

Chapter 7 Options

7-1 Outline of Options

The VAT3FD Series options include those shown below. This chapter will focus on the main circuit options and main circuit wiring devices.

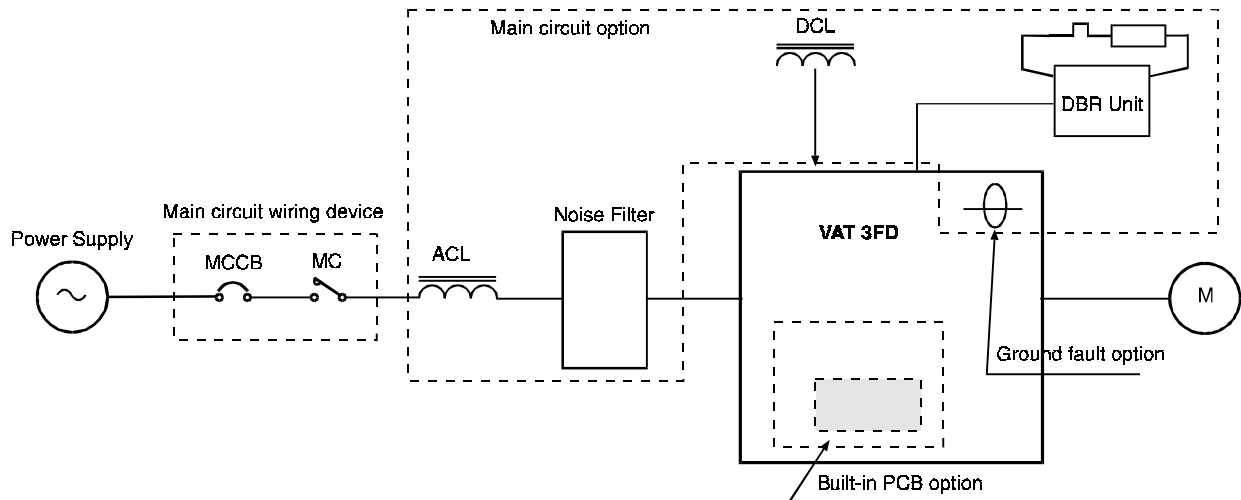


Table 7.1

Item	Type	Function
Main circuit wiring devices		
Breaker for wiring (MCCB)	Select a device that matches the inverter rating.(Table 7.2.)	Always install this device to protect the wiring of the inverter and peripheral devices.
Magnetic contactor (MC)	Select a device that matches the inverter rating. (Refer to Table 7.2.)	Install this device to provide an operation interlock. When using the DBR unit, always install this device to protect the DBR. (Refer to Fig. 2.3.)
Main circuit options		
ACL	(Refer to Table 7.2.)	If the capacity of the inverter's power supply transformer exceeds 10 times the inverter unit capacity , always install this device to protect the inverter. (Balance with power supply) This is also effective for improving the inverter's input power factor to 0,9 and for suppressing the current's high frequency.
DCL	(Refer to Table 7.2.)	Install this device to improve the power factor of the inverter input. This is also effective in creating a balance with the power supply as the ACL. The power factor will be approx. 0.9.
Noise filter	(Refer to Table 7.2.)	This device suppresses the electromagnetic noise generated by the inverter. The electromagnetic noise is the radiation of electromagnetic waves in the radio frequency bands and that conveyed to the power supply wires. Mounting of this device is recommended to achieve EMC compliance
DBR unit	UADOPTDBUHO	This is used when the motor is to be stopped with dynamic braking.

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Table 7.1

Item	Type	Function
Built-in PCB options (These are built-in type options mounted on the basic PCB of the inverter.)		
Relay interface	UADOPTR	This is used to expand the contact input/output points. Relay input : 4 points (PSI6~9) 1c contact output : 2 points (PSO1,2) Open collector output : 2points (PSO3, 4)
Analogue interface	UADOPTA	This is used to give the analogue setting input a higher precision. Analogue input : 3 points, 15 bits The standard FSV, FSI and AUX functions are replaced with this. Relay input : 4 points (PSI6~9) Open collector output : 4 points (PSO1~4) Speed detector for ASR : 0-12Vpulses 10kHz
PLC interface	UADOPTP	This is used to receive parallel settings from the PLC. Parallel data input : 16 bits Data length: select from 16, 12, 8 bits Format : Select either binary or BCD Open collector output : 4 points (PSO1~4) Speed detector for ASR : 0-12V pulses, 10kHz
CPU serial interface	UADOPTM UADOPTN	This is used to make a connection with serial transmission to the personal computer, etc. Transmission : RS-232-C RS-422/485 Multi-drop is possible for up to 32 units. Baud rate : 1200~9600 baud Open collector output : 4 points (PSO1~4) Speed detector for ASR : 0-12V pulses, 10kHz
Trace back	UADOPTT	This is used to register the state such as the frequency and current when a fault occurs, and the analyze the trouble by tracing the state. Analogue output: 4 points (for measurement) Logic output : 8 points (for measurement) Relay input : 4 points (PSI6~9) Open collector output : 4 points (PSO1~4) Speed detector for ASR: 0-12V pulses, 10kHz

Note: The details of PCB options are not described in this manual. Please ask your supplier for specific manual of each option.

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Table 7.2 Main circuit wiring device ratings and main circuit option types

VAT3FD CT units	Large sizes VT units	MCCB current	MC current	ACL	DCL	DBR Unit	Noise Filter
UADX500		100	80	Check section 7.4	Check section 7.4	Check section 7.2	Check section 7.3
UADX600	UADVX550	150	110				
UADX750	UADVX750	150	150				
UADX1000	UADVX1000	200	170				
UADX1200	UADVX1200	300	200				
UADX1500	UADVX1400	300	260				
UADX1700	UADVX1700	350	350				
UADX2200	UADVX2000	400	350				
UADX3000	UADVX2500	500	500				
UADX3600	UADVX3300	700	660				
UADX4000	UADVX4000	800	660				
	UADVX4600	900	800				

