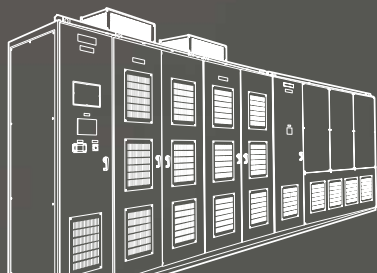


HYUNDAI INVERTER

hi RUN **N** 5000 Medium Voltage



HYUNDAI MV INVERTER



HiRUN **N**5000

Hyundai MV inverters feature intelligent vector controls that allow motors to operate more efficiently and offer customer a full range from 155kW to 6,400kW.

- High performance and efficiency
- Clean power for motors
- Small footprint and economical maintenance
- Global standard CE

Model Name Indication

N5000

Series Name

3930

Applicable Motor Output (kW)

H

Voltage Class

L: 3300V
M: 4160V
H: 6600V

5

Frequency

5: 50Hz
6: 60Hz

*Clean Power
Hyundai Inverter*



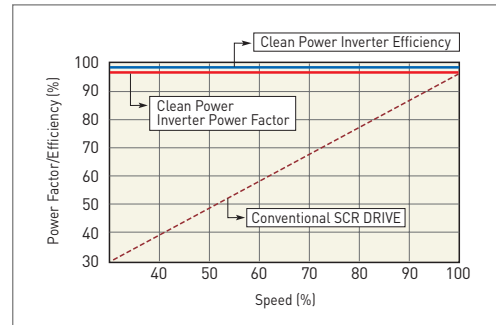
Features
Certification
Circuit Configuration
Connection
Specifications
Outline and Dimensions

Contents 04 09 10 11 12 13

» Features

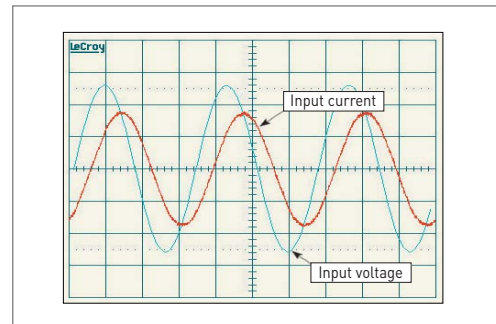
High Performance and Efficiency

- **Power Factor: over 0.95**
No requirements for power factor correction capacitor
- **System Efficiency: over 97%**
System efficiency is improved by connecting the power and motor without input-output filter and output transformer



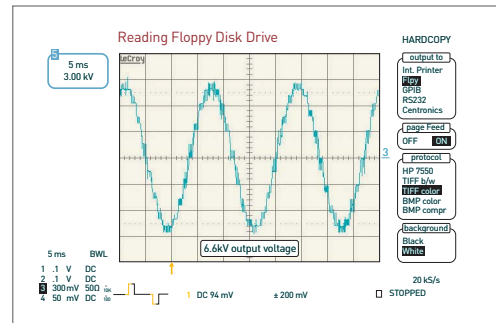
Clean Power Input

- A clean input wave is achieved via a secondary phase-shifted transformer
- Without a filter, N5000 meets the stringent harmonic requirements of IEEE-519 (1992)
- Protects the other equipment from harmonic disturbance



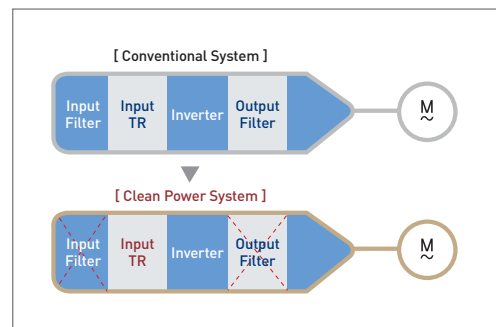
Supplies of Clean Power for Motors

- Output waveforms, without a filter, are close to sine waves due to multiple PWM control
 - No cable length & motor type restrictions
 - Existing motor can be used without modifications
 - Reduced noise and vibration of motors
 - 3.3kV - 13 level/4.16kV -17 level/6.6kV - 25 level output (Based on line to line voltage)



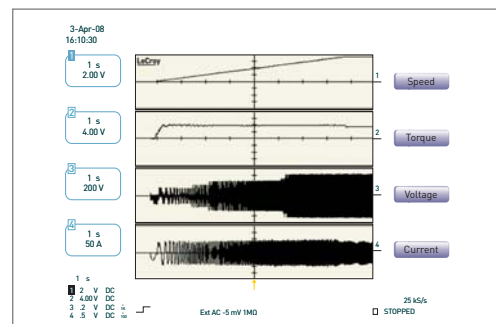
Small Footprint and Economical Maintenance

- Small footprint and reduced installation costs due to no requirements for ancillary equipments such as input & output filter and the integral structure incorporating the input transformer and inverter panel
- Thanks to the modularized single-phase inverter of draw-out type, easy maintenance and time saving are achieved.



Outstanding Operation Features by the Improved Sensorless Vector Control

- Energy saving V/F control for the fluid load (Fan, Pump)
- Inherent speed sensorless vector control of N5000
 - High starting torque operation
 - Control of current, speed and vibration of motor at the low speed range of light duty
 - Quick torque responsiveness and improved speed precision
 - Strong control regardless of motor specifications



※ Much more improved vector control functions can be achieved if the encoder is installed (Option).

