

KRUGER



ECOWATT®

DRIVE SERIES



Simple Installation



Cost Saving



Premium Warranty

Why KRUGER?

KRUGER has been a leading innovator and manufacturer of residential, commercial, and industrial ventilation solutions across Asia since 1985. Today, with a direct presence in over 18 regions throughout Asia, world-class R&D and manufacturing facilities, Kruger is able to offer its customers unparalleled service and support at a local level. Our customers trust Kruger to provide the best solutions for their needs.



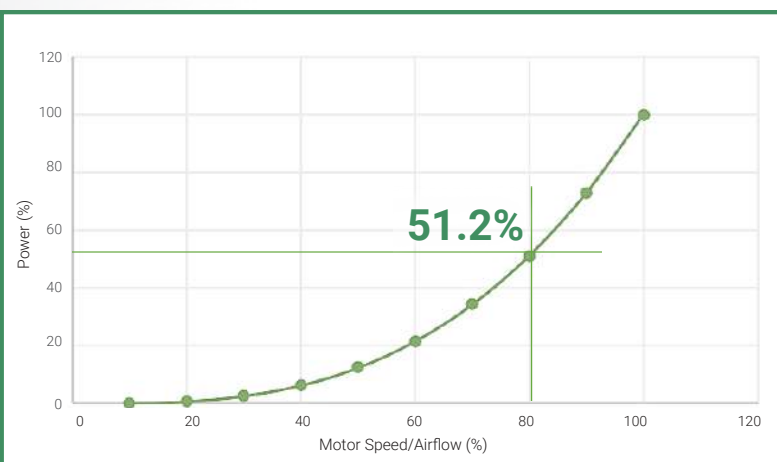
Why use a KRUGER ECOWATT® Drive for Demand Controlled Ventilation (DCV)?

In joining the global effort to combat climate change, KRUGER, a world leader in ventilation, is presenting the Demand Controlled Ventilation (DCV) system. This system enables performance control of installations by adjusting them to the real needs of ventilation.

We also adopt "ECOWATT® Drives K-Series", a new high-performance variable-frequency drive (VFD) specifically designed for fan applications. The VFD comes with the latest PID function to support the DCV system, which can regulate constant or variable pressure, airflow, temperature, and humidity. This helps optimize the output voltage of the VFD to the actual load of the fan motor, thus minimizing power consumption.



As depicted below, when using a KRUGER VFD to reduce the fan flowrate down to 80% flow, there is a reduction in power consumption by 51.2%.



The ability to reduce energy usage also cuts the CO2
EMISSIONS

A major contributor to **CLIMATE CHANGE**



And the dramatic effects on **OUR ENVIRONMENT**

Highlights

Energy
Saving



Friendly with
Environment



Simple
Installation



Security
and Safety



Standard Models

Series	Input Voltage	Output Voltage	Output Power	Ingress Protection
K120	1PH 220V 50/60Hz	3PH 0-220V 0 - 400Hz	0.40 - 4.0kW	IP20
K154			0.75 - 3.7kW	IP54
K320	3PH 400V 50/60Hz	3PH 0-400V 0 - 400Hz	2.20 - 500kW	IP20
K354			5.50 - 110kW	IP54

Applications





Energy Saving

Auto Energy Optimization Function for Real Time Loading



Accurate Motor Autotuning

To optimize the FAN performance and efficiency, Ecowatt® Drives will automatically measure the electrical motor parameters to use in controlling algorithms when commissioning.



