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*We reserve the right to change the information in this manual without prior notice.

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Thankyou for choosing Delta's high performance hybrid servo drive VFD VJ Series dedicated to plastic injection molding machine. The VFD VJ series products are made of high quality components and materials that incorporate the latest microcontroller technology.

This manual is to be used for the installation, parameter setting troubleshooting and daily maintenance of the hybrid servo drive. To guarantee safe operation of the equipment, read the following safety guidelines before connecting power to the hybrid servo drive. Keep this operating manual at hand and distribute to all users for reference.

To ensure the safety of operators and equipment, only qualified personnel familiar with hybrid servo drive are to do installation, start up and maintenance. Always read this manual throughly before using VFD VJ series Hybrid Servo Drive, especially the WARNING, DANGER and CAUDION notes. Failure to comply may result in personal injury and equipment damage. If you have any questions, please contact your dealer

Firmware version V1.02

PLEASE READ PRIOR TO INSTALLATION FOR SAFETY



AC input powermust be disconnected before any wining to the hybrid servo drive is made.

Even if the power has been turned off, a charge may remain in the DC link capacitors with hazardous voltages before the POWER LED is OFE Donot touch the internal circuit and components. For safe maintenance, use a multimeter to measure the voltage across the +1 and - terminals. The measured value should be lower than $25V_{DC}$ for the system to operate normally. There are highly sensitive MOS components on the printed circuit boards. These components are especially sensitive to static electricity. Do not touch these components or the circuit boards before taking anti-static measures. Never reassenble internal components or witing.

Ground the hybrid servo drive using the ground terminal. The grounding method must comply with the laws of the region where the AC motor drive is to be installed

This series of products is used to control the three phase induction notors and permanent magnet synchronous motors. It cannot be used for single phase motors or for other purposes.

This series of products cannot be used on occasions that may endanger personal safety

Please prevent children or unauthorized personnel from approaching the hybrid servo drive.



Neverconnect the output terminals U/F1, V/I2 and WI3 of the hybrid servo drive directly to the AC mains circuit power supply After finishing the wining of the AC motor drive, check if U/F1, V/I2, and WI3 are short-circuited to ground with a multimeter Do NOF power the drive if short circuits occur. Eliminate the short-circuits before the drive is powered

	DONOF use Hipot test for internal components. The semi-conductor used in hybrid servo drive easily damage by high voltage. Even if the 3 phase AC motor is stop a charge may remain in the main circuit terminals of the AC motor drive with hazardous voltages. Only qualified persons are allowed to install, where and maintain AC motor drives. When the hybrid servo drive uses an external terminal as its source of operation commands, the motor may start running immediately after the power is supplied In this case, it may be dangenous to any on site personnel.
CAUTION	 DONOF install the hybrid servo drive in a place subjected to high temperature, direct surlight, high humidity, excessive vibration conosive gases or liquids, or airborne dust correctable particles. Orly use hybrid servo drives with inspecification. Failure to comply may result in fire, explosion or electric shock. When the motor cable between hybrid servo drive and motor is too long the layer insulation of the motor may be damaged. Please add an AC output reactor to prevent damage to the motor. Refer to appendix A Reactor for details. The rated voltage for hybrid servo drive must be 240V (480V for 460V models) and the mains supply content capacity must be 5000 ARMS (10000 A RMS for the 40 hp (30 kW) models). Pay attention to the following when transporting and installing this package (including voorden caste, wood stave and carton box; 1. Fyou need to sterilize a devorant to voorden caste or carton box, do not use steamed some sterilization cryourvill damage the product inside. 2. Use other ways to sterilize or devorant. 3. You may use high temperatures to sterilize or devorant Leave the packaging materials in an environment of over 56°C for 30 minutes. 4. It is strictly for bidden to use steamed some /li>

NOTE

For a detailed explanation of the product specifications, the cover or the safety shields will be disassembled on some pictures or graphics. When the product is put to operation, please install the top cover and safety shield and ensure connect wing. Refer to the manual to ensure safe operation

The figures in this manual are for reference only, they may be slightly different from your actual drive, but it will not affect your customer rights.

The content of this manual may be revised without prior notice. Please consult our distributors or download the latest version at

http://www.deltawwcomfadownload_acmotordrive

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1. Description of Hybrid Servo Drives

1 Receiving and Inspection
 1 Product Specifications
 1 Overview of Hybrid Servo Systems
 1 4 Product Installation
 1 5 Product Dimensions

The hybrid servo drive should be kept in the shipping carton or crate before installation. To retain the waranty coverage, the hybrid servo drive should be stored properly if not used in a short time. Storage conditions are:



Store in a vell-ventilated, clean and dry location
Store in place with ambient temperature range of -20° C to $+60^\circ$ C.
Store in place with a relative humidity range of 0% to 90% and non-condensing
environment
Avoid storing the product in an environment containing conosive gases and liquids.
Place the product on an appropriate stand and DO NOT place it on the ground
directly Put exsiccator in the package if in a critical environment.
Instaling in location fiee firm direct surlight and vibration
DONOT store in an area with rapid charges in temperature even though the
humidity is within large. It may still cause condensation and first
If the hybrid servo drive is unopened and stored for more than these months, the
ambient temperature should not be above 30°C. Temperature above 30°C may affect
the quality of electrolytic capacitors especially when they stored without power
supply lit is always not recommended to store the product without supplying power
formae than are year
If the hybrid servo drive was installed but not used for a certain period of time,
especially in building sites createenely hunid and dusty places, it is always
recommended to remove the hybrid servo drive to an environment that meets the
above mentioned requirements.

1-1 Receiving and Inspection

This VFD VJ hybrid served ive has gone through tough tests at the factory before shipping under quality control and strengthened the packaging method to secure it. Upon receiving the hybrid serve drive, please check the following items immediately:

Inspect the drive to assure it was not damaged during shipping

Make sure the model name on the nameplate conesponds to that of your registered information in the shipping carton

If the registered information does not match your purchase order, or if there is any problem in the product, please

contact the dealer or distributor

Air Cooled:

Nameplate:

Take the 30kW, 40HP, 230V_{AC} 3 Phase model as an example.



Model Name



Serial Number:



Oil Cooled

Nameplate: Take the 37430, 50HP, 460V_{AC} 3 Phase model as an example. #@araii]



Model Name



Serial Number:



1-2 Product Specifications

Air Cooled VFD VJ-C 230 series

Frame Size		E4			
Model VFDVL23_J		300C	370C		
Pover(KW)		30	37		
	Huse Pover(HP)	40	50		
	Rated Output Cunent(A)	120	146		
	Continuus Output Cunent for 60 sec (A)	204	248		
Output	Continuus Output Cunent for 20 sec (A)	240	292		
	CanierFrequency (Hz)	4 k~ 1	lCka gustabl e		
	Raied Input Cuneni(A)	120	146		
Pover	Rated Input Voltage(V)	Three Phase Power:	200V~240V, 50Hz/60Hz		
Supply	Mains Voltage Tolerance	- 15%~ + 10	D%(170V~264)		
	Mains Frequency Tolerance	± 5 %(%(47-63H)		
Weight (kg)			44		
Brake Units		Built In			

Air Cooled VFD VJ-C 460V series

Fiame Size		С			D		E4				
Model VFDVL43J		110C	150C	185C	220C	300C	370C	450C	550C	750C	
Power(KW)		11	15	185	22	30	37	45	55	બ	
Hase Pover(HP)			15	20	25	30	40	50	60	75	100
	Rate Cun	dOutput ient((A)	21	27	34	41	60	73	91	110	150
0+-+	Contin. Cunent f	nus Output àr60sec (A)	36	46	58	70	102	110	155	187	255
Сацая	Contin Cunent f	nus Output àr 20 sec (A)	42	54	68	82	120	124	182	220	300
	Canier	Frequency (Hz)	4k~ 10ka justab e								
	հեր	tCunent(A)	24	30	37	47	60	73	91	110	150
Derson	Rati Vol	ed Input tage(V)	Three Phase Power: 380V ~ 480V, 50Hz / 60Hz								
Supply	Main Tol	s Voltage erance	- 15%~ + 10% (323/~ 525%)								
	Mains Tol	Fiequency eiance	±5%(47~63±2)								
	Weight	(lg)	9 13 36 46					6			
Brake Units		Built-In									

	Frame Size	E5						
Model VFD VL43 JO		300C	370C	450C	550C	750C		
	Pover(KM)	30	37	45	55	75		
]	Horse Power (HP)	40	50	60	75	100		
put	Continuus Output Cunent for 60 sec (A)	102	124	155	187	255		
o	Continuus Output Cunert for 20 sec (A)	120	146	182	220	300		
A.	Rated Input Cunent(A)	60	73	91	110	150		
bhs	Rated Input Voltage(V)	3Phase 380~480V 50/60Hz						
OWEL	Mains Voltage Toleiance	-15~+10%(323~ 528))						
Mains Frequency Tolerance		±5%(47~63H)						
0	Canier Frequency*	414 tz~ 1014 tz adjustable						
]	MaximumBraking Current (A)	40	60	60	80	120		
MinimumResistance		19	127	127	95	63		
Weight (kg)		40	40	40	40	40		
Cooling Method		Oil Cooled Hydraulic Oil: HL:HLP DIN 51524Part1/2R68, R46 Oil Temperature: 10~50 °C						
Required cooling flow rate (L/Min)		16	16	16	16	32		

Oil Cooled VFD VJ-C 460V series

*When the canier fiequency is 4-5kHz, the nated cunent reaches 100% However, as the canier fiequency increases,

the rated current decreases. Therefore, the overload capacity decreases. Refer to parameter PiOI-33 for more

information

**To continuously improve our products, we reserve the rights to change features and specifications without further notice.

VFD VJ-C I 1. Description of Hybrid Servo Drives

General	Specifications		
C	antial Method	SVPWM	
S	ceed Detector	Resolver	
Speed	lConnendInput	DC 0-10V, support 3 point calibration of analog input	
Pressure Command Input		DC 0-10V, support 3 point calibration of analog input	
Pressu	e Feedback Inn t	Support voltage type: DC 0~ 10V and current type: 4~ 20nA	
		(Fordetailed instruction and settings, see PtOB 12 formore information)	
	nctionInputSignal	6chDC24V	
Multitu	rtionOutputSignal	2chDC429V 50m4(max), 1 chRelay cuput	
Analo	g Output Vollage	2 charnels 1 chDCO~ 10V and 1 chDC-10~ 10V, max load 2mA	
Con	municationPort	RJ45x2, USBx1	
Com	unicationProtocol	CANopen and Modbus (can be used at the same time)	
	SpeedFeedback	Built In	
	PG Caid		
8		D. St. La	
	Cord	BUIE IN	
	Bolo Dosistor	Doca incl	
l 8		Required (Connatible with moss up senser with a trut signal 0, 10V or 4, 20mi, 1 iso POB 10	
◄	Pressue Sensor	from sim man to tool are of messure feelback PiOR 11 forminism man to tool are of	
		nessue feethack PtB 12 froutout signal settings and Pt0008 from simmings us setting)	
	EMfilter	Optional (See amendix A 7 in the user manual)	
	MarProtection	Deal then transment an exercited and another that a clock with the words of an (or exercited	
		Near une emperatue no non gran poecion, electrono remaneay proecion(septors	
		KIY84 130/PIC/temperature protection switch)	
ction	Ourocument		
	Protection	Output over current protection and bake over current protection	
	Grundleakage		
	Current Protection	80% higher than drive's rated current	
	Voltage Protection	Over voltage level: V_{DC} > 415/830V; Low voltage Level: V_{DC} < 180/360V	
	Mains Input		
	Over voltage	Varistor(MOV)	
	Protection		
	Over		
	temperature	Minitoing the temperature of Capacitor, IGBT, Bialsing Chopper and Motor	
	Protection		
	Brake Resistor	Opencircuited lowresistorvalue	
	Protection		
	ProtectionLevel	NEVA I/IPAU 1000 / 4500 (1/0E 1100E) (Ulanda calimatic constants is see ad 45 0000 accurate	
	Terrenter	-10C ~ 40C (14F ~ 113F) (When the amount of the provide its and that 40-60C, you need to when a most by 29%)	
	Storgog	declease the fate of cuter Lity 5/a)	
L L	Termerature	-209C ~ 609C (-4°F ~ 140°F)	
5	Hmidity	Belaw90% RH(mm contensine)	
Ĕ	Vibration	Below20Hz 1.0G between 20 and 60Hz 0.6G	
	Cooling Method	Model names end with J: Fan Cooling: Model names end with JO. Oil Cooling	
	8	DONNE arrows the bridgen police to be description or the state of the state	
l H		LONOI espose de lightiservouive constrementa contacti, suchas cus, cuecc	
	T	surlight, conosive/inflammable gasses, humidity, liquid and vibration environment. The salt in the	
		armistie iess then UUing'on' every year:	
_	~		
	erulications		
1			

We have applied for UL certification and will pass the certification sometime in 2019

1-30verview of Hybrid Servo Systems



1-31 Selection of Hybrid Servo Drives and Motors

Due to the differences in the hydraulic system in practical applications, the following choice of drives and notors is provided as a reference. In the following example, a flow of 64L/min and maximum holding pressure of 175Bar are used

Pump Displacement per Revolution
 Based on the maximum flow of the system (L/min), the pump displacement per revolution
 (cc/res) can be calculated
 Example: If the maximum flow of the system is 64L/min and the highest rotation speed of
 the motor is 2000 pm the displacement per revolution would be 64/2000*1000
 = 32 cc/rev.

 Maximum Toque of the Motor
 Based on the maximum pessure (Mpa) and pump displacement per revolution (cc/res),
 the maximum pessure is 17.5 Mpa and pump displacement per
 revolution is 32 cc/rev, the maximum proved be 17.5*32*1.3' (2*p) = 116

3 Rated Torque and Rated Pover of the Motor

When holding pressure is under maximum pressure, the required torque cannot exceed 1.5 times of the motor's rated torque (depending on the data provided by the motor's manufacturer) at most or the motor would be overheated. Let us take the factor 1.5 as an example, if the rated torque of the motor is 77N m, the motor with a power of 1214W* and a rated speed of 1500 npm can be chosen.

*The power of the motor is calculated by using P(W) T(N m) (npm 2/60)

4 MaximumCunent of the Motor

Example: Checkthe parameter kt (Torque/A) in the motor's specifications fist. If kt = 337, the maximum cunent is approximately 116/337 = 34A at the maximum torque of 116N m

5 Selection of Matched Hybrid Servo Drive

Example: Lookup the heavy-duty capability for each hybrid servo drive in the product specifications.

If the holding pressure is under the maximum pressure of 17.5 Mpa by using with a pump of 32 cc/rev, the required motor current would be approximately 1883A.

Undersucha cunent value, overload may occur in different times due to different models.

Formedel VFD450VL43C-JQ, the overload may occur within 20 sec.

Formedel VFD550ML43C-JO, the overload may occur approximately after 60 sec.

NOTE

If there is no suitable motor that meets the specifications, a motor with a higher rated power can be used instead

For any infomation about the hybrid servo drives or any assistance in detailed configuration of your company's products, please contact the manufacturer

Before running the hybrid servo drive, verify if there's enough cooling oil in the oil circulation You need to preheat the cooling medium such as cooling oil to prevent any condensation caused by temperature differences.

Make sue that the cooling medium stay liquidzed to keep the heat dissipating system stays functional. So do follow the oil temperature limitation (10 \sim 50 °C), (50 °F \sim 122 °F) to prevent overheating on cooling oil.

Heat dissipating system The maximum varking pressure cannot go over 1.5 bar at the oil inlet. Do not exchange the positions of oil inlet and oil outlet. Verify the specification of connector's pape thread (1/2'PI) to prevent damaging the pipe thread. With pipe threads with teffon tape (thread seal tape).

Use wall mounting method and follow the space requirements during the installation of the hybrid servo system

1-32 Selection of Pump for Hybrid Servo Motor

Select a pump with a suitable displacement based on the required flow rate and motor speed. If low noise is required, you can choose the screw pump or internal gear type. If a high volumetric efficiency is required, you can choose the piston pump or dual displacement piston pump

Type of Oil	Volumetric	Elex D leation	Detation Smoot	Noise Low	
Punp	Efficiency	FlowFusaton	Nozicispeeu		
Internal Gear	Iau	Modern			
Punp	LOW				
PistenPunp	High	Low	Low	High	
SaewPunp	Međum	High	High	Medium	

Comparison of Commonly Used Pump (This may vary for different pump nanufactures).

1-4 Product Installation

Suggestion for Installing Oil Cooling Circulation System



Please install the hybrid servo drive under the following environmental conditions to ensure safe use

Environmental	Ambient temperature	- 10°C~ 45°C (14°F~ 113°F)
Caritianfar	Relative Humidity	<90% (nancardensing)
Operation	Pressure	8 6~ 1061 . Pa
	Installation Altitude	<1000m
	Vibration	<20Hz 980ms² (1G) max, 20-50H588ms²
		(OGG) mex
Environmental	Ambient temperature	-20C~ 60°C (-4°F ~ 140°F)
ConditionforStorage	Relative Humidity	<90% (nancardensing)
andTiansportation	Pressure	8 6~ 1061 P a
	Vibration	<20Hz 980ms² (1G) max, 20~ 50Hz 588ms²
		(OGG) mex
Contamination		C
ProtectionLevel	Tever & Athreade to	Description of the company

Space for Installation



V H HP mm(inch) mmGinch 7.520HP 75(3 175(7) 2575HP 75(3) 200(8) **50-100HP (all coaled)** 100(4) 100(4) 10**HP** 75(3) 250(10)

- 1) Mount the hybrid servo drive vertically on a solid surface object by scieves. Other directions are not allowed
- 2) Because the hybrid servo drive generates heat during operation, there should be enough space for cooling airflowas shown in the figure above. Leave enough normfor heat dissipation when installing Donot install the drive beneath equipment that is not heat resistant because the generated heat move upwards. If the drive can only be installed in a cabinet, its ambient temperature should be within regulated values. Installing the drive in a confined and insufficient cooling space would make it malfunctioned.
- 3) The temperature of heat sink in the drive varies with environmental temperature and its load capacity during its operation, reaching nearly the highest temperature of 90°C. Therefore, the material of the drive's backside should be able to be ar such a high temperature.
- 4) If mue than one drive are installed in one cabinet, it is recommended to install them horizontally and side by side to reduce heat generated from each other. If they can only be installed up and down, spacer plates should be put between them to decrease heat generated from lower side to upper side.
- 5) For information about air conditioning layout, please refer to the heat dissipation of hybrid servo drive (W) table below

NOTE

Prevent substances like fiber particles, scraps of paper, savdust, metal particles, and so on from entering the hybrid servo drive. The hybrid servo drive should be installed in the cabinet made from non combustible material such as metal to prevent from fire accident.



	Model	Heat Dissipation Rate (W)	AirFlow DissipationRate (CFM)
	VFD110VL43C-J	3836	50
	VFD150VL43C-J	404.1	50
	VFD185VL43C-J	5005	50
460V	VFD220ML43C-J	5809	50
Coded	VFD300ML43C-J	1037.8	133
	VFD370ML43C-J	10787	133
	VFD450VL43C-J	13701	209
	VFD550VL43C-J	15365	209
	VFD 300ML 43C-JO	1077.1	-
460V	VFD 370ML 43C-JO	1121.3	-
	VFD450ML43C-JO	14250	-
Cooled	VFD 550ML43C JO	1597.4	-
	VFD 750ML 43C-JO	2251.7	-

The table above shows the required heat dissipation when installing a single drive in a confined space.

When installing multiple drives, the required heat dissipation needs to be multiplied by the number of drives.

The values of heat dissipation are calculated by rated voltage, rated current and default carrier value.

Lifting

Canyorly the fully assembled hybrid servo drives as shown in the following diagrams. Lift the hybrid servo drive by hooking the lift holes when driving a forkilit or using a crane.



VFD VJ-C I 1. Description of Hybrid Servo Drives

Flange Mounting

Step 1:

Please take out the 16 screws (8 screws for each top and bottom side of the drive) and remove the fixed plate 1 and fixed plate 2 as shown in the following figures.



Step 2

Place the 8 scieves back in to secure the fixed plate 1 and fixed plate 2 (as shown in the following figures) with the following torque.

Frame C: 14 17kgf cm [122 148in bf]

Frame D: 2025kgf cm [17,421.7in bf]



PLC1.ir

Step 3

Note that it is not necessary to put back those 8 sciews shown in the following figures to the drive Mneover, make sure that these 2 different fixed plates are put in the conect side as shown in the figures.



1-5 Product Dimensions

Fiame C: VFD110MA3C-J, VFD150MA3C-J, VFD185MA3C-J, VFD220MA3C-J



Unit mm[inch]

Frame	N	W	H	H	D	S1
С	235	204	350	337	146	65
	[925]	[808]	[1378]	[13 <i>2</i> 7]	[575]	[026]

Frame D: VFD800M43C-J, VFD870M43C-J



					Unit n	m[inch]
Frame	V	W1	H	H	D	S1
D	2550	2260	4038	3840	1780	85
D	[1004]	890	[1590]	[1512]	[7.01]	033

Frame E4 VFD800M23C-J, VFD870M23C-J, VFD450M43C-J, VFD650M43C-J, VFD750M43C-J



								Unit	m	inch
Frame	Ν	W	H	H	H	D	D1 *	Dé	S1	S 2
E4	3300	2850	5650	5400	4920	2734	107.2	160	11.0	180
ĽÆ	[1299]	[11.22]	[22.24]	[2067]	[1937]	[1076]	[422]	[063]	[043]	[071]

Frame E5 (Oil Cooled):

VFD800M43C-JO, VFD870M43C-JO, VFD450M43C-JO, VFD560M43C-JO, VFD750M43C-JO



Unit mm[inch]

Frame	Ν	W	We	H	H	HŁ	HE	H	D	D1	Dź	S1	S 2
E5	3900	3688	3350	5630	5400	4440	2750	1060	2094	350	400	11.0	7.0
	[1535]	[1452]	[1319]	[22.17]	[21.26]	[17.48]	[1083]	[417]	824	[1.38]	[1.57	[043	028



21 Description of Wining

22Description of Terminals on Main Circuit

23 Description of Terminals on Control Circuit

After removing the front cover, check if the power and control terminals are clear. Be sure to observe the following precautions when wining

Make sure that power is only applied to the R/L1, S/L2, and T/L3 terminals. Failure to comply may result inclanage to the equipments. The voltage and current should lie within the range as indicated on the nameplate

All the units must be grounded directly to a common ground terminal to prevent lightning strike or electric shock

Please make sure to fasten the sciewof the main circuit terminals to prevent spaths which is made by the loose sciews due to vibration

DANGER	 It is curial totum off the hybrid served ive power before any wing installation are made. A charge may remain in the DC bus capacitors with hazardous voltages even if the power has been turned off therefore it is suggested for users to measure the remaining voltage before wing. For your personnel safety, please do not perform any wing before the voltage drops to a safe level < 25 Vbc. Wing installation with remaining voltage condition may cause spatks and short circuit. Only qualified personnel familiar with hybrid served ives is alloved to perform installation, wing and commissioning. Make sure the power is turned off before wing to varie short.
CAUTION	Make sue that power is only applied to the R/L1, S/L2, and T/L3 terminals. Failure to comply may result in damage to the equipment. The voltage and current should lie within the range as indicated on the nameplate. Checkfollowing items after finishing the wing 1. Are all connections conect? 2. No loose wires? 3. No short circuits between terminals or to ground?

21 Description of Wining

Users must correct wires according to the circuit diagrams on the following pages. Standard wiring diagram of the VFD VJ hybrid servo drive in factory

<u>Wining Diagram and Concesponding Models:</u> VFD300423C-J, VFD370423C-J VFD450443C-J, VFD550443C-J, VFD750443C-J VFD300443C-JO, VFD370443C-JO, VFD450443C-JO, VFD550443C-JO, VFD750443C-JO



<u>Wiring Diagram and Corresponding Models:</u> VFD110M43C-J, VFD150M43C-J, VFD185M43C-J, VFD220M43C-J, VFD30M43C-J, VFD370M43C-J



*1 Verify the polarity before using KTY84





*3 The peripheral braid sleeve needs to shield completely the internal signal line. Make the signal line which is not shielded by the braid sleeve as short as possible. Also bring signal line as close to the control terminals as possible. Connect the peripheral braid sleeve to PE grounding terminal. If the impulse noise or any other noise is too strong, connect the signal line to the ACM terminal can eliminate much more noise.

21-1 Grounding Short Circuit Plate Description (RFI Switch)

RFI switch

The drive contains Varistors / MOVs that are connected from phase to phase and from phase to ground to protect the drive against mains sugges or voltage spikes.

Because the Varistors/MOVs from phase to ground are connected to ground with the RFI switch, removing the RFI jumper disables the protection

The RFI switch also connects the filter capacitors to ground from a return path for high frequency noise to isolate the noise from contaminating the mains power: Removing the RFI switch strongly reduces this protection

Isolating main power from ground

When the pover distribution system of the drive is a floating ground system (IT Systems) or a TT system (Tene Tene en français, or earth earth in English), you must remove the RFI switch Removing the RFI switch disconnects the internal capacitors from ground to avoid damaging the internal circuits and to reduce the ground leakage current (in accordance with IEO61800 3 regulation). The RFI switch is shown in the images below



RFISvitchanthematardive



Removable RFI Switch

NOTE

Donotremove the RFI switch while the power is an

Efficient galvanic isolation is no longer guaranteed if removing the RFI switch Thenall the input and output terminals are low voltage terminals which have basic isolation Removing the RFI switch also reduces the compliance with the EMC specification

Donot remove the RFI switch while conducting high voltage tests. When conducting a high voltage test to the entire facility, you must disconnect the mains power and the motor if the leakage current is too high

Donot switch off the RFI switch when the main power is a grounded power system To prevent motor drive damage, the RFI switch shall be removed if the motor drive is installed on an ungrounded power system, a high resistance grounded (over 30 chms) power system, or a converge unded TN system Floating Ground System(IT Systems)

A floating gound system is also called IT system, ungrounded system, or high impedance/resistance (greater than 30) gounding system

Disconnect the ground cable from the internal EMC filter:

Insituations where EMC is required, check whether there is excess electromagnetic radiation affecting nearby low voltage circuits. In some situations, the adapter and cable naturally provide enough suppression IF in doubt, install an extra electrostatic shielded cable on the power supply side between the main circuit and the control terminals to increase security.

Asymmetric Ground System(Corner Grounded TN Systems)

Caution Donotherrowe the RFI switch while the input terminal of the hybrid servo drive carries power. In the following four situations, the RFI switch must be removed. This is to prevent the system from grounding through the RFI capacitor and damaging the hybrid servo drive.





VFDVJC | 2 Wining

Mdi-puppoperationMode



NOIE

- 1) VFD VJ-C series do not require external communication card EMVJ-MF01.
- 2) If you need to release the pressure by unning reversely at the slave pump, you don't need to install a one way value at slave pump's oil outlet.



CAUTION

The wining of main circuit and control circuit should be separated to prevent
encreous actions.
Please use shield wire for the control wiring and not to expose the peeled off net in
ficit of the terminal
Please use the shield wire or tube for the pover wiring and ground the two ends of
the shield wire artube.
Damaged insulation of wing may cause personal injury or damage to
cicuits/equipment if it comes in contact with high voltage.
The AC motor drive, motor and wining may cause interference. To prevent the
equipment damage, please take care of the encreous actions of the suncurring
sensors and the equipment.
When the hybrid servo drive output terminals U/171, V/12, and W13 are connected
to the mator terminals U/F1, V/F2, and WF3, respectively. To permanently reverse
the direction of motor iotation, switch over any of the two motor leads.
With long notor cables, high capacitive switching current peaks can cause
overament, highlealage amentarloveramentneadout accuracy. Forlanger
motorcables, use an AC output reactor:
VFD VJ series chesnit have built in brake resistors, but brake resistor can be
installed for those occasions that use higher load inertia or fiequent start/stop
Referto Appendix A-1 for details.
Make sure that the leads are connected connectly and the hybrid servo drive is
properly grounded to reduce mise and for safety
To prevent lighting studie and electric shock, use ground leads that comply with
local regulations. Keep themas short as possible and have themproperly
connected to the ground terminal on the hybrid servo drive.


22 Description of Terminals on Main Circuit

	DouonSumh		liens	Explanations
Т		—	Poversuply	Please follow the specific pover supply requirements shown in Chapter 01.
				There may be an inush current during
റ	٥٦	٥)	FISONER	powerup Please check the chart of
))	Fuse /		AppendixA 2 and select the conect
φ⁄	γ	O/ No Fuse		is optional
		DIGARCI		Please donctuse a Magnetic
			Magnetic	contactoras the I/Oswitch of the AC
—	<u> </u>		(Optional)	motordive, as it will reduce the
				operating lie cycle of the AC drive
L	Ĺ	Ĺ		used to improve the input power racio;
g	a	InputAC		notection from AC line distubances
7	5			(suges, switching spilles, short
			InstACTine	interruptions, etc.). AC line reactor
$(\square$		Zero phase	Reactor	should be installed when the power
		Reactor	(Opticnal)	suply capacity is 500kVA or mile and
				orthe mains wing distance 10m
				We suggest to install the input reactor
	EM Filter			closed to the hybrid motor drive. See
		<i>i</i> .		AppendixA formare details.
	<u>k</u>			Zerophase reactors are used to
R/L1	S/12		Zerophase	a door input is installed near the
			Reactor	inverter Effective formise reduction
		BI O	(Femile Care	onboth the input and output sides.
			Challe	Attenuation quality is good for a wide
		Be	(Optional)	range from AMband to 10MHz
		ð		AppendixA specifies the zero phase
U/T1	V/I2	WI3 ÷		Tored re electron poretic
	Q	¥	EM filter	interference, please refer to Appendix
		7em mase	(Optional)	Aformore details.
(\mathbf{U})		Reactor		Used to reduce the deceleration time of
\mathbf{r}			Brake Resistor	the motor Please refer to the chart in
ਕ੍ਰੇ	a	Output AC		Appendix And specific date Resistors.
7	7	June Reactor	04-44019	Motorsuge voltage amplitude
\sim	\sim		Reactor	depends annotor cable length For
	Motor V	•		applications with long notor cable
			·	(>20m), it is necessary to install a

Motor

Terminal Identification	Description
RL1, S/L2, T/L3	AC line input terminals 3 phase
U/ F1, V/I2, WI 3	Output terminals of the hybrid servo drive that are connected to the motor
+ 1 , + 2/B1	Terminals to connect to DC reactor to improve the powerfactor Remove the RFL switch before connecting a DC reactor to a hybrid servo drive. (DC reactor is built informadels 45KW)
+2/b1, B2	Terminals to connect to brake resistor (optional, see AppendixA-1 formule information)
	Grounding Terminal, please comply with local regulations.



Poversupply input terminals for the main circuit:

Donot correct 3 phase model to one phase power RL1, S/L2 and T/L3 has no phase sequence requirement, it can be used upon random selection It is recommend adding a magnetic contactor (MC) to the power input wining to cut off pover quickly and reduce malfunction when activating the protection function of the AC motor drive. Bothends of the MC should have an R-C surge absorber Fastenthe scieves in the main circuit terminal to prevent sparks condition made by the loose scieves due to vibration Please use voltage and cunent within the specification Please refer to Chapter 1 for the specifications. When using a general GFCI (Ground Fault Circuit Interrupter), select a current sensorvith sensitivity of 200mA or above and not less than 01-second operation time to avoid nuisance tripping Please use the shield vice on the for the pover wining and ground the two ends of the shield wire or tube. Output terminals for the main circuit:

When it needs to install the filter at the output side of terminals U/F1, V/T2, WT3 on the hybrid servo drive. Please use inductance filter Donot use phase compensation capacitors or L-C (Inductance Capacitance) or R-C (Resistance Capacitance), unless approved by Delta DONOT correct phase compensation capacitors or surge absorbers at the output terminals of hybrid servo drives.

The terminals of the DC reactor [1, 2],

This is the terminals used to connect the DC reactor to improve the power factor For the factory setting, it connects the short-circuit object. Please remove this short-circuit object before connecting to the DC reactor.



For those models without built in bala resistor, please connect external bala unit and bala resistor (both of them are optional) to increase bala to que DONOF connect [B2] or [-] to [+2/B1] directly to prevent drive damage.

Specifications of the Main Circuit Terminals

VJ-C Air Cooled

Frame C



	Main Circuit Terminals: R/L1, S/L2, T/L3, U/T1, V/T2, WT3, DC+, DC-, B1, B2					Grounding Terminek E			
Madels	Max Wine Gauge	Mni Wie Gauge	ScrewSize and Taque Face (± 10%)	Max Wite Gauge	Mini Wite Gauge	ScrewSize and Tarque Force (± 10%)			
VFD110ML43C-J		10nn ŕ (8AWG)		10nmf (8AWG)	10mf (8AWG)				
VFD150VL43C-J	16nnf	10mf (8AWG)	Мб	10mf (8AWG)	10mf (8AWG)	МБ			
VFD185VL43C-J	(6AWG)	16nnf (6AWG)	30kg cm (260 b ir) (294 Nm)	16mf (6AWG)	16nm f (6AWG)	30kg cm (260b in) (294Nm)			
VFD220ML43C-J		16nn î (6AWG)		16nm ř (6AWG)	16nmf (6AWG)				

- 1. If you install at Ta 45°C environment, select copper wire with voltage rating of 600V and temperature resistance of 75°C or 90°C
- 2 Fyouinstall at Ta 45°C above environment, select copper vice with voltage rating of 600V and temperature resistance of 90°C or above.
- 3 For VFD220M43C-J model, if you install it at Ta 35°C above environment, select copper wire with voltage rating of 600V and temperature resistance of 90°C or above.
- 4 For UL installation compliance, use copper wites when installing The wite gauge is based on a temperature resistance of 75°C, in accordance with UL requirements and recommendations.
- 5 Donot reduce the wire gauge when using higher temperature wire

											U	n it m m
Frame Size	AWG	VENDOR	₽∕N	A (max)	B (max)	C (min)	D (max)	d2 (min)	E (min)	F (min)	W (max)	t (max)
C	8	KS.T	RNBS85	07 O	60	70	00	20	120	70	105	20
C	6	KS.T	RNBS145	200	O U	~ 0	au	az	130	~ U	123	30

The following additional terminals are required when wining The additional terminal dimension should comply with Figure 1 below

After cimping the wire to the ring lug (must be UL approved), UL and CSA approved R/C (YDPU2), and install heat shink tubing rated at a minimum of 600 V₄C insulation over the live part. Refer to Figure 2 below



VJ-C Air Cooled

Frame D



	1 RALI, SAL2, TA	Vhin Circuit Tem 13, U/T1, V/T2, V B2	rinals V13, DC+, DC-, B1,	Grounding Terminal		
Madels	Max Wite Gauge	Miri Wite Gauge	ScrewSize and Taque Force (± 10%)	Max Vine Gauge	Miri. Vine Gauge	ScrewSize and Taque Farce (± 10%)
VFD300ML43C-J	35mf (2440)	35nm² (2AWG)	MB	35nmf (2AWG)	16nmf (6AWG)	MB
VFD370ML43C-J		35nnf (2AWG)	50kg cm (434 bir) (49 Nm)	35nmf (2AWG)	16nm f (6AWG)	50kg cm (434 b in) (49 Nm)

1. If you install at Ta 45°C environment, select copper wire with voltage rating of 600V and temperature resistance of 75°C or 90°C

2 If you install at Ta 45°C above environment, select copper wire with voltage rating of 600V and temperature resistance of 90°C or above.

