AI1～AI4 to adjust the sliding switches on the bottom of card.

Upper position (ON) is for current mode.
Lower position is for voltage mode.



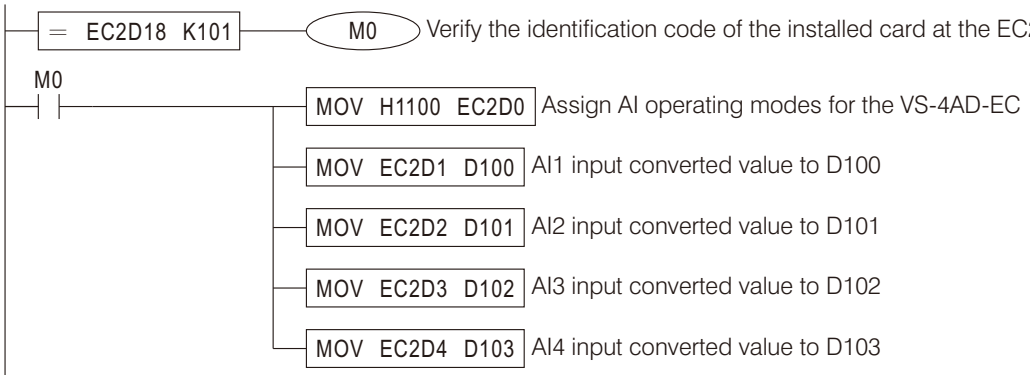
∗1: Please use the Shield Twisted-Pair isolation cable for every analog input channel. Must keep the signal cable away from any power line (including the power of motor, valve or contactor) to prevent external interference or card damage.

∗2: First, please connect the end of the covering layer of shielded cables. Then, connect that end to the earth ground point of Main Unit. After that, make use of class 3 grounding for the point.

∗3: If the reading value of voltage/current signal is fluctuating or with electrically induced noise on the external wiring, please parallel connect a smoothing capacitor (0.1 μF～0.47 μF, 25V) between the input terminals.

- Example Program

If the VS-4AD-EC is installed at the EC2, and its AI1 & AI2 are used for 0～10V inputs, AI3 & AI4 are used for 4～20mA inputs. Input converted values of AI1～AI4 are sequentially stored at D100～D103.

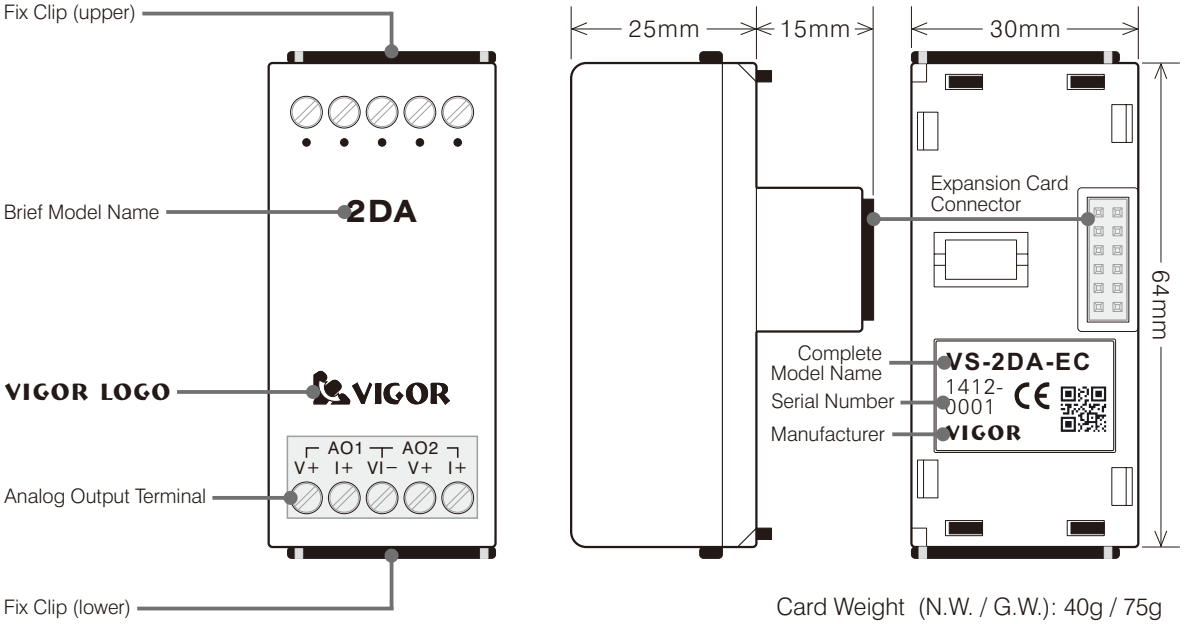


6-3-3 VS-2DA-EC Analog Output Expansion Card

The VS-2DA-EC Analog Output Expansion Card can generate 2 channels of external voltage or current signal output, those are converted from the sources of 12-bit digital set values. When the END instruction is executed, the VS Main Unit sends out source data to the VS-2DA-EC card and stores the values to respective EC card registers then its DA circuit converts the data to analog outputs. Thus, it provides two analog signal outputs from digital set values to control the external loads.

The VS-2DA-EC Analog Output Expansion Card is non-isolated. Please read following instructions before use.

- Product Exterior



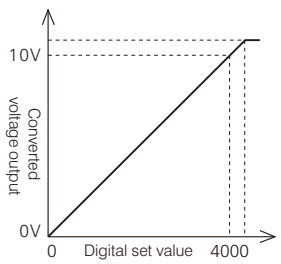
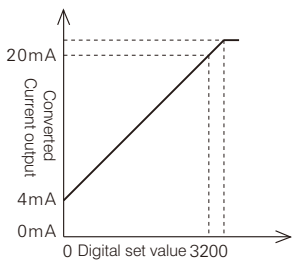
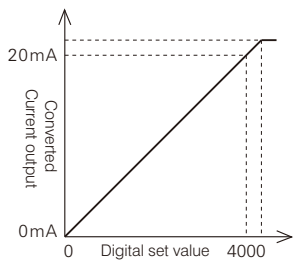
Card Weight (N.W. / G.W.): 40g / 75g

- Product Specification

Basic Specification

Item	Specification
Power Consumption	DC5V 15mA, DC12V 60mA (from PLC Main Unit)

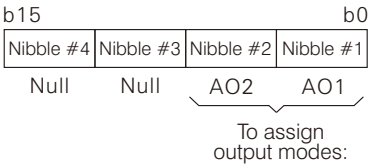
Analog Output Specification

Item	Voltage Output Spec.	Current Output Spec.	
	The voltage or current output is selected by EC card mode register and makes the output through specific terminals		
Analog Output Range	0~10V	4~20mA	0~20mA
Digital Set Range	0~4000	0~3200	0~4000
Load Resistance	500Ω~1MΩ	500Ω(Max.)	500Ω(Max.)
Resolution	2.5mV	5μA	5μA
Overall Accuracy	± 1.5% (Overall Max.)		
Response Time	15 μs × (the No. of enabled AO CHs) ; the AO values will be sent at the END instruction.		
Isolation Method	No isolation between PLC and outputs; no isolation between output channels		
Conversion Curve Diagram			

- EC Card Register (Simple Code) Related to VS-2DA-EC

EC1	EC2	EC3	Component Description
EC1D10	EC2D10	EC3D10	To assign the analog output modes of AO1～AO2.
EC1D11	EC2D11	EC3D11	Digital set value for AO1, 0～4000 or 0～3200.
EC1D12	EC2D12	EC3D12	Digital set value for AO2, 0～4000 or 0～3200.
EC1D18	EC2D18	EC3D18	Identification code: K102 (If code = K240, means connecting error between Main Unit and card)
EC1D19	EC2D19	EC3D19	The version number of this card. (the content value □□ indicates Ver. □.□)

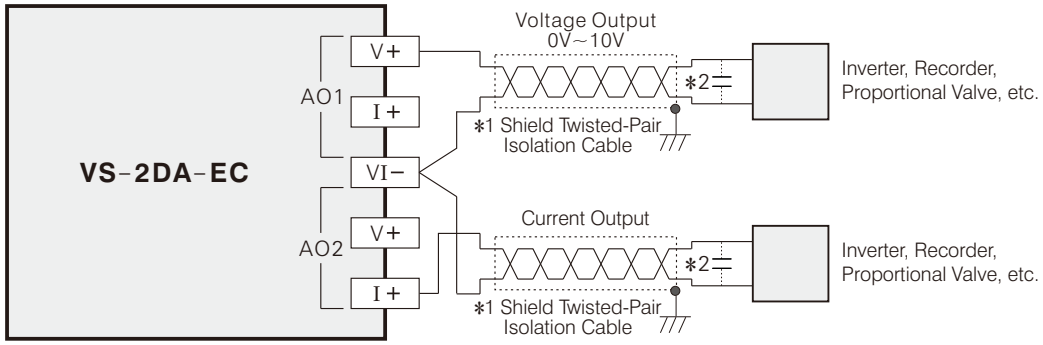
To appoint the modes of analog outputs:



If the nibble = 0, the channel is assigned for (0～10V) voltage output.
If the nibble = 1, the channel is assigned for (4～20mA) current output.
If the nibble = 2, the channel is assigned for (0～20mA) current output.
If the nibble is any number other than 0, 1 or 2, the channel is disabled.

Example: If a VS-2DA-EC is installed at the EC1, and its EC1D10 is set to be H10, then
AO1: voltage output (0～10V) AO2: current output (4～20mA)

- External Wiring



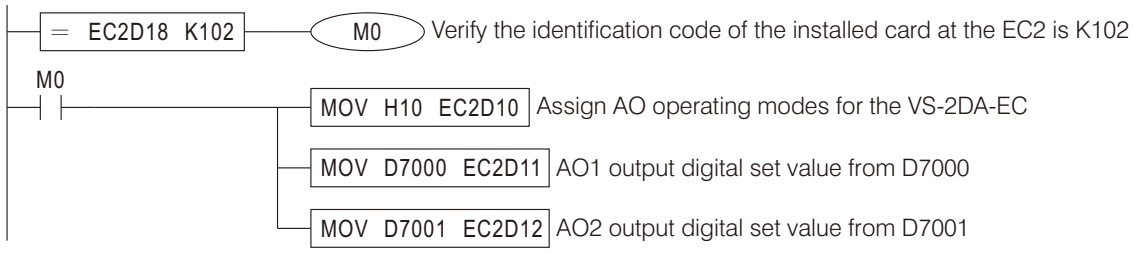
∗1: Please use the Shield Twisted-Pair isolation cable for every analog output channel and ground the cable's shield (class 3 grounding, grounding resistance < 100Ω). Must keep the signal cable away from any power line (including the power of motor, valve or contactor) to prevent external interference or card damage.

∗2: If the reading value of voltage/current signal is fluctuating or with electrically induced noise on the external wiring, please parallel connect a smoothing capacitor (0.1 μF～0.47 μF, 25V) between the input terminals.

∗3: For every analog output channel, either voltage or current output can be used but not both at the same time.

- Example Program

Assume that VS-2DA-EC is installed at the EC2, its AO1 is used for 0～10V output, AO2 is used for 4～20mA output. Output digital set values of AO1～AO2 are sequentially stored at D7000～D7001.