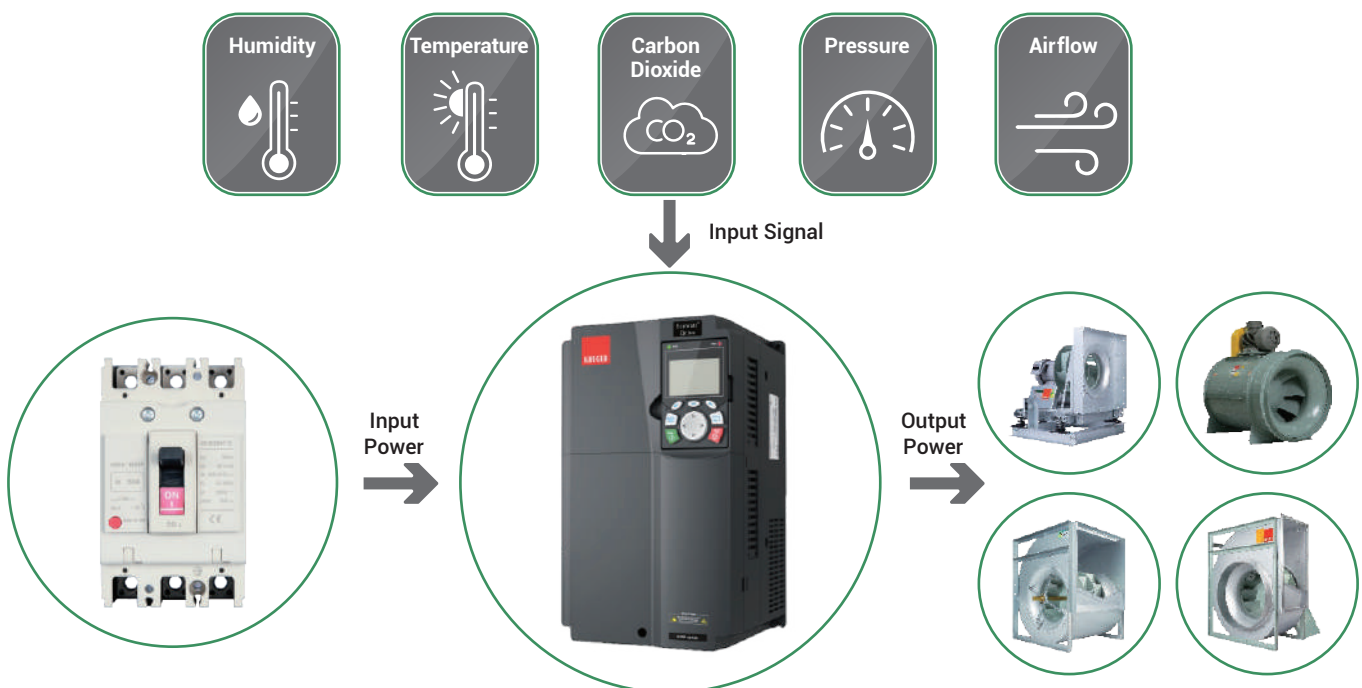
Automatic Energy-Saving Run

In light-load state, the motor can adjust the output voltage automatically to achieve energy saving.

PID Function for Demand Controlled Ventilation

PID control is mainly used to adjust the VFD output frequency or output voltage through performing scale-division, integral and differential operations on the difference between feedback signal of controlled variables and signal of the target.

It is suitable for flow control, pressure control, temperature control, etc. by following Kruger Demand controlled Ventilation concept.



Simple Installation

Simple Power and Control Wiring by following the quick setting manual.

Simple Setting and Easy Monitoring via Big LCD Keypad and PC Interface Program

- ▶ Ecowatt® Drives provide a big LCD keypad with Quick parameter setting function.
- ▶ In case of needing fine tuning or copying VFD parameter, it also has the PC interface program for configuration.





Security and Safety

▶ Safe Torque Off (STO) Function



Safe Torque Off

The STO function switches off the drive output by turning off the drive signals to prevent unexpected startups of the motor when the main power supply of the drive is not switched off.

In the even that any preventive maintenance which requires exposing the fan or any rotational parts to maintenance personal, it is best that the VFD is electrically disconnected by a cutoff switch to ensure the safety of the maintenance personal

Reference Standards:

IEC 61508-1, IEC 61508-2, IEC 61508-3, IEC 61508-4, IEC 62061, ISO 13849-1 and IEC 61800-5-2

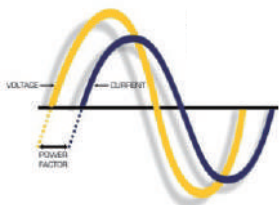
▶ Complied with the EMC and Safety Standards



The CE marking on the name plate of the VFD indicates that the VFD is CE-compliant, meeting the regulations of the European low-voltage directive (2014/35/EU) and EMC directive (2014/30/EU).



