Goodrive20-LA VFD Quick Start Guide

This guide describes the instructions of operating Goodrive20-LA variable-frequency drive (VFD), including information about the safety precautions, peripheral wiring, terminal functions, quick startup, keypad, common function parameters, common faults and solutions, and VFD dimensions. Please scan the e-manual platform QR code provided in part 9 or marked on the VFD housing for more information.

If the product is ultimately used for military affairs or manufacture of weapon, it will be listed on the export control formulated by Foreign Trade Law of the People's Republic of China. Rigorous review and necessary export formalities are needed when exported.

1 Safety precautions

1.1 Warning symbols

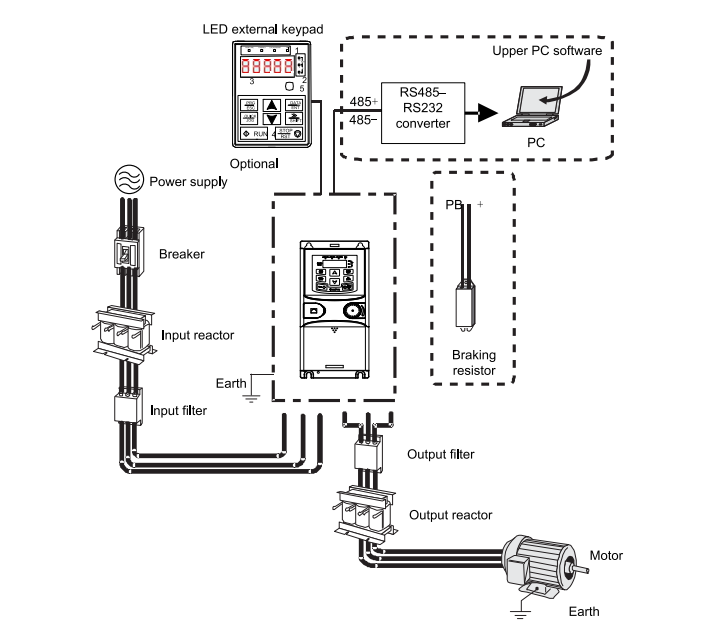| Symbols	Name	Description	Abbreviation
Danger	Danger	Severe personal injury or even death can result if related requirements are not followed.	
Warning	Warning	Personal injury or device damage can result if related requirements are not followed.	
Do not	Electrostatic sensitive	PCBA board damage can result if related requirements are not followed.	
Hot sides	Hot sides	The VFD base may be hot. Do not touch.	
5 min	Electric shock risk	High voltage may be present in bus capacitors after power off. To prevent electric shock, wait at least 5 or 15 or 25 minutes (depending on the device warning symbol) before operating the device that is just powered off.	5 min
	Read manual	Read the manual before operating.	
Note	Note	Actions to ensure proper running.	Note

1.2 Safety guidelines

- Only trained and qualified electricians can operate on the VFD.
- Do not perform any wiring, inspection, or component changing when power is applied. Ensure all input power supplies are disconnected before wiring or checking, and always wait at least the time designated on the VFD or until the DC bus voltage is less than 36V. The following table lists the waiting time.

VFD model		Minimum waiting time
3PH 220V	GD20-0R4G-2-LA	5 minutes
3PH 220V	GD20-0R7G-2-LA	5 minutes
3PH 220V	GD20-1R5G-2-LA	5 minutes
3PH 220V	GD20-2R2G-2-LA	5 minutes
3PH 220V	GD20-004G-2-LA	5 minutes
3PH 220V	GD20-5R5G-2-LA	5 minutes
3PH 220V	GD20-7R5G-2-LA	5 minutes
3PH 220V	GD20-011G-2-LA	5 minutes
3PH 220V	GD20-015G-2-LA	5 minutes
3PH 220V	GD20-018G-2-LA	5 minutes
3PH 220V	GD20-022G-2-LA	5 minutes

