

SVS Nevelin
Power and Environment Solutions

MEIDEN

AC Speed Control Equipment

THYFREC VT240S

High-Function General-Purpose AC Drives

**Next-Generation Global AC drives
with a Variety of New Functions**



Empower for new days

Next-Generation Global AC drives with a Variety of New Functions



All in one

Six control modes are preloaded. This is an all-in-one AC drive that combines six roles into one unit. Induction motors as well as permanent magnet (PM) motors can be used.



Intelligent

The sequencer functions enable arbitrary programming and many special functions such as PID control and multipump control. Can cope with a variety of applications.



Environmentally friendly

The AC drive is equipped with a built-in EMC filter and DC reactors. The AC drive is also compatible with RoHS according to EU environmental specifications. Thanks to the soft sound function, motor noise can be reduced.



Global design

The AC drive complies with the international standards (UL, cUL, CE marks). A multilanguage LCD operation panel is employed. The AC drive is equipped with various fieldbus interfaces and can be used in a wide voltage range.

World class quality from Numazu:

THYFREC VT240S is manufactured at Meiden System Equipment Factory in Numazu-shi, Shizuoka Prefecture, Japan.

Based on the technologies accumulated in integrated production from major components to system products, our customers enjoy complete solutions and their satisfaction lasts throughout the product life.



Acquisition of ISO9001 Certificate
 System Equipment Factory
 Computer System Factory
 Electronic Equipment Factory

All in one

Six control modes are pre-loaded. This is an all-in-one AC drive that plays six roles in one unit. Permanent magnet (PM) synchronous motors as well as induction motors (IMs) can be used. This AC drive is optimal for any need; it can not only drive fans and pumps in energy conservation mode but also be used for the applications requiring high accuracy and high response performance like iron industry processing lines.

V/f (constant torque) control

This is the basic control mode to control the speed of general-purpose motors.



V/f (variable torque) control

This mode is most suitable for the variable torque loads of fans and blowers.



Vector control with sensor

This mode is most suitable for applications where high-response and high-accuracy performance or a wide speed control range is called for.



Sensorless vector control

This mode enables high-accuracy speed/torque control without speed sensor.



PM motor control with sensor

This mode achieves high-efficiency operation for permanent magnet type synchronous motors (PM motors). This mode can be used in various applications without much restriction.



Sensorless PM motor control

Permanent magnet type synchronous motors (PM motors) can be driven without any sensor. This mode is most suitable for energy-saving operation of fans and pumps.

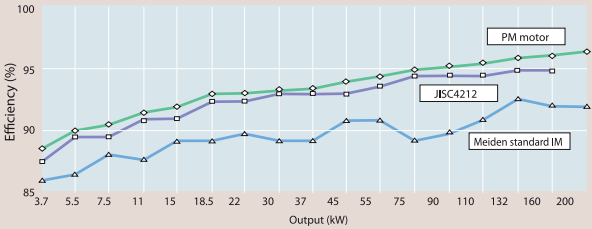


Point 1

The VT240S is applicable for many kinds of machines using the above-mentioned six control modes. Spare parts are interchangeable and any machine can be operated in the same manner. System design and maintenance professionals highly evaluate our products.

Point 2

The combination of this AC drive and Meidensha PM motor has achieved high efficiency and power factors. It satisfies the criterion of high-efficiency motors based on JISC4212(2000) throughout the rated output range.



Intelligent

VT240S is equipped with special application functions as well as sequencer functions enabling arbitrary programming.

Therefore, it can be used for a variety of applications.

Built-in sequencer functions without external controllers:

Since the standard AC drive unit is equipped with a built-in PLC (Programmable Logic Controller), all the provided functions are contained in the VT240S unit. These functions were previously achieved by external sequence circuits and controllers. I/O signal exchange is carried out through the I/O control terminals.

Programming can be done through the personal computer with exclusive software installed or from the operation panel installed in a standard unit. A number of on-site actions can be taken such as conditional modification or programming in environments where a PC cannot be used.

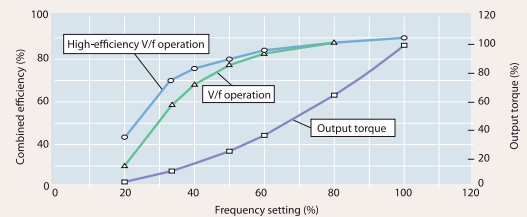


Examples of fans and pumps

Function for high-efficiency operation

The output voltage is automatically reduced according to the load while the motor's no-load loss is suppressed to raise combined efficiency.

The high-efficiency operation is effective for the applications with light load of variable torque.

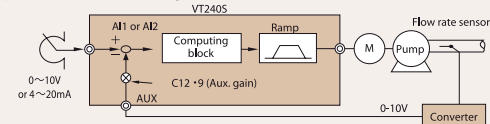


PID control

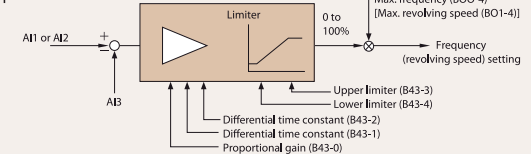
Analog input can be fed back to establish a feedback loop as illustrated.

Features include: stoppage at lower PID limits, sensor input polarity reversal, and sensor error detection.

Example of PID control configuration

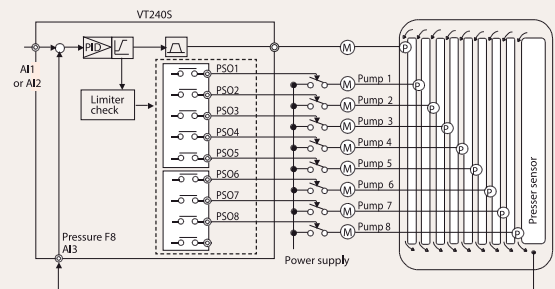


PID operation block



Multi-pump control

With a single VT240S unit, a maximum of 9 pumps can be operated in parallel (one variable speed pump plus a maximum of eight single speed pumps) in order to control the pressure in the flow path. For pressure differences caused by single speed pumps, VT240S maintains continuous by interpolating the variable speed pumps. In addition, the main pump rotation function ensures the automatic changeover of the variable speed pumps according to the pump operation program. While the main pump rotation function is used, a maximum of 8 pumps can be operated in parallel.

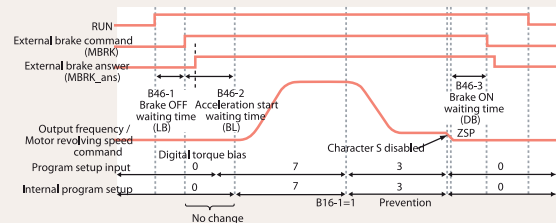


Examples of cranes and elevator machines

External brake control

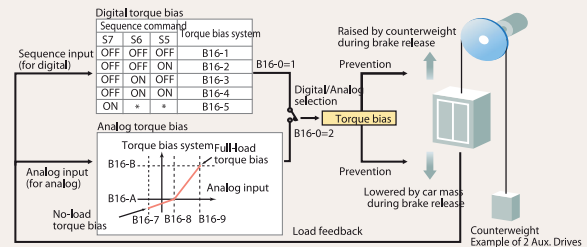
ON/OFF control of an external brake can be done by the inverter's internal sequence.

In regard to the external brake control, various interlocks and protective functions are available. These include: protection against insufficient current during brake release, detection of external brake answering error, and so on.



Automatic torque bias

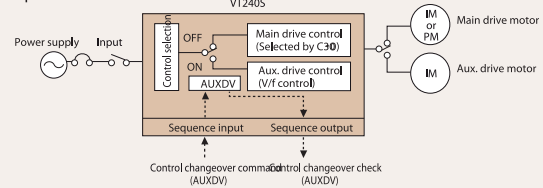
This function is used to provide a torque bias from the beginning of operation with the aid of load feedback. And it also prevents the elevator motor from unwanted rotation (car falling down or rise) at the time of brake release. Either digital or analog mode can be selected for the load feedback. The torque bias value is calculated based on load feedback.



