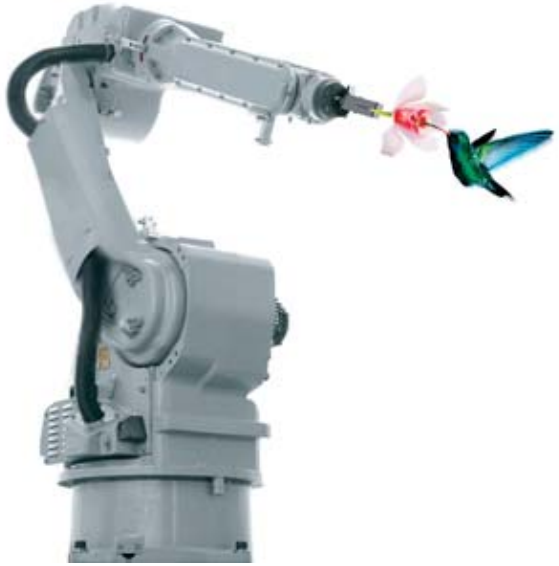
1000 Series Technical Training

Yaskawa Drives Department



Options

Rev.: 07 (16.09.2011)

Overview and Contents

Table of contents

- Inputs
  - F3: Digital Inputs
  - F2: Analogue Inputs
- Output
  - F5: Digital Outputs
  - F4: Analogue Monitor
- F1: Pulse Generator
  - Complementary Type
  - Line Drive Type
- F6: Communication Card
  - H5: RS232 (for J1000)
  - H5: MEMOBUS
  - Profibus-DP
  - CANopen
  - DeviceNet
  - MECHATROLINK
  - CC-Link
  - Modbus TCP IP
  - EtherNetIP
  - EtherCAT
  - F6: Communication Parameters
  - Mounting Example A1000
- Operation
  - H3: Potentiometer
  - Digital Operator & Mounting
  - USB Copy Unit
  - 24V Power Supply
- Peripheral devices
  - EMC Filter
  - AC Input Reactor
  - DC Link Reactor
  - Braking Capability
  - Output Filter
    - dv/dt & sinusoidal
- Mounting kits

How to use this Presentation ?

This presentation shows all property and parameters that can be found in any of the J1000, V1000, A1000 drives. To distinguish whether the property or parameter is available in all of the drives or only in A1000 for example, please note the „ticks“ in the grey bar:

In the example above the function or the parameter would be available in V1000 and A1000 but NOT in J1000.

Default settings (i.e. the standard setting from the factory) are underlined.

Availability in different control modes:

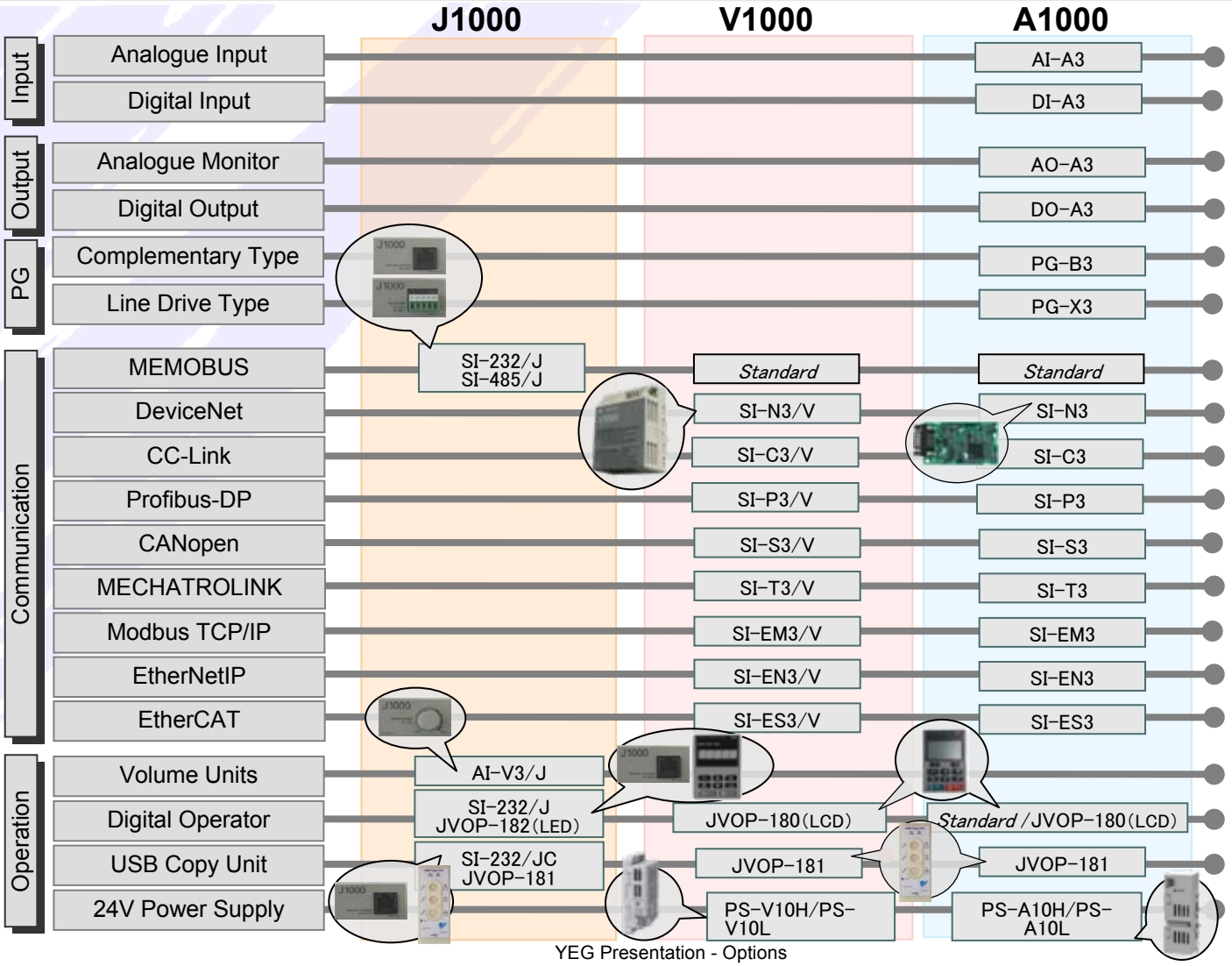
All Modes

V/f | V/f w/PG | OLV | CLV
OLV/PM | AOLV/PM | CLV/PM

V/f | V/f w/PG | OLV | CLV
OLV/PM | AOLV/PM | CLV/PM

1000er Series Options

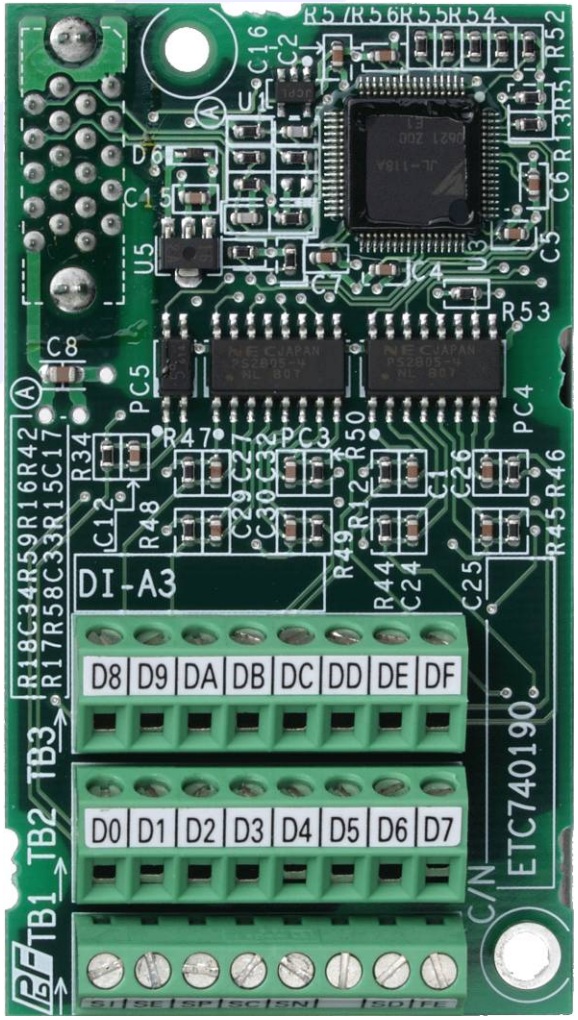
Overview



Technical Training – Options

F3: Digital Input Card DI-A3

DI-A3



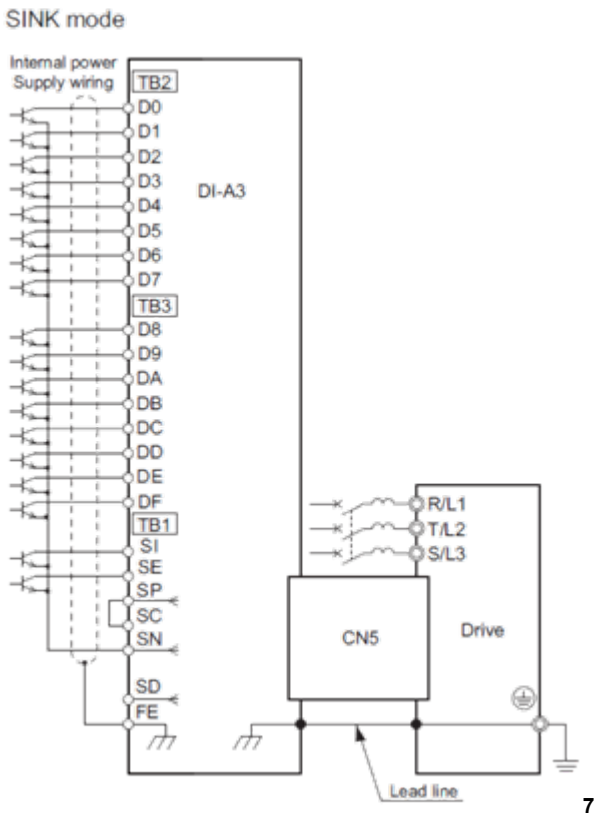
Digital Input Card DI-A3

Hardware Specifications / Connection Diagram

Digital Input	18 Terminals (including SET and SIGN signals)
Input Signal Type (dependent on Parameter Settings)	Binary 16 bit, 4 digit BCD Binary 12 bit, 3 digit BCD Binary 8 bit, 2 digit BCD
Input Signal	Sink, source, external power supply Photocoupler input: 24 Vdc, 8mA
Ambient Temperature	-10°C to 50°C
Humidity	95% RH or less with no conden-sation
Storage Temperature	-20°C to 60°C allowed for short-term transport of the product
Area of Use	Indoor (free of corrosive gas, airborne particles, etc.)
Altitude	3000m or less

Can be used:

- to set binary coded frequency references
- as additional multi-function digital inputs



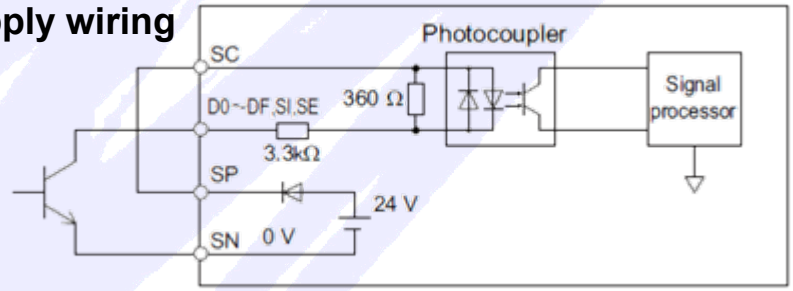
Digital Input Card DI-A3

Power Supply / Logic Specifications

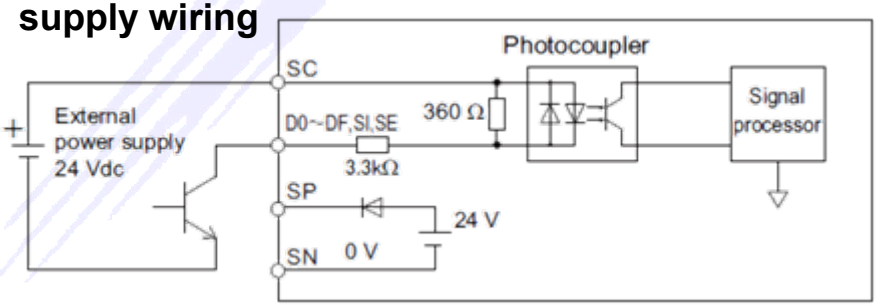
Flexible connection (like A1000)

SINK (NPN) Mode

Internal power supply wiring

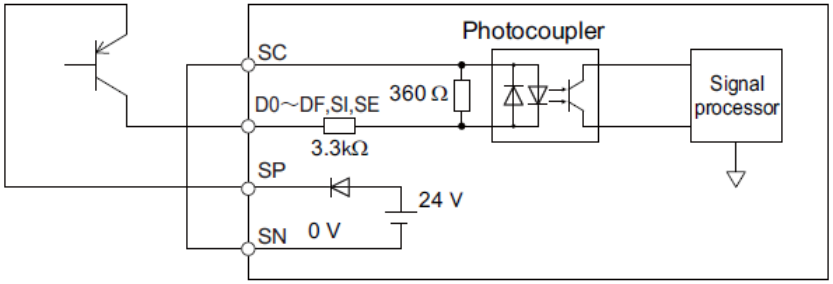


External power supply wiring

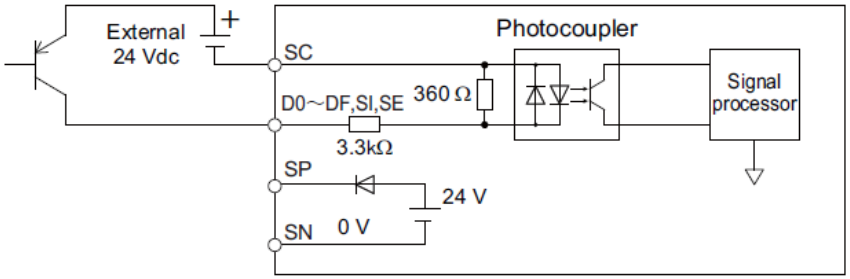


SOURCE (PNP) Mode

Internal power supply wiring



External power supply wiring



Digital Input Card DI-A3

Related Parameters F3-01 und F3-03

J V A

All Modes

F3: Digital Input Card Settings

Parameters to setup the digital option card for frequency reference .

