Medium voltage high-performance VFD

CONTENTS

About us

INVT (Shenzhen INVT Electric Co., Ltd) has been concentrating on industry automation and energy power since its foundation in 2002 and is committed to "Providing the best product and service to allow customers more competitiveness". INVT goes public in 2010 and is the first A-share listed company (002334) in Shenzhen Stock Exchange in the industry. At present, INVT owns 15 subsidiaries and more than 4500 employees, over 40 branches, forming a sales network covering more than 100 overseas countries and regions.

INVT has been awarded as the Key High-tech Enterprise of National Torch Plan based on mastering of key technologies in power electronics, auto control and IT. With business covering industry automation, electric vehicle, network power and rail transit, INVT has established 10 R&D centers nationwide, boasts more than 1400 patents and owns the first lab in the industry awarded ACT qualification from TÜV SÜD, UL-WTDP and CNAS National Lab. The industrial parks in Shenzhen and Suzhou aim to provide customers with advanced integrated product development design management, comprehensive product R&D test and auto informational production. The worldwide INVT branches and warranty service centers are ready to offer customers all-around back-ups including professional solutions, technical trainings and service support.

In the next decade, INVT will continue to take " Sincere Virtuous, Professional Aspiring" as our business philosophy, enhance core business sectors including industrial automation, electric vehicle, network power and rail transit based on the three major technologies in industry automation and energy power fields, and strive to become a leading, responsible and harmonic international professional group armed with proper product structure, leading technologies, efficient management, robust profitability and superior competitiveness.


INVT Guangming Technology Building

INVT Shenzhen Production Industry Park


INVT Suzhou Industry Park


INVT Zhongshan New Energy Industry Base

Excellent product development

Technical precipitation
23years

Licensed patents
1500+

R&D staff proportion
35%

Investment in R&D
10%

R&D centers
10

INVT industrial automation and energy power research institute
Shenzhen Key Enterprise Research Institute

