



**SINE 60™**

**Air & Liquid Cooled Sine Wave Filters  
6 - 70 Hz**

Selection Brochure

# The Optimal Solution for 60 Hz Motor Protection

- **No Common Mode Noise**
- **No Capacitor Maintenance**
- **100% Load at Cold-Start**
- **Low Audible Noise**
- **Liquid Cooled Options**




[ctmmagnetics.com](http://ctmmagnetics.com)

# THE ULTIMATE SOLUTION FOR 60 Hz MOTOR PROTECTION.

CTM's Sine 60 sine wave filters are specifically designed for optimal performance with 60 Hz motors. Attenuated for PWM switching frequencies as low as 2 kHz (and up to 20 kHz), Sine 60 filters will meet your most demanding motor filtering needs for all 60 Hz applications. Coupled with a liquid cooled option, CTM's patented liquid cooled technology traps and removes 97% of the filter's heat in the highest power density solution available to the market.

## PERFORMANCE SPECIFICATIONS

Harmonic Voltage Dist.	<5% THVD @ 2 kHz	
Voltage Range	480 V ±10%	
Voltage Insertion Loss	<3.3%	
Fundamental Frequency	6 - 70 Hz ( <i>higher with de-rating</i> ) - For up to 500 Hz applications, see <a href="#">HighSine Series Sine Wave Filters</a>	
Switching Frequency	2 - 20 kHz (Above 8 kHz, contact CTM for application verification)	
Current Range	100 - 840 A ( <i>Air cooled</i> ) 100 - 1440 A ( <i>Liquid cooled</i> )	
Overload Capability	150% rated current for 1 minute ( <i>Air</i> ) 200% rated current for 1 minute ( <i>Liquid</i> )	
Ambient Temperature Range	Maximum: 50 °C (122 °F)- <i>Air</i> 65 °C (149 °F)- <i>Liquid</i>	Minimum: -40 °C (-40 °F)- <i>Air</i> -40 °C (-40 °F)- <i>Liquid</i> <sup>A</sup>
Audible Noise	~40 dB (Air)	~0 dB (Liquid)
Relative Humidity	95% without condensation	
Enclosure Options	Modular Panel Integrated Panel ( <i>Air cooled only</i> ) NEMA 3R Cabinet	
Motor Cable Length	Up to 15,000 feet	
Maximum Altitude	3,300 ft (Air) <i>Higher with derate</i>	No Limit (Liquid)
Agency Recognitions	c  US LISTED	

### Liquid Cooled Options:

Maximum Coolant Temp.	50 °C (122 °F) ( <i>Higher with de-rating</i> )
Approved Coolants	Drinking water Water-glycol mixture <i>For R134A, contact CTM</i>
Plumbing Material Options	Aluminum (standard) Copper
Heat Removal	97% to Liquid Coolant 3% to Ambient Air

<sup>A</sup> Preventative measures should be taken to ensure the coolant does not freeze in the system.

## SINE 60™ HIGHLIGHTS

### No Common Mode Noise

Common-mode (bearing) current can have disastrous effects on induction motors, leading to electric fluting and premature bearing failure. CTM offers the only sine wave filters that do not introduce common-mode currents.

### High-Reliability Capacitors

CTM sine wave filters utilize high-reliability capacitors. Compared to the electrolytic capacitors used in competitors' filters, CTM capacitors have higher capacitance stability with temperature, higher surge voltage ratings, and are low ESR for higher ripple current handling. CTM capacitors are also self-healing. All of these factors lead to boosts in system reliability and longevity.

### 100% Load at Cold-Start (Automatic Restart)

Electrolytic caps have high ESR at lower temperature. Hence, in cold environments, they require time to heat up during start/restart. If this procedure is not followed, electrolytic caps will fail. On the other hand, CTM's capacitors are ready for 100% load at all temperatures, leading to quick cold-starts and restarts.

### Low Audible Noise

Due to superior materials and geometric shapes, magnetostriction-induced noise is significantly lower in CTM filters.

## LIQUID COOLED ADVANTAGES

### Highest Power Density

Superior heat removal technology enables smaller magnetics, yielding the highest power density reactors available. Low surface temperatures eliminate clearance requirements, further increasing "effective" power density.

### Thermal Isolation

With up to 97% of heat removed through the coolant, liquid cooled reactors have negligible effects on cabinet air temperature. No climate control required.