No.	Parameter name	Setting Range	Default
F3-01	Digital Input Option Card Input Selection	0 to 7	0

Setting 0: BCD, 1% units
Setting 1: BCD, 0.1% units
Setting 2: BCD, 0.01% units
Setting 3: BCD, 1 Hz units
Setting 4: BCD, 0.1 Hz units
Setting 5: BCD, 0.01 Hz units
Setting 6: BCD, special setting (5 digit input), 0.02 Hz units
Setting 7: Binary

No.	Parameter name	Setting Range	Default
F3-03	Digital Input Option DI-A3 Data Length Selection	0 to 2	2

Setting 0: 8 bit
Setting 1: 12 bit
Setting 2: 16 bit

Digital Input Card DI-A3

Standard Terminal Function Selection

Terminal Block	Terminal	BCD, Signed F3-01 = 0 to 5						BCD, Unsigned F3-01 = 6		Binary, Signed F3-01 = 7		
		8 bit		12 bit		16 bit		16 bit		8 bit	12 bit	16 bit
		F3-03 = 0		F3-03 = 1		F3-03 = 2				F3-03 = 0	F3-03 = 1	F3-03 = 2
TB2	D0	1 digit (0 to 9)	1	1 digit (0 to 9)	1	1 digits (0 to 9)	1	1 digit (0 to 9)	2	bit 0	bit 0	bit 0
	D1		2		2		2		4	bit 1	bit 1	bit 1
	D2		4		4		4		8	bit 2	bit 2	bit 2
	D3		8		8		8	2 digits (0 to 9)	1	bit 3	bit 3	bit 3
	D4	2 digits (0 to 15)	1	2 digits (0 to 15)	1	2 digits (0 to 9)	1		2	bit 4	bit 4	bit 4
	D5		2		2		2		4	bit 5	bit 5	bit 5
	D6		4		4		4		8	bit 6	bit 6	bit 6
	D7		8		8		8	3 digits (0 to 9)	1	bit 7	bit 7	bit 7
TB3	D8	–	–	3 digits (0 to 15)	1	3 digits (0 to 9)	1		2	–	bit 8	bit 8
	D9		–		2		2		4	–	bit 9	bit 9
	DA		–		4		4		8	–	bit 10	bit 10
	DB		–		8		8	4 digits (0 to 9)	1	–	bit 11	bit 11
	DC	–	–	–	–	4 digits (0 to 15)	1		2	–	–	bit 12
	DD		–		–		2		4	–	–	bit 13
	DE		–		–		4		8	–	–	bit 14
	DF		–		–		8	5 digits (0 to 3)	1	–	–	bit 15
TB1	SI	Signed 0: Forward 1: Reverse							2	Signed 0: Forward 1: Reverse		
	SE	Set (Read) signal 1: Reads values set to D0 to DF, SI										
	SP	24 V ±5% internal power supply										
	SC	Input signal common										
	SN	Internal power supply common: 0 V										
	SD	Cable shield 2 (open)										
	FE	Shield ground										

Example:

F3-01 = 5 (BCD, 0.01 Hz units)

F3-03 = 2 (16 bit)

Frequency Reference:

5 0 . 0 0 *Hz*

Digit: 4 3 2 1

D0 to DB = 0 (binary)

DC = 1 (binary)

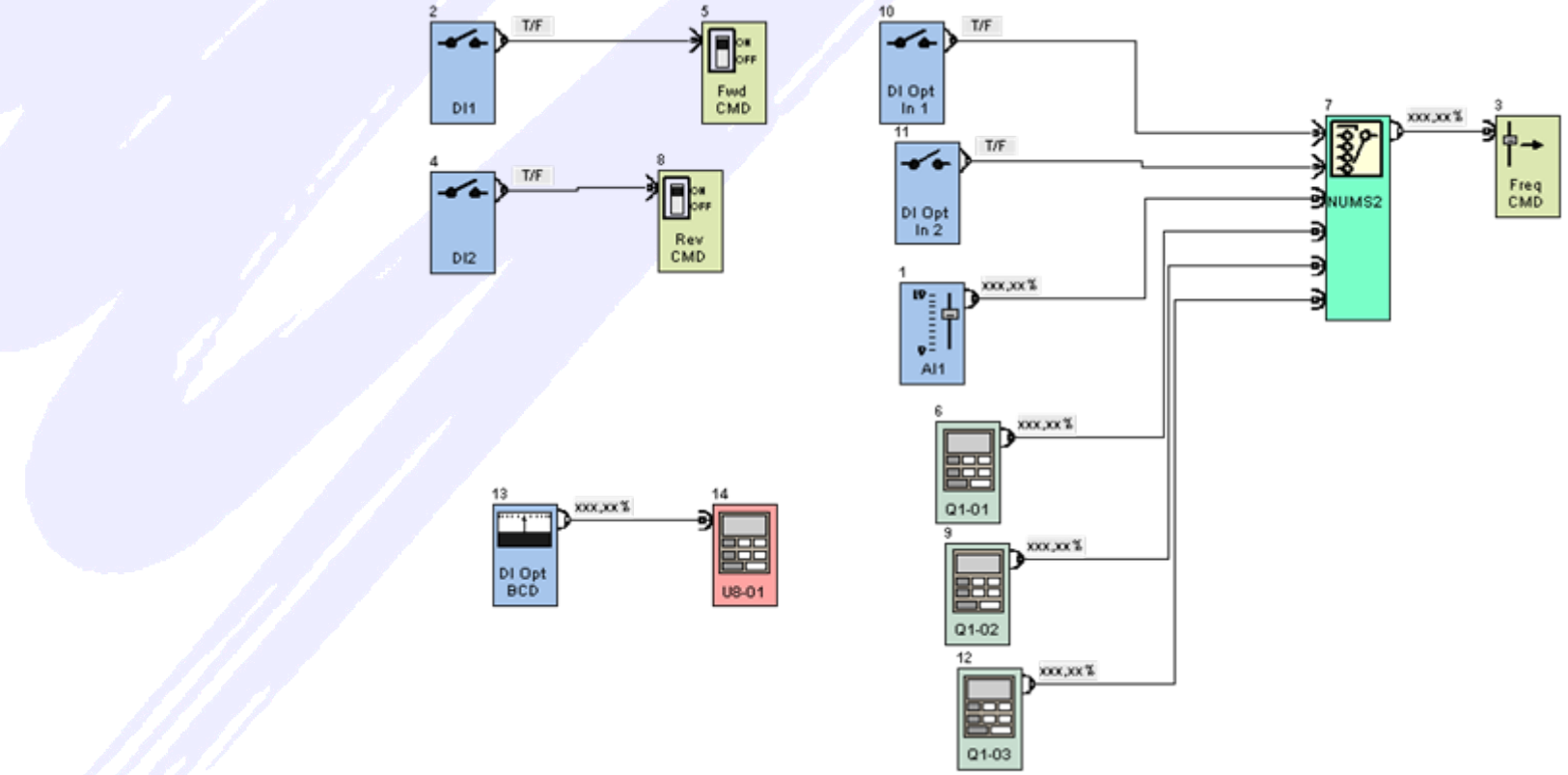
DD = 0 (binary)

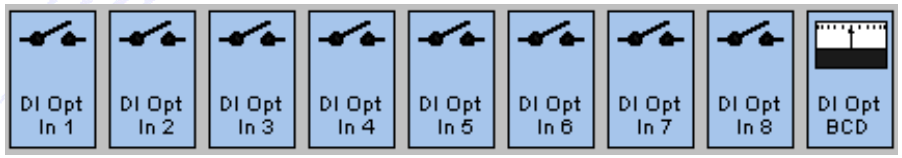
DE = 1 (binary)

DF = 0 (binary)

Digital Input Card DI-A3

Terminal Function Selection with DriveWorksEZ

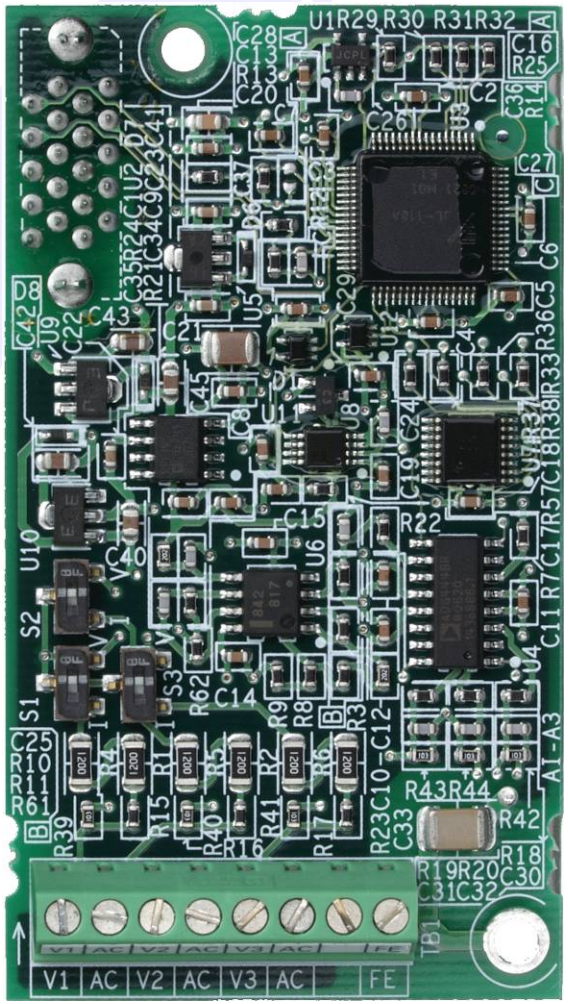




Technical Training – Options

Analogue Input Card AI-A3

AI-A3



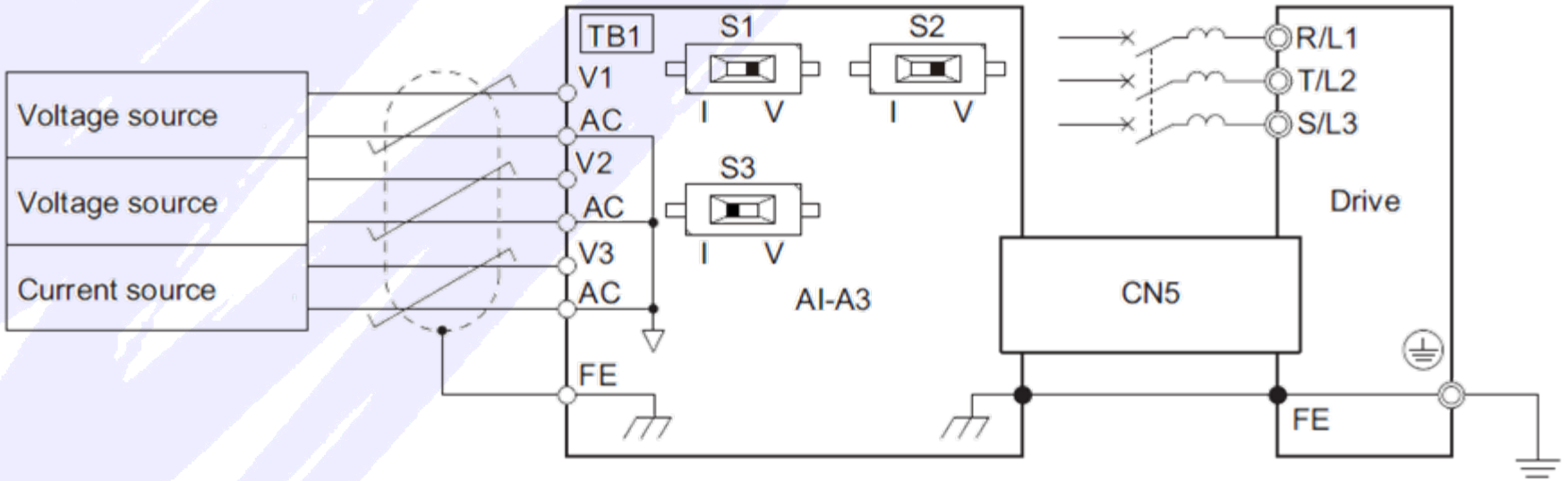
Analogue Input Card AI-A3

Hardware Specifications

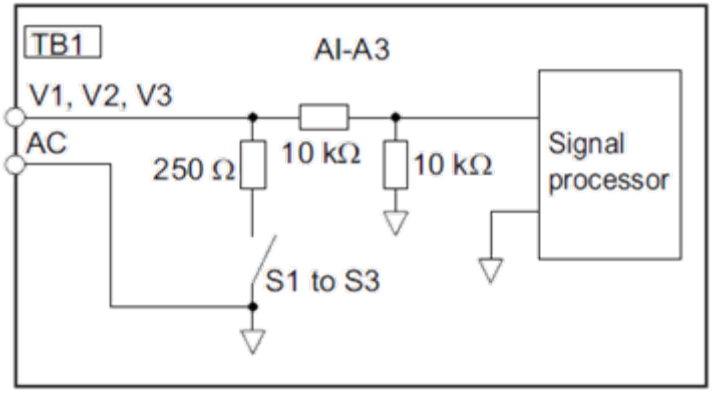
Input Terminals	3 Analogue Inputs
Voltage Input	Input signal voltage: -10 to 10 Vdc Impedance: 20 kΩ → Input resolution: 13 bit plus sign (1 / 8192)
Current Input	Input signal voltage: 4 to 20 mA Impedance: 250 Ω → Input resolution: 12 bit (1 / 4096)
Linear Precision	±0.1% at 25 °C
Ambient Temperature	–10 °C to 50 °C
Humidity	95%Rh or less with no condensation
Storage Temperature	–20 °C to 60 °C allowed for short-term transport of the product
Area of use	Indoor (free of corrosive gas, airborne particles)
Altitude	3000 m or less

Analogue Input Card AI-A3

Connection Diagram



→ **high input resolution**



Resolution of standard analogue input is 11bit plus sign

Analogue Input Card AI-A3

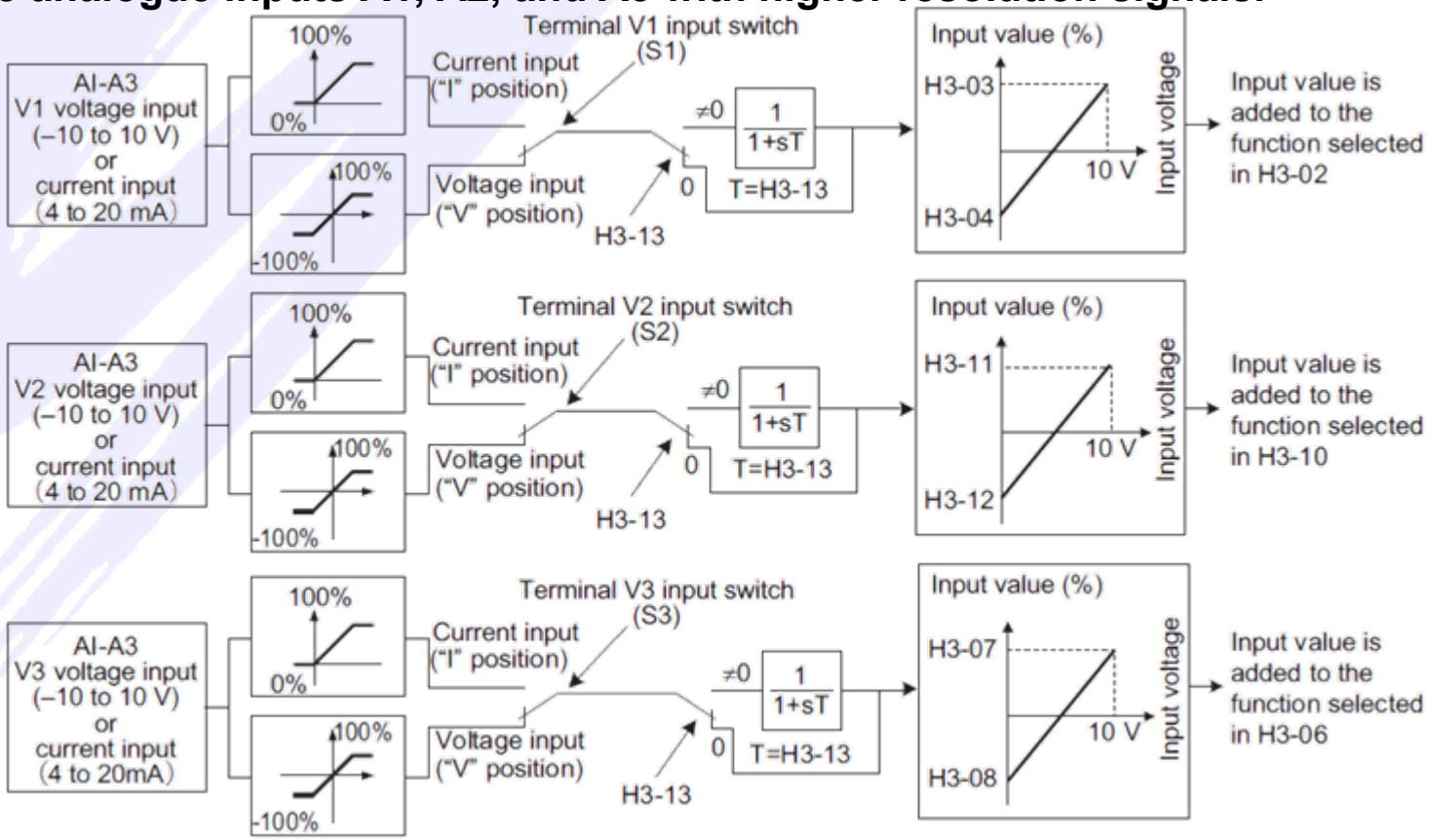
F2-01: Analogue Input Option Card Operation Selection

J V A

All Modes

F2-01 = 0: Separate functions for each terminal

With this setting the terminals V1, V2, and V3 on the option card replace the drive analogue inputs A1, A2, and A3 with higher resolution signals.