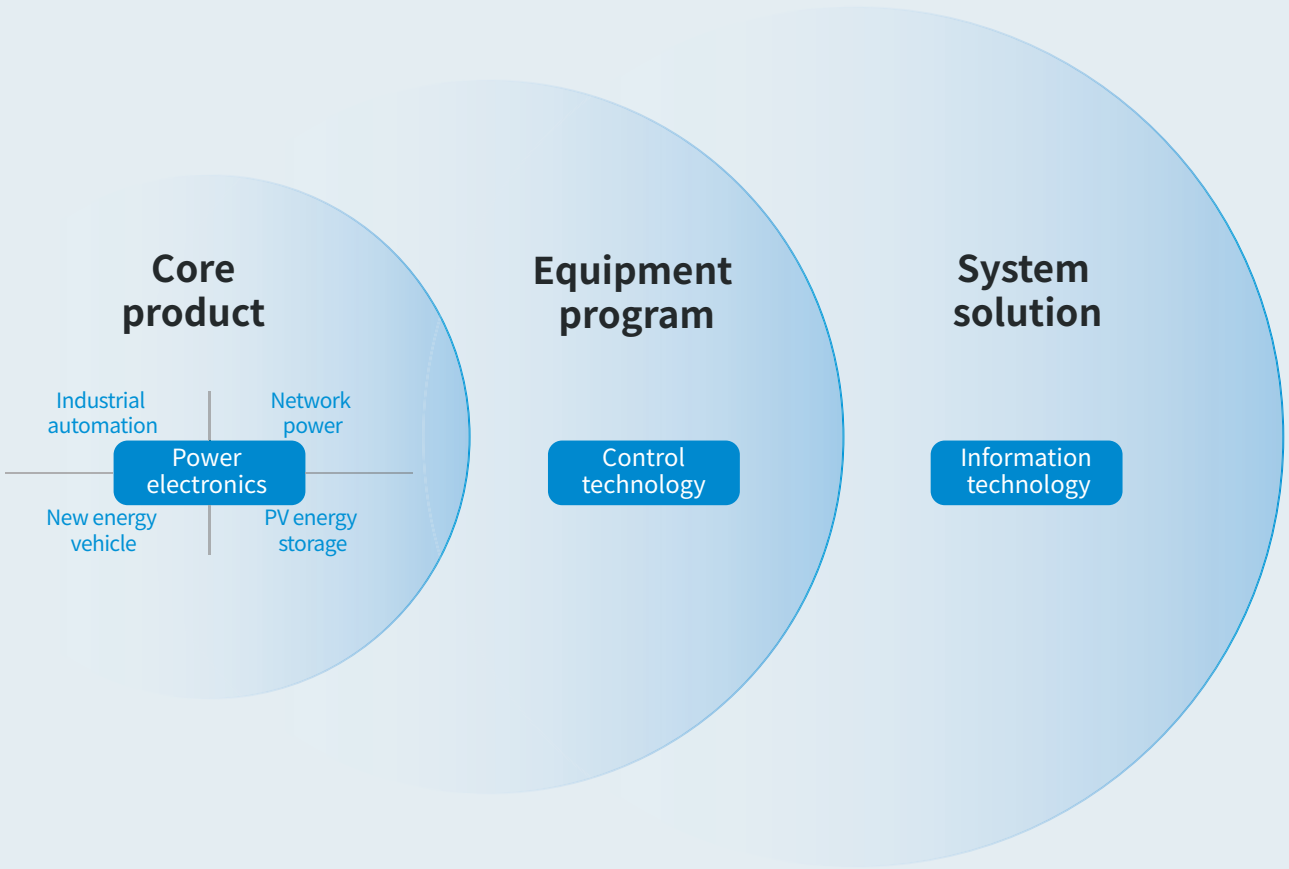
University cooperation

Program cooperation

Institution cooperation

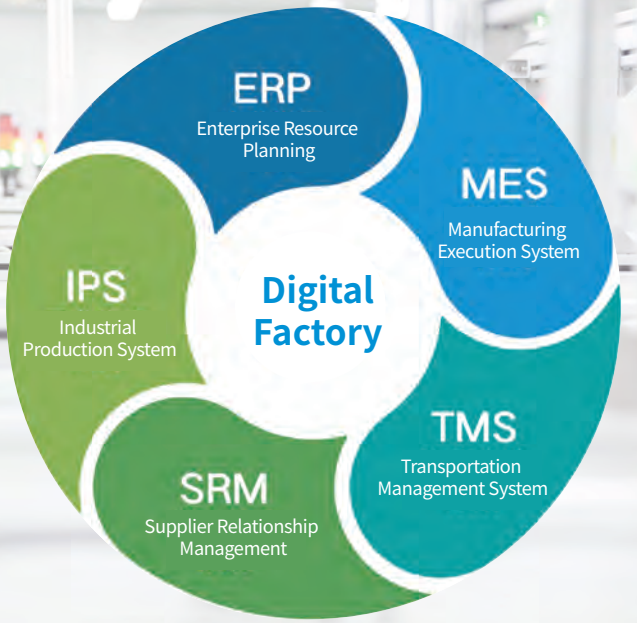
Industry cooperation

Open R&D system with strong alliances of resources from all parties



Constructing system solutions by advancing in three technological directions

Reliable quality assurance



Clean room of class 10000

Full traceability of accessories

Intelligent warehousing

Intelligent automatic production line

Fully automatic SMT equipment

Production visualization

1.Component Lab

2.Environmental Reliability Lab

3. Performance Lab

4. Safety Lab

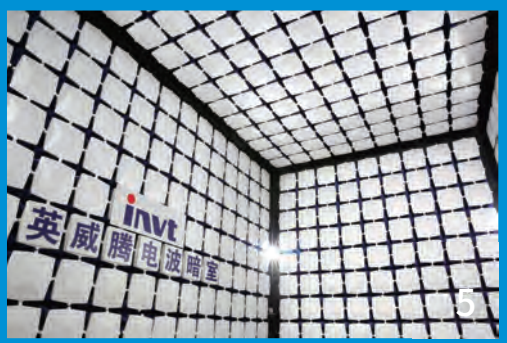
5. EMC Lab

6. Mechanical Reliability Lab

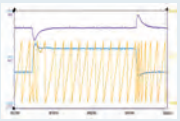
7. Dust/Water Proofing Lab

8. Equipment Development Lab

9. Pre-research Lab



Software control platform 3.0

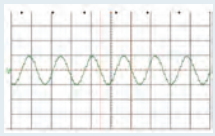


Open-loop vector performance improvement

- Response bandwidth improvement
- Improved motor adaptability
- Stable ride-through of electromotive and power generation