Auxiliary drive

The operation of maximum 5 motors can be switched over, from a main drive motor operated by six control modes to four auxiliary drive motors to be operated by V/f control. This function is suitable for hoist cranes, which have raising/lowering, traveling, traversing, and swiveling functions in one machine.

Example of 2 Aux. Drives

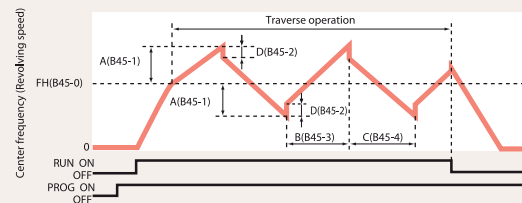


Examples of textile machines

Traverse function

Traverse function enables the operation with the frequency changing pattern as illustrated. This function is suitable for operation of a spinning system where thread should be uniformly wound around the bobbin.

It also enables disorderly wearing control, where the center frequency FH is changed.



Spinning frame operation function

This is an operation pattern for spinning machines. Unlike functions for ordinary pattern operations, the frequency is changed to the next setup position when the preset frequency is attained. Four patterns can be set up in maximum 15 steps. Operation changeover is performed according to the sequential order.

Average frequency of spindles, the number of bundles, pattern residual time, and many other status conditions can be displayed on the operation panel. An alarm output can be generated at the end of the final pattern.

Other application functions

- Frequency jumping function
- Drooping function
- Programmed frequency (revolving speed) setup / Program cushion function
- Interlock ratio setup function
- Momentary power interruption restart function
- Pattern operation function
- Power interruption deceleration function

Environmentally friendly

■ Built-in EMC filter

The built-in EMC filters suppress noise effect. (Optional for 200V class 5P5L and below and 400V class 030H and below)

With the built-in EMC filter, VT240S conforms to IEC61800-3 Category C2 (200V class 5P5L and below, 400V class 015H and below) and 8100-3 Category C3 (400V class 015H~030H).



■ Built-in DC reactors

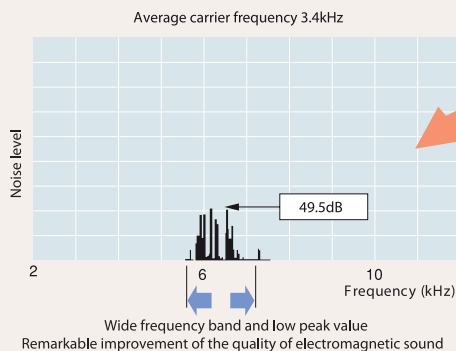
DC reactors (DCL) suppress harmonics in the power source and improve power factors. These DC reactors can be installed in the main body. (Optional for 200V class 022L~075L and 400V class 037H~132H)

Since they are integrated in the VT240S unit, it is unnecessary to create additional installation space for the DCL and subsequent cabling.

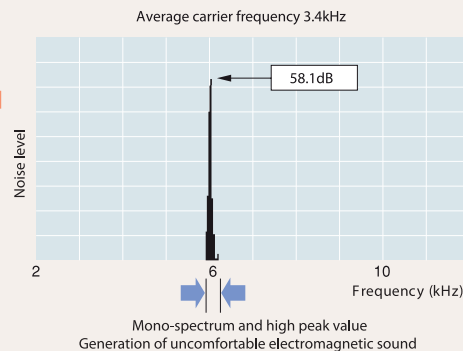
■ Soft sound function

This is Meiden's unique control system, in which the PWM carrier frequency is changed over with a predetermined cycle. When the carrier frequency is increased, the motor's electromagnetic sound approaches the upper limit of the acoustic range for a human being, and this is heard as low-frequency noise. Since the electromagnetic noise is increased, however, peripheral equipment may be adversely affected. The soft sound function is intended to soften irritating electromagnetic noise from the motor by dispersing the audible frequency components without raising the carrier frequency.

Soft sound function (New PWM)



Mono-sound function (Former PWM)



■ RoHS directive compliant

The VT240S conforms to RoHS according to EU environmental policy.

This is an inverter designed to be friendly to the environment by eliminating harmful substances such as lead, hexavalent chromium, etc.

(400V class 075H or above will be released shortly.)

■ Adoption of pollution-free frames

A non-harmful plastic case is used. When it is incinerated, it does not generate dioxin.

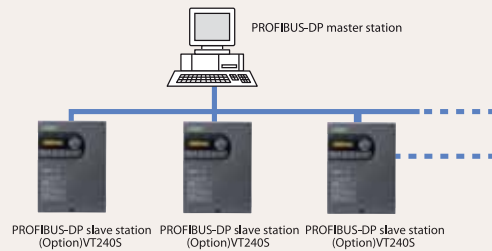
Global design

■ Conformity to international standards

This equipment is manufactured in accordance with the requirements of the UL, cUL, and the CE marks.

■ Serial communications based on Modbus-RTU

Standard THYFREC VT240S equipment is provided with an RS422/485 serial port. The protocol is Meiden's own, but it is applicable to Modbus-RTU. Therefore, it is easy to connect with host computers and controllers.



■ Applicable to major networks in the world (optional)

Profibus-DP, DeviceNet, CANopen, CC-Link (DeviceNet and CANopen to be released shortly)

■ Multi-language LCD operation panel

Two types of operation panel are offered: multi-language LCD operation panel and LED operation panel. The LCD operation panel can display five languages, English, Spanish, Italy, German, and French. With the jog dial, highly-reputed good operability has been inherited. Convenient functions like updated parameter listing and parameter copying will relieve stress at the time of parameter setup.



■ Wide voltage range

The 200V class covers the voltage range of 200~240V (011L or below) and the 400V class covers 380~480V.

■ Applicable to a variety of speed sensors (optional)

Various speed sensors used to detect motor running speed are applicable : conventional complementary outputs, line driver outputs, and also to serial outputs and sinusoidal outputs that are regularly used in Europe.

* PROFIBUS-DP is a registered trademark of PROFIBUS User Organization.

Other functions

■ Easy sensor selection for PM motors

For the conventional PM motor control, it was necessary to install a sensor to detect the position of the motor's magnetic pole (angle of motor revolution). Since the VT240S has a pole position estimation function, general-purpose A-,B-,Z-phase output sensors can detect the position of the motor's magnetic pole. (In order to find the position of the magnetic pole, it is necessary to install an external brake to lock the motor rotation mechanically.)

■ Automatic tuning

Thanks to the automatic tuning function, setting the motor constants and other troublesome setup work can be eliminated. Even when an existing motor of an unknown manufacturer is used, optimal tuning is achieved. Since a simplified automatic tuning mode is incorporated, tuning a motor that is connected with a load machine can be carried out without rotating the motor.

■ Abundance of I/O functions

- For analog I/O, a voltage signal of 0~10V and a current signal of 0~20mA (output: 4~20mA) can be switched over.
- I/O signals for speed setting, speed monitoring, and others can be exchanged in pulses.
- The sequence input block permits changeover between sync logic and source logic.

■ Prevention of tripping

Tripping is prevented with the aid of trip prevention functions such as overcurrent limitation, overvoltage limitation undervoltage limitation, etc.