Analogue Input Card AI-A3

F2-01: Analogue Input Option Card Operation Selection

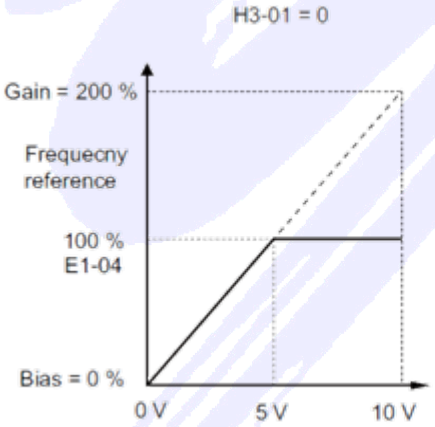
J V A

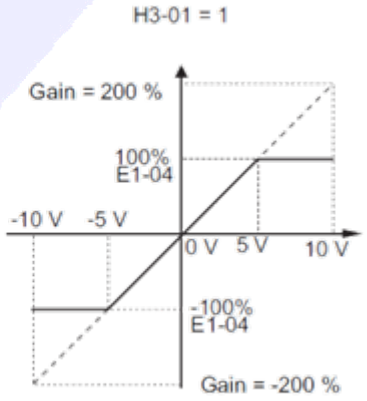
All Modes

F2-01 = 0: Separate functions for each terminal

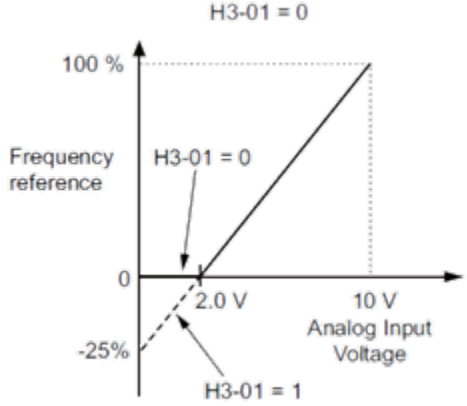
As A1, A2 and A3 are replaced, H3-xx parameter sets are used.
Find examples below:

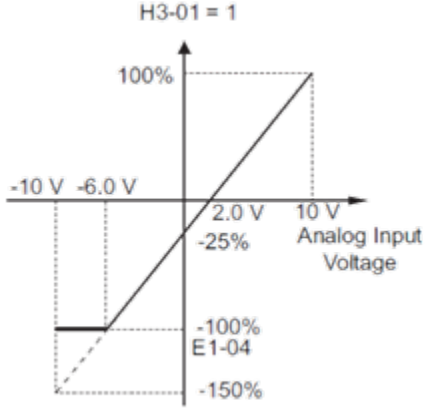
H3-03 = 200%, bias H3-04 = 0





H3-03 = 100%, bias H3-04 = -25%





Analogue Input Card AI-A3

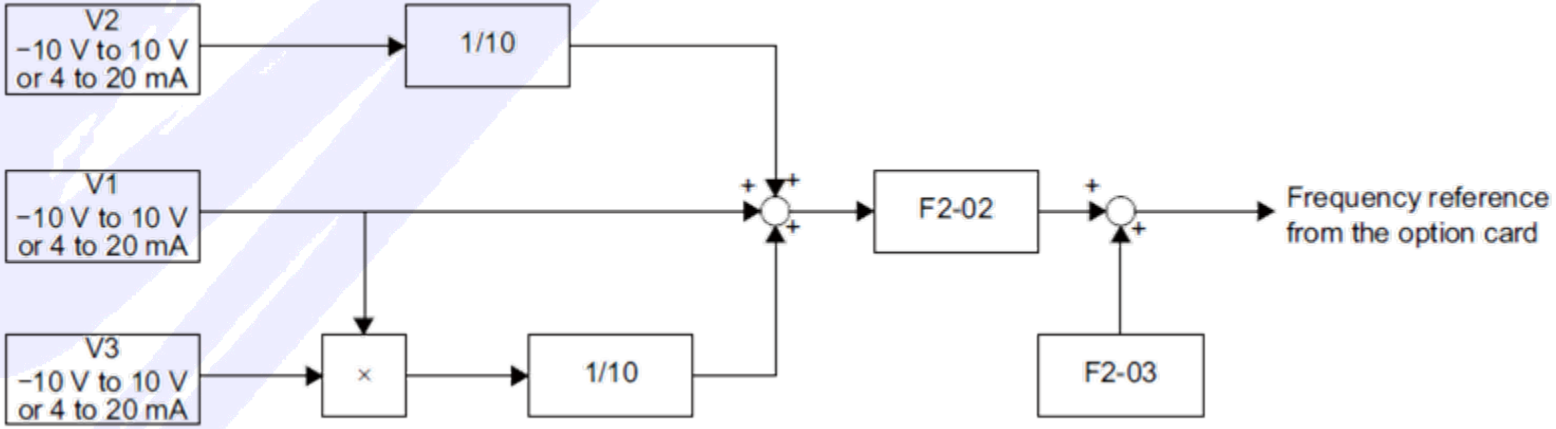
F2-01: Analogue Input Option Card Operation Selection

J V A

All Modes

F2-01 = 1: Combine input terminal values to create frequency reference

With this setting the three input signals of the AI-A3 option card are combined to one frequency reference signal



Note: Parameter b1-01 must be set to 3 to used this function

Analogue Input Card AI-A3

F2-02: Analogue Input Option Card Gain
F2-03: Analogue Input Option Card Bias

J V A

All Modes

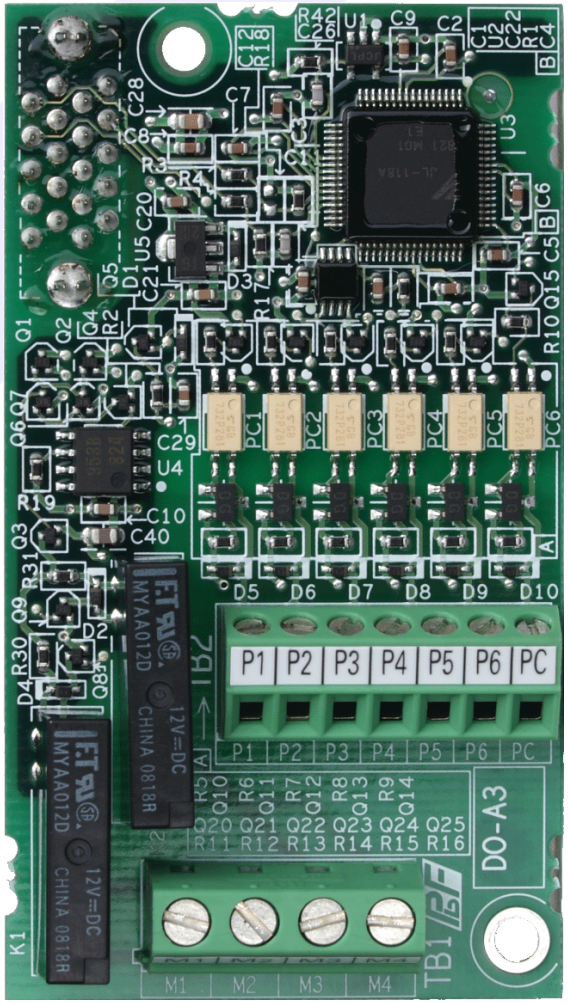
F2-01 = 1: Combine input terminal values to create frequency reference

No.	Parameter Name	Setting Range	Default
F2-02	Analogue Input Option Card Gain	-999.9 to 999.9%	100.0%
F2-03	Analogue Input Option Card Bias	-999.9 to 999.9%	0.0%

Technical Training – Options

Digital Output Card DO-A3

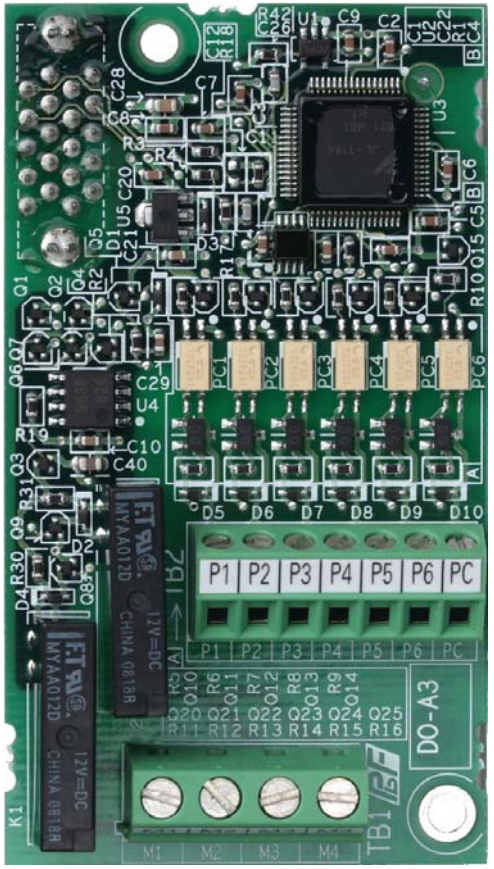
DO-A3



Digital Output Card DO-A3

Hardware Specifications

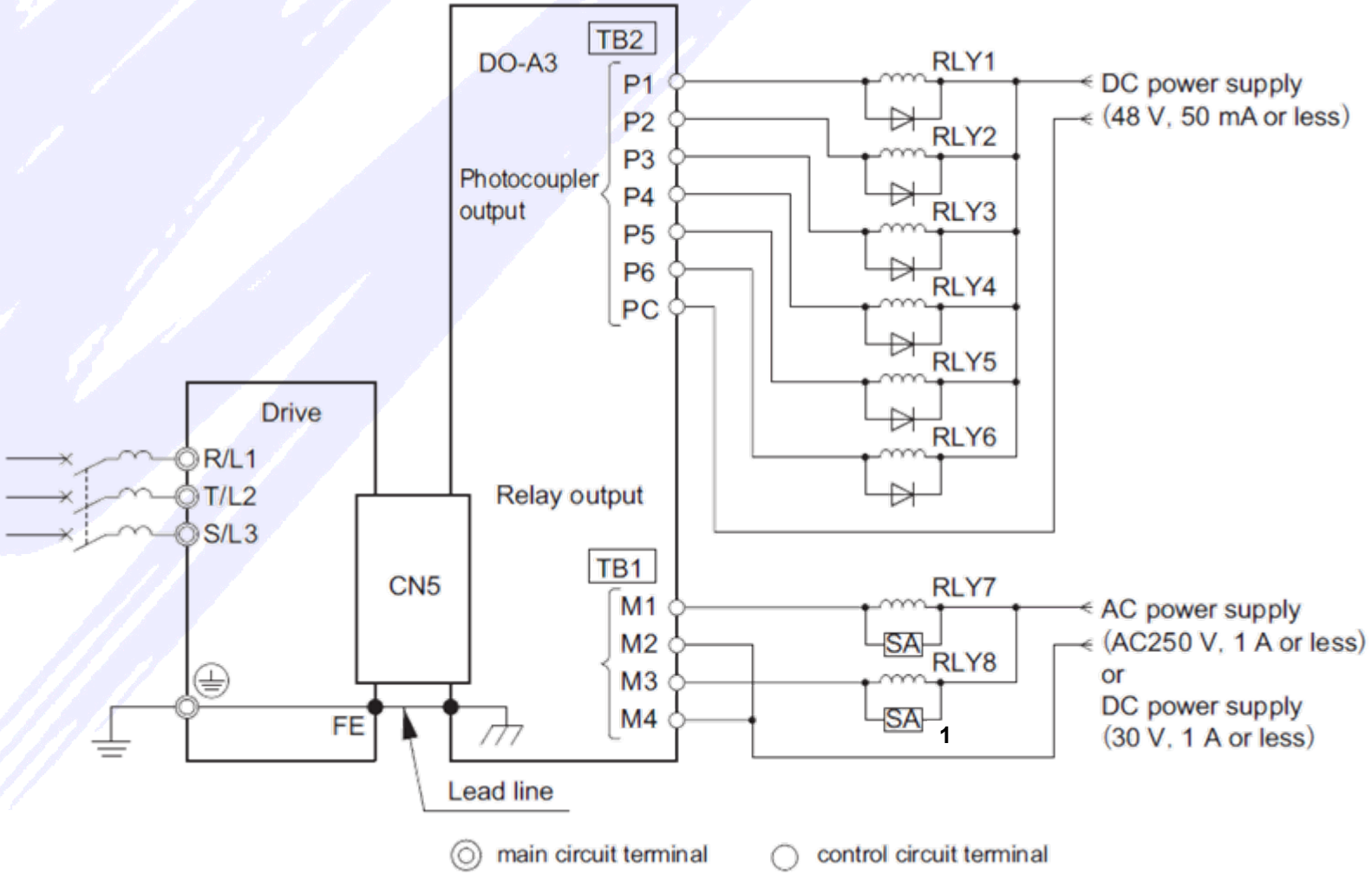
Photocoupler Output	6 outputs (common emitter) Max. Allowable voltage/current: 48Vdc / 50mA
Contact Relay Output	2 outputs (independent) Max. Allowable voltage/current: 250Vac / 1A, 30Vdc / 1A
Ambient Temperature	-10°C to 50°C
Humidity	95% RH or less with no condensation
Storage Temperature	-20°C to 60°C allowed for short-term transport of the product
Area of Use	Indoor (free of corrosive gas, airborne particles, etc.)
Altitude	3000m or less



Enables additional multi-function digital ouputs

Digital Output Card DO-A3

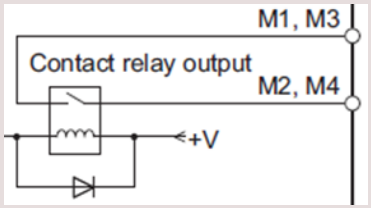
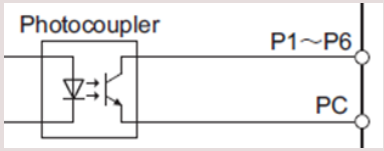
Connection Diagram



<1> Surge absorber should be installed when using an AC relay.

Digital Output Card DO-A3

Terminal Output Selection / Output Interface Circuit

Terminal Block	Terminal	Output	Output Type	Output Level
TB1 	M1	Contact relay output 1	N. O. Output	Max. Voltage And current: 250 Vac, 1A 30 Vdc, 1A
	M2			
	M3	Contact relay output 2		
	M4			
TB2 	P1	Photocoupler output 1	Open-collector Output	Max. Voltage and current: 48 Vdc, 50mA
	P2	Photocoupler output 2		
	P3	Photocoupler output 3		
	P4	Photocoupler output 4		
	P5	Photocoupler output 5		
	P6	Photocoupler output 6		
	PC	Photocoupler common	Emitter common	

Digital Output Card DO-A3

F5-09: DO-A3 Output Mode Selection

J V A

All Modes

Setting 0: Individual output
Setting 1: Binary code
Setting 2: Multi-function output assigned by F5-01 through F5-08

Terminal Block	Terminal	F5-09 = 0 Individual Output (default)	F5-09 = 1 Binary Code Output	F5-09 = 2 Multi-Function Output (*see next slide*)
TB1	M1-M2	Zero speed	During run	Determined by F5-01
	M3-M4	Speed agree	Alarm (excluding bb)	Determined by F5-02
TB2	P1-PC	"oC", "GF" (Overcurrent)	Binary code output (*see next slide*)	Determined by F5-03
	P2-PC	"ov" (Overvoltage)		Determined by F5-04
	P3-PC	"oH2" (Motor overheat) or "oL2" (Drive overload)		Determined by F5-05
	P4-PC	Not used		Determined by F5-06
	P5-PC	"oS" (Overspeed)	Zero speed	Determined by F5-07
	P6-PC	"oH", "oH1" (Motor overheat) or "oL1" (Motor overload)	Speed agree	Determined by F5-08

F5: Digital Output Card DO-A3

Related Parameter F5-09: Setting 1

J V A

F5-09 = 1: Binary code output

Coded Output	Description	TB2			
		P1-PC	P2-PC	P3-PC	P4-PC
0	Normal operation (no fault)	0	0	0	0
1	oC, GF (Overcurrent)	1	0	0	0
2	ov (Overvoltage)	0	1	0	0
3	oL2 (Drive overload)	1	1	0	0
4	oH, oH1 (Drive overheat)	0	0	1	0
5	oS (Overspeed)	1	0	1	0
6	Not used	0	1	1	0
7	rr, rH (Braking resistor overheat)	1	1	1	0
8	EF1 to EF12 (External fault)	0	0	0	1
9	CPF□□, oFA□□, oFb□□, oFC□□ (Drive hardware fault)	1	0	0	1
A	oL1 (Motor overload)	0	1	0	1
B	Not used	1	1	0	1
C	Uv1, Uv2, Uv3 (Undervoltage)	0	0	1	1
D	dEv (Speed deviation)	1	0	1	1
E	PGo (PG disconnect)	0	1	1	1
F	Not used	1	1	1	1

F5: Digital Output Card DO-A3

YASKAWA

Related Parameter F5-09: Setting 2 => F5-01 through F5-08

J V A

F5-09 = 2: Digital Output Option Card Terminal Function Selection through F5-01 ~ F5-08

No.	Parameter name	Setting Range	Default
F5-01	Terminal P1-PC Output Selection	0 to 192	2: Speed agree
F5-02	Terminal P2-PC Output Selection	0 to 192	4: Frequency detection 1
F5-03	Terminal P3-PC Output Selection	0 to 192	6: Drive ready
F5-04	Terminal P4-PC Output Selection	0 to 192	37: During frequency output
F5-05	Terminal P5-PC Output Selection	0 to 192	F: Not used
F5-06	Terminal P6-PC Output Selection	0 to 192	F: Not used
F5-07	Terminal M1-M2 Output Selection	0 to 192	0: During run
F5-08	Terminal M3-M4 Output Selection	0 to 192	1: Zero speed

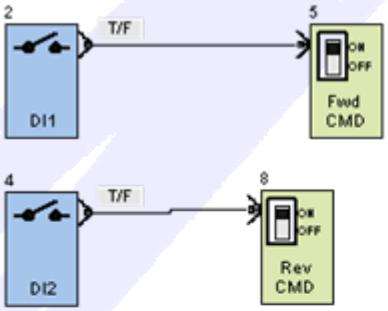
100 to 192: Functions 0 to 92 with inverse output

