FIRE MODE
IN VARIABLE
FREQUENCY DRIVE

DFM Series

A MyAir Technical Data

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MYAIR
VENTILATION GROUP

Made by MyAir UK
Design and Engineering

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FNVFD/DFM-06

Safety instructions

Before installing and putting this equipment into operation, read the following safety instructions and all the warning labels attached to the equipment carefully. For more information, refer to the DFM Operating Instructions.

Fundamental safety instructions

General safety instructions

DANGER

Danger to life due to live parts and other energy sources

Death or serious injury can result when live parts are touched.

- Only work on electrical devices when you are qualified for this job.
- Always observe the country-specific safety rules.

Generally, six steps apply when establishing safety:

1. Prepare for shutdown and notify all those who will be affected by the procedure.
2. Disconnect the machine from the supply.
   - Switch off the machine.
   - Wait until the discharge time specified on the warning labels has elapsed.
   - Check that it really is in a no-voltage condition, from phase conductor to phase conductor and phase conductor to protective conductor.
   - Check whether the existing auxiliary supply circuits are de-energized.
   - Ensure that the motors cannot move.
3. Identify all other dangerous energy sources, e.g. compressed air, hydraulic systems, or water.
4. Isolate or neutralize all hazardous energy sources by closing switches, grounding or short-circuiting or closing valves, for example.
5. Secure the energy sources against switching on again.
6. Ensure that the correct machine is completely interlocked.

After you have completed the work, restore the operational readiness in the inverse sequence.

WARNING

Danger to life through a hazardous voltage when connecting an unsuitable power supply

Touching live components can result in death or severe injury.

- Only use power supplies that provide SELV (Safety Extra Low Voltage) or PELV- (Protective Extra Low Voltage) output voltages for all connections and terminals of the electronics modules.

WARNING

Danger to life when live parts are touched on damaged devices

Improper handling of devices can cause damage.

For damaged devices, hazardous voltages can be present at the enclosure or at exposed components; if touched, this can result in death or severe injury.

- Ensure compliance with the limit values specified in the technical data during transport, storage and operation.
- Do not use any damaged devices.

WARNING

Danger to life through electric shock due to unconnected cable shields

Hazardous touch voltages can occur through capacitive cross-coupling due to unconnected cable shields.

- As a minimum, connect cable shields and the conductors of power cables that are not used (e.g. brake cores) at one end at the grounded housing potential.

WARNING

Danger to life due to electric shock when not grounded

For missing or incorrectly implemented protective conductor connection for devices with protection class I, high voltages can be present at open, exposed parts, which when touched, can result in death or severe injury.

- Ground the device in compliance with the applicable regulations.

WARNING

Danger to life due to electric shock when opening plug connections in operation

When opening plug connections in operation, arcs can result in severe injury or death.

- Only open plug connections when the equipment is in a no-voltage state, unless it has been explicitly stated that they can be opened in operation.

WARNING

Danger to life due to fire spreading if housing is inadequate

Fire and smoke development can cause severe personal injury or material damage.

- Install devices without a protective housing in a metal control cabinet (or protect the device by another equivalent measure) in such a way that contact with fire is prevented.
- Ensure that smoke can only escape via controlled and monitored paths.

WARNING

Danger to life through unexpected movement of machines when using mobile wireless devices or mobile phones

Using mobile wireless devices or mobile phones with a transmit power > 1 W closer than approx. 2 m to the components may cause the devices to malfunction, influence the functional safety of machines therefore putting people at risk or causing material damage.

- Switch the wireless devices or mobile phones off in the immediate vicinity of the components.

WARNING

Danger to life due to the motor catching fire in the event of insulation overload

There is higher stress on the motor insulation through a ground fault in an IT system. If the insulation fails, it is possible that death or severe injury can occur as a result of smoke and fire.

- Use a monitoring device that signals an insulation fault.
- Correct the fault as quickly as possible so the motor insulation is not overloaded.

WARNING

Danger to life due to fire if overheating occurs because of insufficient ventilation clearances

Inadequate ventilation clearances can cause overheating of components with subsequent fire and smoke. This can cause severe injury or even death. This can also result in increased downtime and reduced service lives for devices/systems.

- Ensure compliance with the specified minimum clearance as ventilation clearance for the respective component.

WARNING

Danger of an accident occurring due to missing or illegible warning labels

Missing or illegible warning labels can result in accidents involving death or serious injury.

- Check that the warning labels are complete based on the documentation.
- Attach any missing warning labels to the components, in the national language if necessary.
- Replace illegible warning labels.

NOTICE

Device damage caused by incorrect voltage/insulation tests

Incorrect voltage/insulation tests can damage the device.

- Before carrying out a voltage/insulation check of the system/machine, disconnect the devices as all converters and motors have been subject to a high voltage test by the manufacturer, and therefore it is not necessary to perform an additional test within the system/machine.

WARNING

Danger to life when safety functions are inactive

Safety functions that are inactive or that have not been adjusted accordingly can cause operational faults on machines that could lead to serious injury or death.

- Observe the information in the appropriate product documentation before commissioning.
- Carry out a safety inspection for functions relevant to safety on the entire system, including all safety-related components.
- Ensure that the safety functions used in your drives and automation tasks are adjusted and activated through appropriate parameterizing.
- Perform a function test.
- Only put your plant into live operation once you have guaranteed that the functions relevant to safety are running correctly.

Note

Important safety notices for Safety Integrated functions

If you want to use Safety Integrated functions, you must observe the safety notices in the Safety Integrated manuals.

WARNING

Danger to life or malfunctions of the machine as a result of incorrect or changed parameterization

As a result of incorrect or changed parameterization, machines can malfunction, which in turn can lead to injuries or death.

- Protect the parameterization (parameter assignments) against unauthorized access.
- Respond to possible malfunctions by applying suitable measures (e.g. EMERGENCY STOP or EMERGENCY OFF).

Safety instructions for electromagnetic fields (EMF)

WARNING

Danger to life from electromagnetic fields

Electromagnetic fields (EMF) are generated by the operation of electrical power equipment such as transformers, converters or motors.

People with pacemakers or implants are at a special risk in the immediate vicinity of these devices/systems.

- Ensure that the persons involved are the necessary distance away (minimum 2 m).

Handling electrostatic sensitive devices (ESD)

Electrostatic sensitive devices (ESD) are individual components, integrated circuits, modules or devices that may be damaged by either electric fields or electrostatic discharge.

NOTICE

Damage through electric fields or electrostatic discharge

Electric fields or electrostatic discharge can cause malfunctions through damaged individual components, integrated circuits, modules or devices.

- Only pack, store, transport and send electronic components, modules or devices in their original packaging or in other suitable materials, e.g conductive foam rubber of aluminum foil.
- Only touch components, modules and devices when you are grounded by one of the following methods:
  - Wearing an ESD wrist strap
  - Wearing ESD shoes or ESD grounding straps in ESD areas with conductive flooring
- Only place electronic components, modules or devices on conductive surfaces (table with ESD surface, conductive ESD foam, ESD packaging, ESD transport container).

Industrial security

Note

Industrial security

MY AIR provides products and solutions with industrial security functions that support the secure operation of plants, solutions, machines, equipment and/or networks. They are important components in a holistic industrial security concept. With this in mind, MY AIR products and solutions undergo continuous development. MY AIR recommends strongly that you regularly check for product updates.

