

HD2000 Series

Low Voltage Engineering

Single-Drive/Multi-Drive Variable Frequency System

Product Overview

The HD2000 inverter (hereafter referred to as “the HD2000”) is an engineering single-drive/multi-drive system. Its modular hardware and engineering software design enables it to handle various complex drive scenarios.

The HD2000 includes single-drive AC-DC-AC variable frequency drive units and DC/AC common DC bus multi-drive motor drive units, both of which are available in cabinets. The control unit, HCU20, supports vector control and V/F control modes. It is capable of simultaneously driving 3 vector or 8 V/F axes and enabling parallel connection of 8 power units.

- ◆ **Key features:** Single-/multi-drive system in the form of units/cabinets with two/four quadrants.
- ◆ **Modular design:** application flexibility and comprehensive system integration
- ◆ **Comprehensive rectifier units:** Basic/Smart/PWM rectifier unit
- ◆ **Voltage Levels:** 400V, 690V, 1140V, 1380V
- ◆ **Max. single unit power:** 1400kW (Air-cooled), 2800kW (Liquid-cooled)
- ◆ **Max. parallel operation power:** 11200kW (Air-cooled), 22400kW (Liquid-cooled)
- ◆ **Motors supported:** Asynchronous induction motors, permanent magnet synchronous motors, synchronous reluctance motors
- ◆ **Control modes:** V/F, Closed-loop vector control (CLVC), open-loop vector control (OLVC)
- ◆ **Cooling modes:** Air-Cooled (Standard configuration), liquid-cooled (L)

Description

HD2000 - 10 B 0500 4 B L -S +L +Q

Series Name:

HD2000: Series low voltage engineering single-drive/multi-drive variable frequency system

Topology/Function:

10: Basic rectifier (Diode) 11: Basic rectifier (SCR)
12: Smart rectifier 13: PWM rectifier 14: LCL filter interface (No built-in main contactor) 15: LCL filter interface (Built-in main contactor) 16: Motor drive 17: Control 18: Centralized brake 19: Distributed brake 21: Output inductor (1 unit/cabinet) 22: Output inductor (2 units/cabinet) 30: Incoming for distribution 33: Basic rectifier and frequency regulation

Structure Type:

B: Unit product D: Cabinet product

Rated Current:

0500: 500A

Voltage Level:

4: 400V (380V~480V) 6: 690V (500V~690V) 9: 1140V A: 1380V

Braking Options:

B: Built-in brake Null: No built-in brake

Cooling Method:

L: Liquid-cooled Null: Air-cooled

Motor Drive Unit Type:

S: Compact type Null: Chassis type

Output Inductor Options:

+L: Included Null: Not included

DC Bus Switch Options:

+Q: Included Null: Not included

Typical Application

The HD2000 can be widely used in the drives of various kinds of automated production equipment in the fields of metallurgy, lifting, petroleum, machine tools, plastics, metal products, papermaking, textile, printing, and packaging.



Industry: Metallurgy
Load: High speed wire rod/bar main mill, reducing sizing mill, cold rolling mill, roller bed, straightener, pickling line
Characteristics: Strong overloading capability, high precision, high dynamic response, low speed reduction equivalent



Industry: Port lifting
Load: Quay crane, grab bucket
Characteristics: Potential energy load, constant torque startup, frequent startup, zero-speed suspension



Industry: Oil drilling
Load: Winch, turnplate, mud pump, auto driller, top drive
Characteristics: Multi-axis drive, multi-motor synchronous control, high reliability



Industry: Test benches
Load: Synchronous motor, asynchronous motor
Characteristics: Parallel operation, high power, frequency superposition