7-2 Dynamic Braking (DBR) Option

- In applications where high torque or high frequency deceleration is repeated, the motor must be stopped with dynamic braking. In this case, use a DBR unit listed in Table 7.2.
- Connect the DBR unit according to Fig. 7.1.
Connect the inverter control terminal block RA and RC terminals with the DBR unit control terminal TB2 so that the DBR unit will function only while the inverter is running.
- If the regenerative capacity is insufficient with one DBR unit, connect the DBR units in parallel as shown in Fig. 7.1

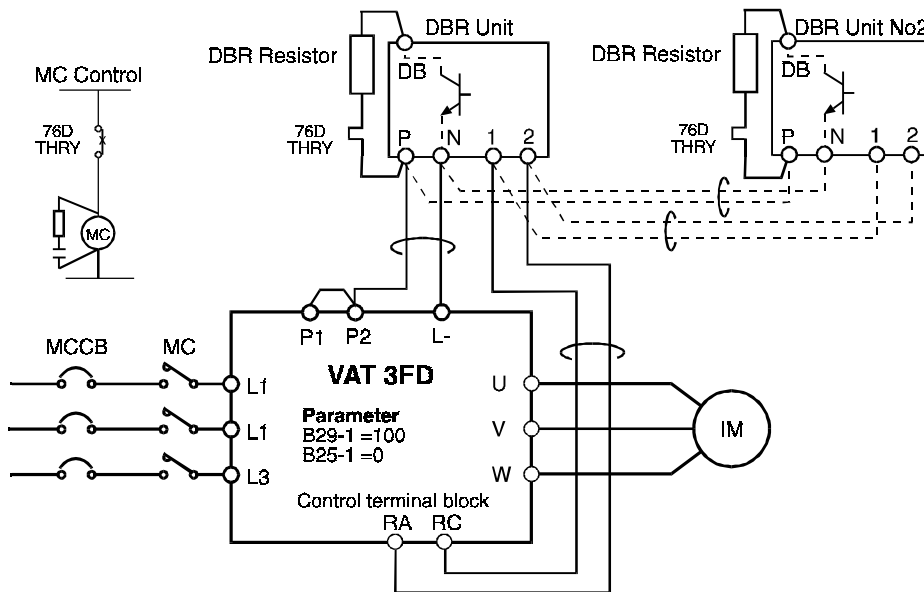


Fig 7-1

- Connect the thermal relay for DBR as shown in the above figure
- Set the following parameters when using the DBR unit.
 B80 - 1/f0 = 2 : External DBR unit is used
 B25 - 1 = 0 : RA, RB terminal output = RUN
 B29 - 1 = 100% : Regenerative torque limit value. Set this to 10% when not using the DBR.
 When limiting the regenerative torque at the full speed range, set the value obtained with the following expression.

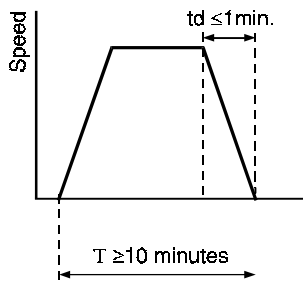
$$\mathbf{B29 - 1 = regenerative\ torque\ [\%] \times 1.1}$$

Make sure that the DBR regenerative capacity is not exceeded

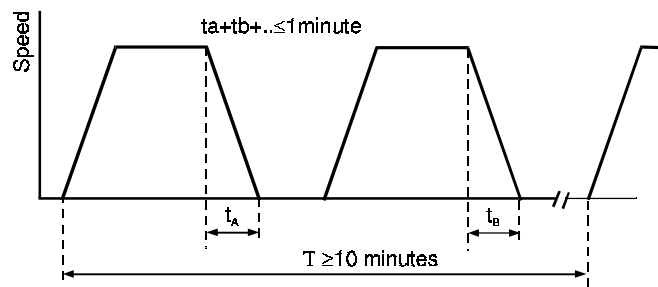
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6. Use this DBR unit at 10% ED or less as shown bellow

a) Basic run pattern



b) Random run pattern



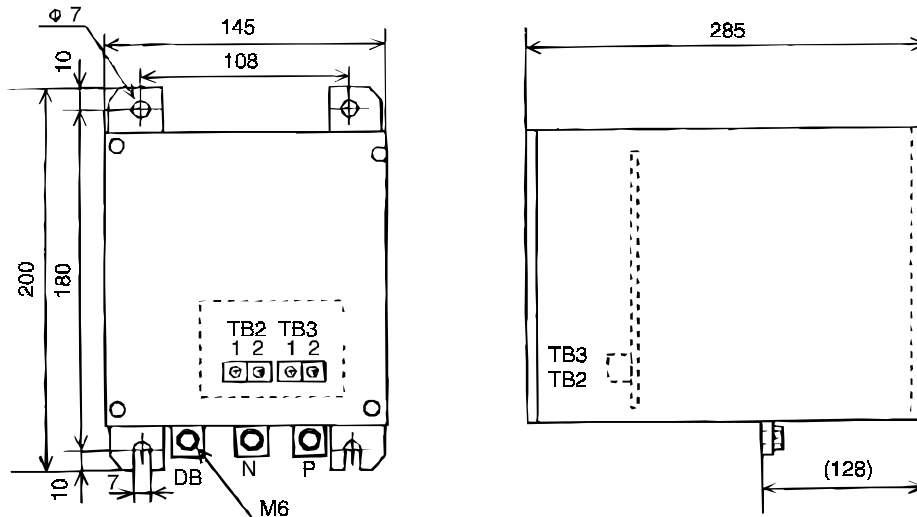
7. Obtain the power generation capacity and DBR resistance value with the following expressions.

$$\text{Power generation capacity [KW]} = \frac{\text{Re generative Torque}}{\text{Motor Rated Torque}} \times 0,8 \times \text{Motor Capacity [KW]}$$

$$\text{DBR resistance value} = \frac{K}{\text{Power generation capacity [KW]}}$$

For VAT3FD, 400V series, **K=593**

8. The minimum resistance value of the resistor that can be connected to the DBR unit is 3,3 Ohms. If the calculated value is lower than this (for units X3600, X4000) increase the No. of DBR units installed, (parallel connection, Fig 7-1).