Friendly with Environment



Built-in EMC filter and a DC choke.

This design replaces the need for an electrical distribution cabinet and saves space for other devices, while providing the benefits of harmonic suppression and better power quality to the system.



IP20 rating is touchproof and will be resistant to dust or objects that are over 12mm in size. However, it has no protection whatsoever against liquids and will be susceptible to damage if it comes into contact with sprays of water.



IP54 rating is protected against dust ingress sufficient to prevent the product from operating normally but it's not dust tight. The product is fully protected against solid objects and splashing of water from any angle.

Model List

Outlook	Model Name	Output Power (kW)	Input Current (A)	Output Current (A)	Input Voltage	Output Voltage	Protection Degree	Frame Type
K120 Series 	K120-0R4G-2	0.40	6.5	2.5	1 PH 220V±15% 50/60Hz	3PH 0 - Vinut 0 - 400Hz	IP20	A
	K120-0R7G-2	0.75	9.3	4.2				B
	K120-1R5G-2	1.50	15.7	7.5				C
	K120-2R2G-2	2.20	24.0	10.0				
	K120-004G-2	4.00	40.0	16.0				
K154 Series 	K154-0R7G-2	0.75	10.0	4.5	1 PH 220V±15% 50/60Hz	3PH 0 - Vinut 0 - 400Hz	IP54	D
	K154-1R5G-2	1.50	15.5	7.0				E
	K154-2R2G-2	2.20	24.0	10.0				
	K154-3R7G-2	3.70	40.0	16.0				
K320 Series 	K320-2R2P-4	2.20	5.8	5.0	3PH 380V±15% 50/60Hz	3PH 0 - Vinut 0 - 400Hz	IP20	F
	K320-003P-4	3.00	11.0	7.0				G
	K320-5R5P-4	5.50	19.5	12.5				H
	K320-7R5P-4	7.50	23.0	17.0				I
	K320-011P-4	11.0	30.0	23.0				J
	K320-015P-4	15.0	40.0	32.0				K
	K320-018P-4	18.5	45.0	38.0				L
	K320-022P-4	22.0	51.0	45.0				M
	K320-030P-4	30.0	64.0	60.0				N
	K320-037P-4	37.0	80.0	75.0				O
	K320-045P-4	45.0	98.0	92.0				P
	K320-055P-4	55.0	128.0	115.0				
	K320-075P-4	75.0	139.0	150.0				
	K320-090P-4	90.0	168.0	170.0				
	K320-110P-4	110.0	201.0	215.0				
	K320-132P-4	132.0	265.0	260.0				
	K320-160P-4	160.0	310.0	305.0				
	K320-185P-4	185.0	345.0	340.0				
	K320-200P-4	200.0	385.0	380.0				
	K320-220P-4	220.0	430.0	425.0				
	K320-250P-4	250.0	460.0	480.0				
	K320-280P-4	280.0	500.0	530.0				
	K320-315P-4	315.0	580.0	600.0				
	K320-355P-4	355.0	625.0	650.0				
	K320-400P-4	400.0	715.0	720.0				
	K320-450P-4	450.0	840.0	820.0				
	K320-500P-4	500.0	890.0	860.0				
K354 Series 	K354-5R5P-4	5.50	19.5	14.0	3PH 380V±15% 50/60Hz	3PH 0 - Vinut 0 - 400Hz	IP54	Q
	K354-7R5P-4	7.50	25.0	18.5				R
	K354-011P-4	11.0	32.0	25.0				S
	K354-015P-4	15.0	40.0	32.0				T
	K354-018P-4	18.5	47.0	38.0				U
	K354-022P-4	22.0	51.0	45.0				V
	K354-030P-4	30.0	70.0	60.0				
	K354-037P-4	37.0	80.0	75.0				
	K354-045P-4	45.0	98.0	92.0				
	K354-055P-4	55.0	128.0	115.0				
	K354-075P-4	75.0	139.0	150.0				
	K354-090P-4	90.0	168.0	180.0				
	K354-110P-4	110.0	201.0	215.0				