Multi-Winding Phase-Shifted Transformer

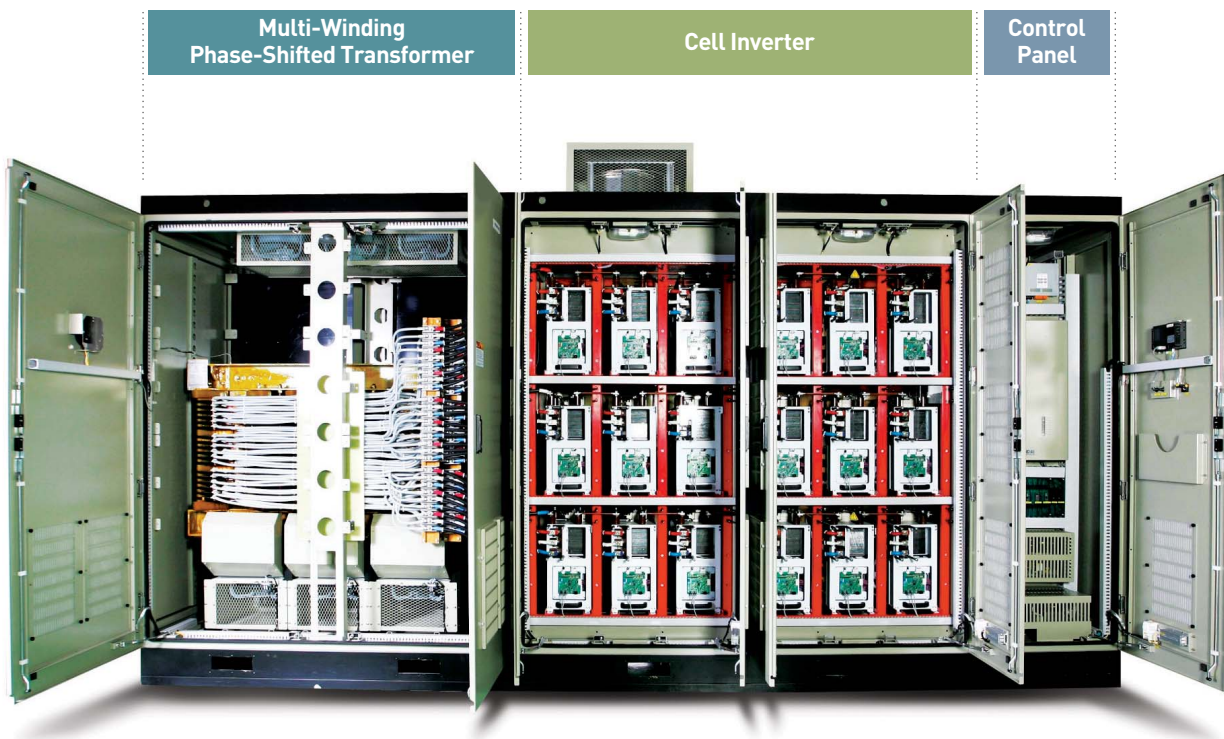
- Power supply lead-in terminal and output terminal section to the cell inverter
- 3.3kV: 9 phase shift windings
- 4.16kV: 12 phase shift windings
- 6.6kV: 18 phase shift windings
- Free standing panel type

Cell Inverter

- 3, 4 or 6 cells connected in series per inverter output phase
- Modulization of PWM controller and power conversion section
- 13 level (3.3kV)/17 level (4.16kV)/25 level (6.6kV) 3 phase direct output

Control Panel

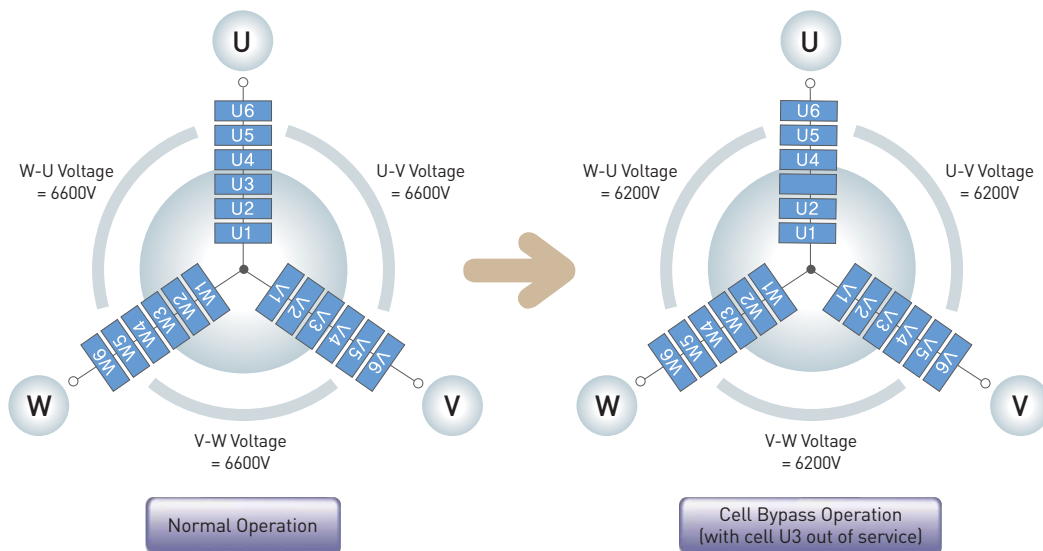
- Process controller for high speed calculating digital signal process
- Self-Diagnostic
- Extendable I/O board
- CAN communication control and optical signal transmission
- UPS for back-up of control power (Option)



Functions for Trip-Free Operation (Option)

Improved Cell Bypass

In case of cell failure during operation, the faulty cell will be bypassed and the neutral point will be shifted (balance is restored through angle adjustment). 92% of the rated voltage can be output after the failure of one cell.