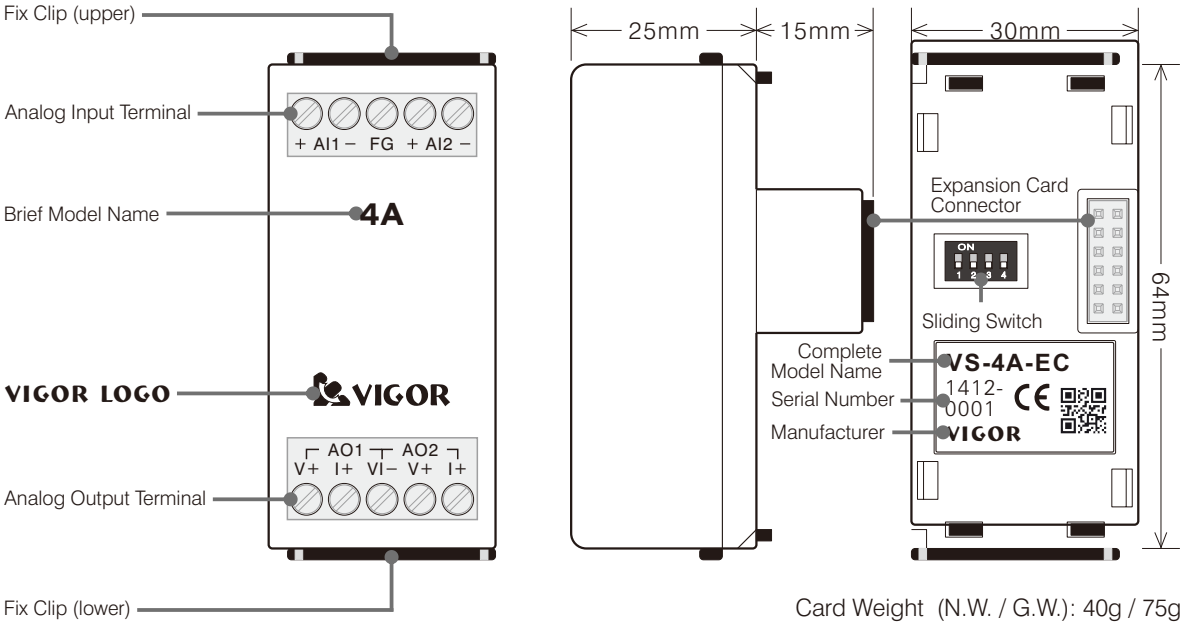


6-3-4 VS-4A-EC Analog Input and Output Expansion Card

The VS-4A-EC Analog Input/Output Expansion Card can receive 2 channels of external voltage or current signal inputs then convert the analog signals to 12-bit digital values. When the END instruction is executed, the VS Main Unit reads out AD conversion data from the VS-4A-EC card and stores the values to respective EC card registers. Thus, it provides the reference data for digital monitoring or control. In addition, this card can generate 2 channels of external voltage or current signal outputs, those are converted from the sources of 12-bit digital set values. When the END instruction is executed, the VS Main Unit sends out source data to the VS-4A-EC card and stores the values to respective EC card registers then its DA circuit converts the data to analog outputs. Thus, it provides two analog signal outputs from digital set values to control the external loads.

The VS-4A-EC Analog Input and Output Expansion Card is non-isolated. Please read following instructions before use.

- Product Exterior



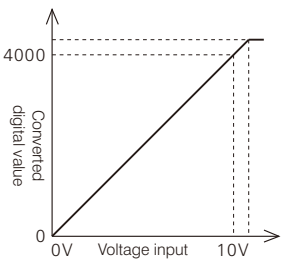
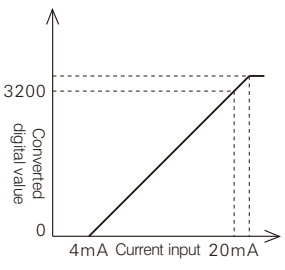
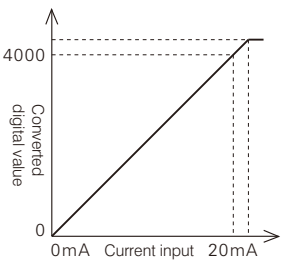
Card Weight (N.W. / G.W.): 40g / 75g

- Product Specification

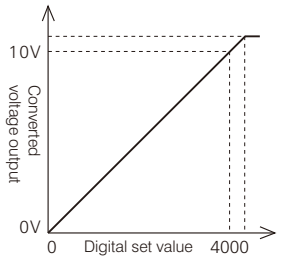
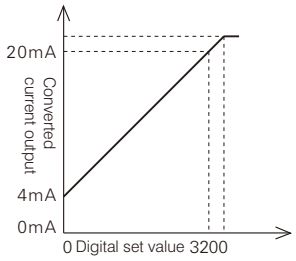
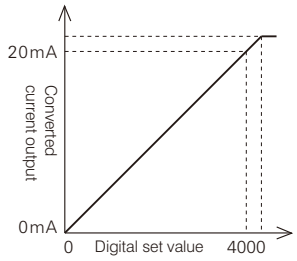
Basic Specification

Item	Specification
Power Consumption	DC5V 20mA, DC12V 60mA (from PLC Main Unit)

Analog Input Specification

Item	Voltage Input Spec.	Current Input Spec.	
	The voltage or current input switch is located on the card's bottom also the operation mode special register is required to set.		
Analog Input Range	0~10V	4~20mA	0~20mA
Converted Value	0~4000	0~3200	0~4000
Input Resistance	200kΩ	250Ω	250Ω
Resolution	2.5mV	5μA	5μA
Overall Accuracy	± 1% Overall Max.		
Response Time	1.2 ms×(No. of enabled AI CHs) + 15 μs×(No. of enabled AO CHs); the AI values will be renewed at the END		
Isolation Method	No isolation between PLC and inputs; no isolation between input channels		
Max. Input Range	−0.5V~+12V	−2mA~+30mA	−2mA~+30mA
Conversion Curve Diagram			

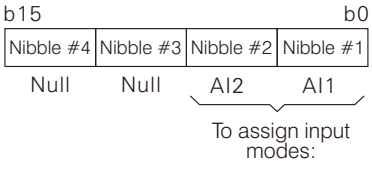
Analog Output Specification

Item	Voltage Output Spec.	Current Output Spec.	
	The voltage or current output is selected by EC card mode register and makes the output through specific terminals		
Analog Output Range	0~10V	4~20mA	0~20mA
Digital Set Range	0~4000	0~3200	0~4000
Load Resistance	500Ω~1MΩ	500Ω(Max.)	500Ω(Max.)
Resolution	2.5mV	5μA	5μA
Overall Accuracy	± 1.5% Overall Max.		
Conversion Speed	1.2 ms×(No. of enabled AI CHs) + 15 μs×(No. of enabled AO CHs); the AI values will be renewed at the END		
Isolation Method	No isolation between PLC and outputs; no isolation between output channels		
Conversion Curve Diagram			

- EC Card Register (Simple Code) related to VS-4A-EC

EC1	EC2	EC3	Component Description
EC1D0	EC2D0	EC3D0	To assign the input modes of AI1~AI2.
EC1D1	EC2D1	EC3D1	Read value of AI1, 0~4000 or 0~3200.
EC1D2	EC2D2	EC3D2	Read value of AI2, 0~4000 or 0~3200.
EC1D10	EC2D10	EC3D10	To assign the output modes of AO1~AO2.
EC1D11	EC2D11	EC3D11	Write value of AO1, 0~4000 or 0~3200.
EC1D12	EC2D12	EC3D12	Write value of AO2, 0~4000 or 0~3200.
EC1D18	EC2D18	EC3D18	Identification code: K103 (If code = K240, means connecting error between Main Unit and card)
EC1D19	EC2D19	EC3D19	The version number of this card. (the content value □□ indicates Ver. □.□)

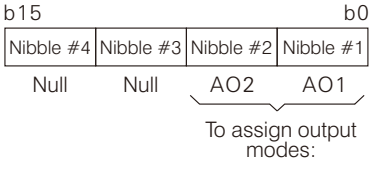
To appoint the modes of analog inputs: (the sliding switch should also consistent with the modes)



If the nibble = 0, the channel is assigned for (0~10V) voltage input.
If the nibble = 1, the channel is assigned for (4~20mA) current input.
If the nibble = 2, the channel is assigned for (0~20mA) current input.
If the nibble is any number other than 0, 1 or 2, the channel is disabled.

Example: If a VS-4A-EC is installed at the EC1, and its EC1D0 is set to be H10, then
AI1: voltage input (0~10V) AI2: current input (4~20mA)

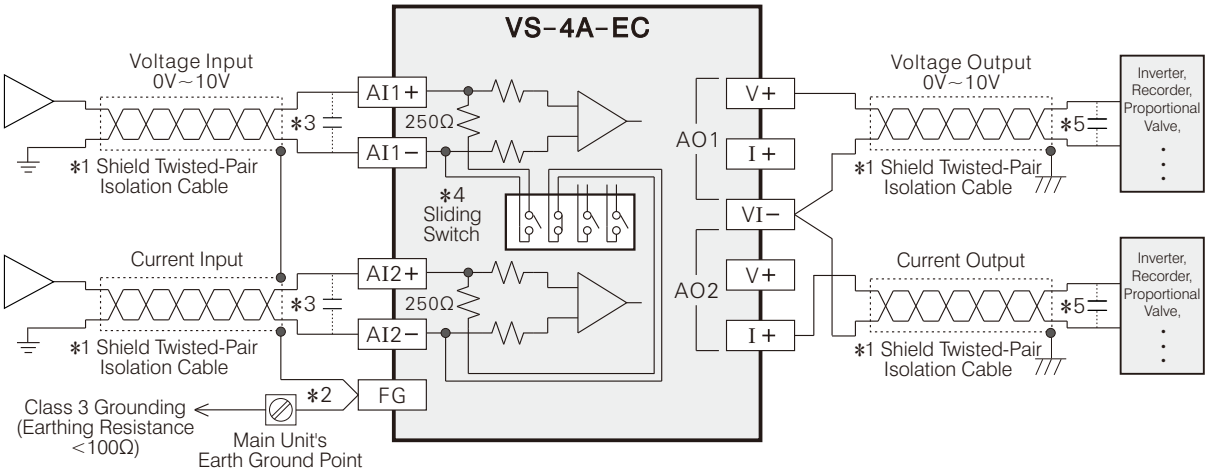
To appoint the modes of analog inputs:



If the nibble = 0, the channel is assigned for (0~10V) voltage output.
If the nibble = 1, the channel is assigned for (4~20mA) current output.
If the nibble = 2, the channel is assigned for (0~20mA) current output.
If the nibble is any number other than 0, 1 or 2, the channel is disabled.

Example: If VS-4A-EC is installed in EC1, and EC1D10 is set to be H10, then
AO1: voltage output (0~10V) AO2: current output (4~20mA)

● External Wiring



∗1: Please use the Shield Twisted-Pair isolation cable for every analog input or output channel. Must keep the signal cable away from any power line (including the power of motor, valve or contactor) to prevent external interference or card damage.

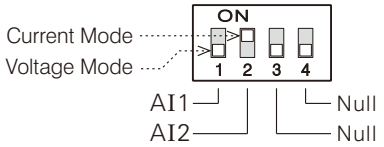
∗2: First, please connect the end of the covering layer of shielded cables. Then, connect that end to the earth ground point of Main Unit. After that, make use of class 3 grounding for the point.

∗3: If the reading value of voltage/current signal is fluctuating or with electrically induced noise on the external wiring, please parallel connect a smoothing capacitor (0.1 μF～0.47 μF, 25V) between the input terminals.

∗4 Please note on setting AI1～AI2 as either voltage or current input:

1. Set EC card register based on the operating modes of AI1～AI2.
2. Based on the operating modes of AI1～AI2 to adjust the sliding switches on the bottom of card.

Upper position (ON) is for current mode.
Lower position is for voltage mode.

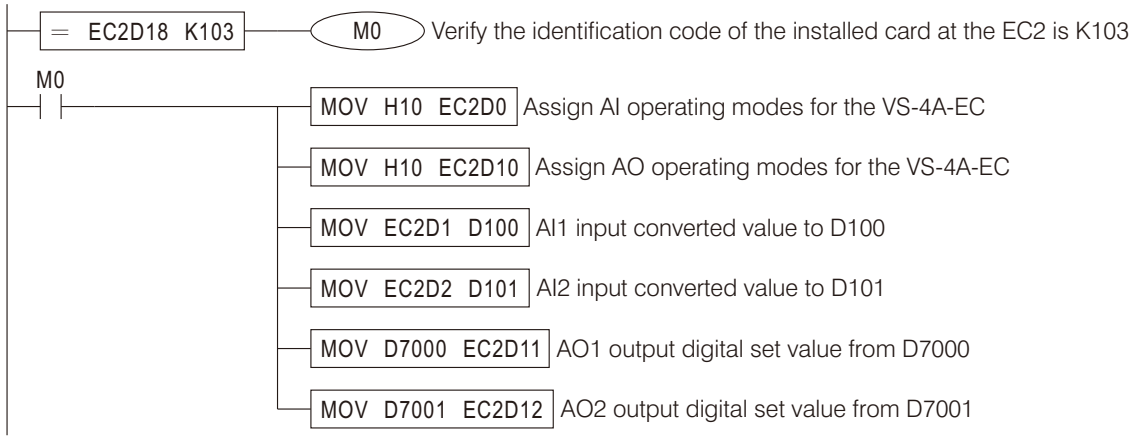


∗5: If the reading value of voltage/current signal is fluctuating or with electrically induced noise on the external wiring, please parallel connect a smoothing capacitor (0.1 μF～0.47 μF, 25V) between the input terminals.

∗6: For every analog output channel, either voltage or current output can be used but not both at the same time.

● Example Program

If the VS-4A-EC is installed at the EC2.
Its AI1 is used for 0～10V input, AI2 is used for 4～20mA input. Input converted values of AI1～AI2 are sequentially stored at D100～D101.
Its AO1 is used for 0～10V output, AO2 is used for 4～20mA output. Output digital set values of AO1～AO2 are sequentially stored at D7000～D7001.