Nomenclature

K320 - 018P - 4

2 is 220-240V 50/60Hz, 4 is 380-440V 50/60Hz

G is Constant torque, P is Variable torque

2R2 is 2.2kW 045 is 45kW
018 is 18.5kW 110 is 110kW

20 IS IP20 54 IS IP54

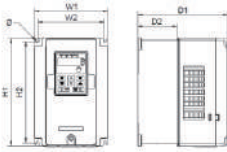
1 is Single phase 3 is Three phase

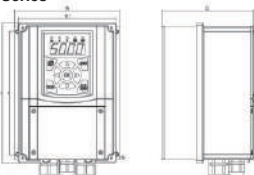
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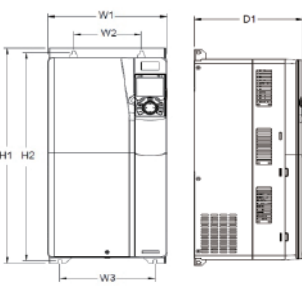
Product Specifications

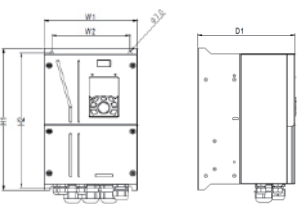
Function Descriptions		Model Series			
		K120 Series	K154 Series	K320 Series	K354 Series
Power Input	Input Voltage (V)	AC 1PH 220V (-15%) - 240V (+10%)		AC 3PH 380V (-15%) - 440V (+10%)	
	Input Current (A)	Refer to Rated Value			
	Input Frequency (Hz)	50Hz or 60Hz, Allowable Range:47-63Hz			
Power Output	Output Voltage (V)	0-Input Voltage			
	Output Current (A)	Refer to Rated Value			
	Output Power (kW)	Refer to Rated Value			
	Output Frequency (Hz)	0-400Hz			
Technical Control Performance	Control Mode	SVC, VC, V/F	VC, V/F	SVPWM, SVC, VC	
	Motor Type	3PH-AC 220V and PMSM	3PH-AC 220V	3PH-AC 380V and PMSM	
	Speed Regulation Ratio	AC Motor 1:100 (SVC) PMSM 1:20 (SVC)	AC Motor 1:100	AC Motor 1:100 (SVC) PMSM 1:20 (SVC), 1:1000 (VC)	
	Speed Control Precision	±0.2% (SVC)	0.01Hz	±0.2% (SVC), ±0.02% (VC)	
	Speed Fluctuation	±0.3% (SVC)	±0.2%	±0.3% (SVC)	
	Torque Response	<20ms (SVC)	-	<20ms (SVC), <10ms (VC)	
	Torque Control Precision	10% (SVC)	-	10% (SVC), 5% (VC)	
	Starting Torque	AC Motor: 0.25Hz/150% (SVC) PMSM: 2.5 Hz/150% (SVC)	AC Motor: 1.5Hz/150%	AC Motor: 0.25Hz/150% (SVC) PMSM: 2.5 Hz/150% (SVC), 0Hz/200% (VC)	
	Overload Capacity	150% of rated current, 1min.		120% of rated current, 1min.	
Running Control Performance	Frequency Setup Mode	Digital Keypad, Analog Signal, Modbus	Digital Keypad, Analog Signal	Digital Keypad, Analog Signal, Modbus	
	Automatic Voltage Regulation Function	Keep the output voltage constant when grid voltage changes.			
	Automatic Voltage Function	Overcurrent, Overvoltage, Under-voltage, Over-temperature, Phase loss and Overload, etc.			
	Speed Tracking Restart Function	Used to implement impact-free smooth startup for rotating motors.			