For the secure operation of MY AIR products and solutions, it is necessary to take suitable preventive action (e.g. cell protection concept) and integrate each component into a holistic, state-of-the-art industrial security concept. Third-party products that may be in use should also be considered. For more information about industrial security, visit this address (http://www.my-air.co.uk).

To stay informed about product updates as they occur, sign up for a product-specific newsletter. For more information, visit this address (http://www.my-air.co.uk).

WARNING

Danger as a result of unsafe operating states resulting from software manipulation

Software manipulation (e.g. by viruses, Trojan horses, malware, worms) can cause unsafe operating states to develop in your installation which can result in death, severe injuries and/or material damage.

- Keep the software up to date.
  You will find relevant information and newsletters at this address (http://www.my-air.co.uk).
- Incorporate the automation and drive components into a holistic, state-of-the-art industrial security concept for the installation or machine.
  You will find further information at this address (http://www.my-air.co.uk).
- Make sure that you include all installed products into the holistic industrial security concept.

Residual risks of power drive systems

The control and drive components of a drive system are approved for industrial and commercial use in industrial line supplies. Their use in public line supplies requires a different configuration and/or additional measures.

These components may only be operated in closed housings or in higher-level control cabinets with protective covers that are closed, and when all of the protective devices are used.

These components may only be handled by qualified and trained technical personnel who are knowledgeable and observe all of the safety instructions on the components and in the associated technical user documentation.

When assessing the machine's risk in accordance with the respective local regulations (e.g., EC Machinery Directive), the machine manufacturer must take into account the following residual risks emanating from the control and drive components of a drive system:

1. Unintentional movements of driven machine components during commissioning, operation, maintenance, and repairs caused by, for example,
   - Hardware and/or software errors in the sensors, control system, actuators, and cables and connections
   - Response times of the control system and of the drive
   - Operation and/or environmental conditions outside the specification
   - Condensation/conductive contamination
   - Parameterization, programming, cabling, and installation errors
   - Use of wireless devices/mobile phones in the immediate vicinity of the control system
   - External influences/damage
2. In the event of a fault, exceptionally high temperatures, including an open fire, as well as emissions of light, noise, particles, gases, etc. can occur inside and outside the inverter, e.g.:
   - Component failure
   - Software errors
   - Operation and/or environmental conditions outside the specification
   - External influences/damage

   Inverters of the Open Type/IP20 degree of protection must be installed in a metal control cabinet (or protected by another equivalent measure) such that contact with fire inside and outside the inverter is not possible.

3. Hazardous shock voltages caused by, for example,
   - Component failure
   - Influence during electrostatic charging
   - Induction of voltages in moving motors
   - Operation and/or environmental conditions outside the specification
   - Condensation/conductive contamination
   - External influences/damage
4. Electrical, magnetic and electromagnetic fields generated in operation that can pose a risk to people with a pacemaker, implants or metal replacement joints, etc., if they are too close
5. Release of environmental pollutants or emissions as a result of improper operation of the system and/or failure to dispose of components safely and correctly

Note

The components must be protected against conductive contamination (e.g. by installing them in a control cabinet with degree of protection IP54 according to IEC 60529 or NEMA 12).

Assuming that conductive contamination at the installation site can definitely be excluded, a lower degree of cabinet protection may be permitted.

For more information about residual risks of the components in a drive system, see the relevant sections in the technical user documentation.

Additional safety instructions

General

DANGER

Protective earthing conductor current

The earth leakage current of the MY AIR DFM inverter may exceed 3.5 mA AC. Therefore, a fixed earth connection is required and the minimum size of the protective earth conductor shall comply with the local safe-ty regulations for high leakage current equipment.

The MY AIR DFM inverter has been designed to be protected by fuses; however, as the inverter can cause a DC current in the protective earthing conductor, if a Residual Current Device (RCD) is to be used upstream in the supply, observe the following:

- All MY AIR DFM single phase AC 230 V inverters (filtered or unfiltered) can be operated on a type A[1)] 30 mA, type A(k) 30 mA, type B(k) 30 mA or type B(k) 300 mA RCD.
- All MY AIR DFM three phase AC 400 V inverters (unfiltered) can be operated on a type B(k) 300 mA RCD.
- MY AIR DFM three phase AC 400 V inverters (unfiltered) FSA to FSD and FSA (filtered) can be operated on a type B(k) 30 mA RCD.

[1)] To use a type A RCD, the regulations in the following FAQ must be observed: MY AIR Web site (http://www.my-air.co.uk)

WARNING

Safe use of inverters

Any unauthorized modifications of the equipment are not allowed.

Protection in case of direct contact by means of voltages < 60 V (PELV = Protective Extra Low Voltage according to EN 61800-5-1) is only permissible in areas with equipotential bonding and in dry indoor rooms. If these conditions are not fulfilled, other protective measures against electric shock must be applied, for example, protective insulation.

Install the inverter on a metal mounting plate in a control cabinet. The mounting plate has to be unpainted and with a good electrical conductivity.

It is strictly prohibited for any mains disconnection to be performed on the motor-side of the system, if the inverter is in operation and the output current is not zero.

Integral solid state short circuit protection does not provide branch circuit protection. Branch circuit protection must be provided in accordance with the National Electrical Code and any additional local codes.

Operation

WARNING

Use of braking resistor

If an unsuitable braking resistor is used, this could result in a fire and severe damage to people, property and equipment. Use an appropriate braking resistor and install it correctly.

The temperature of a braking resistor increases significantly during operation. Avoid coming into direct contact with braking resistors.

WARNING

Hot surface

During operation and for a short time after switching-off the inverter, the marked surfaces of the inverter can reach a high temperature. Avoid coming into direct contact with these surfaces.

Repair

WARNING

Repair and replacement of equipment

Repairs on equipment may only be carried out by MY AIR Service, by repair centers authorized by MY AIR or by authorized personnel who are thoroughly acquainted with all the warnings and operating procedures contained in this manual.

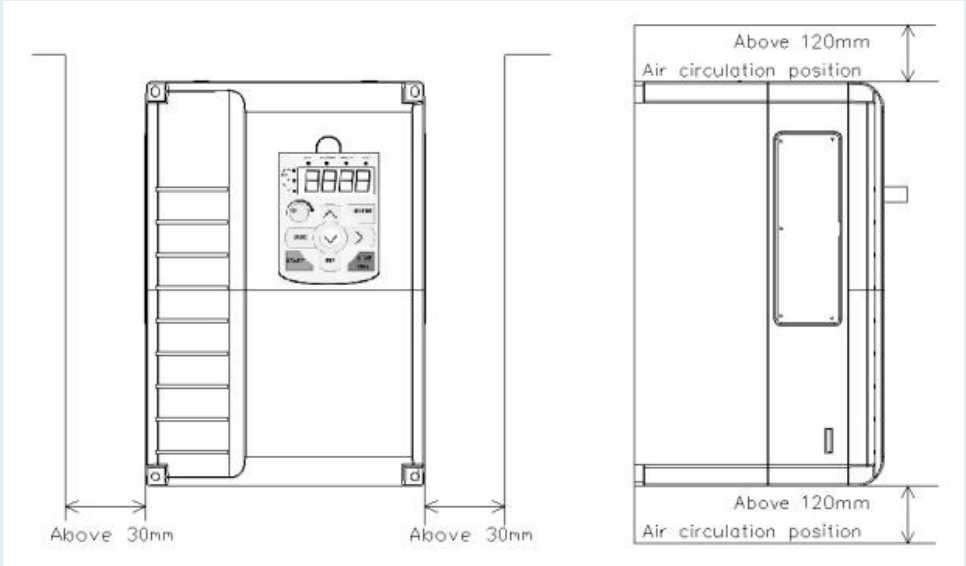
Any defective parts or components must be replaced using parts contained in the relevant spare parts lists.