Redundant Inverter Controller

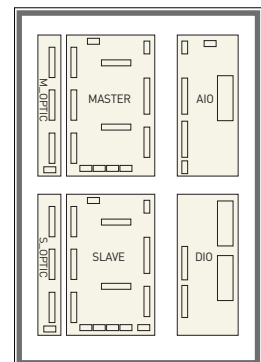
If the master controller is out of service during operation, output is generated due to automatic switching to the slave controller

Redundant Fiber-Optic Cable for CAN Communication

If there are problems with the optic cable during operation, an automatic switching to the standby reserve optical communication H/W is made (It needs a redundant controller as option)

Redundant Control Power

The redundant control power module is equipped with AC 440V and DC 120V and monitors the control power. In case of the failure of a control power module, an automatic switching to the reserve module is realized

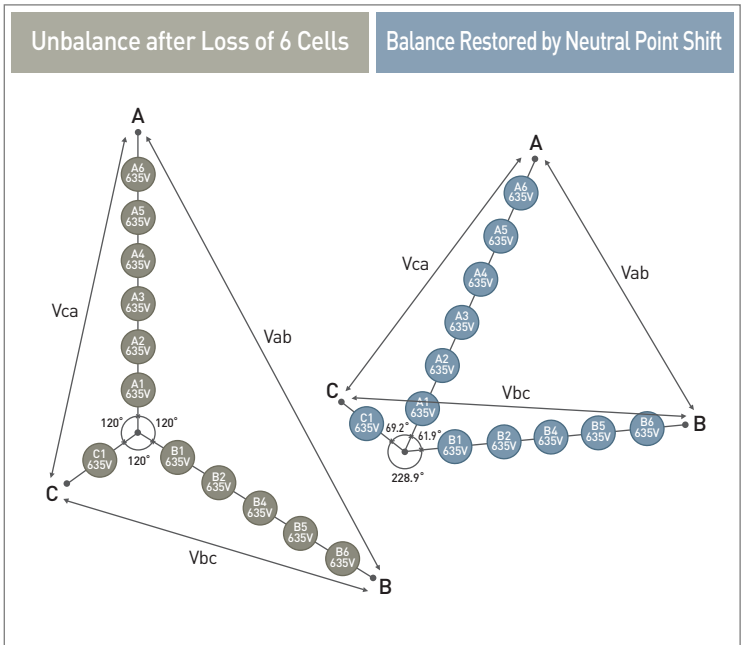
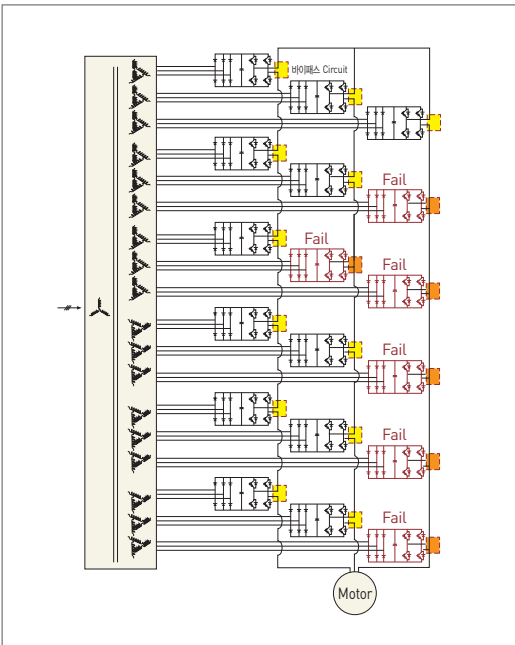


Unbalance Control of Phase Angle

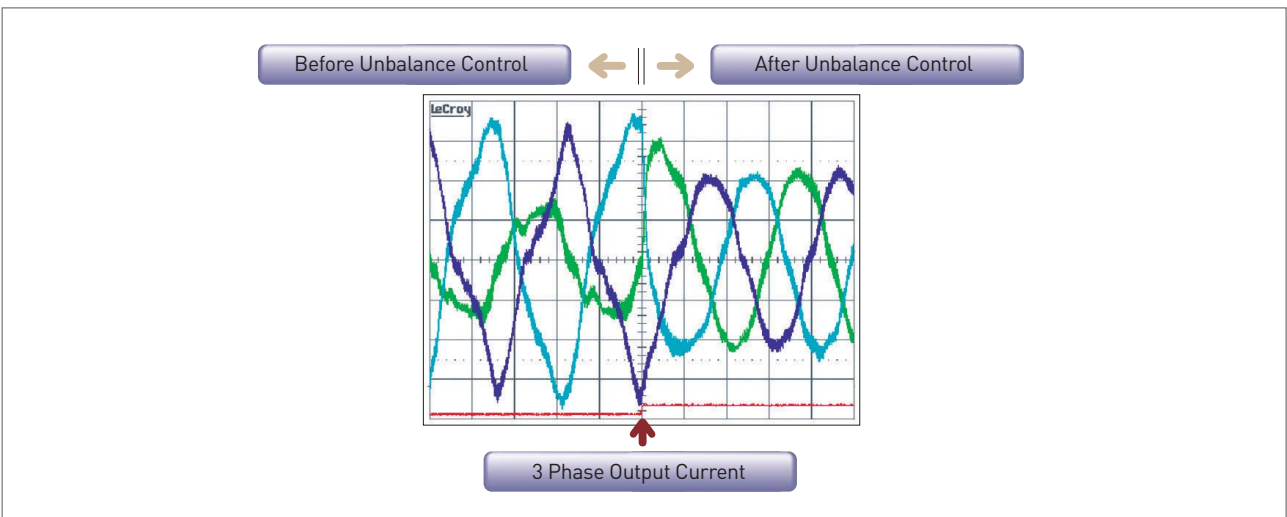
Balance can be restored by neutral point shift adjusting phase angles

Equivalent Circuit with 6 Cells Out of Service

Vector Diagram



Comparison of Output's Characteristic after Unbalance Control



Inverter Operator with User-friendly Design (10.2inch Color LCD)