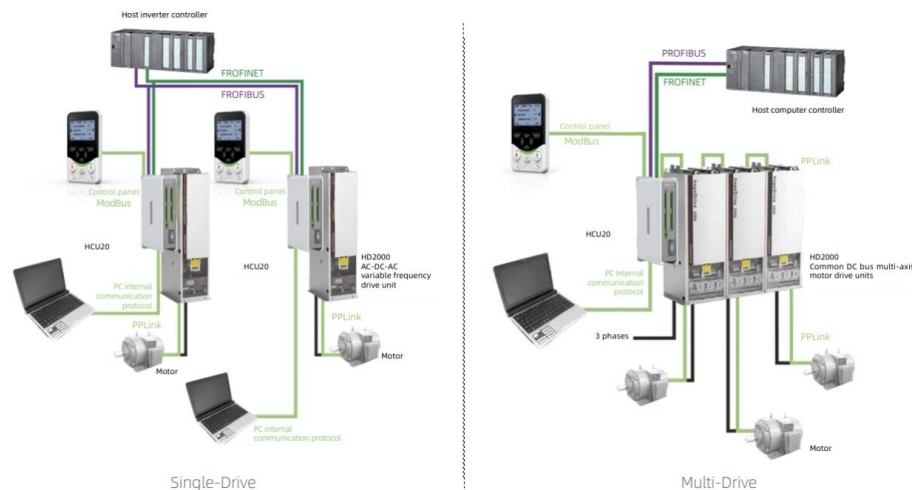


Industry: Mining machinery
Load: Excavator, dump truck, mine hoist, conveyor
Characteristics: Multi-axis drive, low-frequency high torque, multi-motor synchronous control, energy regeneration



Industry: Distributed renewable energy generation
Load: Wind turbine, waste heat generator, tidal power generator
Characteristics: Low grid harmonic current, MPPT, customized algorithm

Single-/Multi-Drive Concept Diagram



HD2000 Series Product Classifications

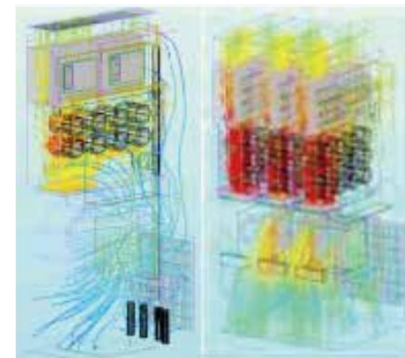
HD2000 Series Low Voltage Engineering Variable Frequency Drive System							
Suitable for Complex Single-Drive/Multi-Drive Modular Drive System							
Cooling method	AC-DC-AC Variable Frequency Unit (Chassis Type)	Multiple AC-DC Rectifier Units and DC/AC Inverters, Suitable for Multi-Drive Applications					
	Basic rectifier type	Basic rectifier unit	Smart rectifier unit	LCL filter interface unit + PWM rectifier unit	Motor drive unit		Standard unit cabinet/whole machine (W*H*D) (mm)
					Chassis type	Compact type	
Air-cooled models	5.5~560kW	90~1500kW	7.5~1600kW	11~1600kW	5.5~1400kW	5.5~160kW	400*2200*650/600*2200*650/800*2200*650 ⁽¹⁾
Liquid-cooled models	/	560~2500kW	200~2000kW	235~3400kW	160~2800kW	/	400*2200*650/450*2200*650/600*2200*650/750*2200*650
  							
Air-cooled models Liquid-cooled models Liquid-cooled models							

Note: HD2000 cabinets or the whole machine can be customized according to customer requirements.

Product Features of HD2000 Series Variable Frequency Drives

■ Reliable Engineering Design

- Highly redundant control and power systems
- Extended lifespan of quick-wear heat dissipation parts (fans, capacitors, etc.)
- Innovative high thermal capacity radiator to withstand strong impact loads
- Optical fiber cables used for control system and power units for resistance to interference
- Isolation of heat dissipation channels from internal components to protect components and better adapt to environment.