6-3-5 VS-3ISC-EC Inverter Speed Control Expansion Card

The VS-3ISC-EC Inverter Speed Control Expansion Card is specially designed by VIGOR Corp. for the VS series PLC could control the operation speed of inverters.

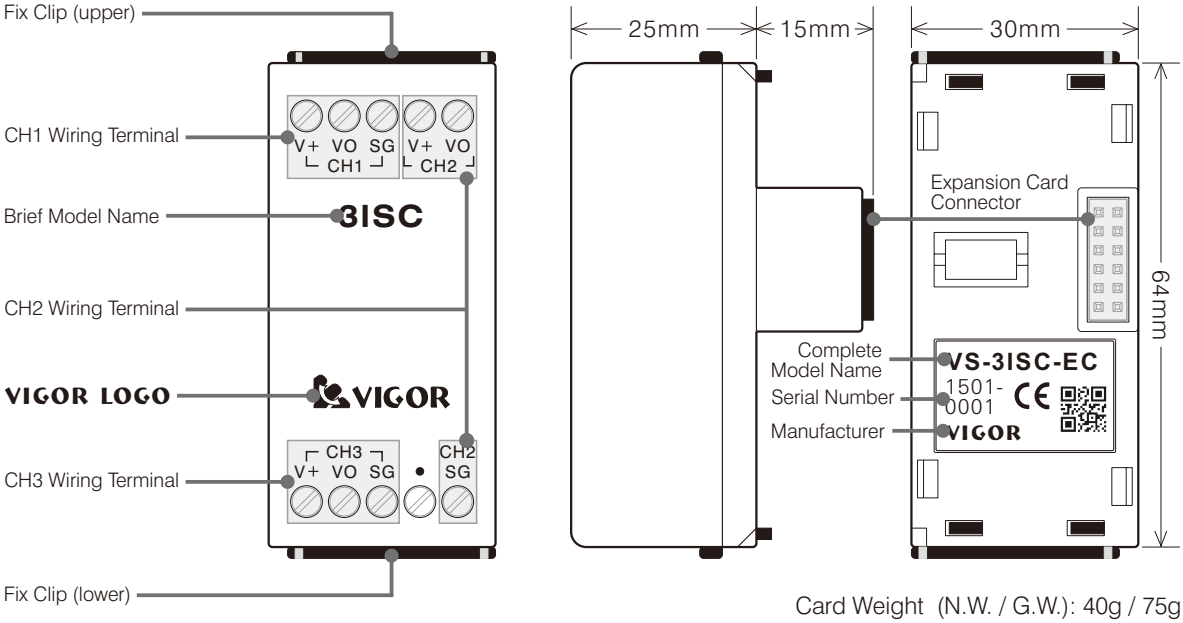
The VS-3ISC-EC offers 3 independent circuits to simultaneously control 3 inverters' operation speed. Since it is completely isolated between these control circuits, that could effectively eliminate the interactions between the analog outputs of multiple inverters.

For users could externally control the speed of an inverter, the inverter is usually equipped with the analog input control circuit and an external control use 5V or 10V power supply. Generally, users control the inverter speed can either connect with an external variable resistor for manual control, or voltage control through its analog input circuit.
The VS-3ISC-EC performs inverter speed control by voltage-division the external control use power (5V/10V) from the inverter and feed the proportional signal back to its analog input circuit.

Firstly, connect external control use power from the inverter to V+ and SG terminals of the VS-3ISC-EC; then connect the VO terminal of the VS-3ISC-EC to analog input point of inverter speed control. Secondly, use program to set "V+ measured voltage" and "VO Max."; then write the "VO set value" (0~1000 = 0.0%~100.0%) into respective EC card register. By the END instruction, the VS Main Unit writes the values of EC card registers into the card thus it converts the "VO set value" to respective voltage signal. The VO terminal outputs that signal to the analog input point of inverter to control speed.

Following is the detailed specification of the VS-3ISC-EC. Please read it before use.

- Product Exterior



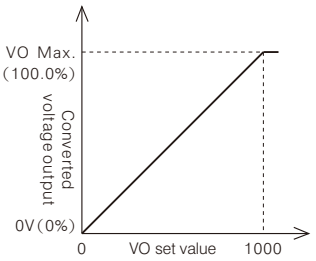
Card Weight (N.W. / G.W.): 40g / 75g

- Product Specification

Basic Specification

Item	Specification
Power Consumption	DC5V 10mA (from PLC Main Unit)

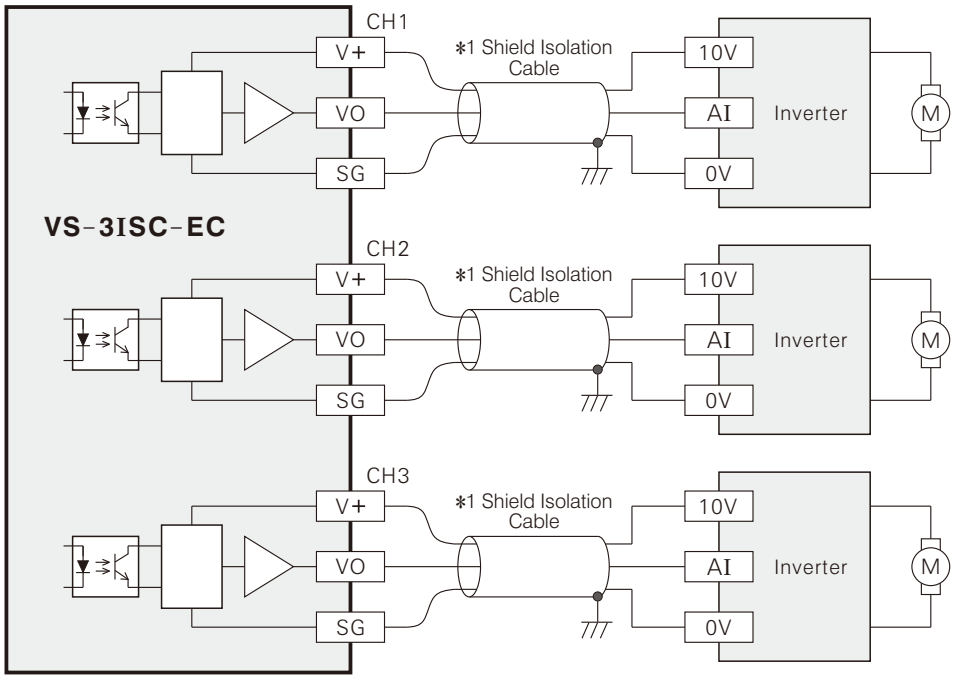
Performance Specification

Item	Specification	Conversion Curve Diagram
VO Output Range	0.0% ~ 100.0% (0V ~ the setting value of VO Max.)	
VO Set Value Range	0~1000	
Inverter's Input Resistance	10 kΩ Min.	
Resolution	0.1%	
Overall Accuracy	± 1.5% Overall Max.	
Response Time	150ms Max	
V+ Input Range	4V~12V (power input from inverter to V+ & SG terminals)	
Isolation Method	Each channel has an independent photocoupler to isolate this part of analog circuit to others and PLC.	

- EC Card Register (Simple Code) Related to VS-3ISC-EC

EC1	EC2	EC3	Component Description	
EC1D0	EC2D0	EC3D0	VO set value of CH1, 0~1000	The output ratio (0% ~ 100.0%) at the VO terminal that connect to the analog speed control point of inverter. This VO set value is the percentage of 0 to "VO Max." If the set value < 0, the output ratio = 0 (0.0 %). If the set value > 1000, the output ratio = 1000 (100.0 %).
EC1D1	EC2D1	EC3D1	VO set value of CH2 ,0~1000	
EC1D2	EC2D2	EC3D2	VO set value of CH3 , 0~1000	
EC1D3	EC2D3	EC3D3	V+ measured voltage value of CH1.	Measure the external control use power from inverter by a voltage meter and fill in the result value here. If the result is 10V, then fill in 1000 (by unit of 0.01V). If the filled result is not between 400 and 1200, then the VO point will output 0V.
EC1D4	EC2D4	EC3D4	V+ measured voltage value of CH2.	
EC1D5	EC2D5	EC3D5	V+ measured voltage value of CH3.	
EC1D6	EC2D6	EC3D6	VO Max. of CH1.	Fill in the control input voltage of the maximum speed for the inverter. If its effective range is 0~10V, then fill in 1000 (by unit of 0.01V). If the filled value is not in the range between 0 to "V+ measured voltage", then the VO point will output 0V.
EC1D7	EC2D7	EC3D7	VO Max. of CH2.	
EC1D8	EC2D8	EC3D8	VO Max. of CH3.	
EC1D18	EC2D18	EC3D18	Identification code: K104 (If code = K240, means connecting error between Main Unit and card)	
EC1D19	EC2D19	EC3D19	The version number of this card. (the content value □□ indicates Ver. □.□)	

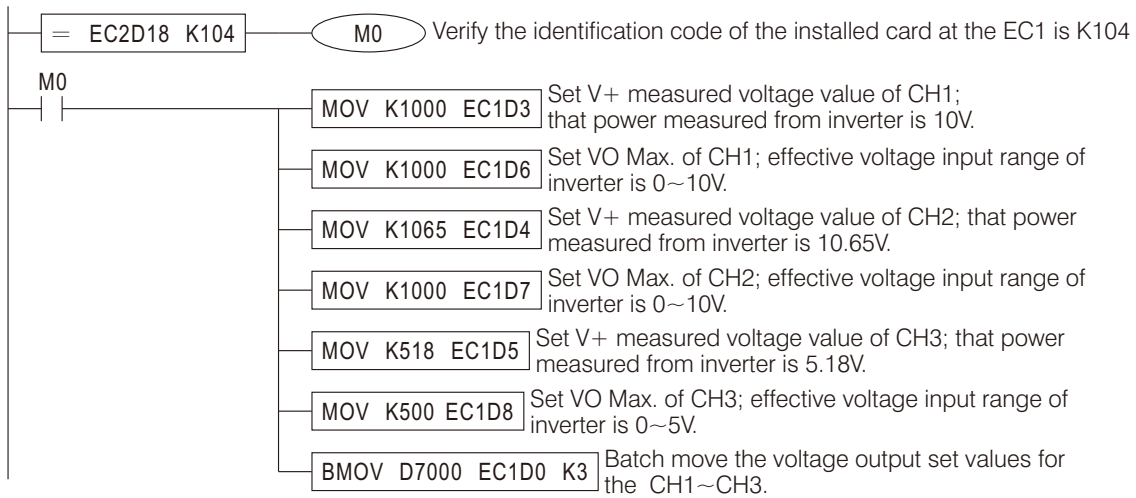
- External Wiring



∗1: Please use the shield isolation cable and keep that away from any power line to prevent external interference or card damage. Ground the isolation layer of the shield cable (Class 3 grounding; earthing resistance < 100Ω).

- Example Program

The VS-3ISC- EC is installed at the EC1 to control three inverters. CH1's voltage output set value at D7000, CH2's voltage output set value at D7001 and CH3's voltage output set value at D7002.

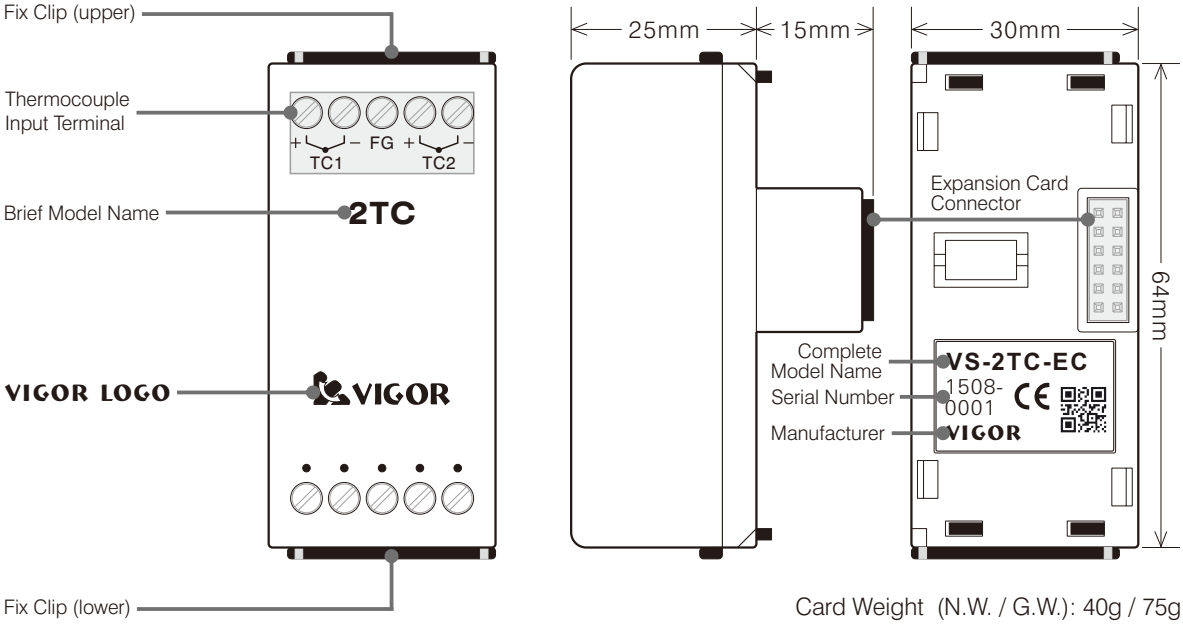


6-3-6 VS-2TC-EC Temperature Input Expansion Card

The VS-2TC-EC Temperature Input Expansion Card can receive external 2 channels of thermocouple signal input, and converts those into temperature related digital values. When the END instruction is executed, the VS Main Unit reads out temperature conversion data from the VS-2TC-EC card and stores the values to respective EC card registers. Thus, it provides the reference data for digital monitoring or control.