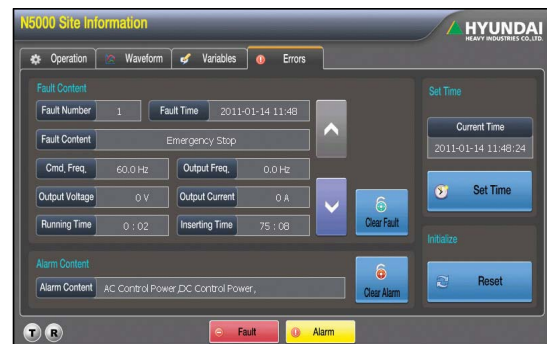
- Multi language support (Option)

Easy Touch Key Settings



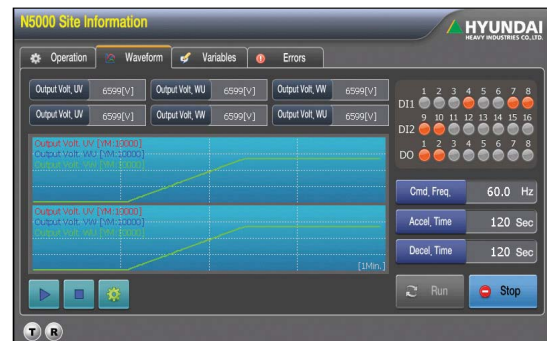
Inverter Fault Display

- Fault type
- Operating frequency at time of fault
- Time of Fault
- Voltage and current at time of fault



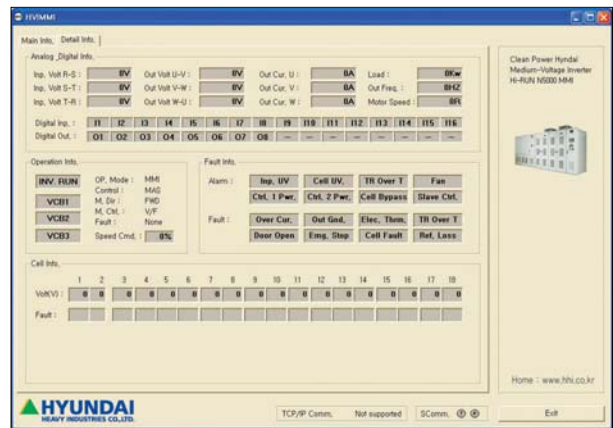
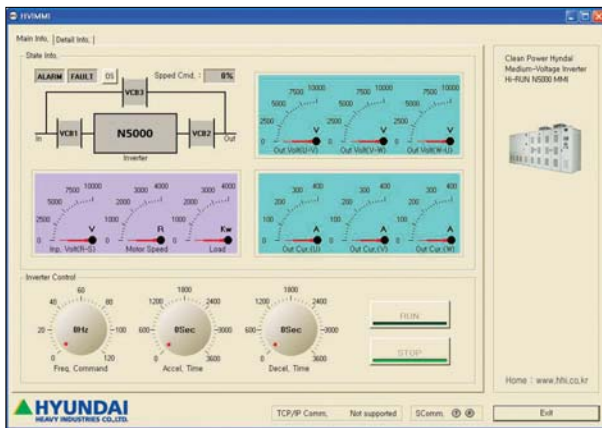
Inverter Operation Status Display

- Operation frequency, input-output voltage, output current
- Input-output of external signals
- MV switchgear on/off status
- Output voltage wave form

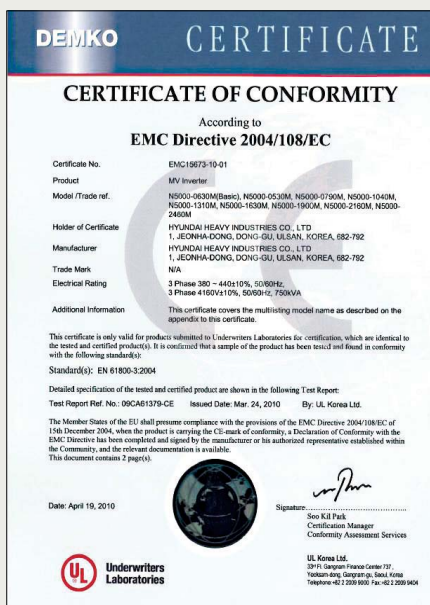


Optional User Friendly PC-based Console (Option)