Standard Specifications

200V class - 0P7L ~ 045L

Item		Specifications													
System		200V series													
Type (VT240S-■■■■■)		0P7L	1P5L	2P2L	4P0L	5P5L	7P5L	011L	015L	018L	022L	030L	037L	045L	
Equipment rating	Normal duty	Rated capacity (kVA) (Note 1)	1.7	2.8	3.8	5.5	8.3	11	16	21	26	30	41	51	60
		Max. continuous rated current (A) (Note 2)	5.0	8.0	11	16	24	33	46	61	76	88	118	146	174
		Max. applicable motor (kW) (Note 3)	0.75	1.5	2.2	3.7	5.5	7.5	11	15	18.5	22	30	37	45
		Carrier frequency (Note 4)	1 ~15kHz (Default: Soft sound 4kHz)												
		Overload current rating	120% for 1min, 140% for 2.5s												
	Heavy duty	Rated capacity (kVA) (Note 1)	1.0	1.7	2.8	3.8	5.5	8.3	11	16	21	26	30	41	51
		Max. continuous rated current (A) (Note 2)	3.0	5.0	8.0	11	16	24	33	46	61	76	88	118	146
		Max. applicable motor (kW) (Note 3)	0.4	0.75	1.5	2.2	3.7	5.5	7.5	11	15	18.5	22	30	37
		Carrier frequency (Note 4)	1 ~15kHz (Default: Soft sound 4kHz)												
		Overload current rating	150% for 1min, 175% for 2.5s												
Power supply	Rated input voltage / Frequency	200 ~ 240V±10% 50 or 60Hz±5%							200 ~ 230V±10% 50 or 60Hz±5%						
Output	Rated output voltage (Note 5)(Note 6)	200~240V (Max.)					200~230V (Max.)								
	Output frequency range	0.1~440Hz													
Main circuit option	EMC filter	Built-in (option)						Stand alone (option)							
	DC reactor	Stand alone (option)						Built-in (option)							
	Dynamic braking circuit	Built-in (standard)						Stand alone (option)							
	Dynamic braking resistor	Built-in (option)						Stand alone (option)							
Construction	Installation system	Wall-mounted (standard)						Wall-mounted (standard) Free-standing (option)							
	Protective enclosure	IP20						IP00 (standard), IP20 (option)							
	Cooling method	Self-cooled						Forced air cooling							
	Color of coating	Munsell N4.0													
Operating environment		Indoor, Operating ambient temperature: -10~50°C(Note 7), Relative humidity: 95% RH or less (no dew condensation), Altitude: 1000m or less, Vibration: 4.9m/s ² or less, Freedom from corrosive or explosive gases, steam, dust, oil mist, or cotton lint.													

400V class - 0P7H ~ 055H

Item		Specifications														
System		400V Series														
Type (VT240S-■■■■■)		0P7H	1P5H	2P2H	4P0H	5P5H	7P5H	011H	015H	018H	022H	030H	037H	045H	055H	
Equipment rating	Normal duty	Rated capacity (kVA) (Note 1)	1.7	2.5	3.8	6.0	9.0	12	16	21	26	30	42	51	60	75
		Max. continuous rated current (A) (Note 2)	2.5	3.6	5.5	8.6	13	17	23	31	37	44	60	73	87	108
		Max. applicable motor (kW) (Note 3)	0.75	1.5	2.2	3.7	5.5	7.5	11	15	18.5	22	30	37	45	55
		Carrier frequency (Note 4)	1 ~15kHz (Default: Soft sound 4kHz)													
		Overload current rating	120% for 1min, 140% for 2.5s													
	Heavy duty	Rated capacity (kVA) (Note 1)	1.0	1.7	2.5	3.8	6.0	9.0	12	16	21	26	30	42	51	60
		Max. continuous rated current (A) (Note 2)	1.5	2.5	3.6	5.5	8.6	13	17	23	31	37	44	60	73	87
		Max. applicable motor (kW) (Note 3)	0.4	0.75	1.5	2.2	3.7	5.5	7.5	11	15	18.5	22	30	37	45
		Carrier frequency (Note 4)	1 ~15kHz (Default: Soft sound 4kHz)													
		Overload current rating	150% for 1min, 175% for 2.5s													
Power supply	Rated input voltage / Frequency	380~480V±10% 50 or 60Hz±5%														
Output	Rated output voltage (Note 5)(Note 6)	380~480V (Max.)														
	Output frequency range	0.1~440Hz														
Main circuit option	EMC filter	Built-in (option)										Stand alone (option)				
	DC reactor	Stand alone (option)										Built-in (option)				
	Dynamic braking circuit	Built-in (standard)										Stand alone (option)				
	Dynamic braking resistor	Built-in (option)										Stand alone (option)				
Construction	Installation system	Wall-mounted (standard)										Wall-mounted (standard) Free-standing (option)				
	Protective enclosure	IP20										IP00 (standard), IP20 (option)				
	Cooling method	Self-cooled										Forced air cooling				
	Color of coating	Munsell N4.0														
Operating environment		Indoor, Operating ambient temperature: -10~50°C(Note 7), Relative humidity: 95% RH or less (no dew condensation), Altitude: 1000m or less, Vibration: 4.9m/s ² or less, Freedom from corrosive or explosive gases, steam, dust, oil mist, or cotton lint.														

200V class - 0P7L ~ 045L

Item		Specifications													
System		200V Series			400V Series										
Type (VT240S-■■■■■)		055L	075L	090L	075H	090H	110H	132H	160H	200H	250H	315H	400H	475H	
Equipment rating	Normal duty	Rated capacity (kVA) (Note 1)	73	99	114	102	124	148	173	222	297	360	409	513	603
		Max. continuous rated current (A) (Note 2)	211	286	328	147	179	214	249	321	428	519	590	740	870
		Max. applicable motor (kW) (Note 3)	55	75	90	75	90	110	132	160	200	250	315	400	475
		Carrier frequency (Note 4)	1 ~8kHz (Default: Soft sound 4kHz)												
		Overload current rating	120% for 1 min, 140% for 2.5s												
	Heavy duty	Rated capacity (kVA) (Note 1)	60	73	99	75	102	124	148	173	222	297	360	409	513
		Max. continuous rated current (A) (Note 2)	174	211	286	108	147	179	214	249	321	428	519	590	740
		Max. applicable motor (kW) (Note 3)	45	55	75	55	75	90	110	132	160	200	250	315	400
		Carrier frequency (Note 4)	1 ~8kHz (Default: Soft sound 4kHz)												
		Overload current rating	150% for 1 min, 175% for 2.5s												
Power supply	Rated input voltage / Frequency	200~230V±10% 50 or 60Hz±5%			380~480V±10% 50 or 60Hz±5%										
Output	Rated output voltage (Note 5)(Note 6)	200~230V (Max.)			380~480V (Max.)										
	Output frequency range	0.1~440Hz													
Main circuit option	EMC filter	Stand alone (option)													
	DC reactor	Built-in (option)	Stand alone (option)	Built-in (option)					Stand alone (option)						
	Dynamic braking circuit	Stand alone (option)													
	Dynamic braking resistor	Stand alone (option)													
Construction	Installation system	Wall-mounted (standard), Free-standing (option)													
	Protective enclosure	IP00 (standard), IP20 (optional)													
	Cooling method	Forced air cooled													
	Color of coating	Munsell N4.0													
Operating environment		Indoor, Operating ambient temperature: -10~50°C, Relative humidity: 95% RH or less (no dew condensation), Altitude: 1000m or less, Vibration: 4.9m/s ² or less, Freedom from corrosive or explosive gases, steam, dust, oil mist, or cotton lint.													

Notes:

- The rated capacity (kVA) is the capacity output when the output voltage is 200V for the 200V class and 400V for the 400V class.
- Total rms values inclusive of harmonics are indicated here.
- Values are applicable to Meiden standard 4-pole square cage-rotor type induction motors.
- When a standard overload is set and the unit operation exceeds 4kHz, or when a heavy overload is set and the unit operation exceeds the values specified below, it is necessary to reduce the maximum continuous rated current.
 - 0P7L~011L / 0P7H~011H 10kHz ■ 015L~018L / 015H~030H 8kHz
 - 022L~030L / 037H~045H 6kHz ■ 037L~090L / 055H~475H 4kHz
- No output voltage is obtainable exceeding the input voltage. (The upper limit of rms output voltage is DC voltage/1.37.)
- For sensorless vector control mode, vector control with sensor, PM control with sensor and sensorless PM control mode, the rated output voltages are specified below.
 - 200V class: 160V/ 180V/ 190V for the input voltages of 200V/ 220V/ 240V, respectively.
 - 400V class: 300V/ 320V/ 360V/ 380V for the input voltages of 380V/ 400V/ 440V/ 480V, respectively.
- Derating may be required for the types below if the ambient temperature exceeds 40°C with the standard overload setting. Please inquire.
 - 5P5L, 011L, 5P5H (with noise filter), 015H

VT240S—2P2H B F 2 10N

Input voltage and applicable motor capacity.