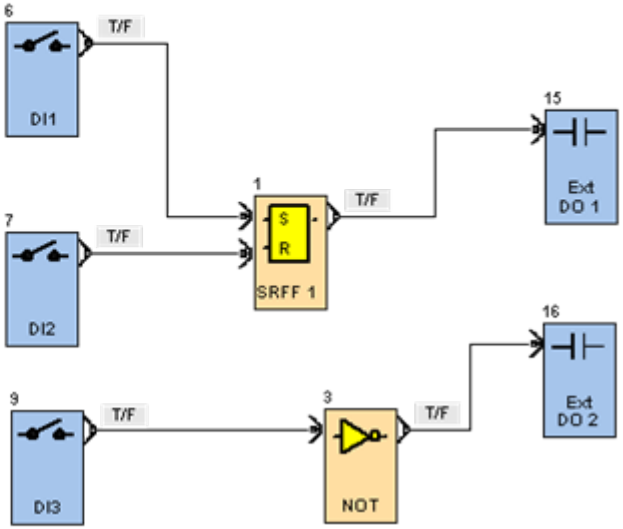
For comprehensive description (0 .. 92) see manual

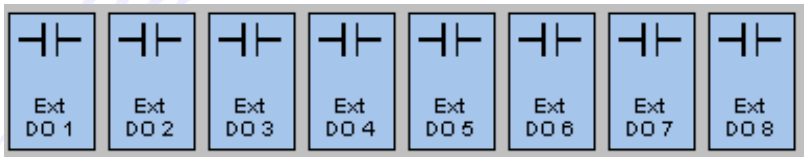
F5: Digital Output Card DO-A3

Example with DriveWorksEZ Standard (Pro)

Digital inputs using individual with DriveWorksEZ)





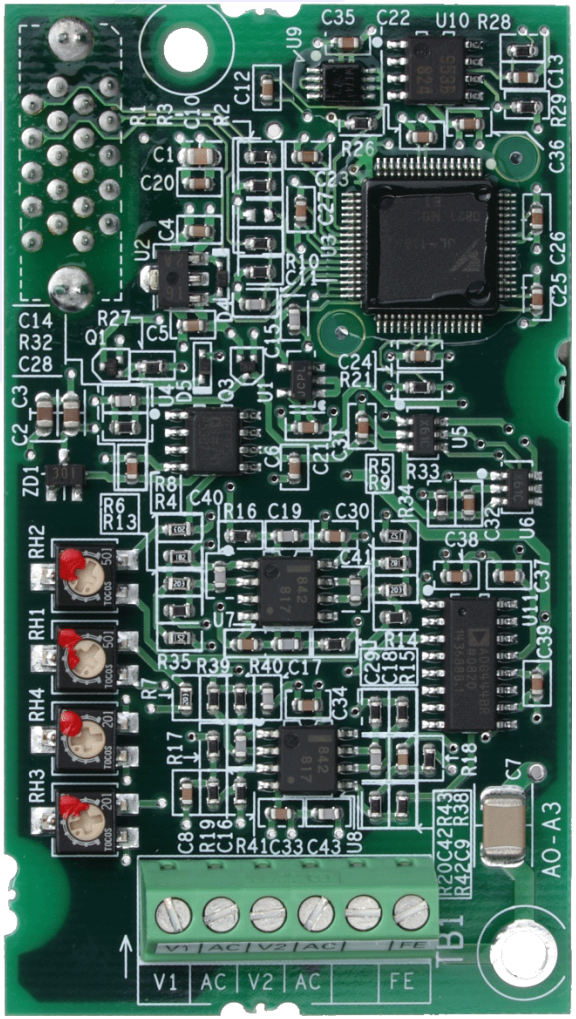


Note: Functions assigned by DriveWorksEZ have priority!

Technical Training – Options

Analogue Monitor Card AO-A3

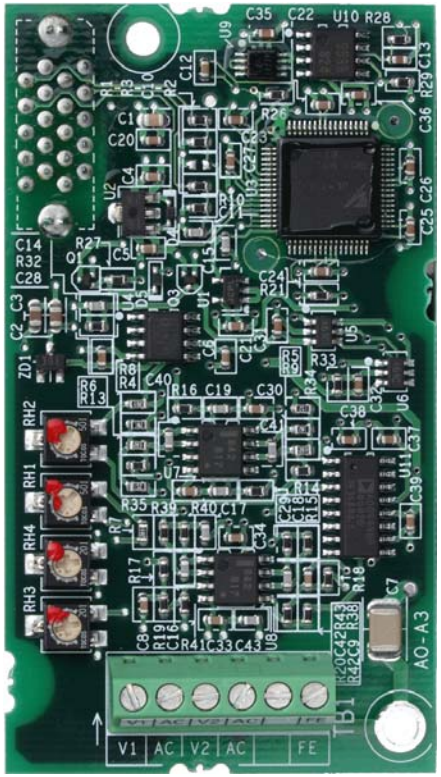
AO-A3



Analogue Monitor Card AO-A3

Hardware Specifications

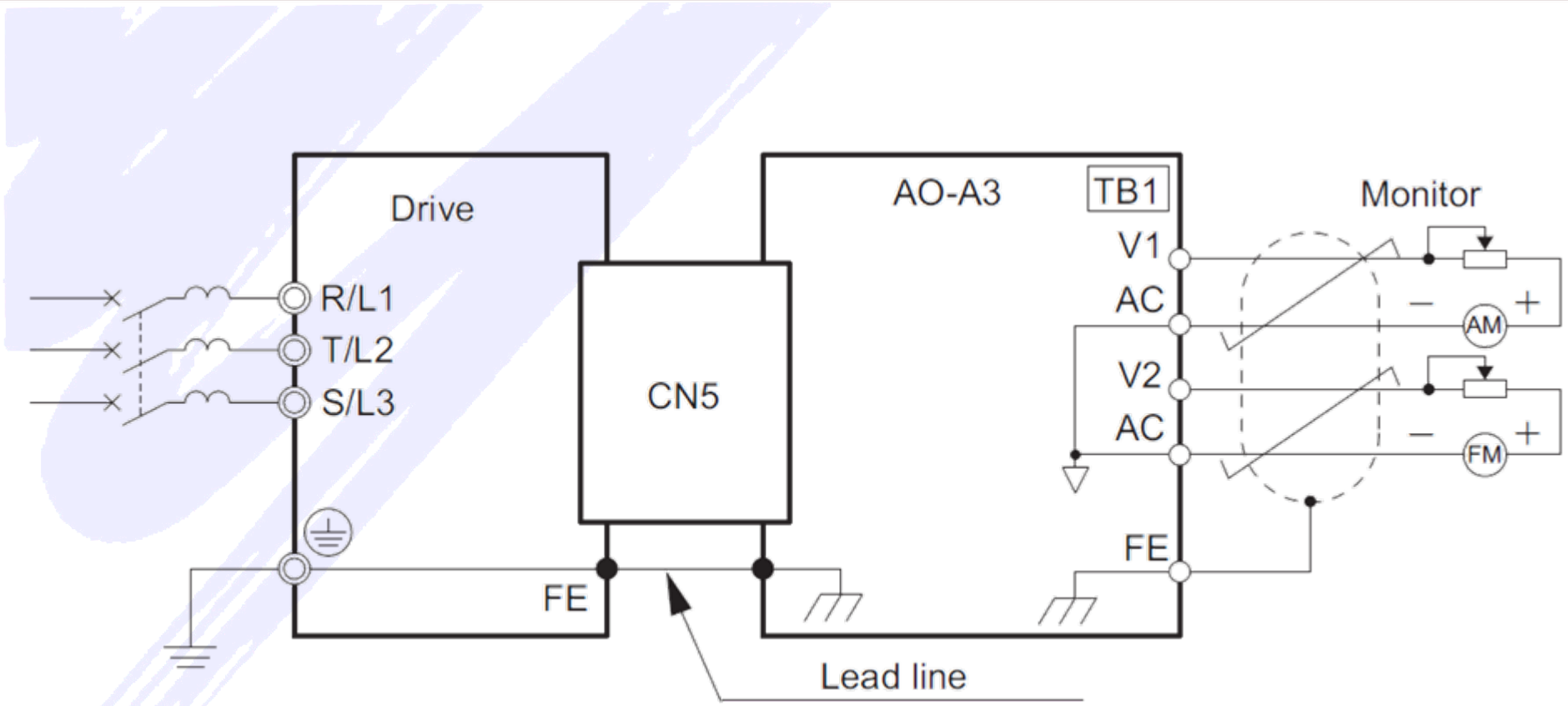
Analogue Output	2 Analogue Output
Output Voltage	Output signal voltage: -10 to 10 Vdc Output resolution: 11 bit plus sign (1/2048) Max. load current: 3 mA
Ambient Temperature	–10°C to 50°C
Humidity	95% RH or less with no condensation
Storage Temperature	–20°C to 60°C allowed for short-term transport of the product
Area of Use	Indoor (free of corrosive gas, airborne particles, etc.)
Altitude	3000 m or less



➔ The AO-A3 option card enables real analogue outputs in contrary to the Drive's standard PWM and filtered outputs.

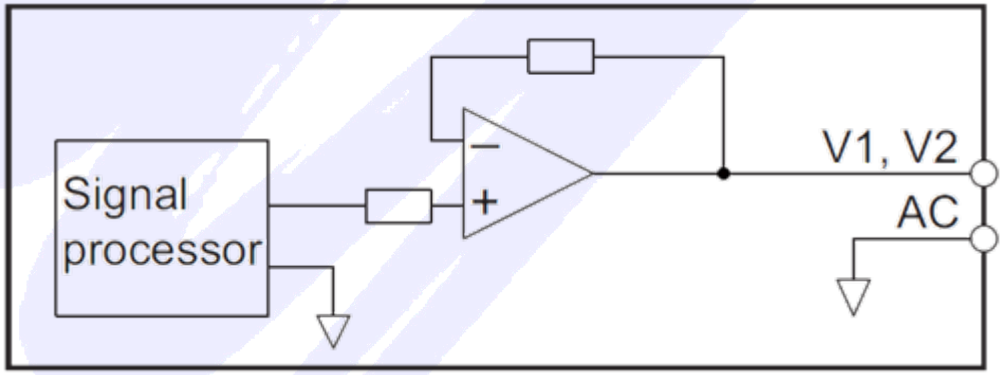
Analogue Monitor Card AO-A3

Connection Diagram



Analogue Monitor Card AO-A3

Output Interface Circuit



-10 V...+10 V
Output resolution 11 bit plus sign (1/2048)
Max. load current 3 mA

0 V
Common for analogue voltage output

Analogue Monitor Card AO-A3

F4-01, F4-02, F4-05, F4-07: Analogue Output 1

J V A

All Modes

No.	Parameter name	Description	Setting Range	Default
F4-01	Analogue Output 1 Monitor Selection	Selects the data to be output through analogue output terminal V1. Set the desired monitor parameter to the digits available in U☐-☐☐. For example, enter "103" for U1-03.	000 to 999	102 (Output frequency)
F4-02	Analogue Output 1 Monitor Gain	Determines the gain for analogue output terminal V1, where 100% equals 10 V output. Terminal output voltage is limited to 10 V.	–999.9 to 999.9	100.0
F4-05	Analogue Output 1 Monitor Bias	Sets the output voltage level when the selected monitor is equal to 0%.	–999.9 to 999.9	0.0
F4-07	Analogue Output 1 Signal Level	Sets the voltage level for the analogue output. 0: 0 to +10 Vdc; 1: –10 to +10 Vdc	0, 1	0

Analogue Monitor Card AO-A3

F4-03, F4-04, F4-06, F4-08: Analogue Output 1

J V A

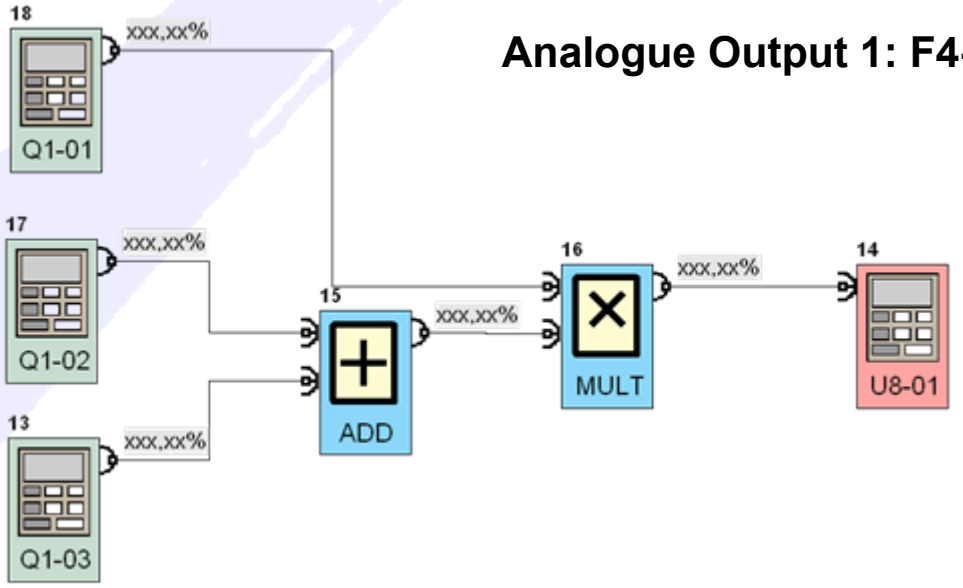
All Modes

No.	Parameter name	Description	Setting Range	Default
F4-03	Analogue Output 2 Monitor Selection	Selects the data to be output through analogue output terminal V2. Set the desired monitor parameter to the digits available in U☐-☐☐. For example, enter "103" for U1-03.	000 to 999	103 (Output current)
F4-04	Analogue Output 2 Monitor Gain	Determines the gain for analogue output 2, where 100% equals 10 V output. Terminal output voltage is limited to 10V.	–999.9 to 999.9	50.0
F4-06	Analogue Output 2 Monitor Bias	Sets the output voltage level when the selected monitor is equal to 0%.	–999.9 to 999.9	0.0
F4-08	Analogue Output 2 Signal Level	Sets the voltage level for the analogue output. 0: 0 to +10 Vdc; 1: –10 to +10 Vdc	0, 1	0

Analogue Monitor Card AO-A3

DriveWorksEZ

Example:



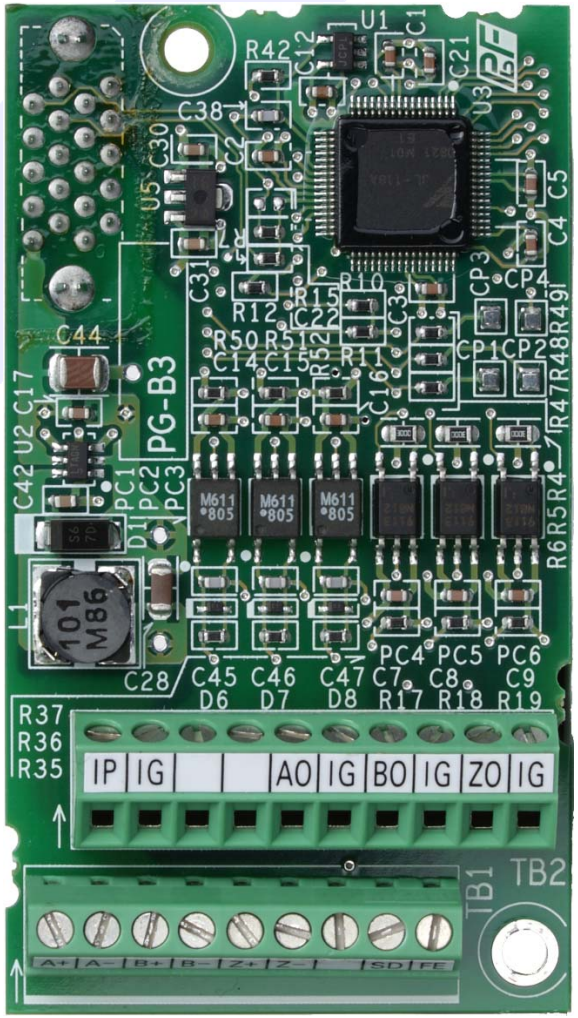
Analogue Output 1: F4-01 = 801

No.	Parameter name	Description	Setting Range	Default
F4-01	Analogue Output 1 Monitor Selection	Selects the data to be output through analogue output terminal V1. Set the desired monitor parameter to the digits available in U☐-☐☐. For example, enter “103” for U1-03.	000 to 999	102 (Output frequency)

Technical Training – Options

PG Complementary Type PG-B3

PG-B3



PG Complementary Type PG-B3

Specification

Option Card	PG-B3
Compatible Pulse Generators	Complementary, Open-collector Single track (A pulse), 2 track (A, B pulse) or 3 track (A, B, Z pulse) H level: 8 to 12 V L level: 2.0 V max.
PG Wiring Length	Complementary: 100 m max. Open-collector: 50 m max.
PG Power Supply	Output voltage: 12 V ± 5% Max. Output Current: 200 mA
Compatible Control Modes	V/f with PG, Closed Loop Vector, Closed Loop Vector for PM motors