7-2 Outline of DBR unit

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7-3 Electro Magnetic Compliance, EMC

Electromagnetic Compliance with the EN50081 & EN50082 under the industrial environment is achieved by using appropriate EMC noise filter specially designed for the large sizes of VAT3FD UADX500G-X4000G (CT units), and UADVX550G-VX4600G (VT units). In addition, ferrite chokes must be used in output power cables, to increase the safety levels of the radiated emissions.

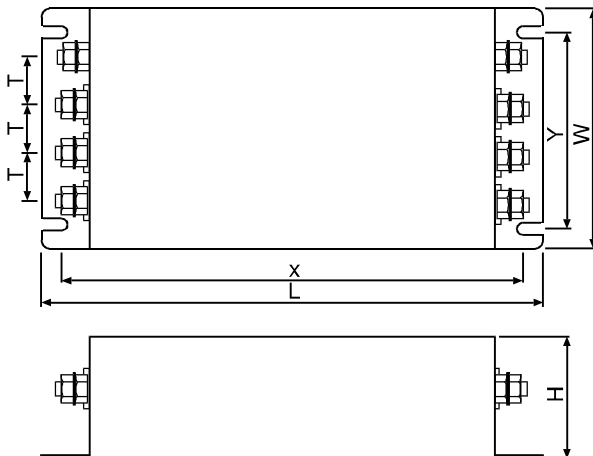
(1) Selection guide of Stand-alone EMC Filters for VAT3FD Large Size drives

EMC Filter Part No	Applied Inverter Ratings		Current	Dimensions			W. Kg
	C/T	V/T		L x W x H	X x Y	Terminals	
RS3100-MDN/Std	UADX500		100A	420x200x130	408x166	Shroud 35mm ²	13,8
RS3150-MDN/Std	UADX600	UADN300 UADVX550	150A	420x200x130	408x166	Shroud 95mm ²	13,8
RS3180-MDN/Std	UADX750	UADVX750	180A	480x200x160	468x166	Shroud 95mm ²	23,5
RS3280-MDN/Std	UADX1000 UADX1200	UADVX1000 UADVX1200	280A	580x250x205	560x170	stud M12	45
RS3330-MDN/Std	UADX1500		330A	580x250x205	560x170	stud M12	48
RS3380-MDN/Std	UADX1700	UADVX1400 UADVX1700	380A	580x250x205	560x170	stud M16	50
RS3450-MDN/Std	UADX2200	UADVX2000	450A	580x250x205	560x170	stud M16	50
RS3660-MDN/Std	UADX3000	UADVX2500	660A	700x370x250	640x300	Tag M16	85
RS3750-MDN/Std	UADX3600	UADVX3300	750A	700x370x250	640x300	Tag M16	90
RS3880-MDN/Std	UADX4000	UADVX4000	880A	700x370x250	640x300	Tag M16	90
RS3990-MDN/Std		UADVX4600	990A	700x370x250	640x300	Tag M16	90

Dimensions

Current leakage:

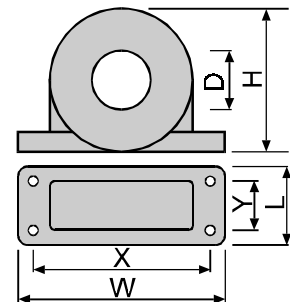
- All three phases connected: less than 0,5mA
- Two phases only connected: less than 20mA
- Only phase only connected: less than 40mA



(The last two can occur on switch-on or under supply fault conditions only)

(2) Output Ferrite chokes, dimensions

Part No	Current	D	W	L	H	X	Y	holes
OC/3	<120A	50	150	50	110	125	30	5
OC/4	>120A	58	200	65	170	180	45	6

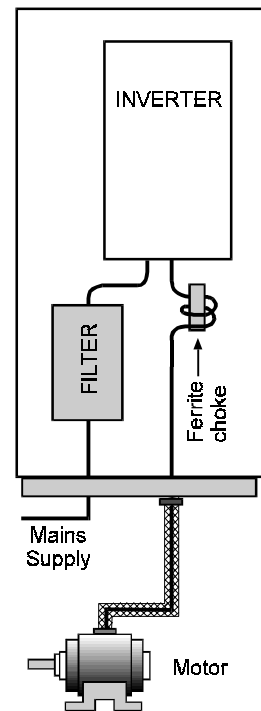


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(3) Recommended Installation instructions for Electro Magnetic Compliance

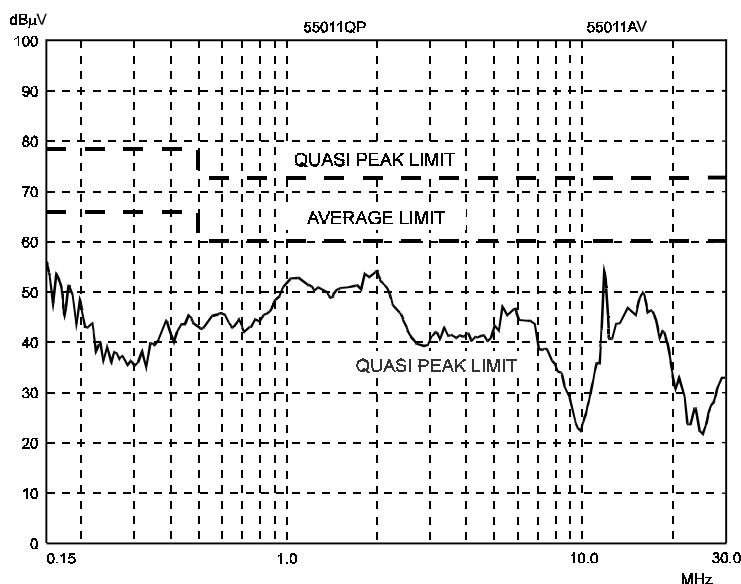
Generally an inverter has not intrinsic function on its own, but is considered as a complex component to be installed with other control components. It should be possible to achieve EMC for the machinery controlled by the inverter by following the guidelines below.