Main-circuit Option 1.

- A: Standard (no options)
- B: With a dynamic braking resistor.
(200V class: 011L and below, 400V class: 015H and below)

Main-circuit Option 2.

- O: Standard (no options)
- F: With a built-in EMC filter.
(200V class: 5P5L and below, 400V class: 030H and below)
- R: With DC reactors.
(200V class: 022L~075L, 400V class: 037H~132H)

An optional control printed-circuit board.
For more details, refer to the relevant page (P17) on optional printed-circuit boards.
[000] if no optional p-boards are attached.

Operation panel selection.

- 0: Nil
- 1: LCD type
- 2: LED type

Standard Specifications

		V/f control (Constant torque, reduced torque)	Sensorless vector control	Vector control with sensor (Note 1)	PM motor control with sensor (Note 2)	Sensorless PM motor control (Note 4)
Frequency control	Control method	All digital control Sine wave approximation PWM				
	Transfer frequency	Mono-sound mode: 1~15kHz (0.1kHz increments) Soft sound mode: Average frequency 2.1~5.0kHz Frequency modulation method (3 tone modulation, 4 tone modulation)				In mono-sound mode (Selected from 4kHz, 6kHz, 8kHz)
	Output frequency resolution	0.01Hz				
	Frequency setting resolution	0.01Hz (digital) 0.03% (analog) in respect to maximum frequency				
	Frequency accuracy	±0.01% (digital) at 25±10°C ±0.1% (analog) at 25±10°C				
Control specifications	Voltage / frequency characteristics	Any setting in 3~440Hz range V/f point setting possible among 5 points	Any setting in the range of 150~9999min ⁻¹ (Max. 180Hz)	Any setting in the range of 150~9999min ⁻¹ (Max. 210Hz)	Any setting in the range of 150~9999min ⁻¹ (Max. 200Hz)	
	Torque boost	Manual auto-select enabled	-			
	Max. torque boost	Max. torque output of applied motor is generated by automatic tuning	-			
	Automatic tuning	Automatic measurement of motor constants Automatic measurement of various parameters Basic method, which does not rotate motor and extended method, which rotates motor are available.		Encoder phase adjustment Detection of magnetic pole position	Automatic measurement of motor constants (with revolutions)	
	Starting frequency	Setting enabled in 0.1~60.0Hz	-			
	Starting torque	200% and above (Note 3) • Meiden standard motor applied • At 150% of rated current • Reach time: Approx. 3s	-			About 50% When PM motor for Meiden sensorless control is applied • At 150% of rated current
	Acceleration Deceleration time	0.01~60,000s Acceleration / deceleration time X 2, Inching only X 1, Program ramp X 8				0.6~6000.0s Acceleration / deceleration time x 2, Inching only x 1, Program ramp x 8
	Acceleration Deceleration mode	Linear / Character S selection				
	Operation method	3-mode selection enabled • Forward run / Reverse run • Run stop / Forward run • Reverse run • Forward run pulse / Reverse run pulse / Stop				
	Stop method	Deceleration stop and coast to stop : selective in respect to run, emergency stop and inching.				
	DC braking	Braking start frequency:	Arbitrary setting in 0.1~60.0Hz	Braking start speed: Arbitrary setting in 0.00~50.00%		-
		Braking voltage: Arbitrary setting in 0.1~20.0Hz	Braking current: Arbitrary setting in 50~150%			
	Braking time	Arbitrary setting in 0.0~20.0s				
	Output frequency	0~440Hz	0~180Hz	0~210Hz	0~240Hz	
	ASR	Control range	-	1 : 100	1 : 1000	1 : 100
Constant output range		Up to 1:7 for Simple ASR control (Note 1)	Up to 1 : 2	Up to 1 : 4	Up to 1 : 1.5	
Control accuracy (At Fmax≥50Hz)		±0.01 for simple ASR Control (Note 1)	±0.5%	±0.01%		±0.1%
Control response		-	5Hz	30Hz	-	

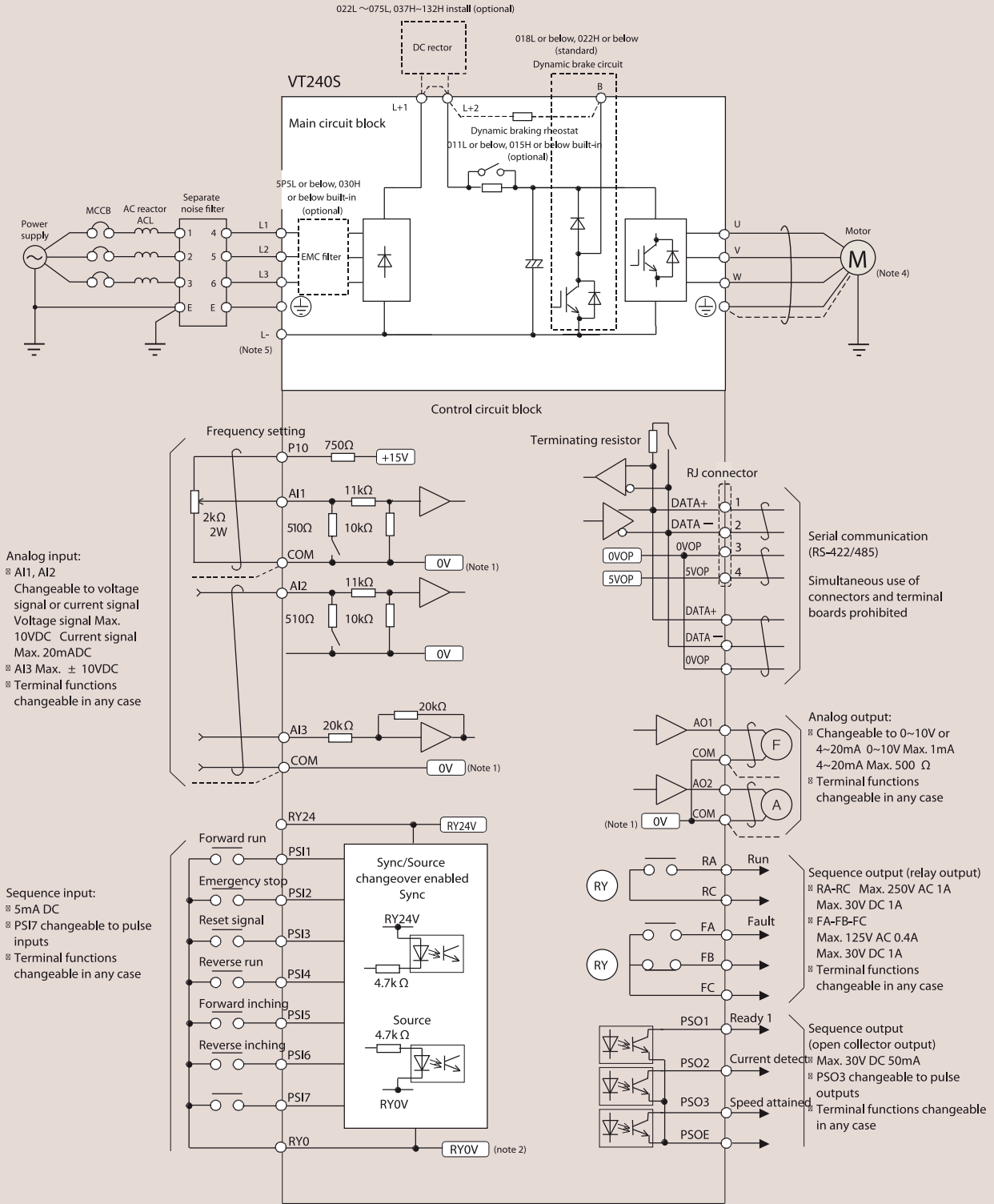
Notes

1. An optional printed circuit board is needed for speed detection.
2. The values are applicable to Meiden standard PM motors. An optional printed circuit board is needed for speed detection.
3. The values can change according to motor capacity, rated voltage, and rated frequency. Almost 150% when 45kW is exceeded.
4. Equipment for sensorless PM motor control is still under development. This product is designed on the assumption that it is used for energy conservation of fans and pumps and that it is combined with PM motors for Meiden sensorless control. For more details, please inquire.

