

正弦波滤波器 (SFR) Sine Wave Filter

■ 产品概述 (Product Introduction)

正弦波滤波器是在PWM变频器驱动下,其开关频率范围在2-8kHz之间仍提供正弦波输出电压。在变频器驱动应用中,这种滤波器可以消除电机绝缘失效问题并通过消除与变频器输出波形相关的高dV/dt来减少电磁干扰,改善电机的性能和寿命,延长变频器输出距离,最长可达3KM。为保护电线电缆,使用正弦波滤波器可防止长引线驱动电机的过电压问题。在其他能源应用下,比如风力发电机,逆变器将电力通过升压变压器还原到实用的配电系统,这种滤波器可以允许使用标准变压器。满载并在60Hz时给变压器输入的谐波电压畸变最大值是5%的话,那么满载时给电机输入的谐波电压畸变一般就是5%。

Driven by the PWM inverter, the sine filter still provides sine wave output voltage when the switching frequency range is within the range of 2-8kHz. In the applications of inverter drives, such a filter can eliminate the problem of motor insulation failure and decrease electromagnetic interference by eliminating the high dV/dt related to inverter output waveform, so as to extend the life and improve the performance of the motor, and extend the output length of the inverter to up to 3KM. For the protection of wires and cables, the sine filter can avoid over-voltage of the drive motor with a long lead. In the application of other energy resources, wind generator, for example, the inverter restores the power to the utility power system through a step-up transformer. And such filters allow the use of a standard transformer. If the maximum value of the harmonic voltage distortion input to the transformer at full load and 60Hz is 5%, the harmonic voltage distortion input to the motor at full load is generally 5%.

■ 产品应用 (Product Application)

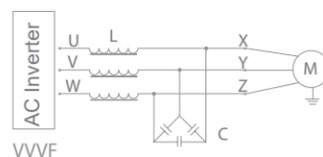
- 1.将变频器输出的PWM波转换成为正弦波
- 2.降低电机的涡流损耗以及电机噪声
- 3.减少输出电缆上和电机中的脉冲电流,延长电机寿命
- 4.可在变频器与电机间使用更长的电缆连线
- 5.减小对外的辐射,在一定场合可以使用非屏蔽电缆,降低了对现场布线的要求
- 6.有效防止高DV/DT、过电压、电机过热和涡流损耗造成的电机提前损坏。

1. Convert the PWM waves output by the inverter sine waves
2. Reduce the eddy current losses of the motor and the motor noise
3. Reduce the pulse current of the output cable and motor, extending the life of the motor"
4. A longer cable wire can be used between the inverter and motor
5. Reduce the external radiation, by using unshielded cable in certain situations, lowering the requirements for on-site wiring requirements
6. Effectively prevent fatigue damage of the motor caused by high DV/DT, over voltage, motor overheating and eddy current loss.

■ 技术规格 (Technical Specifications)

1. 工作电压: 220VAC-690VAC
2. 工作电流: 15A-1500A
3. 工作频率: 50/60Hz.
4. 载波频率: 2K-8K
5. 绝缘等级: class F,H
6. 压降: 8%-12%
7. 电压谐波畸变失真THD \leq 5%
8. 空载电流 \leq 8%
9. 使用环境: -10 \cdots +45 $^{\circ}$ C,额定值不会降低。最高可达+55 $^{\circ}$ C,在45 $^{\circ}$ C以上,每升高1 $^{\circ}$ C,额定电流降低2%
10. 防护等级: IP00-IP22

典型电路图
(Typical circuit diagram)