3 For UL installation compliance, use copper wires when installing The wire gauge is based on a temperature resistance of 75°C, in accordance with UL requirements and recommendations.

4 Donot reduce the wire gauge when using higher temperature wire

Unit mm

Frame Size	AWG	VENDOR	P /N	A (max)	B (max)	C (min)	D (max)	d2 (min)	E (min)	F (min)	W (næx)	t (max)
n	6	KS.T	RNBL146	m 0	100	05	14	69	100	05	105	20
D	2	KS.T	RNBS386	300	IOO	30	14	30	130	30	Cer	30

The following additional terminals are required when wining The additional terminal dimensionshould comply with Figure 1 below

After crimping the wire to the ring lug (must be UL approved), UL and CSA approved R/C (YDPU2), install heat shirk tubing rated at a minimum of 600 V_{AC} insulation over the live part Refer to Figure 2 below



VJ-C Air Cooled

Frame E4



	N RALI, SAL2, TAL3	Viein Circuit Term ; U/T1, V/I2, WI	nals: 3, DC+, DC-, B1, B2	G	Grounding Terminek			
Madels	Max Wine Gauge	Mri Wie Garge	ScrewSize and Taque Face (± 10%)	Max Wine Gauge	Mini Wite Gauge	ScrewSize and Torque Force (± 10%)		
VFD300ML23C-J		70mm f (20AWG)		70mf (20AWG)	35nmf (2AWG)			
VFD370M23C-J		120nn f (40AWG)	MB	120mm² (40AWG)	70nnf (20AWG)	M8 180kg cm (1562 b in)		
VFD450ML43C-J	120mř (40AWG)	50nn f (1/0AWG)	180kgcm (1562bir)	50nn f (1/0AWG)	25mm² (4AWG)			
VFD550ML43C-J		70nm f (2/0AWG)	- (1% dð Nm)	70mf (2/0AWG)	35nmf (2AWG)	(17,65 Nm)		
VFD750M43CJ		120mm² (4/0AWG)		120nm² (40AWG)	70nmf (2/0AWG)			

1. If you install at Ta 45°C environment, select copper wire with voltage rating of 600V and temperature resistance of 75°C or 90°C

2 If you install at Ta 45°C above environment, select copper wire with voltage rating of 600V and temperature resistance of 90°C or above.

3 For UL installation compliance, use copper wires when installing The wire gauge is based on a temperature resistance of 75°C, in accordance with UL requirements and recommendations.

4 Donot reduce the wire gauge when using higher temperature wire

Unit m	m											
Frame Size	AWG	Vendor	P/N	A (MAX)	B (MAX)	C (MIN)	D (MAX)	d2: (MIN)	E (MIN).	F (MIN)	W (MAX)	Т (МАХ)
	4	KS.T	RNB22-8									
	2	KS.T	RNB\$388									
	1/0	KS.T	RNB608									
E4	20	KS.T	RNB708	500	160	100	27.0	83	130	140	280	60
	30	KS.T	RNB808									
	40	KS.T	SQNB\$1008									

NOIE:

The following additional terminals are needed when wining The additional terminal dimensionshould comply with Figure 1 below

After cimping the wire to the ring lug (must be UL approved), UL and CSA approved R/C (YDPU2), install heat shirk tubing rated at a minimum of 600 V_{AC} insulation over the live part. Refer to Figure 2 below



VFDVJC | 2 Wining

VJ-C Oil Cooled

Frame E5



	M RALI, SAL2, T	ain Circuit Termin 1/13, U/ F1, V/ F2,	als: WI3, B1, B2	Granding Terminak 🕀			
Models	Max Wire Gauge	Mri Wie Gauge	ScrewSize and Taque Face (± 10%)	Max Wie Gauge	Mini Wite Gauge	ScrewSize and Taque Farce (± 10%)	
VFD300M43C-JO		35mm² [2AWG]		35mmf [2AWG]	16nmf [64WG]		
VFD370VL43C-JO		35mm ² [2AWG]	MB	35mmf [2AWG]	16nmf [64WG]	MB	
VFD450ML43C-JO	120m² [40AWG]	50m² [1/04WG]	180Kg cm [15624 in]	50mf [1/04WG]	25mm² [44WG]	180Kgcm [15624-in]	
VFD550VL43C-JO		70m² [204WG]	[17.65Nm]	70mř [2/04WG]	35mm² [2AWG]	[17.65Nm]	
VFD750VL43C-JO		120mm² [4/04WG]]	120mm² [4/04WG]	70m² [204WG]		

- 1. If you install at Ta 45°C environment, select copper vice with voltage rating of 600V and temperature resistance of 75°C or 90°C
- 2 If you install at Ta 45°C above environment, select copper vice with voltage rating of 600V and temperature resistance of 90°C or above.
- 3 For UL installation compliance, use copper wites when installing The wite gauge is based on a temperature resistance of 75°C, in accordance with UL requirements and recommendations.
- 4 Donot reduce the wire gauge when using higher temperature wire

Unit mm

FRAME-SIZE	AWG	VENDOR	P/N	A (MAX.)	B (MAX.)	C (MIN.)	D (MAX.)	d2 (MIN.)	E (MIN.)	F (MIN.)	W (MAX.)	t (MAX.)
	4	K.S.T	RNB22-8									
	2	K.S.T	RNBS38-8									
E 5	1/0	K.S.T	RNB60-8	50.0	16.0	10.0	27.0	8.3	13.0	14.0	28.0	6.0
	2/0	K.S.T	RNB70-8			10.0	27.0					
	3/0	K.S.T	RNB80-8									
	4/0	K.S.T	SQNBS100-8									

NOIE:

The following additional terminals are needed when wining The additional terminal dimension should comply with Figure 1 below

After comping the vice to the ring lug (must be UL approved), UL and CSA approved R/C (YDPU2), install heat shirk tubing rated at a minimum of 600 V_{AC} insulation over the live part Refer to Figure 2 below



Figure 1

Figure 2

23 Description of Terminals on Control Circuit

Description of SINK (NPN/SOURCE (PNP) Mode Selection Terminals





			Vi	ie Gauge		Taque (±10%)	
liens	Group	Conductor	Stripping length	Mini Wire Gauge	Max Wire Gauge		
		Solid				5lg cm	
	Α	Stranded	G mm	02mf [24AWG]	33mnf [12AWG]	[44]bin] [05Nn]]	
Control		Solid				5lg cm	
Teminals	B	Stranded	G mm	02mm² [24AWG]	33mnf [12AWG]	[44]bin] [05Nn]]	
		Solid				8 g m	
	С	Stranded	Gmm	05mmf [20AWG]	1.5mrf [16AWG]	[70]bin] [079Nm]	

Wining precautions

Forgroup A, B, C

- 1. Tighten the wining with a 35mm (wide) x06mm (thick) slotted screw driver
- 2 The ideal length of stripped vice at the correction side is 6-7mm
- 3 When wing bare wires, make sure they are perfectly an anged to go through the wiring holes.

Wining	Specificati c	ns of Contro	d Termina	Unit	m		
M	VENDOR	VENDOR	Α	В	D	W	A
		₽∕N	(MAX)	(MAX)	(MAX)	(MAX)	
26	KS.T	E0206					
24	KS.T	E0306	170	80	50	29	
16	KS.T	E1506	140	av	30	32	A <u> </u>
12	KS.T	E4009					

Teminal	Features	Factory Setting (NPN Mode)	Difference between VJ-Aand VJ-B
SON	RunStop	Teminal SON COM ON for Running OFF for Stop	
EMG	Extend encrique	External encrimput	
RES	Resetficmenor	Resetficmencr	
REV	TBA	TBA	New teminal
MB	Milli function input selection 3	Configued as no function in factory	
M4	Milti-function input selection 4	Wienits (N), the input volage is 240 _{DC} (Mex 30 Mc) and then input inpedance is 375k :	
M5	Millifunction input selection 5	when it is OFF, the tolerable leakage cunert is 10 ₄ A	
COM	Camungaurd (Sirk) far digital cantual signals	Cannangeund farm iti-function input terminals	
RA	Enorteminal 1 (RelayNO: a)	Resistive load 54(NO)/34(NC) 240VAC	
RB	Encrteminal 1 (RelayNC. b)	54(NO)/34(NC) 24NDC	
RC	Commend contact for multi-function output terminals (Relay)	Includive load 1.54(NO)/054(NC.) 240/AC 1.54(NO)/054(NC.) 241/DC	
MD1	Milii function output terminal 1 (photocoupler)	The hybrid servo drive sends various monitoring signals by means of open collector configuration Max: 48Vdc/50mA	
MDP	Multi-function output terminal 2 (photocoupler)	MD1 MD2 mD2 minternal circuit MCM T	
MCM	Commonground for Multi-function output terminal (photocoupler)	Max 450 10 mA	

			Difference
Temina	Easterns		between
	ICALIES		VJAand
			VJB
		Pressure feedback	Teminal
		Inpedance 200k Resolution 12 bits	PO
DC		Range: 0~10V cr4~20nA= 0~ meximum	
B	PS/PI/QI PS/PI/QI circuit	pressue feedback value (Pr0008). Use	
		SW100switchtoinput cunent, see P108 12 fa	
		mae information	
		Pressure Command	
		Inpedance 200k Resolution 12 bits	
P		Range: O~ 10V= O~ the maximum pressure	
	ACM internal circuit	commend value (Pi0007)	
	-	Flowrate command	
QI		Inpedance 200k Resolution 12 bits	
		Range: $0 \sim 10V = 0 \sim $ the maximum flow rate	
	Analog Voltage		
		Impedance 11.3k	
AUI	ATT S	Resolution 12 bits	
		Range: - 10~ + 10V _{DC}	
	- 10V		
	internal circuit		
		Powersupply for analog configuration + 10V _{DC}	
+10V	Powersupply for configuration	20mA	
~ ~ ~ ~	Poversuply teminal for the	Powersupply for the pressure sensor + 24 Voc	
+ 24	piessue sensor	100mA	
			Teminal
AFML		Inpedance 192k (voltage output)	AFM
		Output coment 20mAmers	
		Resolution 0~ 10V conesponding to the	
		Parsone accurates Rander O~ 10V	

Teminal	Features	Factory Setting (NPN Mode)	Difference between VJ-A and VJ-B
AFME	AFME TTT ACM	Inpedance: 338k (voltage output) Output cunent: 20mA max Resolution ±10V conesponding to the maximumfiequency Range - 10-10V	
ACM	Commingiound for analog control	Commungound terminal for analog control	
	signals	signals	
T+/T	Mater's themel materian territels	Survet KIV84 130 PIC130 framel saideb	New
			teminal
SG+, SC		See Communication Parameters in Ch04 for	New
SGND	Matus RS-485	mae information	teminal
			New
PE	procedive glounding terminal		teminal

* Specifications of analog control signal vine 18AWG (075mm²), with shielded twisted pair

Analog Input Terminals (PS, PI, QJ, AUI, ACM)

Analog input signals are easily affected by external noise. Use shielded wining and keep it as short as possible (<20n) with proper grounding. If the noise is inductive, connecting the shield to terminal ACM can bring improvement.

If the analog input signals (pessure sensor) are affected by noise from the hybrid servo drive, please connect a capacitor and femile core closed to the hybrid servo drive as indicated in the following diagrams. The magnetic permeability of the femile core should be over 5000 uto ensure an efficient noise isolation

Windeachwires 3 times or more around the core



Transistor Output Terminals (MDI, MD2, MCM)

Make sure to connect the digital outputs to the right polarity

When correcting a relay to the digital culputs correct a surge absorber across the coil and check the polarity

Inside the Hybrid Servo Drive

Frame C:



1: Mains input terminal

2 Output terminal to connect the motor

3 DC reactor terminal: Remove the RFI switch before you connect a DC reactor

4 Brake resistor terminal

VFDVJC | 2 Wining

Frame D.

1



- 1: Mains input terminal
- 2 Output terminal to correct the motor
- **3 DC reactor terminal: Remove the RFI switch before you connect a DC reactor**
- 4: Brake resistor terminal

Frame E:



1: Mains input terminal 2: Output terminal to connect the mtor 0: Dealer angister to resident

3 Bale resistor terminal

3 Machine Adjustment Procedure

31 Description of Control Parel 32 Machine Adjustment Procedure

CAUTION	Please we check if the wining is connect before start running the machine. Particularly, make sure that the output terminals of the hybrid servo drive, U/I1, V/I2, and WI3 must not be used as power input terminals. Make sure that the good ground terminal \oplus is grounded lit is not allowed to operate the switches with wet hands. Make sure that there is no short-circuit or ground short circuit conditions between the terminals or exposed live parts. The power switch can be turned on only with the cover installed
WARNING	If any fault occurs during the operation of the hybrid servo drive and the motor, stop the machine immediately, and refer to "Troubleshooting" to check the cause of the faulty condition. After the hybrid servo drive stop its output but the mein circuit power terminals L1/R, L2/S, and L3/T are not disconnected, if the operator touches the output terminals U/T1, V/12, and W13 of the hybrid servo drive, electric shock may occur.

31 Description of Control Parel

Appearance of Keypad Control Panel KPVJ-LE02



Status display
Display driv's current status

& LEDdisplay

Indicate frequency, voltage, current, user defined units and etc..

- & CANopenindicatorlight
- **UP key**

Set the parameter value and change the numeric data such as frequency.

E Left/Downkey Set the parameter value and change the numeric data. Press and hold the MODE key then you can use the Left key.

Description of Displayed Function litems

Displayed liem	Description
	The cunert fiequency set for the hybrid servo
	drive
	The frequency delivered by hybrid servo drive
	to the matar
	The user defined physical quantity (Parameter
	0004)
RUN FWD REV	Lædcunert
	Favendconnend
	Reverse commend
RUN FWD REV	Displays the selected parameter
RUN • FWD • REV • • • • • • • • • • • • • • • • • • •	Display the parameter value
RUN O FWD O REV O	Display the external fault

If the 'End' message (as shown in the left
figue) is displayed on the display area for
about one second, it means that data has been
accepted and automatically stored in the
internal memory
If the setting data is not accepted or its value
If the setting data is not accepted on its value exceeds the allowed range, this enormessage

Keypad Panel Operation Procedure



Note: In the parameter setting mode, press $[\] \$ **MODE** to return to the mode selecting.

Note:

- 1. To disable LEFT key: press UP/DOWN to adjust the number When finishing the adjustment, press ENIER.
- 2 To enable the LEFT key. Press and hold MODE for two second until last digit of the parameter starts to blink Nowpress UP, the value of the number increases. When the number reaches 9 press UP again, the number goes back to 0
- 3 By pressing DOWN, the blinking cutsor moves are digit to the left. Then press UP to increase the value of the number. Once reaching the desired number; press DOWN again to move the cutsor are digit to the left.
- 4. When finishing setting the parameters, the LEFT function is still enabled Press MODE for two seconds to disable LEFT function



B FrequencyCommentPage

Normal Mode 1(PiOI-O2: Maximum Frequency has two digits. Example: PiOI-O2 = 6000Hz)



Normal Mode 2 (PiOI-O2: MaximumFrequency has three digits. Example: PiOI-O2 = 5990Hz)



List of Characters Shown on the Seven segment Display of the Digital Keypad Panel

Num						~		~		
Numeric	U		~ ~	3	4	3	6		8	9
Seven segnen Display	Ū	;	đ	3	4	5	6]	8	9
EnglishLetter	Α	а	В	b	С	С	D	d	E	е
Seven segnen Display	8			6		C		ď	8	
EnglishLetter	F	f	G	g	Н	h	Ι	i	J	j
Seven segnen Display	F		Ū		H	\mathbf{H}		-	J	J
EnglishLetter	K	k	L	1	Μ	m	Ν	n	0	ο
Seven segnen Display	4							n		0
EnglishLetter	Р	р	Q	q	R	r	S	S	Т	t
Seven segnen Display	2			9		r	5			6
EnglishLetter	U	u	V	v	W	w	X	x	Y	у
Seven segmen Display	Ü	U		Ū					4	
EnglishLetter	Z	Z								
Seven segmen Display	-									

32 Machine Adjustment Procedure

Perform the following operation procedure by using the Digital Keypad (KPVJ LEO2)

Step 1. Enter the motor's parameters

Restore the factory default values by setting Parameter 0002=10

Reset parameter settings

Setting value of Pr0002 10 Reset parameter values

Please make sure if the command source has been restored to the factory default (operation by external terminals)

If the KPVJ-LEO2 is used, Parameter is OI-OI=O

Source of operation command

Setting value	0 Operation by using the digital keypad
of Pr:01-01	1: Operation by using the external terminals. The Stop button on the
	keypad is disabled
	2: Communication using RS-485. The Stop button on the keypad is
	disabled

Charge the display type from Frequency command (Hz) into Speed (rpm)

Display the speed (npm) defined by the user

seu gvale	0.0000
-CD. 0000	0-Secentin
arww	

Set Parameter 01-02

Motor's maximum operation frequency

Setting value of PrOI-02 5000-60000Hz

SetParameter 01-08

Motor's rated frequency

Setting value of PrOI-08

Set Parameters 01-05 & 01-06

Acceleration time setting

Setting value of Pr01-05

Deceleration time setting

Setting value of PrOI-06 0000 seconds

The settings for the induction and synchronous motors are different. Please configure these parameters according to the related adjustment method for the motor

VFDVJC | 3 Machine Adjustment Procedure

Induction motor

SetParameter 01-00= 0

Control mode	
Settingvalue	O VF
of Pr 01-00	1: Reserved
	2: Reserved
	3 FOC vector control + Encoder (FOCPG)
	4 Reserved
	5 FOCPM
	6 Reserved

SetParameter 01-26= 0

Encode type	
Settingvalue	O ABZ
of Pr:01-26	1: ABZ+HALL (only used for Delta's servo motors)
	2: ABZ+HAIL
	3 Resolver

Set Parameter 01-29

Number of pulses for each revolution of the encoder

Setting value of Pr 01-29

Set Parameter 01-08

The rated current of the induction motor

Setting value of Pr 01-08 0-65535Amps

Set Parameter 01-09

The rated power of the induction motor

Setting value of PrOI-09 000-655351&W

Set Parameter OI-10

The rated speed (rpn) of the induction motor

Setting value of PrOI-10

Set Parameter 01-11

Number of poles of the induction motor Setting value of Pr OI-11 2-20

Checkif the motor can be separated from the pump

- 1. Fit can be separated, set Parameter 01-07 as 1 and canyout a dynamic measurement
- 2 If it cannot be separated, open the safety valve, enter the no load cument of the induction motor OI-12 and set Parameter OI-07 as 2 Then can yout the static measurement

Notor Paran	neler Auto Tuning		
Setting value	e of O Nofunction		
Pr 01-07	1: Rolling test for induction motor (IM) (Rs, Rr, Im, Lx, no load current)		
	2 Static test for induction motor (IM)		
	3 Reserved		
	4: Automeasure the angle between magnetic pole and PG origin		
	5 Dynamic rolling test for synchronous permanent magnet (SPM)		
	motor		
	13 Dynamic rolling test for interior permanent magnet (IPM)		
	synchronous motor		

During the automatic measurement process of the induction motor, the digital keypad will show the message "turi? After the measurement is finished, the motor automatically shuts down, and the measurement values are stored into Parameters OI-13 to OI-16 IF the digital keypad shows "AUE", please check if the wining is connect and if the parameters are set connectly.

The machine will shut off the power and then supply the power again

SetParameter01-00= 3

Cartal made

Settingvalue	O VF
of Pr Ol-OO	1: Reserved
	2: Reserved
	3 FOC vector control + Encoder (FOCPG)
	4 Reserved
	5 FOCPM
	6 Reserved

Testrun

When the motor is in a no load state, the speed command is set to 10 pmfor lowspeed test run Make sure that the culput cunent value is close to the no load cunent. If no encroccus, gradually increase the value of speed command to the highest speed

Make sue that the pump's oil supply direction is the forward direction of the motor

VFDVJ-C | 3 Machine Adjustment Procedure

Synchronous motor

SetParameter 01-00= 5

Cantral mode

Setting value	O VF
of Pr:01-00	1: Reserved
	2: Reserved
	3 FOC vector control + Encoder (FOCPG)
	4: Reserved
	5 FOCPM
	6 Reserved

SetParameter Ol-26= 3

Encode type	
Setting value	O ABZ
of Pr 01-26	1: ABZ+HALL (only used for Delta's servo motors)
	2: ABZ+HALL
	3 Resolver

Set Parameter 01-29

Number of pulses for each revolution of the encoder

Sotting of the	
Semigware	1~2000
of PrO1-29	

Set Parameter OI-17

The rated current of the synchronous motor

Setting value of PrOI-17 0-65535 Amps

SetParameter 01-18

The rated power of the synchronous motor

Settingvalue

ofPr01-18 000-65535kW

Set Parameter 01-19

The rated speed (rpn) of the synchronous motor

Setting value of PrOI-19

Set Parameter 01-20

Number of poles of the synchronous motor

Settingvalue

of Pr 01-20 2-20

Set Parameter 01-21

The inertia of the synchronous motor's rotor

Setting value 00-65535*10⁴ kgnf

of Pr01-21

Checkif the motor can be separated from the pump

Fit can be separated, set the Parameter OI-07 as 5 and canyout the parameter measurement of the synchronous motor

Fit cannot be separated, open the safety valve, set the Parameter 01-07 as 5 and cany out the parameter measurement of the synchronous motor

Motor Parameter Auto Turing

Setting value	0 Nofunction
of Pr:01-07	1: Rolling test for induction motor (IM) (Rs, Rr; Lm, Lx, no load cunent)
	2: Static test for induction motor(IM)
	3 Reserved
	4 Automeasure the angle between magnetic pole and PG origin
	5 Dynamic rolling test for synchronous permanent-magnet (SPM)
	motor
	13 Dynamic rolling test for interior permanent magnet (IPM)
	synchronous motor

During the automatic measurement process of the synchronous motor, the digital keypad will show the message "tun". After the measurement is finished, the motor automatically shuts down, and the measurement values are stored into Parameters 01-22 to 01-25. If the digital keypad shows "AUE", please check if the wining is conect and if the parameters are set conectly.

Set the value of Parameter OI-07 as 4 and press [Run]. When the operation is complete, the PG offset angle of PM motor is written to Parameter OI-27

Motor Parameter Auto Tuning

Setting value	O Nofunction
of PrOI-07	1: Rolling test for induction motor(IM) (Rs, Rr, Lm, Lx, no load cunent)
	2: Static test for induction motor(IV)
	3 Reserved
	4: Automeasure the angle between magnetic pole and PG origin
	5 Dynamic rolling test for synchronous permanent magnet (SPM) motor
	13 Dynamic rolling test for interior permanent magnet (IPM) synchronous

The machine will shut off power and then supply power again

Testrun

When the motor is in a no load state, the speed command is set to 10 pmfor lowspeed test run Make sue that the culput cunent value is close to the zero cunent. If no encroccus, gradually increase the value of speed command to the highest speed

VFD VJ-C | 3 Machine Adjustment Procedure

Make sure that the pump's oil supply direction is the forward direction of the motor NOIE: When using SPM motor, set PrOI-07=5 to do rolling test for SPM motor When using IPM motor, set ProI-07=13 to do dynamic rolling test for IPM motor

Step 2 Estimation of Inertia

Set the speed command as 1000 rpm

Set Parameters 01-05 & 01-06= 03-05 seconds

Acceleration time setting

Setting value	000- 60000 seconds

Deceleration time setting

Sofficer of a	
semgware	000 mm
-CD-01 0C	

Set Parameter 01-31 = 2 and then press [Run]

Systemcontrol

Settingvalue	O Nofunction
of Pr:01-31	1: ASR automatic turing
	2 Estimation of inertia

Checkif the value of Parameter OI-32 is converged Fit is converged, stop the operation IF not, switch the rotation direction after the speed is stable.

The unity value of the system inertia

Settingvalue	
	1~66636 (256= 1 peruni)
apru-32	

After the operation stops, select Parameter OI-32 and press the [ENIER] button to complete the "write" operation

Set Parameter OI-31=1 and the estimation of the motor's inertia is complete.

Step 3 Connect the motor and the pump and then confirm the pressure feedback signal

Set Parameter 0004 = 11 and then supply voltage to PS

Selection of multi-function display

Setting value 11: display the signal value of the analog input terminal PS with 0-10V of Pr 0004 mapped to 0-100%

Parameter 00 08 = related pressure setting value of the pressure sensor at 10V Maximum pressure feedback value

Setting value 0-250 bar

of Pr0008

Set the speed command as 10 μ mand μ ess [RUN] to confirm if the pressure value through the pressure gauge > 0

If the pressure value 0 Gradually increase the rotation speed Confirm the operation direction of the pump Make sure that the direction value is in the close state

If the pressure value > 0

Make sure the multi-function display on the keypad panel shows the voltage indicating the same pressure as the pressure gauge

Example: If the pressure sensors indicates 250bar at 10%, when the pressure gauge shows 50 bar, the pressure sensor output voltage should be around 50/250* 10= 2%, and the voltage shown on the keypad panel should be 200(%)

Observe if there is all leakage.

Step 4 Confirm the pressure command and flow command

Parameter 00 09= 1 for pressure control mode

Pressure control mode

Setting value O Speed control

of Pr 0009 1: Pressure control

Parameter 0004 = 12 PI for input voltage

Selection of multi-function display

Setting value12: display the signal value of the analog input terminal PI with 0-10Vof Pr0004mapped to 0-100%

Parameter 0007 = related pressure value of the pressure command at 10V

Maximum pressure command

Setting value of Pr (1007 0-250 bar

Send the maximumpessue command though the controller and then check the mili-function display page to enter this value into Parameter 00 14 Send a half pressue command though the controller and then check the mili-function display page to enter this value into Parameter 00 15 Send the minimumpressue command through the controller and then check the mili-function display page to enter this value into Parameter 00 16

Example The O-10V of the PS input terminal map to the O-250Bar of the pressure sensor. If the maximum pressure on the controller of a machinery is 140Bar and conseponds to 10V, then Parameter 0007=140. Now set the pressure as 140Bar through the controller, the voltage value shown on the display is 56= 10x (140/250). Input this value to the Parameter 00 14. Then set the pressure as 70bar on the controller, and now the voltage value displayed on the keypad panel is about 2.8= 10x (70/250). Input this value to the Parameter 00 15. Then set the pressure as 0 bar on the controller, and the voltage value shown on the display is 00= 10x (0/250). Input this value in the Parameter 00 16.

SetParameter0004=25forQLinputvollage

VFD VJ-C | 3 Machine Adjustment Procedure

Selection of multi-function display

Setting value 25 display the signal value of the analog input terminal OI with 0-10V of Pr 0004 mapped to 0-100%

Send the 100% flow ate though the controller and then check the multi-function display page to enter this value into Parameter 00 17

Send the 50% flow rate through the controller and then check the multi-function display page to enter this value into Parameter 00 18

Send the 0% flow rate through the keyped panel and then check the milli-function display page to enter this value into 00 19

Step 5 Bleed the circuit and make sure if there is any plastic material in the barrel. The machine can start operation only when there are no plastic materials inside the barrel.

Parameter 0009= 1 for pressure control mode

Pressure control mode

Setting value 0 Speed control

of Pr: 0009 1: Pressue control

Set Parameters 01-05 & 01-06 = 0 second

Acceleration time setting

Setting value of Pr: 01-05

Deceleration time setting

Sattingent	
seurgware	000_6000secords

For low pressure and low speed conditions (within 30% of the rated values), use the "manual operation" through the controller for the operation of each cylinder During the operation, check the pipe connection for leaks or strange noise in the pump (Formule information, see Appendix E: Step by Step Enabling Oil Pump_

When the air is bleeding completely, if there is any pressure fluctuation during operation, please adjust the pressure control Parameter PL in accordance with the method described in the "Description of Parameters".

Step 6 Send operation command though the controller

Parameter 01-01=1

Source of operation command

Settingvalue	0 Operation by using the digital keypad
of Pr 01-01	1: Operation by using the external terminals. The Stop button on the
	keypad is disabled
	2: Communication using RS-485. The Stop button on the keyped is
	disabled

Step 7. Adjustment for injection/pressure holding

Heat up the banel to the required temperature and set the controller in manual control mode. Set the Ki values for the three stages PI to O(Parameters 0021, 0023, and 0025) and Kp values to small values (500)

Start the plastic injection operation The "Eaget value" is lowpressure (50 bar) and lowflow rate (30%)

Press the "injection" button on the operation panel for the injection operation or the machine will enter the pressure holding operation (depending on the position of the cylinder) In the pressure holding state without causing the vibration of the motor, increase the speed bandwidth to the maximum value 40Hz (Parameter 00 10).

In the pressure holding condition, if the pointer of the pressure gauge or the monitored pressure waveform has no fluctuation, it means that the pressure is stably fed back. It is allowed to increase the three Kip values.

When the pressure feedback becomes unstable, reduce the three Kp values by 20% (example the three Kp values are reduced from 1000 to 800). Adjust the three Ki values to eliminate the steady state encr so to speed up system response.

When the above steps are completed, increase the "target value" for the pressure command Observe if the pressure feedback is stable. If there is an abnormal condition, please solve it as follows:

Solve the pressure instability problem

Instability at high pressure

If the hybrid servo drive has an overload condition, please increase the power rating of the hybrid servo drive

Instability over the entire pressure range

- 1. Set Parameter 00 09 = O to switch to the speed control
- 2 If the hydraulic circuit is in the closed state, send a lowspeed command so as to allow a pressure feedback value of 40 50% of the value for pressure command (parameters 0007)
- 3 By using the monitoring software, observe if the pressure waveform has inegular fluctuations.

Pressue vaveformfluctuates It may be a ground interference problem If the motor or the three phase power supply is grounded, disconnect the ground wire. If the motor or three phase power supply has no ground wire, you can install a ground wire for anti-interference protection It may be a grounding problem of the shield mesh (as the red thick line shown below). If the shield mesh is properly grounded, the ground wire can be removed, if the shield mesh has no grounding wire, install a ground wire for anti-interference protection



4 If there is any abnormal condition that cannot be solved, please contact the manufacturer

Step 8 Adjustment of system transient response

Reduce the pressure rise time, increase Kp1 (Parameter 0020) and reduce the Ki1 time (Parameter 0021)

For pressure overshoot, increase the Kp3 time (Parameter 0024) and reduce the Ki3 time (Parameter 0025)

Confluence Machine Tuning Procedure

Wining according to Chapter 2

Cany out the automatic measurement of the motor's parameters according to Step 1 and Step 2 described above for the Master and Slave, respectively. Then perform the following procedure

Mastersetting

SetParameter0813=1

Confluence Master/Slave Selection

Setting value O Nofunction of Pr OB 13 1: Master 1 2: Slave/Master 2 3: Slave/Master 3

Set Parameter 08 14

Skwe's proportion of the Master's flow

Setting value of Pr 08 14

Parameter 08 17 can be configured to determine the activation level of the Slave

Slave's activation level

Setting value of Pr 03 17
Slave setting

Parameter 01-01=1

Source of operation command

Settingvalue	0 Operation by using the digital keypad
of Pr 01-01	1: Operation by using the external terminals. The Stop button on the
	keypad is disabled
	2 Comunication using RS-485 The Stop button on the keypad is
	disabled

SetParameter 01-01=2

Source of operation command

Settingvalue	0 Operation by using the digital keypad
of Pr 01-01	1: Operation by using the external terminals. The Stop button on the
	keypad is disabled
	2: Commicationusing RS-485: The Stop button on the keyped is
	disabled

SetParameter0B 15= 1

Sauce of Frequency Command

Setting value	0 Digital Operation Panel
of Pr 08 15	1: RS485Communication
	2-5 reserved
	6 CANopen

Shut down the power and then supply the power again

Set an arbitrary value of the frequency command at the Master to check if the Slave has the same value of the frequency command

Set 10pmat the Master and then press RUN to see if the Slave is also running. If not, check the wining or the parameter setting for any problem

Set Slave Parameter 03 13= 2

Confluence Master/Slave Selection

Setting value	0 Nofunction
of Pr 08 13	1: Master 1
	2 Skve/Master 2
	3 Slave/Master 3

Parameter 08 21 can be set at the Slave to decide if the Salve is performing the reversed operation for depressurization

Note: If it is required to reverse the operation for depressurization at the Slave, it is necessary to make sure that the pump outlet port is not installed with a check valve and Parameter 08 16 should be set as 500% Slave reverse operation for depressurization

Setting valueO Disableof PrO8 211: Enable

Limit for the Slave reverse depressurization torque

Setting value 0-500% of Pr 08 16

Shut off the power and the re-supply power for the Slave, and then set the Slave in the speed control mode

Speed Control Mode

Settingvalue	O Speed control
cfPr 0009	1: Pressure control

In this case, the Master can be tuned according to the Step 3- Step 8 described above

Confluence/Diversion Mode Adjustment Procedure

Wing according to Chapter 2
In a diversion condition, adjust various parameters of the hybrid servo drive according to the Step 1 – Step 8 describe above
In a confluence condition, please refer to the machine adjustment procedure for the confluence operation
Complete the above steps
Set the Misterfor pressure control mode

Parameter0009= 1 for pressure control mode

Pressure control mode

Setting value O Speed control

of Pr: 0009 1: Pressure control

Set the Slave for speed control mode

Parameter 00 09 = Offor speed control mode

Speed Cantral Mode

Settingvalue	O Speed control
cfPr:0009	1: Pressue control

Parameter 0300-0302= 45 confluence/diversion signal input

Mili function liqut

Setting values	
	O Nofunction
dPr.	
<u>ന്നനു</u>	43 Contente/Livestinsgna rput

Through the controller, perform the entire confluence/diversion operation Newprotection mechanism at version C: When Pr0B 00 ~ Pr0B 02 = 45, Pr0I-01 is automatically set as 2 and Pr0B 15 is automatically, set as 1. This is a mechanism to prevent forgetting to set up related parameters and mistales when setting up parameters.