Disconnect the power supply before opening the equipment for access.

Installation

Mechanical installation

Mounting orientation and clearance



Electrical installation

WARNING

Requirements for United States/Canadian installations (UL/cUL)

Suitable for use on a circuit capable of delivering not more than 40000 rms Symmetrical Amperes, 480 VAC maximum for 400 V variants of inverters or 240 VAC maximum for 230 V variants of inverters, when protected by UL/cUL-certified Listed (JDDZ) fuses of any class higher than Class RK5 (for example, Class J, T, CC, G, CF etc.), Listed (NKJH) Type-E combination motor controllers or Listed (DIVQ) circuit breakers as specified later in this section. For each frame size A to E, use 75 °C copper wire only.

This equipment is capable of providing internal motor overload protection according to UL508C. In order to comply with UL508C, parameter P0610 must not be changed from its factory setting of 6.

For Canadian (cUL) installations the inverter mains supply must be fitted with any external recommended suppressor with the following features:

- Surge-protective devices; device shall be a Listed Surge-protective device (Category code VZCA and VZCA7)
- Rated nominal voltage 480/277 VAC (for 400 V variants) or 240 VAC (for 230 V variants), 50/60 Hz, three phase (for 400 V variants) or single phase (for 230V variants)
- Clamping voltage VPR = 2000 V (for 400 V variants) / 1000 V (for 230 V variants), IN = 3 kA min, MCOV = 508 VAC (for 400 V variants) / 264 VAC (for 230V variants), SCCR = 40 kA
- Suitable for Type 1 or Type 2 SPD application
- Clamping shall be provided between phases and also between phase and ground

DFM Series fire mode function

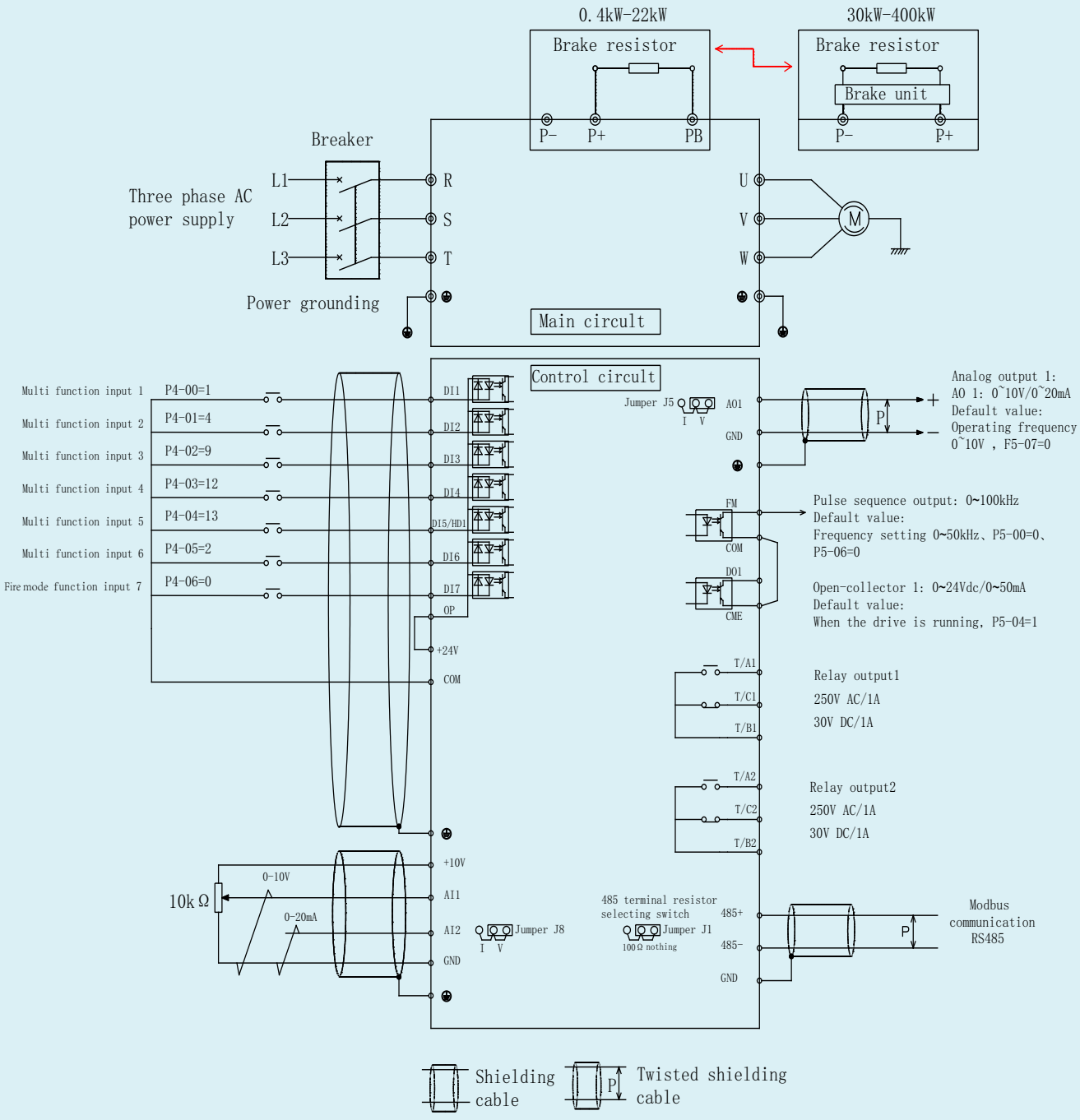
Introduction

Fire mode is used in applications where the VFD maintaining operation is critical to safety. Fire Mode is used in applications such as stairwell pressurization and Tunnel exhaust fans. Fire Mode is activated with a digital input and when activated the DFM series VFD will follow a programmable Fire Mode Speed. Fire Mode disables all interlocks, enable signals and faults and runs the Motor at the programmed Fire mode Speed.

Configuration

The DFM Series VFD is configured out of the box for fire mode operation. Digital Input 5 is assigned to the Fire mode function and the Drive will run at the preset Fire mode Frequency of 50Hz when Digital in-put 5 is on. See wiring diagram Below.

Wiring diagram



Note

The resistance of the potentiometer for each analog input must be ≥ 4.7 kΩ.

MY AIR has always recommended the flowing devices from SIEMENS

Recommended fuses for AC terminals

MY AIR DFM is suitable for use in a power system up to 40000 symmetrical amperes (rms), for the maximum rated voltage +10% when protected by an appropriate standard fuse.