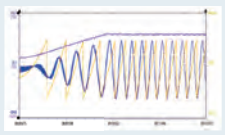
High-speed operation stability

- Deep flux-weakening operation AM10
- Carrier ratio 5:1



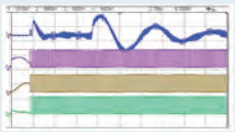
Low-speed load carrying capacity

- Speed regulation ratio 200:1
- Low-speed heavy-load startup



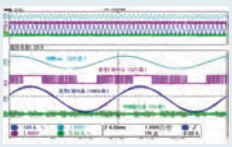
Speed-tracking start

- No need for motor side voltage detection circuit
- Fast tracking, without current surge



Modulation metrics optimization

- Less switch damage
- Low electromagnetic noise
- Low current harmonic

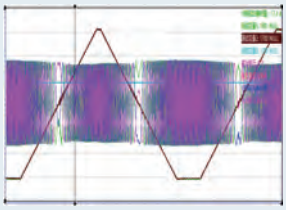


Energy-saving control

- VF and vector energy conservation
- Fast tracking, without current surge

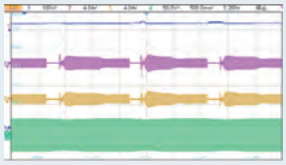
Open-loop low-speed performance improvement

- Speed regulation ratio 1:200
- Startup with 200% load
- Stable ride-through of electromotive and power generation



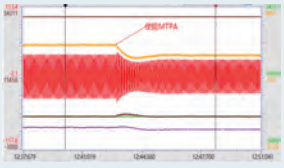
Software speed tracking

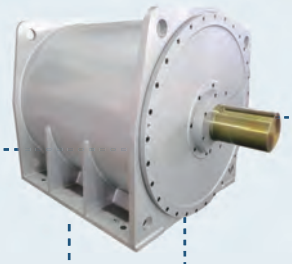
- New software speed tracking algorithm
- Fast tracking, without current surge
- Fast tracking within 400Hz



Energy-saving control

- Low no-load current
- MTPA algorithm





High-speed operation stability

- Deep flux-weakening operation
- Stable operation with low carrier ratio
- On-line counter-emf estimation, demagnetization warning
- Loop parameter adaptation

Improved usability of closed-loop vector

- Parameter autotuning with "one click"
- Automatic identification of encoder PPR, direction
- Loop parameter autotuning, with small speed overshoot and fast torque response
- Load adaptive algorithm with high rigidity and strong anti-interference ability

VVC+ control

- Good parameter robustness
- Low no-load current
- MTPA control supported

Core functions of medium voltage applications

Master-slave control

- Power balancing: meet the VFD output torque balancing after connecting the master-slave VFD to the motor through load connection.
- Speed synchronization: meet the VFD speed synchronization after connecting the master-slave VFD to the motor through load connection.
- Master-Slave switchover: support flexible switching between master and slave with just one click and single machine switching.

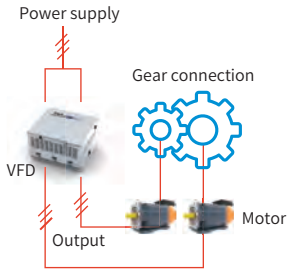


Figure 1

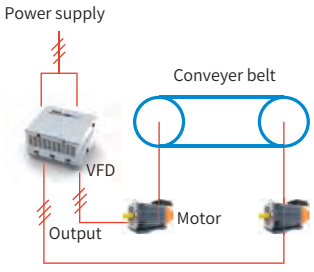
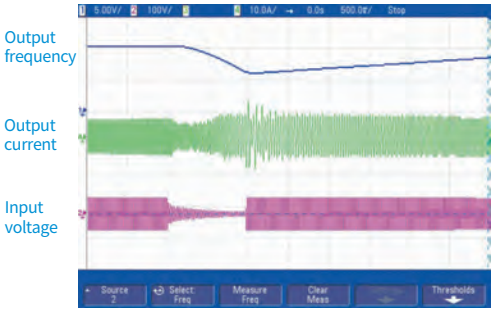