1. Check the filter and inverter rating labels to ensure that the part numbers are correct.
2. Ensure the best possible earthing of the filter.
3. Both filter and inverter have to be securely mounted.
4. Connect the incoming mains supply to the filter terminals marked "Line"; connect any earth cables to the earth stud provided. Connect the filter terminals marked "Load" to the mains supply of the inverter using short lengths of appropriate gauge cable.
5. Connect the motor and fit the output ferrite provided with the filter as close to the inverter as possible. Armoured or screened cable should be used with the three phase conductors only passing twice through the output choke. The earth conductor should be securely earthed at both inverter and motor ends. The screen should be connected to the enclosure body.
6. It is important that the lead length from filter to inverter and unscreened length of motor output cable be kept as short as possible and that the incoming mains and outgoing motor cables are kept well separated,



CONDUCTED EMISSION TEST

The graphic shows typical Conducted EMC measurements obtained for an UADX750GS with RS filter and output choke fitted, the motor being connected with 25mts of flexible armoured cable. The limits lines shown are EN50081-2 "Industrial" levels.



More information in the EMC application manual, PCST-3088E

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7-4 The use of AC and DC Line Reactors

The input part of the VAT3FD, is composed by 6 diodes for 3ph full wave rectification. Large capacitors smooth the DC voltage carried out by the converter. For this reason the input current and power factor of the VAT3FD, are greatly influenced by source impedance.

On the other hand, a very low source impedance increase the Peak/rms current ratio and may result in a damage of Inverter's input rectifier. AC line reactors must be used in this case.

VAT3FD type		ACL			DCL		
CT units	VT units	mH	Amp.	Cat. No.	mH	Amp.	Cat. No.
UADX500		0,22	90	ACR90A0H22	0,49	100	DCR100A0H49
UADX600	UADVX550	0,18	115	ACR115A0H18	0,4	125	DCR125A0H40
UADX750	UADVX750	0,18	115	ACR115A0H18	0,32	140	DCR140A0H32
UADX1000	UADVX1000	0,14	160	ACR160A0H14	0,25	180	DCR180A0H25
UADX1200	UADVX1200	0,11	185	ACR185A0H11	0,25	210	DCR210A0H25
UADX1500	UADVX1400	0,096	225	ACR225A0H096	0,18	270	DCR270A0H18
UADX1700	UADVX1700	0,067	300	ACR300A0H067	0,14	310	DCR310A0H14
UADX2200	UADVX2000	0,056	360	ACR360A0H056	0,13	400	DCR400A0H13
UADX3000	UADVX2500	0,056	460	ACR460A0H056	0,08	540	DCR540A0H08
UADX3600	UADVX3300	0,039	550	ACR550A0H039	0,07	650	DCR650A0H07
UADX4000	UADVX4000	0,035	625	ACR625A0H035	0,06	740	DCR740A0H06
	UADVX4600	0,035	700	ACR700A0H035	0,06	800	DCR800A0H06

The use of line reactors increase the line impedance, and is very effective improving both harmonic currents and power factor. Recommended ACL inductance is 4%.

8. Maintenance and Inspection

Chapter 8 Maintenance and Inspection

DANGER

- Always wait at least ten minutes after turning the input power OFF before starting inspections. Failure to observe this could lead to electric shocks.
- Maintenance, inspections and part replacement must be done by a designated person. (Remove all metal accessories such as watches, bracelets, etc., before starting the work.) (Always use an insulation measure tool.) Failure to observe this could lead to electric shocks and injuries.
- Always turn the power OFF before inspecting the motor or machine . A potential is applied on the motor terminal even when the motor is stopped. Failure to do so could lead to electric shocks and injuries.
- Do not use parts other than those designated for the replacement parts. Failure to observe this could lead to fires.

CAUTION

- Vacuum the inverter with a vacuum cleaner to clean it. Do not use organic solvents. Failure to observe this could lead to fires or damage.

8-1 Inspection Items

The inspections must be carried out periodically according to the working environment and frequency of use. If there are any abnormalities, the cause must be inspected immediately and countermeasures taken.

(1) Daily inspections

Table 8.1

Inspection item	Inspection details and work
Temperature/humidity	Confirm that the ambient temperature is 0 to 50°C, and that the humidity is 90% or less with no dew condensation.
Oil mist and dust	Confirm that there is no oil mist or dust in the VAT 3FD .
Abnormal noise and vibration	Confirm that there is no abnormal noise or vibration from the installation site or VAT 3FD .
Input power source	Confirm that the input voltage and frequency are within the specifications range.
Cooling fan	Confirm that the cooling fan rotates normally and that no lint, etc. is stuck on it.
Indicator	Confirm that all lamps on the operation panel light properly.

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(2) Periodic inspections

Table 8.2

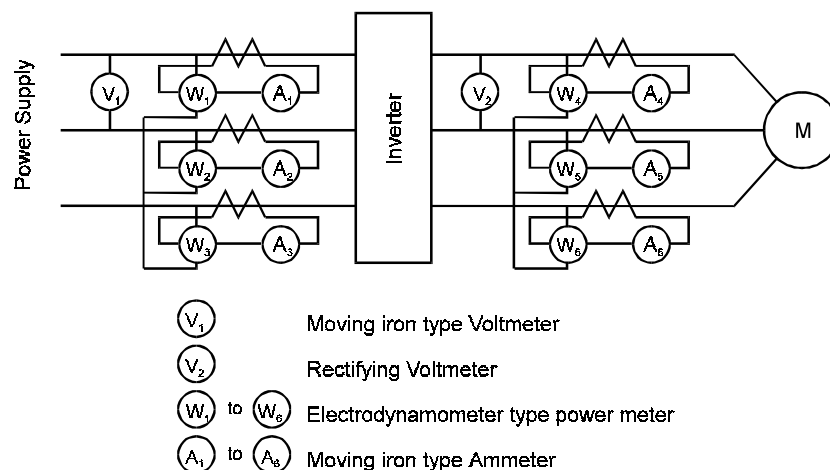
Inspection item	Inspection details and work
VAT 3FD appearance	Check the state of dirt and dust on the vent or heatsink, and clean if necessary.
VAT 3FD interior	Check the state of dirt and dust on the PCB and inside the equipment, and clean if necessary.
Terminal block	Tighten the terminal block screws if loose.
Cooling fan	Replace the fan every three years.
Electrolytic capacitor	Confirm that there is no liquid leaking or sheath discoloration.
Insulation resistance	Do not perform a megger test on the VAT 3FD. When doing a megger test on the external circuit, disconnect all wires connected to the VAT 3FD.