Since between the input channels are non-isolated, the isolated (ungrounded) thermocouple sensors are required. Thus, the VS-2TC-EC Temperature Input Expansion Card is non-isolated. Please read following instructions before use.

- Product Exterior



Card Weight (N.W. / G.W.): 40g / 75g

- Product Specification

Basic Specification

Item	Specification
Power Consumption	DC5V 7mA, DC12V 0mA (from PLC Main Unit)

Performance Specification of Temperature Input

Item		Specification
Sensor Type		K, J, R, S, T, E, B or N type isolated (ungrounded) thermocouple
Measurable Range	K	–200 ℃ ~ 1200 ℃ (–328 ℉ ~ 2192 ℉)
	J	–160 ℃ ~ 1200 ℃ (–256 ℉ ~ 2192 ℉)
	R	0 ℃ ~ 1768 ℃ (32 ℉ ~ 3214.4 ℉)
	S	0 ℃ ~ 1768 ℃ (32 ℉ ~ 3214.4 ℉)
	T	–220 ℃ ~ 400 ℃ (–364 ℉ ~ 752 ℉)
	E	–220 ℃ ~ 1000 ℃ (–364 ℉ ~ 1832 ℉)
	B	300 ℃ ~ 1800 ℃ (572 ℉ ~ 3272 ℉)
	N	–200 ℃ ~ 1300 ℃ (–328 ℉ ~ 2372 ℉)
Converted Value		The measurement results are indicated by the unit of 0.1 ℃ or 0.1 ℉.
Resolution		0.2 ℃ ~ 0.3 ℃ (0.36 ℉ ~ 0.54 ℉)
Overall Accuracy		± 1% (Overall Max.) ± 1 ℃
Response Time		100 ms, the temperature values will be renewed at the END instruction.
Isolation Method		No isolation between PLC and input channels. No isolation between input channels. Please use the isolated (ungrounded) thermocouple sensors.

- EC Card Register (Simple Code) Related to VS-2TC-EC

EC1	EC2	EC3	Component Description	
EC1D0	EC2D0	EC3D0	To assign the thermocouple types for TC1～TC2.	
EC1D1	EC2D1	EC3D1	To assign the unit of temperature measurement. 0:℃; 1:℉; other values: ℃.	
EC1D2	EC2D2	EC3D2	Converted temperature value of TC1, with unit as 0.1 ℃ or 0.1 ℉.	
EC1D3	EC2D3	EC3D3	Converted temperature value of TC2, with unit as 0.1 ℃ or 0.1 ℉.	
EC1D6	EC2D6	EC3D6	To set the average times of TC1	Usable set value is 1～32767; other values = 5.
EC1D7	EC2D7	EC3D7	To set the average times of TC2	
EC1D17	EC2D17	EC3D17	Status and error flag	
EC1D18	EC2D18	EC3D18	Identification code: K105 (If code = K240, means connecting error between Main Unit and card)	
EC1D19	EC2D19	EC3D19	The version number of this card. (the content value □□ indicates Ver. □.□)	

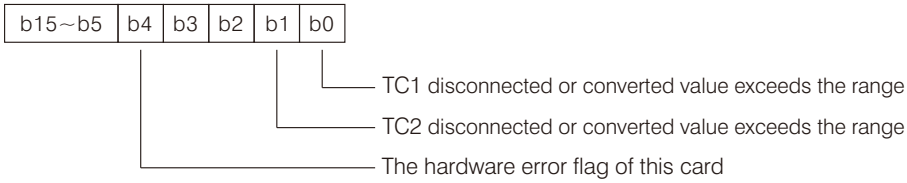
Assign Thermocouple Type:

Value of Nibble	0	1	2	3	4	5	6	7
Thermocouple Type	K	J	R	S	T	E	B	N

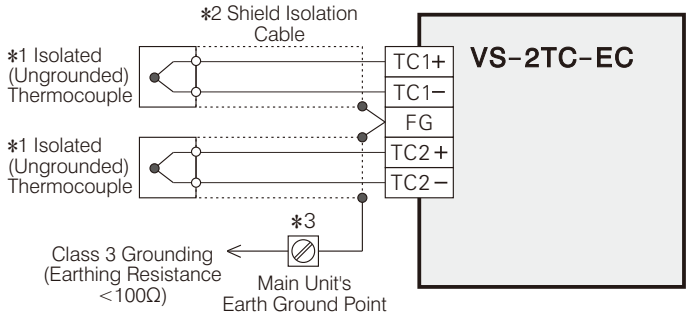
If Value of Nibble is not 0～7, the channel is disabled.

Example: If a VS-2TC-EC is installed at the EC1, and its EC1D0 is set to be H0010, then
TC1: K Type of thermocouple input, TC2: J Type thermocouple input.

Status and Error Flag:



- External Wiring



∗1: Always use isolated (ungrounded) thermocouple sensor

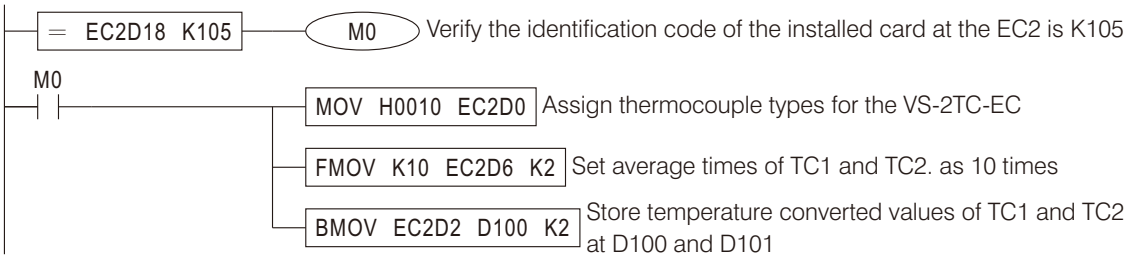
∗2: Please use the shield isolation cable for every temperature input. Must keep the signal cable away from any power line (including the power of motor, valve or contactor) to prevent external interference or card damage.

∗3: First, please connect the end of the covering layer of shielded cables to the FG terminal. Then, connect the FG to the earth ground point of Main Unit. After that, make use of class 3 grounding for the point.

∗4: Please use appropriate compensating cables for thermocouple extension.

- Example Program

The VS-2TC-EC is installed at the EC2, its TC1 is for the K Type thermocouple and TC2 is for the J Type thermocouple; the average times of each temperature input is set to be 10 times.
The input converted values of TC1～TC2 are sequentially stored at D100～D101.

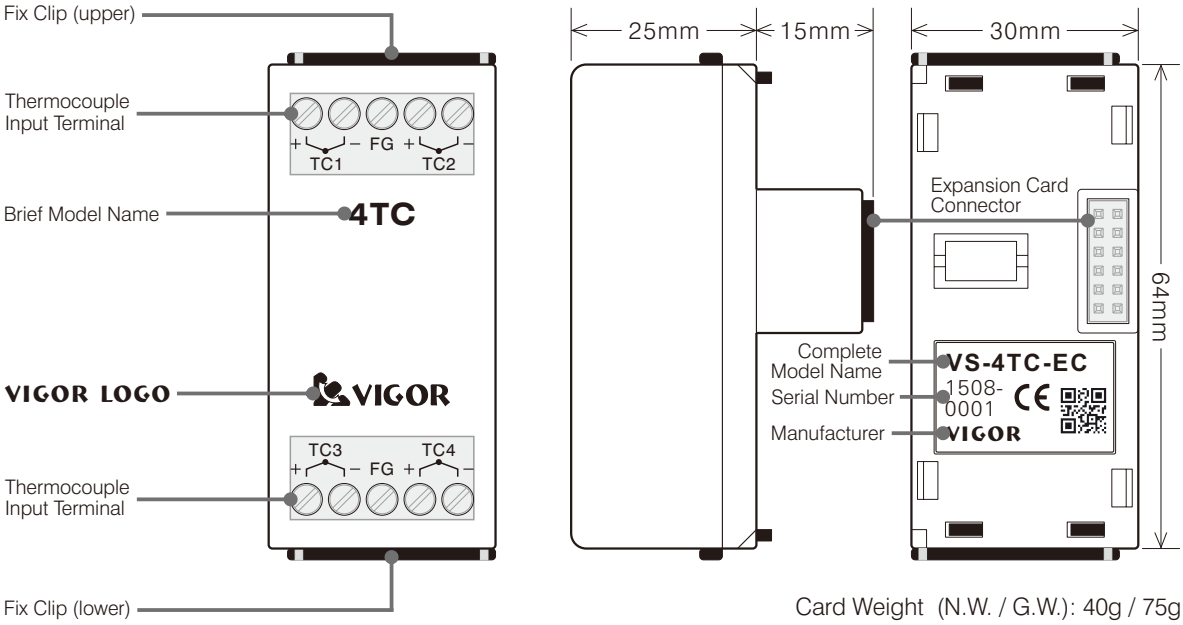


6-3-7 VS-4TC-EC Temperature Input Expansion Card

The VS-4TC-EC Temperature Input Expansion Card can receive external 4 channels of thermocouple signal input, and converts those into temperature related digital values. When the END instruction is executed, the VS Main Unit reads out temperature conversion data from the VS-4TC-EC card and stores the values to respective EC card registers. Thus, it provides the reference data for digital monitoring or control.

Since between the input channels are non-isolated, the isolated (ungrounded) thermocouple sensors are required. Thus, the VS-4TC-EC Temperature Input Expansion Card is non-isolated. Please read following instructions before use.

- Product Exterior



Card Weight (N.W. / G.W.): 40g / 75g

- Product Specification

Basic Specification

Item	Specification
Power Consumption	DC5V 7mA, DC12V 0mA (from PLC Main Unit)

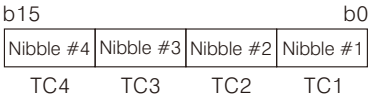
Performance Specification of Temperature Input

Item		Specification
Sensor Type		K, J, R, S, T, E, B or N type isolated (ungrounded) thermocouple
Measurable Range	K	–200 ℃ ~ 1200 ℃ (–328 ℉ ~ 2192 ℉)
	J	–160 ℃ ~ 1200 ℃ (–256 ℉ ~ 2192 ℉)
	R	0 ℃ ~ 1768 ℃ (32 ℉ ~ 3214.4 ℉)
	S	0 ℃ ~ 1768 ℃ (32 ℉ ~ 3214.4 ℉)
	T	–220 ℃ ~ 400 ℃ (–364 ℉ ~ 752 ℉)
	E	–220 ℃ ~ 1000 ℃ (–364 ℉ ~ 1832 ℉)
	B	300 ℃ ~ 1800 ℃ (572 ℉ ~ 3272 ℉)
	N	–200 ℃ ~ 1300 ℃ (–328 ℉ ~ 2372 ℉)
Converted Value		The measurement results are indicated by the unit of 0.1 ℃ or 0.1 ℉
Resolution		0.2 ℃ ~ 0.3 ℃ (0.36 ℉ ~ 0.54 ℉)
Overall Accuracy		±1% (Overall Max.) ±1 ℃
Response Time		100 ms, the temperature values will be renewed at the END instruction.
Isolation Method		No isolation between PLC and input channels. No isolation between input channels. Please use the isolated (ungrounded) thermocouple sensors.