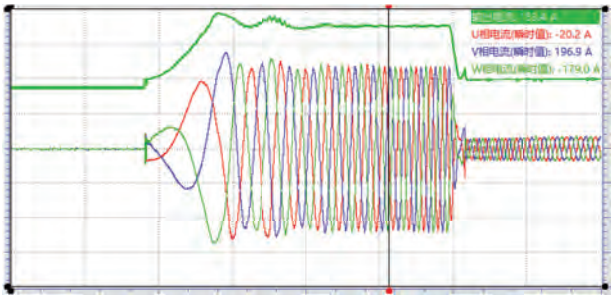
Figure 2

Transient power loss ride-through

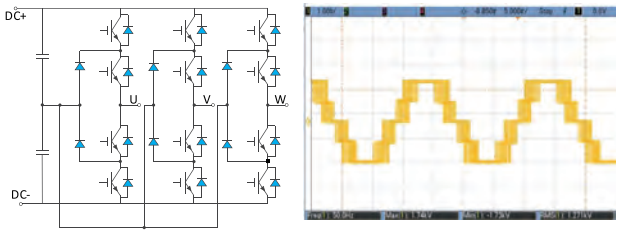
- When the grid transiently drops, the VFD can keep running within an effective time with the regenerative energy.
- It is particularly suitable for applications requiring high continuity of equipment operation, such as belt conveyors, elevators, etc.



200% low-frequency heavy-load startup



NPC three-level inverter technology



- Three-level output, with low harmonic content, reducing filter size and cost.
- Reduced output voltage variation (du/dt) to minimize insulation damage to the motor.
- Lower motor common-mode voltage to reduce shaft current.

Medium-voltage product introduction

The INVT medium-voltage product line is developed on the basis of INVT's self-developed power electronic control technology and tailored to the application characteristics and practical experience of mining and petroleum equipment. It comprises both two-level and three-level products. The product line supports both asynchronous motors and permanent magnet synchronous motors, and covers voltage levels of 380V, 660V, 1140V, 2300V, and 3300V, with a power range from 22 kW to 3750kW. It is widely used in the mining industry, covering mine hoists, belt conveyors, scraper conveyors, emulsion pumps, fans, shearers, shuttle cars and emergency lighting equipment, and also in the petroleum industry, including electric submersible pumps, pumpjacks and fracturing equipment.

Refined core and modular design

A DSP + FPGA control architecture is adopted to achieve enhanced reliability. The modular core design supports both air and water cooling.

Advanced technology and reliable application

Supports asynchronous motors, permanent magnet synchronous motors, permanent magnet drum motors, and permanent magnet linear motors; provides master/slave control, transient power loss ride-through, speed tracking, zero-frequency starting, and comprehensive protections against phase loss, short circuits, voltage and current faults.

Diverse control and operation monitoring

Multiple interfaces for various control methods; IoT-based remote control; fault monitoring and abnormal status data logging.

Multiple loads and four-quadrant operation

Widely applied to mine fans, winches, belt conveyors, scraper conveyors, shearers, and petroleum extraction and pumping equipment. Four-quadrant operation replaces the braking unit, providing energy savings and reliable performance.

Reliability and durability with worry-free after-sales service

Stable components and sufficient spare parts; an extensive marketing and service network ensures reliable after-sales support.