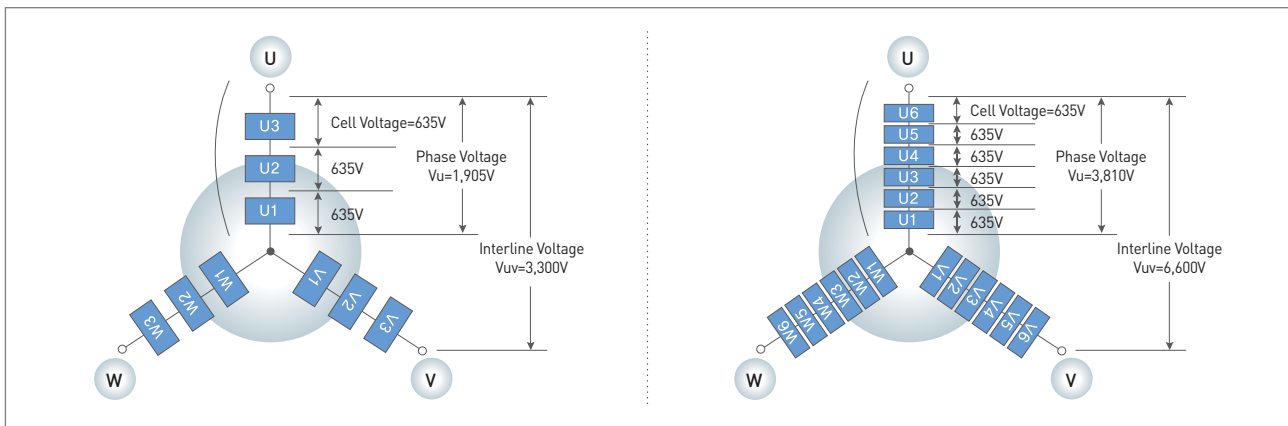
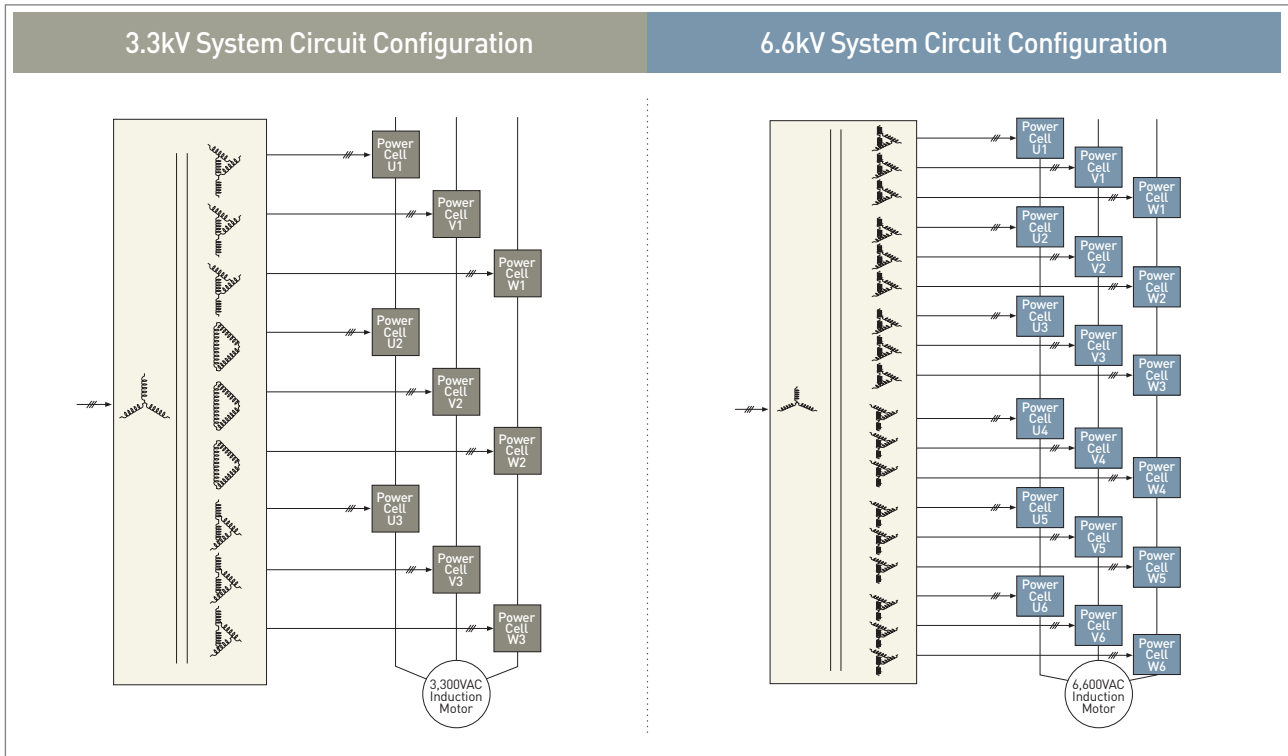
- Remote operation and monitoring via laptop or desktop
- Easy parameter setting and monitoring
- Various communication interfaces (RS-232, RS-485, MODBUS)
- Custom-made MMI display and upgrade support



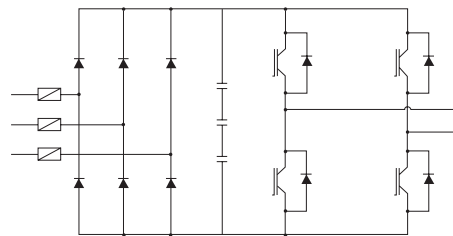
CE (Conformity European)