		V/f control (Constant torque, reduced torque)	Sensorless vector control	Vector control with sensor (Note 1)	PM motor control with sensor (Note 2)	Sensorless PM motor control (Note 4)
Setup	Multi-stage frequency setting	8-stage, acceleration / deceleration changeable, 5-bit non-encode mode				
	Interlocked ratio setting	In remote setup mode: y = Ax + B + C y : result of computation x : computation input A : 0.000~±10.000 B : 0.00~±440.00Hz C : aux. Input With output upper/lower limits	In remote setup mode: y = Ax + B + C y : result of computation x : computation input A : 0.000~±10.000 B : 0~+9999min ⁻¹ C : aux. Input With output upper/lower limits		In remote setup mode: y = Ax + B + C y : result of computation x : computation input A : 0.000~±10.000 B : 0.00~±440.00Hz C : aux. Input With output upper/lower limits	
	Frequency jump	Setting enabled in 3 positions Width variable in 0.0 ~ 10Hz.	-		Setting enabled in 3 positions Width variable in 0.0 ~ 10Hz.	
	Slip compensation	Operation/non-operation selectable; Slip compensation gain: 0.0 ~ 20.0%	-			
	Auto-run function	10-step Auto-run function Sync / Async enabled				
	Interruptive PLC function	Arithmetic and logic calculations, large-small comparison, LPF computation, etc. are enabled for sequence and analog I/O. Program capacity: 16 commands X 20 banks Max., Computing period: 2ms/bank				
	Others	PID control Pickup Auto-start Momentary sag restart Reverse run stop Traverse pattern	Momentary sag deceleration control Multi-pump Spinning frame		Pickup operation (including auto-start and momentary sag restart), traverse pattern, and spinning frame are prohibited.	
Control I/O	Operation panel	Local/remote changeover, local command for forward/reverse run, reference, update, and copying of all parameter options, and installation outside the unit (extension cable 3m Max. for optional) are possible.				
	LCD type	Display: 16 characters X 2 lines	Status display LED: 4 points	Operation: Operation with Knob + Set key		
	LED type	Display: 7-segment LED X 5 digits + Code	Status • unit display LED: 7 points	Operation: Operation with A.Ж key + Set key		
	Sequence input	Programmable: 7 points Sync/Source changeable, One point out of seven and a pulse train input are used in common.				
	Sequence output	Relay 1c contact: 1 point (programmable), relay 1a contact (programmable), open collector: 3 points (programmable), One point out of three and a pulse train output are used in common. Contents of programmable control are speed detection, spare charge end, reverse run, speed attained, local operation current attained, speed attained, acceleration/deceleration, error codes, etc. These are selectable.				
Frequency setting	Voltage input (0~10V/ 0~5V/ 1~5V) or current input (4~20mA/ 0~20mA): 2 points Voltage input (0~+10V/ 0~+5V/ 1~5V): 1 point (Used for interlocked ratio operation or PID feedback) Pulse train input (10kHa Max.): 1 point					
Control	Meter output	Voltage output (0~10V) or current input (4~20mA): 2 points (programmable) Changeable to output frequency, output voltage, output current, DC voltage, and others. Pulse train output (10kHz Max.): 1 point Changeable to output frequency, motor speed, and others.				
Communication	Serial interface	Communication protocol: Modbus-RU or VT240S Series leased communication (Meiden standard serial) Connection: RS485 2-wire system, Transmission distance: total accumulated distance 150m and less, Transmission system: Asynchronous half-duplex communication, Baud rate: Selected from 1200/2400/4800/9600/14400/19200/38400bps, No. of stations: 32 stations Max., Error detection: Sum check, parity, framing				
Protection	Precaution	Overcurrent limit (Current limit level changeable in 3 steps by a sequence input), overvoltage limit, undervoltage limit, overload prediction, auto-reduction of carrier frequency (selectable) in the case of overload (cooling fin overheating).				
	Tripping	Overcurrent, overvoltage, undervoltage, IGBT error, lack of phase (I/O), motor overload (operation level changeable), inverter overload, cooling fin temperature rise, ground fault, and others plus self-diagnosis				
	Fault history	Storage of 4 past records: Contents of storage: primary and secondary factors, output frequency, current, DC voltage shortly before tripping, M-detect fault, accumulated electrification time, accumulated operation time				
	Overload durability	Standard overload setting: 120% - 1min, 140% - 2.5s (reduced to 60% - 1 min during 1Hz to 0.1Hz) inverse time characteristic Heavy overload setting: 150% - 1min, 175% - 2.5s (reduced to 75% - 1 min during 1Hz to 0.1Hz) inverse time characteristic				
	Retry	Arbitrary setting of 0 ~ 10 times				

Main Circuit / Control Circuit Connections

Circuit diagram



Control I/O Functions

Terminal functions

	Symbol	Name	Function
Sequence input	PSI1 —PSI7	Programmable sequence input	These commands can be freely applied to the input signal circuit of the control block by virtue of internal sequence input selection setup. PSI7 is used for pulse train inputs.
	RY0,RY24	Sequence input common	These are the COMMON terminals for PSI1 ~PSI7. A changeover is possible between Sync and Source Logic.
Analog input	AH 1 ,2	Programmable analog input	These commands can be freely applied to the input signal circuit of the control block by virtue of internal input selection setup. A changeover is possible between a voltage setting signal of 0~10V and a current setting signal of 0~20mA.
	AI3		This command can be freely applied to the input signal circuit of the control block by virtue of internal input selection setup. It can be used as a voltage setting signal in the range of -10V~+10V.
	COM	Analog input common	This is the COMMON terminal for AI1, AI2, and AI3 signals.
	P10	Power supply for analog inputs	This is a power supply terminal when a setter is connected for analog inputs. The setter to be used is a variable resistor of 2W-2kΩ.
Analog output	AO1,2	Programmable analog output	These are output signals for meters. These outputs can be freely applied to the output signal circuit of the control block by virtue of internal output selection setup. A changeover is possible between a voltage output signal of 0~10V and a current output signal of 4~20mA.
	COM	Analog output common	This is the COMMON terminal for AO1 and AO2 signals.
Sequence output	RC,RA	Programmable sequence output (1a contact)	These are sequence outputs generated by relays. These outputs can be freely applied to the output signal circuit of the control block by virtue of internal sequence output selection setup.
	FC,FA,FB	Programmable sequence output (1c contact)	These are sequence outputs generated by relays. These outputs can be freely applied to the output signal circuit of the control block by virtue of internal sequence output selection setup.
	PSO1~PSO3	Programmable sequence output (open collector)	These are sequence outputs generated through open collectors. These outputs can be freely applied to the output signal circuit of the control block by virtue of internal sequence output selection setup. PSO3 is used for pulse train inputs.
	PSOE	Open collector output common	This is the COMMON terminal for PSO1, 2, and 3 signals.

Programmable analog inputs and pulse-train outputs

According to the table below, arbitrary functions can be assigned to the three points (AI1~AI3) of the analog input terminal. If the insulated AI/AO option is installed, the terminal can be extended with additional 4 points (PAI1~4).

A maximum of four points for the built-in PLC output are assignable. A coded function can do positive/negative operation when input in the AI3 terminal. When the PSI7 terminal for sequence inputs is used to accept pulse-train inputs, a maximum pulse train of 10kHz can be set for speed setting.

V/f for the control mode denotes V/f (constant torque, reduced torque) control, VEC denotes vector control with/without sensor, and PM denotes PM motor control with/without sensor.

