





CF80 Series Medium Voltage Variable Frequency Drive Model Selection Catalogue

NIETZ ELECTRIC CO.,LTD

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NIETZ

Innovation + Driving Tomorrow

>>>> WHO WE ARE

NIETZ is one Leading Manufacturer of industrial automation products, with more than millions units sold worldwide, established 2005 Shanghai, China. We are committed to building long-lasting and successful business relations with our partners, has gained good reputation and deep influence.

We aim to provide the best quality, unmatched reliability and low price in our services and our products. We aim to reduce your costs, streamline manufacturing, to improve productivity. The products of NIETZ are Variable Frequency Inverters, AC Servo System, Soft Starter, Planetary Gearboxes and Complete Device, The products NIETZ are technological advanced products and it has quite wide product range and already used widely in various applications such as textile machine, air compressor, hoist, packing machine, printing machine, electronic machine and other industries, which exported to over 40 countries and regions such as Europe, South America, Southeast Asia, Middle East and so on.

NIETZ always aims to be the professional driving solution provider and your mutual-benefit partner.



PRODUCT PRODUCTION PROCESS

PCB Placement Unit Process



Automatic board loading, solder paste printing, patching, and welding process



PCB boards for automated testing



Fully automatic conformal paint spraying and drying line



6 set of fully automatic SMT

production lines

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Frequency converter assembly line



Whole machine testing process



Pre-burning test



With load test

AOI Detection

Items that can be tested include:

Missing parts, multiple parts, wrong parts, cheap parts, sideways, tombstones, reverse stickers, extreme reverses, etc. Part replacement, IC pin bending, text recognition.

Soldering has no tin, less tin, more tin, solder balls, short circuit, virtual soldering, floating, etc.



INDUSTRY-UNIVERSITY-RESEARCH COOPERATION

Deepen the industry-university-research cooperation with Shanghai University of Engineering and Technology to promote the timely transformation of scientific research results into products.



Established a "Motion Control Joint Laboratory" with Anhui University of Technology to establish a technology platform and promote the development of technology-based enterprises.



Accelerate the construction of Shanghai Yingang production base, Anhui production base and Songjiang Zhongshan Street R&D center Strengthen industry-leading manufacturing capabilities and R&D core competitiveness.



Anhui Production Base

Songjiang Zhongshan Street R&D Center

Shanghai Maogang Production Base

PRODUCT STRUCTURE

Power cell

Each phase is composed of 3~9 power cells, forming a 4N+1 ladder PWM wave, three-phase Y connection, direct output 3~11kV.

Control system

Intelligent controller based on highspeed ARM, DSP, and FPGA;

Flux closed-loop vector control technology, optimized stacked wave PWM Control technology to achieve high-quality sinusoidal voltage and current output.





Air cooling

Adopt centrifugal fans from internationally renowned brands in the industry. Large air volume, sufficient margin, long life, and high stability.This ensures the heat dissipation needs of the high-voltage inverter itself. Improved product stability.

HMI

Using a well-known brand touch screen with a novel interface,Rich interfaces facilitate on-site expansion and user system and system connection.

Bypass cabinet Cable connecting cabinet

Innovatively integrated design of bypass cabinet,Without changing the installation dimensions of the product, it can Built-in one-drive-one manual bypass cabinet or one-driveone automatical bypass cabinet.

Transformer cabinet

Transformer cabinets and power cell cabinets are arranged in front and back program, through advanced thermal design, ensures on the basis of satisfying heat dissipation, it reduces the safety of the site. installation space to reduce infrastructure costs for customers.

Power cell

Brand new power cell design, the product is more lightweight andaesthetic;

The innovative semi-sealed structural design makes it environmentally friendly Stronger adaptability and higher reliability. No life limit Self-healing film capacitors, even if overvoltage breakdown short circuit.





Modular design

The power cell adopts modular design and can be interchanged at will. The power cell is easy to disassemble and assemble.

Multi-pulse Rectification Method

The input side uses a phase-shifting transformer to form a multi-pulse rectification method, which greatly improves the current waveform on the grid side, increases the input power factor, and reduces the harmonic interference of the equipment on the grid.