Peripheral Interface	Analog Input	AI2: 0-10V/0-20mA AI3: -10-10V.	AI: 0-10V/0-20mA	AI1: 0-10V/0-20mA; AI2: -10-10V.	
	Analog Output	AO1, AO2: 0-10V/0-20mA	-	AO1: 0-10V/0-20mA	
	Digital Input	4 regular inputs: max. frequency: 1kHz; 1 high-speed input; Max. frequency: 50kHz	5 input terminals	4 regular inputs: Max. frequency: 1kHz;Internal impedance: 3.3kΩ 2 high-speed input; Max. frequency: 50kHz	
	Digital Output	Y1 terminal output	-	1 high-speed pulse output; Max. frequency: 50kHz	
	Relay Output	Two programmable Relay Outputs: RO1A NO, RO1B NC, RO1C common port RO2A NO, RO2B NC, RO2C common port Contact Capacity: 3A/AC250V, 1A/DC30V	1 relay outputs: TA-TB on when normal operation TA-TC on when failure	Two programmable Relay Outputs: RO1A NO, RO1B NC, RO1C common port RO2A NO, RO2B NC, RO2C common port Contact Capacity: 3A/AC250V, 1A/DC30V	
Others	Installation Mode	Wall-Mounting, Rail-Mounting and Flange-Mounting	Wall-Mounting	Wall-Mounting, Rail-Mounting and Flange-Mounting	
	Temperature of Running Environment	10~+50°C; Derating is required if the ambient temperature exceeds 40°C			
	Protection Level	IP20	IP54	IP20	IP54
	Cooling Mode	Air Cooling			
	Altitude	Below 1000m. When the altitude exceeds 1000m, derate by 1%			
	Brake Unit	Built-in braking units		Built-in brake units for VFD models 45kW and lower. Optional braking units parts for VFD models 55kW and higher.	Built-in brake units for VFD models 37kW and lower. Optional braking units parts for VFD models 45kW and higher.
	EMC	1PH 220V (4kW) VFD model can satisfy the requirements of IEC 61800-3 C3, other models can satisfy the requirements of IEC 61800-3 C3 by installing optional external filter. The whole series can satisfy the requirements of IEC 61800-3 C2 by installing optional external filter.	VFD model can satisfy the requirements of IEC 61800-3	Conducted emissions of all 380V models meet the requirements of C3 in the IEC/EN 61800-3 standard. External filter is optional: Conducted emission can meet the requirements of C2 in the IEC/EN 61800-3 standard. Note: it is required to observe the EMC compliance required by the appendix of the manual. The motor and motor cables shall be selected based on technical requirements specified in the appendix of the manual.	