4 Description of Parameters

41 Summary of Parameters

42DetailedDescriptionofParameters

41 Summary of Parameters

00 System Parameters

You can set this parameter during operation

Parameter	Explanation	Settings	Factory Setting	Æ	FOCPG	FOCHM
യയ	Hybrid servo drive model code ID	214 230, 40HP 215 230, 50HP 410 480, 15HP 411: 460, 20HP 412 480, 25HP 413 480, 30HP 414 480, 40HP 415 480, 50HP 416 480, 60HP 417 480, 75HP 418 480, 100HP	Read only			
0001	Display of rated current of the hybrid servo drive	Display the model specific values	Readonly			
0002	Reset parameter settings	0 Nofunction 1: Parameterlocked 5: Rest the kWhat drive stop 10: Reset CANopen Index	0			
ODOB	Software version	Readonly	Read only			

VFDVJC | 4 Description of Parameters

Parameter	Explanation	Settings	Factory Setting	VF	FOCPG	FOOPM
0004	Selection of multi-function display	 O Displaythe output cunert (A) 1: Reserved 2: Displaythe actual output frequency (H) 3: Displaythe output voltage (U) 4: Displaythe output power angle (r) 6: Displaythe output power angle (r) 7: Displaythe actual motor speed spin (r) 8: Displaythe estimated output troups N m(t) (%) 9: Displaythe estimated output troups N m(t) (%) 9: Displaythe signal value of the analog input terminal PO% (1.) 12: Displaythe signal value of the analog input terminal PD% (2) 13: Displaythe signal value of the analog input terminal AUI % (3) 14: Displaythe pressure of the heat sink in °C (t) 15: Displaytemperature of the heat sink in °C (t) 16: The status of digital output (ONOFF) (s) 17: The status of digital output (ONOFF) (c) 18: Reserved 19: The conseporting CPU pinstatus of the digital input (i) 20: The conseporting CPU pinstatus of the digital output (o) 21: -24: Reserved 25: Display the signal value of the analog input terminal QI% (5) 26: Display the motor temperature (cunerify only support KIY83) (T) 29: Overload rate of motor with last digit A of HES. (M) (unit %) 31: Display the motor temperature (cunerify only support KIY83) (T) 29: Overload rate of motor with last digit A of HES. (M) (unit %) 31: Display constant KI (K) 	Ο			
0005	Reserved		0			
0006	Display the speed (upm) defined by the user	0-3000 դ.m	2500			
0007	Maximum value of the pressure command	0-400Bar	140			
0008	Mæinumfeedback pæssue	0-400Bar	250			

Parameter	Explanation	Settings	Factory Setting	VF	DCPG	MADO
					H	H
0009	Pressure control mode	O Disable (Speed control) 1: Enable (Pressure control)	0			
CO 10	Speed bandwidth	0-40Hz	20			
CO 11	- Pressue feedback fillering time	0000-1.000secand	0000			
0012	Pressue command filtering time	0000-1.000secand	0000			
0013	Flowconmand filtering time	0000-1.000second	0000			
0014	Percentage for the pressure commend value (Max)	QQ-1000%	560			
00 15	Percentage for the pressure command value (Mid)	QQ-1000%	28 0			
00 16	Percentage for the pressure command value (Min)	QQ-10Q0%	00			
0017	Percentage for the flow commend value (Max)	00-1000%	1000			
0018	Percentage for the flow commend value (Mid)	QQ-10Q0%	500			
CO 19	Percentage for the flow commend value (Min)	QQ-1000%	00			
0020	Pgain1	00-10000	500			
0021	Iintegration time 1	000-50000secants	200			
0022	Pgain2	QQ-10000	500			
0023	lintegration time 2	000-50000secands	200			
0024	Pgain3	QQ-10000	500			
0025	Lintegration time 3	000-50000secards	200			
0026	Pressure stable zone	0-100%	25			
0027	Mrimmpessue	QQ-1000%	01			
0028	Depressurizationspeed	0-100%	25			
0029	Rampupiate of piessue commend	0-1000ns	0			
0030	Rampdowniate of piessure command	0-1000ns	100			

Parameter	Explanation	Settings	Factory Setting	VF	FOCPG	FOCPM
0031	Rampupiate of flow connend	0-1000ms	80			
0032	Rampdowniate of flow connerd	0-1000ns	80			
0033	Valve opening delay time	0-200ns	0			
0034	Reserved					
0035	Over pressure detection level	0-40 0B ar	230			
	Detection of	0: Nofinction				
0036	disconnection of pressure feedback	1: Enable (only for the pressure feedback output signal within 1~5V or 4~20mA)	0			
0037	Differential gain	00-1000%	00			
0038	Pressue/flowcontrol functionselection	 Bit O O Switch the PI Gain according to the pressure feedback level and use single speed bardwidth 1: Switch the PI Gain and speed bardwidth according to the milit function input terminal Bit 1: O No pressure/flow control switch 1: Switch between the pressure and flow control Bit 2: O Use the old pressure overshoot suppression 1: Use the new pressure overshoot suppression Bit 3: O Switch the PI Gain and single speed bardwidth according to the pressure feedback level 1: Switch the PI Gain and single speed bardwidth according to the pressure feedback level 1: Switch the PI Gain and speed bardwidth according to the pressure feedback level 1: Switch the PI Gain and speed bardwidth according to the pressure feedback level 	0			
0039	Integral time Pressure overshoot 1	Q00-50000sec.	020			
0040	Differential gain 2	QQ-1000%	00			
0041	Differential gain 3	QQ-1000%	00			
0042	Pressue overshoot level	0-100%	2			
0043	MeximumFlow	0-100%	100			
0044	Pressure Commend	00-4000bar	00			
0045	FlowRate Commend	00-1000%	00			
0046	Piessue reference S1 time	0- 1000ns	0			

VFDVJ-C | 4 Description of Parameters

Parameter	Explanation	Settings	Factory Setting	VF	FOCPG	FOCPM
0047	Piessue reference S2 time	0-1000ns	0			
0048	Flowneference S1 time	0-1000ns	0			
0049	Flowneference S2 time	0-1000ns	0			
0050	Speed bandwidth 2	0-4 11-2	20			
0051	Speed bandwidth3	0-40Hz	20			
0052	Overpressure Detecting Time	0000-1.000sec	001			
0053	Oil Shortage Detecting Time	00-600sec	00			
0054	Oil Pump Revense Running Detecting Time	00-600sec	00			
0055 ~ 0058	Reserved					
0059	MinimumFlow	000-10000%	500			
0060	Oil Shortage Detecting Time at Startup	0~10n i n	0			
0061	MinimumPressure 2	QQ~ 1000%	01			
0062	MinimumFlow2	000~ 10000%	500			
0063	Pressue Releasing Valve Opening Time Interval	0000~ 0 100 sec	0100			

OI Motor Parameters

You can set this parameter during operation

Parameter	Explanation	Settings	Factory Setting	VF	FOCPG	FOOPM
01-00	Control mode	O VF 1: Reserved 2: Reserved 3: FOCPGIM(InductionMotor) 4: Reserved 5: FOCPGPM(PermanentMotor) 6: Reserved 7: Reserved	5			
01-01	Source of operating command	 O Controlled by using the digital keypad 1: Controlled by using the external terminals. The STOP button on the keypad is disabled 2: Communication using RS-485. The STOP button on the keypad is disabled 3: Controlled by using CANopen 	0			
01-02	Motor's meximum operating fiequency	5000-59900HŁ	16667			
01-08	Motor's nated fiequency	000-59900Hz	11333			
01-04	Motor's rated voltage	230V Series: 0 1V~255.0V 480V Series: 0 1V~5100V	2200 4400			
01-05	Acceleration time setting	000-60000secants	000			
01-06	Deceleration time setting	000-60000secants	000			
O£ 07	Motor Parameter Auto Turing	O Nofunction 1: Dynamic test for induction motor(IM) (Rs, R; Im, Lx, no load current) 2: Static test for induction motor(IM) 3: Reserved 4: Automeasure the angle between magnetic pole and PG Orion	0			
		5 Dynamic test for SPM motor (Surface mounted permanent magnet synchronous motor) 13 Dynamic test for IPM motor (Interior permanent magnet synchronous motor)				
01-08	Rated cunent of the induction motor (A)	40-120% of the dive's rated current	###			

Parameter	Explanation	Settings	Factory Setting	VF	FOCPG	FOCPM
01-09	Rated power of the induction motor	0-6553514W	###			
01-10	Rated speed of the induction motor	0-655357pm 1710(60Hz 4 pole); 1410(50Hz 4 pole)	1710			
01-11	Number of poles of the induction motor	2-20	4			
01-12	No lead current of the induction motor (A)	0-Default value of Parameter 01-08	###			
01-13	Statornesistance (Rs) of the induction motor	0-65.535	0			
01-14	Rotoriesistance (Ri) of the induction notor	0-65.535	0			
01-15	Magnetizing inductance (Im) of the induction motor	00-65535nH	0			
01-16	Total leakage inductance (Lx) of the induction motor	00-65535mH	0			
01-17	Rated cunent of the synchronous motor	000-65535Amps	000			
01-18	Rated power of the synchronous motor	000-6553 5 8W	000			
01-19	Rated speed of the synchronous motor	0-655355pm	1700			
01-20	Number of poles of the synchronous motor	2-20	8			
01-21	Inertia of the synchronous motor's rotor	00-65535*10 ⁴ kgn²	00			
01-22	Stator's phase resistance (Rs) of the synchronous motor	0000-65.535	0000			
01-23	Stator's phase inductance (Ld) of the synchronous motor	000-65535nH	000			
01-24	Stator's phase inductance (Lq) of the synchronous motor	000-65535nH	000			
01-25	BackEMF of the synchronous motor	0-65535 V/ kpm	0			

Parameter	Explanation	Settings	Factory Setting	VF	FOCPG	FOCPM
01-26	Encodertype	3 Resolver	3			
01-27	PG Offset angle of synchronous motor	00-3300	00			
01-28	Numberofpoles of the resolver	1~5	1			
01-29	Encoderpulse	1~20000	1024			
01-30	Encoder's input type setting	 0 Nofinction 1: Phase Aleads in a forward uncommend and phase Bleads in a forward uncommend 2: Phase Bleads in a forward uncommend and phase Aleads in a forward uncommend 3: Phase Aleads in a forward phase B is a direction input (lowinput=forward direction) 4: Phase Alis a pulse input and phase B is a direction input (lowinput=forward direction) 5: Single phase input 0: No forming 	1			
01-31	Systemcontrol	O Notinction 1: ASR automatic turing 2: Estimation of inertia	1			
01-32	Unity value of the system irentia	1~65535 (256= 1 perunit)	260			
01-33	Canierfiequency	4-10KHz	5			
01-34	Reserved					
01-35	Motor ID#	0: NoFunction See 42Description of Parameter Settings formate information	0			
01-36	Change the running direction	O When the drive runs forward, the motor rotates counterclockwise. When the drive runs reversely, the motor rotates clockwise. 1: When the drive runs forward, the motor rotates clockwise. When the drive runs reversely, the motor rotates counterclockwise	0			
01-37	HES ID#	0 NoFunction See 4.2 Description of Parameter Settings formate information	0			
01-38	MaximumOutput Voltage	0~110%	100%			

O²**ProtectionParameters**

You can set this parameter during operation

Parameter	Explanation	Settings	Factory Setting	VF	FOCPG	FOOPM
œm	Software brake basel	230V series: 3500-4500Vnc	3800			
		460V series: 7000-9000Vnc	7600			
0201	Fault record 1	0 No encriecad	0			
0202	Fault record 2	1: Over cunent during acceleration (ocA)	0			
0208	Faultrecord 3	2 Overcunent duing deceleration (cod)	0			
0204	Faultrecord 4	3 Overcunent duing constant speed (con)	0			
0205	Faultrecord 5	4 Ground fault (GFF)	0			
0206	Faultrecord 6	5 ICBI shat circuit (ccc)	0			
		6 Overcunent at stop (ccS)				
		7: Over voltage during acceleration (ovA)				
		8 Over voltage during deceleration (ovd)				
		9 Over voltage during constant speed (ovn)				
		10 Over vollage at stop (ovS)				
		11: Lowvollage during acceleration (LvA)				
		12: Lowvoltage during deceleration (Lvd)				
		13 Lowvoltage during constant speed (Lwr)				
		14: Lowvoltage at stop (LxS)				
		15 Phase loss protection (orP)				
		16 IGBF over heat (cH1)				
		17: Heatsinkover heatfor 40HP and above (oH2)				
		18 THI open IGBT over heat protection circuit				
		encr(ff-llo)				
		19 TH2 open heatsink over heat protection				
		cicuitencr((i-Ro)				
		20 IGBT over heated and unusual fan function (oHF)				
		21: Hybridservodrive overload (ol.)				
		22 Motor over load (Ecl.1)				
		23 Reserved				
		24 Motoroverheat (oH3)				
		25 Reserved				
		20 Reserved				
		27. Reserved				
		28 Reserved				
		29 Reserved				
		30 Menaywile encr(cF1)				
		31: Mennyneadenor(cF2)				

VFDVJ-C | 4 Description of Parameters

Parameter	Explanation	Settines	Factory Setting	Ŀ	CPG	CPM
						Q
		32: Isumcunent detection enor (cdl)				
		33 U-phase current detection enor (cdl)				
		34: V phase current detection enor (cd2)				
		35 Wphase current detection encor (cd3)				
		38 Clampcunent detection encr (HHC)				
		37: Over cunent detection en cr (Hill)				
		38 Overvollage detection enor (HH2)				
		39 Grand curent detection en or (H13)				
		40 Autoturing encr (AuE)				
		41: Reserved				
		42: PG feedbackencr(PGF1)				
		43 PG feedbackloss (PGF2)				
		44: PG feedbackstall (PGF3)				
		45 PG slipencr(PGF4)				
		46 Reserved				
		47. Reserved				
		48 Reserved				
		49 External fault input (EF)				
		50 Em uge ncystop(EF1)				
		51: Reserved				
		52: Passwadena(Pood)				
		53 CPU ener(cood)				
		54 Commicationencr(worg commid)(Œ1)				
		55 Comunication enor (wrong data address)				
		(Æ2)				
		58 Comunicationenor (wrong data value) (cE3)				
		57. Comunicationenor (wrong data written				
		addess) (cE4)				
		58 RS-485 Commication time out (Œ10)				
		59 Reserved				
		60 Baking transistorence (bF)				
		61~63 Reserved				
		64 Reserved				
		65 PG card information encr (PGF5)				
		68 Overpressure (ovP)				
		67. Pressue feedback fault (PfbF)				
		68 Oil pump nans reversely (Prev)				

Parameter	Explanation	Settines	Factory Setting	VF	CPG	CPM
	k				0 H	P
		69: Oil shortage (noil)				
		70 Reserved				
		71: Overcunent at Bialang chopper (ocbs)				
		72: Biaking resistor is open circuit (bro)				
		73 Resistance of backing resistor is too small				
		(b)F)				
		74 Baking dropper overheated (of 14)				
		75 Encroccuned on Brake chopper's themal				
		protection line (tH4o)				
		76-81: Reserved				
		82: Output Phase Loss on Phase U (oPL1)				
		83 Output Phase Loss on Phase V (oPL2)				
		84 Output Phase Loss on Phase W(oPL3)				
		85, 86, 88-100 Reserved				
		87. Hybrid motor drive overloading while running				
		at lowfiequency (cL3)				
		101: Software enor 1 occurred on CANopen				
		(CGdE)				
		102: Software encr2 occurred on CANopen				
		(CHE)				
		108 Reserved				
		104 Hadvae encrocuned on CANopen				
		(ChFE)				
		105 Intexsetting encrocumed on CAN open				
		(CHE)				
		108 Slave #setting encroccured on CANopen				
		(CAdE)				
		107: CANquenindexis out of range (CFrE)				
02.07		1600-2200Vnc	1800			
		3300-4400Vbc	3600			
		0 Wanandkeepoperation				
0208	PIC actionselection	1: Wanandramptostop	1			
		2: Wamand coast to stop				
02:09	PIC level	00-1500°C	130			
02;10	Reserved					
00.11		U Notassigned 1: KIY84 130	6			
	PICTYPE	2 PIC130	U			
		J SVECTUVC, MOCEJ				

VFDVJC | 4 Description of Parameters

Parameter	Explanation	Settings	Factory Setting	VF	FOCPG	FOOPM
02:12	Motorfanactivationlevel	00-1500°C	500			
02 13	Electronic thermal relay selection 1	 O Invertermotor (Separate heat dissipating the cooling fan and the rotating shaft are not synchronized) 1: Standard motor (In lined heat dissipating the cooling fan and the rotating shaft are synchronized) 2: Disable 	2			
02:14	Electronic thermal characteristic formotor	300-6000secants	600			
02:15	Output fiequency at malfunction	000-59900Hz	Read only			
02 16	Output voltage at malfunction	00-6535V	Read only			
02:17	Output of DC side voltage at maliunction	QO-65535V	Read only			
02:18	Output Cunent at mallunction	000-65535Amp	Read only			
02 19	IGBГ temperature at maliunction	- 32767-32767 °C	Read only			
02:20	Auto Reset LxXenor	O Disable, 1: Enable 9C	0			
0821	Decode the parameter protection with the password	0-9999	0			
02:22	Setupa parameter protection password	0-9999	0			
0223 ~ 0231	Reserved					
0232	FrequencyConmendat maliunction	000~ 59900Hz	Read only			
02:33	Capacitor's temperature atmalfunction	- 32767-32767 °C	Read anly			
02:34	Motor's rotating speed at mellignetion	-32767-32767.pm	Read only			
02:35	Taque connendat mellimation	-32767~32767%	Read only			
02:36	Input Terminals' Status at malfunction	0~ 65535	Read only			

VFDVJ-C | 4 Description of Parameters

Parameter	Explanation	Settings	Factory Setting	VF	FOCPG	FOOPM
02.37	Output Terminals' Status	0	Read			
	atmalfunction		anly			
(1) 72 (1) 72	Hybrid servo dive's	0~ 65535	Read			
U a SB	status atmalfunction		anly			
mm	Detecting Braking	0 Parth 1 Farth	4			
0239	Resistoratstartup	u lisade, I: Frade	–			
02:40	Braking resistance	00-65535	00			

OBDigital/Analog Input/Output Parameters

You can set this parameter during operation

Parameter	Explanation	Settings	Factory Setting	VF	FOCPG	FOOPM
രുത	Milifunctioninput connend3(M I3)	0 Nofunction 44 Injectionsignal input	0			
0301	Milifinationinput connend4(Mi4)	45: Confluence/Diversionsignal input 46: Reserved	0			
0802	Milifinationinput connend5(M5)	47: Multi-level pressure PI command 1 48: Multi-level pressure PI command 2 51: Flowrate mode	0			
œœ	Digital input response time	0001~ 30000sec	0005			
0304	Digital input operation direction	0 65535	0			
0305	Milti-function cutput 1 (Relay 1)	0 Nofunction 1: Operation indication	11			
0306	Milii function Output 2 (MD1)	9 Hybrid servo drive is ready 11: Enor indication	0			
0307	Milti-firctionQutput3 (MDP)	45: Motorfancontrol signal 46: Pressure release valve control signal	0			
0308	Milti-functionoutput Direction	0 65535	0			
യയ	Display lowpass filter time on the keypad	0001~65.535 secants	0100			
CB 10	Mæimmoutput vollage for pæssue fædback	50-100V	100			
0311	Mnimmoutput voltage for pressure feedback	00-20V	00			
03 12	Cunent/Voltage type pressure sensor selection	0 Cunentmode 1: Voltage mode	1			
0813	Confluence Mister/Slave Selection	0 Nofunction 1: Master1 2: Slave/Master2 3: Slave/Master3	0			
0B14	The ratio betweenslave's floward mester's flow	00-653555%	1000			
08 15	Sauce officquency connend	0 Digital keypad 1: RS485 Communication 2-5: Reserved 6: CANopen	0			

VFDVJ-C | 4 Description of Parameters

Parameter	Explanation	Settings	Factory Setting	VF	FOCPG	FOOPM				
08 16	Limit for the Slave reverse depressuization torque	0-500%	20							
0B17	Slave's activation level	QQ-1000%	500							
0318	Reserved	eserved								
0319	Reserved									
0820	Start up display selection	0 F (fiequencyconnent) 1: H(actual fiequency) 2 Mili: function display (user defined 0004) 3 A (Output cunent)	0							
0821	Slave reverse operation for depressurization	0 Disabled 1: Enabled 2: Reserved	0							
0822	Slave closing level	0~400bar	400							

04Communication Parameters

You can set this parameter during operation

Parameter	Explanation	Settings	Factory Setting	VF	FOCPG	FOCPM
0400	Communication address	1~254	1			
0401	COMtransmission speed	48-1152Kps	192			
0402	COM transmission fault treatment	0 Wamand continue operation 1: Wamand comptostop 2: Wamand coast to stop 3: Nowarring and continue operation	3			
0408	COMtime-out detection	00-1000sec.	00			
0404	COMI communication protocol	0 7N1 (ASCI) 1: 7N2(ASCI) 2 7E1 (ASCI) 3 7O1 (ASCI) 4 7E2(ASCI) 5 7O2(ASCI) 6 8N1 (ASCI) 7 8N2(ASCI) 8 8E1 (ASCI) 9 8O1 (ASCI) 10 8E2(ASCI) 11: 8O2(ASCI) 12 8N1 (RIU) 13 8N2(RIU) 14 8E1 (RIU) 15 8O1 (RIU) 16 8E2(RIU) 17 8O2(RIU)	13			
0405	Delay time of comunication response	00-2000ms	20			
0406	Mainfiequency of the communication	000- 59900Hz	6000			
0407	Blocktransfer 1	000-65535	000			
0408	Blocktansfer 2	000-65535	000			
0409	Blocktransfer 3	000-65535	000			
04 10	Blocktansfer4	000-65535	000			
04 11	Blocktransfer 5	000-65535	000			
04 12	Blocktansfer6	000-65535	000			
0413	Blocktansfer7	000-65535	000			
04 14	Blocktansfer8	000-65535	000			
04 15	Blocktransfer9	000-65535	000			
04 16	Block transfer 10	000-65535	000			
04 17	CANopenslave address	0 Disable 1~127	0			

Parameter	Explanation	Settings	Factory Setting	VF	FOCPG	FOCHM
04 18	CANopenspeed	0 1 Mips 1: 500 Kips 2: 250 Kips 3: 125 Kips 4: 100 Kips (Delta only) 5: 50 Kips	0			
04 19	CANopen venting record	bit 0 CANopenGuardingTime out bit 1: CANopenHeartbeatTime out bit 1: CANopenHeartbeatTime out bit 3: CANopenSYNCTime out bit 3: CANopenSDO Time out bit 4: CANopenSDO buffer overflow bit 5: CanBus Off bit 6: Encryptotocol of CANopen bit 8: The setting value of CANopen indexfailed bit 9: The setting value of CANopen address failed bit 10: The checksumvalue of CANopen indexfailed	Ο			
0420	CANapendecoding	0 Delta defined decoding method 1: CANonen Standard DS402 motorol	1			
0421	CANopen communication status	 O Node reset state 1: Comreset state 2: Boot up state 3: Pre operation state 4: Operation state 5: Stop state 	0			
04 <i>2</i> 2	CANquen control status	O Not ready for use state 1: Inhibit start state 2: Ready to switch on state 3: Switched on state 4: Enable operation state 7: Quick stop active state 13: Enorreaction activation state 14: Enorstate	Ο			
0423	Reserved	1	<u> </u>	<u> </u>	<u> </u>	<u> </u>
0424	Communication decoding method	0 Decoding method 1 (20x) 1: Decoding method 2 (60x)	1			

42 Description of Parameter Settings

-				e								
D System Parameters				You can set this parameter during operation								
00-00	Hybrid	servo	d ive r	nodel e	code I)					8 1	
Cantral mode	• VF	FOCPO	FOCP	М					Factory	setting	Reado	nly
	Settings	Re	adomly									
00-01	Display	ofiat	edan	ertof	`the hy	bridse	ervod	ive				
Control mode	• VF	FOCPO	FOCP	M					Factory	setting	Reado	nly
	Settings	Re	adonly									
Param	eter0000)is to de	termine	the capa	ciyofth	e hybrid	lservon	notor, wh	ichhas I	beenco	nfigured	inthis
parame	terinfact	ory Ina	ddition, t	the ame	ntvalue	of PiOO	01 can l	e read	attoch	eckifiti	s the rat	ed
anent	af the ca	iespond	ingmod	el Displ	ayvalue	afthea	nentva	le of P	aanete	r 0001 f	àrthe re	lated
Param	eter0000)										
	230V Se	ries					4600	Series				
Power	(KSV)	30	37	15	185	22	30	37	45	55	75	ļ
Hase Po	ver(HP)	40	50	20	25	30	40	50	60	75	100	
Mot		214	215	411	412	413	414	415	416	417	418	
00-02 Contolmode	Image: Control mode VF FOCPG FOCPM Factory setting 0 Settings 0 Nofunction 1: Proputer Locked											
		5	Restth	e kWha CANoog	tdives(nimby	ф						
		1	0 Reset	ta l t he p	aamete	is to fac	taysett	ing (60 E	b)			
•							-	<u> </u>				
00 03	с .		•									
00-03	SOLVE			• •					B		л лл	
		FULP	FULP						Factory	seung	₩ ₩	
	Seurgs	R	eauony	y								
00-04	Selecti	mofr	nHifi		disnla	v						
Control more	VF	FOCPO	FOCP	M		5			Factory	settine	0	
	Settinos		Disrla	 ∕thea≢	utane	nt(A)			y	-	- 8 2	001
		1.	Boson	nd						I		
			INESCIV	eu								

2 Display the actual output frequency (H) (unit: Hz)

3 Display the DC-BUS voltage (U) (unit V)

4 Display the three phase U, V, Woutput voltage (E) (unit V) 5 Display the three phase U, V, Woutput power angle (n) (unit deg) 6 Display the output power in I&V(P)



7 Display the actual motor speed in prostinated by the motor	.r 88
drive or encoder's feedback (r00 forward speed - 00 negative speed) (unit rpm)	88
	L 00
8 Display the estimated output taque Nm(t00 positive taque; - 00 negative taque) (unit %)	
9 Display the PG feedback(G) (unit PLS)	.5 88
10 Reserved	
11: Display the signal value of the analog input terminal PS with	
12 Display the signal value of the analog input terminal PI with	2 00
0-10V mapped to 0-100% (unit: %)	
- 10- 10V napped to 0- 100% (unit: %)	
14 Display temperature of the power module IGBF in °C (t)	. E . 00
15 Display temperature of the power capacitor °C	.f 00
16 The status of digital input (ON/OFF)	
17. The status of digital Output (ONOFF)	.o 88
18 Reserved	.5 8
19 The conesponding CPU pinstatus of the digital input	, <u>,,,,,</u> ,
20 The conesponding CPU pinstatus of the digital Output	0 <u>5555</u>
21~24 Reserved	
25 Display the signal value of the analog input terminal QL with 0-10V memory to 0-100% (unit: %)	. 5. 0.0
26 Display the actual pressure value (unit: Bar)	. 5. 88
27 Disclay the WAh value (unit: WAh)	R 00
28 Display the motor temperature in °C (currently orly support	
	U.U.U.
29 Overload ale of hybrid servo drive, get overloaded at 100% (d) (unit: %)	v . 88
30 Overleaduate of motor with last digit A of HES, get EOL1 at 100% (M) (unit %)	v . 88
31: Display current at basking (A) (unit: A)	
32 Display temperature of the basis gchopper (4) (unit °C)	
33 Reserved	
34 taque constant KT (unit: K)	, 7 , 88

This parameter defines the contents to be displayed in the U page of the digital keypad KPVJ-LEO2 (as showninthe figure).

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88-85 Reserved

111 - 115 Display the speed (npm) defined by the user

Control mode VF FOCPG FOCPM

Settings 0-399991pm

Factorysetting 2500

Factory setting 140

Factory setting 0

Set the maximum speed of the matarcanespanding to the 100% flow

When the control mode is FOCPM(Pt01-00=5), Pt0006 will follow the setting at Pt01-20 < Number of

poles of the synchronous motor> to modify PtOI-OR<Mbtor's maximum operating frequency>. frequency= npntPole/120

111 - 117 Maximum value of the pressure command

Control mode VF FOCPG FOCPM

Settings 0-400Bar

The O-10V for the pressure command on the controller is mapped to O-the value of this parameter When you setup parameters P10007, P10008 and P10014, parameter P10015 will also be modified automatically. However, when the pressure command is bigger than the pressure feedback, P10007 cannot be set up

Only when Pi0007 is smaller than Pi0008, you can set Pi0007 while the hybrid servo drive is running

111 - 118 Maximumpressure feedbackvalue

Control mode VF	FOCPG FOCPM	Factory setting 250
Settings	0-400 Ba r	

The O-10V for the pressure sensor is mapped to O-the value of this parameter

Pressure control mode

C	ontrol m	rle	VF	FOCPG	FOCPM
Š			VI.	FOCI G	TOTAL INT

Settings O Speed control

1: Pressure control

This parameter determines the control mode of the hybrid servo drive. It is recommended to use the speed control at the initial startup. After the motor; pump, pressure sensor; and the entire systemare checked without any enor; switch to the pressure control mode to enter the process control. In pressure control (PrOO 09=1), it is necessary to set bot PrOI-05 (Acceleration time setting) and PrOI-06

(Deceleration time setting) as zero, or it will affect the stability of pressure control

33 - 33 Speed bandwidth

Control mode	FOCPG FOCPM	Factory setting 20
Setting	s 0-40Hz	

Set the speed response. The larger value indicates the faster response.

GG-SG Speed Bandwidth2

Control mode FOCPG FOCPM Factory setting 20 Settings 0 40Hz

[][]-5 ; Speedbandwidth3	
Cantal made FOCPG FOCPM	Factory setting 20
Settings 0 40Hz	
Set the speechesponse. The larger value indicates the fasternes	ponse.
() () - Pressure feedback filtering time PS	
111 - 12 Pressure feedback filtering time PI	
[][] -] Pressure feedback filtering time QI	
Cantral made VF FOCPG FOCPM	Factory setting 0000
Settings 0000-1.000 seconds	
Noises may reside in the analog input signals of the control termin	als PS, PI, and QI. The noise may affect
the control stability. Use an input filter to eliminate such noise.	
If the time constant is too large, a stable control is obtained with po	xaercanticl iespanse. If it is too smell, a
fast response is obtained with unstable control. If the optimal settin	g is not known, adjust it properly
according to the instability croesponse delay.	
00 - 14 Percentage for the pressure command valu	e (Max)
Control mode VF FOCPG FOCPM	Factory setting 560
Settings 00-1000%	
88 - 15 Percentage for the pressure command valu	e (Mid)
Control mode VF FOCPG FOCPM	Factory setting 280
Settings 00-1000%	
88 - 18 Percentage for the pressure command valu	e (Min)
Cantralmade VF FOCPG FOCPM	Factory setting 00
Settings 00-1000%	
When setting maximum value for the pressure command (Pr000)) and maximum pressure feedback value
(Pr0008), Percentage for the pressure command value (Pr0014)	and (PrOO 15) will be revised as well; it
canot be set when pressure command is higher than pressure fe	echackvalue
Pr0007 can be changed when the drive is in operation, but it can	be set when Pr0007 is lower than
Pr0008	
To set these parameters, it is necessary to set Parameter 00 09 a	s 1
Parameter 0004= 12 for PL input vollage	
Send the maximumplessue command through the controller and	l then check the m i ti-function display
page to enter this value into 00 14.	
Send a half pressure command through the controller and then ch	eck the milli-function display page to
enterthis value into 00 15	
Send the minimum pressure command through the controller and t	hencheck the milli-function display page
to enter this value into 00 16	
Example: If the pressure sensor indicates 250barat 10V. If the co	nticler's maximumplessule of 140bar
Example: If the pressure sensor indicates 250barat 10V. If the co conesponds to 10V, then Parameter 0007=140 Set the pres	ntoler's maximumplessue of 140bar ssue as 140bar by using the controller,
Example: If the pressure sensor indicates 250barat 10% If the co conesponds to 10%, then Parameter 0007=140 Set the pres the voltage value shown on the display is about 560(14025	ntoler's maximumplessue of 140bar issue as 140bar by using the controller, 0* 100%). Enter this value into the

VFDVJC | 4 Description of Parameters

keypadis about 280(70/250* 100%). Enter this value to the Parameter 00 15 Thenset the pressure as Obar on controller, and the voltage value shown on the keypadis about 00(0/250* 100%). Enter this value in the Parameter 00 16

00-17	Percentag	e for the flowcommand value (Max)	
Cantral made	e VF FOC	PG FOCPM	Factory setting 1000
	Settings	00 1000%	
00-18	Percentag	e for the flowcommend value (Mic)	
Cantral made	e VF FOO	PG FOCPM	Factory setting 500
	Settings	00 1000%	
88-19	Percentag	e for the flowcommend value (Min)	
Control mode	e VF FOC	PG FOCPM	Factory setting 00
	Settings	00 1000%	
SetPara	m eter (10 (19 =1	l before setting Pr00 17, Pr00 18 and Pr00 19	
Paramet	er0004= <i>2</i> 5f	àr Qlinput vollage	
Sendth	e 100% flowia	e trough the controller and then check the multi-fun	ction display page to enter this
value in	o0017		
Sendth	e 50% flowrate	e trough the controller and then check the multi-func	tion display page to enter this
value in	DOO 18		
Sendth	e 0%flowrate t	though the controller and then check the multi-functi	andisplay page to enter this
value in	DOO 19		
00-20	Pgain 1		
00 00	Pgain2		
<u>00 - 24</u>	Pgain3		
Controlmode	- g • VF FO	PG FOCPM	Factory setting 500
	Settings	00 10000	, ,
00-21	Integratio	ntine 1	
00-23	Integratio	ntine 2	
00-25	Integratio	ntine 3	
Control mode	• VF FOC	PG FOOPM	Factory setting 200
	Settings	000- 50000secants	
00 <u>-37</u>	Differentia	lgain	
00-40	Differentia	lgain 2	
00-41	Differentia	lgain 3	
Control mode	e VF FOO	THE FOOPM	Factory setting 00
	Settings	00-1000%	
This para	meteris functi	anal only when BitO and Bit2 = 1 at Pr0038	
88-28	Pressure s	table zone	
Control mode	e VF FOC	PG FOOPM	Factory setting 25
	G 44	0 100%	



Adjust the Kp value to a proper level first, and then adjust the Ki value (time). If the pressure has overshoot, adjust the kd value.