- EC Card Register (Simple Code) Related to VS-4TC-EC

EC1	EC2	EC3	Component Description	
EC1D0	EC2D0	EC3D0	To assign the thermocouple types for TC1~TC4.	
EC1D1	EC2D1	EC3D1	To assign the unit of temperature measurement. 0:℃; 1:℉; other values:℃.	
EC1D2	EC2D2	EC3D2	Converted temperature value of TC1, with unit as 0.1 ℃ or 0.1 ℉.	
EC1D3	EC2D3	EC3D3	Converted temperature value of TC2, with unit as 0.1 ℃ or 0.1 ℉.	
EC1D4	EC2D4	EC3D4	Converted temperature value of TC3, with unit as 0.1 ℃ or 0.1 ℉.	
EC1D5	EC2D5	EC3D5	Converted temperature value of TC4, with unit as 0.1 ℃ or 0.1 ℉.	
EC1D6	EC2D6	EC3D6	To set the average times of TC1	Usable set value is 1~32767; other values = 5.
EC1D7	EC2D7	EC3D7	To set the average times of TC2	
EC1D8	EC2D8	EC3D8	To set the average times of TC3	
EC1D9	EC2D9	EC3D9	To set the average times of TC4	
EC1D17	EC2D17	EC3D17	Status and error flag	
EC1D18	EC2D18	EC3D18	Identification code: K106 (If code = K240, means connecting error between Main Unit and card)	
EC1D19	EC2D19	EC3D19	The version number of this card. (the content value □□ indicates Ver. □.□)	

To appoint the types of thermocouples:

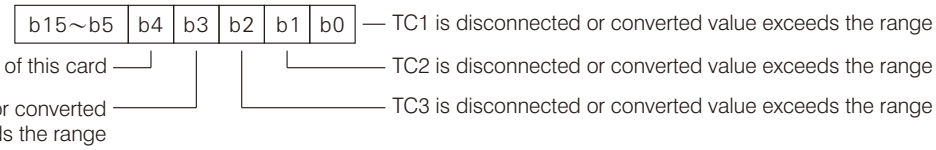


Value of Nibble	0	1	2	3	4	5	6	7
Thermocouple Type	K	J	R	S	T	E	B	N

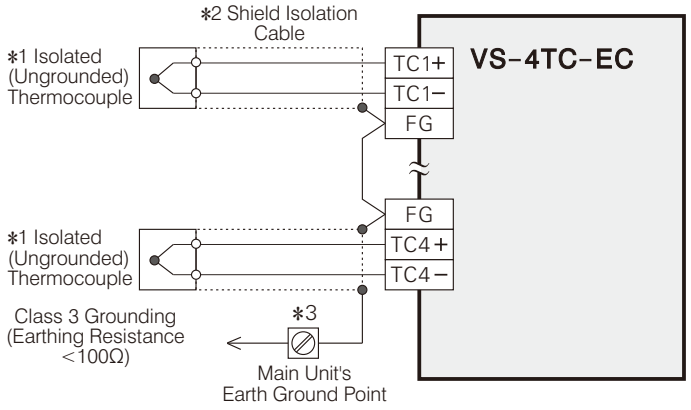
If Value of Nibble is not 0~7, the channel is disabled.

Example: If a VS-4TC-EC is installed at the EC1, and its EC1D0 is set to be H8100, then
TC1 & TC2: K Type of thermocouple input, TC3: J Type thermocouple input, TC4: disabled

Status and Error Flag:



- External Wiring



∗1: Always use isolated (ungrounded) thermocouple sensor

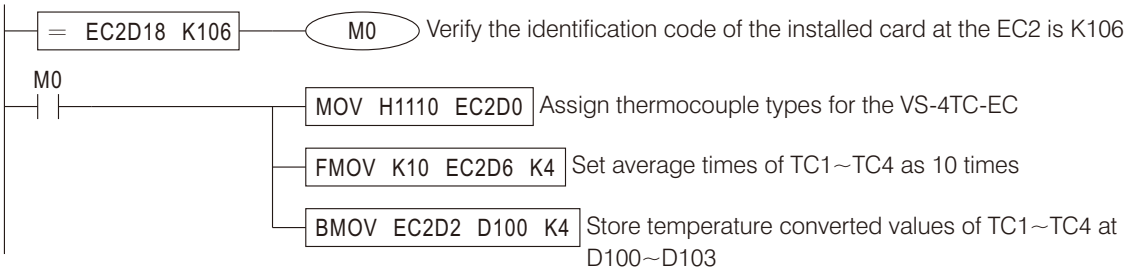
∗2: Please use the shield isolation cable for every temperature input. Must keep the signal cable away from any power line (including the power of motor, valve or contactor) to prevent external interference or card damage.

∗3: First, please connect the end of the covering layer of shielded cables to the FG terminal. Then, connect those FGs to the earth ground point of Main Unit. After that, make use of class 3 grounding for the point.

∗4: Please use appropriate compensating cables for thermocouple extension.

- Example Program

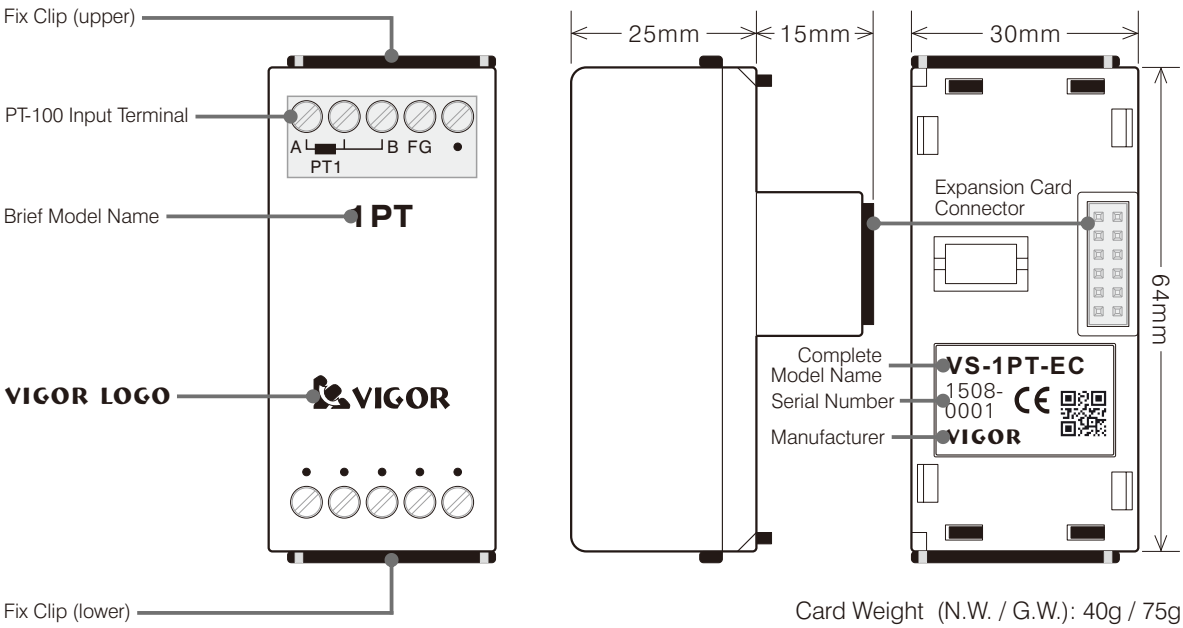
The VS-4TC-EC is installed at the EC2, its TC1 is for the K Type thermocouple and TC2~TC4 are for the J Type thermocouples; the average times of each temperature input is set to be 10 times.
The input converted values of TC1~TC4 are sequentially stored at D100~D103.



6-3-8 VS-1PT-EC Temperature Input Expansion Card

The VS-1PT-EC Temperature Input Expansion Card can receive external 1 channel of PT-100 Platinum RTD signal input, and converts that into temperature related digital value. When the END instruction is executed, the VS Main Unit reads out temperature conversion data from the VS-1PT-EC card and stores the value to respective EC card register. Thus, it provides the reference data for digital monitoring or control.
The VS-1PT-EC Temperature Input Expansion Card is non-isolated. Please read following instructions before use.

- Product Exterior



Card Weight (N.W. / G.W.): 40g / 75g

- Product Specification

Basic Specification

Item	Specification
Power Consumption	DC5V 15mA, DC12V 0mA (from PLC Main Unit)

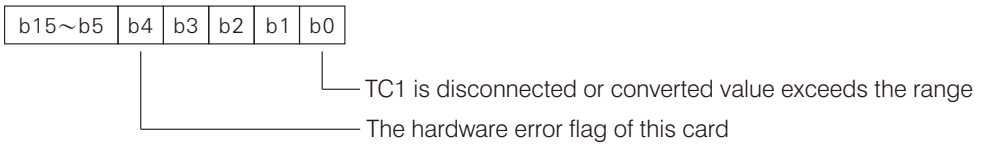
Performance Specification of Temperature Input

Item	Specification
Sensor Type	PT-100, Platinum resistance thermometer (RTD), 3-Wire, 100 Ω @ 0 ℃ , 3850 PPM/℃
Measurable Range	−200 ℃ ～ 850 ℃ (−328 ℉ ～ 1562 ℉)
Converted Value	The measurement results are indicated by the unit of 0.1 ℃ or 0.1 ℉ .
Resolution	0.1 ℃ (0.18 ℉)
Overall Accuracy	± 1% (Overall Max.)
Response Time	25 ms, the temperature values will be renewed at the END instruction.
Isolation Method	No isolation between PLC and PT-100 input

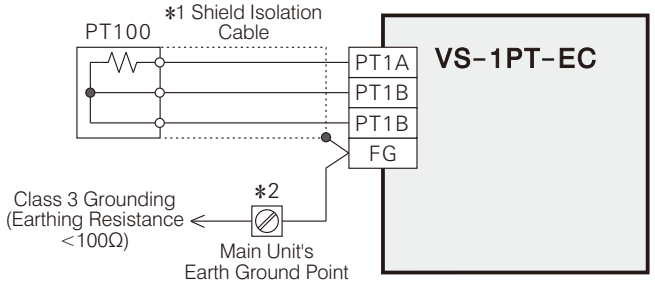
- EC Card Register (Simple Code) Related to VS-1PT-EC

EC1	EC2	EC3	Component Description
EC1D0	EC2D0	EC3D0	To select the frequency of power noise to be filtered out. 0: 60Hz, 1: 50Hz; other values: 60Hz. Reduce the influence of noise from power lines. Always set the value as 1 for 50Hz AC system.
EC1D1	EC2D1	EC3D1	To assign the unit of temperature measurement. 0: ℃ ; 1: ℉ ; other values: ℃ .
EC1D2	EC2D2	EC3D2	Converted temperature value of PT1, with unit as 0.1 ℃ or 0.1 ℉ .
EC1D6	EC2D6	EC3D6	To set the average times of PT1. Usable set value is 1～32767; other values = 1.
EC1D17	EC2D17	EC3D17	Status and error flag
EC1D18	EC2D18	EC3D18	Identification code: K107 (If code = K240, means connecting error between Main Unit and card)
EC1D19	EC2D19	EC3D19	The version number of this card. (the content value □□ indicates Ver. □ . □)

Status and Error Flag:



- External Wiring

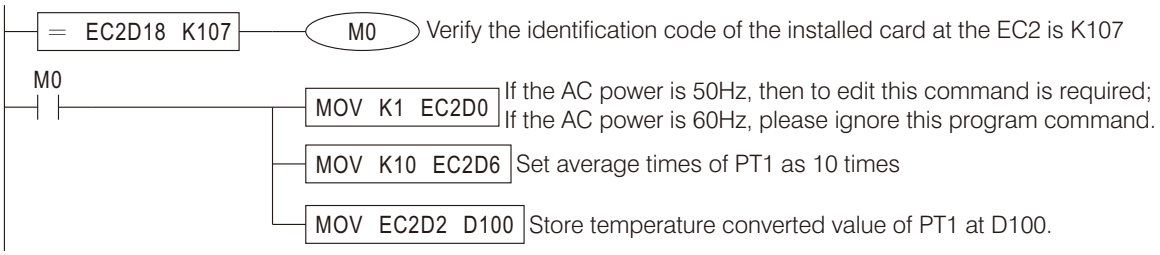


∗1: Please use the shield isolation cable for temperature input. Must keep the signal cable away from any power line (including the power of motor, valve or contactor) to prevent external interference or card damage.

∗2: First, please connect the end of the covering layer of shielded cable to the FG terminal. Then, connect that FG to the earth ground point of Main Unit. After that, make use of class 3 grounding for the point.

- Example Program

The VS-1PT-EC is installed at the EC2, the average times of PT1 is set to be 10 times.
The input converted value of PT1 is stored at D100.