- Do not refit the VFD unless authorized; otherwise, fire, electric shock or other injuries may result.
- The heat sink base may become hot during running. Do not touch it; otherwise, burns may result.
- The electronic components inside the VFD are electrostatic sensitive. Take measurements to avoid electrostatic discharge during related operation.
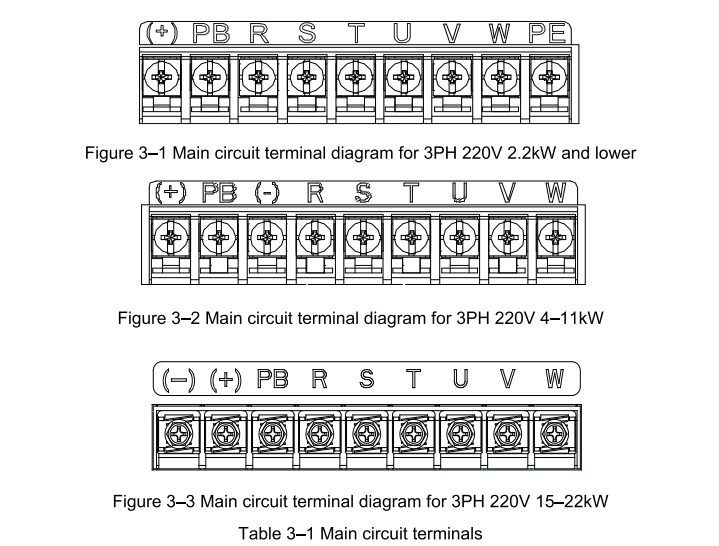
1.3 Environment

Environment	Requirement
Ambient environment	✧ -10–+50°C ✧ If the ambient temperature exceeds 40°C, derate 1% for every increase of 1°C ✧ It is not recommended to use the VFD if the ambient temperature exceeds 50°C ✧ In order to improve device reliability, do not use the VFD if the ambient temperature changes sharply at a sudden. ✧ Use a cooling fan or air conditioner for cooling if the VFD is used in a closed space such as in the control cabinet. ✧ When the temperature is too low, if the VFD needs to restart after a long stop, use an external heating device to increase the internal temperature; otherwise device damage may result.
Humidity	✧ RH ≤ 90%. ✧ No condensation is allowed. ✧ The max. RH cannot exceed 60% in a space with corrosive air.

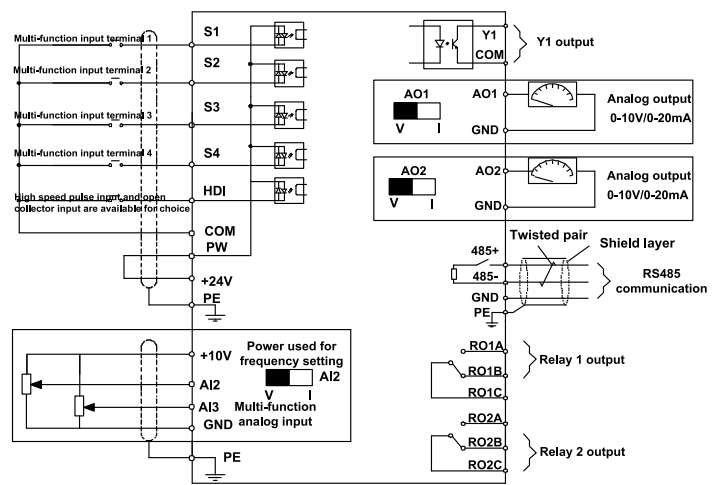| Environment	Requirement
Running environment condition	Install the VFD at a site: ✧ Away from the electromagnetic radiation source. ✧ Without oil mist, corrosive gas, flammable gas, radioactive gas, contaminative air, or contaminative liquid. ✧ Without the condition to bring foreign objects, including metal power, dust, oil, and water into the VFD (disallowing installation on flammable materials such as wood). ✧ Away from highly salty environments and away from direct sunlight.
Altitude	✧ Lower than 1000m ✧ When the altitude exceeds 1000m, derate 1% for every increase of 100m. ✧ When the altitude exceeds 3000m, consult the local INVT dealer or office for details.
Vibration	Max. vibration acceleration: 5.8m/s² (0.6g)
Installation direction	Install the VFD vertically to ensure good heat dissipation effect.