00-27 Minimumpressure				
Control mode VF FOCPG FOCPM	Factory setting 01			
Settings 00 1000%				
Set the minimumplessue value 100% conesponding to Parameter 00 08				
Maintaina minimumpressure to ensure that the oil pipe is infully filled comition to avoid the activation delay				

of the cylinder when a pressure/flow command is activated

Factory setting 50

00-55 Minimumflow

Control mode VF FOCPG FOCPM

Settings 000~10000%

The setting at PiOD OB is the setting of PiOD 27 at 100% The setting at PiOI-O2 is the setting of PiOD 55 at

100%

An inimumpressure must be maintain to ensure the oil circuit is full at all to time. This will prevent delay of oil tark activation when receiving a pressure/flow rate command

00-28 Depressurizationspeed

Control mode VF FOCPG FOCPM

Settings 0 100%

Set the highest rotation speed at depressurization The 100% value is mapped to Parameter OI-O2 (the

maximum rotation speed of the motor)

111 - 29 Rampuprate of pressure command

Control mode VF FOCPG FOCPM

Settings 0-1000ms

HII - HII Rampdowniate of pressure command

Control mode VF FOCPG FOCPM

Settings 0-1000ms

Ramp the pressure value for the pressure command to reduce the vibration of the machine.

Set the time required for ramping the pressure from 0~ the maximum pressure (0008).





Control mode VF FOCPG FOCPM

Settings 0-1000ms

Factory setting 80

Ramp the flow value for the flow command to reduce the vibration of the machine.

Set the time required for ramping the flow firm 0~ the maximum flow (01-02).



Factory setting 0

Factory setting 25

Factory setting 100

Value opening delay time Control mode VF FOCPG FOCPM Factory setting 0 Settings 0-200ms When both the pressure commend and flow commend activate the machine to start from idle, the flow starts to cutput. However, due to the slower response of the value in the hydra lic circuit, the surthensurge of the pressure may occur. The pressure may recover to normal until the value is fully opened. To avoid the

aforementioned effect, set this parameter to increase time for the flow output delay.



Reserved

Over pressure detection level

Control mode VF FOCPG FOCPM

Factory setting 230

Settings 0-400Bar

When the pressure feedback exceeds this parameter setting an "ovP over pressure" enormessage may occur

Firmware version 204 and above, maximum value 400Bar; the previous version's maximum allowed value is 250Bar:

HI-57 Detecting time of pressure overshoot

Control mode VF FOCPG FOCPM

Factory setting 001

Settings 00000-1.0000sec

When the pressure feedback is larger than the level set at PrOO 35 and over the time set at PrOO 52, an ovP (over pressure) vanning code will display.

Warning code: When Pi0035= () disable detection of pressure overshoot

111 - 35 Detection of disconnection of pressure feedback

Control mode VF FOCPG FOCPM

Factory setting 0

Settings O Nofunction

1: Enable (only for the pressure feedback output signal within 1~5V and

4-20mA)

When this parameter is set as 1 and if the pressure feedback signal is below 1V or 4mA, an 'PFbF pressure feedback fault' enormessage may occur.

88-38	Press	ure/flowcantral function	selection
Control mode	• VF	FOCPG FOCPM	Factory setting O
	Bit O O Switch the PI Gain speed bandwidth 1: Switch the PI Gain a		ccording to the pressure feedback level and use single ccording to the multi-function input terminal
		Bit 1: O Nomessue/fource	tal suitch
	1: Switchbetween the p		ressue and flow control
		Bit 2	
		O Use the old pressure	overshootsuppression
		1: Use the newpressur	e overshoot suppression
		Bit3	
		0 Switchthe P1Gaina feedbacklevel	rd single speed bandwidth according to the pressure

When the BitOof this parameteris set as 1, the PI Gainfor the pressure can be switched in conjunction with the multi-function input terminal

1: Switch the PI Gain and speed bandwidth according to the pressure command

SetBit2=0		
Milifuctioninput	Milli-function input	
terminal = 47	teminal = 48	
OFF	OFF	PI1 (Pr00 20 and Pr00 21) and Pr00 10 Speed
		Bandvidh
ON	OFF	P12(P10022 and P10023) and P10050 Speed
		Bardvidih 2
OFF	ON	PB(Pi0024 and Pi0025) and Pi0051: Speed
		Bandwidih
SetBit2=1		
SetBit2=1 Milli-functioninput	Milii function input	
SetBit2=1 Milti-functioninput teminal = 47	Milii function input teminal = 47	
SetBit2=1 Multi-functioninput terminal = 47 OFF	Mili-functioninput teminal = 47 OFF	PID1 (Pt00 20) Pt00 21 artlPt00 37) artlPt00 10
SetBit2=1 Milti-functioninput terminal = 47 OFF	Milti-functioninput terminal = 47 OFF	PID1 (Pt0020) Pt0021 and Pt0037) and Pt0010 Speed Bandwidth
SetBit2=1 Milti-functioninput terminal = 47 OFF ON	Milti-functioninput terminal = 47 OFF OFF	PID1 (Pr0020) Pr0021 and Pr0037) and Pr0010 Speed Bandwidth PID2 (Pr022, 00223 and Pr0040) and Pr0050
SetBit2=1 Milti-functioninput terminal = 47 OFF ON	Milli functioninput terminal = 47 OFF OFF	PID1 (Pt00 20) Pt00 21 and Pt00 37) and Pt00 10 Speed Bandwidth PID2 (Pt0 22, 002 23 and Pt00 40) and Pt00 50 Speed Bandwidth 2
SetBit2=1 Milti-functioninput terminal = 47 OFF ON OFF	Milti-functioninput terminal = 47 OFF OFF OFF	PID1 (Pr00 20) Pr00 21 and Pr00 37) and Pr00 10 Speed Bandwidth PID2 (Pr022, 002 23 and Pr00 40) and Pr00 50 Speed Bandwidth 2 PID3 (Pr00 24, Pr00 25 and Pr00 41) and Pr00 51:

When the Bit 1 of this parameteris set as 1, the pressure feedback is lower than the pressure stable region (please refer to the description of Parameter 00.26) so the flow control will be performed When it enters the

VFDVJ-C | 4 Description of Parameters

pressure stable region, the pressure control will be applied

When Bit1= 0, the Pressure Response is slow and the pressure overshoot is veak When Bit1 = 1, the Pressure Response is fast and the pressure overshoot is strong Set Bit2 = 0, the setting at Pr00 39 and Pr00 42 are used to suppress pressure overshoot But when Bit2 = 1, the setting at Pr00 37 is used to suppress pressure overshoot When Bit3 = 1:

Pressue	P, IGain and Speed	
Commend	Bancwicin	(Set B2 =1)
Sn ele rthancrequal to the	PI1 (Pr00 20 and Pr00 21)	Pr0037
maximum pressure command	and PiOO 10 Speed	
(Pr0007)*25%	Bandvidth	
Equal to the maximum value	P12(P10)22 and P10)23	
forpressue command	and Pi0050 Speed	
(Pi0007)	Bandvidth2	
Pressue command between	The PI Gain and Speed	
25% and 100%	Bandwidth can be obtained by	
	calculating the linear	
	interpolation	

[][] -]? Igain of Pressure overshoot 1

Control mode VF FOCPG FOCPM

Settings 000-50000sec.

111 - 42 Pressue overshoot level

Control mode VF FOCPG FOCPM

Factory setting 2

Factory setting 02

Settings 0-100%

By using the factory setting 250 bar of the PiOOO8MaximumPressure Feedback, when the pressure is over 5 bar(250°2%=5 bar), another integral time of PiOO 39 will do overshoot protection When PiOO 38=1 and PiOO 39=0 PiOO 42 is disabled







88-43 MeximumFlow

Control mode VF FOCPG FOCPM Settings 0-100%

Factory setting 100

Setup this parameter to adjust the maximum totation frequency (maximum flow rate). It is not necessary to stop the hybrid servo drive to set up this parameter. When this parameter is set to be 100%, it corresponds to the maximum totalion frequency of PrOI-02.

Pressure Command	
Control mode VF FOCPG FOCPM	Factory setting 0
Settings 0-400bar	
00-45 FlowCommand	
Control mode VF FOCPG FOCPM	Factory setting O
Settings 0-100%	
When Pr0044 0, Pressure Command will not be given by the a	nakgsignal but input by Pi0044
WhenPr0045 0, FlowCommand will not be given by the analog	gsignal but input by Pr0045
P0044&Pr0045 can be applied in an environment without input	t of analog signal to do simple test
00-46 Pressure reference S1 time	
Control mode VF FOCPG FOCPM	Factory setting 0
Settings 0-1000ms	
Pressure reference S2 time	
Control mode VF FOCPG FOCPM	Factory setting 0
Settings 0-1000ms	

To increase the smootness at start or stop while increasing or decreasing the percentage of the pressure command. The longer the pressure reference time, the smoother it will be



00-48 Flowieference S1 time

Control mode VF FOCPG FOCPM

Factory setting O

Settings 0-1000ms

GG-49 Flow effective S2 time

Control mode VF FOCPG FOCPM

Factory setting 0

Settings 0-1000ms

To increase the smootness at start or stop while increasing or decreasing the percentage of the flow commend. The longer the flow reference time, the smoother it will be.



When the actual pressure is lower than the minimumpressure (PtOD 27) and exceeds the time set at PtOD 53 or PtOD 56 and shortage varing will popupon the keypad These two parameters are functional only when PtOD 09 (Pressure control mode) = 1. When these two parameters are sector() they are disabled PtOD 56 is only functional at startup of the operation IF PtOD 56 = 5, the hybrid servo drive will verify if the actual pressure is bigger than the minimumpressure for 5 minutes. During these 5 minutes, a "bP" varing will display on the keypad but the hybrid servo drive keeps running with the preset minimum pressure and minimumflowrate. Besides the hybrid servo drive doesn't accept any pressure and flow commend during these 5 minutes. If the actual pressure is still under the setting at minimumpressure after running for 5 minutes, an oil shortage varing "mill" will popupon the keypad.

A Cil pumpreverse running detecting time

Control mode VF FOCPG FOCPM

Factory setting 00

Settings 00~600sec

When the oil pump runs reversely exceeds the time set at PrOD 54, a reverse running warning will pop up on the keypad

WhenPr0054=00, this function is disabled

20 - 5 5 ~ Reserved

MrimmFlow

Control mode VF FOCPG FOCPM

Factory setting 500

Settings 000~ 10000%

To set the minimumplessure, the 100% of PrOO 27 matches the setting at PrOO 08 and the 100% of PrOO 55 matches the setting at PrOI-02

It is necessary to maintain a minimum flow to make sure that the oil passage is filled with oil at all times. So that there will not be a delay on oil tank activation when sending a pressure/flow command

111 - 5 | Minimum Pressure 2

Control mode VF FOCPG FOCPM

Factorysetting 01

Settings: 00~ 1000%

The setting value of PiOO OBM aximum Feedback Pressure is the 100% of this parameter PiOO 61.

MinimumFlow2

Cantral made VF FOCPG FOCPM Settings 000~10000% Factory setting 500

The setting value at PiOI-02 Maximum Operating Frequency is the 100% of this parameter PiOO 62

Pressure Releasing Valve Opening Time Interval

Control mode VF FOCPG FOCPM

Factory setting 0100

Settings 0000~0100sec

The output signal MD 46 opens the pressure releasing valve when

- 1) Speed commend is to run reversely,
- 2) Pressure command is to decrease the pressure
- 3) The elapsed time is larger than time set at Pi0063
- 4) The feedback pressure doesn't reach yet the stable pressure zone.

Use Pr0063 to set up the time interval between opening and closing pressure releasing valve to avoid unrecessary valve opening and closing (ON/OFF)

OI Motor Parameters

You can set this parameter during operation

Castalundo VE		Footon cotting 5
	FULFG FULFIVI	rachysettig 5
	O V/F	
Settings	1: Reserved	
	2: Reserved	
	3 FOCPGIM(InductionMotor)	
	4 Reserved	
	5 FOCPGPM(Synchronous Motor)	
	6 Reserved	
	7. Reserved	

O V/F control, the user can design the required V/F ratio This control mode needs induction motors.

- 1: Reserved
- 2 Reserved

3 FOC vector control + Encoder This control mode needs induction motors.

4 Reserved

5 FOC vector control + Encoder. This control mode needs synchronous motors.

- 6 Reserved
- 7: Reserved

() |- () | Source of operating command

Control mode	e VF	FOCPG FOCPM	Factory setting 0
	Settings	0 The operating command is controlled by the digital keypad	
		1: The operating com	rand is controlled by the external terminals.
		The STOP button a	nthe keypad is disabled
		2 The questing com	nand is controlled by the communication interface.
		The STOP button o	nthe keypad is disabled
		3 The operating com	nand is controlled by CAN open
-			

For the operating command, press the PU button to allow the "PU" indicator to be lit. In this case, the RUN, JOG, and STOP button are enabled.

0 1-02 Motor's maximum operating frequency

Control mode VF FOCPG FOCPM

Factory setting 16667

Settings 5000-59900Hz

Set the maximum operating frequency range of the motor. This setting is corresponding to the maximum flow for the system

When the control mode is FOCPGPM(Pt01-00=5), the user defined speed display (Pt0003) follows the setting of number of poles of synchronous motor (Pt01-20) to adjust the motor maximum operating fiequency (Pr01-02)

Frequency = Motor's rotating speed (rpm) xMotor's number of pole / 120

() [-()] Motor's rated frequency

Control mode	VF	FOCPG FOCPM	

Factory setting 11333

Settings 000-59900Hz

Typically, this setting is configured according to the rated voltage and frequency listed in the specifications on the motor's nameplate. If the motor is intended for 60Hz, set this value as 60Hz, if the motor is intended
for 50Hz set this value as 50Hz

Motor's rated fiequency (PiOI-OB) changes as Rated speed of the synchronous motor (PiOI-19) and Number of poles of the synchronous motor (PiO2 120) change.

H - H H Motor's rated voltage

Control mode VF FOCPG

Settings

Factory setting 2200/4400

230V series: 01 - 2550V 460V series: 01 - 5100V

Typically, this setting is configured according to the rated operation voltage shown on the motor's nameplate. If the motor is intended for 220V, set this value as 2200V; if the motor is intended for 200V, set this value as 2000

11 - 115 Acceleration time setting	
Control mode VF FOCPG FOCPM	Factory setting 000
Settings 000-60000seconds	
() /- () { Deceleration time setting	
Cantral made VF FOCPG FOCPM	Factory setting 000
Settings 000-60000seconds	

The acceleration time determines the time required for the hybrid servo motor to accelerate from OOOHz to [the motor's maximumfiequency] (PrOI-O2). The deceleration time determines the time required for the hybrid servo matar to decelerate from [the matar's maximum frequency] (PrOI-02) to OOHz.

[] |- []] Motor Parameter Auto Turing

Factory setting 0 Control mode VF FOCPG FOCPM

Settings

O Nofunction

- 1: Dynamic test for induction motor (IM) (Rs, Rr, Lm Lx no load current)
- 2 Static test for induction motor (IM)
- **3 Reserved**
- 4 Automeasure the angle between magnetic pole and PG anigin
- 5 Dynamic test for SPM motor
- 13 Dynamic test for IPM motor

If the parameter is set as 1~2, it will perform the parameter automatic tuning for the Induction motor In this case, press the [Run] button to perform the automatic measurement operation immediately. After the measurement is complete, the values are filled into Parameters OI-13-16 (no load current, Rs, Rr, Lm, and Lx), respectively.

Induction motor AUTO Turing procedure (Rolling test)

- 1. All parameters of the hybrid servo drive are set to factory settings and the motor is corrected conectly.
- Users are storgly advised to disconnect the motor firm any load before tuning. That is to say the 2 motor contains only the output shaft and connects to neither a belt nor a decelerator. Otherwise, it will be impossible to disconnect the motor firm any loads. Static tuning is advised .

- 3 Set the nated voltage 01-04, nated frequency 01-03, nated current 01-08, nated power 01-09, nated speed 01-10, and number of poles 01-11 of the motor with connect values, respectively. For the acceleration/deceleration time, please set the connect values.
- 4 Set Parameter OI-07 as 1 and then press the RUN button on the keypad. The autotuning process for the motor is canied out immediately. (Note: the motor starts running).
- 5 After the process is finished, checkif the motor's parameters (parameters OI-13~16) have been automatically entered with the measurement data.
- 6 Equivalent circuit of the motor



Motorequivalent circuit used by VJ

NOTE

.When the static tuning (parameters 01-07 = 2) is used, you must enter the no load current to the motor. It is generally 20 to 50% of the nated current.

If the parameteris set as 5 or 13, it will perform the parameter automatic tuning for the synchronous motor In this case, press the [Run] button to perform the automatic measurement operation immediately. After the measurement is complete, the values are filled into Parameters OI-22 (Rs), OI-23 & 24 (Ld & Lq), OI-25 (Back EMF of the synchronous motor), respectively.

Synchronous motor AUTO Turing procedure: (static measurement)

- 1. All parameters of the hybrid servo drive are set to factory settings and the motor is connected connectly.
- 2 Set the nated current OI-17, nated power OI-18, nated speed OI-19, and number of poles OI-20 of the motor with connect values, respectively. For the acceleration/deceleration time, please set the values according to the motor's capacity.
- 3 Set Parameter OI-07 as 5 and then press the RUN button The auto tuning process for the motor is canied out immediately (Note: the motor starts running slightly).
- 4 After the process is finished, check if the motor's parameters (parameters 01-22~01-25) have been automatically entered with the measurement data.

If the Parameter is set as 4, the automatic measurement of the angle between magnetic pole and the PG origin for the synchronous motor is performed. In this case, press the [Run] button to immediately perform automatic measurement. The measured data will be entered into Parameter OI-27.

Angle between magnetic pole and the PG originAuto Tuning process for the synchronous motor:

- 1. After the measurement process for parameter value of 5 is performed completely or manually enter the Parameters 01-08, 01-17 to 01-25, respectively.
- 2 Before turing it is recommended to separate the motor and the load
- 3 Set Parameter 01-07 as 4 and then press the RUN button on the keypad. The auto tuning process for the motor is canied out immediately. (Note: the motor starts running).

4 After the process is complete, please check if the values for the angle between magnetic poles and PG origin have been automatically entered in the Parameter OI-27.

0:-08	Rated cu	nent of the inductio	nmotor(A)
Control	TY	XTX	Unit Ampere
Contamble	e Fu		Factory setting # ##
	Settings	40-120% of the rated	divingcunent
Tosetti	is parameter;	the usercan set the rate	imptorcunent range shown on the motor's nameplate. The
Factorys	etting is 90%	of the rated current of th	e hybrid servo drive.
Forexa	n ple: For the	7.5HP (5.5kW) motor, the	e rated current is 25, the factory settings: 22.5A.
]	The custome	s can set the parameters	within the range 10~30A
2	25*40%=10	25*120%=30	
01-09	Rated po	werof the induction	maker
Control mode	e FC	CPG	Factorysetting ###
	Settings	0-65535kW	
Setthen	notor's nated j	power The Factory setting	g value is the power of the hybrid servo drive.
8 :- :8	Ratedsp	eed of the induction	mokar
Control mode	e FC	XPG	Factorysetting
			1710(60Hz 4 pole)
			1410(50Hz 4 pole)
	Settings	0-65535	
This para	metersets ti	e rated speed of the mot	or It is necessary to refer to the specifications shown on the
motor's r	rameplate.		
[] -	Number	fpoles of the indu	tionmotor
Control mode	e FC	CPG	Factory setting 4
	Settings	2-20	
This para	metersets ti	e nunber of motor nunb	erofpoles (oddnumberis notallowed).
81-12	No load o	unentoftheinduct	ionmotor(A)
Control mode	e FC	XCPG	Unit Ampere
			Factory setting 40
	Settings	0- Default value of Pa	nameter 01-08

The Factory setting is 40% of the rated current of the hybrid servo drive.

01-13	Statories	sistance (Rs) of the in	rkriannotar
Control mod	e FC	CCPG	Factorysetting O
0:	Rotories	istance (Rr) of the in	ductionmotor
Control mod	e FC	CCPG	Factorysetting 0
	Settings	0-65535	
81-15	Magnetiz	inginductance (Lm)	of the induction motor
Control mod	e FC	CCPG	Factory setting O
01-16	Total leal	æge indictance (Lx)	of the induction motor
Control mod	e FC	CCPG	Factory setting O
	Settings	00-65535mH	
0:-:7	Rated cu	nert of the synchron	aus motor
Control mode	•	FOCPM	Factory setting 000
	Settings	0-65535Amps	
The use	rcansetthe	ated current shown on the	synchionous motor's nameplate.
8 :- :8	Ratedpo	werof the synchrono	us motor
Control mode		FOCPM	Factory setting 000
	Settings	000-65535kW	
This Pau	ametersets t	he rated pover of the synd	nonous motor
01-19	Ratedsp	eed of the synchrono	us motor
Control mode	•	FOCPM	Factory setting 1700
	Settings	0-65535	
This par	ametersets t	he rated speed of the sync	honous motor It is necessary to refer to the specifications
showna	nthe notor's	nameplate	
0:-20	Nunbero	fpdes of the synch	anous motor
Control mode	•	FOCPM	Factory setting 8
	Settings	2-20	
This par	ametersets t	he number of the synchron	ous motor's number of poles (odd number is not allowed).
01-21	Inertia of	"the synchronics mo	tar's rotar
Control mod	e	FOCPM	Factory setting 00
	Settings	00-65535*10 ⁴ kgm	8
81-95	Stator's p	hase resistance (Rs)	of the synchronous motor
Control mode		FOCPM	Faciny setting UUU
Control mode	Settings	FOCPM 0000-65.535	Factory setting UCUD

Enter the phase resistance of the synchronous motor

0:-23	stator 's p	hase inductance(l	(d) of the synchronous motor
81-24	stator's p	hase inductance(l	(q) of the synchronous motor
Cantral made	•	FOCPM	Factory setting 000
	Settings	00-65535mH	
Entert	e synchron	rous motor's phase in	rluctance. For surface type magnets (SPM), Id = Iq for
bit in	mægnets (IF	M, Id Iq	
01-25	BackEV	Fafthesynchron	ous motor
Control mode	•	FOCPM	Factory setting 0
	Settings	0-65535V/lapm	
Enterth	e backEMF (of the synchronous mot	or and the second se
81-28	Encoder	type selection	
Control mode	9	FOCPM	Factory setting 3
	Settings	3 Resolver	
01-27	PG Offse	tangle of synchro	ncus motor
Cantral made	9	FOCPM	Factory setting 00
	Settings	00 3600	
Offseta	ngle of the P	G aiginfarthe synchra	nous molor
81-28	Number	of poles of the res	alver
Control mod	e	FOCPM	Factory setting: 1
	Settings	1~5	
01-29	Encoder	Pulse	
Control mode	e FC	CPG FOCPM	Factory setting 1024
	Settings	1~20000	

This parameter can be set the encoder's number of pulses perrevolution (PPR).

[] :-]] Encoder's input type setting

Control mode FOCPG FOCPM

Factory setting 1

Settings O Nofunction

1: Phase Aleads in a forward run command and phase Bleads in a reverse run

command



2 Phase Bleads in a forward run command and phase Aleads in a reverse run

commend



3 Phase A is a pulse input and phase B is a direction input (lowinput = reverse

direction, high input = forward direction).



4 Phase A is a pulse input and phase B is a direction input (low input = forward

direction, high input = reverse direction).



5 Single phase input



Enter the conect setting for the pulse type is helpful in controlling the stability

() -] System	ncontrol		
Cantral made	FOCPG	FOCPM	Factorysetting 1
Settings	0 N	ofunction	
	1: A	SR automatic turing	
	2 E	stimation of inertia	
If the setting value	e is 1: The s	peed control gain is d	etermined by Parameters 00 10
F the setting value	e is 2 The s	ysteminertia is estime	ted Refertodescriptions in Chapter 3
01-32 Unity	alue of t	ne systeminertia	
Control mode	FOCPG F	OCPM	Factory setting 260
Settings	1~6	635 (256 = 1 perunit)	

[] -]] Canierfieq	uency	
Control mode FOCE	G FOCPM	Factorysetting 5
Settings	4-10 111	

When this parameter is configured, please restart the hybrid servo drive.

The canier frequency of the PWM output has a significant influence on the electromagnetic noise of the motor. The heat dissipation of the hybrid servo drive and the interference from the environment may also affect the noise. Therefore, if the ambient noise is greater than the motor noise, reducing the carrier frequency of the drive may have the benefits of reducing a temperature rise; if the carrier frequency is high, even if a quiet operation is obtained, the overall wiring and interference control should be taken into consideration.

When the canier fiequency increases, the rated current decreases as shown in the table below So the overload capacity also decreases.

Canier	Rated Cunent (0001)
Frequency(kHz)	
4	100%
5	100%
6	90%
7	82 %
8	75%
9	68%
10	62%

[] |-] | Reserved

8 /- 35 **MotorID**

Cantral made

FOCPG FOCPM

Factory setting 0

Settings

	Delta's Hybrid Servo Motor	
0	Disabled	
16	ECMA-ER181EP3	1114W220V motor
17	ECVA-KR181EP3	1114W380V motor
18	ECMA-ER221FPS	15kW220V motor
19	ECMA-KR221FPS	1514W380V motor
20	ECMA-ER222APS	2014W220V motor
ଯ	ECMA KR222APS	2014W380V motor
125	M&J KR133AE49B	3014W380V motor
215	M5J IR2070F42C	7141/3801/ motor
216	M&J DR201AE42C	104 1372207 motor
217	M5J IR201AE42C	103 & \$\$\$\$\$#3 \$ 07 motor
218	M&J DR201EE42C	146137220V motor
219	M5J IR201EE42C	14 :21333330 0 motor
220	M&J DR2011F42C	18414V220V motor
221	M5J IR201IF42C	18314V390V motor
222	M&J GR202DE42C	23 1kW220V motor
223	M&JOR202DE42C	2314W380V motor
224	MSJ DR2021F42C	27.61.31.2201/ motor
225	M5JLR202FE42C	2514W380V motor
227	M5J IR208CE42C	3214W380V motor
229	M5J OR264FE48C	45 21333301/ motor
231	M6J IR265CE48C	52.5131380V motor
233	M6J IR200IE428	6914W390V motor
245	MSJ R2021E42C	2713W380V motor

01-36 Chan	ge the rot	ation directi	n
Cantral made	FOCPG	FOCPM	Factory setting O
Setting		Ahenthe drive : hive runs revers Ahenthe drive : everse, the mat	uns forward, the motornotates counterclockwise. When the e, the motornotates clockwise uns forward, the motornotates clockwise. When the drive runs protates counterclockwise.

This parameter can be modified only when the whole system is at stop

{; :- } ; **HES ID**#

Cantral made

FOCPG FOCPM Settings 0: Nofunction

Model	D #	Model	D #	Model	D #
HESO63HE3C	2122	HESO63G43A	2040	HESO63H43C	2142
HESOBOHR3C	3122	HESO63-143A	2140	HESOBOH43C	3142
HES100HP3C	4122	HES080G43A	3040	HES100H43C	4142
HES125H23C	5122	HESOBOHIBA	3140	HES125H43C	5142
HES160H23C	6122	HES100G43A	4040	HES 160H43C	6142
HES200H23C	7122	HES 100H43A	4140	HESO63M43C	2342
HES250G23C	8022	HES 100Z43A	4240	HESOBOMIC	3342
HESO63H23A	2120	HES 125G43A	5040	HES100M43C	4342
HESOBOG23A	3020	HES 125H43A	5140	HES125M43C	5342
HESOBOH23A	3120	HES160G43A	6040	HES 160M43C	6342
HES100G23A	4020	HES 160H43A	6140	HES200M43C	7342
HES100H23A	4120	HES200G43A	7040	HES200H43C	7142
HES100223A	4220		·	HES250MI3C	8342
HES 125G23A	5020	и 		HES320M43C	9842
HES125H23A	5120			·	
HES 160G23A	6020				
HES160H23A	6120				

HES200G23A

Control mode

FOCPG FOCPM

7020

Settings 0~110%

The maximum output voltage is (V_{DC} * PrOI-38)/ 2. Once the motor is in the weak magnetic field, user can increase the output voltage to decrease motor's current by using DC bus voltage. However, if the output voltage is too high, there will be a current distortion, which will affect the stability of motor torque force.

442

FactorySetting 100%

Factory setting 0

Factory setting 3800/7600

FOCPG FOCPM

O2Protection Parameters

Youcanset this parameter during

				deta	tion	
82-88	Software	bake le	el			
Control mode	VF FC	CPG F	OCPM			Factor
	Settings	230V se	enies: 3500-4500	VDC		
		460V se	enies: 7000-9000	VDC		
Sets the	reference po	int of softwa	ne brake. The refe	ience value is	s the DC bus	voltage.
82-81	Faultre	card 1				
50-50	Faultre	cord 2				
02-03	Faultre	cord 3				
02-04	Faultre	cord 4				
82-85	Faultre	cord 5				
88-88	Faultre	card 6				
	Settings			Co	ntial made	VF
	0 Noena	recard				
	1: Overcu	rentdring	acceleration(ocA)			
	2 Overcu	nentduring	deceleration(ocd)			

3 Over current during constant speed (cor)

- 4 Ground fault (GFF)
- 5 IGBT short-circuit (ccc)
- 6 Overcupentatstop(ccS)
- 7 Overvoltage during acceleration (ovA)
- 8 Over voltage during deceleration (ovd)
- 9 Over voltage during constant speed (ovn)
- 10 Overvollage at stop (ovS)
- 11: Lowvoltage during acceleration (LvA)
- 12: Lowvoltage during deceleration (Lvd)
- 13 Lowvoltage during constant speed (Lw)
- 14: Lowvoltage at stop (LxS)
- 15 Phase loss protection (PHL)
- 16 IGBT over heat (oH1)
- 17. Heatsink over heat for 40HP and above (oH2)
- 18 THI open IGBT over heat protection circuit enor (fHlo)
- 19 TH2 open heatsink over heat protection circuit enor (fH2o)
- 20 IGBT over heated and unusual fan function (oHF)
- 21: Hybrid servo drive overload (oI.)
- 22: Motor 1 overload (EoL1)
- 23 Reserved
- 24 Motoroverheat, detect by PIC (dH3)
- 25 Reserved

- **20 Reserved**
- 27. Reserved
- 28 Reserved
- **29 Reserved**
- 30 Menorywite enor(cF1)
- 31: Menoryread enor (cF2)
- 32: Isumcunent detection enor (cdl)
- 33 U phase current detection en cr (cd1)
- 34 V phase current detection encr (cd2)
- 35 Wphase current detection enor (cd3)
- 38 Clanpeunent detection en or (Htl)
- 37: Over current detection en ar (Htll)
- 38 Overvallage current detection enor (HH2)
- 39 Grand curent detection enor (HB)
- 40 Autoturing encr(AuE)
- 41: Reserved
- 42: PG feedbackenor (PGF1)
- **43 PG feedbackloss (PGF2)**
- 44: PG feedbackstall (PGF3)
- 45 PG feedbackslip (PGF4)
- **46 Reserved**
- 47. Reserved
- **48** Reserved
- 49 External fault input (EF)
- 50 Energencystep(EF1)
- 51: Reserved
- 52: Password enor (Pcod)
- 53 CPU enor(cccd)
- 54 Commicationencr(cE1)
- 55 Commication enor (cE2)
- 56 Commicationencr(cE3)
- 57: Commicationencr(cE4)
- 58 RS-485 Modus Commication time out (cE10)
- **59 Reserved**
- 60 Braking transistorenor (bF)
- 61~64 Reserved
- 65 PG cardinformation enor (PGF5)
- 68 Overpressure (ovP)
- 67. Pressure feedbackfault (PFbF)
- 68 Oil pumpions reversely (Prev)
- 69 Oil shortage (noil)
- 70 Reserved

71: Overcunent at baking chopper overflowed (ocbs) 72: Braking resistor is open circuit (bro) 73 Resistance of braking resistor is too small (brF) 74: Braking chopper overheated (of 14) 75 Encroccured on Brake chopper's thermal protection line (tH4o) 76-81: Reserved 82: Output Phase Loss on Phase U (oPL1) 83 Output Phase Loss on Phase V (oPL2) 84 Output Phase Loss on Phase W(oPL3) 85, 86, 88-100 Reserved 87. Hybrid motor dive overloading while running at lowfrequency (oL3) 101: Software encr 1 occurred on CANopen (CGdE) 102 Software encr2occured on CANopen (CHbE) **103 Reserved** 104 Hadware encroccured on CANopen (CbFE) 105 Indexsetting encrocured on CANopen (CIdE) 108 Slave #setting encroccuned on CANopen (CAdE) 107. CANopenis Indexis out of range (CFrE)

As soon as a fault is occurred, the whole system is forced shutting down. The fault will be recorded During shutting down, the LxS (low voltage when stop) is not recorded

02-07 Lowvoltage level

Control mode VF	FOCPG	FOCPM
-----------------	-------	-------

 Settings
 230V Series:
 160~220V

 460V Series:
 320~440V

Factory setting 180360

This parameter is to set the LV discrimination level.