Symbol	Setting range	Code	Pulse train	Functions	Control mode		
					V/f	VEC	PM
Speed setup 1, 2, 3	0~100%	o	o	This function is used to set up the frequency (revolving speed). Speed setup 1, 2, 3 can be selected by a sequence input (AFS1, AFS2, AFS3).	o	o	o
Interlocked ratio bias setup	0~100%	o		Bias setting is made for interlocked ratio operation.	o	o	o
Traverse center frequency setup	0~100%		o	A center frequency is set up for traverse operation.	o	o	o
PID feedback	0~100%			Used as a feedback input for PID control.	o	o	o
Torque setup	0~300%	o	o	This function is used for torque setup for ACR operation.		o	o
Driving torque limiter reduction setup	0~100%			Used to reduce the limit value being multiplied by the setting value of the driving torque limiter.		o	o
Regenerative torque limiter reduction setup	0~100%			Used to reduce the limit value being multiplied by the setting value of the regenerative torque limiter.		o	o
Torque Bias 1 setup	0~300%	o		Added to speed AMP output for ASR operation or to torque setup for ACR operation. This function becomes effective when Torque Bias Setup 1 (TRQB1) is turned ON by a sequence input.		o	o
Analog torque bias setup	0~100%	o		This function is used for torque bias setting when auto-torque bias selection (B16-0) is set at analog.		o	o

Control I/O Functions

Programmable sequence inputs

Any function specified in the table below can be assigned to the seven sequence input terminals (PSI1~7). When a relay interface option is installed, four more terminals (PSI8~11) can be used. Functions which are always used can be fixed to ON by parameters. It is possible to assign a maximum of four built-in PLC outputs. V/f for the control mode denotes V/f (constant torque, reduced torque) control, VEC denotes vector control with/without sensor, and PM denotes PM motor control with/without sensor.

Symbol	Name	Functions	Control mode			
			V/f	VEC	PM	
F RUN	Forward run	This is a command for forward run in remote operation mode.	○	○	○	
R RUN	Reverse run	This is a command for reverse run in run/reverse mode.	○	○	○	
EMS	Emergency stop	A stop action is taken when this function is ON during operation. For stoppage, ramp deceleration stop or free run stop can be selected. This signal can be used as a fault (FLT) output.	○	○	○	
F JOG	Forward inching	This is an inching command. If this signal is ON while RUN is ON, operation conforms to the inching setup frequency (revolving speed) in the control circuit. For stoppage, ramp deceleration stop or free run stop can be selected.	○	○	○	
R JOG	Reverse inching		○	○	○	
HOLD	Holding signal	This is a stop signal when setting in RUN mode is set at self-holding mode. The machine stops with OFF. With ON, an input of RUN or R RUN can be held.	○	○	○	
BRAKE	DC brake	This signal can be used for DC braking. DC excitation operation is performed in PM motor control mode. Shaft torsion may be caused according to the load torque.	○	○	○	
RESET	Fault reset	The faulty condition is reset.	○	○	○	
COP	Serial transmission select	A sequence command by serial transmission is enabled.	○	○	○	
CSEL	Ramp changeover	Ramp acceleration/deceleration is selected. Ramp acceleration/deceleration 2 is effective with ON, and ramp acceleration/deceleration 1 is effective with OFF.	○	○	○	
IPASS	Interlocked ratio bypass	The interlocked ratio function is bypassed.	○	○	○	
CPASS	Ramp pass	The ramp function is bypassed.	○	○	○	
PIDEN	PID control select	PID control is enabled.	○	○	○	
AFS1~3	Speed set 1~3	Frequency setting (revolving speed) is made through the input terminal that has been selected by C07-0~2.	For simultaneous inputs, setup selection conforms to the preference order specified below. JOG > CFS > PLS_IN > PROG > AFS3 > AFS2 > AFS1	○	○	○
PROG	Program setup	Used for multiple setup selections. Selection of program frequencies (revolving speed) 0~7 is made by S0~S3, SE.		○	○	○
CFS	CPU setup	A setting condition is selected from serial or parallel transmission options.		○	○	○
SO~S3 SE	Program setup select	Selection of program frequencies (revolving speed) 0~7 is made when PROG is ON. Setting of select mode can be selected by binary/direct input mode.	○	○	○	
FUP	Frequency (revolving speed) increase	Frequency is increased or decreased for the presently selected direct frequency (revolving speed) setup or program frequency (revolving speed) setup 0~7. If the ON state is continued, frequency is increased or decreased at the presently effective ramp rate.	○	○	○	
FDW	Frequency (revolving speed) decrease		○	○	○	
BUP	Interlocked ratio bias increase	If the ON state of BUP or BDW is continued while IVLM is ON, the interlocked ratio bias is increased or decreased at the presently effective ramp rate. When IVLM is OFF, the bias increment or decrement is cleared to zero. If IVLM is OFF, operation of BUP or BDW is disabled.	○	○	○	
BDW	Interlocked ratio bias decrease		○	○	○	
IVLM	Interlocked ratio bias increase/decrease select		○	○	○	
AUXDV	Auxiliary drive setup	With this signal, aux. Drive setup is enabled. Operation is effective only if the inverter is out of service.	○	○	○	
PICK	Pickup	Pickup operation is started when this signal is ON, and RUN or R RUN is ON.	○	○		
MBRK_ans	External brake answer	An answer input is entered for an external brake command.	○	○	○	
PRST	STP reset	A reset signal input for pattern operation is entered in the middle of spinning frame operation.	○			
S5~S7	Digital torque bias 1~3	According to input, selection is made from digital torque bias values 0~4.	○	○	○	
AUXSW0~1	Aux. Drive No. select	According to input, an applicable parameter can be chosen from four auxiliary drive parameters.	○			
PLSIN	Pulse train input	A pulse train input is enabled.	○	○	○	
OCLLV1 ~2	OCL level select	An overcurrent limitation level can be selected while the main drive is operated.	○	○	○	
E.FLT1~8	External fault	A fault input of external equipment is entered. If this signal is ON during operation, it is regarded as a fault and free run stop takes place.	○	○	○	
EXC	Aux. excitation	Auxiliary excitation run is carried out. Auxiliary excitation run means that magnetic fluxes only are established inside the motor while no torque is generated.		○		
ACR	ACR	Selection of ACR operation is performed.		○	○	
PTL	P control	PI control of the speed AMP is changed over to P control.		○	○	
LIM1	Drive torque limiter changeover	Driving torque limiter reduction setup is enabled by analog input or serial transmission.		○	○	
LIM2	Regenerative torque limiter changeover	Regenerative torque limiter reduction setup is enabled by analog input or serial transmission.		○	○	
MCH	Mechanical time constant changeover	Gain 1 or 2 of the speed amplifier is selected during ASR operation.		○	○	
RFO	0 setup	Speed setup is changed over to 0min ⁻¹ .		○	○	
DROOP	Drooping	The drooping function is enabled.		○	○	
DEDB	Dead band setup	Dead band setup of the speed amplifier is enabled.		○	○	
TRQB1~2	Torque bias setup 1~2	Torque bias setup 1 or 2 is enabled.		○	○	

Control I/O Functions

Programmable sequence outputs

Any function specified in the table below can be assigned to the five sequence output terminals (RA-RC, FA-FB-FC, PSO1~3).
When a relay or a parallel interface option is installed, terminals can be increased. (4 points by relay interface, 2 points by parallel interface)