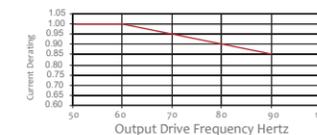
11. 最大电流: 1.5 \times 额定电流,持续60S
12. 噪音: \leq 65dB
13. 温升: \leq 85K
14. 抗电强度: 铁芯-绕组 3000VAC/50Hz/5mA/10s无飞弧击穿(工厂测试)
15. 绝缘电阻: 1000VDC绝缘阻值 \geq 100M Ω
16. 海拔高度不超过2000米。
17. 运行环境温度-25 $^{\circ}$ C \sim +45 $^{\circ}$ C,相对湿度不超过90%。
18. 周围无有害气体,无易燃易爆物品。
19. 周围环境应有良好的通风条件,如装在柜内,应加装通风设备。

1. Work Voltage: 220VAC-690VAC
2. Work Current: 15A-1500A
3. Work Frequency: 50/60Hz
4. Switching frequency: 2~8KHz
5. Insulation Class: class F, H
6. Rated voltage drop: 8~12%
7. Voltage harmonic distortion: THD \leq 5%
8. Load Current \leq 8%
9. Operation Environment:-10 \sim +45 $^{\circ}$ C, rated value won't lower, when higher than 55 $^{\circ}$ C, and every 1 $^{\circ}$ C, the current will step down 2%
10. Protection class: IP00-IP22
11. Max Current: 1.5 \times Rated current, continuous 60S
12. Noise: \leq 65dB
13. Temperature Rise: \leq 85K
14. Dielectric strength: Core Coil 3000VAC/50Hz/5mA/10s no electric arcing puncture (factory test)
15. Insulation Resistor: 1000VDC insulation resistance value \geq 100M Ω
16. Under seal level 2000m
17. Running ambient temperature -25 $^{\circ}$ C \sim +45 $^{\circ}$ C, comparative moisture not over 90%.
18. No hazardous gas, no inflammables and explosives
19. With well-ventilated condition, ventilation devices shall be mounted if installation in panels

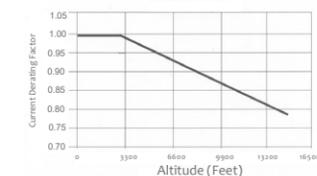
■ 执行标准 (Applicable Standards)

IEC289: 1987 Reactor
GB10229-88 Reactor (equiv IEC289: 1987)
JB9644-1999 Reactors used for semiconductor electrical driving

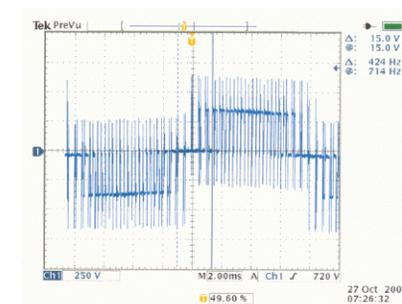
Sine Wave Filter Current Derating for Drive Output Frequency