Improve short circuit protection technology

Phase-shifting transformer secondary short-circuit protection technology to avoid fires and In the event of accidents such as equipment damage, reduce customer losses and prevent the failure from expanding.

Timely: The short circuit information can be detected in time within the transformer's endurance time, and protective measures can be taken to ensure the safety of the equipment;

All-round: The number of short-circuit phases and short-circuit locations are considered in all directions, and can be effectively protected under various working conditions;

Flexible: No need to add additional equipment, more flexible and reliable.

AFTER-SALES SERVICE



Global service site

Products are exported to more than 50 countries and regions in Europe (Italy, Spain, Russia, Poland), Asia (South Korea, India, Thailand, Vietnam), the Middle East (Turkey, Egypt, Iran), South America (Brazil, Chile), etc.



PERFECT HARMONIC-FREE SOLUTION

The secondary winding of the phase-shifting transformer adopts the delta wye connection method to change the phase angle of the secondary winding of each phase.

- Eliminate the impact of harmonics generated by the power cell on the power grid.
- Taking two power cells in series as an example for analysis: phase shift angle σ= 60° / 2 = 30°
- Convert the current to the primary input side and expand it according to Fourier series:

$$Ia = \frac{1}{2} (I1sin(\omega t) + I5sin(7\omega t) + I7sin(7\omega t) + I11sin(11\omega t)$$

+ I13sin(13\omega t) ...
$$Ib = \frac{1}{2} (I1sin(\omega t) - I5sin(7\omega t) - I7sin(7\omega t) - I11sin(11\omega t)$$

+ I13sin(13\omega t) ...

The phase angles of the 5th, 7th, and 11th harmonics are 180 ° different. Through phase-shifting rectification technology, the harmonics cancel each other out.





Taking the input phase-shifting transformer of a 10 kV frequency converter as an example, the primary winding is 10 kV, the secondary side has a total of 24 three-phase windings, and the output voltage of each group is 690 V. Each winding is the delta wye connection method, with a phase shift angle difference of 7.5 °, can effectively eliminate harmonics below the 47th order. In other words, 48-pulse rectification can effectively eliminate the 47th order (6n-1,n is the number of units per phase) or less.

FEATURES





Unique heat dissipation design transfers heat from the radiator to the cooling air.

The input fuse is at the three-phase voltage input end and has good protection performance.

The control board transmits the PWM control signal to the gate driver, and the gate driver circuit board directly drives the IGBT.

TECHNICAL PRINCIPLES

The main circuit of the CF80 series medium-voltage inverter is composed of an input transformer and several singlephase PWM frequency conversion units. For 6kV, 5 frequency conversion power cells per phase can produce 11 levels of output voltage. For 10kV, 8 frequency conversion units per phase can produce 17 levels of output voltage. The precharge circuit can reduce the capacitor charging current and transformer excitation inrush current when highvoltage power is applied, reducing the impact on the power grid and protecting the inverter, extending the life of the inverter.



PERFORMANCE ADVANTAGES



PRODUCT ADVANTAGE

Thermal Simulation Analysis

Use mainstream simulation software to conduct thermal analysis to determine the radiator temperature and air duct air flow direction.