Symbol	Name	Functions	Control mode		
			V/f	VEC	PM
RUN	Operation	This signal is ON during operation, inching (JOG), and DC braking. Auxiliary excitation can be included. Selection is possible.	○	○	○
FLT	Fault	This signal is ON upon the occurrence of a fault.	○	○	○
MC	End of charge	ON when DC voltage in the main circuit has exceeded the ON level of MC.	○	○	○
RDY1	Ready (1)	ON in cases of no fault, EMS non-operation, end of charge, and encoder signal detection (sensor-attached PM motor control mode only).	○	○	○
RDY2	Ready (2)	ON in cases of no fault, end of charge, and encoder signal detection (sensor-attached PM motor control mode only).	○	○	○
LCL	Local	ON when the operation mode is set for local (operation from the operation panel).	○	○	○
REV	Reverse	V/f: ON when the output frequency is set for reverse run. VEC, PM: ON when the motor is set for reverse run.	○	○	○
IDET	Current detection	ON when the output current is above the setting value of the detection level.	○	○	○
ATN	Frequency (revolving speed) attained	ON when the output frequency (revolving speed) has attained the setup frequency (revolving speed).	○	○	○
SPD1,SPD2	Speed detection (1)(2)	ON when the absolute value of output frequency (revolving speed) is above the setting value of the detection level. Outputs can be generated for two points where detection levels are different.	○	○	○
COP	Transmission select	ON when serial transmission run is selected.	○	○	○
ECO~EC3	Specific fault output	Any of four faults can be assigned.	○	○	○
ACC,DCC	Acceleration deceleration	ON while ACC is in acceleration and DCC is in deceleration.	○	○	○
AUXDV	Aux. drive select	ON when parameter setting of the auxiliary drive is enabled.	○	○	○
ALM	Minor fault	ON in the case of a minor fault.	○	○	○
FAN	Fan control	ON during operation, inching (JOG), auxiliary excitation, and DC braking. Since this circuit is provided with a 3min OFF delay feature, it is not turned off for three minutes even after any of the above-mentioned operation has occurred. This feature is used for the control of external fan.	○	○	○
ASW	Auto-start standby	ON in the middle of auto-start standby mode when COB-0 is selected and auto-start function is used.	○	○	○
ZSP	Zero speed	ON when the absolute value of output frequency (revolving speed) is below the setting level for zero speed.	○	○	○
LLMT,ULMT	PID lower/upper limit output	ON when the feedback value for PID control has exceeded the setting level of the lower/upper limit.	○	○	○
Doff-End	Doff-End alarm output	ON during spinning frame operation before the time setup value after the auto-stop of the final step.	○		
MBRK	External brake output	An external brake command output is generated.	○	○	○
DVER	Speed deviation error	ON when a speed deviation error is present.		○	○
BPF	Service interruption deceleration output	ON when the DC voltage is below the preset value.	○	○	○
RDELAY	Run delay answer	The above-mentioned operation (RUN) is added with an OFF delay function. This signal is turned off after the lapse of a preset delay time (C15-6) after the operation has been turned off.	○	○	○
MP01~8	Multi-pump output	This is an output signal for multi-pump control.	○	○	○
PLC1~8	Built-in PLC output	This is a sequence output signal for the built-in PLC function.	○	○	○

Programmable analog outputs and pulse train outputs

Any function specified in the table below can be assigned to the two analog output terminals (AO1, AO2). When an insulated AI/AO option is installed, additional four terminals (AOP1~4) can be used. If the PSO3 terminal of sequence outputs is used for pulse train outputs, outputs of motor rotating speed and others can be generated in a pulse train of 6kHz Max. It is also possible to set up the output gain. Outputs of coded functions can be generated in the form of coded data by setting up the offset voltage and current. (Example: Output frequency -50~0~+50Hz/0~5~10V)

Symbol name	Output (For voltage output of 0~1 0V)	Code	Pulse train	Functions	Control mode		
					V/f	VEC	PM
Output frequency	10V/Max. frequency	○	○	An output of output frequency is generated.	○		
Motor revolving speed	10V/Max. revolving speed	○	○	An output of motor revolving speed is generated. If a speed detector option is provided, a detected revolving speed output is also generated for V/f control or sensorless vector control.	○	○	○
Preset frequency (revolving speed)	10V/Max. frequency (revolving speed)	○	○	An output of preset value is generated for the presently selected frequency (revolving speed).	○	○	○
Ramp output	10V/Max. frequency (revolving speed)		○	An output of preset frequency (revolving speed) is generated at the output point of ramp function.	○	○	○
Output current	5V/Rated current			An output of output current is generated. Either a motor's rated current standard or an inverter's rated current standard can be selected.	○	○	○
Output voltage	10V/Motor's rated voltage			An output of output voltage command is generated. According to the status of power supply or load, the output voltage may differ from actual one.	○	○	○
Inverter output power	5V/(motor's rated voltage X motor's rated current)			An output of output power is generated. According to the status of power supply or load, the output power may differ from actual one.	○	○	○
DC voltage	200V class: 5V/300V 400V class: 5V/600V			An output of DC voltage in the main circuit is generated.	○	○	○
Overload monitor	10V/100%			At 100% level, a function of overload control trip begins to be active. Either motor protection or inverter protection can be selected.	○	○	○
Heat sink temperature	10V/100°c			An output of heat sink temperature is generated.	○	○	○
Torque current	5V/Motor's rated current	○		An output of the detected torque current is generated.		○	○
Excitation current	5V/Motor's rated current			An output of the detected excitation current is generated.		○	○
Ramp output (torque command)	5V/Rated torque	○		An output of speed control amplifier (torque command) is generated.		○	○
Built-in PLC output 1~4	10V/1000hex			An output of numerical data for the built-in PLC function is generated.	○	○	○

Operation Panel

For the operation panel, two types of panels are available, a multi-language LCD panel and an LED panel. These panels can be removed and remounted easily. When an appropriate cable (3 meters Max.) is connected, the panel can be installed apart from the main unit. If you already have an operation panel, a version without a panel can be selected.

Operation panel types and respective components

LCD panel (V24 —OP1)



LED panel (V24 —OP2)



■ Major functions

- Operation for remote/local changeover, forward/reverse run, and fault reset
- Status display
Output frequency (motor revolving speed), setting frequency (revolving speed), output current/torque, setting torque, output voltage, output power, sequence I/O status, analog I/O status, pattern operation status, multi-pump control status, spinning frame run status, built-in PLC status, auto-tuning status, fault status, fault history, accumulated electrification time, accumulated run time, CPU versions, etc.
- Parameter reference/updating
Reference/updating of all parameters, display of a list of parameters changed from the default values, and others.
- Parameter copying
AC drive parameters are saved or loaded in the operation panel. Parameters in the AC drive and the operation panel are compared.

External Dimensions

Wall type unit

Type		Dimensions (mm)							Mass (kg)		
200V class	400V class	W0	W1	H0	H1	D	∅d	∅E			
0P7L 1P5L 2P2L	0P7H 1P5H 2P2H	155	140	250	235	180	6	-	3		
4P0L 5P5L	4P0H 5P5H										
7P5L 011L	7P5H 011H 015H										205
015L 018L	018H 022H 030H	260	240	350	330	298	7	12			
022L 030L	037H 045H	300	200	470	450	317	10	15	23		
	055H			520	500				27		
037L 045L		340	240						30		
	075H	435	300	615	595	350	10	20	42		
055L	090H								45		
	110H	500	400	710	684	350	10	20	60		
075L	132H								65		
	160H	580	400	1020	990	470	13	23	90		
090L	200H			1260	1230				100		
	250H	870	600	1260	1230	470	15	23	200		
	315H								285		
	400H								290		
	475H								295		

- Note: The above-mentioned dimensions are applicable when no DC reactor is mounted on the main unit. Please inquire for the dimensions with the DC reactor.

Options

Control PCB options

These are built-in options to be mounted on the control printed-circuit board of VT240S. There are three types, Option I, II, and III, according to the mounting position. It is possible to select one type of each while a maximum of three PCB options can be mounted on one unit. The PCB options can easily be mounted on the control PCB of VT240S with connectors. They can be mounted on VT240S unit after its purchase. However, if you want to install PCB Options II and III at the same time, a special PCB mounting tool is required.