(3) Inspection of spare VAT 3FD

The inspection shown in Table 8.2 must also be performed for spare VAT 3FD that are left connected but are not used in normal operation. The operation of the VAT 3FD must be checked every six months by turning the power on.

8-2 Measuring Devices

As the voltage and current on the input and output sides include high harmonics, the measured value will differ according to the measuring device. When measuring with a device for commercial frequencies, measure with the following circuits and noted measuring devices.



8. Maintenance and Inspection

8-3 Protective Functions

The VAT 3FD has the protective functions shown in Table 8.3.

Table 8.3 Protective function

Name	Function
Overcurrent trip (OC-1 to 5)	The output is cut off and the inverter stops if the instantaneous value of the output current exceeds the preset value.
Overvoltage trip (OV-1 to 5)	The output is cut off and the inverter stops if the instantaneous value of the DC voltage in the main circuit exceeds the preset value.
Undervoltage trip (UV-1 to 5)	The output is cut off and the inverter stops if the DC voltage drops to approx. 65% or less due to a power failure or voltage drop during operation.
Overcurrent limit	If an overload occurs, the output frequency is automatically adjusted so that the output current is less than the overcurrent limit (150% as a standard) set with B29-0.
Overvoltage limit	If the output frequency is reduced suddenly, the DC voltage will rise in the main circuit due to the regenerative power. The output frequency will be automatically adjusted to prevent the DC voltage in the main circuit from exceeding the preset value.
Overload trip (OL-1)	The output will be cut off and the inverter will stop if the overload characteristics set with B30-0, 1 and 2 are exceeded. The setting (150% for 1 min. as a standard) can be changed according to the characteristics of the motor.
Overheat (UOH)	A thermistor is installed to detect temperature rises of the heatsink.
Self-diagnosis (IO, dER, CPU)	The built-in CPU, peripheral circuits and data are tested and monitored for abnormalities.
Grounding trip (Grd1 to 5)	The output will be cut off and the inverter will stop if a ground fault is detected.
Power module fault (PM 1 to 5)	The operation of the main circuit power module protection function is detected, and the inverter will stop if a fault is detected.

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8-4 Troubleshooting with Fault Display

The countermeasures for when the inverter stops with a fault code display are shown in Table 8.4.

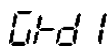
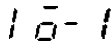

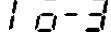
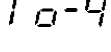
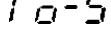


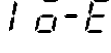
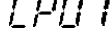
Table 8.4 Troubleshooting (1)

Display symbol	Name	Causes and countermeasures
$E\bar{n}4$ EMS	Emergency stop	1. The sequence input EMS has been activated. Check the signal wiring. 2. This fault occurs when B01-1/f1=2.
$P\bar{n}-1$ PM-1~PM-5	Power module	1. The protection circuit (overcurrent, short circuit, overheat, control power voltage drop) of the power module built in N110 or X110 and smaller has activated. 2. A DC overcurrent has flowed in 15kVA and larger. 3. The sub-codes and causes and countermeasures are the same as for OC-1~5.
$\bar{a}C-1$ OC-1	Overcurrent during stop	1. The power module in the main circuit may be broken.
$\bar{a}C-2$ OC-2	Overcurrent during constant speed operation	1. A sudden change in the load or short circuit may have occurred. Reduce the load fluctuation.
$\bar{a}C-3$ OC-3	Overcurrent during acceleration	1. Increase the acceleration time setting (A01-0). 2. Reduce the torque boost voltage (A02-0). 3. An excess GD^2 , short circuit or rapid fluctuation of the load may have occurred.
$\bar{a}C-4$ OC-4	Overcurrent during deceleration	1. Increase the deceleration time setting (A01-0) 2. A short circuit or rapid fluctuation of the load may have occurred.
$\bar{a}C-5$ OC-5	Overcurrent during braking	1. Reduce the brake voltage setting (A03-0). 2. A short circuit in the load may have occurred.
$\bar{a}U-1$ OV-1	Overvoltage during stop	1. The power supply voltage may have risen. Reduce the voltage to within the specified range.


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Display symbol	Name	Causes and countermeasures
$\overline{OV-2}$ OV-2	Overvoltage during constant speed operation	1. The power supply voltage may have risen. Reduce the voltage to within the specified range. 2. The speed may be fluctuating.
$\overline{OV-3}$ OV-3	Overvoltage during acceleration	
$\overline{OV-4}$ OV-4	Overvoltage during deceleration	1. The load GD^2 may be too large. Set the deceleration time (A01-1) according to the load GD^2 . 2. The power supply voltage may have risen. Reduce the voltage to within the specified range.
$\overline{OV-5}$ OV-5	Overvoltage during braking	1. The power supply voltage may have risen. Reduce the voltage to within the specified range.
$\overline{UV-1}$ UV-1~UV-5	Undervoltage	1. A drop in voltage, phase dropout or power supply failure may have occurred. Check the power supply system and correct if necessary.
\overline{UOH} UOH	Overheat	1. A trouble may have occurred in the cooling fan. Replace if necessary. 2. The ambient temperature may have risen. Lower the ambient temperature. (50.C or less) 3. The vent or heatsink may be clogged. Clean the dirt and dust accumulated in the vent, etc.
$\overline{OL-1}$ OL-1	Overload	1. The motor may have overloaded. Reduce the load or increase the motor and inverter capacity.

8. Maintenance and Inspection

Display symbol	Name	Causes and countermeasures
 GRD.1~GRD.5	Grounding	1. A ground fault may have occurred in the output line or motor. Restore the grounded point.
 IO-1	I/O error (gate turn-off circuit error)	1. The VAT 3FD may be malfunctioning due to external noise, etc. Look for the noise source and remove the cause. The control circuit may be faulty.
 IO-2	I/O error (A/D converter error)	
 IO-3	I/O error (current detection error)	1. The current detector connectors may be connected improperly. Properly connect these. 2. The current detection may be faulty.
 IO-4	I/O error (retry time-out)	1. Retry has failed. There are no countermeasures for this code, so reset the VAT 3FD .
 IO-5	I/O error (option expansion error)	1. Set the PCB option selection (B80-0) correctly.
 IO-6	I/O error (main circuit capacity setting error)	1. Press the  key while turning the power on.
 IO-E	I/O error (thermistor error)	1. Securely connect the thermistor connector.
 CPU-1~CPU-8	CPU error	1. The unit may be malfunctioning due to external noise, etc. Look for the noise source and remove the cause. 2. The control circuit may be faulty. 3. For all sub-codes other than 8, turn the power off and on once.