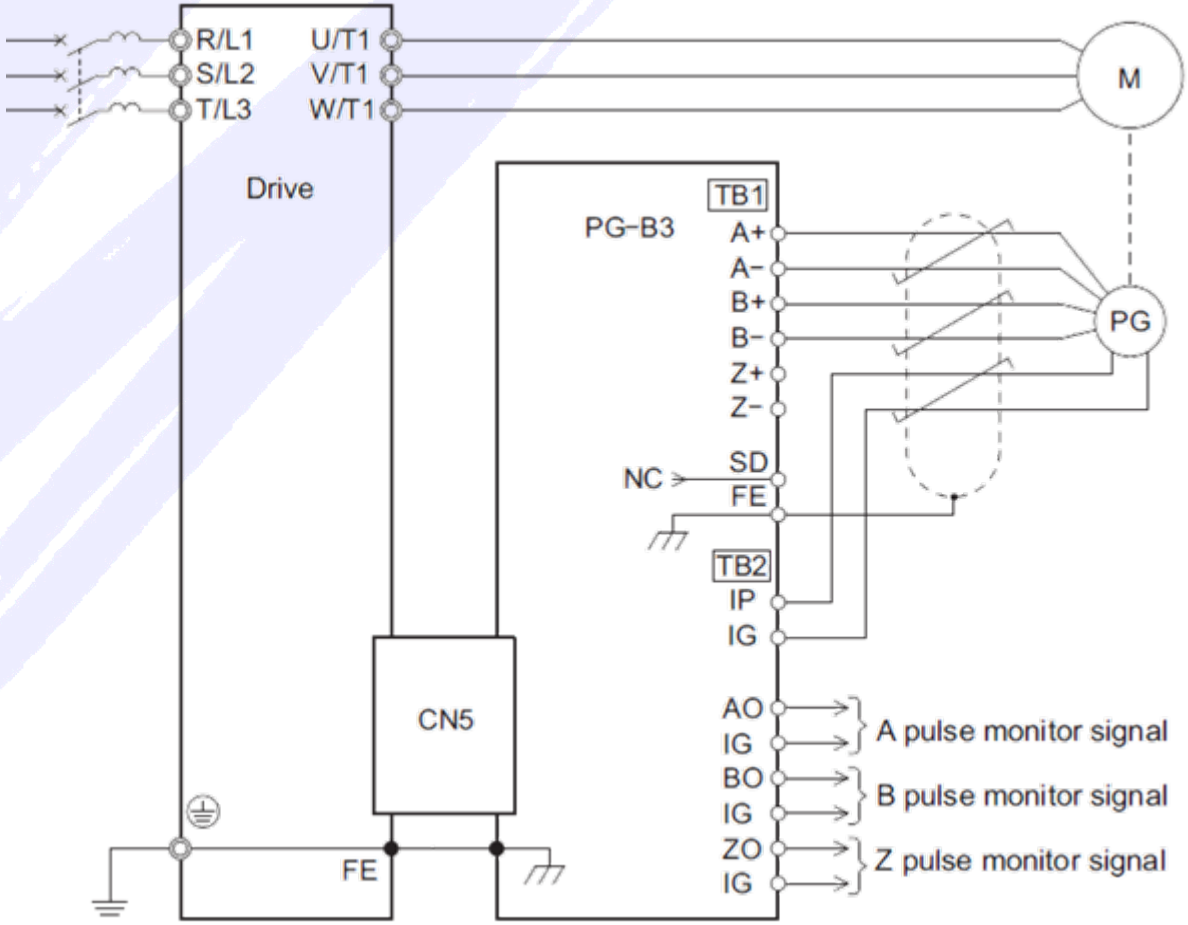
PG Complementary Type PG-B3

Specification

Maximum Input Frequency	50 kHz
Pulse Monitor Output	Monitor for A, B, and Z pulse output: 24 V max, 30 mA Open-collector output
PG Disconnect Detection	Software detection
Ambient Temperature	–10°C to 50°C
Humidity	95% RH or less with no condensation
Storage Temperature	–20°C to 60°C allowed for short-term transport of the product
Area of Use	Indoor (free of corrosive gas, airborne particles, etc.)
Altitude	3000 m or less

PG Complementary Type PG-B3

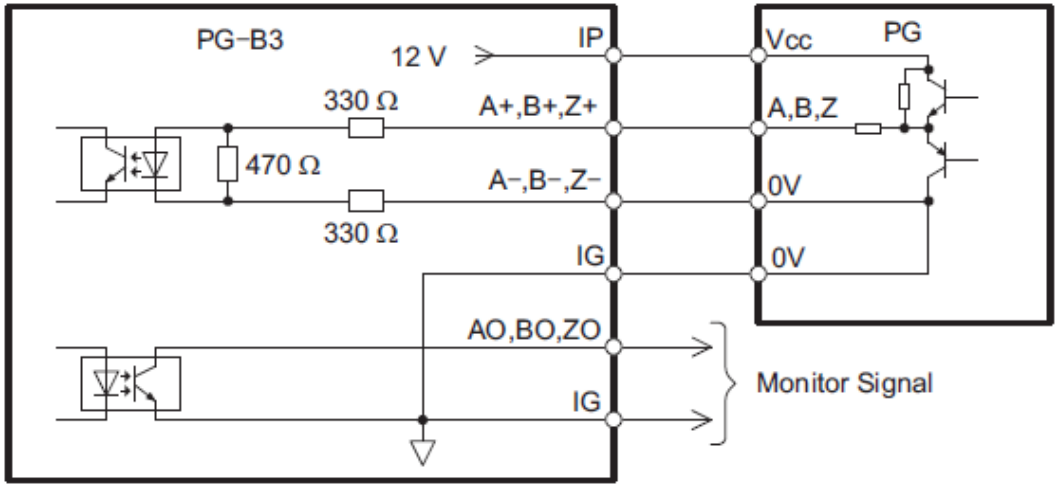
Connection Diagram



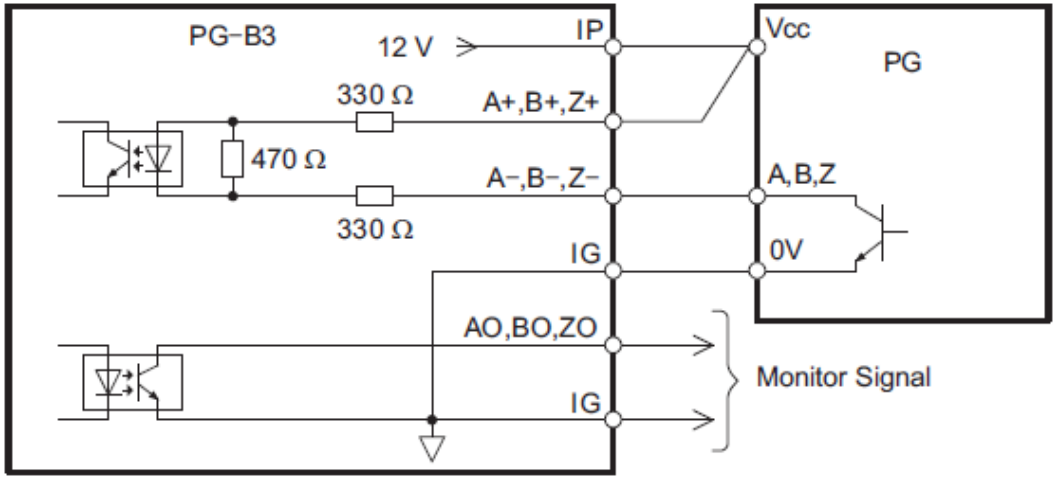
PG Complementary Type PG-B3

Interface Circuit

PG with Complementary Outputs



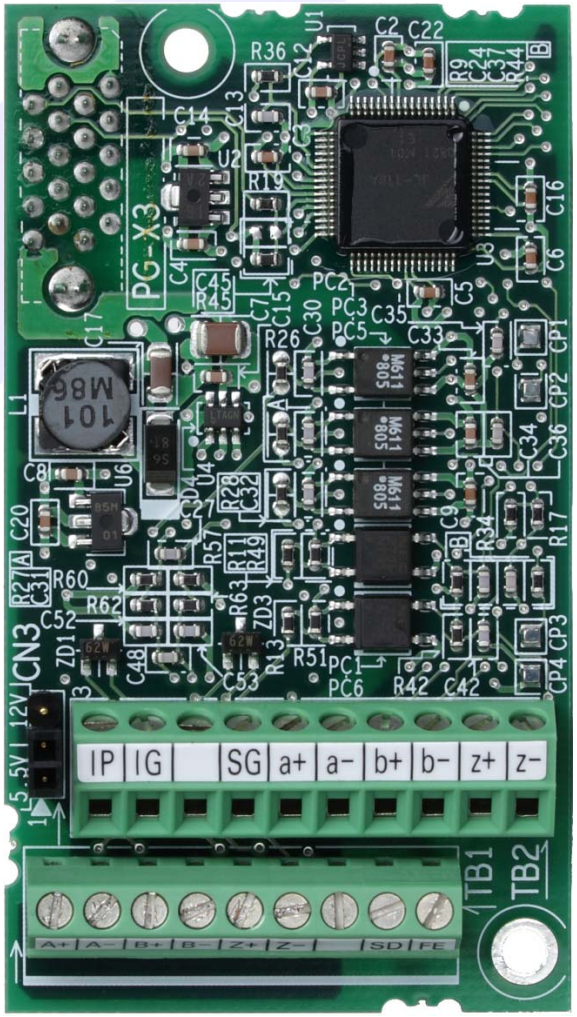
PG with Open-Collector Outputs



Technical Training – Options

PG Line Drive Type PG-X3

PG-X3



PG Line Drive Type PG-X3

Specification

Option Card	PG-X3
Compatible Pulse Generators	Line driver Single track (A pulse), 2 track (A, B pulse) or 3 track (A, B, Z pulse)
PG Wiring Length	100 m max.
PG Power Supply	Output voltage: 12 V ± 5% or 5.5 V ± 5% Max. Output Current: 200 mA
Compatible Control Modes	V/f with PG, Closed Loop Vector, Closed Loop Vector for PM motors
Maximum Input Frequency	300 kHz

PG Line Drive Type PG-X3

Specification

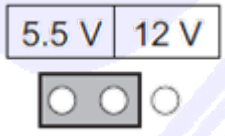
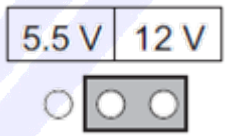
Pulse Monitor Output	Monitor for A, B, and Z pulse output Matches RS-422 level
PG Disconnect Detection	Software and hardware detection
Ambient Temperature	–10°C to 50°C
Humidity	95% RH or less with no condensation
Storage Temperature	–20°C to 60°C allowed for short-term transport of the product
Area of Use	Indoor (free of corrosive gas, airborne particles, etc.)
Altitude	3000 m or less

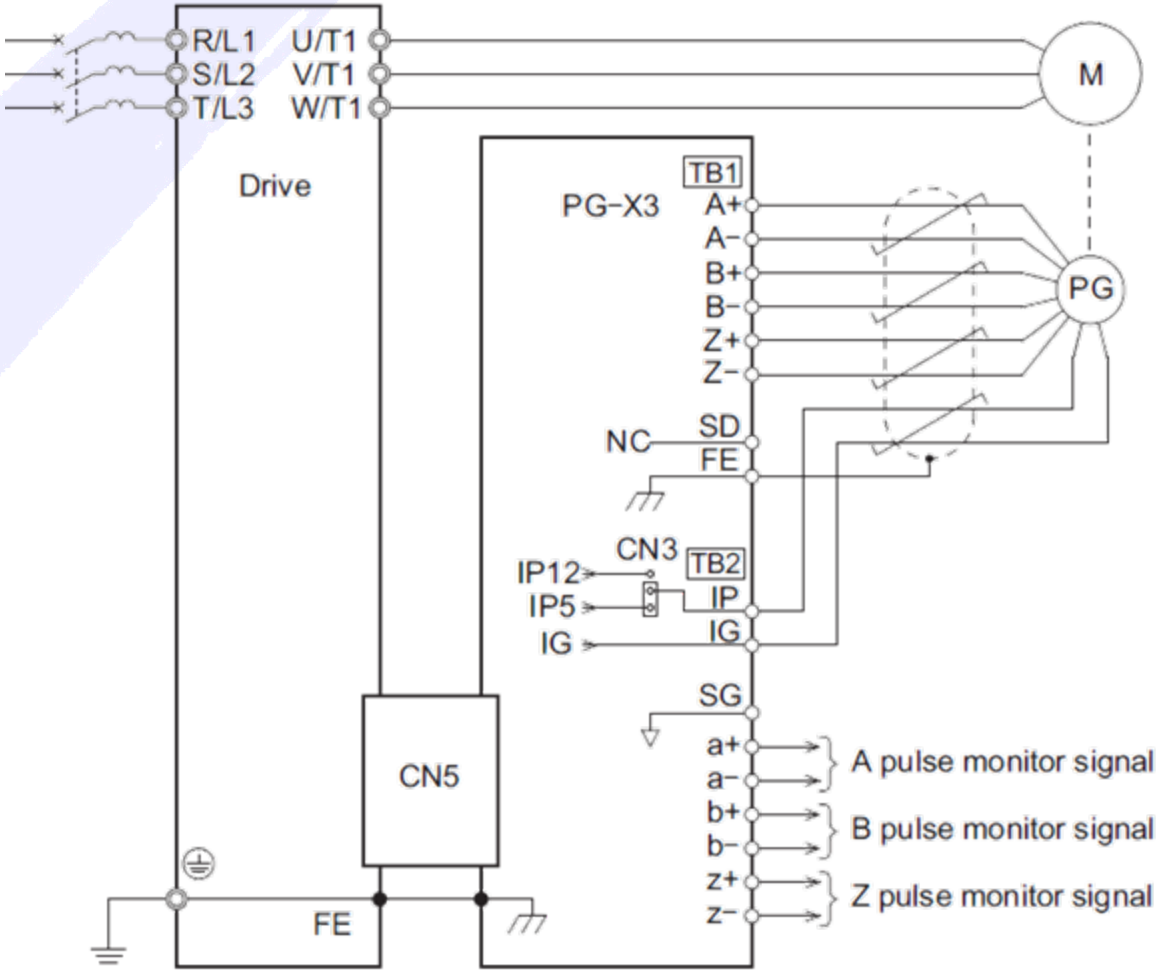
PG Line Drive Type PG-X3

Connection Diagram

J V A

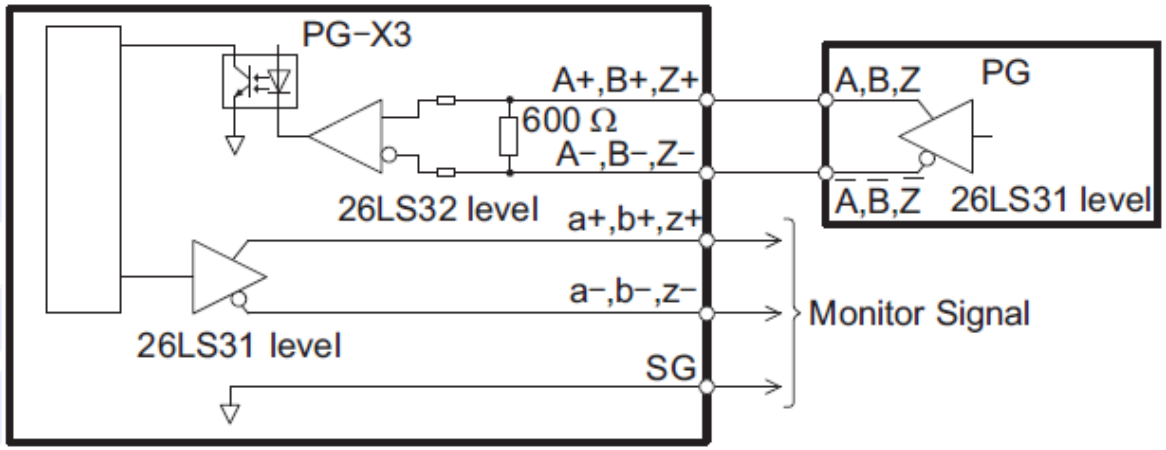
Setting the Voltage for the PG Power Supply by positioning the jumper CN3