Frame size		Inverter power rating (kW)	Recommended fuse type		Frame size		Inverter power rating (kW)	Recommended fuse type	
			CE-compliant fuse (Siemens)	UL/cUL-compliant Listed (JDDZ) fuse *				CE-compliant fuse (Siemens)	UL/cUL-compliant Listed (JDDZ) fuse *
400 V	A	0.37 to 1.1	3NA3801 (6 A)	15 A	230 V	A	0.12 to 0.55	3NA3803 (10 A)	15 A
		1.5	3NA3803 (10 A)						
		2.2	3NA3805 (16 A)				0.75	3NA3805 (16 A)	
	B	3.0	3NA3805 (16 A)	20 A		B	1.1	3NA3807 (20 A)	30 A
		4.0	3NA3807 (20 A)				1.5	3NA3812 (32 A)	
	C	5.5	3NA3812 (32 A)	30 A		C	2.2	3NA3814 (35 A)	50 A
	D	7.5 to 15	3NA3822 (63 A)	60 A					
	E	18.5	3NA3022 (63 A)	80 A					
		22	3NA3024 (80 A)	100 A			3.0	3NA3820 (50 A)	

* SCCR: 100 kA (star connection of motor terminals for 400 V inverters only)

You can also use Listed (JDDZ) fuses of any class higher than Class RK5 (for example, Class J, T, CC, G, CF etc.) instead if they meet the following requirements:

- The rated current of the substitute fuse does not exceed the maximum rated current (Imax) of the corresponding fuse given in the table above.

- The rated voltage of the substitute fuse is equal to or greater than 480 VAC/240 VAC.

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Recommended Type-E combination motor controllers

Frame size		Inverter power rating (kW)	Type-E combination motor controller (CMC) [1] (rated voltage of CMC for 400 V inverters: 460 V rated voltage of CMC for 230 V inverters: 230 V)			
			Order number (Siemens) [2]	Imax (A)	Maximum rated power at 460 V/230 V (hp)	SCCR (kA) [3]
400 V	A	0.37	3RV20.1-1CA**	2.5	1.0	65.0
		0.55	3RV20.1-1DA**	3.2	1.5	65.0
		0.75	3RV20.1-1EA**	4.0	2.0	65.0
		1.1	3RV20.1-1GA**	6.3	3.0	65.0
		1.5	3RV20.1-1HA**	8.0	5.0	65.0
		2.2	3RV20.1-1JA**	10.0	5.0	65.0
	B	3.0	3RV20.1-1KA**	12.5	7.5	65.0
		4.0	3RV20.1-4AA**	16.0	10.0	65.0
			3RV.03.-4AA##	16.0	10.0	65.0
	C	5.5	3RV20.1-4AA**	16.0	10.0	65.0
			3RV2021-4BA**	20.0	10.0	65.0
			3RV.03.-4BA##	20.0	15.0	65.0
	D	7.5	3RV20.1-4AA**	16.0	10.0	65.0
			3RV2021-4DA**	25.0	15.0	65.0
			3RV.03.-4DA##	25.0	20.0	65.0
		11	3RV.03.-4HA##	50.0	40.0	65.0
			3RV104.-4HA##	50.0	40.0	65.0
			3RV2021-4EA**	32.0	20.0	50.0
		15	3RV.03.-4HA##	50.0	40.0	65.0
			3RV104.-4JA##	63.0	50.0	65.0
	E	18.5	3RV104.-4KA##	75.0	60.0	65.0
		22	3RV104.-4LA##	90.0	75.0	65.0

1) The above types for Type-E combination motor controllers are listed in compliance with both CE and UL/cUL standards. You can also use Listed (NKJH) Type-E combination motor controllers instead if they meet the following requirements:

- The rated current of the substitute motor controller does not exceed the maximum rated current (Imax) of the corresponding motor controller given in the table above.
- The rated voltage of the substitute motor controller is equal to or greater than the rated voltage of the supply circuit.

2) "." can be 1 or 2"; "**" can be 10, 15, 20, 25 or 40; "##" represents the last two digits available in order numbers.

3) For 400 V inverters, star/delta connection of motor terminals is available.

MY AIR has always recommended the flowing devices from SIEMENS

Recommended circuit breakers

Frame size		Inverter power rating (kW)	Circuit breaker 1)	
			Order number (Siemens)	Imax (A)
400 V	A	0.37 to 2.2	3RV1742, 3RV2711 2), LGG, CED6	15
	B	3.0		
		4.0	3RV1742, 3RV2711 2), 3RV2721 3), LGG, CED6, NCGA 4), HCGA	20
	C	5.5		30
	D	7.5		
		11	3RV1742, LGG, CED6, NCGA 4), HCGA, HDGA, HDGB, LDGA, LDGB, NDGA 4), NDGB 4)	50
		15		60
	E	18.5	3RV1742, LGG, CED6, HCGA, NCGA 4), HDGA, HDGB, LDGA, LDGB, NDGA 4), NDGB 4), HFD6, HFXD6, HHFD6, HHFXD6, CFD6, FXD6-A, FD6-A	70 (for Type "3RV1742") 80 (for types other than "3RV1742")
		22		70 (for Type "3RV1742") 100 (for types other than "3RV1742")

Frame size		Inverter power rating (kW)	Circuit breaker 1)	
			Order number (MY AIR)	Imax (A)
230 V	A	0.12 to 0.75	3RV1742, 3RV2711, LGG, CED6	15
	B	1.1 to 1.5	3RV1742, 3RV2711, 3RV2721 3), LGG, CED6, NCGA, HCGA	30
	C	2.2	3RV1742, LGG, CED6, NCGA, HCGA	40
		3.0	3RV1742, LGG, CED6, NCGA, HCGA, NDGA, HDGA, LDGA, NDGB, HDGB, LDGB	50

1) The above types for circuit breakers are listed in compliance with both CE and UL/cUL standards. You can also use Listed (DIVQ) circuit breakers instead if they meet the following requirements:

- The rated current of the substitute circuit breaker does not exceed the maximum rated current (Imax) of the corresponding circuit breaker given in the table above.
- The rated voltage of the substitute circuit breaker is equal to or greater than the rated voltage of the supply circuit.

2) SCCR: 65 kA (star/delta connection of motor terminals available for 400 V inverters)

3) SCCR: 50 kA (star/delta connection of motor terminals available for 400 V inverters)
SCCR of 230 V inverters protected by circuit breaker types other than 3): 65 kA

4) SCCR: 35 kA (star connection of motor terminals only)
SCCR of 400 V inverters protected by circuit breaker types other than 2), 3), 4): 65 kA (star connection of motor terminals only)

Note

To disconnect the built-in EMC filter on FSE, you can use a Pozidriv or flat-bit screwdriver to remove the EMC screw.

NOTICE

Damage to the mains terminals

During electrical installation of the inverter frame sizes A and B, use stranded cables or cables with UL/cUL-certified, suitable fork crimps rather than solid cables or cables with pin crimps for mains terminal connection; for frame size E, use cables with UL/cUL-certified ring crimps for the mains terminal connections.