2 Peripheral wiring

LED external keypad

3 Terminal functions

Figure 3–1 Main circuit terminal diagram for 3PH 220V 2.2kW and lower

Figure 3–2 Main circuit terminal diagram for 3PH 220V 4–11kW

Figure 3–3 Main circuit terminal diagram for 3PH 220V 15–22kW

Table 3–1 Main circuit terminals

Terminal symbol	Terminal name	Terminal function
R S T	Power input of 3PH main circuit	3PH AC input terminals, connected to the grid.
U V W	VFD output	3PH AC output terminals, generally connected to the motor.
(+)	Brake unit terminal	✧ (+) and (-) connect to external brake unit terminals/shared DC bus terminals. ✧ PB and (+) connect to external brake resistor terminals.
(-)	Brake unit terminal	
PB	Brake resistor terminal	
⏚	Protective earth (PE) terminal	The PE terminal of each device must be grounded reliably.

Figure 3–4 Control circuit wiring

Table 3–2 Control circuit terminals

Terminal symbol	Terminal name
+10V	10V provided locally.
AI2/AI3	AI2 is analog input. It uses voltage input by default. It can be changed to current input by jumper, dial switch, or parameter setting.
GND	+10V reference zero potential.
HDI	High frequency input channel 1. Max input frequency: 50kHz 2. Duty cycle: 30%–70%
Y1	Digital output 1. Switch capacity: 5mA/30V. 2. Range of output frequency: 0–1kHz.
AO1/AO2	Analog output 1. Output range: 0–10V or 0–20mA. 2. Whether voltage or current is used for output is set through the jumper. 3. Deviation ±1%, 25°C.
RO1A/RO2A RO1B/ RO2B RO1C/ RO2C	Relay output: ROA is NO, ROB is NC, ROC is a common terminal. Contact capacity: 3A/AC250V, 1A/DC30V
COM	Common terminal of +24V.
485+	RS485 communication port, RS485 differential signal port. A standard RS485 communication interface must use the shielded twisted pair. The 120ohm terminal matching resistor of RS485 communication can be connected by toggle switch or jumper.
485-	
PE	Grounding terminal
PW	Input digital working power is provided from external to internal.
24V	Power supply provided by the VFD. Max. output current: 200mA
S1–S4	Digital input	✧ Internal impedance: 3.3kΩ ✧ 12–30V voltage input is acceptable ✧ Bi-directional input terminal, supporting NPN/PNP connection modes ✧ Max. input frequency: 1kHz ✧ All are programmable digital input terminals, for which functions can be set through function codes

Note: For details about terminal wiring diagram, scan the e-manual platform QR code provided in part 9 or marked on the VFD housing to refer to the operation manual.
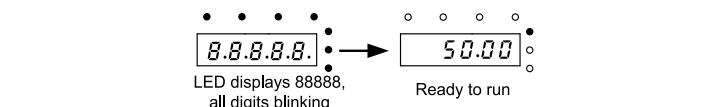
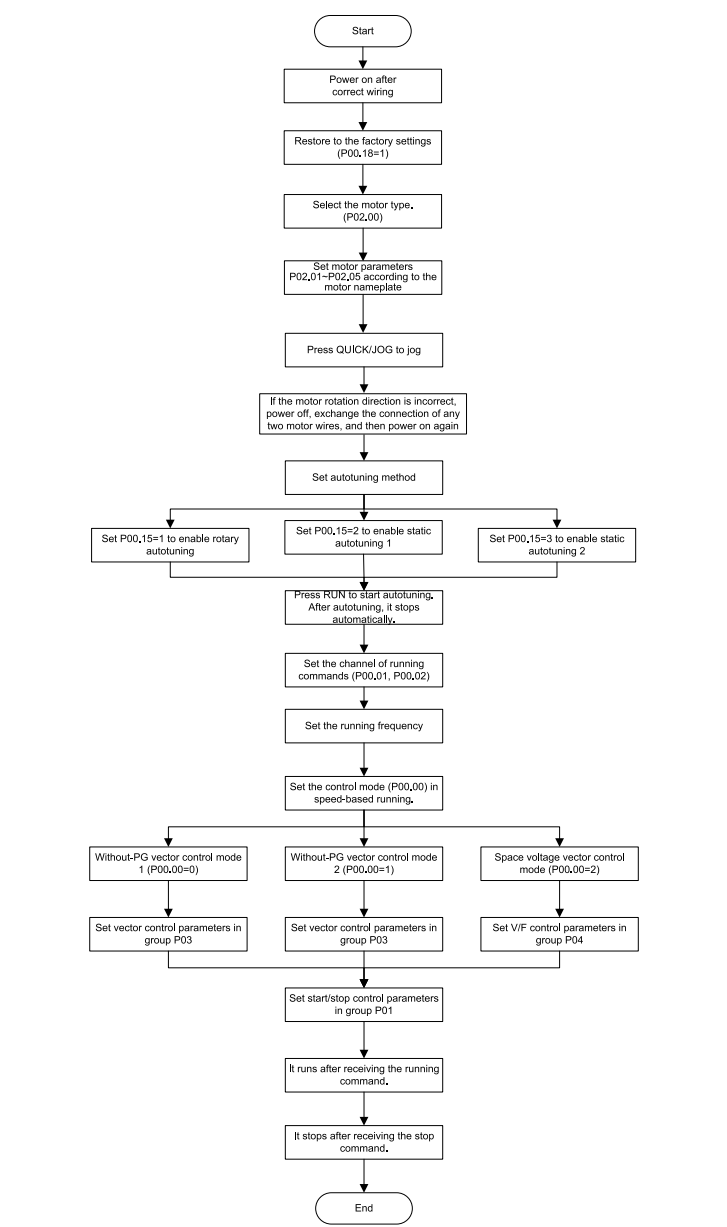## 4 Quick startup