02-08 PICa	tionselection	
Control mode VF	FOCPG FOCPM	Factory setting 1
Settings	0 Wanandkeepoperation	
	1: Wanandramptostop	
	2: Warnand coast to stop	

Set PiO2 OB to define the operation mode of the drive after the PTC is activated

() 2 - () 9 **PIC level**

Control mode VF FOCPG FOCPM

Settings

00-1500'C

3 Switch(NC. type)

00-1000% 00-1500°C

This parameter only works on KTY84 130

{} ? - {} Reserved

[] 2 - | | PIC type

ntial made	VF	FOCPG	FOCPM
	Settings	Q	Notassigned
		1: F	GTY84 130
		21	TC130

12 - 12 Motorfanactivation level

Control mode VF FOCPG FOCPM

Settings

Factory setting 0

Factory setting: 500

600

Factory setting 1300

When the Parameters 0805 to 0807 for the milti-function output terminal are set to 45, the motor fan will

start or stop according to this parameter setting

Bectronic themal relay 1 selection Control mode VF FOCPG FOCPM Factory setting 2 Settings O Inverter motor (independent cooling the cooling fan and the shaft are not synchronized) 1: Standard motor (co axial cooling the cooling fan and the shaft are synchronized) Listable Disable

	cuenna leay i acuvatoriu re	
Control mode VF FO	CPG FOCPM	Factorysetting
Settings	300~ 6000 secands	

To prevent self coded motor firm overheating at lowspeed operation, the user can set the electronic

the maluelay to limit the allowed output power of the hybrid servo drive.

82-15	Outputfieq	uencyat malifunction	
Control mode	VF FOC	PG FOCPM	Factory setting Read only
	Settings	000-59900Hz	
81 - 50	Output volt	age at malfunction	
Cantral mode	VF FOC	PG FOCPM	Factory setting Read only
	Settings	00-65535V	

<i>B</i>2 - <i>H</i> Output of DC side voltage at malfunction	
Control mode VF FOCPG FOCPM	Factory setting Read only
Settings 00-65535V	
02-18 Output cunent at malfunction	
Cantral mode VF FOCPG FOCPM	Factory setting Read only
Settings 000-65535Amp	
() 2 - 13 IGBT temperature at malfunction	
Cantral mode VF FOCPG FOCPM	Factory setting Read only
Settings -32767~32767	
82-28 AutoresetLxXenor	
Cantral made VF FOCPG FOCPM	Factory setting 0
Settings O Disable, 1: Enable	
When this parameter is enabled and when there is RUN signal, t	the hybrid servo drive will
automatically restart after repowering on	
02-23 ~ 02-3 Reserved	
82-32 Frequency commendat malfunction	
Control mode VF FOCPG FOCPM	Factory setting Read only
Settings 000-59900Hz	
[] 2 - 3 3 Capacitors' temperature at malfunction	
Control mode VF FOCPG FOCPM	Factory setting Read only
Settings - 32767-32767	
32-34 Motor's rotating speed at malfunction	
Cantral made VF FOCPG FOCPM	Factory setting Read only
Settings - 32767-32767/pm	
82-35 Taque command at malfunction	
Cantral made VF FOCPG FOCPM	Factory setting Read only
Settings - 32767-32767%	
82 - 35 Input terminals status at malfunction	
Cantral made VF FOCPG FOCPM	Factory setting Read only
Control mode VF FOCPG FOCPM Settings 0-65535	Factory setting Read only
Control mode VF FOCPG FOCPM Settings 0-65535 [] 2 - 3 ?? Output terminals status at malfunction	Factory setting Read only
Control mode VF FOCPG FOCPM Settings 0-65535 Output terminals status at malfunction Control mode VF FOCPG FOCPM	Factory setting: Read only Factory setting: Read only
Control mode VF FOCPG FOCPM Settings 0-65535 Output terminals status at malfunction Control mode VF FOCPG FOCPM Settings 0-65535	Factory setting: Read only Factory setting: Read only
Control modeVFFOCPG FOCPMSettings0-65535Output terminals status at malfunctionControl modeVFFOCPG FOCPMSettings0-65535Output servo drive status at malfunction	Factory setting: Read only Factory setting: Read only
Control modeVFFOCPG FOCPMSettings0-655335Output terminals status at malfunctionControl modeVFSettings0-655335Settings0-655335Image: Settings0-655335Image: Settings0-655355Image: Settings0-65535Image: Settings0-655355Image: Settings0-65535Image: Settings0-655355Image: Settings0-65535Image: Settings0-65535Image: Settings0-65535 <t< th=""><th>Factory setting: Read only Factory setting: Read only Factory setting: Read only</th></t<>	Factory setting: Read only Factory setting: Read only Factory setting: Read only

[] ? - 39 Detecting Braking Resistor at startup

Control mode VF FOCPG FOCPM

Settings O Disable 1; Enable Factorysetting 1

Biaking resistance

Control mode VF FOCPG FOCPM Settings 00~65535

Factory setting 00

Factory setting 0

Factory setting 0

Set PiO2 39=1 (Enable detection of basking resistor at startup), then as soon as the hybrid servo drive is powered on, a checkup will be performed to know if the basking resistance is appropriate and if the basking resistor is vorking properly.

If the basing resistance is too small, the basing resistor could be an an open circuit or is not properly installed. The encroade < bro- will be displayed on the keypad.

If the braking resistance is smaller than the allowable minimum resistance or is on a short circuit, the enor

- code < brF > ar < acb\$> will be displayed on the keypad
- Pr0240 is the detected braking resistance

112 - 2 Contract the parameter protection with the password

Cantral mode

Settings 0-9999

Display 0-3 times of entering wrong password

Enter the password set at PiO2 22 into PiO2 21, and then the parameters will be unlocked for modifications. Write down the setting vale after you set up this parameter to avoid inconveniences.

Use PiO2 21 and PiO2 22 to prevent any unauthorized personnel to modify delete parameters.

If you forget the password, input 9999 and press ENIER, themepeat inputting 9999 and pressing ENIER to complete the decoding procedure (This procedure has to be done in 10 seconds, if you don't finish that in 10 seconds, repeat the same procedure until you finish the procedure in 10 seco.). Once you finish this decoding process, all the parameters will be back to the factory settings.

When setting up a password, all the parameters will be read as 0, except Pr02,22.

[] ? - ? ? Setup a parameter protection password

Cantral mode

Settings 0-9999

Display 0 No passward set or passward entered successfully in Pt02.21.

1: Parameters are locked

This parameter is forsetting up a password to protect parameters. When you finish setting up a password, keypad will display 1, which means the password protection is now effective.

Once you input the conect password into PrO2 21, the hybrid servo drive is temporarily unlocked To cancel the parameter protection, set PrO2 22=0. Once the parameter protection is cancelled, the hybrid servo drive is without password protection even after reboot.

Decode temporarily or cancel the password then you will be able to use keypad to copy parameters. But the password set at PrO3 22 will not be copied. When the parameters saved in the keypad are transferred to the

VFDVJC | 4 Description of Parameters

hybrid servo drive, you will need to set up a password at PrO2 22 to enable parameter protection

Pr02-22 Pr02-21 Pr02-21 When you finish setting up a password, keypad vill display 1 which means the password protection is now enabled Input 9000 and press ENTER, the mepeat inputing 9990 and pressing ENTER to complete the decoding procedure. (This procedure has to be done in10 sec If you don't finish that in 10 sec., repeat the same procedure until you finish the procedure until you finish the keypad vill display 01. If the 1st attempt is income the keypad vill display 02. Orce you finish this decoding process, all the parameters will be back to the factory settings. If the 4th attempt is still we the keypad vill display 03.
Whenyou finish setting up a password, keypad vill display 1 which means the password protection is now enabledInput 9999 and press ENTER, themepeat inputting 9999 and pressing ENTER to complete the decoding procedure. (This procedure has to be done in10 sec If you don't finish that in 110 sec., repeat the same procedure in10 secYou only have 3 password trials to enter the conect password.If the 1st attempt is income the keypad vill display 02.If the 1st attempt is income the keypad vill display 02.If the 3rd attempt is income proceedure in10 sec.If the 3rd attempt is income the keypad vill display 02.If the 3rd attempt is income the keypad vill display 03.If the 3rd attempt is income the keypad vill display 03.If the 3rd attempt is still we the keypad vill display 03.If the 3rd attempt is still we the keypad vill display 04.
After 3 failed logon attem the keypad will be locked Power off the motor drive and then re-power on to enter the password

OBDigital/Analog Input/Output Parameters

	Youcanset	this parameter during operation
03-00 Millifund	tioninput commend 3 (MB)	
()] - () / Millifund	tioninput commend 4 (M4)	
83-82 Millifund	tioninput commend 5 (M5)	
Control mode VF FO	CPG FOCPM	Factory setting 0
Settings	0 Nofunction	
	44 lijecionsignal i put	
	45 Confluence/Diversionsignal input	
	46 Reserved	
	47 : Mi lti level pressure PI command 1	
	48 Mili level pressue P1 command 2 51: Flowrate mode	
When the value of this	parameteris setas 44, the pressure feedbackis	lover than the pressure stable
region(please refer to	the description of Parameter 0026) so the flowo	antral will be performed When it
enters the pressure sta	able region, the pressure control will be performed	l
If the setting value is 4	5, the confluence (OFF)/diversion(ON) function v	vil be performed Fordetailed
operation, please refer	rtoChapter2fcrwinigandChapter3fcrtuning	
Newprotectionmecha	nismat versionC:: WhenPr0800~ Pr0802= 45	5, PiOI-OI is
automatically set as 2 a	ndPi08 15 is automatically, set as 1. This is a m	ed enis mtopevent
fagetting to set up rela	ated parameters and mistakes when setting up pa	ameters.
Please refer to the des	cciptionParameters 00 36 if the setting value is 4	7 and 48 ,
When the setting value commend is the flowor	e is 51 and when the pressure control mode is en command. The PI calculation is no longer required	abled (Pr00 09= 1), the speed
(;] - (;] Digital inp	utresponse time	
Cantral made VF FO	CPG FOCPM	Factory setting 0005
Settings	0001~30000sec	
This parameter is to de	http://www.configuration.configuration.configuration.com	
	eayancummuesgiauneuganpute	ninal
()] - () Y Digital inp	ut operation direction	mirel
Digital inp Control mode VF FO	utoperation direction CPG FOCPM	ninal Factory setting 0
Original implementation Original implementation Control mode VF FOR Settings	utoperation direction CPG FOCPM 0-65535	ninal Factorysetting O
Original implementation Digital implementation Control mode VF FOR Settings This parameter defines	ut operation direction CPG FOCPM 0-65535 s the activation level of the input signal	ninal Factory setting 0
Digital inp Control mode VF FOR Settings This parameter defines Bit Ofor the SON termination	ut operation direction CPG FOCPM 0-65535 s the activation level of the input signal inal, bit 2 for the EMG terminal, bit 3 for the RES t	ninal Factory setting 0 eminal, bits 4-6 conespond to
Digital inp Control mode VF FO Settings This parameter defines Bit Offer the SON termine MI3-MI5, respectively.	ut operation direction CPG FOCPM 0-65535 s the activation level of the input signal inal, bit 2 for the EMG terminal, bit 3 for the RES (Factory setting: 0
03-04 Digital inp Control mode VF Settings This parameter defines Bit Ofor the SON termine MI3-MI5, respectively	tion output 1 (Relay 1)	Factory setting 0
03-04 Digital inp Control mode VF Settings This parameter defines Bit O for the SON termine M3-M5, respectively 03-05 Milli-function Control mode VF FO	tion output 1 (Rekay 1)	Factory setting 0
03-04 Digital inp Control mode VF FO Settings Settings This parameter defines Bit O for the SON termine M3-M5, respectively 03-015 Midi-function Control mode VF FO 03-015 Midi-function Control mode VF FO M3-M5 Midi-function Control mode VF FO M3-M5 Midi-function Midi-function	tion Output 2 (MOI)	Factory setting 0
03-04 Digital input Control mode VF FO Settings Settings This parameter defines Bit O for the SON termines M3-M5; respectively 03-05 Multi-function Control mode VF FO 03-05 Multi-function Control mode VF FO 03-05 Multi-function Control mode VF FO	La peration direction CPG FOCPM 0-65535 s the activation level of the input signal inal, bit 2 for the EMG terminal, bit 3 for the RES (tion output 1 (Relay 1) CPG FOCPM tion Output 2 (MOI) CPG FOCPM	rinal Factory setting 0 eminal, bits 4-6 conespond to Factory setting 11 Factory setting 0
03-04 Digital input Control mode VF FO Settings Itis parameter defines Bit Offor the SON termine M3-M5; respectively 03-05 Midii-function Control mode VF FO 03-05 Midii-function Midii-function	La peration direction CPG FOCPM 0-65535 s the activation level of the input signal inal, bit 2 for the EMG terminal, bit 3 for the RES (fion output 1 (Relay 1) CPG FOCPM fion Output 2 (MOI) CPG FOCPM fion Output 3 (MO2)	Factory setting 0 Factory setting 11 Factory setting 0 Factory setting 11
03-04 Digital input Control mode VF FO Settings Settings This parameter defines Bit O for the SON termin M3-M5 respectively 03-015 Milli funct Control mode VF FO 03-015 Milli funct Control mode VF 03-015 Milli funct Control mode VF FO 03-017 Milli funct Control mode VF FO 03-017 Milli funct Control mode VF FO	La peration direction CPG FOCPM 0-65535 s the activation level of the input signal inal, bit 2 for the EMG terminal, bit 3 for the RES (tion output 1 (Relay 1) CPG FOCPM tion Output 2 (MOI) CPG FOCPM tion Output 3 (MO2) CPG FOCPM	Factory setting 0 Factory setting 11 Factory setting 0 Factory setting 0 Factory setting 0 Factory setting 0
03-04 Digital input Control mode VF Settings This parameter defines Bit O for the SON termin M3-M5; respectively 03-05 M1di function Control mode VF FO Settings	Licrocutput 1 (Rekry 1) CPG FOCPM 0-65535 s the activation level of the input signal inal, bit 2 for the EMG terminal, bit 3 for the RES (fion output 1 (Rekry 1) CPG FOCPM fion Output 2 (MOI) CPG FOCPM fion Output 3 (MO2) CPG FOCPM 0 Nofunction	rinal Factorysetting O Eminal, bits 4-6 conespond to Factory setting 11 Factory setting 0 Factory setting 0
03-04 Digital input Control mode VF FO Settings Settings This parameter defines Bit Ofor the SON termine M3-M5; respectively 03-05 Mildi-function Control mode VF FO 03-05 Mildi-function Control mode VF 03-05 Mildi-function Control mode VF FO 05-05 Mildi-function Control mode VF FO 05-05 Mildi-function Control mode VF FO 05-05 Mildi-function<	Licrocutput 1 (Relay 1) CPG FOCPM 0-65535 s the activation level of the input signal inal, bit 2 for the EMG terminal, bit 3 for the RES to ticnocutput 1 (Relay 1) CPG FOCPM ticnOutput 2 (MOI) CPG FOCPM ticnOutput 3 (MO2) CPG FOCPM 0 No function 1: Operation indication	rinal. Factorysetting O Factorysetting 11 Factorysetting O Factorysetting O

		ę	hybrid servo drive is ready	
		1	1: Encrindication	
		4	5 Motorfancontrol signal 18 December 20 polosso valeo control sio	
03-08	Milii fi	inclio	noutout direction	3 m
Control mode	e VF	FOCPO	FOCPM	Factory setting 0
	Settines	(-6535	
This par	aneteris	farbitv	ise setting. If the conesponding bit is	s 1. the milli-function output is set as reverse
direction	1		8 1 8	,
		_		_
83-88	Display	ylowj	ass filtering time on the ke	synad
Control mode	e VF	FOCPO	FOCPM	Factory setting 0100
	Settings	(1001~65535 seconds	
This pa	ameterh	elps to i	educe the fluctuation of the readings	ontre læypad
03-10	Mexim	uma	tput voltage for pressure fee	xback
Cantral made	e VF	FOCP	G FOCPM	Factory setting 100
	Settings	Ę	i0-100V	
83-11	Minim	mau	put vollage for pressure feed	doack .
Control mode	• VF	FOCPO	FOCPM	Factory setting 00
	Settings	(10-20V	
This par	aneterde	sines th	e pressure feedback output voltage.	
Ifthepa	essure fee	chac kł	as a bias, adjust this parameter to	eliminate the bias.
03-12	Ciner		e note nessue sensors	election
Control mode	VF	FOCPO	FOCPM	Factorysetting 1
	Settines	(Current mode (4mA~20mA)	
	Seal Br	1	: Voltage mode	
PS (Pre	essue Fe	edback	teminal: Add a current fed messure	e feedback (4-20m4)
The fol	ovingare	iequie	lwhenusing it:	
Switcht	the PS an	the IO	board to 'T' (factory setting is PS-V).	
Set Pi0	B 12 = 0(4	4-20m)	
Set Pi0	0 36=1 (E	Enable d	étection of the pressure feedback dis	scamedian)
			-	
03-13	Carflu	enceN	/aster/Slave Selection	
Cantral made	• VF	FOCPO	FOCPM	Factory setting 0
	Settings	(Nofunction	
		1	: Master 1	
		2	SlaveMaster 2	
		3	Slave/Mester 3	
Inastar	ndakmes	setom t	his narameteris set as 0	
	-	youchti (

Withmulti-function input terminal function 45, the confluence/diversion can be configured. For detailed

operation, please refer to Chapter 2 for wining and Chapter 3 for tuning. The difference between Master 2 and Master 3 is that the Master 3 can be configured as confluent with other Slaves during confluence, however, the Master 2 can be configured for stand alone operation

113 - 14 The ration between slave's flow and master's flow

Control mode VF FOCPG FOCPM	Factory setting 1000		
Settings 00-65535%			
This parameter setting is required only for the Master but not needed for the Slave.			
In a confluence system, this parameter value defines the Slave's portion of the Master's flow			
Example: Slave is 60L/min and Master is 40L/min, so the setting is 60/40* 100% = 150%			

For confluence of more than 2 pump, the values for the slaves must be the same. For example, if the total flowfor a three pump system is 200L/min, where the Master is 40L/min, then the two Slaves should be 80L/min. The setting of Parameter 08 14 should be 160/40 = 400%

[]] - [] Souce of fiequency command	
Control mode VF FOCPG FOCPM	Factory setting 0
Settings O Digital Keypad	
1: RS485Commication	
2-5 Reserved	
6 CANopen	

In a confluence system, if the Slave's frequency command is given through the RS485 communication, the setting value should be 1.

[]] - | [] Limit for the Slave reverse depressurization to que

Control mode VF FOCPG FOCPM	Factory setting 0
Settings 0-500%	
Set the tage limit for the Slave's reverse operation	
[]] -] Slave's activation level	
Cantral mode VF FOCPG FOCPM	Factory setting 50

Settings 0-100%

This parameter setting is required only for the Master but not needed for the Slave.

This parameter determines the activation level for the Slave. A 100% value conesponds to the full flow of the Master

{}}- ;
Reserved

{} }- {} Reserved

[] 3 - 2 [] Startup display selection

 Settings
 O F (fiequency command)

 1: H(actual fiequency)

 2: Mili-function display (user defined Pr0004)

 3: A(Output current)

This parameter is to set up the contents of the start up screen. The content of the user defined option is displayed in accordance with the setting value of Parameter 00.04.

[]] - ? / Slave reverse running for depressurization

Control mode VF FOCPG FOCPM

Settings O Disable 1: Enable 2: Reserved Factory setting 0

This parameter setting is required only for the Slave but not needed for the Master

When the parameter is set as 1, make sure that the outlet end of the Slave is not installed with any one way

valve and the parameter 08 16 is set as 500 The maximum evense running speed is determined by

Pi0028Depressurizationspeed

[] - 2 2 Slave closing level

Factory setting 400

Settings 0-400Bar

Set up this parameter firma Master. The slave pump(s) will be shut down when the master pump detects the pressure higher than the setting value at this parameter. The slave pump(s) will resume to run after the hybrid servo drive goes into stand by:

Factory setting 0

O4Communication Parameters

You can set this parameter during operation

The communication port is defined as shown in the figure on the right. We recommend using Delta IFD6500 or IFD6530 as your communication converter between the hybrid servo drive and your computer. See wining dagram in ChO2 to know the position of this communication port



() 4 - () () COML Communication Address

FactorySetting 1

Settings 1~254

If the hybrid servo dive is controlled by RS-485 serial communication, the communication address for this dive must be set via this parameter and each hybrid servo dive's communication address must be different.

() \ - () | COML Transmission Speed

FactorySetting 192

Settings 48-1152Khps

This parameter is for setting up the transmission speed of computer and the hybrid servo drive Please set 48 Khps, 96 Khps, 192 Khps, 384 Khps, 57.6 Khps, or 1152 Khps. Otherwise the transmission speed will be replaced by 192 Khps.

04-02 COM Transmission Fault Treatment

FactorySetting 3

Settings 0 Warnand keep operation

- 1: Wanandramptostop
- 2: Wamand coast to stop
- 3 Novaning and continue operation

This parameteris to set the response to the transmission encus such as a discorrection

() 4 - ()] COMI Time-aut Detection

FactorySetting 00

Settings 00-1000sec.

Use this parameter to set the communication transmission time-out

Image: Protocol COMI Communication Protocol

- Settings () 7, N, 1 for ASCII
 - 1) 7, N, 2fcrASCII
 - 2) 7, E, 1 for ASCII
 - 3) 7, 0, 1 for ASCII
 - 4) 7, E, 2forASCI

FactorySetting 13

5) 7, 0, 2 for ASCII
6) 8, N, 1 for ASCII
7) 8, N, 2farASCII
8) 8, E, 1 for ASCII
9) 8, 0, 1 for ASCII
10) 8, E 2.forASCII
11) 8, 0, 2 for ASCII)
12) 8, N, 1 for RIU)
13) 8, N, 2 for RIU
14) 8, E, 1 for RIU
15) 8, 0, 1 for RIU
16) 8, E, 2 for RIU
17) 8, 0, 2 for RIU

Control by PC (Computer Link)

When using RS-485 serial communication interface, each drive must be pre-specified its communication address in Pr 0900) the computer can implement control according to their individual address. MODBUS ASCII (American Standard Code for Information Interchange): Each byte data is the combination of two ASCII characters. For example, a 1-byte data 64 Hex, shown as '64' in ASCII, consists of '6 (36 Hex) and '4 (34 Hex).

1. Code Description

Communication protocol is in hexadecimal, ASCIE '0' ... '9', 'A'' ... 'F', every 16 hexadecimal represent ASCII code. For example:

Character	'O	'1'	'Z	' 3	'4	'5	6	'7
ASCII code	30H	31H	32H	33H	34H	35H	36H	37H
Character	'8	'9	'A '	B	'C '	Ð	E	F
ASCILcode	38H	39H	41H	42H	43H	44 H	45 H	46H

2 Data Format

10 bit character fiame (For ASCII):

(7, N, 2)



(7, E, 1)



(7, Q, 1)



11-bit character fiame (For RIU):

(8 N 2)



(8, E, 1)



(8, Q, 1)



3 Communication Protocol

Comunication Data Frame

ASCII mode:

STX	Startchracter = ':'(34H)
Addess Hi	Communication address:
Address Lo	8 bit address consists of 2 ASCII codes
FunctionHi	Canmendeade
FurctionLo	8 bit commend consists of 2 ASCII codes
DAIA (n 1)	Contents of data
••••	Nx8bitdata consist of 2nASCII codes
DATAO	N 16 maximum of 32 ASCII codes (20 sets of data)
IRC CHKH	LRC checksum
IRC CHKLo	8 bit check sum consists of 2 ASCII codes
ENDH	Endcharacters
ENDLO	ENDH = CR (CDH), ENDLo = LF (CAH)

RIUmde

START	Asilent interval of more than 10 ms	
Address	Comunication address: 8 bit address	
Function	Connandcode Shitconnand	
DAIA (n 1)		
	Ny Shirdata n 16	
DATAO		
CRC CHKLow	CRC checksum	
CRC CHKHigh	16 bit check sum consists of 28 bit characters	
END	Asilent interval of more than 10 ms	

CommicationAddress (Address)

00H broadcast to all hybrid servo drives

01H hybrid servo drive of address 01

OFH hybrid servo dive of address 15

10H hybrid servo drive of address 16

FEH Hybrid servo dive of address 254

Function code (Function) and DATA (Data characters)

03H read data ficmregister

OGH write single register

:

Example reading continuous 2 data firmnegister address 2102H AVD address is 01H

ASCIInce

CommandMessage		Response Message		
STX	6 . 9	STX	، ,	
Addama	6 1 1 1	Addage	O	
Address	'1'	Addess	'1'	
E	'O	Ei wardiowa	'O	
FUELUET	'3	FURCHI	'3	
	'2	Numberofregister	'O	
Stration motors	'1'	(count by byte)	'4	
Sauglegser	'O		'1'	
	'2	Content of starting	'7	
	'O	register 2102H	'7	
Numberofiegister	'O		'O	
(cantbywad)	'O		'O	
	'2	Content of moiston 2102LI	'O	
IPC Chode	Ð		'O	
INCLER	'7		'O	
END	CR	IBC Check	'7	
	IF		'1'	
			CR	
			IF	

RIUnode

Command Message:		Response Message		
Address	OIH	Address	OIH	
Function	OBH	Function	OBH	
	21H	Nurberofiegister	M I	
Statung data tegster	OZH	(count by byte)	U	
Numberofiegister	OCH	Content of register	17H	
(court by work)	OZH	address 2102H	ЯH	
CRC CHKLow	6FH	Content of register	Ю	
CRC CHKHigh	F7H	address 2103H	OCH	
		CRC CHKLow	Reh	
		CRC CHKHigh	5CH	

06H single write, write single data to register

Example: witting data 6000 (1770H) to register 0100H AMD address is 01H

ASCII mode:

Command Message:		Response Message		
SIX	، ب	SIX	، ب	
Address	'O		'O	
	'1'	ALLIESS	'1'	
The most former	'O		'O	
Función	'6	FULUII	'6	
	'O		'O	
Transform	'1'	Trent and the	'1'	
Rigeriegsler	'O	Lagenegser	'O	
	'O		'O	
	'1'	Destances	'1'	
Decisions	"7		"7	
Negstercoment	"7	Negsterconten	"7	
	'O		'O	
IDC Cheeds	"7	IDC Clearly	"7	
	'1'	INCURK	'1'	
END	CR		CR	
END	IF	END	IF	

RIUnode

ConnerdMes	Command Message:		sage
Achiess	OIH	Acchess	OIH
Function	06H	Function	OGH
Townshing Sectors	OIH	Tagetregister	O1H
Lageliegster	COH		OCH
Desistancestast	17H	Bootstoneoutrat	17H
Negster content	7 H	Negsiercuner	70H
CRC CHKLOW	86H	CRC CHKLow	86H
CRC CHK High	22H	CRC CHKHigh	22H

10H write multiple registers (write multiple data to registers) (at most 20 sets of data can be written simultaneously)

Example: Set the multi-stage speed of hybrid servo drive (address is OIH):

Pr 0400= 5000(13891), Pr 0401 = 4000(0FA01)

ASCII Mode

Command Message:		Response Message		
SIX	6 ,9	SIX	، • •	
ADR 1	'O	ADR 1	'O	
ADRO	'1'	ADRO	'1'	
CMD1	'1'	CMD1	'1'	
CMDO	'O	CMDO	'O	
	'O		'O	
	'5		'5	
lagenegser	'O		'O	
	'O		'O	
	'O		'O	
Numberofiegister	'O	Numberofiegister	'O	
(cantbyvad)	'O	(cautbyvad)	'O	
	'2		' 2	
Numberofiegister	'O		E	
(count by Byte)	'4		'8	
	'1'	END	CR	
	'3		IF	
	'8	· · ·		
	'8			
	'O			
T	F			
	'A'			
	'O			
	'9			
LKC Check	'A '			
	CR	1		

RIUmde

END

Commend Message:		Response Mess	age
ADR	OIH	ADR	OIH
CMD	1 CH	CMD1	10H
Therestown	O5H	Thursday	05H
lageliegser	Ю	lagelegser	COH
Numberofiegister	Ю	Numberofiegister	COH
(Cantbyvad)	OZH	(Cartbywad)	02H
Quantity of data (Byte)	04	CRC CheckLow	41H
The first data content	13H	CRC Check High	0#H
	89 H		
The coord data contact	OFH		
The second cata content	ACH		
CRC CheckLow	'9		
CRC CheckHigh	'A'		

IF

Checksum

ASCIIncde

LRC (Longiturinal Redundancy Check) is calculated by summing up module 256 and the values of the bytes fiomADR1 to last data character then calculating the hexadecimal representation of the 2s complement regation of the sum Forexample

01H+ 03H+ 21H+ 02H+ 00H+ 02H= 29H, the 2s-complement regation of 29H is <u>D7</u>H

RIUnde

CRC (Cyclical Redundancy Check) is calculated by the following steps:

Step 1: Load a 16 bit register (called CRC register) with FFFFH

Step 2: Exclusive OR the first 8 bit byte of the command message with the loworder byte of the 16 bit CRC register; putting the result in the CRC register:

Step 3 Examine the ISB of CRC register

- Step 4 If the LSB of CRC register is () shift the CRC register one bit to the right with MSB zero filling then repeat step 3 If the LSB of CRC register is 1, shift the CRC register one bit to the right with MSB zero filling Exclusive OR the CRC register with the polynomial value A001H, then repeat step 3
- Step 5 Repeat step 3 and 4 until eight shifts have been performed. When this is done, a complete 8 bit byte will be processed.
- Step 8 Repeat step 2 to 5 for the next 8 bit byte of the command message. Continue doing this until all bytes are processed. The final contents of the CRC register are the CRC value. When transmitting the CRC value in the message, the upper and lower bytes of the CRC value must be swapped, i.e. the lower order byte will be transmitted first.

The following is an example of CRC generation using C language. The function takes two arguments:

Unsigned char* data a pointer to the message buffer

Unsigned charlength the quantity of bytes in the message buffer

The function returns the CRC value as a type of unsigned integer

Unsigned int ac_cht(unsigned char* data, unsigned charlength)

{

}

```
intj
unsigned intneg_ac=CMIII;
vhile(length-){
    neg_acc^= *data++;
    fu(j=Qj<8j++){
        if(neg_acc &OAOI){ /* ISB(bO)=1 */
            reg_acc=(neg_acc>>1) ^OKaOOI;
        }else{
            reg_acc=neg_acc>>1;
        }
    }
returneg_ac; //returnegisterCRC
```

4 Ackless list

Content	Register	Function	
Hybridservodive	GGmH	GG means parameter group mmeans parameter number; for	
paanees Community of a	900011	example, u	e access of PT 0401 is 0401H
Connartiwile only	AUUH		
			10B Dup
			11B Frahle ICC
		h#3.2	Reserved
		ht 5-4	(CR Nofimion
			OIB FWD
			10B REV
			11B: Charge direction
		bit 14~13	OB: Nofunction
			OIB: Operated by digital keypad
			10B: Operated by Pi0021
			11B: Charge source of operation command
		bit 15	Reserved
	2001H	Frequency	comment(SetPi0006=0) Input XXXXXHz)
	2002H	bito	1: EF (external fault) on
		bit 1	1: Reset
		bit 2	1: BBON
<u> </u>		bit 15-3	Reserved
Status montoriead	2100H	Hghbyte:	
aiy	21011	LOWDye: I	Libridson a china constitutation status
		bit 1~0	MB Drip stors
			OIR Drive decelerating
			10B Divestariby
			11B: Drive in operation
		bit 2	1: Reserved
		bit4-3	Operation direction
			COB: FWDrun
			01B: FramREV runtoFWD run
			10B: FramFWDruntoREV run
			11B REV nn
		bit 8	1: Masterilequency controlled by communication
			1. Metanting provortal of hyperplaysing on
		bit9	estendin temink
			1: Operation commend controlled by communication
		bit 10	interface
		bit 11	1: Parameterlocked
		bit 12~15	Reserved
	2102H	Frequency	command(XXXXXHz)
	2103H	Outputfieq	pency (XXXXXHz)
	2104H	Output cun	ent (XXXXA).
	2105H	DC BLS w	llage (XXXXV)
	2106H	Output volt	age (XXXXV)
	2107H	Reserved	
		Keserved	
			andisplay (Proces)
		Displayou	pecunere (A)
	2202LI		t first rates/(XXX XX LL-)
	2202LI	DC.RI K	
	2204H	O for t volk	
	2205H	Powerand	
22044 Displays		Displayact	ual motor speed l&W of U. V. W(XXXXX l&N)
	000	Displaymo	tarspeed in prestingted by the dive are noder
	2407H	feedback(2	
	220 9 H	dive (100	nive / regaine cupul laighe in % estimated by the motor positive talque, -00 negative talque) (XXXX%)

Content	Register	Function
		(Pr0004#8)
	2209H	Display PG feedback (Pr: 0004 #9)
	220AH	Reserved
	220EH	Display the signal value of the analog input terminal PS with 4, 20 mJ/O, 10V merced to 0, 100%
	220CH	Display the signal value of the analog input terminal PI with 0-10V named to 0-100%
	220DH	Display the signal value of the analog input terminal AUI with - 10- 10V mapped to- 100- 100%
	220EH	Display the temperature of the power module IGBT (XXXX°C)
	220FH	Display the temperature of the power capacitor (XXXX°C)
	2210H	Display the status of digital input (ON/OFF)
	2211H	Display the status of digital output (ON/OFF)
	2212H	Reserved
	2213H	The conesponding CPU pinstatus of digital input (d)
	2214H	The conesponding CPU pin status of digital output (Q)
	2215H	Reserved
	2216H	Reserved
	2217H	Reserved
	2218H	Reserved
	2219H	Display the signal value of the analog input terminal QI with 0-10V mapped to 0-100%
	221AH	Display the actual pressure value (XXXXBar)
	221BH	Display the KMh value (XXXX KMh)
	221CH	Display the motor temperature (XXXX°C)
	221DH	Overload rate of hybrid servo drive (XXXX%)
	221EH	Overload ate of motor with last digit A of HES (XXXX%)
	221FH	Display cunert at baking (XXXA)
	2220H	Display temperature of the basis g chopper (XXXX°C)

5 Exception response

When drive is doing communication connection, if an encroccuts drive will respond the encroced and set the highest bit (bit 7) of code to 1 (function code AND 80H) themespanse to control system to know that an encroccuted

If keypad displays "CE-XX" as a varing message, "XX" is the encroade at that time. Please refer to the meaning of encroade in communication encoder for reference.