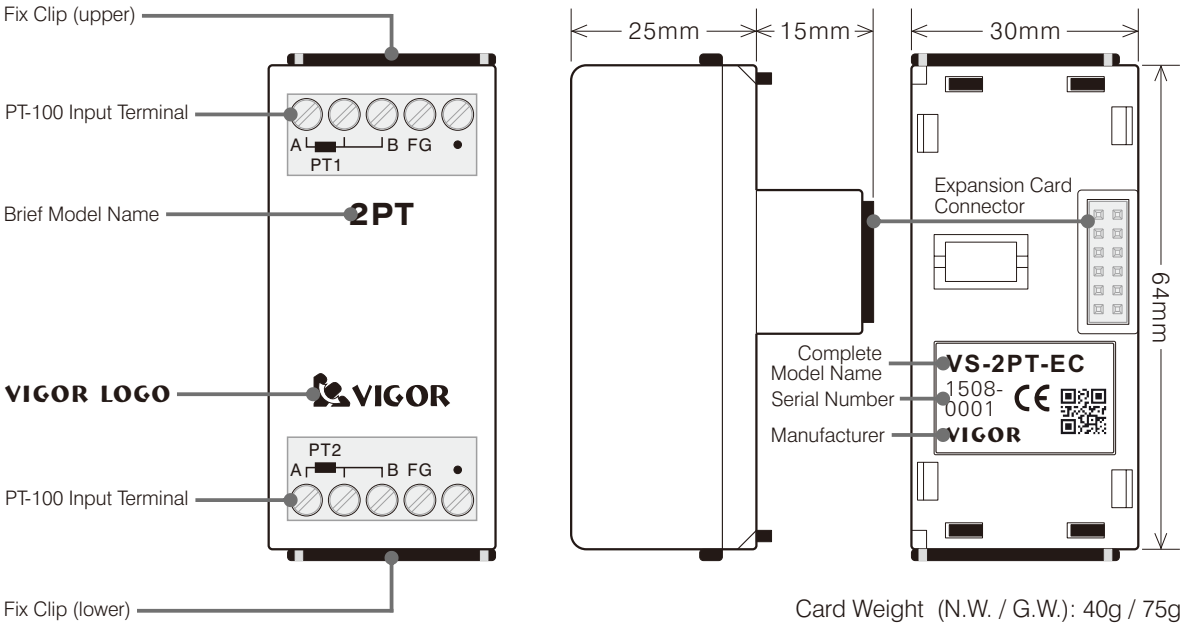


6-3-9 VS-2PT-EC Temperature Input Expansion Card

The VS-2PT-EC Temperature Input Expansion Card can receive external 2 channels of PT-100 Platinum RTD signal input, and converts those into temperature related digital values. When the END instruction is executed, the VS Main Unit reads out temperature conversion data from the VS-2PT-EC card and stores the values to respective EC card registers. Thus, it provides the reference data for digital monitoring or control.

The VS-2PT-EC Temperature Input Expansion Card is non-isolated. Please read following instructions before use.

- Product Exterior



Card Weight (N.W. / G.W.): 40g / 75g

- Product Specification

Basic Specification

Item	Specification
Power Consumption	DC5V 22mA, DC12V 0mA (from PLC Main Unit)

Performance Specification of Temperature Input

Item	Specification
Sensor Type	PT-100, Platinum resistance thermometer (RTD), 3-Wire, 100 Ω @ 0 ℃ , 3850 PPM/℃
Measurable Range	−200 ℃ ~ 850 ℃ (−328 ℉ ~ 1562 ℉)
Converted Value	The measurement results are indicated by the unit of 0.1 ℃ or 0.1 ℉ .
Resolution	0.1 ℃ (0.18 ℉)
Overall Accuracy	± 1% (Overall Max.)
Response Time	25 ms, the temperature values will be renewed at the END instruction.
Isolation Method	No isolation between PLC and PT-100 inputs; no isolation between PT-100 input channels

- EC Card Register (Simple Code) Related to VS-2PT-EC

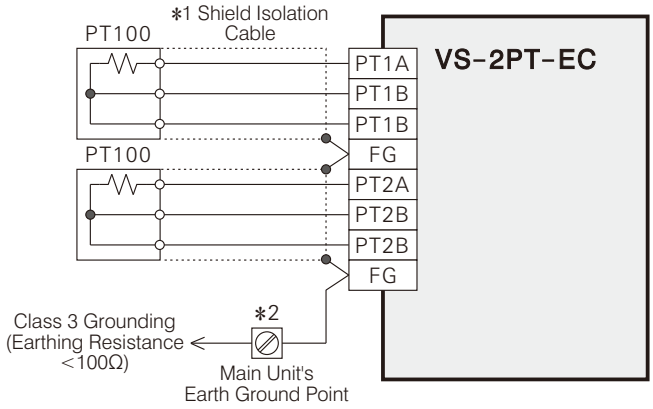
EC1	EC2	EC3	Component Description
EC1D0	EC2D0	EC3D0	To select the frequency of power noise to be filtered out. 0: 60Hz, 1: 50Hz; other values: 60Hz. Reduce the influence of noise from power lines. Always set the value as 1 for 50Hz AC system.
EC1D1	EC2D1	EC3D1	To assign the unit of temperature measurement. 0: ℃ ; 1: ℉ ; other values: ℃ .
EC1D2	EC2D2	EC3D2	Converted temperature value of PT1, with unit as 0.1 ℃ or 0.1 ℉ .
EC1D3	EC2D3	EC3D3	Converted temperature value of PT2, with unit as 0.1 ℃ or 0.1 ℉ .
EC1D6	EC2D6	EC3D6	To set the average times of PT1. Usable set value is 1~32767; other values = 1.
EC1D7	EC2D7	EC3D7	To set the average times of PT2.
EC1D17	EC2D17	EC3D17	Status and error flag.
EC1D18	EC2D18	EC3D18	Identification code: K108 (If code = K240, means connecting error between Main Unit and card)
EC1D19	EC2D19	EC3D19	The version number of this card. (the content value □□ indicates Ver. □.□)

Status and Error Flag:

b15~b5	b4	b3	b2	b1	b0

- b0: PT1 is disconnected or converted value exceeds the range
- b1: PT2 is disconnected or converted value exceeds the range
- b4: The hardware error flag of this card

- External Wiring

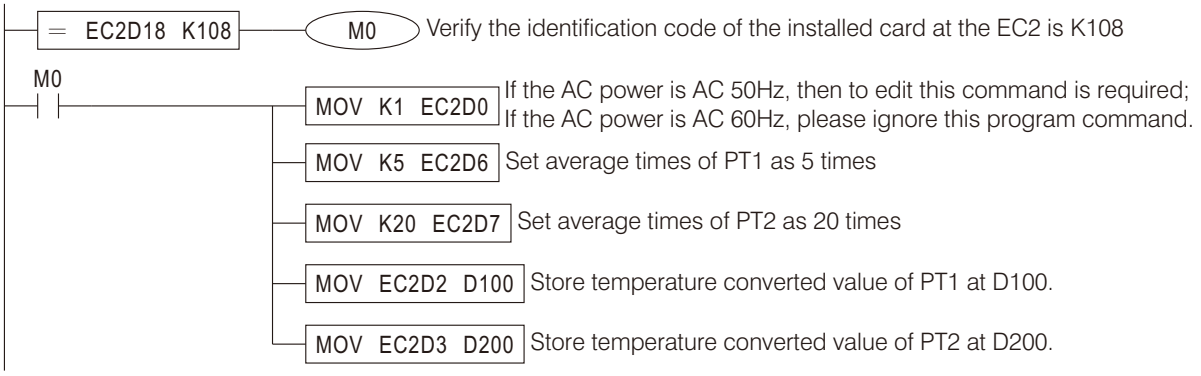


∗1: Please use the shield isolation cable for every temperature input. Must keep the signal cable away from any power line (including the power of motor, valve or contactor) to prevent external interference or card damage.

∗2: First, please connect the end of the covering layer of shielded cable to the FG terminal. Then, connect those FGs to the earth ground point of Main Unit. After that, make use of class 3 grounding for the point.

- Example Program

The VS-2PT-EC is installed at the EC2, the average times of PT1 is set to be 5 times and the average times of PT2 is set to be 20 times.
The input converted value of PT1 is stored at D100; the input converted value of PT2 is stored at D200.



MEMO

7. Memory Card

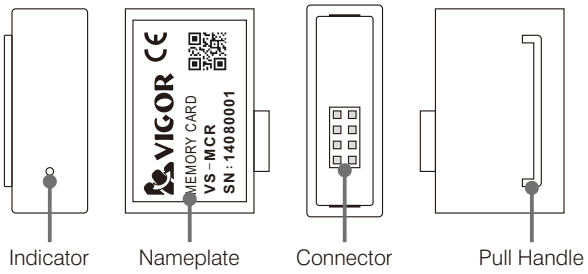
The Memory Card Socket under the left cover of VS series PLC is available for mounting a VS-MC or VS-MCR Memory Card, that exterior memory could store a user project and huge data also the real time clock RTC is optional.
The memory of those cards uses the Flash ROM technology which has the advantage of no battery required data latched ability. Thus, its effect is alike the hard disk of the PLC.

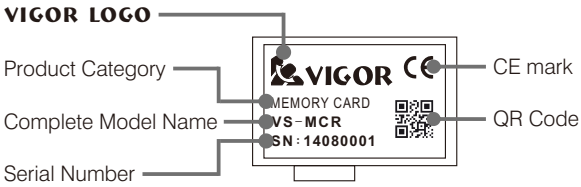
The memory capacity of the card is 16 Mb (Mega bit), the PLC system separates that into three sections:
Section I: User Project Memory, 1Mb (= 64K Words = 65,536 Words) is assigned for to store a user's project.
Section II: Data Bank, 10Mb (=640K Words = 655,360 Words) is assigned for to store huge data.
Section III: 5Mb, reserved.

The appropriate user project and relevant data (such as system setting, molding parameters, event records...) are all stored in the card. If the PLC Main Unit got failed, the user can quickly move the card into a new spare unit. With the card, the maintenance work can complete by an ordinary trained worker, not necessary by a professional. It solves the problem of inconvenient maintenance if the controller fails.

Besides,the large memory capacity is ideal for data collecting system or the control that requires a large amount of formula data (such as dynamic theater, water dance...). The RTC of the VS-MCR Multi-Function Memory Card is providing the timing control ability, suitable for automatic sprinkling, energy saving and other timing controls.

- Product Exterior





- Product Specification

Item	VS-MCR	VS-MC
Memory Capacity	16Mb Flash ROM, no battery required latched memory	
Memory Life Span	Rewrite: 100,000 times; read: no limit	
User Project Memory	Support a user project storage or project duplicate function for all VS series PLCs.	
Data Bank	Data storage capacity of 655,360 Words	
Real Time Clock (RTC)	Indicates year, month, date, hour, minute, second and day of week	—

- Description of the User Project Memory in the Card
  The memory card's User Project Memory has 2 working modes: General Mode / Copy Mode.
  For the General Mode, the installed memory card becomes the project memory component of the system. If the PLC malfunctions, user can easily move the memory card to the spare equipment to transfer the whole control system smoothly. When a PLC has a General Mode card, any programming process (project write or read) and the PLC's operation are all working on the User Project Memory section of the memory card.

  On the other hand, the Copy Mode is for to duplicate PLCs' project at production line or to reprogram a system that is far away. When a PLC has a card which is under the Copy Mode the PLC is not allowed to execute any other mission also all communication ports are disabled.
  The default setting of a memory card is the General Mode, the programmer can install a user project into the card. Then, by the programming software Ladder Master S, “Connect” - “PLC Memory Card setup” function or other programming device to set this card be the Copy Mode, also the number of Copy Times is selectable.

  - How to identify the working mode of memory card
    Install the memory card to a Main Unit then turn on the power. The working mode can be identified by the indicator on memory card: General Mode (light OFF); Copy Mode (light ON).
  - How to duplicate user's project from the memory card to the memory of Main Unit
    When the Main Unit has a Copy Mode memory card and then power is supplied, the indicator on the card is ON. Gently press down the RUN/STOP button once to start duplicate the project from the card to the unit, that will cause the indicator blinking during the process. After a few seconds, the duplication is completed, the indicator turns ON again and the number of “Copy Times” decreases 1. When the number goes to 0, the working mode of this card turns back to General Mode. Any errors happen during duplication, the indicator light will turn OFF.
  - How to manually force a memory card from the Copy Mode to the General Mode
    The card's indicator will stay ON if it's at Copy Mode. Press and hold the RUN/STOP button until the indicator OFF. Thus, the Copy Times is cleared to 0 (become the General Mode).

- Functional Description of the Data Bank in the Memory Card

  As its name suggests, the Data Bank is a device to store the large amount of data. Therefore, the Data Bank in the memory card becomes the extra huge data storage of the VS series PLC.

  With the DBWR instruction, the VS Main Unit moves and stores data at registers to the Data Bank. Furthermore, with the DBRD instruction, PLC reads data from the Data Bank to its registers for operation and reference.