4.1 Check before power-on

⚠ ✧ Ensure that all terminals are properly fastened and connected.
✧ Check whether the motor and VFD power are matched.
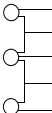
4.2 First power-up operation

After confirming the wiring and power are correct, close the air switch of the AC power supply at the VFD input side to power on the VFD. The following uses the VFD with an LED keypad for example. The keypad displays 8.8.8.8.8.. When the characters displayed on the LED has changed to the set frequency (such as 50.00), the VFD is initialized and ready for run.

LED displays 88888, all digits blinking　Ready to run

The quick startup diagram is as follows:

5 Keypad

Table 5–1 LED keypad

Item		Description
Status indicator	RUN/TUNE	VFD running status indicator. LED off: The VFD is stopped. LED blinking: The VFD is autotuning parameters. LED on: The VFD is running.
	FWD/REV	Forward or reverse running indicator. LED off: The VFD is running forward. LED on: The VFD is running reversely.
	LOCAL/REMOT	Indicates whether the VFD is controlled through the keypad, terminals, or communication. LED off: The VFD is controlled through the keypad. LED blinking: The VFD is controlled through terminals. LED on: The VFD is controlled through remote communication.
	TRIP	Fault indicator. LED on: in fault state LED off: in normal state LED blinking: in pre-alarm state
Unit indicator	Unit displayed currently	
	Hz	Frequency unit
	RPM	Rotational speed unit
	A	Current unit
	%	Percentage
	V	Voltage unit
Digital display zone	Five-digit LED displays various monitoring data and alarm codes such as the set frequency and output frequency.	

Item	Description					
	Display	Means	Display	Means	Display	Means
	0	0	1	1	2	2
	3	3	4	4	5	5
	6	6	7	7	8	8
	9	9	A.	A	b.	B
	C.	C	d.	d	E.	E
	F.	F	H.	H	i.	I
	L.	L	n.	N	o	o
	o	o	P.	P	r	r
	S.	S	t.	t	U.	U
	v	v	.	.	-	-

Digital potentiometer		Frequency tuning. For details, see the description of P08.41.
Keys	PRG ESC Programming key	Press it to enter or exit level-1 menus or delete a parameter.
	DATA ENT Entry key	Press it to enter menus in cascading mode or confirm the setting of a parameter.
	Up key	Press it to increase data or move upward.
	Down key	Press it to decrease data or move downward.
	SHIFT Right-shifting key	Press it to select display parameters rightward in the interface for the device in stopped or running state, or to select digits to change during parameter setting.
	RUN Run key	Press it to run the device when using the keypad for control.
	STOP RST Stop/Reset key	Press it to stop the device that is running. The function of this key is restricted by P07.04. In fault alarm state, this key can be used for reset in any control modes.
	QUICK JOG Shortcut multifunction key	The function is determined by P07.02.

6 Common function parameters

The following lists only some common function parameters and function descriptions.

○: The parameter setting can be modified in both stopped and running states.

◎: The parameter setting cannot be modified in running state.