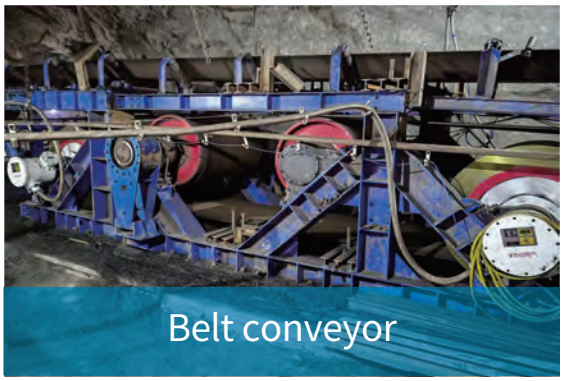
Application scenarios


Coal mining machine


Hoists


Scraper


Emulsion pump

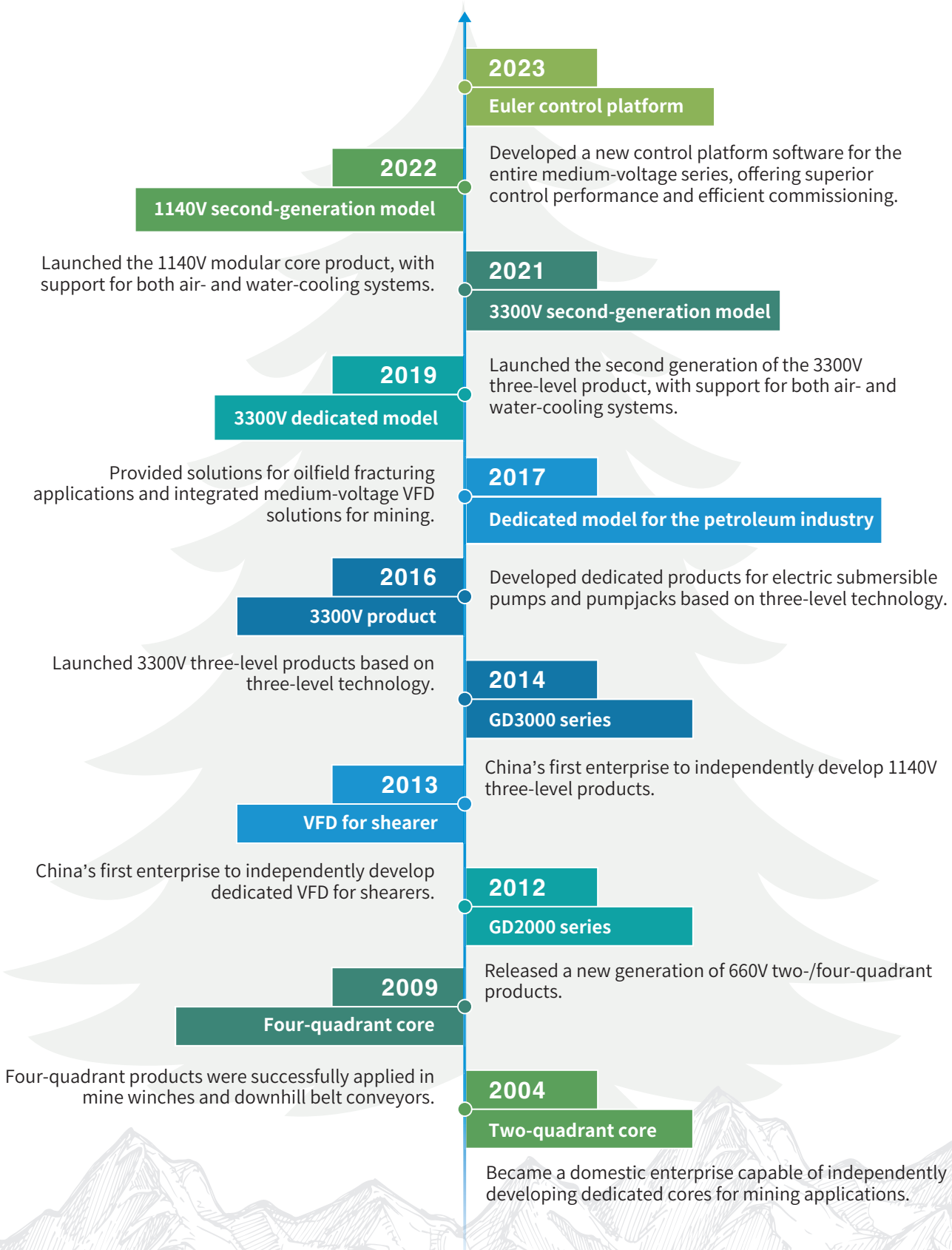

Belt conveyor


Local fan


Oil pumping machine


Petroleum drilling

Development history



Detailed technical parameters

Item		Specifications
Input and output	Input voltage	AC 3PH 325V~437V（380V）
		AC 3PH 560V~760V（660V）
		AC 3PH 970V~1310V (1140V)
		AC 3PH 2805V~3630V (3300V)
	Input frequency	50/60Hz（47~63Hz）
	Power factor	＞0.95@ rated
	Output voltage	0–Input voltage
	Output power	For details, see the product ratings table.
	Output frequency	0~400Hz
	Rated efficiency	＞96.5%
Control feature	Rectifier control mode	Six-pulse regenerative rectifier
	Inverter control mode	Space voltage vector control, sensorless vector control (SVC), and sensor vector control (VC)
	Motor type	Asynchronous motor (AM), permanent magnetic synchronous motor (SM), and linear motor
	Running commands	Keypad, terminal, and communication
	Frequency reference	Digital setting, analog setting, communication setting, multi-step speed setting, and simple PLC setting, which can implement the setting combination and method switchover
	Overload capacity	150% of rated current: 60s; 180% of rated current: 10s; 200% of rated current: 1s
	Torque response	SVC<10ms、FVC<5ms
	Torque accuracy	10%（SVC），5%（FVC）
	Starting torque	For asynchronous motors: 0Hz/150%(SVC) For synchronous motors: 0.25Hz/150%(SVC)、2.5Hz/200%(SVC)、Asynchronous & synchronous motors: 0Hz/200%(FVC)
	Speed regulation range	1:50（VF）、1:200（SVC）、1:1000（FVC）
	Speed accuracy	±0.2%（SVC），±0.02%（FVC）
	Braking mode	Regenerative braking, DC braking
	Important functions	Master-slave control, torque control, torque boost, retention at transient voltage drop, droop control, PID control, speed tracking, multi-step speed running, simple PLC, S curve acceleration
	Protection functions	More than 30 protection functions, such as protection against overcurrent, overvoltage, undervoltage, overtemperature, phase loss, and overload
Communication and interfaces	Communication function	RS485 embedded as standard configuration, expandable for PROFIBUS-DP, CANopen, PROFINET, CAN master-slave, Ethernet, GPRS, etc
	Analog input	Two inputs; AI1: 0–10V/0–20mA; AI2: -10–10V
	Analog output	One input; AO1: 0–10V/0–20mA
	Digital input	Four regular inputs; max. frequency: 1kHz; internal impedance: 3.3kΩ Two high-speed inputs; max. frequency: 50kHz; supporting quadrature encoder input; with speed measurement function
	Digital output	One high-speed pulse output; max. frequency: 50kHz One Y terminal open collector output