5.5 V ± 5% (default)	12.0 V ± 5%
	



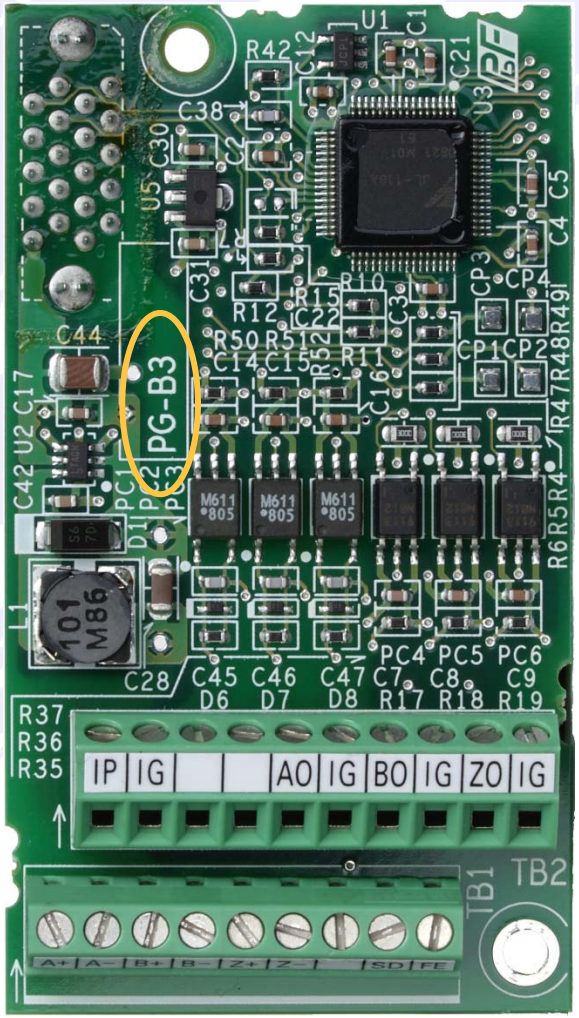
PG Line Drive Type PG-X3

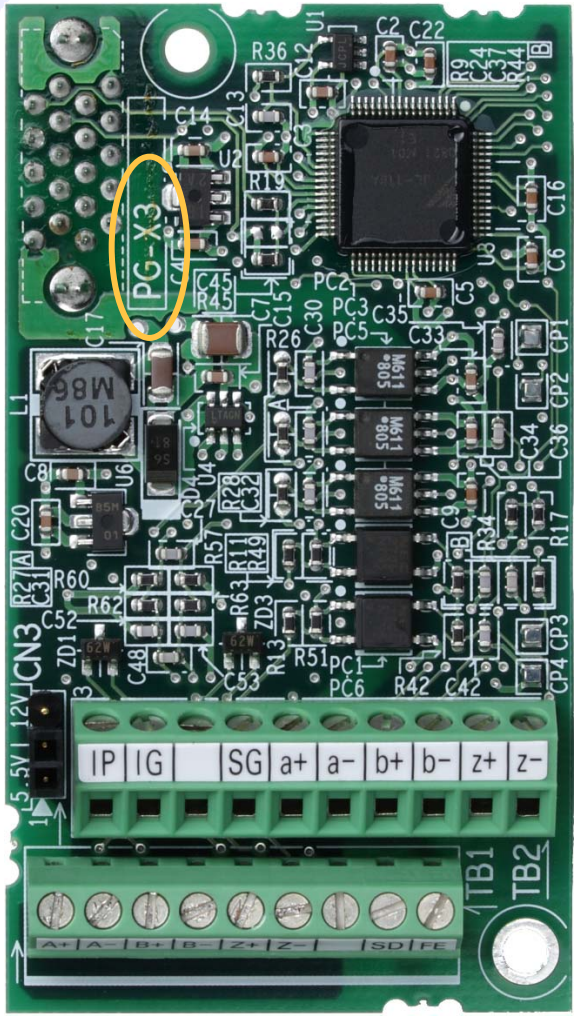
Interface Circuit



PG Complementary Type PG-B3
PG Line Drive Type PG-X3

Related Parameters F1





PG Complementary Type PG-B3
PG Line Drive Type PG-X3

Related Parameters F1:
Basic setup for PG Speed Control Card

J V A

V/f | V/f w/PG | OLV | CLV | OLV/PM | AOLV/PM | CLV/PM

No.	Parameter	Description	Range	Default
F1-01	PG 1 Pulse Setting	Sets the pulses per revolution of the pulse generator.	0 to 60000	1024
F1-05	PG 1 Rotation	0: Forward = A pulse leads 1: Forward = B pulse leads	0, 1	0 (1 for PM motors)
F1-06	PG 1 Ratio for PG Pulse Monitor	Sets the division ratio for the pulses monitor from the PG encoder. Set as a three digit number where x is the first digit, y is the Second digit, and z the third: Ratio = $\frac{(1+x)}{yz}$ When only the A pulse is read, this ratio is disabled and pulses are set as 1 : 1.	1 to 132	1

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F1-02 / F1-14
PG Open Detection

J V A

V/f | V/f w/PG | OLV | CLV
OLV/PM | AOLV/PM | CLV/PM

PG open is detected when not PG pulses could be detected for the time set in F1-14.

No.	Parameter	Description	Range	Default
F1-02	PG Feedback Loss (PGo) Operation Selection	Sets the stopping method when the PG becomes disconnected (PGo). 0: Ramp to stop (C1-02) 1: Coast to stop 2: Fast Stop (C1-09) 3: Continue running	0 to 3	1
F1-14	PG Disconnect (PGo) Detection Time	Sets the time in seconds for PG disconnect to be detected.	0.0 to 10.0s	2.0s

YASKAWA

F1-03 / F1-08 / F1-09: Overspeed Detection

J V A

V/f | V/f w/PG | OLV | CLV | OLV/PM | AOLV/PM | CLV/PM

Overspeed is detected when the speed feedback exceeds The level set in F1-08 for longer than the time in F1-09.

No.	Parameter	Description	Range	Default
F1-03	PG Overspeed (oS) Operation Selection (not in AOLV/PM)	Sets the stopping method when overspeed is detected. 0: Ramp to stop (C1-02) 1: Coast to stop 2: Fast Stop (C1-09) 3: Continue running	0 to 3	1
F1-08	PG Overspeed (oS) Level	Sets the level for detecting overspeed (oS). Set as a percentage of the maximum output frequency.	0 to 120%	115%
F1-09	Overspeed (oS) Detection Time	Sets the time required for the motor to exceed the level set in F1-08 to trigger a fault.	0.0 to 2.0s	<2>

<2> Value changes according to the control mode selection in A1-02.

PG Complementary Type PG-B3
PG Line Drive Type PG-X3

F1-04 / F1-10 / F1-11: Speed Deviation Selection

J V A

V/f | V/f w/PG | OLV | CLV | OLV/PM | AOLV/PM | CLV/PM

Speed Deviation is detected when the difference between frequency reference and speed feedback exceeds the level in F1-10 for longer than the time set in F1-11.

No.	Parameter	Description	Range	Default
F1-04	PG Deviation (dEv) Operation Selection	0: Ramp to stop (C1-02) 1: Coast to stop 2: Fast Stop (C1-09) 3: Continue running	0 to 3	3
F1-10	Excessive Speed Deviation Detection (dEv) Level	Sets the degree of speed deviation to trigger a dEv fault. Set as a percentage of the maximum output frequency.	0 to 50%	10%
F1-11	Excessive Speed Deviation Detection (DEv) Time	Sets the time required a speed deviation situation to trigger a fault.	0.0 to 10.0s	0.5s

PG Complementary Type PG-B3
PG Line Drive Type PG-X3

F1-12 / F1-13 / F1-21:
PG Gear Setup for V/f with PG

J V A

V/f | V/f w/PG | OLV | CLV | OLV/PM | AOLV/PM | CLV/PM

In case of a gear between Motor and PG (in V/f with PG) a gear ratio can be set to match the speed feedback with Frequency reference.

No.	Parameter	Description	Range	Default
F1-12	PG 1 Gear Teeth 1	Number of gear teeth between the PG and motor. $\frac{\text{Pulses} \times 60}{\text{F1-01}} \times \frac{\text{F1-13 (load side)}}{\text{F1-12 (motor side)}}$ A gear ratio of 1 will be used if any of these parameters is set to 0.	0 to 1000	0
F1-13	PG 1 Gear Teeth 2			
F1-21	PG 1 Option Card Function	Determines if the option card is used with single track or two tracks. 0: A pulse detection 1: AB pulse detection	0, 1	0

F1-18 / F1-19: dv3 / dv4 Detection

J V A

V/f | V/f w/PG | OLV | CLV | OLV/PM | AOLV/PM | CLV/PM

- dv3 is detected when the torque and the speed reference are in opposite directions while the difference between the actual motor speed and the speed reference is greater than 30%. F1-18 sets the number of occurences of this situation before dv3 is triggered.

- dv4 is detected when there is a motor speed deviation opposite to the frequency reference and larger than the number of pulses set in F1-19.

No.	Parameter	Description	Range	Default
F1-18	Reverse Rotation detection for PG 1 (dv3)	0: Disabled n: Number of times a dv3 situation must be detected to trigger a fault.	0 to 10	10
F1-19	Reverse Rotation detection for PG 1 (dv4)	0: Disabled n: Number of deviation pulses before dv4 is detecteds	0 to 5000	128

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F1-30 to F1-17: Setup for second PG Option Card

J V A

V/f | V/f w/PG | OLV | CLV | OLV/PM | AOLV/PM | CLV/PM

In case of applications requiring a second PG option card can be installed to the Drive.

Parameter F1-30 selects the port the PG card is connected to.

All setup parameters (F1-31 to F1-37) are set in the same way like the corresponding parameters for Motor 1.

No.	Parameter	Description	Range	Default
F1-30	Motor 2 PG Card Connector	Selects the connector for the PG option card connected to motor 2. 0: CN5-C 1: CN5-B	0 to 1	1
F1-31 to -37	Same settings as F1-01, -05, -06, -12, -13, -21		See Motor 1 settings	

PG Complementary Type PG-B3
PG Line Drive Type PG-X3

2 Application Examples for using 2 PG Speed Control Cards

- The drive is used for switching between 2 motors
  - Motor 2 parameters are activated by digital input
  - Both encoders are connected to the drive <u>at the same time</u>

    ➔ Time consuming rewiring is not needed

- The second PG card is used as reference input for synchronizing 2 motors
  - Install the encoder of a second motor to the second PG card
  - Set the connected motor to follow second motor with a defined gear ratio

    ➔ Very simple way to realize Electronic Line Shaft applications:
    Just use YASKAWA's PC Software "DriveWorks EZ"!

Technical Training – Options

Communication Option Cards

Overview

J V A

CANopen

PROFIBUS PROCESS FIELD BUS

DeviceNet™

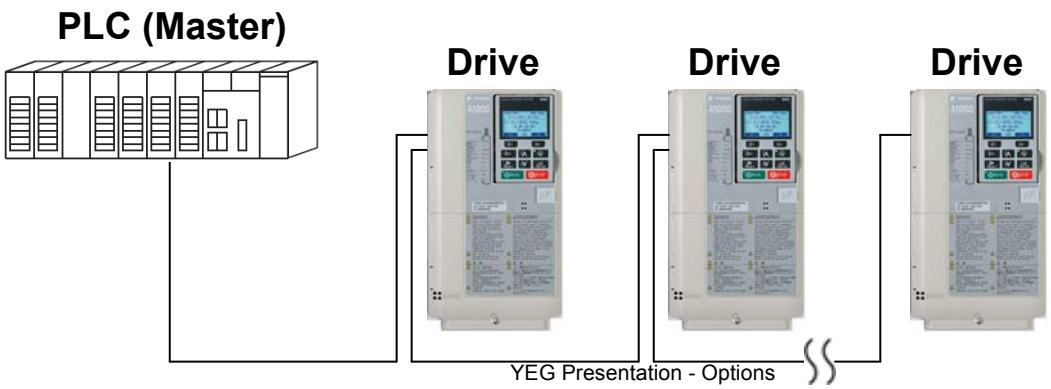
CC-Link

Modbus®

EtherNet/IP™

MECHATROLINK

EtherCAT® Technology Group

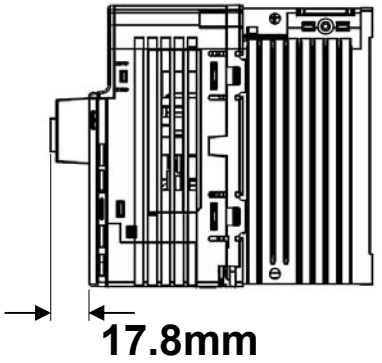


Technical Training – Options

RS232 (SI-232/J and SI-232/JC)

Overview

Standard for A1000 and V1000; Pluggable option for J1000



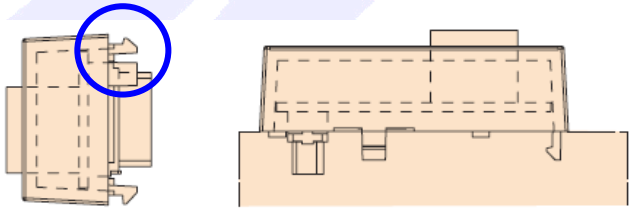
- **Optional Cards SI-232/J and SI-232/JC with RJ45 Connector: These Cards and a connection cable are required to connect to the RS232 of a computer with the configuration software DriveWizard Plus or**

RS232 (SI-232/J and SI-232/JC)

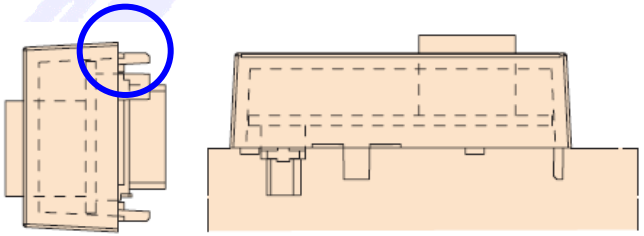
Overview

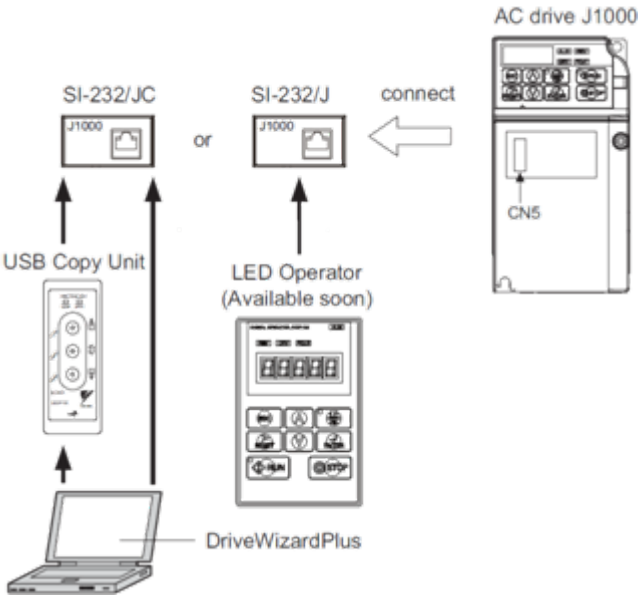
- SI-232/JC can be more easily connected and disconnected than SI-232/J. This is useful when copying parameter settings between multiple drives. SI-232/J does have barbed hooks to avoid accidental disconnection, even so but it can be removed if necessary.

SI-232/J



SI-232/JC





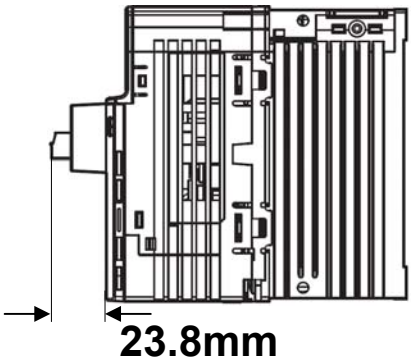
Technical Training – Options

MEMOBUS (SI-485/J)

Overview

J V A

Standard for A1000 and V1000; Pluggable Option for J1000



- **Optional Card SI-485/J:**
  By installing this option unit, the user can operate the drive with a PLC or some other type of control device with max. 38.4kbps (115.2kbps A1000, J1000). For example: Drive operation, monitor drive operational status, change drive parameter settings.