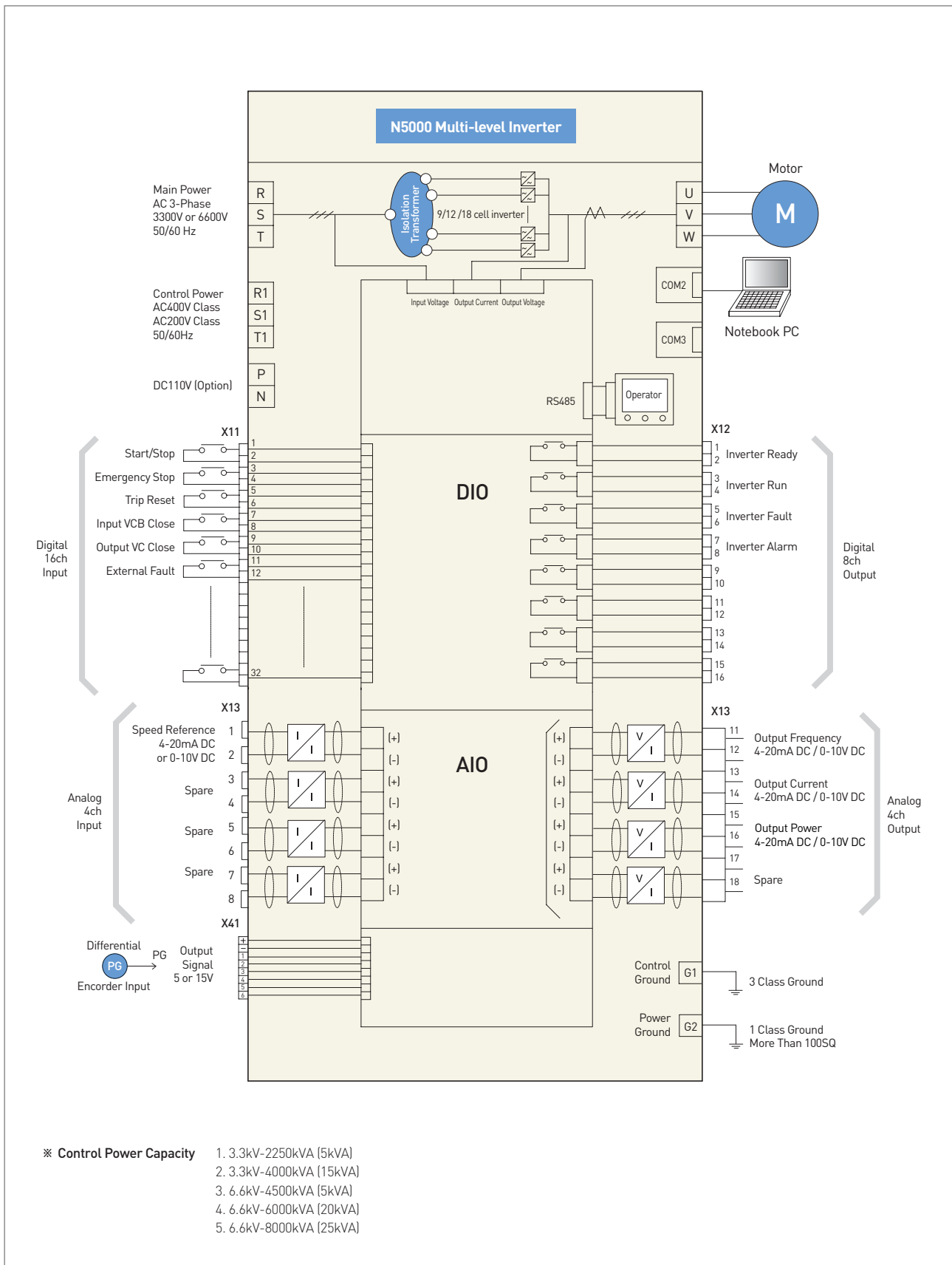


» Circuit Configuration



Single-phase Cell Inverter (Power Cell)





» Specifications

Voltage class		3300V ¹⁾															
3.3kV output capacity (kVA)		200	300	400	500	600	750	1000	1250	1500	1750	2000	2250	2700	3000	3500	4000
Rated output current (A)		35	53	70	88	105	132	175	219	263	307	350	394	473	525	619	707
Motor power output (kW) ²⁾		155	245	325	410	490	620	835	1040	1270	1500	1710	1940	2250	2500	2800	3200
Voltage class		4160V ¹⁾															
4.16kV output capacity (kVA)		250	380	500	640	750	950	1250	1550	1900	2200	2500	2850	3400	3750	4400	5000
Rated output current (A)		35	53	70	89	105	132	174	216	264	306	347	396	473	525	619	707
Motor power output (kW) ²⁾		205	310	410	530	630	790	1040	1310	1630	1900	2160	2460	2930	3240	3500	4000
Voltage class		6600V ¹⁾															
6.6kV output capacity (kVA)		400	600	800	1000	1200	1500	2000	2500	3000	3500	4000	4500	5400	6000	7000	8000
Rated output current (A)		35	53	70	88	105	132	175	219	263	307	350	394	473	525	619	707
Motor power output (kW) ²⁾		330	495	675	835	1000	1270	1700	2130	2590	3020	3450	3930	4500	5000	5600	6400
Output	Output frequency range (Hz)	0-120Hz															
	Overload capacity	120%, 60 sec															
Input	Main circuit	3-phase 3300V, 50/60Hz, 3-phase 4160V, 50/60Hz, or 3-phase 6600V, 50/60Hz															
	Control circuit	3-phase 200V or 400V, 50Hz or 60Hz															
	Tolerance	Voltage: $\pm 10\%$, Frequency: $\pm 5\%$															
Power factor of main power supply		Approx 95% or more at normal operating speed															
Efficiency		Approx 97% (Including transformer)															
Control specification	Control method	Sensorless vector control + Multi-level sinusoidal PWM (Pulse Width Modulation)															
	Frequency precision	$\pm 0.5\%$ of maximum output frequency (Analog input)															
	Torque characteristics of load	Square torque load, Constant torque load															
	Acceleration/deceleration time	0.1-3600 sec (depend on GD ² of load machine)															
	Main control function	Soft stall (Automatic load reduction control during overload), Ride-through function (0-83ms, non-torque control), specific frequency evasion function, total run time display function, non-stop operation during speed reference loss, multiple Acc./Dcc. rate setting, flying start															
	Main protective function	Current limit, overcurrent, overvoltage, overload, undervoltage, ground fault, CPU error, cooling fan abnormal, control power abnormal															
Data transmission		2ea among RS485/232/modbus (standard), ethernet, profibus-DP (Option)															
Operation board	Display	Color LCD graphic display: Color TFT touch method 10.2 inch LCD															
	Control method	Start, stop, reset fault, interlock (Emergency stop)															
Signal interface	Analog	Input: 4 channel (DC 0-10V or DC 4-20mA) Output: 4 channel (DC 0-10V or DC 4-20mA)															
	Digital	Input: 16 channel (Dry contact) Output: 8 channel (Dry contact: AC 250V 5A or DC 30V 5A)															
Main reliability function (Option)	Cell bypass	If an inverter cell functions abnormally, continuous operation is possible via reduced power output															
	Control device redundancy	When main control device is abnormal, auxiliary control device is communicated with optical signal transmitter															
	Control power redundancy	In case of power failure AC and DC can be received together for control input power															
Input transformer		Temperature class H, dry type, tapping range $\pm 5\%$ for N5000															
Construction	Protection degree of enclosure	IP20 (IEC-529), IP42 (Option)															
	Panel construction	Free standing, front maintenance type, door handle key attached															
	Cooling	Air cooled by ventilation fans mounted on panels															
	Panel color	Munsell No. 5Y 7/1															
Ambient constructions	Ambient temperature	0-40°C															
	Humidity	Max 90% (No condensation)															
	Noise level	Max 75dB (A)															
	Altitude	1000m above sea level or less															
	Vibration	0.5G or less at 10-50Hz															
Installation		Indoors															
Applications		Fan, blower, pump, compressor, extruder, mixer etc.															
Standards		Electrical performance: IEC Components and others: KS															