	Relay output	RO1A: NO; RO1B: NC; RO1C: common RO2A: NO; RO2B: NC; RO2C: common Contact capacity: 3A/AC250V, 1A/DC30V
	Extended interfaces	Supporting PG cards, communication expansion cards, and I/O cards
Others	Cooling method	Water cooling/Heat pipe cooling
	Ingress protection (IP) rating	IP00
	Storage temperature	-40~70°C
	Working environment temperature	-10~50°C ; derating is required if the ambient temperature exceeds 40° C.
	Relative humidity	5%~95%, no condensation
	Altitude	< 4000m. Derating is required when the altitude exceeds 1000m.

Note: There are slight differences in the functions and configurations of different series of products. Please refer to the instructions of our corresponding series of products for details.

Model description

Product model designation

GD2000-01A-500G-06-NE

Field	Specification
Product series	GD1000 series GD2000 series GD3000 series ICE mining truck series
Product subseries	01: Two-quadrant module, 11: Four-quadrant module 31: Six-pulse rectification 00: Two-quadrant cabinet, 10: Four-quadrant cabinet A, B, C: Product management version 52: Mining truck version
Rated power	500G: 500kW
Rated voltage	04: 380V 06: 660V 12: 1140V 33: 3300V
Product management code	N: Air cooling/heat pipe, Q: Water cooling E: Euler software or legacy software DC: DC-DC VFD RU: Rectifier unit IU: Inverter unit CU: Control unit

Goodrive1000 series four-quadrant VFD main ratings

Product model	Rated voltage(V)	Rated power (kW)	Rated input current (A)	Rated output current (A)	Product dimensions (W×H×D mm)
GD1000-31-110G-04	380	110	201	215	340×600×185
GD1000-31A-160G-04	380	160	310	320	329×500×182
GD1000-31A-315G-06	660	315	334	320	329×500×182
GD1000-31A-110G-12	1140	110	68	73	374×462×200

Goodrive2000 series two-quadrant VFD main ratings

Product model	Rated voltage(V)	Rated power (kW)	Rated input current (A)	Rated output current (A)	Product dimensions (W×H×D mm)
GD2000-01-022G-06	660	22	22	23	330×270×240
GD2000-01-030G-06	660	30	31	32	330×270×240
GD2000-01-037G-06	660	37	39	40	330×270×240
GD2000-01-075G-06	660	75	85	86	560×308×320
GD2000-01-090G-06	660	90	95	98	560×308×320
GD2000-01-110G-06	660	110	118	120	560×308×320
GD2000-01-132G-06	660	132	145	150	360×600×311
GD2000-01-160G-06	660	160	165	175	360×600×311
GD2000-01-185G-06	660	185	190	200	360×600×311
GD2000-01-200G-06	660	200	210	220	580×660×308
GD2000-01-250G-06	660	250	255	270	580×660×308
GD2000-01A-315G-06	660	315	306	350	600×646×385.5
GD2000-01A-400G-06	660	400	390	430	600×646×385.5
GD2000-01A-500G-06	660	500	486	540	600×646×385.5
GD2000-01A-630G-06	660	630	615	680	750×540×406