MEMOBUS (SI-485/J)

Specification

J V A

Interface	RS-485	
Communication Parameters	Communication speeds available	1.2; 2.4; 4.8; 9.6; 19.2; 38.4 kbps
	Data length	8 bit (fixed)
	Parity	Select even, odd, or none
	Stop bit	1 bit (fixed)
Connector	5-pin open-style screw connector	
Protocol	MEMOBUS (using Remote Terminal Unit mode only)	
Maximum Number of Slaves	31 drives	

Technical Training – Options

F6: Profibus-DP (SI-P3/V and SI-P3)

Profibus Card

SI-P3

SI-P3/V

F6: Profibus-DP (SI-P3/V and SI-P3)

Specification

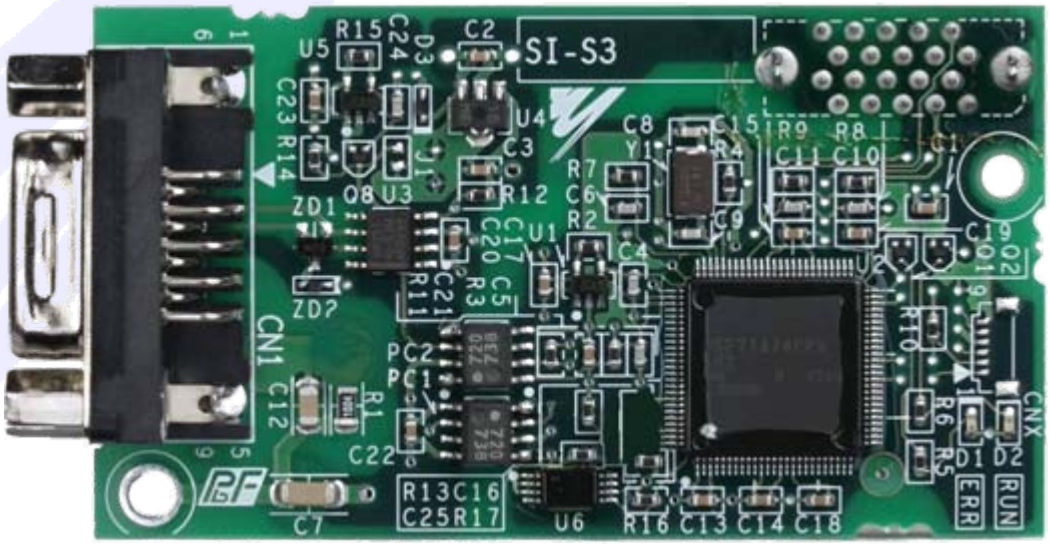
Communication Profile	PROFIBUS DP-V0, V1 PPO TYPE: 1~5 (No. 3.072, Profile for Variable Speed Drives)
Data Lengths	Extended data 1 • High-speed I/O data (inputs: 16 bytes, outputs: 16 bytes) • MEMOBUS/Modbus message (inputs: 16 bytes, outputs: 16 bytes) Extended data 2 • High-speed I/O data (inputs: 4 bytes, outputs: 4 bytes) • MEMOBUS/Modbus message (inputs: 8 bytes, outputs: 8 bytes) Basic data • High-speed I/O data (inputs: 6 bytes, outputs: 6 bytes)
Connector	9-pin D-sub connector
Communication Speed	9.6 kbps to 12 Mbps

Note: There are no termination resistors on the card!

Technical Training – Options

F6: CANopen (SI-S3/V and SI-S3)

CANopen



F6: CANopen (SI-S3/V and SI-S3)

Specification

All Modes

Communication Profile	DS 301 Ver. 4.02 DSP 402 Ver. 1.1 Velocity Mode
Connector	9-pin D-sub connector (#4/40 UNC thread)
Communications Speed	10 kbps to 1 Mbps

Note: There is no termination resistor on the card!

Automatic Bitrate Detection:

After power up the CANopen card will listen to messages on the bus and adjust its bitrate setting automatically.

Technical Training – Options

F6: DeviceNet (SI-N3/V and SI-N3)

DeviceNet Card

F6: DeviceNet (SI-N3/V and SI-N3)

Specification

Unconnected Message Manager

SI-N3 Supported Messages	Group 2 Server (Unconnected Message Manager capable) Explicit Messages: Fragmentation is supported. Up to 32 bytes can be input and output. Polled I/O Messages: Fragmentation is not supported. Up to 8 bytes can be input and output. Faulted Node Recovery / Offline Connection Set Messages / Automatic Device Replacement (ADR) Change of State Message (COS). COS can be used as an I/O Input Assembly.
I/O Assembly Instance	Input: 17 types (4~8 bytes) Output: 18 types (4~8 bytes)
DeviceNet Specification	Conformance Level 19: Passed
DeviceNet Profile	AC Drive
Input Power	Voltage: 11~25 Vdc Current: 40 mA

F6: DeviceNet (SI-N3/V and SI-N3)

Specification/Related Parameters

Connector	5-pin open-style screw connector
Physical Layer Type	Isolated Physical Layer CAN transceiver + photocoupler
MAC ID Setting	Programmable from drive keypad or network: MAC ID 0 to 63
Communications Speed/Baud Rate	Programmable from drive keypad or network: 125/250/500 k bit/s Auto Baud Rate Idle Mode Detect Heartbeat

Technical Training – Options

F6: MECHATROLINK II (SI-T3/V and SI-T3)

SI-T3/V, SI-T3

F6: MECHATROLINK II (SI-T3/V and SI-T3)

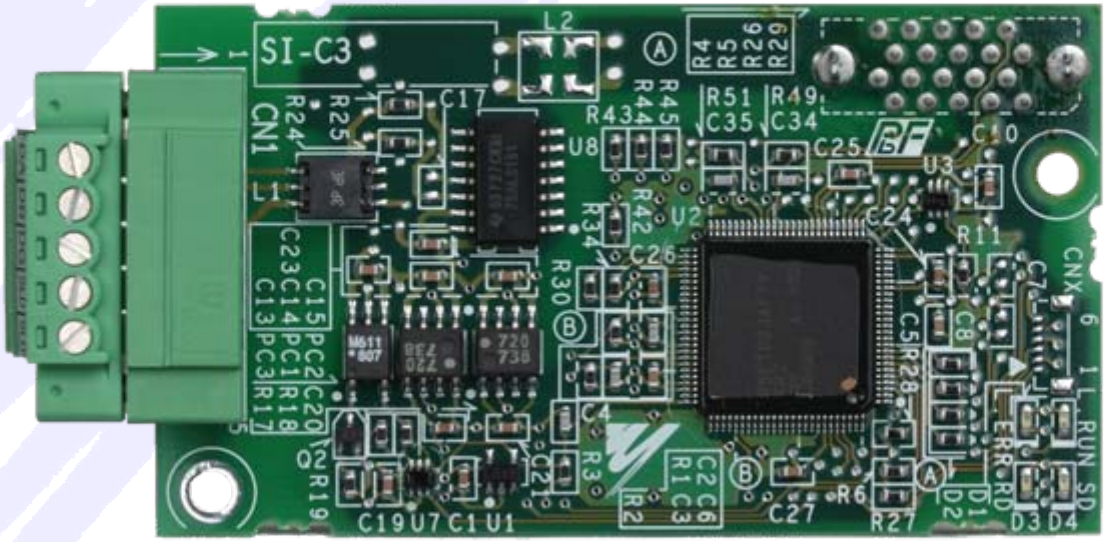
Specification

Access mode	Start-stop synchronization, master/slave method
Communication Speed	10 Mbps (MECHATROLINK-II), 4 Mbps (MECHATROLINK-I)
Transmission cycle	500 µs to 8 ms
Maximum transmission distance	50 m
Minimum wiring distance between stations	0.5 m
Data length	17-byte data transmission or 32-byte data transmission
Maximum number of stations	30

Technical Training – Options

F6: CC-Link (SI-C3/V and SI-C3)

Specification



CC-Link Version	Version 1.10
Station Type	Remote device station
No. of Occupied Stations	1
Communication Speed	156 kbps to 10 Mbps
Connector	5-pin open-style screw connector

Technical Training – Options

F6: Modbus TCP/IP (SI-EM3/V and SI-EM3)

SI-EM3/V, SI-EM3

F6: Modbus TCP/IP (SI-EM3/V and SI-EM3)

Specification

Supported Messages	•Read Multiple[1)] Registers (03H) •Write Single Registers (06H) •Write Multiple[1)] Registers (10H) •Read&Write Registers (17H)
High Speed Access	Many Registers mapped to increase Network Performance
Number of Connections	Modbus TCP/IP: 10 Web Page Access: 2
Communication Speed	10/100 Mbs, Auto-Negotiate
Duplex Mode	Half Forced, Full Forced, Auto-Negotiate
Physical Layer Type	•Isolated Physical Layer •TCP Protocol Transformer Isolated
Connector Type	RJ45 for 8-pin Shielded Twisted Pair Cat 5e cable

1) Commands for multiple registers have a max. Read/Write size of 16 registers.

Technical Training – Options

F6: EtherNet/IP (SI-EN3/V and SI-EN3)

SI-EN3/V, SI-EN3

F6: EtherNet/IP (SI-EN3/V and SI-EN3)

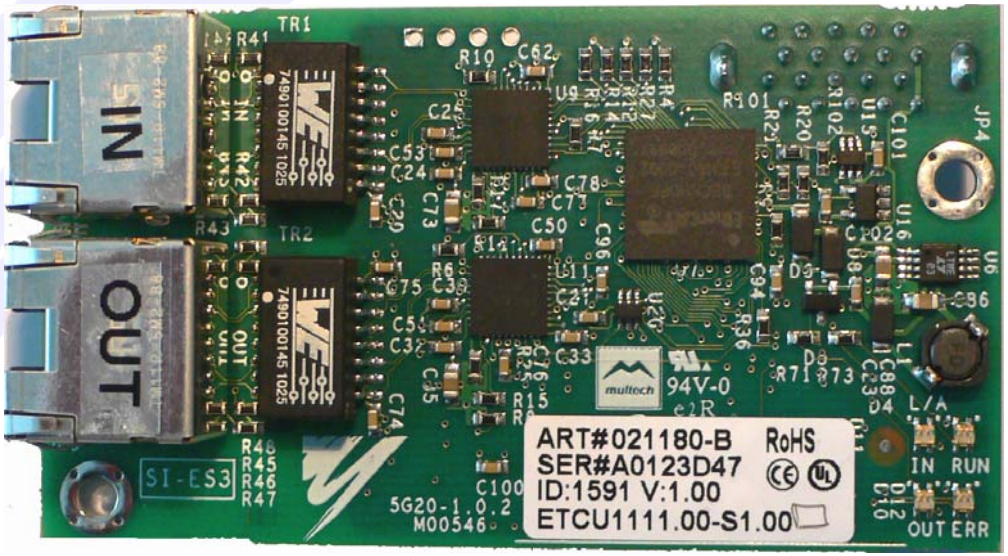
Specification

EtherNet IP Specification	Conformance Level A5: Passed
EtherNet IP Profile	AC Drive
Address Startup Mode	Static, BOOTP, DHCP
Supported Messages	•Explicit: Explicit Class 3, Unconnected •I/O: Class1, Listen Only, Input Only
I/O Assembly Instance	•Input: 7 Types (4~44 Bytes) •Output: 7 Types (4~44 Bytes)
Number of Connections	I/O: 2 Explicit: 6
Communication Speed	10/100 Mbs, Auto-Negotiate
Duplex Mode	Half Forced, Full Forced, Auto-Negotiate
Physical Layer Type	•Isolated Physical Layer •TCP Protocol Transformer Isolated
Connector Type	RJ45 for 8-pin Straight Shielded Twisted Pair Cat 5e cable

Technical Training – Options

F6: EtherCAT (SI-ES3/V and SI-ES3)

SI-ES3/V, SI-ES3



F6: EtherCAT (SI-ES3/V and SI-ES3)

Features

- Operation, setup and monitoring of the Drives via EtherCAT
- Double port RJ45 connector for easiest wiring
- Communication Speed 10 or 100 Mbps
- Automatic configuration
- ESI file (EtherCAT Slave Information)
  as download from YASKAWA Website
- Read out and Write in of Parameters through SDO and PDO
- Communication Profile : DS301, Ver. 4.02
  Drive Profile : DSP 402, Ver. 3.0 Velocity Mode
  Vendor-specific objects: Direct access to drive Parameter
- Applicable drives: V1000 with S1020 and higher
  A1000 with S1017 and higher

Technical Training – Options

F6-01: Communications Error Operation Selection

All Modes

Determines drive operation if a communication error occurs.

Setting 0: Ramp to stop (uses the deceleration time set to C1-02)

Setting 1: Coast to stop

Setting 2: Fast Stop (uses the Fast Stop time set to C1-09)

Setting 3: Alarm only (continue operation)

F6-02: External fault from Comm. Option Detection Selection

All Modes

Determines the detection method of an external fault initiated by communication option

Setting 0: Always detected

Setting 1: Detection during run only

F6-03: External Fault from Communication Option Operation Selection

All Modes

Determines the operation when an external fault is initiated by a communication option

Setting 0: Ramp to stop

<u>Setting 1: Coast to stop</u>

Setting 2: Fast stop

Setting 3: Alarm only (continue operation)

F6-06: Torque Reference / Torque Limit Selection from Communication Card

J V A

V/f | V/f w/PG | OLV | CLV | OLV/PM | AOLV/PM | CLV/PM

Used to select if torque reference and torque limit values are assigned to the drive from the network

Setting 0: Enabled

Setting 1: Disabled

Note: Not in Mechatrolink

F6-08: Reset Communication Parameters

All Modes

Determines whether communication-related parameters (F6-□□) are reset when the drive is initialized using parameter A1-03

Setting 0: Do not reset parameters F6-□□ when the drive is initialized with A1-03

Setting 1: Reset F6-□□ when the drive is initialized with A1-03

Note: F6-08 is not reset when the drive is initialized, but does determine whether initializing the drive with A1-03 resets the other communication parameters, F6-□□
Keep in mind that communication might not be possible anymore, if initialization resets the communication parameters

Technical Training – Options

Mounting Example

A1000 Option Cards

- More compact than ever
- Up to 3 option boards at the same time
- Inside mounting

PG-Card
CN5-C

Digital Input Card
CN5-B

PROFI-BUS DP Card
CN5-A

Card Installing

Option Card	Port/Connector	Number of Cards Possible
SI-C3, SI-N3, SI-P3, SI-S3, SI-T3, AI-A3, DI-A3	CN5-A	1
PG-B3, PG-X3	CN5-B, C	2
DO-A3, AO-A3	CN5-A, B, C	1

➔ Speed synchronous operation with two PG Cards possible

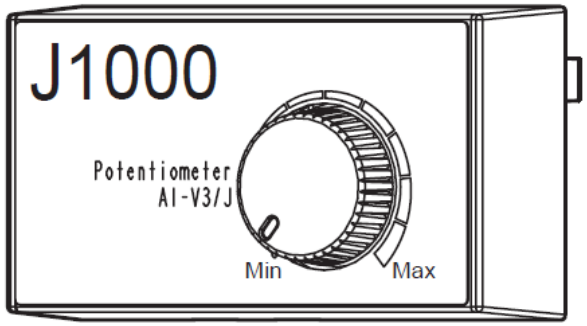
NOTE: Communication cards only applicable in CN5-A

Technical Training – Options

Potentiometer AI-V3/J

J V A

The Potentiometer Option allows the user to adjust the frequency reference by rotating a potentiometer dial. Turning the potentiometer changes the frequency reference making it easier to adjust the motor speed.



No.	Parameter Name	Description	Setting Range	Default
H3-13	Analogue Input Filter Time Constant	Sets the primary delay filter time constant for terminal A1. Used for noise filtering.	0 to 2s	0.03s

Technical Training – Options

Digital Operator

Operator	J1000	V1000	A1000
JVOP-182 (LED)	Optional[1)2)]	optional[2)]	optional
JVOP-180 (LCD)	N/A	optional[2)]	standard

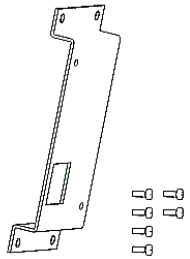
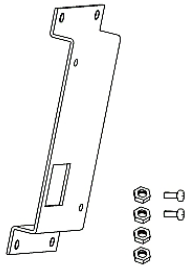
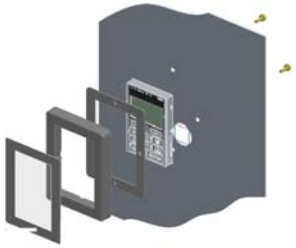
1) SI-232/J necessary
2) Remote only

JVOP-182 (LED)

JVOP-180 (LCD)

Digital Operator Mounting Kits

Three different mounting kits for the digital operators are available:

Name	Drawing	Order code
Installation Kit A (With screws)		100-039-992
Installation Kit B (With nuts)		100-039-993
IP65 Frame for Digital Operator		EUOP-V11001 (to be released June 2010)

Technical Training – Options

USB Copy Unit

The copy unit has two functions:

- USB/Serial converter (J1000 und V1000):
  Allows the drive to connect to the USB port on a PC
- Reading and copying drive parameter settings so that those settings can be transferred to another drive

NOTE: For J1000 SI-232/J is necessary

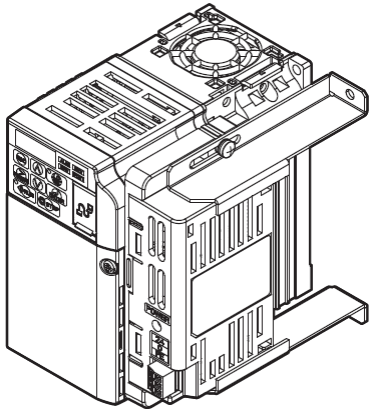
Technical Training – Options

24V Power Supply (PS-V10M/PS-V10S) (200V/400V)

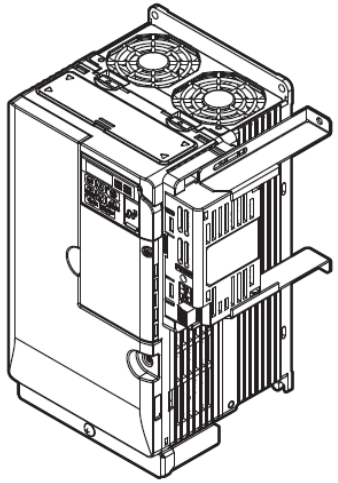
The 24 V Power Supply Option maintains drive control circuit power in the event of a main power outage.