Example

ASCII mode:		RIUnode	
STX	د و؟	Acthess	OIH
A.11	'O	Function	86H
Addess	'1 '	Exceptioncode	OZH
F	'8	CRC CHKLow	СЗН
Function	'6	CRC CHKHigh	A1H
	'O		
Exceptioncode	'2		
	'7		
	'7		
	CR		
END	IF		

The explanation of exception codes:

Exceptioncode	Explanation
1	Function code is not supported or unecognized
2	Address is not supported or unecognized
3	Data is not conect or unecognized
4	Fail to execute this function code

114 - 115 Delay Time of Communication Response

FactorySetting 20

Settings 00-2000ms

This parameter is the response delay time after hybrid servo drive receives communication command as

shownin the following



114 - 115 Main Frequency of the Communication

Factory Setting 6000

Settings 000-59900Hz

When Pr 00 20 is set to 1 (RS-485 communication). The hybrid servo dive will save the last frequency command at Pr04 06 when abnormal turn off or momentary power loss.

After reboding the power, if no new fiequency command is given, the hybrid servo drive will continue to run by using the frequency set at Pr0406

04-07	BlockTiansfer 1
84-88	BlockTransfer 2
84-89	BlockTiansfer3
84-18	BlockTransfer4
04-11	BlockTransfer 5
84-12	BlockTransfer6
84-13	BlockTransfer 7
84-14	BlockTransfer8
84-15	BlockTransfer9
84-18	BlockTransfer 10
	Factory Setting 000

Settings 000-65535

There is a group of block transfer parameter available in the hybrid serve drive (Pr04-07 to Pr04-16). Through communication code 03H, you can use them (Pr04-07 to Pr04-1626) to save those parameters that you want to read

84-17	CANquer	nSlave Achiess	
			FactorySetting 0
Sa	Sottings	0 Disable	
	scuigs	1~127	
84-18	CANoper	Speed	
			Factory Setting 0
	Settings	0) 1 Mps	
		1) 500kbps	
		2) 250 kbps	
		3) 125 kbps	
		4) 100 kbps (Delta only)	
		5) 50kbps	
84-19	CANoper	WaringRecord	
			Factory Setting 0
	Settings	bit O CANopensoftware disconnection 1 (CANopen	Guarding Time out)
		bit 1: CANopensoftware disconnection 2(CANopen	Heartbeat Time out)
		bit 2 CANopenSYNC time out	
		bit 3 CANopenSDO time out	
		bit 4 CANopenSDO buffer overflow	
		bit 5 CANopenhadware disconnection warring (Ca	mBus Off)
		bit 6 Encrypolocal of CANopen	
		bit 8 The setting values of CAN open indexes fail.	
		bit 9 The setting value of CAN open address fails.	
		bit10 The checksumvalue of CANopen indexes fail	

84-28	CANquer	n Decoding Method	
			Factory Setting 1
	Settings	0 Delta defined decoding method	
		1: CANopenStandard DS402 protocol	
84-21	CANquer	nCommunicationStatus	
			Factory Setting Read Only
	Settings	0 Node ResetState	
		1: ComResetState	
		2 BootupState	
		3 Pre Operation State	
		4 OperationState	
		5 StopState	
04-22	CANope	n Control Status	

Settings O Not ready for use state

- **1: Inhibit start state**
- 2 Ready to switch on state
- 3 Switched on state
- 4 Enable operation state
- 7. Quickstop active state
- 13 Encreactionactivationstate
- **14: Encrstate**

[]4-23 Reserved

*Q***4-***Q***4 Commitation Decoding Method**

FactorySetting 1

Factory Setting Read Only

Settings 0 Decoding method 1

1: Decoding method 2

		Decoding Method 1	Decoding Method 2	
Sauce of	Digital Keypad	Digital keypad controls the drive action regardless decoding method 1 or 2		
	External Terminal	External terminal controls the drive action regardless decoding method 1 or 2		
Control	RS-485	Refer to address: 2000h-20FFh	Refer to address: 6000h~ 60FFh	
	CANquen	Refer to index 202001h-2020FFh	Refer to index 2080 01h~ 2080 FFh	

5 Methods of Anomaly Diagnosis

- 51) Unsual signal
- 52) Overcurent (cc)
- 53 Gaundfault (GFF)
- 54) Overvollage (ov)
- 55) Lowvoltage (Lv)
- **56 Overheat (OHI)**
- 57) Overload (OL)
- 58) Phase loss in pover supply (PHI)
- 59 Hybrid servo dive overloading while running at lowfrequency (oL3)
- 510) Resolution for electromagnetic noise and induction noise
- 5 11) Environment and facilities for installation

The hybrid servo drive is capable of displaying varning messages such as overvoltage, low voltage, and overcurrent and equipped with the protection function. Once any malfunction occurs, the protection function will be enabled and the hybrid servo drive will stops its input, followed by the action of the anomaly connection point and stopping of the servo oil pump. Please refer to the cause and resolution that corresponds to the enormessage displayed by the hybrid servo drive for troubleshooting. The enormecord will be stored in the internal memory of the hybrid servo drive (up to the last six enormessages) and can be read by the digital leypad or communication through parametric readout.



Upon the occurrence of anomaly, wait for five seconds after the anomaly is resolved

before pressing the RESET key

Verify that the power indicator is off before opening the machine cover and starting the inspection

51Unsual Signal 51-1 Indicator Display



- 1) PowerIndicator
- 2) EncoderFeedbackIndicator
- 3) EncoderFeedbackWarningIndicator
- 4) Brake Indicator



Here are two images of KPVJ LEO2 displaying unusual signals. On the left, it shows the number of the unusual signals. On the right, it shows the name of the unusual signal. The KPVJ LEO2 switches automatically back and forth between these two ways of displaying the unusual signal.

<E> = Enor, press the RESET ley to clear the enor

- <F> = Fault, power off the hybrid servo drive, wait for 3 minutes before you repower on the servo drive
- <A> = Alam

The LINE VFD online assistant is now available. To learn about the unusual signals, scan the QR code below (The wechat assistant is under construction)



51-2 EnorMessages Displayed on Digital Operation Panel KPVJ LEO2

Display	DirectoryCords	Fault	The blocked
Code	Depaycole	Description	licutesroong
E1	oc 8	Overcunent occuss in acceleration, output cunent exceeds by thee times the rated cunent of the dive (ocA)	 Checkif the insulation of the wire from U-V-W to the hybrid servomotor is bad Checkif the hybrid servomotor is stalled Suchenous occur when the red light of PG card flashes. The causes of these enous could be loose contact/disconnection between carrying write when the red writer
E2	ocd	Overconent occuss in deceleration, output conent exceeds by the times the nated conent of the drive. (ocd)	 4 Whensuchenous occuratile beginning during or at the end of pressure/flow command Adjust also the nampup/down ate of pressure/flow command (PrOD 29 to PrOD 32) or Adjust the pressure/flow reference time (PrOD 46-PrOD 49) or Adjust the show from the label standard time
E3	000	Overconent accus duing constant speed Output conent exceeds by thee times the rated conent of the dive (ocr)	 Adjust the slope from the hybrid servo drive. When such encors occur while pressure/flow command is constant, adjust PI value (Pr00 20~ Pr00 25) Make sure if there is any disturbance/moise, set Pr00 04 # (Pressure feedback), #12(Pressure command), 25 (flow command). Then observe if the values fluctuate. Replace the hybrid servo drive with a larger output capacity model.
E4	575	Ground failt: Ground wire protection applies when one of the output terminal is ground current is higher than its rated value by over 80% Note that this protection is only for hybrid servo drive and not for human (GFF)	 Creck the vice of hybrid servon otor is shorted or grounded Creck if IGBT power module is damaged Creck if the output side vice has bad insulation
E5	<u> </u>	KBT shot circuit between upper and lower bridge. (ccc)	Short-circuit is detected between the upper and lower bridge of the IGBT module. Check the motor wining. Cycle the power, if occ still exists, return to the factory for repair.
E6	ocS	Over cunent or hadware failure in cunent detection at Stop (ocs)	Sendbacktommufactuerforiepeir
Display		Fault	
------------	--------------	--	---
Code	Display Code	Description	Ticubleshooting
E7	008	DC BUS over voltage during acceleration (ovA)	230V: DC 4115V : 460V: DC 830V
E8	oud	DC BUS over voltage during deceleration (ovd)	 Checkif the input voltage is within the range of voltage rating of Hybrid Servo Drive and monitor for any occurrence of suge voltage. The issue can be resolved by adjusting the software brake
E9	OυΛ	DC BUS over voltage at constant speed (ovr)	action level in PrO200 3 When such encroccuned at the beginning during crat the end of the pressure/flow command, adjust PrO029~PrO32 <rampup command="" down="" flow="" of="" pressure="" rate=""> or PrO046 ~PrO049 < Pressure/flow reference S1/S2 time></rampup>
E10	ouS	Overvollage occus atstop and hadvae falue. (ovS)	Checkif the input voltage is within the range of voltage rating of hybrid servo drive and monitor for any occurrence of surge voltage.
E11	108	DC bus voltage is lower than the setting at PiO2 07 during acceleration (LvA)	
E12	لاسط	DC hus voltage is lower than the setting in PrO2 07 during deceleration (Lvd)	 Checkif the voltage of input power is normal Checkif there is any surblen heavy load Adjust the low voltage level in PrO2 07. Lynoften occurs when the motor drive has a power failure
E13	Lun	DC bus voltage is lowerthanthe setting at PtO2:07 when running at constant speed (Lw)	while the operating signals are still being sent.
E14	LuS	DC bus vollage is lowerthanthe setting at P102:07 at stop (LxS)	
E15		Phase loss protection (PHL)	Checkif only single phase power is sent or phase los occus for three phase models
E16	o X	IGBI's temperature exceeds the protection level (oHI)	 Check if ambient temperature is too high Checkif there is any foreign object on the heat sink and if the fan is running Checkif there is sufficient space for air circulation for Hybrid Servo Drive

Display	Display Code	Fault	Traubleshooting
Code	•••	Description	
E17	045	Capacitors' temperature exceeds the protection level) (oH2)	 Checkif ambient temperature is too high Checkif there is any foreign dject on the heat sink and if the famis running Checkif there is sufficient space for air circulation for hybrid servo drive
E18	2X 10	Hadvae fal ue (fHlo)	Sendbacktomanufactuerforiepair
E19	682o	Hadvae falue (1-Ro)	Sendbacktomentfactuerfortepeir
E20	oXF	IGBT overheated and cooling fan failure (oHF)	Check the fan kit to see if it is blocked Return to factory for repair
F21	οĹ	The hybrid motor drive detects excessive output cunent (cI)	 Checkif the hybrid servo motor is stalled Replace the hybrid servo drive with a larger output capacity model Set Prop 04=29, observe if the value returns to zero after every molding cycle. If the number accumulates to 100, OL occurs The causes of this enorcould be loose contact/ discorrection between encoder, servo drive and the motor. This enoralso occurs when a motor or an oil pump is stalled which make unusual rotating speed and overcurrent.
F22	Eol 1	Servonator overload (FoL1)	 Set Pr0004=30 (v206 and above), observe if the value returns to zero after every molding cycle. If the number accumulates to 100, EoLoccus. Change the molding conditions. Replace with the hybrid servo drive with a larger output capacity model. If the pressure -flow is too high during the blending such enor occus easily. To clear this enory decrease the pressure commend and the flow command.
E24	o X 3	(02:09PIC leve) Overheating inside the motor dive detected by hybrid servo drive, exceeding the protection level (Pr02:09PIC leve) (oHB).	 Checkif the motor drive is blocked Checkif the ambient temperature is too high Increase the capacity of the motor drive.
E30	c	Encron memory wite-in(cF1)	Piess RESET leyto ietum all parameters to factory default values If the above does not work, send back to manufacturer for repair

Display	Dialas - Cal	Fait	
Code	Display Code	Description	licubleshooting
	<u> </u>	Encronmentay	
ESI	CrC	readout(cF2	
		Detection of	
	ា	abromal output of	
F32	COU	thee phase total	
		anert(al)	
		Detection of	
F33	641	abromal curent in	Tumoff the pover and restart. If the same problem persists, send
		phase U (cdi)	backtomenufacturerforrepair
		Detection of	
F34	667	abromal cunert in	
		phase V (cd2)	
		Detection of	
F35	CŐĴ	abromal current in phase W(cdB)	
		Campanent	
F36	- HAÜ	detectionencr	
		(HH)	
		Overament	
F37	ngi	(Hill)	
		Overvoltage	Tunoff the power and restart. If the same problem persists, send back to man facture for repair
F38	825	detectionencr	
		(HH2)	
		Gandanent	
F39	883	detectionencr	
		(HH3)	
E		Autotuningenar	1. Checkif the wining of the motor is conect.
F AU	nuc	(ALE)	2 Checkif the motor's parameter settings are conect.
F4 0	OFC I	PG feedbackenor	The actual rotating speed doesn't followspeed commend and the observations because a second leafing area, devisible (1.20
Lak	rur i	(PGF1)	is not equal to zero and check PG feedback wing
E4O	0660	PG feedbackloss	Checkthe BC foodbackwing it on idle an averagin it
E43	rurc	(PGF2)	
		Stalled PG feedback (the	1. Checkthe PG feedbackwining
		actual rotating	2 Checkif PI gain and the settings for acceleration / deceleration
	nrra	speed is 115% faster than the	are suitable.
E44	7073	meximumspeed	3 Creckif there's an output phase loss.
		time longer than	The causes of these encus could be base contact/ discorrection
		are second)	betweenencoder, hybrid servo motor dive and motor (OC might

Display Code	Display Code	Fault Description	Traubleshooting
E45	рсгч	PG s i penor (PGF4)	 Checkif the connection between all pump and motor is stuck Send back to manufacture for repair
E49	88	Whenexternal terminals EF are closed, Hybrid servodrive stops its output (EF)	Tioubleshoot and piess 'RESEI'
E50	8F ;	Whenestemal EMG terminal is not connected to the heating switch of hybrid servo motor or the motor is overheated (130 °C), hybrid servo drive stops its input (EF1)	Ticubleshoot and press 'RESEI''
F52	Pcod	Password is locked after thee attempts (Pcod)	Shutdown the servo dive, wait for certain time. Make sue that the power indicator is off. (22kW. wait for 5 min after shut down, 30kW. wait for 10 min after shut down). Them estat the servo dive and enter the right password
F53	ccod	CPU failt (cccd)	Sendback to manufactuer for repair
E54	c E 1	llegal conmand (cE1)	Verify if the communication command is contect (Communication code must be 08, 06, 10)
E55	c E 2	llegal data address (cE2)	Verify if the communication data length is conect.
E56	c E 3	llegal data value (cE3)	Verify if the data value is bigger than the maximum or smaller than the minimum value.
E57	cE4	Data is written to read-only address (cE4)	Verify if the communication address is conrect.
E58	cE 10	Malus tansnission tine-a.t.(Œ10)	Verify the wining and grounding of the communication circuit. Press RESET button on the keyped to clear this encroade. If cE10 pensists, send back to manufacturer for repair.
E60	68	Brake transistor enor(bF)	Piess RESET button on the keypad to clear this encroode. If bF peisists, send back to manufacturer for repair
E65	<i>PGFS</i>	Hadwae encrof PG cad (PGF5)	- Sendbacktomenufacturerforrepair
E66	008	Overpressure	 Checkif the pressure sensor is varking properly and if its specification is conrect Adjust pressure PI control Pr00 20-00 37 Checkif the wing of pressure sensor is conrect

VFDVJ-C | 5 Methods of Anomaly Diagnosis

Display Code	Display Code	Fault Description	Traubleshooting
			4. Check the position of SW100 dipswitch (current type or open collector) on the control board if correct
F67	<i>PF</i> b <i>F</i>	Piessue feedback encr(PfbF)	 Checkif the wining of pressure sensor is conect. It could be open circuit. Checkif the pressure sensor signal is below 1V.
E68	PrEu	Oil pumpiturs reversely (Prev)	 Creckif there's any zero shift at the pressue sensor Creckif the wing of pressue sensor is conect
E89	noīl	Oil shortage (noil)	 Check the amount of oil in the oil tank Check if any leakage at hydraulic circuit If there's a suction filter installed at the oil inlet, check if that suction filter is blocked up
E70		Business hours end. (tUP)	Sendbacktomanufactuerforrepair
E71	oc b S	Overcunent at baking chopper (ocbs)	 Checkif the basking choppen is short-circuit? Is the resistance value toosmall? Send back to manufacture for repair
F72	bro	Brahing resistor is openciacuit (bro)	Checkif the baking resistor is open circuit or properly wied?
F73	brF	Baking resistor's resistance value is toosmall (hrF)	Checkif the resistance value big enough?
E74	oH4	Baking chapper overheated (oF4)	 Checkif there are too many times of deceleration and pressure releasing during formation period? Modify formation period
E75	6440	Encrocuned on baking chopper's themo protection line (tH1o)	Sendbacktomandactuerforiepär
E 82	oPL I	Output Phase Loss an Phase U (aPL1)	 Creckif the wining of motor to see if any loose or broken wires. Creckif the resistance of each phase is the same.
E8 3	oPL2	Output Phase Loss an Phase V (aPL <i>2</i>)	3 Use an an peremeter to measure if the 3 phase current is in balance. If this encreade still paps up when it is in balance,
E84	oPL3	Output Phase Loss on Phase W(oPL3)	sendback to manufactuer for repair: 4. Choose a motor and a servo dive which are compatible with each other:
E87		Servodive overloading while numing at low fiequency (ol.3)	 Reduce the ambient temperature of the operating drive. Replace the drive with a larger power model. Reset drive parameters or decrease canier frequency. Send back to the manufacturer for repair if none of the above works.

Display Code	Display Code	Fault Description	Traubleshooting
E101	ССаЕ	Software encr 1 occurred on CANopen (CGdE) (CANopen guading encr)	 Increase grading time (Index 1000). Check the communication wing and grounding 90 degrees wing layout or separation from main circuit is suggested to prevent interference. Make sure the communication wing is serial. Use dedicated CAN open cable and install terminating resistor. Check the status of communication cable or change new cable.
E102	ЕНЬЕ	Software encr2 occurred on CANopen (CHbE) (CANopen heartbeat encr)	 Increase Heart beat time (Index 1016). Check the communication wining and grounding 90 degrees wining layout or separation from main circuit is suggested to prevent interference. Melle sure the communication wining is serial. Use dedicated CAN open cable and install terminating resistor. Check the status of communication cable or change new cable.
E104	[bfE	Hadvae enor occuned on CANopen (ChFE) (CANopenbas off enor)	 Reinstall CANopencard Check the communication wining and grounding 90 degrees wining layout or separation from main circuit is suggested to prevent interference. Make sure the communication wining is serial. Use dedicated CANopencable and install terminating resistor. Check the status of communication cable or change new cable.
E105	EI dE	Intexsetting enor occuned on CANopen (CHE) (CANopen intex enor)	Reset CANopen Index(Pi0002=7)
E106	EAGE	Slave #setting encroccured on CANopen(CACE)	Disable CANoper(Pr04 17=0) Reset CANopen (Pr0002=7)
E107	[FrE	CANopenis Index is Out of Range (CFrE) CANopen (CANopenmentary enco)	Disable CANopen(Pr04 17=0) Reset CANopen (Pr0002=7)

Reset Alarm

Once the issue that tripped the system and triggers the alarmis eliminated, one can resume the system to namel status by pressing the RESET key on the digital keypad (as shown in the figure) to set the external terminal to "Anomaly reset command" and sending the command by turning on the terminal crivia communication. Before any anomaly alarmis resolved, make sure the operation signal is at open circuit status (OFF) to avoid immediate machine running upon anomaly reset that may case mechanical damage or personnel casualty.



Stop/Resetkey: Press this button to stoprunning and resetabromality

51-3WaringCodes

DNa	Display	Descriptions
		Madus function code encr (llegal function code)
A1		Conective Actions
AL		Check if the function code is conect.
		(Function code must be 08, 06, 10, 63)
		Mochus data address is enor (llegal data address (00Hto 254H)
A2		Conective Actions
		Checkif the communication address is conrect.
		Modbus data enor (llegal data value)
A3		Conective Actions
		Checkif the data value exceeds maximum/minimumvalue.
		Modus communication enor (Data is written to read only address)
A		Conective Actions
		Checkif the communication address is conrect.
A5		Madus transmission time out
A 6		Keypad transmission time-out
		Keypad COPY encr1
A7		Keypad simulation encry including communication delays, communication
		enor(leypadueceives enorFF86) and parameter value enor
٨Q		Keypad COPY encr2
Að		Keypad simulation done, parameter writes enor:
		IGBT is over heated than protection level: 95°C
		Conective Actions
		Ensue that the ambient temperature fails within the specified
40		temperature range.
AS		Make sure that the ventilation holes are not obstructed
		Remove any foreign objects from the heat sink and check for
		possible distinheatsink
		Provide encughspacing for adequate ventilation

DNa	Display	Descriptions
		Motor drive is over heated than protection level: 95°C. This warring code
		is ONLY forfiame E, NOT for other fiames.
		Conective Actions
		Ensue that the ambient temperature fails within the specified
A10		temperature range.
		Make sure that the ventilation holes are not obstructed
		Remove any foreign objects from the heat sink and check for
		possible dist in heat sink
		Provide encughspacing for adequate ventilation
A 11		
AII		PIDieedbackloss
		Motor parameters auto tuning enor
A1/1		Conective Actions
		Checkif motor wing is conect.
		Checkif notor capacity and parameters are conect.
		PG feedbackener
	-	
A15	6	Conective Actions
		Checkif the encoder's wining is conect.
		Checkif PG cands red light is on because of some interferences.
A17		Oversneedvaning
A18		Overspeed deviation warning
		ou of the second
A19		Input Phase Loss
		•
A22		Motoroverheating
A24		Overslip
A25		Autoturing in process
		Contenting
A26		Charle Film and marker and
		Cherefer and English Grift
		Clean the cooling tan

DNa	Display	Descriptions
		The function of this warring code is to prevent oil pump from damaging
		while running without sucking in any hydraulic oil
		When the hybrid servodrive goes from SIOP to RUN, it starts to check if
		the pressure is over05Bar within the time set at Pr0060 During this
		checking period, the servo drive refuses pressure command and flow
		commend sent from keypad. The keypad displays bp (building pressure).
A27		If the pressure is still under O5bar after the checking period set at
		Pr0060) there will be an oil shortage warning and the hybrid servo drive
		vill stoprunning. The keyped will display noil (no cil).
		If the pressure is over 0.5 bar within the checking time set at Pr0060, the
		hybrid servo drive continues torun normally. There won't be a bp warring
		This function is effective when PiOO 27 < minimum pressure> is
		set as higher than 0.3% and the time setting at P10060 is NOT 0
A28		Output Phase Loss
A36	6	Saftware enar 1 occurred on CANopen
A37		Software encr2cccurred on CANopen (CHbE)
A38		CANqpenSynchronizationoff
A39		CANopenbus off
A40	[[dn	CANquenindexenor
A41		CANopenstation address enor
A42		CANquennemuyenar
AAB		CANquenSDO transmission time out
A41		CANquenSDO received register overflow
A45		CANopenbootupfault
A46		CANopen protocol format enor

520erCurent (oc)



53GroundFatt(GFF)





55LowVoltage (Lv)



560verHeat(dHl)



570verload(d)



58Phase Loss (PH)



59Hybrid servo drive overloading when running at lowfrequency (oL3)



5 10 Electromagnetic/Induction Noise

If there exist noise sources around hybrid servo drive, they will affect hybrid servo drive through radiation on the power lines, leading to malfunction of control bop and causing tripping or even damage of hybrid servo drive. One natural solution is to make hybrid servo drive more immune to noise. However, it is not economical and the improvement is limited. It is best to resort to methods that achieve improvements outside hybrid servo drive.

- 1. Add suge killer on the relay or contact to suppress switching suge between ONOFE
- 2 Shorten the wining length of the control circuit or serial circuit and separate from the main circuit wining
- 3 Comply with the wining regulation for those shielded wire and use isolation amplifier for long wire
- 4 The gound terminal of hybrid servo drive must be connected to gound by following the associated regulations. It must have its own ground connection and cannot share with electrical welder and other power equipment.
- 5 Insert noise filter to the input terminal of hybrid servo drive to prevent the noise entering from the power lines.

In a word, three level solutions for electromagnetic noise are "no product", "no spread" and "no receive".

5 11 Environment and Facilities for Installation

The hybrid servo drive is a device for electronic components. Detailed descriptions of the environment suitable for its operation can be found in the specifications. If the listed regulations cannot be followed for any reason, there must be corresponding remedial measures or contingency solutions.

- 1. To prevent vibration, anti-vibration spacer is the last choice. The vibration tolerance must be within the specification. The vibration effect is equal to the mechanical stress and it cannot occurfice pently, continuously or repeatedly to prevent damaging AC motor drive.
- 2 Store in a dean and dry location fiee from conosive funes/dust to prevent rustiness, poor contact. It also may cause short by lowinsulation in a hunid location. The solution is to use both paint and dust poor. For particular occasion, use the enclosure with whole seal structure.
- 3 The ambient temperature must be just right. If the temperature is too high or too low the lifetime and action reliability of electronic components will be affected. For semiconductor devices, once the conditions exceed the rated values, consequences associated with "damage" are expected. As a result, in addition to providing cooler and shades that block the direct surlight that are aimed to achieve required ambient temperature, it is also necessary to perform cleaning and spot check the air filter in the storage tray of hybrid servo drive and the angle of cooling fan. Mneover, the microcomputer may not work at extremely temperature, space heater is needed formachines that are installed and operated incodd regions.
- 4 Avoid misture and occurrence of condensation If the hybrid servo drive is expected to be shut downfor an extended period of time, be careful not to let condensation happen once the air conditioning is turned off. It is also preferred that the cooling equipment in the electrical room can also work as a defunitilitier.

6 Suggestions and Encr Conections for Hybrid Servo Drives

61 Maintenance and Inspections 62 Greasy Dist Problem 63 Fiber Dust Problem 64 Erosion Problem 65 Inclustrial Dust Problem 66 Wing and Installation Problem 67 Milli-function Input/Output Terminals Problem

The hybrid servo drive has a comprehensive fault diagnostic system that includes several different alarms and fault messages. Once a fault is detected, the conesponding protective functions will be activated. The following faults are displayed as shown on the hybrid servo drive digital keypad display. The six most recent faults can be read from the digital keypad or communication.

The hybrid servo drive is made up by numerous components, such as electronic components, including IC, resistor, capacity, transistor, and cooling fan, relay, etc. These components can't be used permanently. They have limited life even undernormal operation. Preventive maintenance is required to operate this hybrid servo drive in its optimal condition, and to ensure a long life.

Checkyour hybrid servo drive regularly to ensure there are no abnormalities during operation and follows the precautions:



Whit 5 seconds after a fault has been deared before performing reset via keypad of input terminal.

When the power is off after 5 minutes for 22kW models and 10 minutes for 30 kW models, please confirm that the capacitors have fully discharged by measuring the voltage between + and -. The voltage between + and - should be less than $25V_{DC}$.

Only qualified personnel can install, whe and maintain drives. Please take off any metal objects, such as watches and rings, before operation And only insulated tools are allowed

Neverteassemble internal components criviting

Make sure that installation environment comply with regulations without abnormal noise, vibration and smell.

61 Maintenance and Inspections

Before the checkup, always turn off the AC input power and remove the cover Wait at least 10 minutes after all display lamps have gone out, and then confirm that the capacitors have fully discharged by measuring the voltage between DC+ and DC. The voltage between DC+ and DC-should be less than $25V_{DC}$.

Ambient environment

		Maintenance		
Check liens	Methods and Criterion	Period		
			Half	One
		Leny	Year	Year
Check the ambient temperature, humidity,	Visual inspection and			
vination and see if there are any dust, gas,	neasurement with equipment			
al arvaterdique	withstandard specification			
If there are any dangerous objects	Visual inspection			

Voltage

Check liems	Methods and Criterion	Maintenance Period		
		Daily	Half Year	One Year
Checkifthe voltage of main circuit and	Measure with multimeter with			
control circuit is conect	standard specification			

Digital Keypad Display

Check liems	Methods and Criterion	Maintenance Period		
		Daily	Half Year	One Year
Is the display clear for reading	Visual inspection			
Any missing characters	Visual inspection			

Mechanical parts

Check liens	Methods and Criterion	Maintenance Period			
		Daily	Half Year	One Year	
If there is any abnormal sound or vibration	Visual and aural inspection				
If there are any loose scievs	Tighten the sciews				
Fanypartis deformed or damaged	Visual inspection				
If there is any color charge by overheating	Visual inspection				
Fibre is any dust or dit	Visual inspection				

Checkliens	Methods and Criterion	Maintenance Period			
		Daily	Half Year	One Year	
If there are any bose or missing screws	Tighten or replace the screw				
	Visual inspection				
dramand an the orbit of the draman draman	NOIE: Please ignore the				
carraged or wincolor charge due to overheating crageing	color change of copper				
	plate				
If there is any dust or dit	Visual inspection				

Main circuit

Teminals and wining of main circuit

Checkliems	Methods and Criterion	Maintenance Period				
		Daily	Half Year	One Year		
If the terminal or the plate is color change or	Visual inspection					
deformation due to overheat						
If the insulator of wing is damaged or color	View of instruction					
change	vouanopeuun					
Fibre is any damage	Visual inspection					

DC capacity of main circuit

Creckliens	Methods and Criterion	Maintenance Period			
		Daily	Half Year	One Year	
If there is any leak of liquid, color change, crack or deformation	Visual inspection				
If the safety valve is not removed? If valve is inflated?	Visual inspection				
Measure static capacity when required					

Resistor of main circuit

		Maintenance			
Creckliens	Methods and Criterion	Period			
		Daily	Half Year	One Year	
If there is any peculiar smell or insulator					
caches due to overheat	visual i special și sitea				
If there is any disconnection	Visual inspection				
Former director descented	Measure with multimeter with				
a corrections canaged:	standard specification				

Transformer and reactor of main circuit

Checklitems	Methods and Criterion	Maintenance Period			
		Daily	Half Year	One Year	
If there is any abromal vibration or peculiar	Visual, aural inspection and				
snel	snel				

Magnetic contactor and relay of main circuit

Check liems	Methods and Criterion	Maintenance Period			
		Daily	Half Year	One Year	
If there are any loose screws	Visual and aural inspection				
If the contact works connectly	Visual inspection				

Printed circuit board and connector of main circuit

		Maintenance				
Check Items	Methods and Criterion	Period				
		Daily	Half Year	One Year		
	Tighten the scievis and					
If there are any loose scievs and correctors	press the correctors firmly					
	inplace.					
If there is any peculiar smell and color charge	Visual and smell inspection					
If there is any crack, damage, deformation or conosion	Visual inspection					
If there is any liquid is leaked or deformation in capacity	Visual inspection					

Cooling fan of cooling system

		Maintenance			
Check liems	Methods and Criterion		Period	l	
		D.L.	Haff	One	
		Leily	Year	Year	
	Visual, aural inspection and				
	tum the fan with hand (tum				
If there is any abramels and ary bation	off the power before				
	operation) to see if it rotates				
	smoothly				
If there is any loose screw	Tighten the screw				
If there is any color charge due to overheat	Changefan				

Ventilation channel of cooling system

Checklitens	Methods and Criterion	Maintenance			
			Half	One	
		Daily	Year	Year	
If there is any obstruction in the heat sink, air					
intake craincutle t					



Please use the neutral dothfor dean and use dust deaner to remove dust when necessary

62GreasyDirtProblem

Serious greasy dist problems generally occur in processing industries such as machine tools, purching machines and so on Please be aware of the possible damages that greasy oil may cause to your drive:

- 1. Electronic components that silt up with greasy oil may cause the drive to burn out or even explode.
- 2 Most greasy dirt contains conosive substances that may damage the drive.

Solution

Install the hybrid servo drive in a standard cabinet to keep it away from dirt. Clean and remove greasy dirt regularly to prevent damage of the drive.





63FiberDustProblem

Serious fiber dust publicns generally occur in the textile industry. Please be aware of the possible damages that fiber may cause to your drives:

- 1. Fiber that accumulates or adheres to the fans will lead to poor ventilation and cause overheating publicms.
- 2 Plantensionnents in the textile industry have higher degrees of hunidity that may cause the drive to burnout, become damaged or explode due to vet fiber dust adhering to the devices. Solution:

Install the hybrid servo drive in a standard cabinet to keep it away from fiber dust. Clean and remove fiber dust regularly to prevent damage to the drive.