TECHNICAL SPECIFICATION SHEET

ltem	Voltage	6KV Series	10KV Series			
	Rated voltage	3 phase 50/60Hz, 6KV	3 phase 50/60Hz, 10KV			
	Voltage fluctuation range	$6kV/10kV \pm 10\%$ full load operation, -10%~-35% allows long-term derated operation				
Input	Frequency range	50Hz+10%	<u> </u>			
mput	Power cell input voltage	690V				
	Input power factor	>0.95 (above 20% load)				
	Input current harmonics	<2% meets IEEE519-1992 and GBT14549-93				
	Output voltage range	0-6KV 0-10KV				
	Output capacity range	230-7000KVA	250-12500KVA			
	Output Voltage	690V				
Output	Output frequency range	0~50Hz, max330Hz, manufacturer customization above 120Hz				
output	Speed ratio	40:1(Universal Vector)100:1(SVc)200:1(FVC)				
	Speed accuracy	$\pm 0.5 (Svc) \pm 0.2 \% (FVC)$				
	Torque response	>750rad/s				
	Startingtorque	0.5HZ/150%6 (Svc) ;0Hz/180% (FVC)				
	Technical solutions	Power cell cascade, AC-DC-AC, MV-MV t	уре			
Control	Model	Universal vector, without/with speed ser	nsor control method (SVC/FVC)			
Rectifica	tion type	Diode three-phase full bridge				
Contrava	ariant type	IGBT inverter bridge				
Acceleration and deceleration time		0.1-6500 seconds, >6500 seconds factory customized				
Start/stop control		Local or distant				
Control systerm		ARM、DSP、FPGA、CPLD HMI				
HMI		Touch screen/LCD optional, Simplified Chinese, English				
Overload capacity		120% rated current, 1 minute				
Overall machine efficiency		> 97.5%				
Fuse		Power cell input side with fuse				
Whether the electrical isolation part uses optical fiber		Yes				
Whether	r the input filter required	No				
Whether	the output filter required	No				
Whether	the power factor compensation required	No				
	Power cell protection	Overvoltage, undervoltage, voltage equalization, input phase loss, overcurrent, overtemperature, communication, etc.				
Mean tin	ne between failures	50,000 hours				
System protection		Motor overload, output overload, output short circuit, output grounding, input overcurrent, input overvoltage, input unbalance, input grounding, cooling fan failure alarm, door switch interlock protection, transformer overheating alarm, transformer overheating trip, etc.				
	Communication Interface	CANbus, Modbus and PROFIBUS can be	customized according to user requirements			
Switch	input	10-way, relay dry contact				
Switch	output	16-way, relay dry contact				
Analogi	nput	4 ways, 4~20mA or 0~10V	nA or 0~10V			
Analog output		5 ways, 4~20mA or 0~10V				
Usage environment		Indoor				
Ambien	t temperature	-10°C ~+40°C ,+40°C ~+50°C derated opera starting	tion; low T-10°C , preheating is required before			
Environ	ment humidity	5%~95%, no condensatio				
Altitude		<1000m, more than 1000m requires derating operation, please specify when ordering				
Total equipment noise		<75dB				
Cooling	method	Forced air cooling				
IP Class	, method					
Cableer	ntry and exit methods	Bottom in and bottom out top in and top out customized				
Control	Power	380V±10%AC three-phase four-wire				

PRINCIPLE OF ENERGY SAVING

Fans and pumps are mechanical devices used to transport fluids (gases and liquids). The function of fans and water pumps is to transfer the mechanical energy of the prime mover or the energy of other energy sources to the fluid to achieve fluid transportation. That is, after the fluid obtains mechanical energy, in addition to overcoming the flow resistance during transportation, it can also be transported from a low-pressure area to a high-pressure area, or from a low-level area to a high-level area. The mechanical equipment usually used to transport gas is called a fan (compressor), while the mechanical equipment used to transport liquid is called a pump.

Performance parameters of fans and water pumps

The basic performance parameters of fans and water pumps represent the basic performance. The basic performance parameters include flow, total pressure, shaft power, efficiency, speed, specific speed, etc, totally six parameters.

Flow:

Represented by the letter Q(q), the unit is (liter) l/s, m³/s, m³/h, etc.

Full pressure :

The total pressure p represents the mechanical energy obtained by the gas or liquid after entering the fan or pump. The total pressure p refers to the mechanical energy obtained by the unit volume of gas or liquid inlet section 1 flowing to the outlet section 2. The calculation formula of full pressure is: $p = (p_2 + \frac{1}{2}\rho v_2^2) - (p_1 + \frac{1}{2}\rho v_1^2)N/m^2$

Shaft power:

The power transmitted from the prime mover or transmission device to the shaft of the fan or water pump is called shaft power, expressed by P, and the unit is kW. $P = \frac{Q \times p \times g}{1000 \eta_r \eta_f} = \frac{Q \times p}{102 \eta_r \eta_f}$