Recommended cable cross-sections and screw tightening torques

Frame size	Rated output power	Mains and PE terminals		Motor / DC / braking resistor / output earth terminals	
		Cable cross-section*	Screw tightening torque (tolerance: ± 10%)	Cable cross-section*	Screw tightening torque (tolerance: ± 10%)
400 V					
A	0.37 kW to 0.75 kW	1.0 mm²(12)	1.0 Nm	1.0 mm² (12)	1.0 Nm
	1.1 kW to 2.2 kW	1.5 mm² (12)		1.5 mm² (12)	
B	3.0 kW to 4.0 kW	6 mm² (10)		6 mm² (10)	1.5 Nm
C	5.5 kW	6 mm² (10)	2.4 Nm	6 mm² (10)	2.4 Nm
D	7.5 kW	6 mm² (10)		6 mm² (10)	
	11 kW to 15 kW	10 mm²(6)		10 mm² (6)	
E	18.5 kW (HO)	10 mm² (6)		6 mm² (8)	
	22 kW (LO)	16 mm² (4)		10 mm² (6)	
	22 kW (HO)	16 mm² (4)		10 mm² (6)	
	30 kW (LO)	25 mm² (3)		16 mm² (4)	
230 V					
A	0.12 kW to 0.25 kW	1.5 mm² (12)	1.0 Nm	1.0 mm² (12)	1.0 Nm
	0.37 kW to 0.55 kW	2.5 mm² (12)			
	0.75 kW	4.0 mm² (12)			
B	1.1 kW to 1.5 kW	6.0 mm² ** (10)		2.5 mm² (10)	1.5 Nm
C	2.2 kW to 3.0 kW	10 mm² (6)	2.4 Nm	4.0 mm² (8)	2.4 Nm

* Data in brackets indicates the corresponding AWG values.

** With a UL/cUL-certified, suitable fork crimp

Maximum motor cable lengths

Inverter variant	Maximum cable length					
	Without output reactor or external EMC filter			With output reactor		With external EMC filter [1]
400 V	**Unshielded**	**Shielded**	**EMC compliant (RE/CE C3)** [2]	**Unshielded**	**Shielded**	**EMC compliant (RE/CE C2)** [3]
FSA	50 m	25 m	10 m	150 m	150 m	25 m
FSB to FSD	50 m	25 m	25 m	150 m	150 m	25 m
FSE	100 m	50 m	50 m	300 m	200 m	25 m
230 V	**Unshielded**	**Shielded**	**EMC compliant (RE/CE C2)** [2]	**Unshielded**	**Shielded**	**EMC compliant (RE/CE C2)** [3]
FSA	50 m	25 m	10 m	200 m	200 m	5 m
FSB to FSC	50 m	25 m	25 m	200 m	200 m	5 m

1) As specified in Section B.1.8 of the MY AIR Inverter Operating Instructions.

2) For filtered variants only. RE/CE C3 refers to EMC compliance to EN61800-3 Category C3 for Radiated and Conducted Emissions; RE/CE C2 refers to EMC compliance to EN61800-3 Category C2 for Radiated and Conducted Emissions.

3) For unfiltered variants only.

Permissible I/O terminal cable cross-sections

Cable type	Permissible cable cross-section
Solid or stranded cable	0.5 mm^2 to 1.5 mm^2
Ferrule with insulating sleeve	0.25 mm^2

Technical specifications

	Three phase AC 400 V inverters	Single phase AC 230 V inverters
Line supply characteristics		
Voltage range	380 V to 480 V AC (tolerance: -15 % to +10 %) 47 Hz to 63 Hz Current derating exists at the input voltages / switching frequencies higher than 400 V / 4kHz. *	200 V to 240 V AC (tolerance: -10 % to +10 %) 47 Hz to 63 Hz Current derating exists at the input voltages / switching frequencies higher than 230 V / 8kHz. *
Overvoltage category	EN 60664-1 Category III	
Permissible supply configuration	TN, TT, IT **, TT earthed line	TN, TT
Supply environment	Second environment (private power network) *	
Overload current	Rated power 0.12 kW to 15 kW	150% rated for 60 seconds
	Rated power 18.5 kW (HO)/22 kW (HO)	
	Rated power 22 kW (LO)/30 kW (LO)	110% rated for 60 seconds
Environmental conditions		
Surrounding air temperature	- 10 °C to 40 °C: without derating 40 °C to 60 °C: with derating (UL/cUL-compliant: 40 °C to 50 °C, with derating)*	
Storage temperature	- 40 °C to + 70 °C	
Protection class	IP 20	
Maximum humidity level	95% (non-condensing)	
Shock and vibration	Long-term storage in the transport packaging according to EN 60721-3-1 Class 1M2	
	Transport in the transport packaging according to EN 60721-3-2 Class 2M3	
	Vibration during operation according to EN 60721-3-3 Class 3M2	
Operating altitude	Up to 4000 m above sea level 1000 m to 4000 m: output current derating * 2000 m to 4000 m: input voltage derating *	
Environmental classes	Pollution degree: 2 Solid particles: class 3S2 Chemical gases: class 3C2 (SO_2, H_2S) Climate class: 3K3	

* For more information, refer to the MY AIR Inverter Operating Instructions.

** Note that for three phase AC 400 V inverters FSA to FSD, only unfiltered variants can be operated on IT power system; to operate FSE (filtered/unfiltered) on IT power supply, make sure you remove the screw for the EMC filter.

Display Interface

Modification of function parameter, monitoring of inverter operation, control of inverter operation (start and stop) can be performed through the operation panel.Its shape and function area are shown as below：

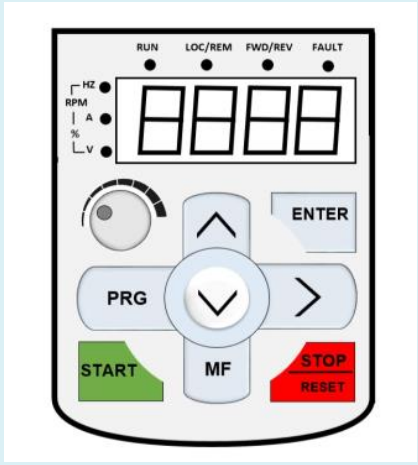

Fig. 4-2.1

Function description of operation panel

Keyboard Parameter	Description
FWD/REV	Forward/Reserved Running Light *ON：forward running *OFF：Reserved running
RUN	Running indicator *ON：running state *OFF：stop state
LOCAL/REMOT	Command source indicator keyboard operation, terminal operation and remote operation(communication control) indicator *ON：terminal operation control state *OFF：keyboard operation control state *Flashing：remote operation control state

TUNE/TC	Tuning/Fault indicator *ON：torque control mode *Slow flashing：tuning state *Quick flashing：fault state
Hz A V RPM(Hz+A) %(A+V	Unit indicator * Hz frequency unit *A current unit *V voltage unit *RMP(Hz+A)revolving speed unit *%(A+V)percentage
Digital display	Digital display area *5-bit LED display,monitor set frequency,output frequency,various monitoring data,alarm code etc.
PRG+>/SHIFT=QUIC K	Menu mode selection code,shift different menu mode according to the value of PP.03 (Function parameter mode as default)
PRG	Programming key *Primary menu enter or exit
>/SHIFT	Shift key *On the stop display interface or running display interface, it can be used to circularly select the display parameters. When modifying the parameters, it can be used to select the bits of parameter for modification
ENTER	Confirmation key *Gradually step into the menu screen,set parameters confirmation
∧	Increase key *Increase of the data or function code
∨	Decrease key *Decrease of the data or function code
MF/REV	Multi-function selection key *It is used as functions witching selection according to P7-01.