64ErosionProblem

Existence of the contract of t

1. Exosion of internal components may cause the drive to malfunction and possibility to explode. Solution

Install the hybrid servo drive in a standard cabinet to keep it away from fluids. Clean the drive regularly to prevent crossion







65**Industrial Dust Problem**

Serious industrial dust pollution frequently occurs instone processing plants, flournills, cement plants, and so on Please be avare of the possible damage that industrial dust may cause to your drives:

- 1. Distaccumilating on electronic components may cause overheating problem and shorten the service life of the drive.
- 2 Conductive dust may damage the circuit board and may even cause the drive to explode. Solution

Install the hybrid servo drive in a standard cabinet and cover the drive with a dust cover. Clean the cabinet and ventilation hole regularly for good ventilation





Check Rems	Methods and Criterion		Troubleshooting
Visual checkon the overall appearance	Anyaccumilation of distand dust?	1.	Shutdown the servo dive, wait for a certain time. Make sure that the power indicator is off before you go to the next step (22kW wait for 5 min after shut down, 30kW wait for 10 min after shut down) Trum on a vacum cleaner to remove the dust
Ventilation Channel	Any obstruction in the heat sink, air intake or air outlet? Any accumulation of dust on the cooling far? Is the cooling fan damaged?	1 2 3	Shutdown the servodive, wait for a certain time Make sue that the power indicator is off before you go to the next step (22kW wait for 5 min after shutdown, 30kW wait for 10 min after shut down) Follow the instruction in this manual to remove and clean the cooling fan Tumona vacuum clean er to clean the dust in the heat sink If the cooling fan doesn't run at all, replace it with a new one Clean the vertilation channel periodically to avoid accumulation of dit and dust

Install and Remove Cooling Fans





NOTE

Do follow the fan installing/ removing instructions in this manual. Make sure the air outlet is facing the right direction. If air outlet is facing the wrong direction, the servo drive might be damaged. You can see an owsymbols indicating the air blowing direction on the side of the cooling fans.

66Wing and Installation Problem

When wining the drive, the most common problem is wrong vine installation or poor wining. Please be aware of the possible damages that poor wining may cause to your drives:

- 1. Scieves are not fully fastered. Occurrence of sparks as impedance increases.
- 2 If a customer has opened the drive and modified the internal circuit board, the internal components may have been damaged

Solution

Ensure all scieves are fastened when installing the hybrid servo drive. If the hybrid servo drive functions abnormally, send it back to the repairstation DONOF try to reassen ble the internal components or wire.







67M Hi function Input/Output Terminals Problem

Mili-function input/output terminal encors are generally caused by overusage of terminals and not following specifications. Please be aware of the possible damages that encors comulti-function input/output terminals may cause to your drives:

1. Input/output circuit may burns out when the terminal usage exceeds its limit.

Solution

Refer to the user manual formulti-function input output terminals usage and follow the specified voltage and current. DONOT exceed the specification limits.







Appendix A: Optional Accessories

A 1 Baking Resistor A 2 Non-fise Circuit Breaker A 3 Fuse A 4 Reactor A 5 Digital Keyped KPV-CC01 A 6 EMI Filter A 7 Speed Feedback Encoder A 8 Wall-Mounted Installation



This hybrid servo drive has gone through rightons quality control tests at the factory before shipment. If the package is chanaged during shipping please contact your dealer The accessories work red by Dalta are only firm simulith Dalta hybrid servo drive

The accessories produced by Delta are only for using with Delta hybrid servo drive. Do NOT use with other drive to prevent damage.

A 1 Braking Resistor Selection Chart

VJ-CAirCooled series:

	Appl	Icable Motor 125% Braking Torque 10% ED*1 Maximum Braking Torque Torque					125% Braking Torque 10%ED*1				
HP	ław	Midel	Braking Resistor Models *2	Quantity	Paallel or Serial Correction	Effective Baking Resistance of Each Drive	Total Basking Cunert (A)	Mn Beling Resistance	Meximum Total Basking Cunent (A)	Max Peak Power (KW)	
40	300	VFDCOM23C-J	BRIKOWSP1	4	2 in parallel, 2 In serial* ³	4000W 51	75	48	80	304	
50	37.0	VFD870M23C-J	BRIKZW3P9	4	2 in parallel, 2 Inserial	4900W 39	97	32	120	456	
15	11.0	VFD110M43C-J	BR1K5W043	1		1500W43	176	308	247	188	
20	150	VFD150M43C-J	BR1KOW016	2	2 inserial	2000W32	24	250	304	231	
25	185	VFD185M43C-J	BR1K5W013	2	2 inserial	300 0W2 6	29	208	365	27.7	
30	220	VFD220M43C-J	BR1K5W013	2	2 inserial	3000W26	29	190	40	304	
40	300	VFD300M43C-J	BRIKUMEPI	4	4 inserial	4000W 204	37	190	40	304	
50	37.0	VFD370M43C-J	BR1K2W015	4	2 in parallel, 2 inserial	4800W15	50	140	54	408	
60	450	VFD450M/43C-J	BR1K5W013	4	2 in parallel, 2 inserial	6000W13	59	127	60	457	
75	550	VFD550M43C-J	BR1K0W5P1	8	2 in parallel, 4 inserial *4	8000W 102	76	95	80	608	
100	750	VFD750M43C-J	BR1K2W015	8	4 in parallel, 2 inserial * ⁵	9800W 7.5	100	63	120	907	

	Appl	icable Motor	125% Baling Taque 10%ED *1						MaimmBaking Trope			
HP	IAW	Midel	Baking Resistor Models 2	Quantity	Parallel or Serial Cornection	Effective Basking Resistance of Each Drive	Total Balárg Cunert (A)	Mn Balág Resistance	Maximum Total Braking Cunent (A)	Max Peak Power(KW)		
40	300	VFDROMA3C-JO	BR1K0W5P1	4	4 inserial	4000W 204	37	190	40	304		
50	370	VFD370M43C-JO	BR1K2W01 5	4	2 in parallel, 2 inserial *3	4800W15	50	127	60	457		
60	450	VFD450M43C-JO	BR1K5W013	4	2 In parallel, 2 inserial	6000W13	59	127	60	457		
6	550	VFD550M43C-JO	BRIKOW5P1	8	2 in parallel 4 inserial *4	8000W 102	76	95	80	608		
100	750	VFD750M43C-JO	BR1K2W01 5	8	4 in parallel, 2 inserial * ⁵	9800W 7.5	100	63	120	907		

VJ-C Oil Cooled series:

*1 Calculation for 125% baske toque: (kW)*125%*08; where 08 is notor efficiency

Because there is a resistor limit of power consumption, the longest operation time for 10% ED is 10sec

(an 10sec/aff 90sec).

*² Forheat dissipation, a resistor of 400W or lower should be fixed to the fiame and maintain the surface temperature below 250°C; a resistor of 1000W and above should maintain the surface temperature below 350°C.



		NOTE
	~	

1. Definition for Brake Usage ED%

Explanation The definition of the brake usage ED (%) is for assurance of enough time for the brake unit and brake resistor to dissipate away heat generated by braking. When the brake resistor heats up the resistance would increase with temperature, and brake torque would decrease accordingly Recommended cycle time is one minute.

Definition of Brake Usage ED%



Forsafety concern, install an overload relay (OL) between the bake unit and the bake resistor in conjunction with the magnetic contactor (MC) prior to the drive for abnormal protection. The purpose of installing the thermal overload relay is to protect the bake resistor from damage due to frequent bake, or due to bake unit keeping operating resulted from unusual high input voltage. Under surh circumstance, just turn off the power to prevent damaging the bake resistor.



Note1: When using the AC drive with DC reactor, please refer to wiring diagram in the AC drive user manual for the wiring of terminal +(P) of Braking unit.

Note2: Do NOT wire terminal -(N) to the neutral point of power system.

- 2 If damage to the drive or other equipment is due to the fact that the brake resistors and brake modules in use are not provided by Delta, the varianty will be void
- 3 Take into consideration the safety of the environment when installing the brake resistors. If the minimum resistance value is to be utilized, consult local dealers for the calculation of Watt figures.
- 4 When using more than 2 bake units, equivalent resistor value of parallel bake unit cannot be less than the value in the column "Minimum Equivalent Resistor Value for Each Hybrid Servo Drive" (the right most column in the table). Please read the wining information in the user manual of bake unit thoroughly prior to operation
- 5 This chart is for normal usage; if the hybrid servo drive is applied for frequent braking it is suggested to enlarge 2-3 times of the Wats.
- 6 The position to install bala units needs to be at least 15 cm away from the hybrid servo dive.

7. Appearance and specification of brake resistors

7.1Wirevound resistor: for 1000W (included) and above. Refer to the following image for its appearance. See table belowfor specification comparison



7.2 Bialae Resistors' model name and comparison

					-						Un it :	mm
Model	A	В	С	D	Е	F	G	Н	Ø	ØJ	K	L
BR1KOW5P1												
BR1K2W015	470 ± 10	445 ± 5	48 ± 02	91 ± 01	390 ± 3	98 ± 5	47 ± 5	15 ± 1	555 ± 5	81 ± 01	21 ± 02	8 ± 1
BR1K5W013												
7.3 Aluninumhoused resistor: for below 1000W.Refer to the following image for its appearance. See table belowfor specification comparison



7.4 Brake Resistors' model name and comparison

							Unit m	
Model	L1	L2	L3	W	н	Α	L	
BROSOW200	140 - 0	107 . 0	100 - 1	1 0 · 0.7	m . 07			
ER080W750	140± %	IZD±Z	100± 1	IW± 1 40±05				
BR200W091	107 - 0	170 . 0	107 . 1			53±0,5		
BR200W360	165±2	150± 2	130±2 125±1				200±20	
BR30014070	015 - 0		1777 1 1		m 07			
BR300W250	213±2	200±2	1/3±1	60±05	30±05			
BR40010040		0770 ± 0	007 1					
BR400W150	200±2	200±22	740±1					

A 2 Non Fuse Circuit Breaker

VJ-C series:

Comply with the UL standard Per UL 508, paragraph 4584, parta,

The rated current of the breaker shall be $2 \sim 4$ times of the maximum rated input current of hybrid servo drive.

Air Cooled:

Model	Recommended Cunent (A)
VFD300VL23C-J	250
VFD370VL23C-J	300
VFD110VL43C-J	50
VFD150VL43C-J	60
VFD185VL43C-J	80
VFD220VL43C-J	100
VFD300VL43C-J	125
VFD370VL43C-J	150
VFD450VL43C-J	200
VFD550VL43C-J	225
VFD750M43C-J	300

Oil Cooled:

Model	Recommended Cunert (A)
VFD300ML43C-JO	150
VFD3701L43C-JO	175
VFD450ML43C-JO	225
VFD550ML43C-JO	300
VFD750ML43C-JO	400

A3Fuse

Fuse specifications lower transfer table belowate allowed

For installation in the United States, branch circuit protection must be provided in accordance with the National Electrical Code (NEC) and any applicable local codes. Use UL classified fuses to fulfill this requirement.

For installation in Canada, branch circuit protection must be provided in accordance with Canadian Electrical Code and any applicable provincial codes. Use UL classified fuses to fulfill this requirement.

Air Cooled

200V-marchi		Line Fuse		
		InputCunert(A)	Bussmann P/N	
VFD000M23C-J	120	250	JIS-250	
VFD370M23C-J	146	300	JIS-300	

Air Cooled:

		Line Fuse		
		hpt(A)	Bussmam P/N	
VFD110/L43C-J	24	50	JIS-50	
VFD150VL43C-J	30	60	JIS-60	
VFD185VL43C-J	37	80	JIS-80	
VFD220M43C-J	47	100	JIS-100	
VFDCOM43C-J	60	125	JJS-125	
VFD870M43C-J	73	150	JIS-150	
VFD450ML43C-J	91	200	JIS-200	
VFD550ML43C-J	110	225	JJS-225	
VFD750M43C-J	150	300	JIS-300	

Oil Cooled

		Line Fuse			
4000 11008	I JUL CUIEL(A)	I (A)	BussmannP/N		
VFD300ML43C-JO	60	150	JJS-150		
VFD370M43C-JO	73	175	JIS-175		
VFD450VL43C-JO	91	225	JJS-225		
VFD550M43C-JO	110	300	JJS-300		
VFD750M43C-JO	150	400	JJS-400		

A4Reactor

Installing an AC reactor on the input side of a hybrid servo drive can increase line inpedance, improve the powerfactor, reduce input cunent, and reduce interference generated from the hybrid servo drive. It also reduces nomentary voltage sugges or abromal cunent spikes. For example, when the main power capacity is higher than 500 kVA, or when using a switching capacitor bank, momentary voltage and cunent spikes may damage the hybrid servo drive's internal circuit. An AC reactor on the input side of the hybrid servo drive's internal circuit. An AC reactor on the input side of the hybrid servo drive protects it by suppressing sugges.

As shownin the image below an AC input reactor is installed between the mains power inputs and the RS Tinput terminals on the hybrid servo drive.



A41AC Reactor

Specifications: AC Input Reactor

AirCoded

200V~230V/50-60Hz model VFDXXXVL23C-J series AC Input Reactor									
				Rated Current	SaturationCurrent	3%Reactor	5%Reactor	3%Input Reactor:	
	INV	H	(Ams)	(Ams)	(nH)	(nH)	DeltaPart #		
300	30	40	120	240	012	02	DR105AP106		
370	37	5 0	146	292	0087	0145	DR146AP087		

380V~460V/50-60Hz model VFDXXXVL43C-J series AC Input Reactor									
Mada					Rated Current	Saturation Current	3%Reactor	5%Reactor	3% Input Reactor:
IVIDUE	INV	T	(Ams)	(Ams)	(nH)	(nH)	Delta Part#		
110	11	15	21	42	1.01	1.683	DRO24AP881		
150	15	20	27	54	076	1.267	DR032AP660		
185	18 5	25	34	68	0639	1.036	DR038AP639		
220	83	30	41	86	0541	09	DR045AP541		
300	30	40	60	120	0405	0675	DR060AP405		
370	37	50	73	146	0334	0555	DR073AP334		
450	45	60	91	182	0267	0445	DR091AP267		
550	55	75	110	220	0221	0368	DR110AP221		
750	75	100	150	300	0162	027	DR150AP162		

Oil Cooled

380V~460V/50-60Hz model VFDXXXVL43C-JO series AC Input Reactor											
	14.1						Rated Current	Saturation Current	3%Reactor	5%Reactor	3%Input Reactor
Model KM	INV	F	(Ams)	(Ams)	(nH)	(nH)	Delta Part#				
300	30	40	60	1026	0405	0675	DR060AP405				
370	37	50	73	146	0334	0555	DR073AP334				
450	45	60	91	182	0267	0445	DR091AP267				
550	55	75	110	220	0221	0368	DR110AP221				
750	75	100	150	300	0162	027	DR150AP162				

Specifications: AC Output Reactor

			Misimum	Inductance mH		
kw	W HP Rated Cunent of Reactor		Continuus Cunert	3%	5%	
				Inpedance	Inpedance	
30	40	130	195	01	02	
37	50	160	240	0075	015	

230V, 50/60Hz, Three Phase

460V, 50/60Hz, Three Phase

_			Maimm	Inductance mH		
kv	HP	Rated Current of Reactor	Continuus Cunert	3%	5%	
				Inpedance	Inpedance	
15	20	35	525	08	1.2	
185	25	45	67.5	07	1.2	
22	30	45	67.5	07	1.2	
30	40	80	120	04	07	
37	50	80	120	04	07	
45	60	100	150	03	045	
55	75	130	195	02	03	
75	100	160	240	015	023	

Application of AC Reactor

Corrected in input circuit Application 1 When more than one hybrid drive is corrected to the same mains power and one of them is ON during operation

Problem When applying power to one of the hybrid drive, the charge current of the capacitors may

cause voltage dip The hybrid drive may be damaged when over current occurs during operation

Conectving



Application 2

Silicon rectifier and hybrid drive are connected to the same power

Problem Switching spikes will be generated when the silicon rectifier switches ONOFE. These spikes may damage the mains circuit.

Conectvining



Application 3 When the power supply capacity exceeds 10 times of the inverter capacity.

Problem When the mains power capacity is too large, line impedance will be small and the charge current will be too high This may damage hybrid drive due to higher rectifier temperature.





A42ZeroPhase Reactor

RF220M00A



Cable type (Note)	Re Wi	com e Size	0	Wing	
	AWG	mf	Nominal (nmf)	цу.	Method
Single care	10	53	55	1	FigueA
	2	336	38	3	Figue B
Three core	12	33	35	1	Figure A
	1	42.4	50	3	Figue B

Figure A

Please wind each wire 4 times around the core. The reactor must be placed at inverter output as close as possible.



NOTE

600V insulated pover line.

- The table above gives approximate vice size for the zero phase reactors but the selection is ultimately governed by the type and diameter of cable fitted i.e. the cable must fit through the center hole of zero phase reactors.
- 2 Only the phase conductors should pass through, not the earth core or screen
- 3 Whenlong motor output cables are used an output zero phase reactor may be required to reduce radiated emissions from the cable.

Figure B Please put all wires through 4 cores in series without winding



A 5 Digital Keypad KPC-CCO1

The VFD VJ series products use the digital keyped KPC-CCOI as the display unit For the actual keyped appearance, please refer to the actual product. This picture shows the schematic diagram for illustrative purposes only.

KPC-CCO1 Digital Keypad



Communication Interface RJ-45 (socket) , RS-485 (Interface)

Installation

Embedded type and can be put flat on the surface of the control box. The front cover is waterproof. Buy a MKC-KPPK model to do wall mounting or embedded mounting. Its protection level is IP66 The maximum RJ45 extension lead is 5 m (16ft)

Descriptions of Keypad Functions

Key	Descriptions
RUN	Start Operation Key 1. It is only valid when the source of operation command is from the keypad 2. It can operate the hybrid servo drive by the function setting and the RUN LED will be on 3. It can be pressed repeatedly during stop 4. When enabling "HAND" mode, it is only valid when the source of operation command is from the keypad
STOP RESET	 Stop Command Key. This key has the highest processing priority in any situation When it receives STOP command, no matter the hybrid servo drive is in operation or stop status, the hybrid servo drive needs to execute "STOP" command. The RESET key can be used to reset the drive after the fault occurs. For those faults that cannot be reset by the RESET key, see the fault records after pressing MENU key for details.
FWD	 Operation Direction Key 1. This key is only control the operation direction NOT for activate the drive. FWD: forward, REV: reverse. 2. Refer to the LED descriptions for more details.
ENTER	ENIER Key Press ENIER and go to the next level. If it is the last level then press ENIER to execute the command
ESC	ESC Key ESC keyfunction is to leave current menu and return to the last menu lit is also functioned as a return key in the submenu
MENU	Press menutoretum to meinmenu
	Direction Left/Right/Up/Down 1. In the numeric value setting mode, it is to move the cursor and change the numeric value. 2. In the menufest selection mode, it is for itemselection
F1 F2 F3 F4	 Function Keys The functions keys have factory settings and can be defined by users. Other functions must be defined by TPE ditor first.
HAND	 HAND Key 1. This key is controlled by the parameter settings of the source of Hand frequency and hand operation. The factory settings of both source of Hand frequency and hand operation are the digital keypad. 2. Press HAND key at stop, the setting will switch to hand frequency source and hand operations ource. Press HAND key when the hybrid servo drive is running, it stops the hybrid servo drive first (display AHSP warning), and switch to hand frequency source and hand operations ource.
AUTO	 This key is controlled by the parameter settings of the source of AUTO frequency and AUTO operation. The factory setting is the external terminal (source of operation is 4.20mA). Press Auto key at stop, the setting will switch to hand frequency source and hand operation source. Press Auto key when the hybrid servo drive is running it stops the hybrid servo drive first (display AHSP warning), and switch to auto frequency source and auto operation source.

Descriptions of LED Functions

LED	Descriptions
	SteadyON operation indicator of the hybrid servo drive, including DC brake, zero speed,
	standby restart after fault and speed search
RUN	Blinking drive is decelerating to stop or in the status of base block
	Steady OFF: drive doesn't execute the operation command
	Steady ON: step indicator of the hybrid servo drive.
<u>STOP</u>	Binking drive is in the standby status.
RESET	Steady OFF: drive does not execute "STOP" command
	OperationDirectionLED
FWD	1. Green light is on the drive is running forward
REV	2 Redlight is on, the drive is running backward
	3 Twinking light: the drive is changing direction

Characters of Digital Keypad Displayed on the LCD

Number	0	1	2	3	4	5	6	7	8	9
ICD	Û	I I	<u>c</u>]	4	5	6		8	9
Alphabet	Α	b	Cc	d	Е	F	G	Hh	Ι	J
ICD	8	6	C c	ď	E	F	6	<u>ዘ ዞ</u>	1	j
Alphabet	K	L	n	Oo	Р	q	r	S	Tt	U
ICD	\mathcal{P}		n	<i>0</i> o	9	9	r	5	712	U
Aphabet	V	Y	Z							
LCD	U	4	-							

A6EMFiler

VJ-C series

AirCooled

Drive	Applicable Filter Model #	Reference Website		
VFD110ML43C-J				
VFD150ML43C-J	B941/200050D100			
VFD185VL43C-J	- ESH434UDURIU 6			
VFD220ML43C-J				
VFD300ML43C-J	- B84143A0100R106	PowerLine EMC Filter (EPCOS)		
VFDB70ML43C-J				
VFD450ML43C-J				
VFD550ML43C-J				
VFD750ML43C-J	B84143D0200R127			
VFDB00ML23C-J				
VFD370M23CJ				

https://www.tckelectronics.tck.com/en/530116/products/product-catalog/ene-components/power - line-ene-filters-epcos

Oil Coded

Drive	Applicable Filter Model #	Reference Website
VFD300M43C-JO		
VFD370M43C-JO	BS4143D0200R12 7	PowerLine EMC Files (EPCOS)
VFD450ML43C-JO		
VFD550ML43C-JO		
VFD750M43C-JO		

https://www.tck.electronics.tck.com/en/530116/products/product-catalog/enro-components/powerline-enrc

-files-epcos-

EMIFilterInstallation

All electrical equipment, including hybrid drives, will generate high frequency/low frequency noise and will interfere with peripheral equipment by radiation or conduction when in operation By using an EMI filter with connect installation, much interference can be eliminated. It is recommended to use DELTA EMI filter to have the best interference elimination performance.

We assure that it can comply with following rules when hybrid drive and EM filter are installed and wired

according to user manual EN6100064 EN618003 1996 EN55011 (1991) Class A Group 1 (1st Environment, restricted distribution)

General precaution

- 1. EM filter and hybrid drive should be installed on the same metal plate.
- 2 Please install hybrid drive on footprint EVI filter or install EVI filter as close as possible to the hybrid drive.
- 3 Please vice as short as possible.
- 4 Metal plate should be grounded
- 5 The cover of EMI filter and hybrid drive or grounding should be fixed on the metal plate and the contact area should be as large as possible.

Choose suitable motor cable and precautions

Improper installation and choice of motor cable will affect the performance of EM filter. Be sure to observe

the following precautions when selecting motor cable.

- 1. Use the cable with shielding (double shielding is the best).
- 2 The shielding on both ends of the motor cable should be grounded with the minimum length and maximum contact area.
- 3 Remove any paint connetal saddle for good ground contact with the plate and shielding



Saddle onbothends



Figure 2

The length of motor cable

When notor is driven by a hybrid drive of PWM type, the notor terminals will experience surge voltages easily due to components conversion of hybrid drive and cable capacitance. When the notor cable is very long (especially for the 460V series), surge voltages may reduce insulation quality. To prevent this situation please follow the rules below:

Use a motor with enhanced insulation

Correct an output reactor (optional) to the output terminals of the hybrid dive

The length of the cable between hybrid drive and motor should be as short as possible (10 to 20 mor less)

Formatels 7.5hp and above

Insulation level of motor	1000V	1300V	1600V
460V_{AC} input voltage	66ft(20n)	328ft(100m)	1312ft(400m)
230V_{AC} input voltage	1312ft(400m)	1312ft(400m)	1312ft(400m)

NOTE

Neverconnect phase lead capacitors or suge absorbers to the output terminals of the hybrid drive.

If the length is too long the stray capacitance between cables will increase and may cause leakage current. It will activate the protection of overcurrent, increase leakage current or not insure the conection of current display. The worst case is that hybrid drive may damage.

If more than one motor is connected to the hybrid drive, the total wining length is the sum of the wining length from hybrid drive to each motor:

For the 460V series hybrid dive, when an overload relay is installed between the drive and the motor to protect motor from overheating the connecting cable must be shorter than 50m. However, an overload relay malfunction may still occur. To prevent the malfunction, install an output reactor (optional) to the drive or lower the canier friequency setting (Pr:0017).

NOTE

When a themal O/Luelay protected by motor is used between hybrid drive and motor, it may malfunction (especially for 460V series), even if the length of motor cable is only 165 ft (50m) or less. To prevent it, please use AC reactor and/or lower the canier frequency (Pr 00 17 PWM canier frequency).

A 7 Speed Feedback Encoder



Function of J1 Terminal



4	SIN (S4)	Resolver culput signal		
5	SIN+ (S2)		05-0175 10H	
7	COS+ (S1)		SJEUT / DVIITS, TURFIZ	
9	COS- (S3)			
14,16	REF+ (R1)	D 1 • 4	D!	
13,15	REF- (R2)	Resolver i put pover		
	blocked	Blocked		

Selection of Wining Rod

Encoder Wining — Wine Gauge mnf (AWG)					
Size #of cores (pairs) Specification Standard Length					
013mnf(AWG26) 10cares(4pairs) UL2464 3m(984ft)					

NOIE

- 1 Please use shielded twisted pair cable for encoder wining so as to reduce the interference of the noise
- 2 The shield should correct to the 🕀 phase of SHELD
- 3 Please follow the Selection of Wire Rod when wining in order to avoid the danger it may occur. **Connector Specification**



Title	Pat#	Manfacturer
PLUG	3M10120 3000PE	3M
SHELL	3M1032052A0008	3M

A8Wall-Mounted Installation



Push the hybrid servo drive through the wall, then fasten 4 pieces of MIO screw 6 pieces of M6 screw an their nuts to fix the hybrid servo drive.

MIOsaewlengthL1 = t(vall thickness) + 16mm snewtarque = 200Kg cm[1734lb in] M6snewlengthL2 = t(vall thickness) + 12mm safewtarque = 40Kg cm[34.7lb in]

Cutout Dimensions



Appendix B: CANopen Overview

B1CANopenOverview B2WingforCANopen **B**3CANopenCommicationInterface Description B-31 CANapenControl Mode Selection (DS402 Standard Control Mode or Delta Standard B32D6402Standard Control Mode B321 Related setup of AC motor drive (DS402 standard B322The status of the motor drive (DS402 standard B323Various control modes (DS402 standard) B33By using Delta Standard (Old Definition, only support speed mode) B331 Related setup of AC notor drive **B332Various control modes** B34By using Delta Standard (Delta New definition) **B341 Related setup of AC motor drive (Delta** New Standard B342Various control mode (Delta NewStandard) **B4CANopenSupportingIndex B5CANopenFaultCodes B6CAN**openLEDFunction

The built in CAN open function is a kind of remote control. You can control the AC motor drive using the CAN open protocol. CAN open is a CAN based higher layer protocol that provides standardized communication drives, including real-time data (Process Data Objects, PDO), configuration data (Service Data Objects, SDO), and special functions (Time Stamp, Sync message, and Emergency message). It also has network management data, including Boot up message, NMT message, and Enor Control message. Refer to the CA website http://www.can.cia.org/ for details. The content of this instruction sheet may be revised without prior notice. Consult our distributors or download the most up dated version at http://www.bla.com/windustrial.submetion

Delta CANopen supported functions:

Supports CAN20A Protocol Supports CANopen DS301 V402 Supports DSP-402 V20

Delta CANopen supported services:

PDO (Process Data Objects): PDO1-PDO4

SDO (Service Data Object):

Initiate SDO Download;

Initiate SDO Upload;

Abort SDO,

You can use the SDO message to configure the slave node and access the Object Dictionary in every node.

SOP (Special Object Protocol):

Supports default COB ID in Predefined Master/Slave Correction Set in DS301 V402;

Supports SYNC service;

Supports Emergency service.

NMT (Network Management): Supports NMT module control; Supports NMT Encorcontrol; Supports Boot=up

Delta CANopen does not support this service

Time Stampservice

B-1 CANopen Overview

CANopen Protocol

CANopenis a CAN based higher layer protocol, and was designed formation oriented machine control networks such as handling systems. Version 4 02 of CANopen (CAD 5301) is standardized as EN50825.4. The CANopen specifications cover the application layer and communication profile (CAD 5301), as well as a framework for programmable devices (CiA 302), recommendations for cables and connectors (CiA 308 1) and SI units and prefix representations (CiA 308 2).



PIN	Signal	Description
1	CAN_H	CAN_Hbus line (dominant high)
2	CAN_I	CAN_Lbus line (dominant low)
Э	CAN_GND	Ground/C V A
E	CAN_GND	Ground/C V A

CANopen Communication Protocol contains the following services:

NMF (Network Management Object)

- SDO (Service Data Objects)
- PDO (Process Data Object)
- EMCY (Energency Object)

NMIT (Network Management Object)

The Network Management (NMI) follows a Master/Slave structure for executing NMI service. A network has only one NMT master; and the other nodes are slaves. All CAN open nodes have a present NMF state, and the NMF master can control the state of the slave nodes. The following shows the state diagram of a node:



(1) Afterpoveris applied, start in the auto initialization state	A: NM
(2) Automatically enter the pre-operational state	B: Node Guard
(3) (6) Startremole mode	C: SDO
(4) (7) Enterthe pre-operational state	D Energency
(5) (8) Stopienole node	E PDO
(9) (10) (11) Reset node	F: Bootup

- (9 (10) (11) Reset node
- (12) (13) (14) Reset communication

(15) Automatically enterneset application state

(16) Automatically enterreset communication state

	Initializi ng	Pre-Operational	Operational	Stopped
PDO				
SDO				
SYNC				
Time Stamp				
EMCY				
Bootsup				
NM				

SDO (Service Data Objects)

Use SDO to access the Object Dictionary in every CANopennode using the Client/Server model. One SDO has two COB IDs (request SDO and response SDO) to upload or download data between two nodes. There is no data limit for SDOs to transfer data, but it must transfer data by segment when the data exceeds four bytes with an end signal in the last segment. The VJ series does not currently support segment transmission

The Object Dictionary (OD) is a group of objects in a CAN open node. Every node has an OD in the system, and OD contains all parameters describing the device and its network behavior. The access path in the OD is the index and sub index, each object has a unique index in the OD, and has a sub indexif recessary. The following shows the request and response frame structure of SDO communication.

PDO (Process Data Object)

PDO communication can be described by the producer/consumer model. Each node of the network listens to the messages of the transmission node and distinguishes whether the message has to be processed or not after receiving the message. APDO can be transmitted from one device to one another device or to many other devices. Every PDO has two PDO services: a TxPDO and an RxPDO. PDOs are transmitted in a non-confirmed mode. All transmission types are listed in the following table:

Type Number		PDO									
	Cyclic	Acyclic	Synchronous	Asynchronous	RIR any						
0											
1-240											
241-251			Reserved								
252											
253											
254											
255											

Type numberOindicates the synchronous aperiodic message between two PDO transmissions. Type number 1-240 indicates the number of SYNC message between two PDO transmissions. Type number 252 indicates the data is updated (but not sent) immediately after receiving SYNC. Type number 253 indicates the data is updated immediately after receiving RIR. Type number 254: Delta CAN open doesn't support this transmission format. Type number 255 indicates the data is an asynchronous aperiodic transmission

All PDO transmission data must be mapped to the index with Object Dictionary

EMCY (Emergency Object)

When encus occur inside the hardware, an emergency object is triggered Amemergency object is only sent when an encroccurs. As long as there is nothing wrong with the hardware, there is no emergency object warring of an encromessage.

B-2Wining for CANopen

The wining between CAN open and VJ doesn't require any external communication card. Use an RJ45 cable to connect CAN open to a VJ. You must terminate the two faithest ends with 120 terminating resistors as shown in the picture below.



B-3CANopen Communication Interface Descriptions

B-31 CAN open Control Mode Selection

There are two control modes for CANopen the DS402 standard (PrO4 20 set to 1) is the factory setting and the Delta's standard setting (PrO4 20 set to 0). There are two control modes according to Delta's standard. One is the old control mode (PrO4 24=0); this control mode can only control the motor drive under frequency control. The other mode is a new standard (PrO4 24= 1); this new control mode allows the motor drive to be controlled under multiple modes. The VJ currently supports speed mode. The following table shows the control mode definitions:

CANI	Control						
CANOPEN		Speed					
contente	Intex	lex Description					
DS402	604200	Target rotating speed (RPM)					
PrO4 20=1							
Delta Standard (Old definition) Pr:04:20=0, Pr:04:24=0	2020 02	Target rotating speed (Hz)					
Delta Standad	2060 08	Target rotating speed (Hz)					
(Newdefinition) Pr:04:20=0; Pr:04:24=1	206004	Taque Imit (%)					

CANopen	Ope	Operation control				
control mode	Index	Description				
DS402	604000	OperationCommand				
PrO420-1						
Delta Standard (Old definition) Pr:04 20=0, Pr:04 24=0	202001	OperationCommand				
Delta Standard	2060 01	OperationCommand				
Pr0420=0, Pr0424=1						

CANopen		Other				
control mode	Index	Description				
DS402	6054-00	Quickstopprocessingmode				
PrO420=1	605C-00	Disable operation processing mode				
Delta Standard (Old definition) Pr:04 20=0, Pr:04 24=0						
Delta Standard						
Pr0420=0 Pr0424=1						

You can use some indices in either DS402 or Delta's standard For example

1. Indices that are defined as RO attributes

- 2 The conesponding index of available parameter groups (2000 00-200E-XX)
- 3 Accelerating/Decelerating Index 604F 6050

B32DS402Standard Control Mode

B 3 2 1 Related set up for an AC motor drive (following the DS 402 standard)

If you want to use the DS402 standard to control the motor drive, follow these steps:

- 1. Whe the hardware (refer to chapter B 2 Whing for CAN open).
- 2 Set the operation source: set PrOI-01 to 3 for CAN open communication card control.
- 3 Set the frequency source set PrOB 15 to 6 Choose the source for the Frequency command from the CAN open setting
- 4 SetDS402 for the control mode: PrO420=1
- 5 Set the CANopenstation set the CANopenstation (range 1-127, Ois the disable CANopen slave function) with PrO4 17. Note: set PrOOO2 = 7 to reset if the station number enor CAdE or CANopen memory enor CFiE appears.
- 6 Setthe CANopenbauchate: set PrO4 18(CANBUS Bauch Rate: 1M(0), 500K(1), 250K(2), 125K(3), 100K(4) or 50K(5).