●: The parameter setting is the actually detected value and cannot be modified.

The VFD automatically checks and constrains the modification of parameters, helping prevent incorrect modifications.

Function code	Function name	Description	Default	Modify
P00.00	Speed control mode	0: Sensorless vector control mode 0 1: Sensorless vector control mode 1 2: Space voltage vector control mode	2	◎
P00.01	Channel of running commands	0: Keypad 1: Terminal 2: Communication	0	○
P00.03	Max. output frequency	Setting range: P00.04–400.00Hz	50.00Hz	◎
P00.04	Upper limit of the running frequency	Setting range: P00.05–P00.03 (Max. output frequency)	50.00Hz	◎
P00.05	Lower limit of the running frequency	Setting range: 0.00Hz–P00.04 (Upper limit of the running frequency)	0.00Hz	◎
P00.06	A frequency command selection	0: Set through keypad 2: Set through AI2 (corresponding to terminal AI) 8: Set through Modbus communication	0	○
P00.07	B frequency command selection		2	○
P00.10	Frequency set through keypad	0.00 Hz–P00.03 (Max. output frequency)	50.00Hz	○
P00.11	ACC time 1	0.0–3600.0s	Model depended	○
P00.12	DEC time 1		Model depended	○
P00.13	Running direction	0: Run in default direction 1: Run in reverse direction 2: Reverse running is prohibited	0	○

Function code	Function name	Description	Default	Modify
P00.15	Motor parameter autotuning	0: No operation 1: Rotary autotuning 2: Static autotuning 1 3: Static autotuning 2	0	◎
P00.18	Function parameter restoration	0: No operation 1: Restore to default settings 2: Clear fault history 3: Lock (all) function codes	0	◎
P01.00	Start mode	0: Direct start 1: Start after DC brake 2: Start after speed tracking 1 3: Start after speed tracking 2	0	◎
P01.08	Stop mode	0: Decelerate to stop 1: Coast to stop	0	○
P01.09	Starting frequency of DC brake after stop	Setting range: 0.00Hz–P00.03 (Max. output frequency)	0.00Hz	○
P01.11	DC brake current of stop	Setting range: 0.0–100.0%	0.00%	○
P01.12	DC brake time of stop	Setting range: 0.00–50.00s	0.00s	○
P01.18	Power-on terminal running protection selection	0: Terminal running command is invalid at power on 1: Terminal running command is valid at power on	0	◎
P02.00	Type of motor 1	0: Asynchronous motor (AM)	0	◎
P02.01	Rated power of AM 1	0.1–3000.0kW	Model depended	◎
P02.02	Rated frequency of AM 1	0.01Hz–P00.03 (Max. output frequency)	50.00Hz	◎
P02.03	Rated speed of AM 1	1–36000rpm	Model depended	◎
P02.04	Rated voltage of AM 1	0–1200V	Model depended	◎
P02.05	Rated current of AM 1	0.8–6000.0A	Model depended	◎
P03.00	Speed loop proportional gain1	0.0–200.0	20.0	○
P03.01	Speed loop integral time1	0.000–10.000s	0.200s	○
P03.03	Speed loop proportional gain 2	0.0–200.0	20.0	○
P03.04	Speed loop integral time 2	0.000–10.000s	0.200s	○
P03.09	Current loop proportional coefficient P	0–65535	1000	○
P04.01	Torque boost	Setting range: 0.0% (Auto); 0.1%–10.0%	0	○
P04.09	V/F slip compensation gain	0.0–200.0%	100.0%	○
P04.10	Low frequency vibration control factor	0–100	10	○
P04.11	High frequency vibration control factor	0–100	10	○
P05.00	HDI input type	0–1 0: HDI is high-speed pulse input 1: HDI is digital input	0	◎
P05.01	Function of S1 terminal	0: No function 1: Forward running (FWD) 2: Reverse running (REV) 3: 3-wire control/Sin 4: Forward jogging 5: Reverse jogging 6: Coast to stop 7: Fault reset 8: Running pause 9: External fault input 10: Frequency increase (Up) 11: Frequency decrease (Down) 12: Clear the frequency increase/decrease setting 13: Switch between A setting and B setting 14: Switch between combination setting and A setting 15: Switch between combination setting and B setting 21: ACC/DEC time selectio 1 22: ACC/DEC time selection 2 30: Disable ACC/DEC	1	◎
P05.02	Function of S2 terminal		4	◎
P05.03	Function of S3 terminal		7	◎
P05.04	Function of S4 terminal		0	◎
P05.09	Function of HDI terminal		0	◎