■ Modular Design for Easy Maintenance

- Easy maintenance as no special tools needed
- Enabling all modules to be maintained from the front
- Intelligent fault diagnosis system to locate faults quickly

■ High-Strength Anti-Seismic Design

- Normal operation under IEC 60721 class 3M5 mechanical conditions
- Precise mechanical design for stronger anti-seismic capability

■ Customizable Communication Protocols

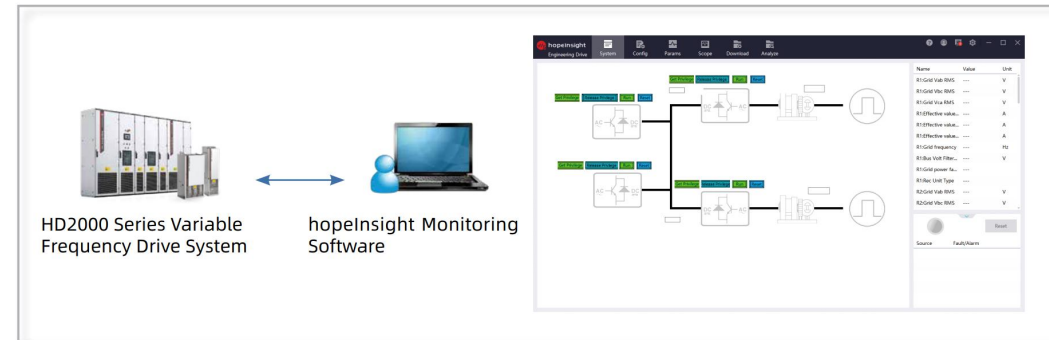
- Supported via optional modules for seamless connection with existing PLC, facilitating replacement and maintenance.
- Including profibus-DP, CANopen, profinet IO, modbus RTU, modbus TCP, etherCAT, etherNet/ IP, controlNet and deviceNet, achieving interconnectivity of industrial devices.

■ Rich Tools for Human-Machine Interaction

- Configurable LCD keypad panel supporting setting parameters and displaying system information
- Supporting connection to hopeInSight via PC for intelligent fault recording and diagnosis

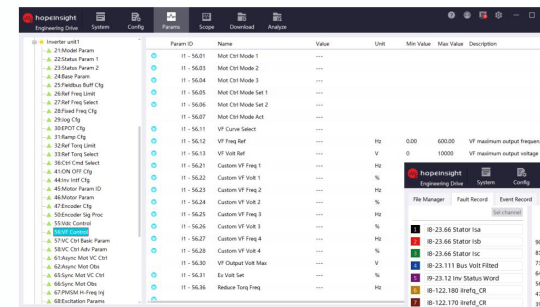
■ hopeInSight Background Rapid Commissioning Software

hopeInSight is a rapid commissioning tool developed for drive systems. It can be connected to PC background through optical fiber cables. The software offers a wide range of debugging functions, including batch parameter settings, fault data downloading and waveform analysis, high-speed oscilloscope and editing. It supports communication through serial port or Ethernet, thus users can maintain the inverter via serial port or Ethernet in the central control room. The working schematic is as follows:

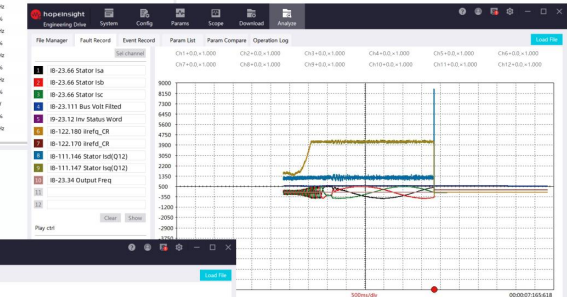


Working Diagram of hopeInSight

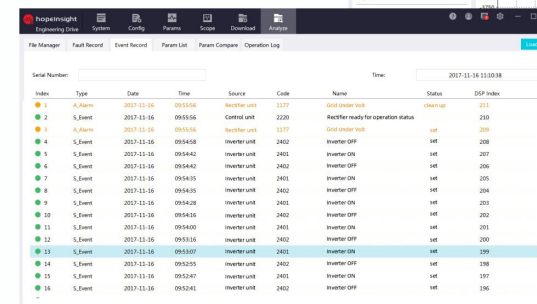
▼ Batch Parameter Settings



▼ 12-Channel High-Speed Software Oscilloscope



▼ Powerful Fault Wave Recording and Detailed Event Recording



Performance Advantages

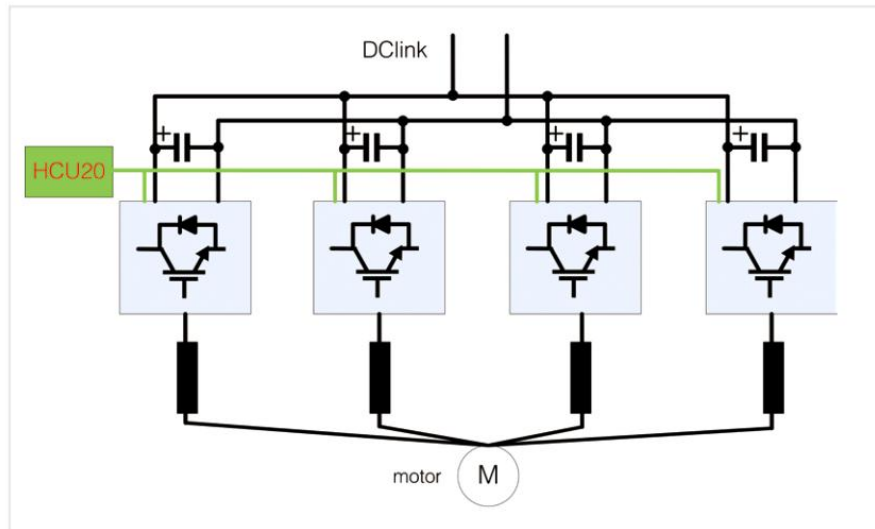
■ Direct Parallel Technology

Key Technical Points

-When units are connected in parallel, discrete differences in the drive system or power hardware can result in unbalanced load currents between units. The control system synchronization and parallel current-sharing technology can adjust the output current of each unit in real time to achieve balance control of load currents.

Technical Competitiveness

-Supporting system derated operation in face of unit faults
 -Centralized control but decentralized execution system, connected through fiber optics, more conducive to direct parallel connection of units
 -Parallel current-sharing technology supporting direct parallel connection of multiple rectifier and inverter units with nanosecond (ns) level synchronization.



■ Multi-Motor Synchronization and Load Balance Control

Key Technical Points

-Multiple motors drive the same load, synchronized or proportionally synchronized through bearings, gears, chains, belts, etc. Flexible parameter interconnection helps easily achieve master-slave drive control, static load balance with zero difference, dynamic load balance at

millisecond (ms) level, and free switching between master and slave control modes for special applications.

Technical Competitiveness

-Separated multi-axis controllers and power modules, connected through high-speed fiber optic communication, facilitating synchronous control.
 -Anti-torsional vibration, anti-slip, precise speed synchronization, and load balance control.
 -Droop control to achieve automatic speed adjustment and load balance without encoder.

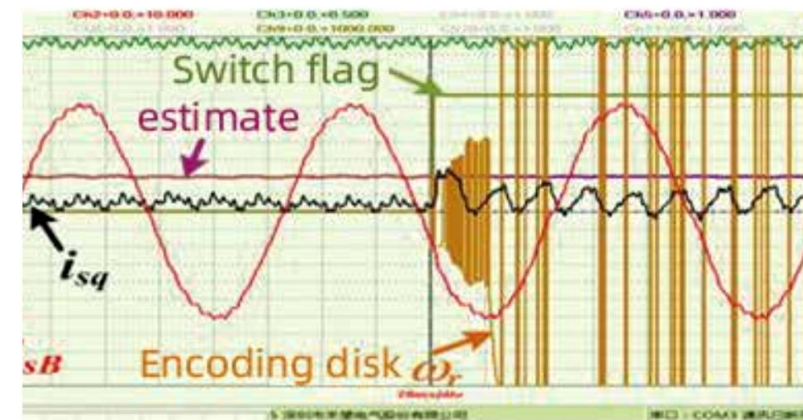
■ CLVC and OLVC Automatic Online Switching

Key Technical Points

-During CLVC operation, the motor speed is monitored in real time through an accurate motor model. The system can automatically switch to OLVC mode online when an encoder fault occurs and switch back to CLVC mode when it becomes normal.