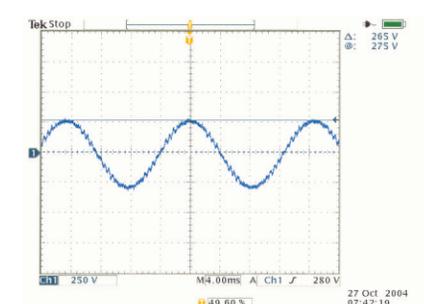
Altitude Derating Curve



Raw output voltage waveform



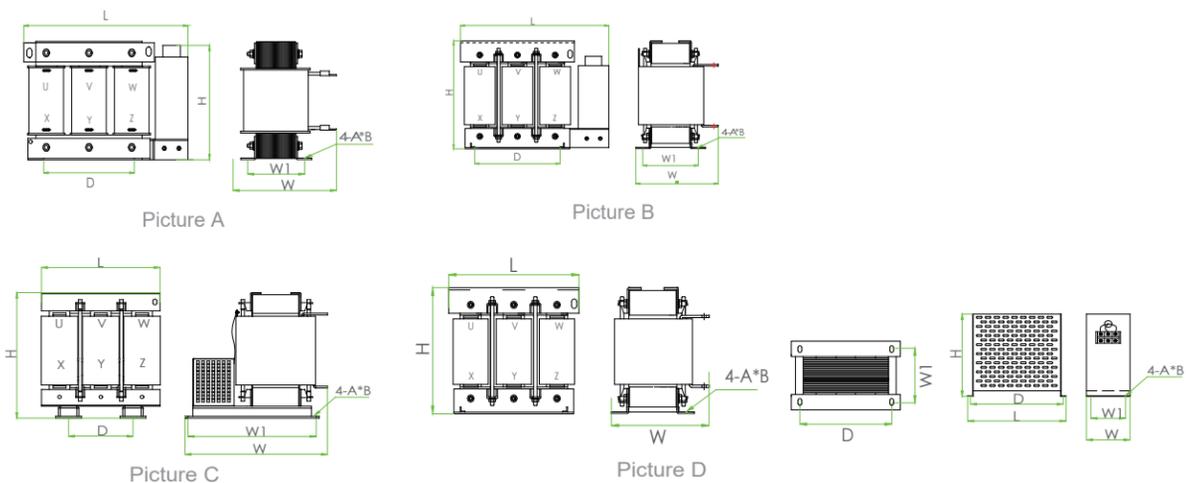
Output Voltage after Sine Wave Filter



■ 成品识别码 (Product Identification Code)

SFR	—	0330	—	0M20	—	0.4SC
正弦波滤波器 Sine Wave Filter		额定电流 Rated Current		电感量 Inductance		0.4: Working Voltage 0.2=220V, 0.4=380V, 0.7=690V, 1.1=1140V S: D=Single Phase Reactor S=Three Phase Reactor C: C=Copper A: Aluminium

■ 产品尺寸图 (Product Size)



滤波器型号 TYPE	适配功率 Power(kw)	图号 Picture NO.	额定电流 Rated Current (A)	绝缘等级 Insulation Class	尺寸 Dimension(±5mm)						
					L(max)	W(max)	H(max)	W1±2	D±2	A*B	
SFR-0007-8M00-0.4SC	2.2	图 A Picture A	7	F,H	195	200	195	72	120	8.5*20	
SFR-0010-6M00-0.4SC	3.7		10	F,H	275	160	265	92	120	8.5*20	
SFR-0015-4M00-0.4SC	5.5		15	F,H	275	160	265	92	120	8.5*20	
SFR-0020-3M00-0.4SC	7.5		20	F,H	290	160	250	110	120	11*18	
SFR-0030-2M00-0.4SC	11		30	F,H	330	185	250	104	182	11*18	
SFR-0040-1M50-0.4SC	15		40	F,H	330	185	250	104	182	11*18	
SFR-0050-1M20-0.4SC	18.5		50	F,H	380	210	260	118	214	11*18	
SFR-0060-1M10-0.4SC	22		60	F,H	380	210	260	118	214	11*18	
SFR-0080-0M85-0.4SA	30		80	F,H	460	230	290	149	243	11*18	
SFR-0090-0M80-0.4SA	37		90	F,H	460	230	290	149	243	11*18	
SFR-0120-0M52-0.4SA	45	图 B Picture B	120	F,H	525	270	335	164	260	15*25	
SFR-0150-0M45-0.4SA	55		150	F,H	525	270	350	174	260	15*25	
SFR-0200-0M30-0.4SA	75		200	F,H	525	310	350	194	260	15*25	
SFR-0250-0M28-0.4SA	110		250	F,H	550	335	375	214	260	15*25	
SFR-0290-0M23-0.4SA	132		290	F,H	540	330	430	216	260	15*25	
SFR-0330-0M20-0.4SA	160		330	F,H	600	340	450	204	350	15*25	
SFR-0390-0M17-0.4SA	185	390	F,H	600	340	460	216	350	15*25		
SFR-0490-0M14-0.4SA	220	图 C Picture C	490	F,H	480	580	560	480	300	15*25	
SFR-0600-0M12-0.4SA	280		600	F,H	480	640	575	510	300	15*25	
SFR-0660-0M10-0.4SA	315		660	F,H	480	640	575	510	300	15*25	
SFR-0800-087U-0.4SA	380	800	F,H	550	400	640	320	360	15*25		
电容+壳体 Capacitor+ Shell					520	165	310	100	480	11*18	
SFR-1000-070U-0.4SA	450	图 D Picture D	1000	F,H	680	490	750	320	400	15*25	
电容+壳体 Capacitor+ Shell						565	180	380	100	540	11*18
SFR-1200-058U-0.4SA	500		1200	F,H	680	510	780	320	400	15*25	
电容+壳体 Capacitor+ Shell						410	360	380	275	380	11*18
SFR-1500-050U-0.4SA	630		1500	F,H	700	530	800	370	400	15*25	
电容+壳体					565	365	380	275	540	11*18	