B322The status of the motor drive (by following DS402 standard)

According to the DS402 definition, the motor drive is divided into 3 blocks and 9 statuses as described below

3blocks

- 1. PowerDisable: without PWM output
- 2 PowerEnable with PWM output
- 3 Fault one or more encus have occured

9status

- 1. Start poveron
- 2 Not Ready to Switch On the motor drive is initiating
- 3 Switch On Disable: occurs when the motor drive finishes initiating
- 4 Ready to Switch On warning up before running
- 5 Switch On the motor drive has the PWM output, but the reference command is not effective.
- 6 Operate Enable: able to control normally
- 7 QuickStopActive when there is a QuickStoprequest, stoprunning the motor drive.
- 8 Fault Reaction Active the motor drive detects conditions which might triggerenou(s).
- 9 Fault: are armae encus have accuned in the matarchive.

When the motor drive is turned on and finishes the initiation, it remains in Ready to Switch On status. To control the operation of the motor drive, change to Operate Enable status. To do this, set the control words bit0-bit3 and bit7 of the Index 6040H and pair with Index Status Word (Status Word 0X6044). The control steps and index definition are described below

Index6040

15-9	8	7	6-4	3	2	1	0
Reserved	Halt	FaultReset	Operation	Enable operation	QuickStop	Enable Voltage	SwitchOn

Index6041

15-14	13-12	11	10	9	8	7	6	5	4	3	2	1	0
Reserved	Operation	Internal 1 limit active	Target reached	Remote	Reserved	Waring	Svitch on disabled	Quick I stop	Voltage enabled	Fault	Operation enable	Swiitch an	Ready to switch on



Set command 6040=0xE, then set another command 6040=0xE. Then you can switch the motor drive to Operation Enable. The Index 605A determines the direction of the lines from Operation Enable when the control mode changes from Quick Stop Active. When the setting value is 5-7, both lines are active, but when the setting value of 605A is not 5-7, once the motor drive is switched to Quick Stop Active, it is not able to switch back to Operation Enable.

Index	Sub	Definition	Factory Setting	RW	Size	Unit	PDO Map	Mode	nde
									O Disable drive function
									1: Slowdownonslowdowniamp
									2 Slowdownonquickstopramp
		Oddratan							5 Slowdownonslowdowniamp
6054h	0	optioncode	ptioncode 2	RW	S16		No		andstayinQuickStop
									6 Slowdownonquickstopramp
									7 Slowdomonthe a pert init
									andstavinQuickStop

When the control section switches from Power Enable to Power Disable, use 605C to define the parking method

Index	Sub	Definition	Factory Setting	RW	Size	Unit	PDO Map	Mode	nde
605Ch	0	Disable operation optioncode	1	RW	S16		No		O Disable drive function 1: Slowdown with slowdown ramp, disable the drive function

B323Various mode control method (by following DS402 standard)

Speed mode

- 1. SetVJ to speed control mode set Index6060 to 2
- 2 Switch to Operation Enable mode: set 6040=0xE, then set 6040=0xE
- 3 Set the target fiequency, set target fiequency for 6042, since the operation unit of 6042 is npm, a transform is required

n f <u>120</u> p n rotationspeed (pm) (rounds/ninute) p number of poles in the motor (Pole)

f: iotationfiequency(Hz)

Forexample

Set 6042H= 1500(npm), if the number of poles is 4 (Pr05 04 or Pr05 16), then the motor drive's operation frequency is 1500 (1204) = 50 Hz. The 6042 is defined as a signed operation. The plus or minus sign means to rotate clockwise or counter-clockwise.

- 4 To set acceleration and deceleration use 604F (Acceleration) and 6050 (Deceleration).
- 5 Trigger an ACK signal: in the speed control mode, the bit 6-4 of Index 6040 needs to be

controlled It is defined below

		Intex6040		CI D.A
Constant in the	Bite	Bit 5	Bit 4	SUVI
Speed more	1	C	1	Locked at the cunert signal
(1123000-2)	1	1	1	Runtoreachtargeting signal
		Other		Decelerate to C Hz.



NOIE OI: Read 6043 to get the current rotation speed (unit: rpm). NOIE O2: Read bit 10 of 6041 to find if the rotation speed has reached the targeting value (0 Not reached; 1: Reached).

B-33Using Delta Standard (Old definition)

B 3 3 1 Various mode control method (Delta Old Standard).

Follow the steps below

- 1. When the handware (refer to Section B 2 Whing for CANoper).
- 2 Set the operation source set PrOI-OI to 3 for CAN open communication card control
- 3 Set the fiequency source set PrOB 15 to 6 Choose the source for the Frequency commend from the CAN open setting
- 4 Set Delta Standard (Old definition, only supports speed mode) as the control mode: PrO420=0 and PrO424=0
- 5 Set the CANopenstation set Pr0936; the range is between 1–127. When Pr0936=0; the CANopenskive function is disabled Note: if an enor appears (CAdE or CANopen memory enor) as you complete the station setting set Pr0002=10 to reset.
- 6 Set the CANopenbauchate: set PrO4 18(CANBUS Bauch Rate: 1M(0), 500K(1), 250K
 (2), 125K(3), 100K(4) and 50K(5)

B332Byspeedmode

- 1. Set the target fiequency. set 202002, the unit is Hz, with 2 decimal places. For example 1000 is 1000 Hz.
- 2 Operation control: set 202001 = 0002Hforrunning: and set 202001 = 0001Hfor stopping



B34Using Delta Standard (New definition)

B 341 Related set up for an AC motor drive (Delta New Standard)

Follow the steps below

- 1. Wire the hardware (refer to Section B 2 Wiring for CAN open).
- 2 Set the operation source set PrOI-01 to 3 for CAN open communication card control.
- 3 Set the frequency source set PrOB 15 to 6 Choose the source for the Frequency commend from the CAN open setting
- 4 Set Delta Standard (New definition) as the control mode: Pr0420= 0 and 0424= 1.
- 5 Set the CANopenstation set PrO4 17; the range is between 1–127. When PrO4 17=0 the CANopensiave function is disabled Note: if an enor appears (CAdE or CANopen memory enor) as you complete the station setting set PrOD 02=10 to reset.
- 6 Set the CANopen baudrate: set PrO4 18 (CANBUS Baud Rate: 1M(0), 500K(1), 250K
 (2), 125K(3), 100K(4) and 50K(5))

B342 Various mode control method (Delta NewStandard)

Speed Mode

- 1. Set VJ to speed control mode set index 6060 = 2.
- 2 Set the target frequency. set 206008, unit is Hz, with 2 decimal places. For example 1000 is 1000Hz
- 3 Operation control: set 2060 01 = 0080H for server on, and set 2060 01 = 0081H for numing



B4CANopenSupporting Index

VJ Index

The parameter index conesponds as shown in this example:

Index	sub Index
2000H+ Group	nenber+1

Forexample

PrOI-OI (Source of operation command) Group member OI(OIH) - OI(OIH)

Index= 2000H+ 01H= 2001 Sub Index= 01H+ 1H= 2H

VJ Control Index

Delta Standard Mode (Old definition)

Index	Sub	Definition	Factory Setting	RW	Size		Note
00001	Ð	Pressure Crimand	0	RW	U16		
auun	Æ	FlowCommend	0	RW	U16		
	0	Number	3	R	U8		
							OORDisable
						B410	OBStep
							10B:Disable
							11B: JOG Enable
				RW		Bi3-2	Reserved
							00B:Disable
						B45_ /	OIB: Direction forward
	1	Cantral ward	0		U16		10B: Direction reverse
					-		11B: Switchdirection
						Bt7-6	Reserved
						Bit11-8	Reserved
						Bt12	Reserved
2020H						Bit14-13	OOB: Nofunction
							01B: Operation command by
							the digital keypad
							10B: Operation command
							according to PrO1-01
							setting
							11B: Switch the source of
							queration command
						Bt 15	Reserved
	2	Fieq connand(XXXXX Hz)	0	RW	U16		
						BIO	1: EF ON
	3	Othertrigger	0	RW	U16	Bt1	1: Reset
						Bt15-3	Reserved
2021H	0	Number	10	R	U8		
	-		•		THO		Highbyte: WarnCode
	L	Encrcode	U	ĸ	016		LowByte EngrCode
	2	AC motor drive status	0	R	U16	Bit 1-0	COB Stop
	~						OIB Decelerate tostop
							10B Waiing for operation
							comend
							11B: Inoperation
						Bit 2	Reserved
						Bt4-3	COB Runforward
							01B Switchfiamrunimeverse

Index	Sub	Definition	Factory Setting	RW	Size		Note
			3				torunforward
							10B Switchfiomrunforward
							touninesese
							11B Runingserse
						B#75	Deserved
							1 Madan Francisco and
						FIS	controlled by communication
							interlace
							1: NasterFrequency
						B ⁴ O	commend controlled by
							analog/external terminal
							signalinput
							1: Operation command
						Bit 10	controlled by communication
							interface
						R4 -11	1. Deservation look
						D4 10	
							Reserved
						Bit 15-13	Reserved
	3	Frequencycommend	Ο	R	U16		
	3		<u> </u>	14			
	4	Output fieq (XXXXXHz)	0	R	U16		
	5	Output cunent (XXXXXA)	0	R	U16		
	6	DC BLS voltage (XXXXV)	0	R	U16		
	7		0	P	LI16		
		Descend	0	D			
	8	Reserved	0	R			
	9	Reserved	0	R	U16		
	Α	Reserved	0	R	U16		
	B	Reserved	0	R	U16		
	C	Reserved	0	R	U16		
	D	Reserved	0	R	U16		
	Е	Reserved	0	R	U16		
	F	Reserved	0	R	LI16		
	10	Deserved	0	D			
		M Hi Carationa Conton :	U	IV			
	17	The cost	0	R	U16		
2022H	0	Reserved	0	R	U16		
	-	Display output current	0	D	THO		
			U	ĸ	UIG		
	2	Display countervalue	0	R	U16		
		Display actual cutout					
	3		0	R	U16		
	4	Display DC-DUS volage	0	R	U16		
	5	Display output voltage	0	R	U16		
	-	(XXXXV)	•				
	ß	Display output power angle	0	D	I 11G		
	U	(XXXX)	U	N	010		
		Display output power by U		_			
	7	V. Winkw(XXXXXIAN)	U	K	U 16		
		Display actual motorspeed					
	8	(XXXXX man)	0	R	U16		
	9		0	R	U16		
	-	icique (XXXXX%)		<u> _ </u>			
L	A	Display PG feedback	0	R	U 16		
	В	Reserved	0	R	U16		
ļ			~	-*			
	С	Displaysignal for PS analog	0	R	U16		

VFD VJ·C | Appendix B: CANopen Overview

Index	Sub	Definition	Factory Setting	RW	Size	Note		
		input terminal , 4-20mA/ 0-10V conesponds to 0-100% (totvodecimal places)						
	D	Display signal of PI analog input terminal, 0-10V conesponds to 0~100% (to tvo decimal places)	0	R	U16			
	F	Display the IGBT temperature of drive power module (XXXXC)	0	R	U16			
	10	Display motor drive's capacitor temperature (XXXXC)	0	R	U16			
	11	The status of digital input (ON/OFF), refer to PrO2 12	0	R	U16			
	12	The status of digital output (ON/OFF), refer to PrO2 18	0	R	U16			
	13	Reserved	0	R	U16			
	14	The conesponding CPU pin status of digital input	0	R	U16			
	15	The conesponding CPU pin status of digital output	0	R	U16			
	16	Reserved	0	R	U16			
	17	Reserved	0	R	U16			
	18	Reserved.	0	R	U16			
	14	Display signal of QL analog input terminal, 0~10V conesponds to 0~100% (to two decimal places)	0	R	U16			
	1B	Display actual pressure (Bar)	0	R	U16			
	1C	Display law hr	0	R	U16			
	1D	Displaymotor's temperature °C	0	R	U16			
	1E	Display motor dive's over load in%	0	R	U16			
	1F	Display motor's overload in % of HES type A	0	R	U16			
	20	Display current at basing (Ampere)	0	R	U16			
	21	Display baking chopper's temperature °C	0	R	U16			

Delta Standard Mode (New definition)

Index			Size	Descriptions			See DAL	
	SUD	FC/VV		bit	Definition	Priority	speedwide	
	00h	R	U8					
				0	Ack	4	0 fcml=0 1: fcml= Fset(Fpic)	
				1	Dir	4	0 FWDrunconnend 1: REV runconnend	
				2				
			U16	3	Halt	3	0 Drive runs until target speed is reached 1: Drive stops by declaration setting	
		RW		4	Hold	4	O Drive runs until target speed is reached 1: Frequency stop at current frequency	
				5	JOG	4	OJOG OFF Pulse 1:JOG RUN	
2060h				6	QStop	2	QuickStep	
				7	Power	1	0 PowerOFF 1: PowerON	
				8	Ext_Cmt2	4	0 1: Clear the absolute position	
				14-8				
				15	RST	4	Pulse 1: Fault code cleared	
	02h	RW	U16		Mode Cmd		0 SpeedMode	
	OBh	RW	U16				Speed command (unsigned decimal)	
	O ⁴ h	KW	U16					
	<u>Céh</u>		S32					
	Uch		610					
			SI6					
	Ush	KVV	UIG					
			U16	0	Anive		Frequencyreached	
				1	Dir		0 MotorFWDrun 1: MotorREV run	
		-		2	Wan		Warning	
	Olh	к		3	Encr		Encrétected	
				4			100	
2061h				5	JUG			
				6				
				15.0	Powerun		SWICHUN	
		P		<u>6-CT</u>				
		r P	LIIG				Act al a ta t for a ver-	
		R D	010					
		R D	522				Actual matica (absolt to)	
	06h	R						
	07h	R	S16				Actual taque	

DS402Standard

Index	c.h	Definition	Factory	DAN	RW Size	Unit	PDO	Mada	Nhin
	Sub		Setting	I V/VV			Map	NDCIE	INDIE
6007h		Abarteameetion option	2	RW					0 No action
	0				S16		Yes		2 Disable voltage
		cote							3 QuickStep
608Fh	0	Encrcade	0	RO	U16		Yes		
6040h	0	Cantral ward	0	RW	U16		Yes		
6041h	0	Status word	0	RO	U16		Yes		
6042h	0	vl target velocity	0	RW	S16	фm	Yes	પ્ર	
6043h	0	vl velocity demand	0	RO	S16	фm	Yes	પ્ર	
6044h	0	vl control effort	0	RO	S16	фm	Yes	v	
60 4 Fh	0	d campfinction time	10000	RW	U32	1ms	Yes	પ્ર	
6050h	0	vislowdowntime	10000	RW	U32	1ms	Yes	પ્ર	Unitmust be 100ms, and check if the setting is 0
6051h	0	vlquicksteptine	1000	RW	U32	1ms	Yes	પ્ર	8
		Quickstop option code	2	RW	S16		No		0 Disable drive function
									1: Slowdownanslow
	0								downanp
									2: Slowdown on quick
									stopianp
6054h									5 Slowdownanslow
									downanpandstayin
									QUICKSTOP
									6 Slowdownanquick
									stopianpandstayin
									QUICKSTOP
605Ch	0	Disable operation option code	1		S16		No		0 Disable drive function
									1: Slowdownwithslow
									down amp, disable the
									dive function
6060h	0	Mode of operation	2	RW	S8		Yes		
									2: Velocity mode
6061h	0	Mode of operation display	2	RO	S8		Yes		Same as above

B-5CANopen Fault Codes

* Refer to settings for Pr06 17-Pr06-22 and Pr14 70-Pr14 73

Setting*	Display	Fault code	Description	CANoper fault register (bit 0-7)	CANopen fault code
1	oc R	0001H	Overcunent during acceleration	1	2213H
2	ocd	0002H	Over current during deceleration	1	2213H
3	ocn	0003H	Overcunent during steady status operation	1	2214H
4	588	00041	Grandfault Whencre of the cutput terminal(s) is graunded, the short circuit current is more than 50% of the AC motor drive rated current. Note: the short circuit protection is provided for AC motor drive protection, not for protection of the user	1	2240H
6	ocS	000 6 H	Over cunent at STOP. Hardware failure in cunent detection	1	2214H
7	008	0007H	Over cunert during acceleration Hardware failure in cunert detection	2	3210H
8	oud	000811	Over cunent during deceleration Hardware failure in cunent detection	2	3210H
9	000	COORT	Over cunert during steady speed Hardware failure in cunert detection	2	3210H
10	ouS	CODAH	Overvoltage at STOP. Hadvare failure incurrent detection	2	3210H
11	108	COOBH	DC BUS voltage is less than Pr0600 during acceleration	2	3220H
12	ίυσ	ссосн	DC BUS voltage is less than Pr0600 during deceleration	2	3220H
13	Lun	COODH	DC BUS voltage is less than Pr0600 inconstant speed	2	3220H
14	LuS	COOEH	DC BUS voltage is less than Pr0600 at stop	2	3220H
Setting*	Display	Fault code	Description	CANoper fault register (bit 0-7)	CANopen fault code
----------	---------	---------------	---	---	-----------------------
15	P X L	COOFH	Phase loss protection	2	3130H
16	o X	COLCH	IGBT over heat IGBT temperature exceeds protection level	3	4310H
18	082	001211	IGBINIC openciat	3	FFOOH
21	ol	0015H	Overload, the AC motor drive detects excessive drive output cunent.	1	2310H
22	Eol 1	0016H	Electronic thermal relay 1 protection	1	2310H
24	oX3	0018H	Motor PIC overheat	3	FF2OH
31	c F 2	OOIFH	Internal EEPROMicannot be programmed	5	5530H
33	cd¦	0021H	U phase encr	1	FF04H
34	cd2	0022H	V phase encr	1	FFO5H
35	cd3	0023H	Wphase encr	1	FFOGH
36	X48	0084H	Clampcunent detection enor (H:10)Abnomal oc protection hardware vine	5	FFO7H
37	X8 :	0025H	Over current detection en or (Heli) Abnomel oc protection hardware wire	5	FFOSH
38	862	0026H	Over voltage detection encr (H:12)Abnomal ov protection hardware vine	5	FFOSH
39	Xd3	0027H	Ground cunent detection enor (Ht3Abnomel GFF protection hardware wire	5	FFOSH
40		002 8H	Autouringencr	1	FF21H

Setting*	Display	Fault code	Description	CANoper fault register (bit 0-7)	CANopen faultcode
42	P6F ;	OOPAH	PG feedbackenor	7	7301H
43	62434	002 EH	PG feedbackloss	7	7301H
44	<i>PGF</i> 3	OORCH	PG feedbackstal	7	7301H
45	የርናዓ	COPULI	PG slipenor	7	7301H
49	۶۶	COBIH	External Fault; when the multi-function input terminal (EF) is active, the AC motor drive stops output.	5	9000H
50	EF ;	003211	Emergency stop, when the multi-function input terminal (EF1) is active, the AC motor drive stops output	5	9000H
52		0034H	Keypadis locked after you enter the wrong password three times.	5	FF26H
53		0035 1 H	CPU encr	4	7500H
54		COBEHI	Modus function code enor (illegal function code)	4	7500H
55		0033H	Modus data address is in enor [illegal data address (00Hto254H)]	4	7500H
56		003 91 1	Mbabus data encr(illegal data value)	4	7500H
57		0039H	Modus comunicationence (attempt to write data to read-only address)	4	7500H
58		0084H	Madus transmission time out	4	7500H
60	68	COBBH	Balingchoppercuor	5	7110H
65	<i>PGFS</i>	0041H	PG cardinformation enor	5	FF29H

Setting*	Display	Fault code	Description	CANoper fault register (bit 0-7)	CANopen fault code
66	008	0042H	Overpressure	5	FF29H
67	PF 6 F	00 43 H	Pressure feedback fault (PfbF)	5	FF29H
68		004H	Oil pumpiums reversely (Prev)	5	FF29H
69		0045H	Oil shartage (noil)	5	FF29H
71		0047H	Overcument at baking chopper (ocbs)	1	FF29H
72		00491	Baling resistoris openaicuit (bro)	32	FF29H
73		0049H	Braking resistor's resistance value is too small. (brF)	32	FF29H
74		004AH	Baling chopper overheated (oH4)	3	FF29H
75		00 Æ H	Encroccuned on baking chopper's thermo protection line (tH4o)	3	FF29H
82		0052H	Output phase loss 1 (Phase U)	2	2331H
83		0053H	Output phase loss 2 (Phase V)	2	2332H
84		005 /H	Output phase loss 3 (Phase W)	2	2333H
101		0065H	CANqpenguaiding entor	4	8130H
102		006611	CANqpenheartbeatenor	4	8130H
104		006911	CANqpenbus offenor	4	8140H
105		0000000HI	CANqpenintexenor	4	8100H

Setting*	Display	Fault code	Description	CANoper fault register (bit 0-7)	CANopen fault code
106		0064H	CANqpenstation achiess enor	4	8100H
107		006 BH I	CANquennemuyencr	4	8100H

B-6CANopenLEDFunction

There are two CAN open flash signs: RUN and ERR.

RUNIED (greencolar):

IEDstatus	Candilian	CANopenState
OFF	Keep lighting off	Inital
Binking	ON-200 200 ms ms ms	Pre-operation
Single flash	ON 200 200 1000 ms ms ms ms	Stopped
ON	Keep lighting on	Operation

ERR LED (red color):

LEDstatus	Condition/State							
OFF	NoEncr							
Single flash	One Message fail ON 200 1000 OFF NB NB							
Double flash	Guanding fail or heartbeat fail ON 200 200 200 1000 ms ms ms ms							
Triple flash	SYNC EL ON 200 200 200 200 1000 OFF NB NB NB NB NB							
ON	Bus aff							

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AppendixC: M6J 220V & 380V Hybrid Servo Motor

C 1 Product Description

C-2Model Explanation

C-3MbtorSpecifications

C-4Toque - Rotation characteristic curve

C-5ProductAppearance and Dimensions

C-6WingofServoOilPunp



This hybrid servodive has gone though ignous quality control tests at the factory before shipment. If the package is damaged during shipping please contact your dealer: The accessories produced by Delta are only for using with Delta hybrid servodive. Donot use with other dive to prevent damage.

Donotuse accessories, which are not produced or recommended by Delta on Delta hybrid servo drive.

C-1 Product Description

Introducing Delta M6J servo notors, which are designed for hybrid servo system The Delta M6J servo notors have specialized functions to provide efficient output when working with VFD VJ hybrid servo drives.

C-2Mbdel Name Explanation



C-3MbtorSpecifications

220V:

Mada		C						
IVID	08	DR201AE42	DR201EE42	DR2011E42	GR202DE42	DR2021E42		
PrO1-35 Motor I	D#	216	218	220	222	224		
Valt	age	2201/						
Rated Output Power	kW	10	14	18	23	27		
No of Poles				8		1		
RatedTorque	Nm	58	81.5	103	122	154		
Maximum Taque	Nm	116	176	210	282	308		
Rated Speed	ıpm	1700	1700	1700	1800	1700		
Maximum Speed ^{*1}	ıp m	2100	2200	2200	2250	2200		
RatedCunent	Α	38	53	69	87	101		
Taque Canstant	NmA	1.52	1.54	1.49	1.47	1.52		
Voltage Constant	Vlapm	100	95	965	90	95		
Phase Resistance	dm	0239	0145	0110	0064	0000		
Inductance	nH	2740	1.791	1.438	0939	0864		
RotorMoment of Inertia	kgnf	68x10 ³	90x10 ³	11.7x10 ³	133x10 ³	17.5x10 ³		
Weight	kg	46	53	595	67.5	836		
Frame	m			200x200				
Insulatio	nClass		Clas	ssF(WindingClass	H			
Protectio	n Class			IP 54				
Efficien	y Class	E3/GB32532	013(Chinese Standa Em	ıdon Mirimum Allov 292 y Efficiency Grade	able Values of Energ	yEfficiencyand		
Cooling	Method		Fano	odingbyACFan(22	OV _{AC})			
Eno	oder			Resolver2Poles				
MotorTemper	ture Protection	PI	iC temperature protec	tion and KTY84 130	temperature sensor*	3		
			Te	mperature: 15 40	c			
Operating E	invionment		Hmidiy: 2	0 90% RH(Nanca	ndensation)			
				Aliiude < 1000m				
Installatio	nMethod		F	large/SupportLegs	l			
Certific	ations	CE						

VFD VJC | AppendixC: M6J 220V & 380V Hybrid Servo Mbtor

380V:

NA HI		M6JC								
Model		IR201AE42	R201EE42	R201E42	OR202DE42	LR202FE42	IR208CE42	CR264FE48	IR265CE48	R200E48
PiOI-35Mbtor	D#	217	219	221	223	225	227	229	231	ТВА
Voltage	•					380V				
Rated Output Power	kW	10	14	18	23	25	32	45	52	68
#ofPole	5					8				
Rated Torque	Nm	58	83	103	120	159	180	240	295	385
Meximum Taque	Nm	112	155	208	215	336	320	365	455	695
RatedSpeed	դրո	1700	1700	1700	1800	1500	1700	1800	1700	1700
Mæimm Speed *1	щm	2150	2150	2150	2250	1950	2150	2250	2150	2150
Rated Cunent	A	23	328	42.1	467	559	70	965	115	149
Taque Canstant	NmA	252	253	245	257	285	26	249	257	258
Voltage Constant	V/kpm	171	171	180	171	192	177	175	182	190
Phase Resistance	dım	0673	0396	0319	0271	0232	0148	0088	0074	0047
Intrane	nH	8584	6218	4663	3995	3636	2740	2385	2305	1.721
RotorMoment of	12	7.4	96	11.6	138	180	191	41.6	505	61.4
Inertia	igm.	x10 ³	x10 ³	x10 ³	x10 ³	x10 ³	x10 ³	x10 ³	x10 ³	x10 ³
Weight	kg	46	53	595	67.5	836	85	134	152	171
Fiane	nm			200)x200				264 x 264	
InsulationC	265				Class	F (Winding C	ass Hj			
ProtectionC	ass					P 54				
EfficiencyC	ass	IE3/GB302532013 (Chinese Standard on Minimum Allovable Values of Energy Efficiency and Energy Efficiency Gardes)								
CoolingMet	hod				FanCo	oling (AC Far	220V AC)			
Encoder	•				R	esolver2Pol	35			
Motor Temper	atue			PIC temper	ature protectic	n ^e and KIYS	14 130 tempe	alue sensor*	3	
FICEORI					T	varda are 15	4090			
Operating Enviro	ament				Hmidiy 20	90% RH(No	40C ncondensatio	I)		
					I	Mitude < 1000	m			
InstallationM	school				Flan	ge/Support]	legs			
Certificatio	116	Œ								

- *1: This chart states the maximum operation speed of a motor with no field weakening control.
- *2 Set up PIC type PiO2 11 = 2 to use PIC130 as temperature protection
- *3 Users are required to set up the parameter Pr02 09 PTC Level (factory setting: 130 °C)

when using the KTY84 13O temperature sensor (PTC type PtO2 11 = 1) for motor overheating protection

*4 Delta reserves the right to revise specifications without prior notice.

C-4 Torque - Rotation characteristic curve









АркС-6





380V:

VFD VJ-C | Appendix C: M6J 220V & 380V Hybrid Servo Motor 380V:







АркС-8

C-5Product Appearance and Dimensions

220V:

C-51: Frame 200



Model			M6JC								
		DR201AE42	DR201EE42	DR2011E42	GR202DE42	DR20211E42					
A	m	381	417	453	489	575					
В	m	285	310	350	395	470					

*Note: Size of Model B can be customized according to your requirement.

380V:



ъ	6-del			M6J	C		
	ouei	R201AE42	R201EE42	R201E42	OR202DE42	LR202FE42	R208CE42C
Α	m	381	417	453	489	575	590
В	mm	285	310	350	395	470	470

* Note: Size of Model B can be customized according to your requirement.

C-53 Frame 264



Model		MS	C	
		CR264FE48	R265CE48	IR266E48C
A	nm	577	631	684
В	nm	370	423	476

*Note: Size of Model B can be customized according to your

requirement

C-6Wining of Servo Oil Pump



C-61: Wining Box of 220V & 380V

C-62: Recommended Wiring Size and Temperature Rating

220V:

Model			C									
		DR201AE42	DR201FE42	DR2011E42	GR202DE42	DR202FE42						
Minimum Wilting Size	AWG	6	5	4	3	2						
	mŕ	135	17	21	27	35						
*Mistuse coppervises of temperature rating 90 for installation												

380V:

Model				M6JC						
		R2070F42	IR201AE42	IR201FF42	R201E 42	OR202DE42	LR202FE42, R202FE42	R2080F42	OR264FE48, IR265CE48	IR200E48
Minimum Witing Size	AWG	10	8	7	6	5	4	3	2	1
	mŕ	53	85	105	135	17	21	27	35	45
	*Mistuse coppervices of temperature rating 90 for installation									

C-63 EncoderCable (CEHE-E5M)

220V & 380V:



1	SCSI(MDR) Plug
	<drive side=""></drive>
2	MDR Shell with SCSI
	teminal
3	Cable
4	StainRelief
5	MilayConnector
	<mbtarside></mbtarside>
6	Cable Tie

VFDVJC | Appendix D: MSO 380V Oil Cooled Hybrid Servo Motor

Appendix D. MSO 380V Oil Cooled Hybrid Servo Motor

D 1 Product Description

D2Model Explanation

D3MotorSpecifications

D4Taque - Rotation characteristic curve

D 5 Product Appearance and Dimensions

D6WingofServoOlPunp



This hybrid servodive has gone through rigorous quality control tests at the factory before shipment. If the package is damaged during shipping please contact your dealer: The accessories produced by Delta are only for using with Delta hybrid servodive. Donot use with other drive to prevent damage Donot use accessories, which are not produced or recommended by Delta on Delta hybrid servodive.

D1 Product Description

Introducing Delta M6O servo motors which are designed for oil cooled hybrid servo system The Delta M6O servo motors have specialized functions to provide efficient output when working with VFD VJ oil cooled hybrid servo drives.

D2Mbdel Name Explanation



D3MbtorSpecifications

Mixtel		C						
		R208AE42	R2631E48	R264F48	R265JE48	IR206IE48		
Voltage		380V						
Rated Output	3	~	~		-	~		
Power	KAVV	30	37	4/	59	68		
No of Poles		8						
Rated Torque	Nm	170	210	266	333	385		
Maximum	Nm	320	336	426	533	695		
RatedSpeed	IDD	1200						
Maximum	•							
Speed ^{*1}	ıpm	2150						
Rated Cunent	Α	705	85	102	127	149		
Taque Constant	Nm/A	241	247	260	262	258		
Voltage Constant	V/kapm	179	183	190	186	190		
Phase Resistance	dım	0143	0110	Q077	0054	0047		
Inductance	nH	233	350	266	1.95	1.72		
RotorMoment of Inertia	kganf	180	326	416	505	588		
Weight	łg	98	1265	145	167.5	190		
Frame	m	200x200		264	x264			
Insulation	Class	Class F (Winning Class H)						
Protection	Class	P 54						
		IE3/GB302532013(Chinese Standard on Minimum Allovable Values of Energy Efficiency and						
Efficiency	Class	Energy Efficiency Grades						
			OilCooiing					
CoolingMethod		(Required cooling flowrate: 151/min, maxim moil temperature 50)						
Encoder		Resolver 2 Poles						
Motor Temperature								
Protection		PIC tenperature protection and KTY84 130 temperature sensor ^{*3}						
Operating Environment		Temperature: - 15 409C						
		Hanidity: 20 90% RH (Noncondensation)						
			Altitude < 1000m					
Installation	Method	Flange						
Certifications		Œ						

VFDVJC | Appendix D: M6O380V Oil Cooled Hybrid Servo Motor

- *1: This chart states the maximum operation speed of a motor without field weakening control.
- *2 Users are required to set up the parameter PiO200 PTC Level (factory setting 130 °C)

when using the KTY84 13O temperature sensor (PTC type PtO2 11 = 1) for motor overheating protection

*3 Delta reserves the right to revise specifications without prior notice.



D4Taque Rotation characteristic curve

390/:





*1: The curves in images above display the maximum operation speed of a motor without field weakening control.

D5ProductAppearance and Dimensions

D51: Frame 200



ъл	ised a l	M6O	_C
IVI	ue	R208AE42	
A	m	292	
B mm		573	



Madal		M6OC					
		R263HE48	R264HE48	R265JE48	IR266E48		
Α	m	143	197	250	304		
В	m	508	557	610	664		

D52 Frame 264

D6WingofServoOilPunp

D61: Wing Box of 380V



The colors mentioned above are the colors of vines inside the motor; not the colors of encoder's vines.

Voltage	380V	U, V, W, PE	
Frame size	Della part#	SciewSize	Teminal width
Frame 200	M60 IR208AE42C	MB	19mm
	M60 IR263 IE48C		<i>2</i> 5mm
English 204	M50 R264 E48C		
Flate 404	MSO IR265JF48C	IVD	<i>27</i> mm
	M60 IR266IE48C		

D62: Wing Part Spec. 380V:

Model		MJOC					
		R203AE42	R263HE48	R264HE48	R265JE48	R206E48	
Minimum	AWG	3	3	2	2	1	
WingSize mmf		27	27	35	35	50	
*Mistuse coppervices of temperature rating 90 for installation							



D63 EncoderCable

1	SCSI(MDR) Plug
	<driverside></driverside>
2	MDR Shell with SCSI
	terminal
3	Cable
4	StainRelief
5	MilayConnector
	<motorside></motorside>
6	Cable Tie

Appendix E: Activate the Oil Pump, Step by Step



E-1 Step by Step

Step 1. Verify if there's enough hydraulic oil in the oil tank before you tumon the power

Step 2 Afteryoutumon the pover of the hybrid servo drive, use jogging to enable the oil pump The jogging here means pressing ON button and release right away. Then you will hear the sound of oil pipe sucks in air. Repeat this step few more times until you no longer hear the sound of sucking in air.

Step 3 After you clear the air in the oil tank Run the motor without any load at a rotation speed of 1200 RPM for 15 minutes.

Step 4 After you finish Step 3 and before you start to test machinery, increase progressively the pressure by following the 5 stages below

Forexample: the maximumplessure is 1790bar and the maximum speed is 1200pm Apply jogging method while increase the pressure from stage 1 to stage 5 Stage 1: 30bar Stage 3: 100bar Stage 3: 100bar Stage 4: 140bar Stage 5: 170bar

You need to finish the 5 stages above then you can start to test the machinery