Technical Competitiveness

-Reducing unnecessary losses caused by encoder fault and abnormal shutdown, meeting the requirements of special applications. Coordinated with the braking control function in lifting scenarios, improving the operation safety of overhead travelling cranes.
 -Smooth switching process without any current impacts or disturbances



Technical Specifications of HD2000 Series Products

Basic Rectifier	Input voltage	4: 380V ~ 480V, 6: 500V ~ 690V
	Input frequency	(50Hz/60Hz) ±6%
	Output voltage	Input voltage * 1.32 (Under full-load condition)
	Overload capacity	Relative overload at 150% of rated current for 60 seconds, maximum current (Imax), DC overload for 5 seconds
	Operating efficiency	≥99% Efficiency
	Protection functions	Protection functions: Overheating protection, soft-start protection, Interlock protection, and more.
Intelligent rectifier	Input voltage	4: 380V ~ 480V, 6: 500V ~ 690V
	Input frequency	47 ~ 63Hz
	Output voltage	Input voltage * 1.3 (Under full-load condition)
	Overload capacity	Relative overload at 150% of rated current for 60 Seconds, Maximum current (Imax), DC overload for 5 seconds
	Operating efficiency	≥98.5% Efficiency
	Protection functions	Protection functions: Overheating protection, Overcurrent protection, IGBT pass-through protection, and more.
PWM rectifier	Input voltage	4: 380V~480V, 6: 500V~690V, 9: 1140V, A: 1380V
	Input frequency	47 ~ 63Hz
	Output voltage	Input voltage * 1.5 (Under rated conditions)
	Overload capacity	Relative overload at 150% of rated current for 60 seconds, Maximum current (Imax), DC overload for 5 seconds
	Operating efficiency	≥98% Efficiency (Including LCL filter unit)
	Power factor	Adjustable (Factory setting at 1)
	Protection functions	Protection functions: Overheating protection, Overcurrent protection, Overload protection, IGBT pass-through protection, and more.
Inversion	Rated Input voltage	4: 410Vdc ~ 780Vdc, 6: 550Vdc ~ 1100Vdc, 9: 1488Vdc ~ 2200Vdc, A: 1488Vdc~2200Vdc
	Output voltage	0 ~ Rectifier AC input voltage
	Output frequency	0 ~ 500Hz
	Speed range	V/F: 1:50 OLVC: 1:200 CLVC: 1:1000
	Speed stability	OLVC: 0.2% CLVC: 0.01%
	Speed fluctuation	OLVC: 0.2% CLVC: 0.1%
	Starting torque	OLVC: 150%(0.5Hz) CLVC: 200%(0Hz)
	Torque control	V/F: Unsupported OLVC: Supported CLVC: supported
	Torque accuracy	OLVC: 5% CLVC: 5%
	Torque response time	OLVC: 5ms CLVC: 5ms
	Speed response time	OLVC: 100ms CLVC: 100ms
	Dynamic speed drop equivalent	OLVC: 0.5%*s CLVC: 0.3%*s
Environmental conditions	Temperature	-15°C ~ +40°C Without derating, +40°C ~ +55°C derating applies
	Humidity	5% ~ 95% Non-condensing
	Altitude	≤4000m, Derating applies from 2000m to 4000m
Mechanical data	Anti-vibration performance	Complies with IEC 60721-3-3:2002
	Protection level	IP00 / IP20 / IP40
	Safety level	Complies with UL 508C-2004
	Cooling method	Air-cooled, Water-cooled