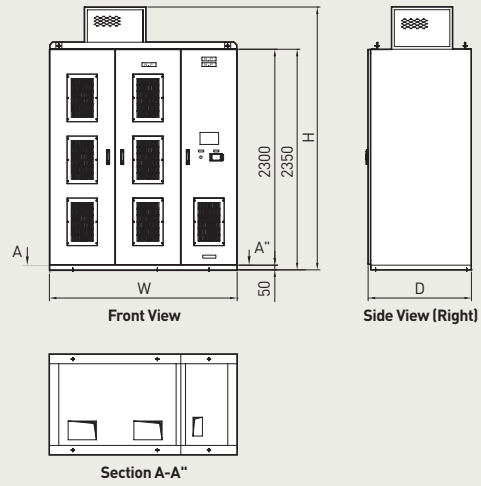
※ 1) As for the non-standard voltage (3.0/6.0/6.3/11/13.8kV) motor or over 8MVA inverter, please contact Hyundai Heavy Industries Co., Ltd.

2) Based on standard squirrel type 4 pole motors.

» Outline and Dimensions

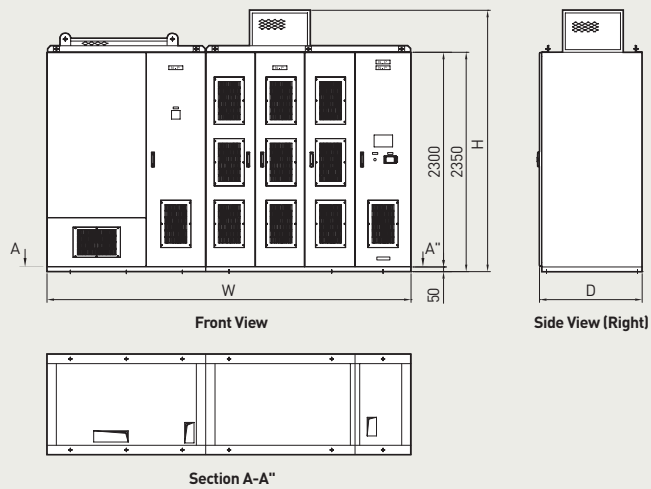
A Type

[Unit: mm]



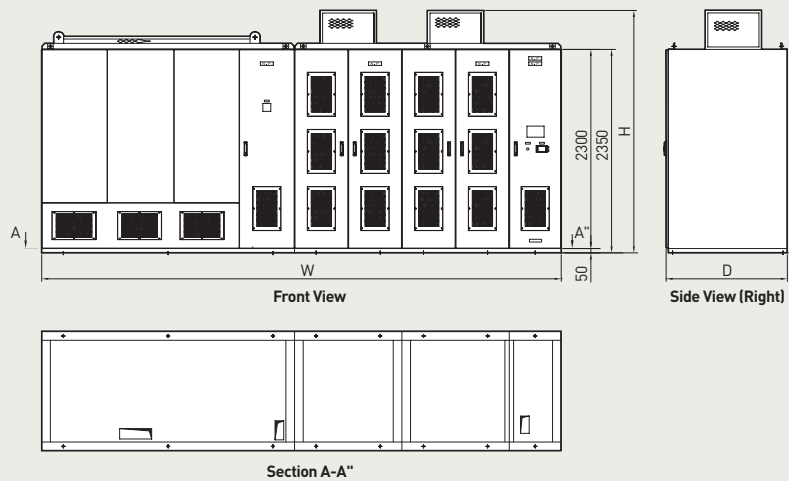
B Type

[Unit: mm]



C Type

[Unit: mm]