In the formula: Q--- air volume, water volume (m³/s, Nm³/s);

p---full pressure (kg/m²);

 η f - efficiency;

"1/102" = g/1000---- The unit conversion coefficient from kg.m/s to kW.

etar - transmission efficiency;

1) If the unit of air volume and water volume is "m³/h" and the unit is "kg/m²", it must be divided by

$$3600: P = \frac{Q \times p \times g}{3,600,000\eta_r \eta_f}$$

2) If the unit of air volume and water volume is "m³/s" and the unit of pressure is "MPa", then: $P = \frac{1000 \times Q \times p}{3600\eta_{e}\eta_{f}} = \frac{Q \times p}{3.6\eta_{e}\eta_{f}}$ 3) If the unit of air volume and water volume is "m³/h" and the unit of pressure is "MPa", then it must be divided

by 3600:
$$P = \frac{Q \times p \times 1000}{1000\eta_r \eta_f} = \frac{Q \times p}{\eta_r \eta_f}$$

4) If the unit of air volume and water volume is "m³/s" and the unit of pressure is "kPa", then: $P = \frac{Q \times p \times 1000}{1000\eta_r \eta_f} = \frac{Q \times p}{\eta_r \eta_f}$ Motor capacity selection:

 $P_d = \frac{P}{\eta_d}$ = (where: ηd - motor efficiency.)

ENERGY SAVING PRINCIPLE

This is
$$P = \frac{Q \times p}{\eta_r \eta_f \eta_d}$$

Efficiency :

The ratio of the air volume and water volume output power (effective power) Pu to the input power (shaft power) P is called the efficiency of the air volume and water volume or the total pressure efficiency, represented by η :

$$\eta_f = \frac{R}{P} = \frac{Q.p}{P}$$

Rotating speed :

The speed of air volume and water volume refers to the speed of shaft rotation, that is, the number of revolutions of the fan shaft per unit time, expressed in n, and the unit is rpm (r/min) or s-1 (rad/second).

Specific speed:

The specific speed of air volume and water volume is expressed in ny and is defined by the following formula:

$$n_{y} = \frac{5.54n\sqrt{q}}{\left(\frac{1.2}{\rho}p\right)^{3/4}}$$

The specific speed as a performance parameter is calculated based on the basic performance parameters corresponding to the highest efficiency points of air volume and water volume. For geometrically similar air volumes and water volumes, regardless of their size and speed, the specific speed is constant. Therefore, the specific speed is also a criterion for classifying air volume and water volume.

The main features of air volume and water volume dragging system:

The load characteristics of the vane fan water pump belong to the square torque type, that is, the torque that needs to be provided on the shaft is proportional to the square of the rotational speed. Fans and water pumps follow similar laws when they meet three similar conditions: similar geometry, similar motion and similar power; for the same fan (or water pump), when the density ρ of the fluid being transported remains unchanged and only the rotational speed changes, its performance parameters will change. Changes follow the law of proportion: flow rate is proportional to the first power of the rotational speed; head (pressure) is proportional to the second power of the rotational speed; shaft power is proportional to the third power of the rotational speed. Right now:

$$\frac{Q}{Q'} = \frac{n}{n} \quad ; \quad \frac{H}{H'} = (\frac{n}{n})^2 \quad \frac{p}{p} = (\frac{n}{n})^2 \quad ; \quad \frac{P}{P'} = (\frac{n}{n})^3$$



INDUSTRY APPLICATION

Smelting Industry

In the metallurgical industry, frequency converters are needed to drive high-power and high-flow equipment, and the stability of the frequency converters can be further improved.



Typical applications: raw mill fans, dust removal fans, preheating fans, coal mill fans, grinders, rotary kilns, high temperature fans, etc.

Through modular design, frequency converters simplify installation, commissioning and maintenance in the cement industry. Proven performance is more reliable.



pump, seed pump, underflow pump, dissolution pump, feeding pump, etc.

The frequency converter adopts power unit series multi-level technology to meet the needs of load speed regulation, energy saving and improvement of production technology.



In the petrochemical industry, frequency converters can be seamlessly integrated into pump station control systems without the need to modify existing motors and wiring, making them fully capable of new construction/renovation projects.