Potentiometer	Potentiometer * P0.03 is set to 4 as default;
RUN	Running key * It is used to start the running of the inverter under keyboard control mode
STOP/RESET	Stop/reset * In running status,it can stop the running by pressing this key. In alarm status,it can reset operation with this key. The characteristics of this key are limited by function code P7.02.

Table 4-2.1

Examples for parameter setting

Description of function code viewing and modification method

The operation panel of DSI-400 inverter adopts three-level menu structure to perform parameter setting.The three-level menu includes： function parameter group(level1menu)→ function code(level 2 menu)→setting value of function code(level 3 menu).The operation process is as shown in Figure below.

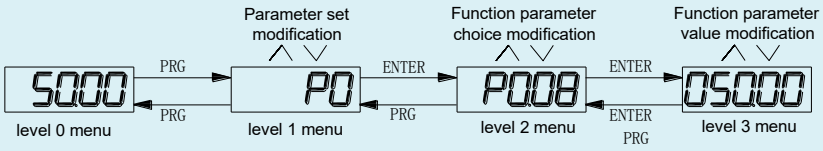

Table 4-3.1

Caution： When operating on level 3 menu, press PRG key or ENTER key to return to level 2 menu. The difference between ENTER and PRG keys is that pressing ENTER KEY will save the setup parameter and return to level 2 menu and then automatically shift to the next function code, while pressing PRG key will directly return to level 2 menu without saving the parameter, and it will return to the current function code.

Take the modification of function code P3.02(ranging from 10.00Hz to 15.00Hz) as an example. (The boldface bit indicates the flashing bit).

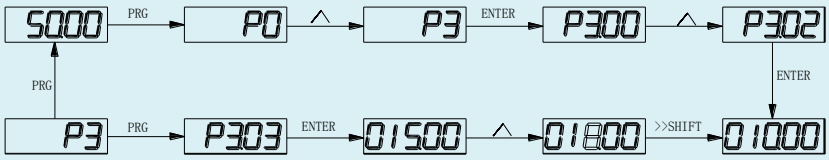

Table 4-3.2

In level 3 menu, if the parameter has no flashing bit, it indicates that the function code cannot be modified. The possible reasons include：

1) The function code is an unchangeable parameter, such as actual detection parameter, running record parameter, etc.

2) The function code cannot be modified in running status but can be modified after the unit is stopped.

Parameter display mode

Parameter display mode is mainly established to view different arrangement forms of function parameters according to user's actual needs.3 kinds of display mode：

Name	Description

Function parameter mode	Sequence display inverter function parameters ,there are P0~PF、A0~AF、U0~UF function groups respectively.
User set parameter mode	User set individual function parameters(32 at most), parameters that needed to be displayed can be set through PE group
User modify parameter mode	Inconsistent with factory default parameters

Table 4-3.1

Relevant function parameters PP.02、PP.03, set as below：

PP.02	Parameters display mode attributes		Default value	11
	Set range	1bit	U group display selection	
		0	No display	
		1	Display	
		10bit	A group display selection	
		0	No display	
		1	Display	
PP.03	Individual parameter mode display selection		Default value	00
	Set range	1bit	User set parameter display selection	
		0	No display	
		1	Display	
		10bit	User modify parameter display selection	
		0	No display	
		1	Display	

Table 4-3.2

Parameter display mode	Display
Function parameter mode-FunC	-FunC
User set parameter mode -USEt	-USEt
User modify parameter mode -U--C	-U--C

Table 4-3.3

Switching mode as below：

E.g：To switch current function parameter mode to user set parameter mode.

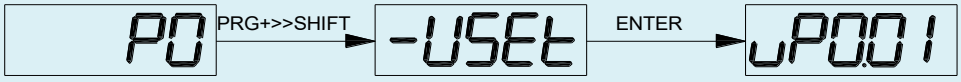

Fig. 4-3.3

User set parameter operation mode

User set menu is established for quick checkup and modification. The display mode is “uP3.02”,which represents function parameter P3.02. It has the same effect of modifying parameter in user set menu and normal programming state.

Function parameters of user set menu come from PE group.PE group chooses function parameter：when PE is set to P0.00 ,it means no choosing,totally 30 functions can be set. If display “NULL” when entering menu, it means user set menu is null.

16 parameters have been stored at initial time for user’s convenience：

P0.01：Control mode	P0.02：Command source selection
P0.03：Main frequency source selection	P0.07：Frequency source selection
P0.08：Preset frequency	P0.17：Acceleration time
P0.18：Deceleration time	P3.00：V/F curve set
P3.01：Torque boost	P4.00：DI1Terminal function selection
P4.01：DI2terminal function selection	P4.02：DI3 terminal function selection
P5.04：DO1output selection	P5.07：AO1 output selection
P6.00：Startup mode	P6.10：Stop mode

Users could modify the user set parameter according to specific need of your own.

Check method of state parameter

When the inverter is in stop or running status, multiple status parameters can be displayed. It can select if this parameter is to be displayed in binary bit with the function codes P7.03 (running parameter1) , P7.04 (running parameter2) and P7.05(stop parameter).

In stop status, there are 4 running state parameter：set frequency, bus voltage,analog input voltage AI1, analog input voltage AI2 which of them are of default display.Other display parameters respectively：DI input state,DO output state,analog input voltage AI3, actual count value, actual length value, PLC running steps, load speed display, PID set, PULSE input pulse frequency and 3 reserved parameters (whether to display or not is determined by function code P7.05 binary bit choice). Selected parameter are switched in sequence order.

In running status, there are a total of 5 running status parameters, including：setup frequency, running frequency, bus voltage,output voltage,output current ,which of them are of default display. Other display parameters respectively ：output power, output torque, DI input state,DO output state, analog input voltage AI1, analog input voltage AI2, analog input voltage AI3, actual count value, actual length value, linear velocity, PID set, PID feedback etc. Whether to display or not is determined by function code P7.03、P7.04 binary bit choice. Selected parameter are switched in

sequence order.

When inverter power on after powered off , the display parameter is the one that chosen before power off as default.

Password Setting

The inverter provides user password protection function. When PP.00 is set to non-zero value, it is user password and enabled after exiting the function code editing status. When the user presses the PRG key again, "-----"will be displayed to require the user to enter user password, or the user cannot enter the general menu.

To cancel the password protection function, the user needs to enter the relevant interface through password, and change the PP.00 setting to 0.

Motor parameter automatic tuning

Vector control running mode：before running, user must accurately input motor nameplate parameters. DSI-400 series inverter will be matching standard motor parameter according to this nameplate. Vector control methods are very much dependent on motor parameters, to get good control performance, accurate control motor parameters must be acquired.