Dimensions

Outlook	Model Name	Frame Type	Dimension WxHxD (mm)	W1	W2	H1	H2	D1	Hole Diameter	Screw	Net Weight (kg)	Gross Weight (kg)
K120 Series  Figure B-6 Wall mounting of VFDs of 1PH 230 V (4kW)	K120- 0R4G- 2	A	80x160x123.5	80	60	160	150	123.5	5	M3	0.9	1.3
	K120- 0R7G- 2											
	K120- 1R5G- 2	B	80x185x140.5	80	60	185	175	140.5	5	M3	1.2	1.6
	K120- 2R2G- 2											
	K120- 004G- 2	C	170x320x196.3	170	151	320	303.5	196.3	6	M5	5.83	6.55

Outlook	Model Name	Frame Type	Dimension WxHxD (mm)	W1	W2	H1	H2	D1	Hole Diameter	Screw	Net Weight (kg)	Gross Weight (kg)
K154 Series 	K154- 0R7G- 2	D	150x193x131	150	140	193	170	131	4.5	M4	2.25	3
	K154- 1R5G- 2											
	K154- 2R2G- 2											
	K154- 3R7G- 2	E	150x228x131	150	140	228	205	131	4.5	M4	2.75	3.5

Outlook	Model Name	Frame Type	Dimension WxHxD (mm)	W1	W2	H1	H2	D1	Hole Diameter	Screw	Net Weight (kg)	Gross Weight (kg)
K320 Series 	K320-2R2P-4	F	126x186x185	126.0	115.0	186.0	175.0	185.0	5.0	M4	2.0	3.0
	K320-003P-4											
	K320-5R5P-4	G	126x186x201	126.0	115.0	186.0	175.0	201.0	5.0	M4	2.5	3.5
	K320-7R5P-4									M5		
	K320-011P-4	H	146x256x192	146.0	131.0	256.0	243.5	192.0	6.0	M5	3	4.0
	K320-015P-4	I	170x320x220	170.0	151.0	320.0	303.5	220.0	6.0	M5	6	7.0
	K320-018P-4											
	K320-022P-4	J	200x340.6x208	200.0	185.0	340.6	328.6	208.0	6.0	M5	8.5	10.6
	K320-030P-4									M6		
	K320-037P-4	K	250x400x223	250.0	230.0	400.0	380.0	223.0	6.0	M6	16	17.0
	K320-045P-4											
	K320-055P-4	L	282x560x201	282.0	320.0	560.0	542.0	258.0	9.0	M8	25	29.0
	K320-075P-4											
	K320-090P-4											
	K320-110P-4											
	K320-132P-4	M	338x554x330	338.0	400.0	554.0	535.0	330.0	10.0	M10	41	52.0
	K320-160P-4											
	K320-185P-4	N	500x870x360	500.0	560.0	870.0	850.0	360.0	11.0	M12	85	101.0
	K320-200P-4											
	K320-220P-4											
	K320-250P-4											
	K320-280P-4	O	750x1410x380	750.0	230.0	1410.0	1390.0	380.0	13/12	M12/M10	135	165.0
	K320-315P-4											
	K320-355P-4											
	K320-400P-4											
	K320-450P-4	P	620x1700x560	650.0	230.0	1700.0	1678.0	560.0	22/12	M12/M10	350	407.0
	K320-500P-4											

Outlook	Model Name	Frame Type	Dimension WxHxD (mm)	W1	W2	H1	H2	D1	Hole Diameter	Screw	Net Weight (kg)	Gross Weight (kg)
K354 Series 	K354- 5R5P- 4	Q	196x296x212	196.0	164.0	296.0	282.0	212.0	6.0	M5	7.0	8.5
	K354- 7R5P- 4											
	K354- 011P- 4	R	223x352x231	223.0	187.0	352.0	335.5	231.0	7.0	M6	10.6	12.5
	K354- 015P- 4											
	K354- 018P- 4	S	274x399x231	274.0	234.0	399.0	380.5	231.0	7.0	M6	17.7	20.1
	K354- 022P- 4											
	K354- 030P- 4											
	K354- 037P- 4	T	318x447x235	318.0	263.0	447.0	426.5	235.0	9.0	M8	23.4	26.1
	K354- 045P- 4											
	K354- 055P- 4	U	338x610x269	338.0	283.0	610.0	588.5	269.0	9.0	M8	38.0	42.0
	K354- 075P- 4										41.0	44.8
	K354- 090P- 4	V	370x750x320	370.0	283.0	750.0	728.5	320.0	9.0	M8	54.3	67.2
	K354- 110P- 4											

Accessories

The following figure shows the external option wiring of the VFD.