Typical applications: water supply pump, primary fan, air supply fan, exhaust fan, mortar pump, circulation pump, increase pump, condensate pump, slurry pump, etc.

Traditional control methods are not only inefficient, but also very cumbersome to maintain. Frequency converters provide more reliable, precise and efficient direct drive speed control.



In large conveyor applications, precise torque control and automatic load balancing in multimachine control are key. Frequency converters respond well to this demand.

INDUSTRY APPLICATION

	Electricity: induced draft fan, primary/secondary fan, circulating water pump, feed water pump, condensate pump, slurry circulating pump, vertical coal mill
	Oil, gas and chemical industry: electric submersible pumps, water injection pumps, oil transfer pumps, pipeline compressors, LNG compressors, air separation compressors, syngas compressors, ammonia compressors (ice machines) product gas compressors, propylene compressors, carbon dioxide compressor
	Mining: belt conveyors, main fans, gas discharge pumps, mud pumps, crushers, semi-autogenous grinding, ball mills, high-pressure grinding mills
Common applications	Cement: raw mill circulating fan, coal mill exhaust fan, cement mill exhaust fan, kiln head exhaust fan, kiln tail high temperature fan kiln tail exhaust fan, running cooling fan, coal mill, roller press
	Metallurgy: dust removal fans, sintering main exhaust fans, blast furnace blowers, circulating water pumps, phosphorus removal pumps, slag washing pumps, air separation compressors, mills, stamping machines, two-way energy recovery compressors
	Municipal: water intake pump, water supply pump, primary water pump, secondary clean water pump, desalination pump, booster pump, irrigation pump
	Waste-to-energy: various types of ordinary fans and water pumps
The main function	Low voltage ride through, self-start after power failure recovery (within 20s), unit bypass function, on-the-fly start function, synchronous switching function, control power supply redundancy design (optional), power unit redundancy design (N+1, optional)), fan redundancy (optional) and other functions customized according to customer needs, mill-specific control function modules
Frequency converter supporting equipment	Excitation inrush current suppression cabinet, one-to-one manual bypass cabinet, one-to-two manual bypass cabinet, one-to-one automatic bypass cabinet, one-to-two automatic bypass cabinet, one-to-one synchronous switching cabinet, output reactor cabinet, Isolation cabinet

PRIMARY CIRCUIT DIAGRAM



One-drive-one manual bypass system



Dual power supply one-drive-two manual switching system



One-drive-one automatic bypass system



Dual power supply one-drive-two automatic switching system

MEDIUM VOLTAGE INVERTER PRODUCT SELECTION

MODEL DEFINITION



Installation Specification Sheet

VFD Model	Motor power(kW)	VFD capacity(kVA)	Weigh(kg)	Cabinet type	Cabinet Dimension (W×D×H)
CF80-H-06-185kW	185	230			2150×1400×2400
CF80-H-06-220kW	220	275	2650		
CF80-H-06-250kW	250	320			
CF80-H-06-280kW	280	350	2760		
CF80-H-06-315kW	315	400	2700	Cabinet A1	
CF80-H-06-355kW	355	450	2020		
CF80-H-06-400kW	400	500	2930		
CF80-H-06-450kW	450	560	3160		
CF80-H-06-500kW	500	630	3360		
CF80-H-06-560kW	560	700	3985		3450×1600×2250
CF80-H-06-630kW	630	800	4042		
CF80-H-06-710kW	710	900	4160		
CF80-H-06-800kW	800	1000	4382	Cabinat P1	
CF80-H-06-900kW	900	1150	4590		
CF80-H-06-1000kW	1000	1250	4792		
CF80-H-06-1120kW	1120	1400	4985		
CF80-H-06-1250kW	1250	1600	5285		
CF80-H-06-1400kW	1400	1800	6120		4150×1600×2250
CF80-H-06-1600kW	1600	2000	6390	Cabinat C1	
CF80-H-06-1800kW	1800	2250	6745	Cabillet CI	
CF80-H-06-2000kW	2000	2500	7090		
CF80-H-06-2250kW	2250	2800	9220		5400×1400×2400
CF80-H-06-2500kW	2500	3200	9570		
CF80-H-06-2800kW	2800	3500	10070	Cabinet D1	
CF80-H-06-3200kW	3200	4000	10670		
CF80-H-06-3600kW	3550	4500	11240		
CF80-H-06-4000kW	4000	5000	12500		6850×1400×2400
CF80-H-06-4500kW	4500	5650	13000	Cabinet F1	
CF80-H-06-5000kW	5000	6300	14000		
CF80-H-06-5600kW	5600	7000	17755		8200×1600×2400/2600
CF80-H-06-6300kW	6300	8000	18795	Cabinet G1	
CF80-H-06-6600kW	7100	9000	19450		