Motor parameter auto tuning procedure is as follows：

Firstly, select command source(P0.02) as operation panel command channel.Secondly, input parameters below in accordance with motor actual parameter：

Motor selection	Parameter	
Motor 1	P1.00：Motor type selection	P1.01：Motor rated power
	P1.02：Motor rated voltage	P1.03：Motor rated current
	P1.04：Motor rated frequency	P1.05：Motor rated revolving speed
Motor 2	A2.00：Motor type selection	A2.01：Motor rated power
	A2.02：Motor rated voltage	A2.03：Motor rated current
	A2.04：Motor rated frequency	A2.05：Motor rated revolving speed
Motor 3	A3.00：Motor type selection	A3.01：Motor rated power
	A3.02：Motor rated voltage	A3.03：Motor rated current

	A3.04：Motor rated frequency	A3.05：Motor rated revolving speed
Motor 4	A4.00：Motor type selection	A4.01：Motor rated power
	A4.02：Motor rated voltage	A4.03：Motor rated current
	A4.04：Motor rated frequency	A4.05：Motor rated revolving speed

Table 4-3.4

E.g：Asynchronous motor parameter tuning

If motor and the load can be totally separated, please select P1.37(Motor 2\3\4 as A2\A3\A4.37) to 2(Asynchronous machine complete tuning), then press RUN key on keyboard panel, inverter will automatically calculate the motor of the following parameters：

Motor selection	Parameter
Motor 1	P1.06：Asynchronous motor stator resistance P1.07： Asynchronous motor rotor resistance P1.08： Asynchronous motor leakage inductance P1.09： Asynchronous motor mutual inductance P1.10： Asynchronous motor no-load current
Motor 2	A2.06： Asynchronous motor stator resistance A2.07： Asynchronous motor rotor resistance A2.08： Asynchronous motor leakage inductance A2.09： Asynchronous motor mutual inductance P2.10： Asynchronous motor no-load current
Motor 3	A3.06： Asynchronous motor stator resistance

	A3.07： Asynchronous motor rotor resistance A3.08： Asynchronous motor leakage inductance A3.09： Asynchronous motor mutual inductance P3.10： Asynchronous motor no-load current
Motor 4	A4.06： Asynchronous motor stator resistance A4.07： Asynchronous motor rotor resistance A4.08： Asynchronous motor leakage inductance A4.09： Asynchronous motor mutual inductance P4.10： Asynchronous motor no-load current

Table4-3.5

If motor and the load can not be totally separated, please select P1.37(Motor 2\3\4 as A2\A3\A4.37) to 1(Asynchronous machine static tuning), then press RUN key on keyboard panel.

4.4 Test running

DSI-400 General machine type factory setting value

Code	Factory setting	Description
P0.01	0	Speed sensorless vector control(SVC)
P0.02	0	Operation panel command channel(LED OFF)
P0.03	4	AI3(Potentiometer)

Users set motor parameters P1.00~P1.05 to correct values, after parameters auto tuning, motor operation can be directly controlled through keyboard, while frequency can be set through keyboard potentiometer.

2.6.3 Description of wiring of control terminals

1） Analog input terminal

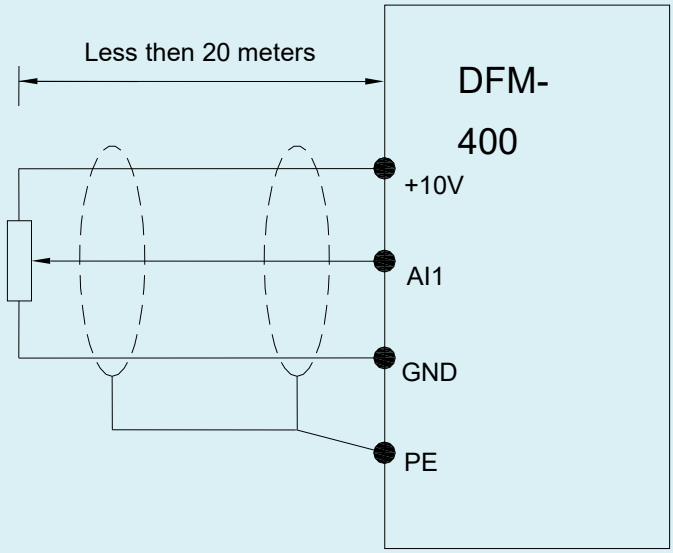

Fig. 2-6.1 Analog input terminal wiring diagram

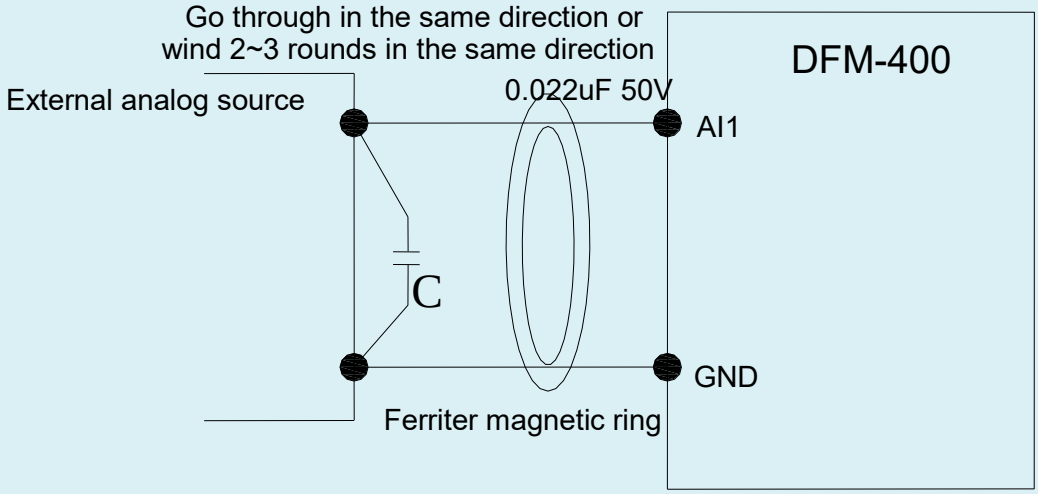

Fig.2-6.2Analog input terminal processing wiring diagram

2) Digital input terminal

It needs to employ shielded cable generally, with wiring distance of no longer than 20 meters. When valid driving is adopted, necessary filtering measures shall be taken to prevent the interference to the power supply.

It is recommended to use the contact control mode.

a) DI terminal wiring method (The drain wiring mode)

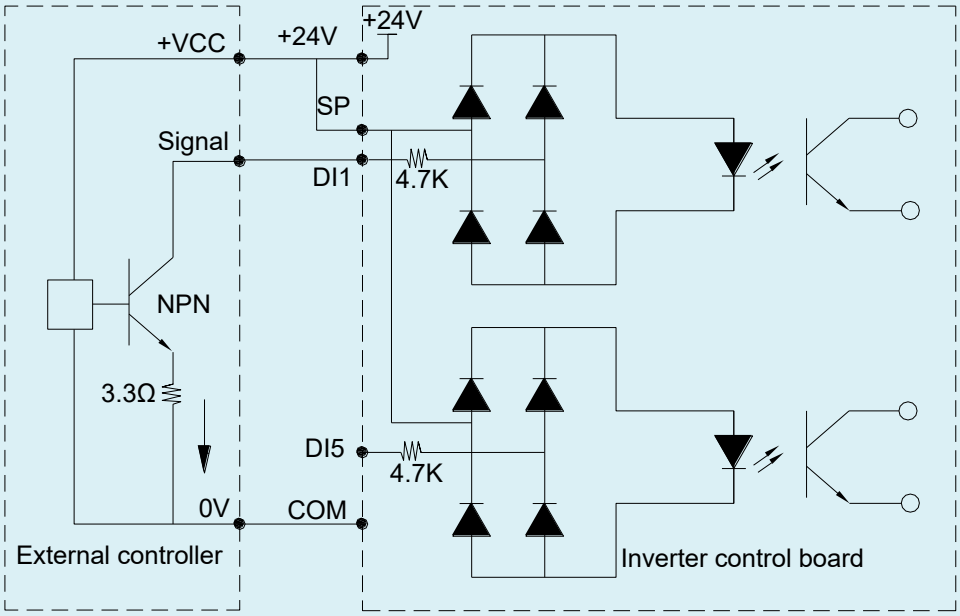

Fig.2-6.3 Drain wiring mode

This is one of the most commonly used connection mode. If you use an external power supply, J9 jumper must be removed, and connect the external positive power supply to OP,while negative power supply to DI port.