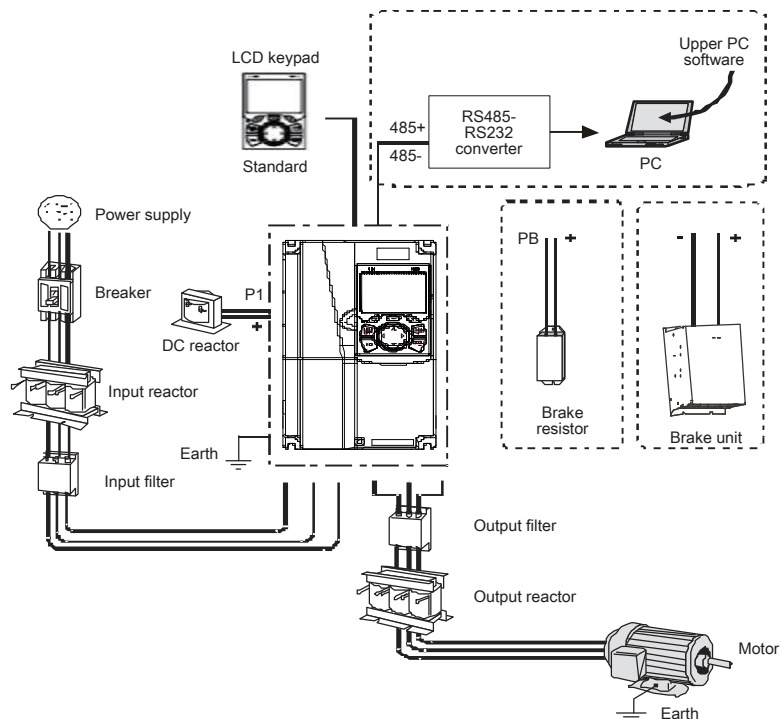
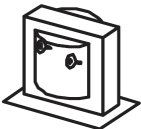
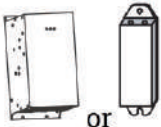
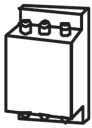


Image	Name	Description
	Input Reactor	Accessories used to improve the current adjustment coefficient on the input side of the VFD, and thus restrict high-order harmonic currents. The VFD models of 160P and higher can be directly connected to external DC reactors.
	DC Reactor	
	Input Filter	Accessory that restricts the electromagnetic interference generated by the VFD and transmitted to the public grid through the power cable. Try to install the input filter near the input terminal side of the VFD.
	Braking Unit or Braking Resistor	Accessories used to consume the regenerative energy of the motor to reduce the DEC time.
	Output Filter	Accessory used to restrict interference generated in the wiring area on the output side of the VFD. Try to install the output filter near the output terminal side of the VFD.
	Output Reactor	Accessory used to lengthen the valid transmission distance of the VFD, which effectively restricts the transient high voltage generated during the switch-on and switch-off of the IGBT module of the VFD.