Name	Type	Functions available	Sort	Rating display
Speed detection 1	V24-DN1 N62P30609=1-01	This is a speed detection P-board applicable to an encoder of the complementary output type. Response frequency: Selectable between 60 ± 10kHz and 20kHz Encoder power supply: 12V DC ± 1.2V, 150mA and below.	I	1
Speed detection 2	V24-DN2 N62P30610=1-01	This is a speed detection P-board applicable to an encoder of the line driver output type. Response frequency: 250kHz (Signal: Phases A, B, C, serial) Encoder power supply: 5V DC ± 0.25V, 350mA and below.	I	2
Speed detection 3 (PM applicable)	V24-DN3 N62P30611=1-01	This is a speed (magnetic pole position) detection P-board for sensor-attached PM motor control applicable to an encoder of the line driver output type. Response frequency: 250kHz (Signal: Phases A, B, Z, U, V, W) Encoder power supply: 5V DC ± 0.25V, 250mA and below.	I	3
Speed detection 4 (Note 1)	V24-DN4 N62P30642=1-01	This is a speed detection P-board applicable to the ERN1387 made by Heidenhein, Inc. 1Vp-p • 2-phase • 2-set sine wave + Phase-Z pulses Encoder power supply: 5V DC ± 0.25V, 200mA and below.	I	4
Speed detection 6	V24-DN6 N62P30609=2-01	This is a speed detection P-board applicable to an encoder circuit of the single-phase complementary output type. The signal level is set at 4.0V and above for high and 1.0V and below for low. Encoder power supply: 12V DC ± 1.2V, 150mA and below.	I	6
Relay interface	V24-RY0 N62P30612=1-01	Used for contact I/O extension. Relay input: 4 points (PSI8—11) 1c contact output: 4 points (PSO4—7)	III	N
Parallel interface (Note 2)	V24-PIO N62P30614=1-01	Used to receive the parallel setup data from the PLC. Parallel data input: 16 bits Data length: 16, 12, 8bit selectable. Format: Binary, BCD selectable Open collector output: 2 points (PSO4, 5)	III	M
Insulation AI/AO (Note 1)	V24-AIO N62P30622=1-01	Applicable to insulated 4-channel analog inputs and outputs. Analog input: 16bit (input range ±10V) Analog output: 12bit (output range 10V)	II	S
ProfiBus-DP interface	V24-SL0 N62P30616=1-01	Applicable to network connections based on the ProfiBus-DP communication protocol. Transmission speed: 12Mbps No. of stations: 126/network	III	H
CC-Link interface	V24-SL3 N62P30619=1-01	Applicable to CC-Link network connections. Transmission speed: 156kbps, 625kbps, 2.5Mbps, 5Mbps, 10Mbps (Setting enabled with dipswitches) No. of stations: 64/network	III	K
DeviceNet interface (Note 2)	V24-SL2 N62P30618=1-01	Applicable to DeviceNet network connections. Transmission speed: 125kbps, 250kbps, 500kbps (Setting enabled with dipswitches) No. of stations: 64/network	III	J
CANopen interface (Note 2)	V24-SL1 N62P30617=1-01	Applicable to CANopen network connections. Transmission speed: 125kbps, 250kbps, 500kbps, 1Mbps (Setting enabled with dipswitches) No. of stations: 128/network	III	I

Notes:

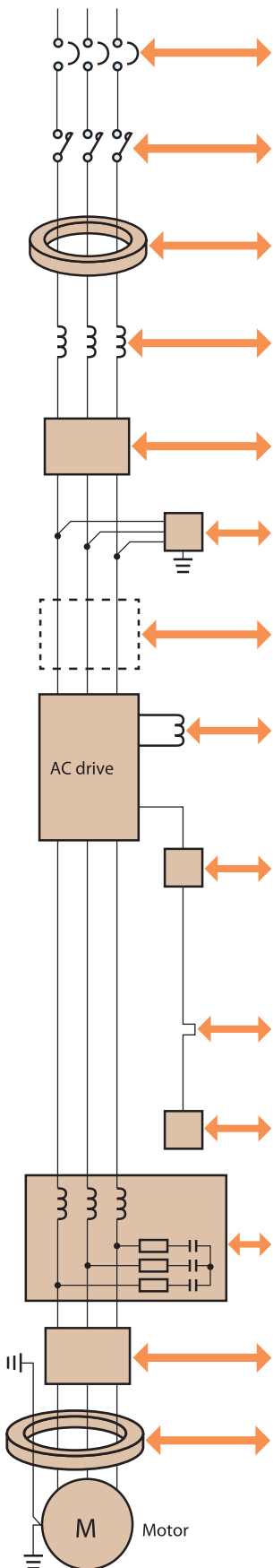
1. Speed detection 4 (V24-DN4) and Insulated AI/AO (V24-AIO) cannot be used at the same time.

2. To be released shortly.

* DeviceNet is a registered trademark of ODVA, U.S.

* CC-Link is a registered trademark of Mitsubishi Electric Corporation in Japan and U.S.

Peripheral Equipment



Component name	Functions
MCB or fuses	This equipment should be installed, without fail, for the protection of cables for the AC drive and peripheral equipment.
Magnetic contactor	To be installed for operation interlock. When a brake unit is used and a DBR overload is detected, the magnetic contactor should be turned off for DBR protection or the MCB with trip coils should be tripped.
Line noise filter (Ferrite core) (Note 1)	Used to reduce noise generated from the AC drive. It is most effective in the frequency band of 10kHz to 10MHz.
AC reactor (ACL)	It is effective in improving the input power factor and reducing harmonics. If it is used with a DC reactor, a higher effect can be obtained. If the capacity of power supply exceeds ten times the AC drive capacity, it is always necessary to consider coordination with the power supply.
Noise filter on input side (Note 1)	Used to reduce noise generated from the AC drive. It is most effective in the frequency band of 100kHz to 30MHz. It is used exclusively on input side. Versions of 5P5L and below and 030H and below can be accommodated in the AC drive unit. (Optional)
Radio noise filter on input side (CR filter) (Note 1)	Used to reduce noise generated from the AC drive. It is effective in the AM radio frequency band. It is used exclusively on input side.
High power factor converter	It extremely reduces harmonics in the power supply. It also improves the power factor to almost 1.0. Since the regenerative function is provided, performance for energy conservation is intensified. Please refer to the THYFREC CV210S catalog: LB521-2739.
DC reactor (DCL)	It is effective in improving the input power factor and reducing harmonics. Its effect is greater than that of an AC reactor, and it is compact. Versions of 022L ~ 075L and 037H ~ 132H can be accommodated in the AC drive unit. (Optional)
Brake unit (DBU)	This is a braking circuit unit used for the dynamic braking of a motor. According to the applied voltage and motor capacity, V23-DBU-L1~4 and V23-DBU-H1~4 are available. It is used in combination with a braking resistor to obtain a greater braking capability. For versions of 018L and below and those of 022H and below, the braking circuit is accommodated in a standard AC drive unit.
Thermal relay	Used to protect the braking resistor. The thermal relay is required for versions of 018L and below and those of 022H and below, provided with an external resistor. This device is not required for the V23-DBU type brake unit because the unit incorporates an overload detection function.
Braking rheostat (DBR)	Used to increase AC drive's braking capability when rapid deceleration or stoppage is needed. It is used in combination with the brake unit. Versions of 011L and below and those of 015H and below can be accommodated in the AC drive unit. (Optional)
Surge absorber	This is a surge filter intended to suppress surge voltages generated from the AC drive. For the 400V class, the AC drive should be applied to insulation-reinforced motors. Otherwise, surge voltages from AC drives may deteriorate the motor insulation. It is recommended to use surge absorbers where ordinary motors of 400V class without reinforced insulation are used or if the cable length is long (exceeding 20 meters).
Noise filter on output side (Note 2)	Used to reduce noise generated from the AC drive. It is effective in reducing radio noise coming from cables. It is used exclusively on output side.
Line noise filter (Ferrite core) (Note 2)	Used to reduce noise generated from the AC drive. It is effective in reducing unnecessary radio noise and propagation noise.

Notes:

1. When both are used, higher effect can be obtained.
2. When both are used, higher effect can be obtained.

* For more details on peripheral equipment, please refer to the separate brochure: Peripheral Equipment Selection Guide for AC drives.