备注：其他规格尺寸，可根据用户要求制造。Remark: Dimension can be customization

LCL滤波器 (LCL Filters)

■ 产品概述 (Product Introduction)

LCL 滤波器在现代的可再生能源行业十分普遍，可以有效、经济地确保和提高从能源到电网的馈电质量。滤波器用于过滤逆变器的开关频率。达到目标畸变水平时，滤波器将节约可观的成本。LCL 滤波器的典型特点是损失小、体积小、重量轻、电容大

LCL filters are very commonly used in the modern renewable energy industry, and can efficiently and economically ensure and improve the feed quality from energy sources to the grid. The filters are used for filtration of the switching frequency of the inverter. When reaching the target distortion level, the filters can save considerable costs. LCL filters are typically characterized by small loss, small size, light weight, and high capacitance.

■ 产品特点 (Product Features)

功率半导体开关器件技术的进步，促进了电力电子变流装置技术的迅速发展，出现了以脉宽调制(PWM)控制为基础的各类变流装置，比如逆变电源，变频器等各类变流器，并且这些变流器已经在全国的各个领域中得到了广泛的应用。三相电压型PWM整流器具有电能双向传输，较快的动态控制响应。当前的PWM整流器采用的功率开关器件多是IGBT，就可以实现很高的开关频率，一般开关频率为2kHz~15kHz。然而功率开关器件的高开通关断频率却会产生高次谐波，注入到电网中，产生谐波污染。为了解决LCL滤波器所碰到的难题，我们一般选择LCL滤波器。LCL滤波器可以选取较小的电感电容值，在千瓦至上百千瓦间实现满意的滤波效果。

The advancement of the technology of the high power semiconductor switching device promotes the rapid development of the technology of power electronic converters, giving birth to various types of converters, such as inverter power supplies, frequency converters, etc. And these converters have been widely used in various fields all over the country. Three-phase voltage-type PWM rectifiers have the functions of bidirectional power transmission and fast dynamic control response. Most PWM rectifiers currently adopt IGBT as the power switch device, which can achieve very high switching frequency compared to the general switching frequency of 2kHz-15kHz. However, the high on/off frequency of power switch device will generate high order harmonics to be injected into the grid, thus causing harmonic pollution. In order to solve the problems encountered by LCL filters, we generally choose LCL filters. Smaller inductance and capacitance values can be selected for the LCL filters to achieve satisfactory filtering effects between one kilowatt to hundreds of kilowatts.

电流范围 Current Range: 10-1600A
电压范围 Voltage Range: 220-1140V

■ 成品识别码 (Product Identification Code)

LCL — 250 — 0.4SC
LCL滤波器 LCL Filter
额定电流 Rated Current
0.4: Working Voltage
0.2=220V, 0.4=380V, 0.7=690V, 1.1=1140V
S: D=Single Phase Reactor
S=Three Phase Reactor
C: C=Copper
A: Aluminium



典型电路图
(Typical circuit diagram)