  As long as the dynamic data of PLC (such as system setting, molding parameters, event records, etc.) is stored in the Data Bank and via user's project to store all variable data of PLC to the memory card. Since all data and the user's project are in the memory card, the system can be quickly and smoothly transferred to another if the regular used one is malfunctioned. In other words, if data like molding parameters is stored in the latched area of PLC and in case the PLC fails, the only way to retrieve those data is waiting until PLC is repaired, which causes a lot of troubles.

  For the usage descriptions of DBWR and DBRD, please see “VS Series PLC Programming Manual”

- Functional Description of the Real Time Clock (RTC) in the VS-MCR Card

  • Read Out RTC Time

  Once the VB-MCR card is installed in a Main Unit, the PLC system will actively read out time data of RTC in the VB-MCR, and store the data in particular special registers D9013~D9019 for the reference of the project is used. Moreover, the TRD instruction is able to read out time data of RTC to data registers.

  • RTC Time Setup

  Time at the RTC is set by the “Connect” – “PLC Real Time Clock Setup” function in programming tool the Ladder Master S.

  In addition, the TWR instruction is able to write RTC time data. Other peripheral equipment like HMI could change RTC time by using this instruction.

  • Special Relay and Special Register Related to RTC ■ Represents that component is read only.

Relay ID No.	Description
M9015	RTC stops and write the values in D9013~D9019 to the RTC
M9016	Stop reading time data from RTC.
M9017	Modify RTC ±30sec.
■M9018	M9018= “ON” when RTC is installed in the Main Unit.
■M9019	Write wrong data onto RCT

Register ID No.	Description
D9013	Seconds value. (0~59)
D9014	Minute value. (0~59)
D9015	Hour value. (0~23)
D9016	Date value. (1~31)
D9017	Month value. (1~12)
D9018	Year value. (2000~20YY, 4 digits)
D9019	Day of week. 0 (Sunday) ~ 6 (Saturday).

The VS-MCR card is equipped with a rechargeable lithium battery, that is for the operational demand of RTC during the period of non-powered. When the VS-MCR is installed in a VS series PLC and it is powered, the battery will charge automatically. After 24 hours, the battery is fully charged that can provide the RTC to operate continuously for 6 months.

The characteristic of the lithium battery will gradually decrease the carrying capacity when the temperature is high. Thus, please avoid the high temperature place to ensure the RTC can work normally.

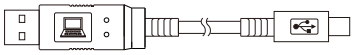
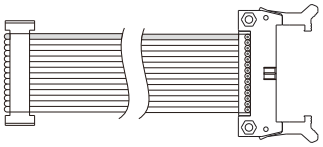
8. Peripheral Products

The VS series not only has the control system consisting of the Main Units, expansion modules, expansion cards and memory cards, but also with numbers of peripheral products, such as connection cables and accessories of the IDC (Insulation-Displacement Contact) connector models. The peripherals can enhance conveniences and a variety of options..

- List of VS series PLC's Peripheral Products

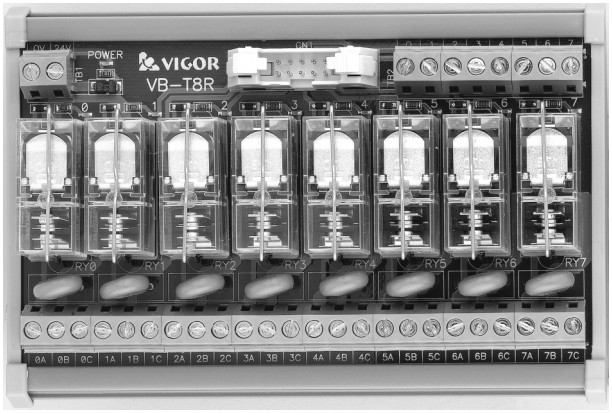
Item	Model Name	Specification
Connection Cable	VSPC-200A	USB Comm. Cable: Between the PLC's Mini USB Programming Port and computer's A-type USB; length: 200 cm
	VSEC-050	Extension Cable: For the Expansion Slot of the VS series; length: 50 cm
	VSEC-100	Extension Cable: For the Expansion Slot of the VS series; length: 100 cm
IDC Connector Related Accessory	VB-T8R	8 Relays Output Module: 16A 1c contact relays; with varistors and relay sockets
	VB-T8RS	8 Relays Output Module: 5A 1a contact relays; with 5mm pluggable screw-clamp terminals
	VB-T8M	8 MOSFETs Output Module: 2A current source MOSFETs; with flyback diodes
	VB-T16M	16 MOSFETs Output Module: 2A current source MOSFETs; with flyback diodes
	VB-T16TB	16 Points Adapted Board: Transfer between the IDC connectors and screw-clamp terminals
	VBIDC-050	IDC Ribbon Cable: Assembled with two 10-pin female connectors; length: 50 cm
	VBIDC-100	IDC Ribbon Cable: Assembled with two 10-pin female connectors; length: 100 cm
	VBIDC-150	IDC Ribbon Cable: Assembled with two 10-pin female connectors; length: 150 cm
	VBIDC-200	IDC Ribbon Cable: Assembled with two 10-pin female connectors; length: 200 cm
	VBIDC-250	IDC Ribbon Cable: Assembled with two 10-pin female connectors; length: 250 cm
	VBIDC-300	IDC Ribbon Cable: Assembled with two 10-pin female connectors; length: 300 cm
	VBIW-050	IDC's Dispersed Wires: An IDC female connector with 10 rainbow 22 AWG wires; length: 50 cm
	VBIW-100	IDC's Dispersed Wires: An IDC female connector with 10 rainbow 22 AWG wires; length: 100 cm
	VBIW-200	IDC's Dispersed Wires: An IDC female connector with 10 rainbow 22 AWG wires; length: 200 cm
	VBIW-300	IDC's Dispersed Wires: An IDC female connector with 10 rainbow 22 AWG wires; length: 300 cm
	VBIDC-FC100	10-pin Ribbon Cable: Flat, Grey, 28 AWG; length: 100 foot
	VBIDC-FC250	10-pin Ribbon Cable: Flat, Grey, 28 AWG; length: 250 foot
	VBIDC-HD20	10-pin IDC Connector: Female connector with strain relief, Grey, 20 pcs.
	VBIDC-HD100	10-pin IDC Connector: Female connector with strain relief, Grey, 100 pcs.
	VB-HT214	Crimping tool: Merge the IDC connector and ribbon cable

8-1 Connection Cable

Model Name	Diagram	Application
VSPC-200A (L: 200cm)		USB Communication Cable: Between the PLC's Mini USB Programming Port and a computer's A-type USB
VSEC-050 (L: 50cm) VSEC-100 (L: 100cm)		VS series PLC's Expansion Slot length extended cable: (Signals through this extension cable tends to be interfered by noises. Please keep this cable away from intense noise sources.)

8-2 Accessories Related to IDC Connector Model

8-2-1 VB-T8R 8 Relays Output Module

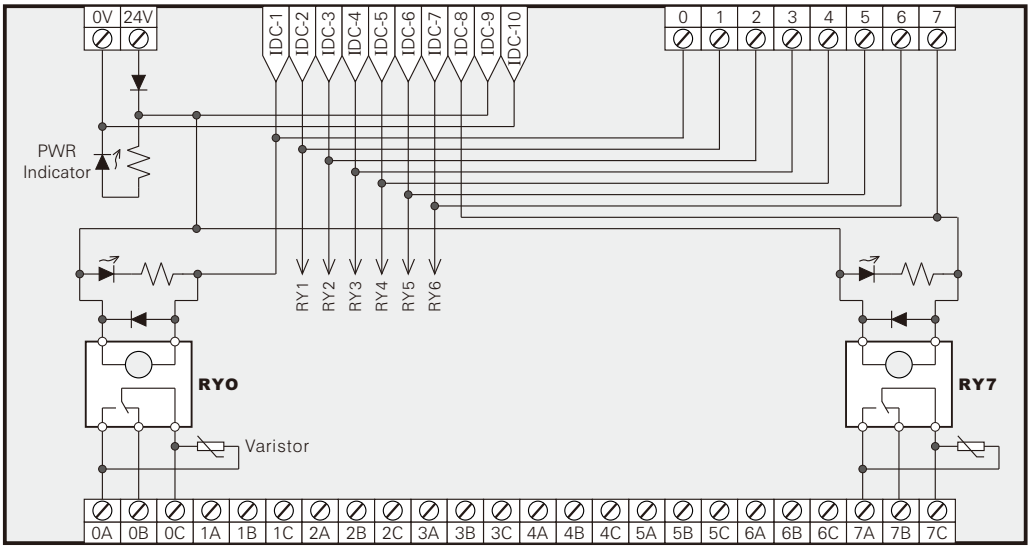


Module Weight (N.W. / G.W.): 335g / 415g

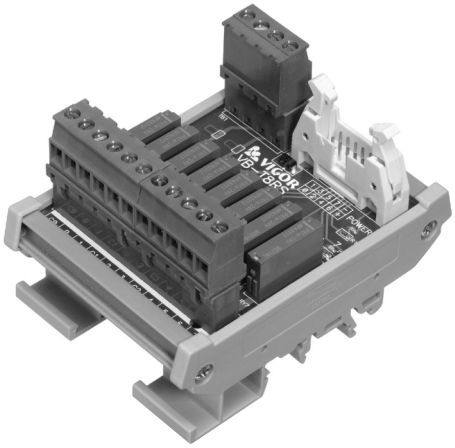
Item	Specification
Power Input	DC 24V –15%/ +20%, 180mA, by 5mm fixed screw-clamp terminal block, with red PWR LED indicator
Number of Relay	8, with relay sockets
Contact of Relay	1c contact, 16A
Status Indicator	Red LED indicator
Protection of Contact	Varistor, join with the “a” contact of each relay in parallel
Signal Input Connection	IDC 10P connector or screw-clamp terminal block
Output Wiring	5mm fixed screw-clamp terminal block
Dimension	130mm (W) × 87mm(H) × 60mm(D)
Mounting Method	35mm DIN rail

Pin Definition of IDC Connector

IDC-2	1	3	5	7	0V	IDC-10
IDC-1	0	2	4	6	24V	IDC-9



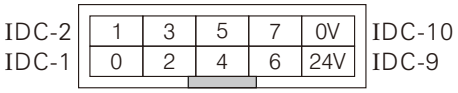
8-2-2 VB-T8RS 8 Relays Output Module



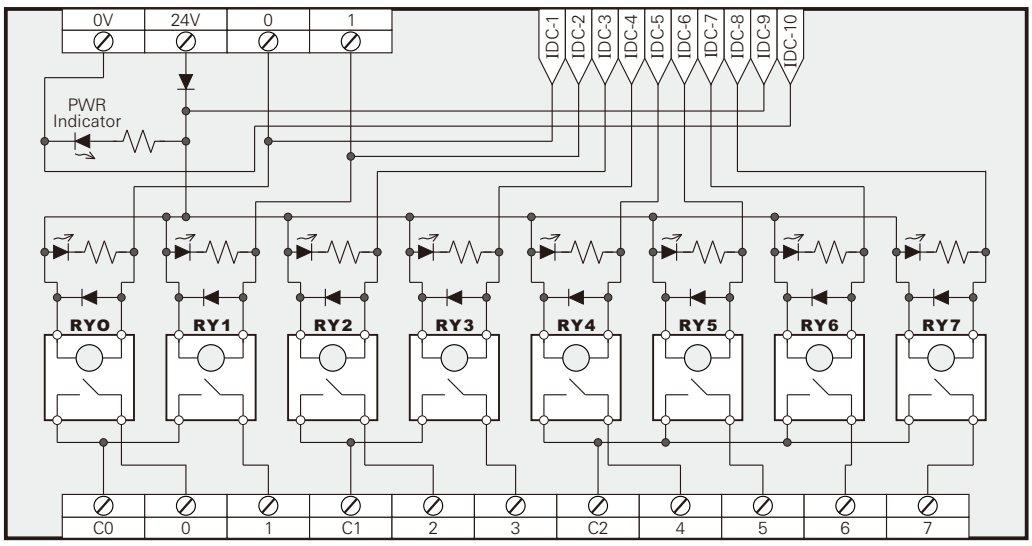
Module Weight (N.W. / G.W.): 140g / 190g

Item	Specification
Power Input	DC 24V –15%/ +20%, 70mA, by 5mm removable screw-clamp terminal block, with red PWR LED indicator
Number of Relay	8
Contact of Relay	1a contact, 5A
Status Indicator	Red LED indicator
Protection of Contact	—
Signal Input Connection	IDC 10P connector
Output Wiring	5mm removable screw-clamp terminal block
Dimension	65mm (W) × 87mm(H) × 55mm(D)
Mounting Method	35mm DIN rail