» Outline and Dimensions

■ Panel size for 50Hz

Voltage	Model	[kVA]	[A]	Type	W	D	H
3300V	N5000 - 0155 L 5	200	35	A	2000	1200	2800
	N5000 - 0245 L 5	300	53	A	2000	1200	2800
	N5000 - 0325 L 5	400	70	A	2400	1200	2800
	N5000 - 0410 L 5	500	88	A	2400	1200	2800
	N5000 - 0490 L 5	600	105	B	3400	1200	2800
	N5000 - 0620 L 5	750	132	B	3500	1200	2800
	N5000 - 0835 L 5	1000	175	B	3700	1200	2800
	N5000 - 1040 L 5	1250	219	B	3800	1200	2800
	N5000 - 1270 L 5	1500	263	B	3900	1400	2800
	N5000 - 1500 L 5	1750	307	B	3950	1500	2800
	N5000 - 1710 L 5	2000	350	B	4000	1500	2800
	N5000 - 1940 L 5	2250	394	B	4100	1500	2800
	N5000 - 2250 L 5	2700	473	B	4500	1500	3250
	N5000 - 2500 L 5	3000	525	B	5000	1500	3250
	N5000 - 2800 L 5	3500	619	B	5900	1700	3300
	N5000 - 3200 L 5	4000	707	B	5900	1700	3300
4160V	N5000 - 0205 M 5	250	35	B	3120	1200	2800
	N5000 - 0310 M 5	380	53	B	3220	1200	2800
	N5000 - 0410 M 5	500	70	B	3650	1200	2800
	N5000 - 0530 M 5	640	88	B	3650	1200	2800
	N5000 - 0630 M 5	750	105	C	4360	1200	2800
	N5000 - 0790 M 5	950	132	C	4360	1400	2800
	N5000 - 1040 M 5	1250	175	C	4560	1400	2800
	N5000 - 1310 M 5	1550	219	C	4960	1400	2800
	N5000 - 1630 M 5	1900	263	C	5010	1400	2800
	N5000 - 1900 M 5	2200	307	C	5210	1500	2800
	N5000 - 2160 M 5	2500	350	C	5360	1500	2800
	N5000 - 2460 M 5	2850	394	C	5560	1500	2800
	N5000 - 2930 M 5	3400	473	C	6100	1500	3250
	N5000 - 3240 M 5	3750	525	C	6100	1500	3250
	N5000 - 3500 M 5	4400	619	C	7500	1700	3300
	N5000 - 4000 M 5	5000	707	C	7500	1700	3300
6600V	N5000 - 0330 H 5	400	35	B	3400	1200	2800
	N5000 - 0495 H 5	600	53	B	3500	1200	2800
	N5000 - 0675 H 5	800	70	B	4000	1200	2800
	N5000 - 0835 H 5	1000	88	B	4000	1200	2800
	N5000 - 1000 H 5	1200	105	C	5000	1200	2800
	N5000 - 1270 H 5	1500	132	C	5000	1400	2800
	N5000 - 1700 H 5	2000	175	C	5200	1400	2800
	N5000 - 2130 H 5	2500	219	C	5600	1400	2800
	N5000 - 2590 H 5	3000	263	C	5650	1400	2800
	N5000 - 3020 H 5	3500	307	C	5850	1500	2800
	N5000 - 3450 H 5	4000	350	C	6000	1500	2800
	N5000 - 3930 H 5	4500	394	C	6200	1500	2800
	N5000 - 4500 H 5	5400	473	C	7000	1500	3250
	N5000 - 5000 H 5	6000	525	C	7000	1500	3250
	N5000 - 5600 H 5	7000	619	C	9200	1700	3300
	N5000 - 6400 H 5	8000	707	C	9200	1700	3300

※ As for the non-standard size, please contact Hyundai Heavy Industries Co.,Ltd.

■ Panel size for 60Hz

Voltage	Model	[kVA]	[A]	Type	W	D	H
3300V	N5000 - 0155 L 6	200	35	A	2000	1100	2800
	N5000 - 0245 L 6	300	53	A	2000	1100	2800
	N5000 - 0325 L 6	400	70	A	2400	1100	2800
	N5000 - 0410 L 6	500	88	A	2400	1100	2800
	N5000 - 0490 L 6	600	105	B	3300	1100	2800
	N5000 - 0620 L 6	750	132	B	3300	1100	2800
	N5000 - 0835 L 6	1000	175	B	3600	1200	2800
	N5000 - 1040 L 6	1250	219	B	3600	1200	2800
	N5000 - 1270 L 6	1500	263	B	3800	1400	2800
	N5000 - 1500 L 6	1750	307	B	3800	1400	2800
	N5000 - 1710 L 6	2000	350	B	3900	1400	2800
	N5000 - 1940 L 6	2250	394	B	3900	1400	2800
	N5000 - 2250 L 6	2700	473	B	4500	1500	3250
	N5000 - 2500 L 6	3000	525	B	4600	1500	3250
	N5000 - 2800 L 6	3500	619	B	5700	1700	3300
	N5000 - 3200 L 6	4000	707	B	5800	1700	3300
4160V	N5000 - 0205 M 6	250	35	B	3020	1100	2800
	N5000 - 0310 M 6	380	53	B	3020	1100	2800
	N5000 - 0410 M 6	500	70	B	3410	1100	2800
	N5000 - 0530 M 6	640	88	B	3450	1100	2800
	N5000 - 0630 M 6	750	105	C	4160	1100	2800
	N5000 - 0790 M 6	950	132	C	4160	1100	2800
	N5000 - 1040 M 6	1250	175	C	4340	1400	2800
	N5000 - 1310 M 6	1550	219	C	4340	1400	2800
	N5000 - 1630 M 6	1900	263	C	4440	1400	2800
	N5000 - 1900 M 6	2200	307	C	4740	1400	2800
	N5000 - 2160 M 6	2500	350	C	5040	1400	2800
	N5000 - 2460 M 6	2850	394	C	5040	1400	2800
	N5000 - 2930 M 6	3400	473	C	5900	1500	3250
	N5000 - 3240 M 6	3750	525	C	5900	1500	3250
	N5000 - 3500 M 6	4400	619	C	7200	1700	3300
	N5000 - 4000 M 6	5000	707	C	7200	1700	3300
6600V	N5000 - 0330 H 6	400	35	B	3300	1100	2800
	N5000 - 0495 H 6	600	53	B	3300	1100	2800
	N5000 - 0675 H 6	800	70	B	3900	1100	2800
	N5000 - 0835 H 6	1000	88	B	3900	1100	2800
	N5000 - 1000 H 6	1200	105	C	4900	1100	2800
	N5000 - 1270 H 6	1500	132	C	4900	1100	2800
	N5000 - 1700 H 6	2000	175	C	5100	1400	2800
	N5000 - 2130 H 6	2500	219	C	5100	1400	2800
	N5000 - 2590 H 6	3000	263	C	5200	1400	2800
	N5000 - 3020 H 6	3500	307	C	5700	1400	2800
	N5000 - 3450 H 6	4000	350	C	5900	1400	2800
	N5000 - 3930 H 6	4500	394	C	6100	1400	2800
	N5000 - 4500 H 6	5400	473	C	7000	1500	3250
	N5000 - 5000 H 6	6000	525	C	7000	1500	3250
	N5000 - 5600 H 6	7000	619	C	9000	1700	3300
	N5000 - 6400 H 6	8000	707	C	9000	1700	3300

※ As for the non-standard size, please contact Hyundai Heavy Industries Co.,Ltd.