List of Accessories

Power Input	Protection Degree	No.	Model Name	Power (kW)	OPTIONS					
					Input Reactor (Harmonic)	Output Reactor (Transient Voltage)	DC Reactor (Power Factor)	Input C2 Filter (EMC)	Output C2 Filter (EMC)	Braking Units (Regenerative Energy)
1 Phase 220V 50/60Hz	IP20	1	K120-0R4G-2	0.4	-	-	Built-in DC Reactor	FLT-PS2010H-B	FLT-L04006L-B	Built-in Braking Unit
		2	K120-0R7G-2	0.8	-	-				
		3	K120-1R5G-2	1.5	-	-		FLT-PS2025L-B	FLT-L04016L-B	
		4	K120-2R2G-2	2.2	-	-				
		5	K120-004G-2	4.0	ACL2-015-4	OL2-015-4		FLT-P04045L-B	FLT-L04045L-B	
1 Phase 220V 50/60Hz	IP54	6	K154-0R7G-2	0.8	-	-	Built-in DC Reactor	BK-10A-H0.2	BKL-5A*H0.2	Built-in Braking Unit
		7	K154-1R5G-2	1.5	-	-			BKL-10A*H0.2	
		8	K154-2R2G-2	2.2	-	-				
		9	K154-3R7G-2	3.7	-	-		BK-20A-H0.2	BKL-20A*H0.2	
3 Phase 380V 50/60Hz	IP20	10	K320-2R2P-4	2.2	ACL2-1R5-4	OCL2-1R5-4	-	FLT-P04016L-B	FLT-L04016L-B	Built-in Braking Unit
		11	K320-003P-4	3.0	ACL2-2R2-4	OCL2-2R2-4				
		12	K320-5R5P-4	5.5	ACL2-004-4	OCL2-004-4				
		13	K320-7R5P-4	7.5	ACL2-5R5-4	OCL2-5R5-4		FLT-P04032L-B	FLT-L04032L-B	
		14	K320-011P-4	11.0	ACL2-7R5-4	OCL2-7R5-4				
		15	K320-015P-4	15.0	ACL2-011-4	OCL2-011-4				
		16	K320-018P-4	18.5	ACL2-015-4	OCL2-015-4				
		17	K320-022P-4	22.0	ACL2-018-4	OCL2-018-4	Built-in DC Reactor	FLT-P04065L-B	FLT-L04065L-B	DBU100H-110-4
		18	K320-030P-4	30.0	ACL2-022-4	OCL2-022-4				
		19	K320-037P-4	37.0	ACL2-037-4	OCL2-037-4		FLT-P04100L-B	FLT-L04100L-B	
		20	K320-045P-4	45.0	ACL2-037-4	OCL2-037-4				
		21	K320-055P-4	55.0	ACL2-045-4	OCL2-045-4		FLT-P04150L-B	FLT-L04150L-B	
		22	K320-075P-4	75.0	ACL2-055-4	OCL2-055-4				
		23	K320-090P-4	90.0	ACL2-075-4	OCL2-075-4		FLT-P04240L-B	FLT-L04240L-B	
		24	K320-110P-4	110.0	ACL2-110-4	OCL2-110-4				
		25	K320-132P-4	132.0						
		26	K320-160P-4	160.0	ACL2-160-4	OCL2-160-4		DCL2-132-4	FLT-P04400L-B	
		27	K320-185P-4	185.0			DCL2-160-4	DBU100H-320-4		
		28	K320-200P-4	200.0	ACL2-200-4	OCL2-200-4	DCL2-220-4			DBU100H-400-4
		29	K320-220P-4	220.0						
		30	K320-250P-4	250.0	ACL2-280-4	OCL2-280-4	DCL2-280-4	FLT-P04600L-B	FLT-L04600L-B	Two sets DBU100H-320-4
		31	K320-280P-4	280.0						
		32	K320-315P-4	315.0						
		33	K320-355P-4	355.0	ACL2-350-4	OCL2-350-4	DCL2-315-4	FLT-P04800L-B	FLT-L04800L-B	Two sets DBU100H-400-4
		34	K320-400P-4	400.0	Standard		DCL2-350-4			
		35	K320-450P-4	450.0		OCL2-400-4	DCL2-400-4	FLT-P041000L-B	FLT-P041000L-B	
		36	K320-500P-4	500.0		OCL2-500-4	DCL2-500-4			
3 Phase 380V 50/60Hz	IP54	37	K354-5R5P-4	5.5	ACL2-004-4	OCL2-004-4	-	FLT-P04032L-B	FLT-P04032L-B	Built-in Braking Unit
		38	K354-7R5P-4	7.5	ACL2-5R5-4	OCL2-5R5-4				
		39	K354-011P-4	11.0	ACL2-7R5-4	OCL2-7R5-4				
		40	K354-015P-4	15.0	ACL2-011-4	OCL2-011-4				
		41	K354-018P-4	18.5	ACL2-015-4	OCL2-015-4		FLT-P04065L-B	FLT-P04065L-B	
		42	K354-022P-4	22.0	ACL2-018-4	OCL2-018-4	Built-in DC Reactor			DBU100H-110-4
		43	K354-030P-4	30.0	ACL2-022-4	OCL2-022-4		FLT-P04100L-B	FLT-L04100L-B	
		44	K354-037P-4	37.0	ACL2-037-4	OCL2-037-4				
		45	K354-045P-4	45.0	ACL2-037-4	OCL2-037-4				
		46	K354-055P-4	55.0	ACL2-045-4	OCL2-045-4		FLT-P04150L-B	FLT-L04150L-B	
		47	K354-075P-4	75.0	ACL2-055-4	OCL2-055-4				
		48	K354-090P-4	90.0	ACL2-075-4	OCL2-075-4				
		49	K354-110P-4	110.0	ACL2-110-4	OCL2-110-4		FLT-P04240L-B	FLT-L04240L-B	