8. Maintenance and Inspection

Display symbol	Name	Causes and countermeasures
.dEt.	EEPROM data error	<p>The parameter setting value is incorrect. Correct the parameter setting value with the following procedure.</p> <ol style="list-style-type: none"> (1) Select D05-2 with the monitor mode, and press the set key. The parameter for which an error occurred will display. (2) Set the correct parameter in this state. (3) Display the parameters in order with the  key.

8-5 Troubleshooting with No Fault Display

The causes and countermeasures for errors with no fault display are shown Table 8.5.

Table 8.5 Troubleshooting (2)

Phenomenon	Causes and countermeasures
Motor does not run	<ol style="list-style-type: none"> 1. The input/output wiring may be improper, or phase or power failure may have occurred. Inspect and correct the wiring. 2. The motor may be locked or the load excessively heavy. Reduce the load. 3. The reverse run interlock function (B06-1) may be set or the other parameters may be incorrect. Check the parameters. 4. The voltage may not be output to the VAT 3FD output terminal. Measure the output voltage, and confirm that the three phases are balanced. 5. The local/remote setting may be incorrect. Set according to the required mode.
Motor runs in opposite direction	<ol style="list-style-type: none"> 1. The output terminals U, V, and W sequence may be incorrect. Interchange the phase sequence. 2. The sequence input wires for forward/reverse run may not be connected to the specified terminals. Connect the wires as follows: Forward run: Short-circuit terminals F RUN - RY0 Reverse run: Short-circuit terminals PS11 - RY0 (When input terminal function setting is B03-0=1 (default value))

8. Maintenance and Inspection

Phenomenon	Causes and countermeasures
Motor runs but the speed does not vary	<ol style="list-style-type: none"><li data-bbox="574 367 951 427">1. The load may be too heavy. Reduce the load.<li data-bbox="574 432 1214 492">2. The frequency setting signal level may be too low. Check the signal level and circuit.
Motor acceleration/ deceleration is not smooth	<ol style="list-style-type: none"><li data-bbox="574 542 1418 629">1. The motor acceleration/deceleration time setting (A01-0, 1) may be too low. Increase the acceleration/deceleration time.
Motor speed varies during constant speed operation	<ol style="list-style-type: none"><li data-bbox="574 680 1386 741">1. The load may be fluctuating excessively or the load is too heavy. Reduce the load or fluctuation.<li data-bbox="574 745 1222 806">2. The inverter-motor ratings may not match the load. Select an inverter-motor set that matches the load.
Motor speed is too high or low	<ol style="list-style-type: none"><li data-bbox="574 851 1203 911">1. The number of poles or voltage may be incorrect. Check the motor specifications.<li data-bbox="574 916 1362 976">2. The maximum frequency or base frequency (B00-2, 3) may be incorrect.<li data-bbox="574 981 1086 1041">3. The motor terminal voltage may be low. Use a thicker output cable.

Appendix

Appendix 1 Type Description System

Standard Specifications

System		400V System										
Constant Torque Drives												
Unit type, UADX.. type	X500	X600	X750	X1000	X1200	X1500	X1700	X2200	X3000	X3600	X4000	
Rated capacity (kVA)	50	60	75	100	120	150	170	220	300	360	400	
Rated output current (A)	72	87	108	145	173	214	245	321	428	519	590	
(2)												
Max. applicable motor (kW)	37	45	55	75	90	110	132	160	200	250	315	
(3)												
Working ambient temperature	-10 to +50°C											
Carrier frequency	Standard 4 KHz, 3-12Khz variable (Note 5)											
Overload Capacity	150% for one minute											
Variable Torque Drives												
Unit type, UADVX.. type	VX550	VX750	VX1000	VX1200	VX1400	VX1700	VX2000	VX2500	VX3300	VX4000	VX4600	
Rated capacity (kVA)	55	75	100	120	140	170	200	250	330	400	460	
(1)												
Rated output current (A)	84	108	147	179	208	242	293	365	479	581	661	
(2)												
Max. applicable motor (kW)	45	55	75	90	110	132	160	200	250	315	370	
(3)												
Working ambient temperature	-10 to +50°C											
Carrier frequency	Standard 4 KHz, 3-12Khz variable (Note 5)											
Overload Capacity	112% for one minute											
Common specifications												
Power supply	Rated input AC voltage;	380-460V±10%										
	rated input frequency	50Hz, 60Hz±5%										
Rated output	Rated output voltage	380-460V (Max.) (Note 6)										
	Output frequency range	0.1-440Hz										
Others	Enclosure	IP00										
	Structure	Wall-mounted unit type										
	Approx. mass (kg)	27	50	55	60	65	70	90	100	210	300	300
	Cooling method	Forced air cooling										
Paint color	Munsell 5Y7/1											
Working environment	Indoors, relative humidity 95% or below (no dew condensation); altitude 1000m or less. Freedom from corrosive or explosive gases, dust, steam, or oil mist. Vibration 3.0m/s ² or less.											