Function code	Function name	Description	Default	Modify
		33: Clear frequency increase/decrease setting temporarily 34: DC braking for stop 36: Switch the running command channel to keypad 37: Switch the running command channel to terminal 38: Switch the running command channel to communication 39: Pre-exciting command 42: Emergency stop		
P05.37	Lower limit of AI2	Setting range: 0.00V–P05.39	0.00V	○
P05.39	Upper limit of AI2	Setting range: P05.37–10.00V	10.00V	○
P05.42	Lower limit of AI3	-10.00–P05.44V	-10.00V	○
P05.43	Corresponding setting of AI3 lower limit	-100.0–100.0%	-100.0%	○
P05.44	Middle value of AI3	P05.42–P05.46V	0V	○
P05.46	Upper limit of AI3	P05.44–10.00V	10.00V	◎
P05.50	Lower limit frequency of HDI	0.00–P05.52KHz	0.00kHz	○
P05.51	Corresponding setting of HDI lower limit frequency	-100.0–100.0%	0.0%	○
P05.52	Upper limit frequency of HDI	P05.50–50.00kHz	50kHz	◎
P05.53	Corresponding setting of HDI upper limit frequency	-100.0–100.0%	100.0%	○
P06.03	RO1 output	0–26 0: Invalid 1: Running 2: Running forward 3: Running reversely 4: Jogging 5: VFD in fault 6: Frequency level detection FDT1 7: Frequency level detection FDT2 8: Frequency reached 9: Running in zero speed (output in running state)	1	○
P06.04	RO2 output	10: Upper limit frequency reached 11: Lower limit frequency reached 12: Ready for running 13: Pre-exciting 14: Overload pre-alarm 15: Underload pre-alarm 16–19: Reserved 20: External fault is valid 21: Running in zero speed (output in both running and stopping states) 22: Running time reached 23: Modbus communication virtual terminal output 26: DC bus voltage established	5	○
P06.14	AO1 output	0–23 0: Running frequency 1: Set frequency 2: Ramp reference frequency 3: Rotational speed 4: Output current (relative to twice the VFD rated current) 5: Output current (relative to twice the motor rated current) 6: Output voltage 7: Output power 8: Set torque 9: Output torque 10: AI1 input 11: AI2 input 12: AI3 input 13: High-speed pulse HDI input 14: Value 1 set through Modbus communication 15: Value 2 set through Modbus communication 22: Torque current (relative to triple the motor rated current) 23: Ramp reference frequency (signed)	0	○
P06.15	AO2 output		0	○

Function code	Function name	Description	Default	Modify
P06.17	Lower limit of AO1 output	-100.0–P06.19%	0.0%	○
P06.18	AO1 output corresponding to lower limit	0.00–10.00V	0.00V	○
P06.19	Upper limit of AO1 output	P06.17–100.0%	100.0%	○
P06.20	AO1 output corresponding to upper limit	0.00–10.00V	10.00V	○
P06.22	Lower limit of AO2 output	-100.0–P06.24%	0.0%	○
P06.23	AO2 output corresponding to lower limit	0.00–10.00V	0.00V	○
P06.24	Upper limit of AO2 output	P06.22–100.0%	100.0%	○
P07.00	User password	0–65535	0	○
P14.00	Local communication address	1–247 Note: The slave address cannot be set to 0.	1	○
P14.01	Communication baud rate setting	0: 1200BPS 1: 2400BPS 2: 4800BPS 3: 9600BPS 4: 19200BPS 5: 38400BPS	4	○
P14.02	Data bit check setting	0: No parity check (N, 8, 1) for RTU 1: Even parity (E, 8, 1) for RTU 2: Odd parity (O, 8, 1) for RTU 3: No parity check (N, 8, 2) for RTU 4: Even parity (E, 8, 2) for RTU 5: Odd parity (O, 8, 2) for RTU	1	○

7 Common faults and solutions

The following lists common VFD faults, possible causes, and solutions.