➔: The control circuit keeps the network communications and I/O data operational in the event of a power outage.

Item	Specifications
Option Input Operating Voltage	24 Vdc ± 20% (19.2 to 28.8 V)
Option 24 V Input Current	0.41 A
Consumption Power	10 W
Output Power	8 W
Output Ride-thru time (when power is off)	Over 50 ms
Ambient Temperature	-10 to 50°C
Storage Temperature	-20 to 60°C
Maximum Possible Drive Connections	10
Weight	0.1 kg
Complied Standard	UL, CE



Drive with PS-V10S



Drive with PS-V10M

YASKAWA

24V Power Supply (PS-A10H/PS-A10L) (200V/400V)

J V A

Item	Specifications
Option Input Operating Voltage	24 Vdc ± 20% (19.2 to 28.8 V)
Option 24 V Input Current	1.9 A
Consumption Power	38 W
Output Voltage	PS-A10L: 140 V PS-A10H: 280 V
Output Power	30 W
Output Ride-Thru time (when power is off)	Over 50 ms
Ambient Temperature	–10 to 50 °C
Storage Temperature	–20 to 60 °C
Maximum Possible Drive Connections	3
Weight	0.2 kg
Compliance	UL, CE

Technical Training – Options

Special Application Software

Yaskawa releases special software regularly. Currently following software are available:

Crane Application Software
(Product release June 2011)

1000Hz Software for IM and with simple PM motor control
(Product release June 2011)

1000Hz software for IM
(Product release June 2011)

Under Development:

1000Hz software with automatic switching from
Closed Loop Vector (low speed) ➔ V/f

Positioning software (Posicontrol replacement)

Outlook: Electronic Line Shaft, Winder

Technical Training – Options

Connecting Peripheral Devices

Input Filter

Output Filter

- EMC Filter
- AC Input Reactor (Lift)
- DC Reactor
- Braking Resistor
- Braking Unit (Transistor)
- dv/dt Filter
- Sinusfilter

EMC Filter and AC Input Reactor (for Lifts) are necessary. All other peripheral devices are depending on the application.

EMC Filter

	J1000	V1000	A1000
FS series	▪ EN61800-3: Class 1 (20 m) ▪ Functional Safety: No ▪ Footprint mounting	▪ EN61800-3: Class 1 (20 m) ▪ Functional Safety: Yes ▪ Footprint mounting	▪ EN61800-3: Class 2 (10 m) ▪ Functional Safety: Yes
FB series			▪ EN61800-3: Class 1 (25 m) Class 2 (50 m) ▪ Functional Safety: No ▪ Footprint or Stand-alone Filter

EMC Filter

Footprint mounting

Stand-alone Filter

Footprint Filters can alternatively be mounted on the side. They have fixed cables.
Stand-alone Filters for CIMR-AC4A0044 and bigger do have a terminal block.

Technical Training – Options

AC Input Reactor
(mandatory for lift application)

J V A

For lift applications: V1000 -> L1000V
A1000 -> L1000A

- **EN12015 (keep harmonic limits)**
- **From LC4A0009 up to LC4A0112 (L1000A) and from LC4V0009 up to LC4V0031 (L1000V) available**
- **About 10% voltage drop**
- **Suppresses harmonic current**
- **Improves the power factor on the supply side**
- **Improves handling of transients and surges from mains**

- **For industrial applications, 3-phase, 2% and 4% input reactors are available.**

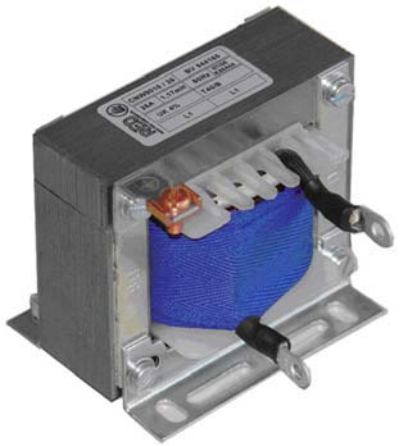
Technical Training – Options

DC Link Reactor

External option [1] for
J1000, V1000 and A1000 < CIMR-AC2A0110, CIMR-AC4A0058

➔: Built-in for
A1000 ≥ CIMR-AC2A0110, CIMR-AC4A0058

- **Suppresses harmonic current**
- **Improves the power factor on the supply side**
- **Less voltage drop than with line reactor**



1) **On request only.**
Please note that external wiring increases radiated noise. Keep wires short and use shielded cables!

Technical Training – Options

YASKAWA

Braking Capability

J V A

	J1000	V1000	A1000
Brake transistor	▪ Built-in		▪ Built-in ≤ AC2A0138 (ND), ≤ AC4A0072 (ND)
Optional ext. brake resistor	3% ED : to JA2A0020 ERF-150WJ□□□ 150 W, 62 Ω ~ 500 Ω 1)	3% ED : to VA2A0018 ERF-150WJ□□□ 150 W, 62 Ω ~ 500 Ω 1)	3% ED : to AA2A0021 ERF-150WJ□□□ 150 W, 62 Ω ~ 500 Ω 1)
	10% ED : 70W up to 520W RH□□□□W□□□-10	10% ED : all 100W up to 9600W RH□□□□W□□□-10	10% ED : all 100W up to 48000W RH□□□□W□□□-10
		40% ED : 100W up to 9600W RH□□□□W□□□	40% ED : 100W up to 9600W RH□□□□W□□□

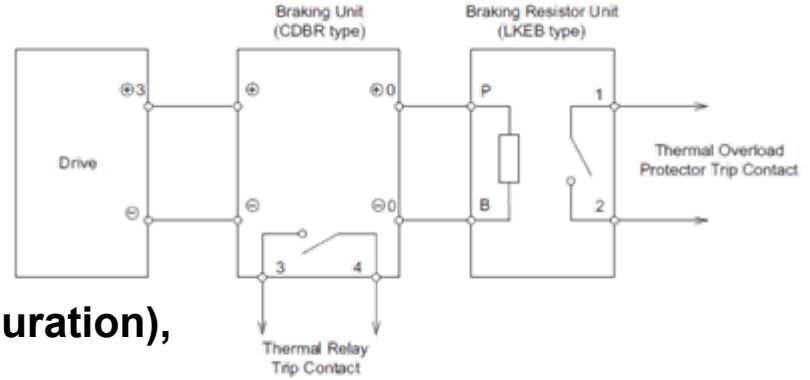
1) Appropriate value of resistance is determined by the rating of the inverter. Do not connect a brake resistor that has a resistance below the minimum resistance specified for the inverter!

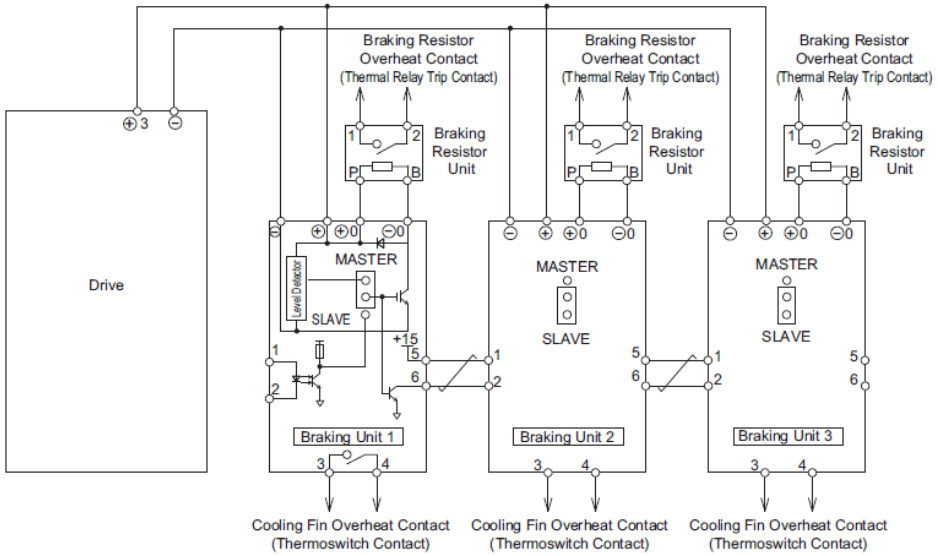
2) Please attach the filter all table

Braking Capability

Optional ext. CDBR unit [1)]

- Can be used with all inverters, even though it is designed for use with inverters that do not have a built-in Brake Transistor
- Multiple CDBR supported (Master/slave configuration), each CDBR requires a separate Brake resistor





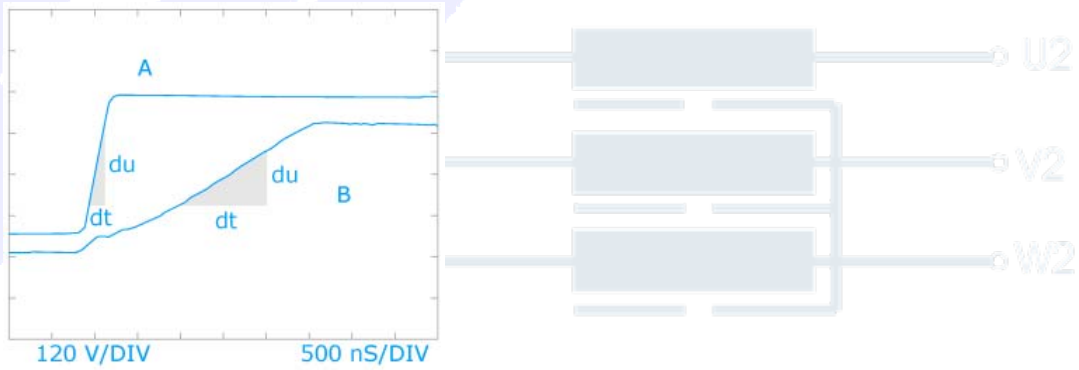
1) CDBR unit can also be used in conjunction with a common DC-Link for multiple inverters.

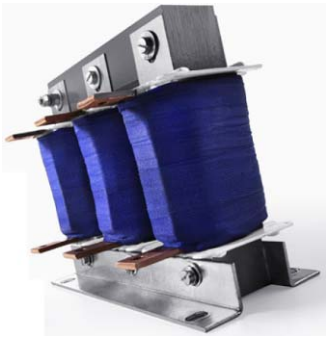
Technical Training – Options

Output Filter (if necessary)

dv/dt and sinusoidal filter available on request
Available in IP00 and IP20

- **dv/dt Filter: reduce dv/dt on motor cable**





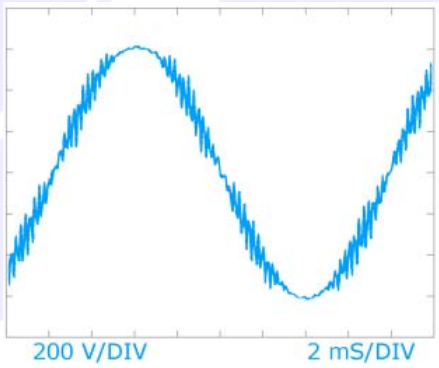
➔ **longer motor cable**
➔ **reduction of voltage stress of the motor winding**
➔ **reduction of motor bearing current**

Output Filter (if necessary)

J V A

dv/dt and sinusoidal filter available on request
Available in IP00 and IP20

- **Sinusoidal filter: sine wave creation of the output voltage**

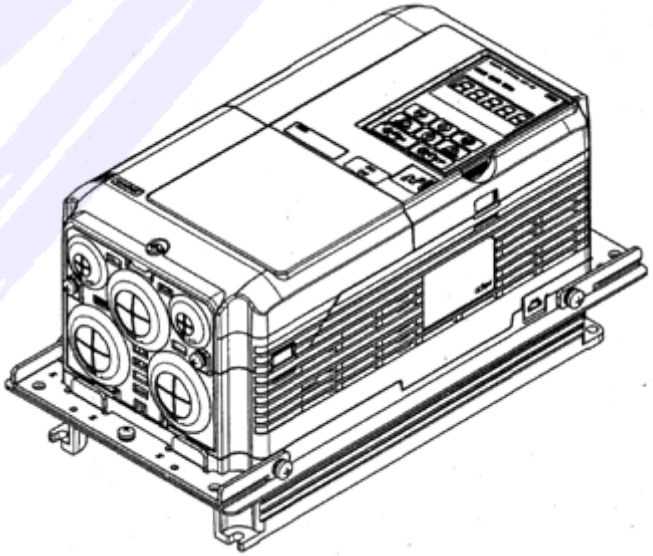
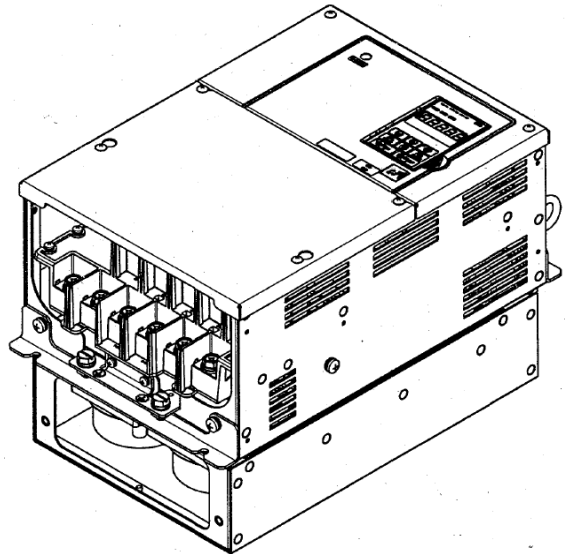


- ➔ **additional benefits to dv/dt Filter**
- ➔ **multimotor drive: several motors with one drive**
- ➔ **noise reduction**
- ➔ **no screened cable necessary**

Technical Training – Options

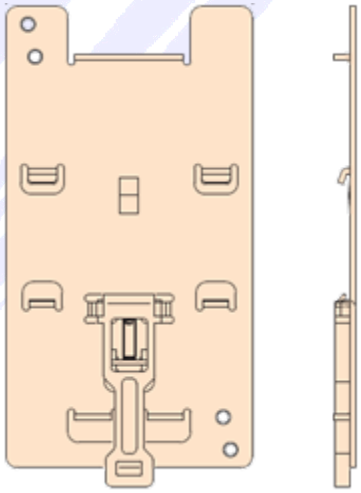
Heatsink External Mounting Attachment

J1000/V1000: optional for complete power range

	Optional	**Standard from CIMR-A☐2A0110 and CIMR-A☐4A0058**
A1000:		

DIN Rail Attachment

		Optional
J1000	Single/Three-Phase 200 V	CIMR-J☐2A0001 to CIMR-J☐2A0020 CIMR-J☐BA0001 to CIMR-J☐BA0010
	Three-Phase 400 V	CIMR-J☐4A0001 to CIMR-J☐4A0011
V1000	Single/Three-Phase 200 V	CIMR-V☐2A0001 to CIMR-V☐2A0020 CIMR-V☐BA0001 to CIMR-J☐BA0018
	Three-Phase 400 V	CIMR-V☐4A0001 to CIMR-V☐4A0011



NEMA Type 1 Kit

		Standard	Optional
J1000	Single/Three-Phase 200 V		CIMR-JCBA0001 to CIMR-JCBA0010 CIMR-JC2A0001 to CIMR-JC2A0020
	Three-Phase 400 V		CIMR-JC4A0001 to CIMR-JC4A0011
V1000	Single/Three-Phase 200 V		CIMR-VCBA0001 to CIMR-VCBA0018 CIMR-VC2A0001 to CIMR-VC2A0069
	Three-Phase 400 V		CIMR-VC4A0001 to CIMR-VC4A0038
A1000	Single/Three-Phase 200 V	CIMR-AC2A0004 to CIMR-AC2A0081	CIMR-AC2A0110 to CIMR-AC2A0360
	Three-Phase 400 V	CIMR-AC4A0002 to CIMR-AC4A0044	CIMR-AC4A0058 to CIMR-AC4A0362

Peripheral Devices

Mechanical Options overview

	J1000	V1000	A1000
Heatsink External Mounting Attachment	Yes		
DIN Rail Attachment	Yes		No
NEMA Type 1 Kit	Yes		
Installation Support for Remote Operator			
Set A	Mounting with screws through holes in the panel		
Set B	Mounting with threaded studs that have to be fixed inside the panel		
IP65 Frame for Digital Operator	Released in June 2010		

Technical Training – Options