b)DI terminal wiring method (The source wiring mode)

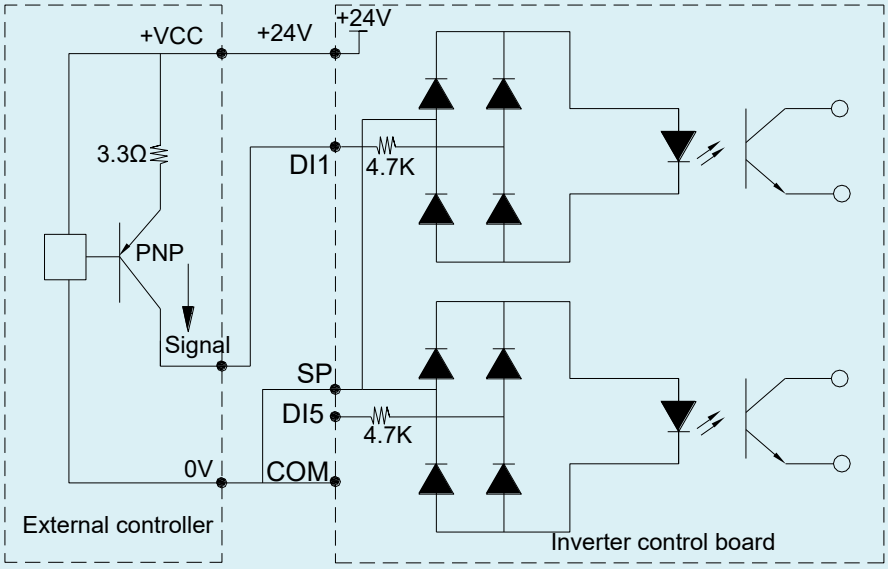

Fig. 2-6.4 Source wiring mode

This connection mode must make OP of jumper J9 connect to COM port,and connect +24V and public terminal of external controller together.If you use an external power supply,jumper J9 must be removed,and connect external negative power supply to OP ,while positive power supply to DI port.

2） Digital output terminal

When drive relay is essential for digital output terminal,you should add absorption diode to both sides of relay coil.Or +24V dc power supply will be easily damaged.

Caution： The polarity of the absorption diode must be installed correctly according to the picture below.Or +24V dc power supply will immediately get burnt after digital output terminal outputs.

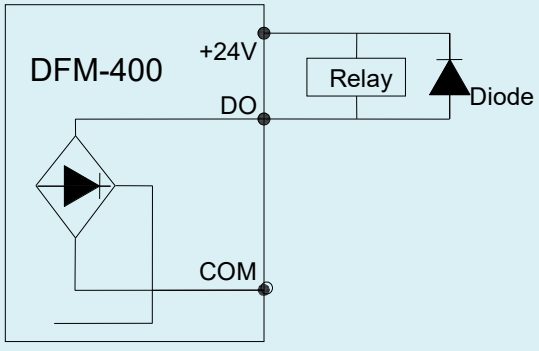

Fig. 2-6.5 Digtal output terminal wiring diagram

Standby circuit

Inverter fault or jump may cause great breakdown loss or other accident. To avoid this happens, please add the standby circuit below to ensure security.

Note：Confirm and test the running characteristic of the standby circuit, make sure that the industrial phase and the converter phase are in the same direction.

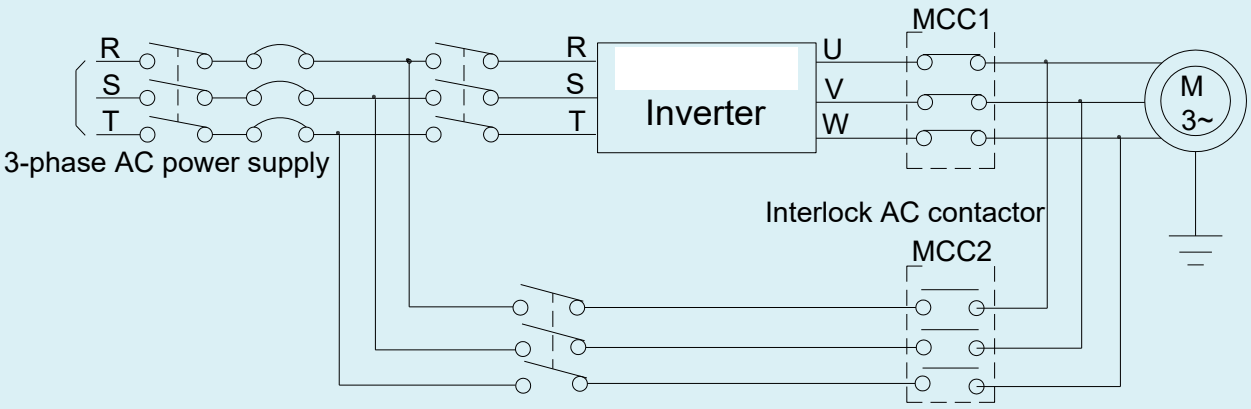

Fig. 2-7.1

DFM
Outline Dimension

Shape DIM	Shape dimension（mm）			Installation dimension（mm）				note
	W	H	L	W1	H1	D1	Assembly	
DFM-K40G1	118	185	164	106	175	156	**aper** M4	
DFM-K75G1								
DFM-1K5G1								
DFM-2K2G1								
DFM−K75G3								
DFM-1K5G3								
DFM-2K2G3								
DFM-004G3								
DFM-5K5G3								
DFM-7K5G3/011P3	160	247	190	148	235	182	M5	
DFM-011G3/015P3								
DFM-015G3/018P3	220	320	210	205	306	202	M5	
DFM-018G3/022P3								
DFM-022G3/030P3								
DFM-030G3/037P3	250	400	244	230	380	232	M7	
DFM-037G3/045P3								
DFM-045G3/055P3	280	583	290	200	562	150	M10	
DFM-055G3/75P3								
DFM-075G3/90P3	300	688	340	200	667	——	M10	
DFM-090G3/110P3								

DFM-110G3/132P3 DFM-132G3/160P3 DFM-160G3/185P3	420	840	350	300	815	——	M11	
DFM−185G3/200P3 DFM−200G3/220P3 DFM−220G3/250P3 DFM−250G3/280P3 DFM−280G3/315P3 DFM−315G3/355P3	640	1035	395	500	100 3	——	M13	
DFM−355G3/400P3 DFM−400G3/450P3 DFM−450G3 DFM−500G3	960	1240	400	740	120 5	——	M14	

1) Height of frame sizes with fan(s)
2) Depth inside the cabinet for push-through mounting
3) Depth of Flat Plate inverter (400 V 0.75 kW variant only)

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