Fault code	Fault type	Possible cause	Solution
OUt1	Phase-U protection of inverting unit	ACC is too fast. IGBT module is damaged. Misacts are caused by interference. Drive wires are poorly connected. To-ground short circuit occurred.	Increase ACC time. Replace the power unit. Check drive wires. Check whether there is strong interference surrounding peripheral equipment.
OUt2	Phase-V protection of inverting unit		
OUt3	Phase-W protection of inverting unit		
OV1	Overvoltage during ACC	DEC time is too short. Input voltage exception occurred. Large energy feedback occurred. There is no brake unit. Energy consumption braking is disabled.	Check the input power supply. Check whether load DEC time is too short. Install an energy consumption braking unit. Check the settings of related function codes.
OV2	Overvoltage during DEC		
OV3	Overvoltage during constant speed running		
OC1	Overcurrent during ACC	ACC/DEC is too fast. Grid voltage is too low. VFD power is too small. Load transient or exception occurred. To-ground short circuit or output phase loss occurred. Strong external interference sources exist. Overcurrent stall protection is disabled.	Increase ACC/DEC time. Check the input power supply. Select a VFD with higher power. Check whether the load encounters (to-ground or line-to-line) short circuit or the rotation is blocked. Check the output wiring. Check whether there is strong interference. Check the settings of related function codes.
OC2	Overcurrent during DEC		
OC3	Overcurrent during constant speed running		
UV	Bus undervoltage	Grid voltage is too low. Overvoltage stall protection is disabled.	Check the input power supply. Check the settings of related function codes.
OL1	Motor overload	Grid voltage is too low. Rated motor current is set improperly. Motor stall or load jumps violently.	Check grid voltage. Reset motor rated current. Check the load and adjust torque boost.
OL2	VFD overload	ACC is too fast. The motor in rotating is restarted. Grid voltage is too low. Load is too large.	Increase ACC time. Avoid restart after stop. Check grid voltage; Select a VFD with higher power.

| Fault code	Fault type	Possible cause	Solution
SPI	Phase loss on input side	Power is too small.	Select a proper motor
		Phase loss or violent fluctuation occurred to R, S and T.	Check the input power supply. Check installation wiring.
SPO	Phase loss on output side	Phase loss occurred to U, V, and W (or the three phases of the load is asymmetrical)	Check output wiring. Check the motor and cable.
OH2	Inverting module overheat	Air duct is blocked or fan is damaged. Ambient temperature is too high. Long-time overload running.	Dredge the air duct or replace the fan. Lower the ambient temperature.
CE	RS485 communication fault	Incorrect baud rate setting. Communication line fault. Incorrect communication address. Communication suffers from strong interference.	Set a proper baud rate. Check communication interface wiring. Set a proper communication address. Replace or change the wiring to enhance anti-interference capacity.

8 VFD dimensions
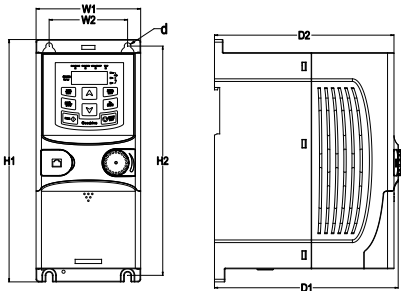
Figure 8–1 Wall mounting for 3PH 220V (≤2.2kW) VFDs

VFD model	W1	W2	H1	H2	D1	D2	Installation hole diameter (d)	Weight (kg)
GD20-0R4G-2-LA	80.0	60.0	185.0	175.0	140.5	137.3	Ø 5	1
GD20-0R7G-2-LA	80.0	60.0	185.0	175.0	140.5	137.3	Ø 5	1
GD20-1R5G-2-LA	80.0	60.0	185.0	175.0	140.5	137.3	Ø 5	1
GD20-2R2G-2-LA	80.0	60.0	185.0	175.0	140.5	137.3	Ø 5	1
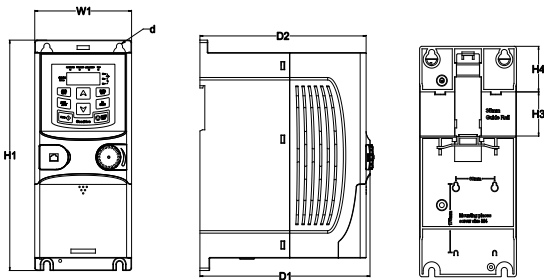
Figure 8–2 Rail mounting for 3PH 220V (≤2.2kW) VFDs