Goodrive2000 series four-quadrant VFD main ratings

Product model	Rated voltage(V)	Rated power (kW)	Rated input current (A)	Rated output current (A)	Product dimensions (W×H×D mm)
GD2000-31-075G-06	660	75	85	86	401×564×289.5
GD2000-31-090G-06	660	90	95	98	401×564×289.5
GD2000-31-110G-06	660	110	118	120	401×564×289.5
GD2000-31-132G-06	660	132	145	150	401×564×289.5
GD2000-31-160G-06	660	160	165	175	401×564×289.5
GD2000-31-185G-06	660	185	190	200	401×564×289.5
GD2000-31-200G-06	660	200	210	220	540×560×295
GD2000-31-250G-06	660	250	255	270	540×560×295
GD2000-31-315G-06	660	315	306	350	610×704×336.5
GD2000-31-400G-06	660	400	390	430	610×704×336.5
GD2000-31-500G-06	660	500	486	540	610×704×336.5
GD2000-31-630G-06	660	630	615	680	750×736×338

Goodrive3000 series two-quadrant VFD main ratings

Product model	Rated voltage(V)	VFD power (kW)	Rated input current (A)	Rated output current (A)	Product dimensions (W×H×D mm)
Two-quadrant product: IP00 core (A, B, and C are version management codes)					
GD3000-01-055G-12	1140	55	34	36	663×505×352
GD3000-01-075G-12	1140	75	47	50	663×505×352
GD3000-01-090G-12	1140	90	56	60	663×505×352
GD3000-01-110G-12	1140	110	68	73	663×505×352
GD3000-01C-132G-12	1140	132	82	85	634×558×291.5
GD3000-01C-160G-12	1140	160	98	104	634×558×291.5
GD3000-01C-200G-12	1140	200	122	128	634×558×291.5
GD3000-01C-250G-12	1140	250	150	160	678×568×390.5
GD3000-01C-315G-12	1140	315	185	195	678×568×390.5
GD3000-01C-400G-12	1140	400	235	250	678×568×390,5
GD3000-01C-500G-12	1140	450	275	285	704.5×761×365
GD3000-01C-630G-12	1140	500	300	310	704.5×761×365
GD3000-01C-710G-12	1140	630	380	395	704.5×761×365
GD3000-01A-800G-12	1140	800	480	500	1110×1005.8×565
GD3000-01A-1000G-12	1140	1000	600	620	1110×1005.8×565
GD3000-01A-0855G-33	3300	855	187	190	1105×1479×1071
GD3000-01A-1250G-33	3300	1250	260	280	1105×1479×1071
GD3000-01A-1600G-33	3300	1600	330	360	1105×1479×1071

Goodrive3000 series four-quadrant VFD main ratings

Product model	Rated voltage(V)	VFD power (kW)	Rated input current (A)	Rated output current (A)	Product dimensions (W×H×D mm)
Four-quadrant product: IP00 core (A, B, and C are version management codes)					
GD3000-11-055G-12	1140	55	34	36	663×505×352
GD3000-11-075G-12	1140	75	47	50	663×505×352
GD3000-11-090G-12	1140	90	56	60	663×505×352
GD3000-11-110G-12	1140	110	68	73	663×505×352
GD3000-11B-132G-12	1140	132	82	85	811×528×265
GD3000-11B-160G-12	1140	160	98	104	811×528×265
GD3000-11B-200G-12	1140	200	122	128	811×558×265
GD3000-11B-250G-12	1140	250	150	160	811×528×370
GD3000-11B-315G-12	1140	315	185	195	811×558×370
GD3000-11B-400G-12	1140	400	235	250	811×558×370
GD3000-11B-500G-12	1140	450	275	285	923×745×365
GD3000-11B-630G-12	1140	500	300	310	923×745×365
GD3000-11B-710G-12	1140	630	380	395	923×745×365
GD3000-11A-800G-12	1140	800	480	500	1210×1193×538
GD3000-11A-1000G-12	1140	1000	600	620	1210×1193×538