VFD Model	Motor power (kW)	VFD capacity(kVA)	Weigh(kg)	Cabinet type	Cabinet Dimension (W×D×H)
CF80-H-10-185kW	185	230	2220		2000×1500×2000
CF80-H-10-220kW	220	275	2240		
CF80-H-10-250kW	250	320	2260		
CF80-H-10-280kW	280	350	2286		
CF80-H-10-315kW	315	400	2316		
CF80-H-10-355kW	355	450	2346		
CF80-H-10-400kW	400	500	2383	Cabinet A	
CF80-H-10-450kW	450	560	2433		
CF80-H-10-500kW	500	630	2483		
CF80-H-10-560kW	560	700	2593		
CF80-H-10-630kW	630	800	2719		
CF80-H-10-710kW	710	900	2875		
CF80-H-10-800kW	800	1000	3062		
CF80-H-10-900kW	900	1150	3192		2500×1650×2200
CF80-H-10-1000kW	1000	1250	3258		
CF80-H-10-1120kW	1120	1400	3409		
CF80-H-10-1250kW	1250	1600	4390	Cabinet B	
CF80-H-10-1400kW	1400	1800	4648	-	
CF80-H-10-1600kW	1600	2000	4948		
CF80-H-10-1800kW	1800	2250	5270		
CF80-H-10-2000kW	2000	2500	5604		4000×1500×2200
CF80-H-10-2250kW	2250	2800	5916		
CF80-H-10-2500kW	2500	3150	7990	Cabinet C	
CF80-H-10-2800kW	2800	3500	8150		
CF80-H-10-3200kW	3200	4000	8700		
CF80-H-10-3600kW	3550	4500	8820		6925×1500×2455
CF80-H-10-4000kW	4000	5000	11990		
CF80-H-10-4500kW	4500	5600	12500	Cabinet D	
CF80-H-10-5000kW	5000	6300	13300		
CF80-H-10-5500kW	5600	7000	13800		
CF80-H-10-6300kW	6300	8000	18410	Cabinat F	9100×1650×2455
CF80-H-10-7100kW	7100	9000	19700	Cabinet E	
CF80-H-10-8000kW	8000	10000	20400	Cabinat F	9200×1700×2800
CF80-H-10-9000kW	9000	11250	22500	Capifiel F	
CF80-H-10-10000kW	10000	12500	27120	Cabinat C	12200×1600×2455
CF80-H-10-11000kW	11000	13750	28860	Cabillet G	

Remarks:

The above dimensions and weight are for reference only, the specific dimensions and weight are subject to the technical agreement;

- The input voltage and output voltage of the standard series are the same;
- The height of the overall size does not include the height of the fan, which requires an additional 300mm to 600mm;
- The above overall machine size and weight refer to the sum of the control cabinet, unit cabinet, and transformer cabinet, excluding the power frequency bypass cabinet;
- The distance between the front of the device and the wall is no less than 1500mm, the distance between the back and the wall is no less than 1000mm, the distance between the sides and the wall is no less than 800mm, and the distance between the top and the roof is no less than 1000mm.

Standard overload capacity is 120%/1 minute, overload is allowed for 1 minute every 10 minutes; overload capacity of 125%, 150%, and 200% can be selected to meet the needs of different applications;

The applicable motor power may change due to differences in the form and structure of the motor and is for reference only.



PROVE POWER WITH TECHNOLOGY



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