VFD model	W1	H1	H3	H4	D1	D2	Installation hole diameter (d)	Weight (kg)
GD20-0R4G-2-LA	80.0	185.0	35.4	36.6	140.5	137.3	Ø 5	1
GD20-0R7G-2-LA	80.0	185.0	35.4	36.6	140.5	137.3	Ø 5	1
GD20-1R5G-2-LA	80.0	185.0	35.4	36.6	140.5	137.3	Ø 5	1
GD20-2R2G-2-LA	80.0	185.0	35.4	36.6	140.5	137.3	Ø 5	1
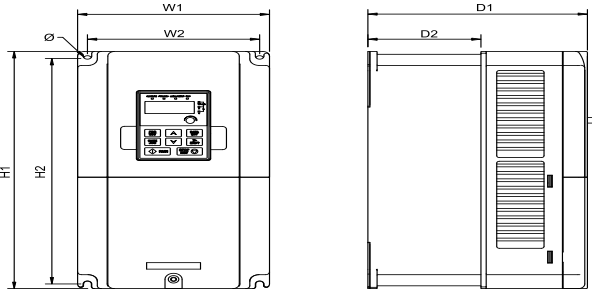
Figure 8–3 Wall mounting for 3PH 220V 4–22kW VFDs

VFD model	W1	W2	H1	H2	D1	D2	Installation hole diameter (d)	Weight (kg)
GD20-004G-2-LA	126	115	186	175	171.5	84.8	Ø5	3.5
GD20-5R5G-2-LA	146	131	256	243.5	167	86	Ø6	4
GD20-7R5G-2-LA	170	151	320	303.5	196.3	115	Ø6	6.3
GD20-011G-2-LA	200	185	340.6	328.6	184.6	105.8	Ø6	9.8
GD20-015G-2-LA	250	230	400	380	202	120.3	Ø6	16
GD20-018G-2-LA	250	230	400	380	202	120.3	Ø6	16.1
GD20-022G-2-LA	250	230	400	380	202	120.3	Ø6	16.1
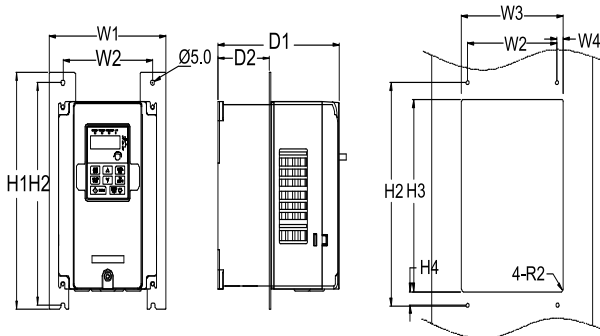
Figure 8–4 Flange mounting for 3PH 220V 4–22kW VFDs

VFD model	W1	W2	W3	W4	H1	H2	H3	H4	D1	D2	Installation hole diameter (d)	Weight (kg)
GD20-004G-2-LA	150.2	115	130	7.5	234	220	190	13.5	171.5	82.8	Ø 5	3.5
GD20-5R5G-2-LA	170.2	131	150	9.5	292	276	260	6	167	84	Ø 6	4
GD20-7R5G-2-LA	191.2	151	174	11.5	370	351	324	12	196.3	113	Ø 6	6.3
GD20-011G-2-LA	266	250	224	13	371	250	350.6	20.3	184.6	103.8	Ø 6	9.8
GD20-015G-2-LA	316	300	274	13	430	300	410	55	202	118.3	Ø 6	16
GD20-018G-2-LA	316	300	274	13	430	300	410	55	202	118.3	Ø 6	16.1
GD20-022G-2-LA	316	300	274	13	430	300	410	55	202	118.3	Ø 6	16.1

9 More services

Please contact us for any information. It is necessary to provide the product model and serial number during consultation. To obtain more information and services, you can:

1. Contact INVT local office.

2. Visit www.invt.com or scan the QR code of INVT official website.

3. Scan the e-manual platform QR code provided in part 9 or marked on the VFD housing to click "E-manuals" and select the corresponding product series, then you can view the operation manual online and use the search function.

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