(Notes)

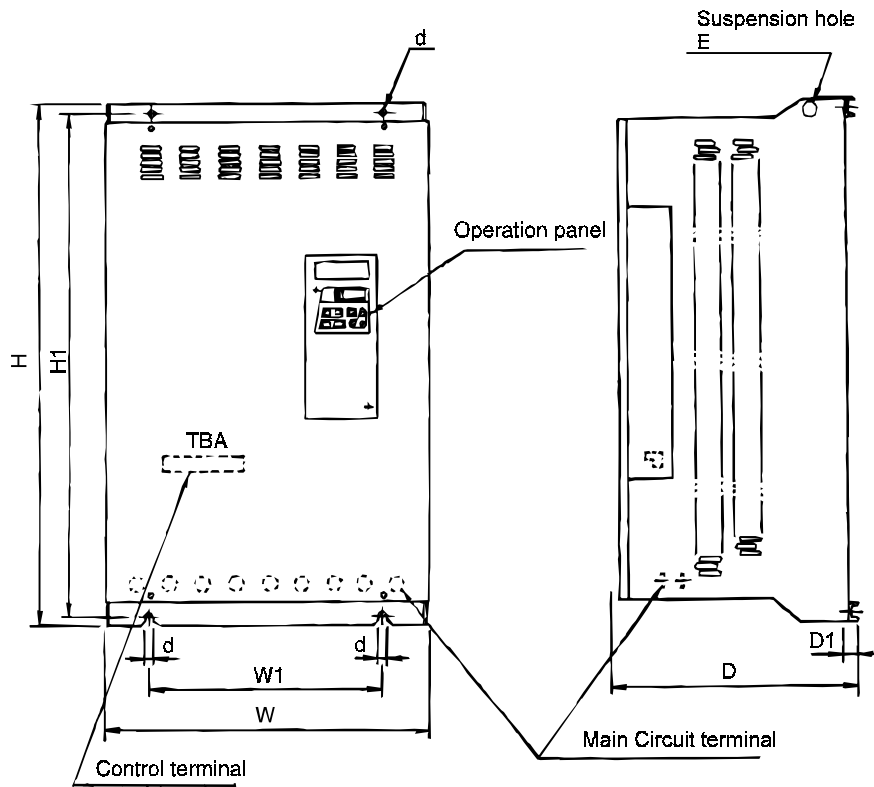
1. The unit capacity (kVA) is applicable where the output voltage is 400V.
2. The rated output current includes the harmonic current.
3. The maximum applicable motor is the standard squirrel-cage-rotor-type induction motor.
4. An output voltage higher than power supply voltage is not obtainable.
5. When the carrier frequency is higher than 4khz, reduce the output current at a rate of 5% per 1Khz

Appendix

Control Specifications	
Item	Specifications
Frequency control	
Control system	All-digital sinusoidal PWM system
Carrier frequency	3-8kHz (Arbitrarily selected with 1kHz units)
Output frequency resolution	0.01Hz
Frequency setting resolution	Digital setting input: 0.01Hz, Analog setting (external) input: 0.1% of maximum frequency
Frequency accuracy	Digital setting: $\pm 0.01\%$ ($25^{\circ}\text{C} \pm 10^{\circ}\text{C}$) Analog setting: $\pm 0.5\%$ ($25^{\circ}\text{C} \pm 10^{\circ}\text{C}$)
Control specifications	
Voltage/Frequency characteristics	Constant torque, constant power, and reduced variable torque. Each can be set arbitrarily in the range of 3-440Hz. Selection by preset patterns are also available.
Torque boost	Auto/Manual selection available Range of setting boost: 0.0-20.0%, square low: 0.0-25.0%
Start frequency	0.1-60.0Hz (1.0Hz for standard)
Starting torque	150% or more
Accel./decel. time	0.01-60,000 sec (accel./decel. set separately) In addition to two sets of acceleration/deceleration time, eight sets of acceleration/deceleration time can be selected. There is acceleration/deceleration time available exclusively for inching operation.
Accel./decel. mode	Linear/S shape characteristics accel. and decel. selection available
Operation system	3-mode selection available Forward reverse run Operating and revolving directions Forward operation pulses/reverse operation pulses/stop, Inching operation available
Stopping system	Ramp down stop/coast-to-stop stop selection possible Deceleration and stop with each command for run, emergency stop, and inching
DC brake	DC brake starting frequency: 0.1-60.0Hz/braking voltage: 0.1-20% braking time: 0.1 \pm 20 sec, arbitrarily set.
Operation Specifications	
Pattern operation	Multi-step setting: 8 steps, accel./decel. time selection possible at same time
Interlock ratio	In the case of remote operating mode $F = AX + B + C$ X: Frequency setting input, C: AUX-input F: Output, A: ± 0.001 -10.000, B: ± 0.00 -440Hz
Frequency limit	Upper/lower limit setting possible of F (above)
Frequency skip	3-position setting (Jumping width can be arbitrarily set for each Skip frequency in a range of 0.1-10Hz.)
Slip compensation	Selection of operation/no-operation is possible.
Pattern-run function	Pattern-run is possible in 10 steps. Synchronization (process stepping)/asynchronization (internal timer operated) is possible.
Other functions	PID control, pick-up, auto-start, instantaneous power failure restart, reverse run prevention, traverse pattern for fiber machine..
External I/O	
Operation panel	5-digit 7-segment LEDs: 8 mode/unit lamps Local/remote selection possible, forward/reverse run operate selection possible. Reference and updating can be applied for all parameters. (Prevention of panel operation can be set.)
Sequence input	Forward/reverse run, emergency stop, fault reset, 5 point programmable inputs
Sequence output	Fault (relay 1-c contact), run (relay 1-a contact) In addition to the above, changeover to the following internal status signals is possible for operation and speed attainment: READY TO RUN, END OF PRELIMINARY CHARGING, REVERSE RUN, DIRECT OPERATION, CURRENT DETECTION, SPEED DETECTION, ACCELERATION, DECELERATION FAULT CODES
Frequency setting input	FSV: DC0-10V voltage input, FSI: DC4-20mA current input AUX: DC0-10V/DC \pm 10V AUX-input (Applicable to ratio interlock operation or PID feedback)
Output for meter	Frequency meter, ampere meter (DC0-10V/1mA) Each can be changed over to the following internal parameters: FREQUENCY SETTING, OUTPUT VOLTAGE, DC VOLTAGE
Power supply for frequency setting	DC10V (2W 2k \bullet variable resistor)
Protective features	
Prevention	Overcurrent limitation: OCL (drive/regeneration level variable), overvoltage limitation: OVL Current detection feature is available for overload prediction. (An ON signal is output when an arbitrarily set current detection level is exceeded.)
Trip	Overcurrent trip: OCT, overvoltage trip: OVT, under voltage trip: UVT, IGBT fault, overload trip: OLT, overheat trip: OHT, ground fault trip: GRD (option) and self-diagnostic features.
Fault history	The past four errors are recorded. Contents of memory are causes of primary and secondary errors and frequency and current shortly before tripping.
Overload current rating	150%/60s, 170% / 2.5sec (75%/60s when frequency is under 0.5Hz), For UADX.. type units 112%/60s, 132% / 0,5sec (56%/60s when frequency is under 0.5Hz), For UADVX.. type units
Retry	1-10 times selection possible