Goodrive3000 series 1140V IP20 series cabinet units

Product model	Rated voltage(V)	VFD power (kW)	Rated input current (A)	Rated output current (A)	Product dimensions (W×H×D mm)
GD3000-00-055G-12 (Wall-mounted)	1140	55	34	36	601×307×340
GD3000-00-110G-12 (Wall-mounted)	1140	110	68	73	980×464×500
GD3000-00-200G-12-NE	1140	200	122	128	1010×650×2300
GD3000-00-400G-12-NE	1140	400	235	250	1010×650×2300
GD3000-00-630G-12-NE	1140	630	335	395	1000×900×2300
GD3000-00-1000G-12-QE	1140	1000	600	620	1010×850×2100

IP54 series cabinet units

Product model	Rated voltage(V)	VFD power (kW)	Rated input current (A)	Rated output current (A)	Product dimensions (W×H×D mm)
GD3000-05-200G-12-NE	1140	200	122	128	1000×700×2300
GD3000-05-400G-12-NE	1140	400	235	250	1000×700×2300
GD3000-05-630G-12-NE	1140	630	335	395	1000×900×2300

Options

Medium voltage optional cards

Optional card type	GD1000 series	GD2000 series	GD3000 series
IO expansion card	/	EC-IO501-00	EC-IO501-00
CANopen card	EC-TX105	EC-TX505D	EC-TX505D
CAN master/slave card	/	EC-TX505D	EC-TX505D
PROFIBUS-DP	EC-TX103	EC-TX503D	EC-TX503D
PROFINET communication card	/	EC-TX509C	EC-TX509C
GPRS expansion card	/	EC–IC502-2	EC–IC502-2
Ethernet communication card	/	EC-TX510B	EC-TX510B
UVW incremental PG card	EC-PG103-05	EC-PG503-05	EC-PG503-05
Resolver PG card	/	EC-PG504-00	EC-PG504-00
Sin/Cos PG card	EC-PG102-05	EC-PG502	EC-PG502
24V incremental PG card	EC-PG101-24	EC-PG505-24B	EC-PG505-24B

Optional card specification table

Optional card type	Model	Specification
IO expansion card 1	EC-IO501-00	· Four digital inputs · One digital output · One analog input · One analog output · Two relay outputs: one double-contact output and one single-contact output
IO expansion card 2	EC-IO502-00	· Four digital inputs · One PT100 · One PT1000 · Two relay outputs: single-contact NO output
PROFIBUS-DP communication card	EC-TX503D	Supporting the PROFIBUS-DP protocol
Ethernet communication card	EC-TX510B	· Supporting Ethernet communication with internal INVT protocol · Used with the host controller monitoring software, INVT Workshop
CANopen communication card	EC-TX505D	· Based on the CAN2.0A and CAN2.0B physical layer · Supporting the CANopen protocol · Adopting INVT master/slave control proprietary protocol
PROFINET communication card	EC-TX509C	Supporting the PROFINET protocol
Modbus TCP communication card	EC-TX515	· Equipped with two Modbus TCP IO ports, supporting 100M full/half duplex operating, and supporting line and star network topologies, with the nodes up to 32 · Available as Modbus TCP slave
Sin/Cos PG card	EC-PG502	· Applicable to Sin/Cos encoders with or without CD signals · Supporting the frequency-divided output of A, B, and Z · Supporting input of pulse train reference
UVW incremental PG card	EC-PG503-05	· Applicable to differential encoders of 5V · Supporting the orthogonal input of A, B, and Z · Supporting the pulse input of phase U, V, and W · Supporting the frequency-divided output of A, B, and Z · Supporting input of pulse train reference
Resolver PG card	EC-PG504-00	· Applicable to resolver encoders · Supporting frequency-divided output of resolver-simulated A, B, Z · Supporting input of pulse train reference
24V incremental PG card	EC-PG505-24B	· Applicable to OC encoders of 24V · Applicable to push-pull encoders of 24V · Supporting the orthogonal input of A, B, and Z · Supporting the frequency-divided output of A, B, and Z · Supporting input of pulse train reference
GPRS expansion card	EC–IC502-2	· Supporting IoT monitoring · Supporting remote VFD upgrade
4G expansion card	EC-IC502-2-CN	· Supporting standard RS485 interface · Supporting 4G communication
	EC-IC502-2-EU	
	EC-IC502-2-LA	
	EC-TX501-2	
	EC-TX502-2	

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