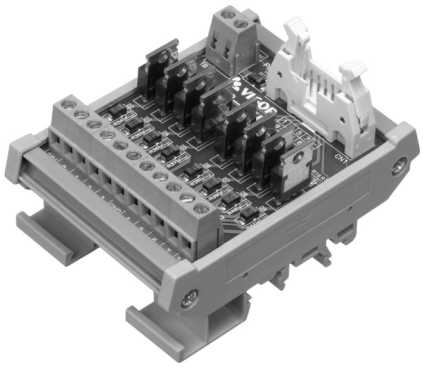
Pin Definition of IDC Connector



107



8-2-3 VB-T8M 8 MOSFETs Output Module

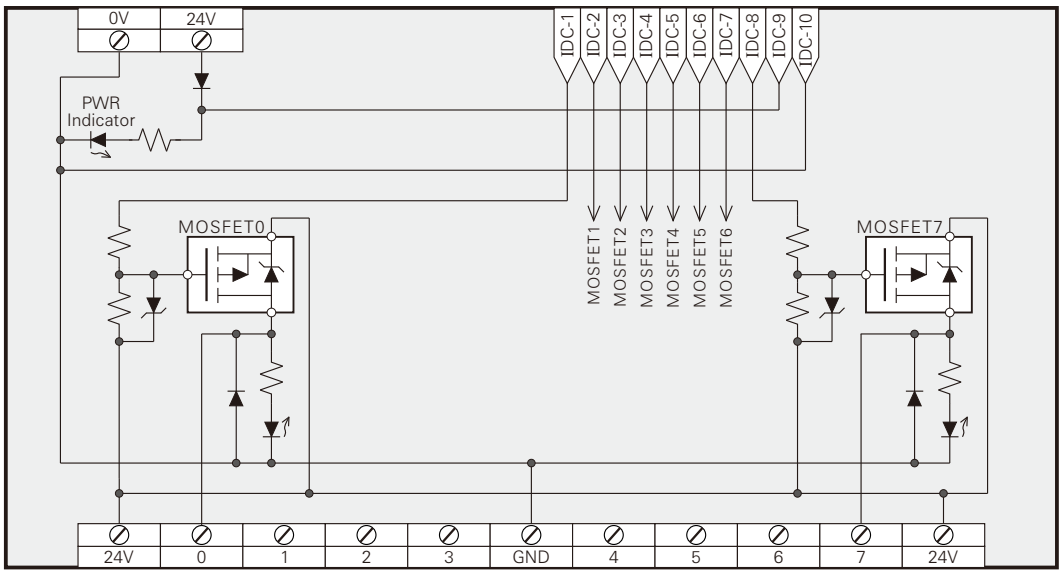


Module Weight (N.W. / G.W.): 105g / 155g

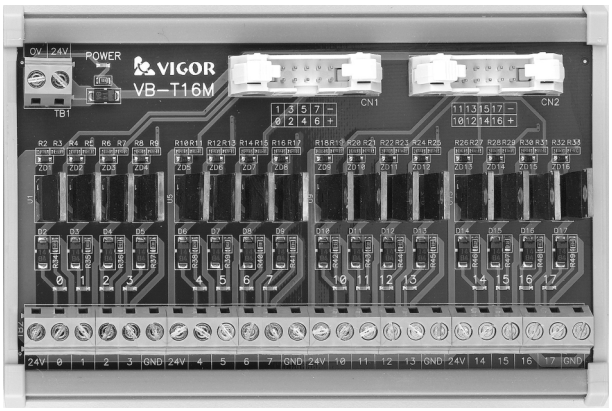
Item	Specification
Power Input	DC 24V –15%/ +20%, 25mA, by 5mm fixed screw-clamp terminal block, with red PWR LED indicator
Number of MOSFET	8
Output Type	Sourcing, 2A
Status Indicator	Red LED indicator, parallel connected at load
Protection of Output	Flyback diode
Signal Input Connection	IDC 10P connector
Output Wiring	5mm fixed screw-clamp terminal block
Dimension	65mm (W) × 87mm(H) × 52mm(D)
Mounting Method	35mm DIN rail

Pin Definition of IDC Connector

IDC-2	1	3	5	7	0V	IDC-10
IDC-1	0	2	4	6	24V	IDC-9



8-2-4 VB-T16M 16 MOSFETs Output Module



Module Weight (N.W. / G.W.): 195g / 275g

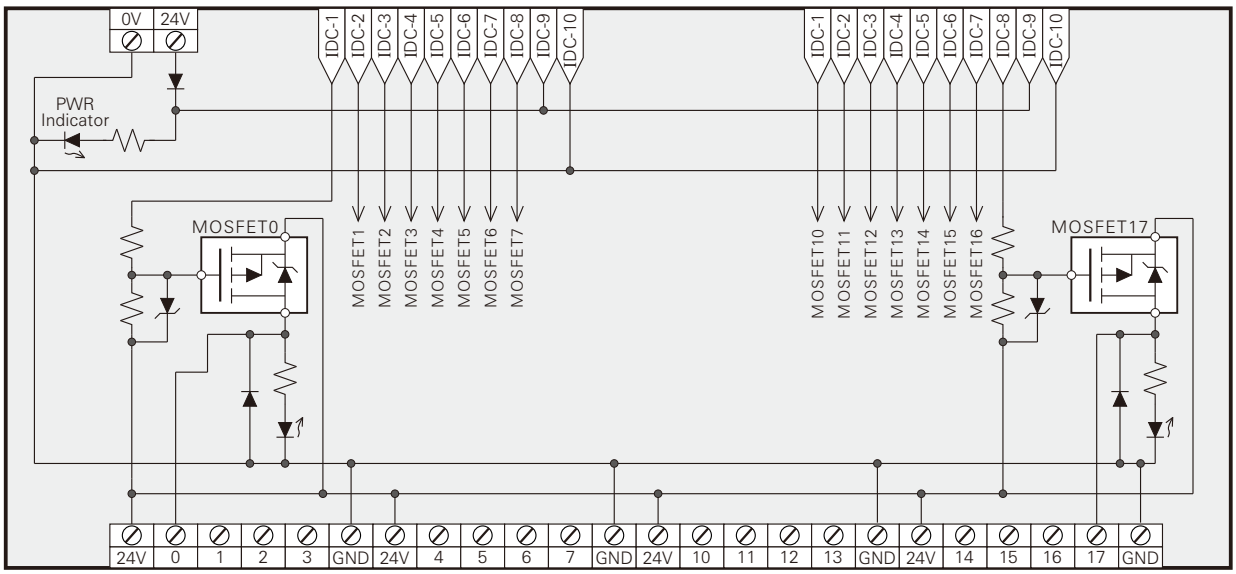
Item	Specification
Power Input	DC 24V –15%/ +20%, 50mA, by 5mm fixed screw-clamp terminal block, with red PWR LED indicator
Number of MOSFET	16
Output Type	Sourcing, 2A
Status Indicator	Red LED indicator, parallel connected at load
Protection of Output	Flyback diode
Signal Input Connection	IDC 10P connector x 2
Output Wiring	5mm fixed screw-clamp terminal block
Dimension	130mm (W) × 87mm(H) × 52mm(D)
Mounting Method	35mm DIN rail

Pin Definition of Left IDC Connector

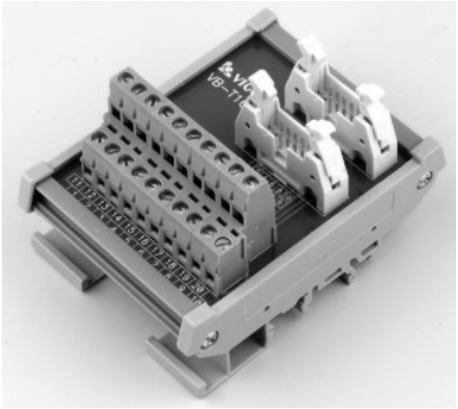
IDC-2	1	3	5	7	0V	IDC-10
IDC-1	0	2	4	6	24V	IDC-9

Pin Definition of Left IDC Connector

IDC-2	11	13	15	17	0V	IDC-10
IDC-1	10	12	14	16	24V	IDC-9



8-2-5 VB-T16TB 16 Channels IDC to Screw-Clamp Terminal Convert Module



Module Weight (N.W. / G.W.): 115g / 165g

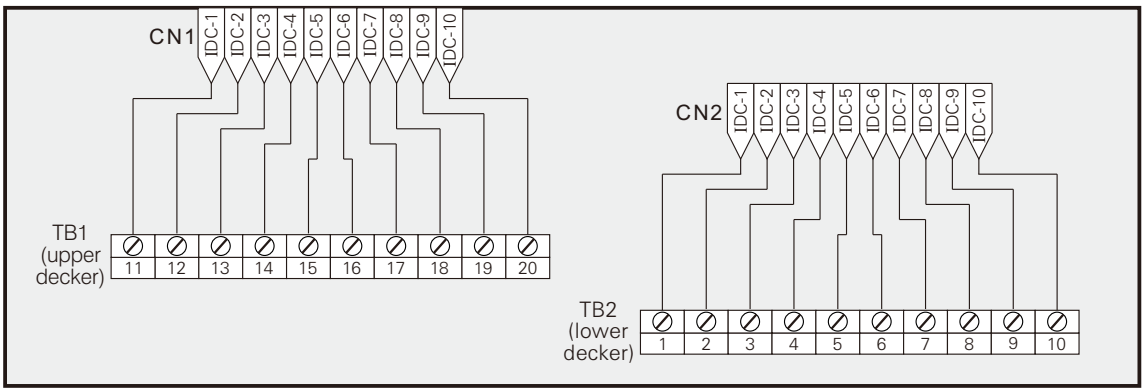
Item	Specification
Signal Connection	IDC 10P connector x 2
Output Wiring	5mm double decker fixed screw-clamp terminal block
Dimension	65mm (W) × 87mm(H) × 52mm(D)
Mounting Method	35mm DIN rail

Pin Definition of IDC Connector at CN1

IDC-2	12	14	16	18	20	IDC-10
IDC-1	11	13	15	17	19	IDC-9

Pin Definition of IDC Connector at CN2

IDC-2	2	4	6	8	10	IDC-10
IDC-1	1	3	5	7	9	IDC-9



Pin Definition of TB1 (Screw-Clamp Terminal Block)

11	12	13	14	15	16	17	18	19	20
1	2	3	4	5	6	7	8	9	10

8-2-6 Connecting Cable and Other Accessories

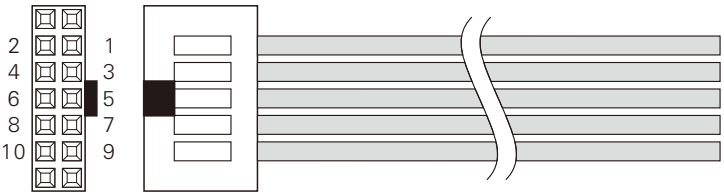
- VBIDC Ribbon Connection Cable

Item	Specification
VBIDC-050	IDC Ribbon Cable: Assembled with two 10-pin female connectors; length: 50 cm
VBIDC-100	IDC Ribbon Cable: Assembled with two 10-pin female connectors; length: 100 cm
VBIDC-150	IDC Ribbon Cable: Assembled with two 10-pin female connectors; length: 150 cm
VBIDC-200	IDC Ribbon Cable: Assembled with two 10-pin female connectors; length: 200 cm
VBIDC-250	IDC Ribbon Cable: Assembled with two 10-pin female connectors; length: 250 cm
VBIDC-300	IDC Ribbon Cable: Assembled with two 10-pin female connectors; length: 300 cm

- VBIW Dispersed Connection Cable

Item	Specification
VBIW-050	IDC's Dispersed Wires: An IDC female connector with 10 rainbow 22 AWG wires; length: 50 cm
VBIW-100	IDC's Dispersed Wires: An IDC female connector with 10 rainbow 22 AWG wires; length: 100 cm
VBIW-200	IDC's Dispersed Wires: An IDC female connector with 10 rainbow 22 AWG wires; length: 200 cm
VBIW-300	IDC's Dispersed Wires: An IDC female connector with 10 rainbow 22 AWG wires; length: 300 cm

2	BN	1	BK
4	OG	3	RD
6	GN	5	YL
8	PL	7	BU
10	WT	9	GY



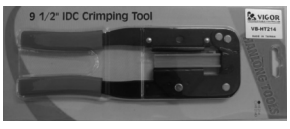
- VBIDC Ribbon Cable

Item	Specification
VBIDC-FC100	10-pin Ribbon Cable: Flat, Grey, 28 AWG; length: 100 foot
VBIDC-FC250	10-pin Ribbon Cable: Flat, Grey, 28 AWG; length: 250 foot

- VBIDC Connector

Item	Specification
VBIDC-HD20	10-pin IDC Connector: Female connector with strain relief, Grey, 20 pcs.
VBIDC-HD100	10-pin IDC Connector: Female connector with strain relief, Grey, 100 pcs.

- VB-HT214 Ribbon Cable Crimping Pliers



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