Appendix

Appendix 2 External Dimensions



VAT3FD, 400V Series

CT Types	VT Types	Dimensions (mm)								Main circuit terminal
		W	W1	H	H1	D	D1	d	E	
UADX500	UADVX550	320	200	510	490	305	10	10	15	M 8
UADX600	UADVX750	380	275	600	580	317	12	10	15	
UADX750	UADVX1000	420	300	690	666	317	14	10	20	M10
UADX1000	UADVX1200	480	400	740	714	360	14	10	20	M10
UADX1200	UADVX1400									M10
UADX1500	UADVX1700									M10
UADX1700	UADVX2000	490	320	980	956	370	14	13	23	M12
UADX2200	UADVX2500	680	500	1100	1070	395	23	15	23	M16
UADX3000	UADVX3300									
UADX3600	UADVX4000									
UADX4000	UADVX4600									

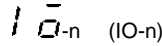

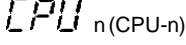
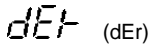
Appendix

Appendix 3 Fault Codes & Display

Code	Display	Fault	Description	Retry
0	---	No fault	No fault recorded.	
1	<i>Err</i> (EmS)	Emergency stop	Indicates that the EMS sequence signal has been received when Parameter B02-1 is set at f1=2 (Fault output at EMS).	
2	<i>Pn-n</i> (PM-n)	Power Module	For drives up to 11kVA, an IPM fault. For drives exceeding 11kVA, an overcurrent in the DC section. n: sub-code 1: during stop 2: during operation at the set speed 3: during acceleration 4: during deceleration 5: during braking	○
3	<i>OL-n</i> (OC-n)	Over current	The output has risen to or beyond 300%. n: sub-code 1: during stop 2: during operation at the set speed 3: during acceleration 4: during deceleration 5: during braking	○
4	<i>OV-n</i> (OV-n)	Over voltage	The DC voltage has risen to or beyond the preset level. (Vdc 800 or 400V) n: sub-code 1: during stop 2: during operation at the set speed 3: during acceleration 4: during deceleration 5: during braking	○
5	<i>UV-n</i> (UV-n)	Under voltage	While the drive is running, the DC voltage has lowered to or beyond the preset level (65% of the rating). n: sub-code 1: during stop 2: during operation at the set speed 3: during acceleration 4: during deceleration 5: during braking When Auto Restart is selected (Parameter B02-0 set at f3=2 or f3=3), the drive will display the fault code but will not illuminate the FLT LED and will not activate the Relay Outputs FA, FB and FC. EC 0-3 will however be activated.	○
6		Not used		
7	<i>UoH</i>	Overheat	The heatsink temperature has risen to or beyond 90°C.	○
8		Not used		
9		Not used		
A		Not used		
B	<i>OL-n</i> (OL-n)	Overload	The output current has exceeded the thermal time count which has an inverse time characteristics and which is 150% for one minute when Parameter B00-5 is set at 100%, and 170% for 2.5 seconds if the output current has risen to or beyond 155%. n: sub-code 1: Drive output overload 2: DBR overload	○
C	<i>Grd n</i> (GRD. n)	Ground	The Drive has sensed a grounded conditions on the output.. n: sub-code 1: during stop 2: during operation at the set speed 3: during acceleration 4: during deceleration 5: during braking	--

Note) ○ : Retry possible

Appendix

Code	Display	Fault	Description	Retry
D	 (IO-n)	I/O Error	<p>There has been an error in communications through the I/O port.</p> <p>n: sub-code</p> <ol style="list-style-type: none"> 1: Gate Shutdown Circuit. A feedback signal has disagreed to a Gate Shutdown command. 2: A/D Converter. The A/D Converter has been jammed. 3: Current Detector Offset. The offset of the Current Detector has increased to or beyond 0.3V. 4: Retries exceeded. The Retry function has failed for the number of times set. 5: Optional PCB unmatched. The optional PCB installed do not correspond to the settings on Parameter. 6: Drive Capacity changed. The drive capacity setting on B91-0 has been changed. To clear fault, adjust B90-0 or power up again while pressing  key. <p>E: Thermistor fault F: Drive Capacity misread. The drive has failed to read the Drive Capacity Parameter correctly.</p>	
E	 (CPU-n)	CPU Error	<p>There has been an error while the Drive is in the self-diagnosis mode at power-up.</p> <p>n: sub-code</p> <ol style="list-style-type: none"> 1: Watch-dog error, indicating that the CPU has been jammed. This fault may appear during at-speed operation. 2: CPU calculation error. 3: CPU RAM error. 4: External RAM error. 5: External ROM error. 6: EEPROM check-sum error. 7: EEPROM read error. 8: EEPROM write error. This error is for display only, and will not shutdown the output or activate FLT terminals. <p>With the exception of Sub-code 8, the power should once be removed and reapplied to reset and restart the Drive.</p>	
F	 (dEr)	EEPROM Data Error	<p>There are errors among the data stored in the EEPROM. This error, when appearing at power-up, will not be stored and therefore will not be read after the drive has started.</p>	

Appendix

Appendix 4 7-Segment LED Display

(1) Numeric

Display	0	1	2	3	4	5	6	7	8	9
Numerics	0	1	2	3	4	5	6	7	8	9

(2) Alphabet

Display	A	b	C	d	E	F	G	H	i	J
Alphabet	A	B (b)	C	D (d)	E	F	G	H	i	J

Display	L	m	o	P	q	R	S	T	U	v
Alphabet	L	M (m)	O	P	Q (q)	R (r)	S	T (t)	U	V (v)

Display	y	-	[]
Alphabet	Y		(Brackets)	

(3) Message

LOC	LOCK	LSt	LIST
br	BRAKE		
rUn	RUN	trC	TRACE
OFF	--	d. Err	Data ERROR
rty	RETRY	d. End	Data END
Err	ERROR	d. CHG	Data CHANGE

Appendix

Function	<Remarks>	Function	<Remarks>