### Sealed Design for Harsh Environments

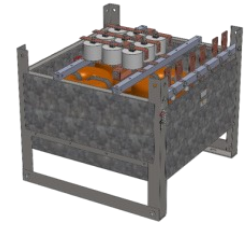
CTM inductors are environmentally sealed in potting, creating an extremely rugged and reliable design ideal for use in the harshest environments.

### Extremely Low Audible Noise

Due to superior materials and geometric shapes, magnetostriction-induced noise is significantly lower in CTM filters. When combined with a sealed package, the result is a nearly silent solution.

# MECHANICAL SPECIFICATIONS (AIR):

Size filter based on the Full Load Amps (FLA) of the drive. The filter current rating must be greater than or equal to the FLA. Order filters by CTM Part Number online at [ctmmagnetics.com/contact-us](http://ctmmagnetics.com/contact-us), or call us directly at [480.967.9447](tel:480.967.9447).



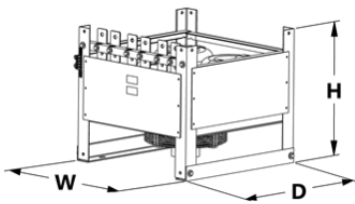
Rated Current (A <sub>RMS</sub> )	Est. Motor HP <sup>1</sup>	Modular Panel				Integrated Panel			NEMA 3R Cabinet		
		Part Number <sup>2</sup>	Size (W x D x H)		Approx. Weight (lb)	Part Number <sup>2</sup>	Size (W x D x H) (in)	Approx. Weight (lb)	Part Number <sup>2</sup>	Size (W x D x H) (in)	Approx. Weight (lb)
			Reactor (in)	Cap Panel (in)							
100	75	S060F100A20MA00	18.3 x 18.3 x 18.0	11.0 x 8.9 x 5.9	94	S060F100A20PA00	18.3 x 18.3 x 19.4	94	S060F100A20RA00	25.3 x 36.4 x 44.5	221
130	100	S060F130A20MA00	18.3 x 18.3 x 18.0	11.0 x 8.9 x 5.9	96	S060F130A20PA00	18.3 x 18.3 x 19.4	96	S060F130A20RA00	25.3 x 36.4 x 44.5	223
160	125	S060F160A20MA00	18.3 x 18.3 x 18.0	11.0 x 8.9 x 5.9	117	S060F160A20PA00	18.3 x 18.3 x 19.4	117	S060F160A20RA00	25.3 x 36.4 x 44.5	244
200	150	S060F200A20MA00	18.3 x 18.3 x 18.0	11.0 x 8.9 x 5.9	122	S060F200A20PA00	18.3 x 18.3 x 19.4	122	S060F200A20RA00	25.3 x 36.4 x 44.5	248
240	200	S060F240A20MA00	20.8 x 20.8 x 18.3	11.0 x 8.9 x 5.9	158	S060F240A20PA00	20.8 x 20.8 x 19.9	158	S060F240A20RA00	25.3 x 36.4 x 44.5	279
300	250	S060F300A20MA00	24.8 x 24.8 x 20.5	11.0 x 8.9 x 5.9	239	S060F300A20PA00	24.8 x 24.8 x 19.9	239	S060F300A20RA00	30.5 x 41.9 x 49.5	405
360	300	S060F360A20MA00	24.8 x 24.8 x 20.5	11.0 x 8.9 x 12.1	255	S060F360A20PA00	24.8 x 24.8 x 21.8	255	S060F360A20RA00	30.5 x 41.9 x 49.5	420
420	350	S060F420A20MA00	24.8 x 24.8 x 20.5	11.0 x 8.9 x 8.6	246	S060F420A20PA00	24.8 x 24.8 x 22.6	246	S060F420A20RA00	30.5 x 41.9 x 49.5	411
480	400	S060F480A20MA00	26.0 x 26.0 x 21.6	11.0 x 8.9 x 8.6	278	S060F480A20PA00	26.0 x 26.0 x 23.4	278	S060F480A20RA00	30.5 x 41.9 x 49.5	440
540	450	S060F540A20MA00	26.0 x 26.0 x 21.6	11.0 x 8.9 x 8.6	294	S060F540A20PA00	26.0 x 26.0 x 23.4	294	S060F540A20RA00	30.5 x 41.9 x 49.5	455
600	500	S060F600A20MA00	26.0 x 26.0 x 21.6	11.0 x 8.9 x 12.1	283	S060F600A20PA00	26.0 x 26.0 x 24.4	283	S060F600A20RA00	30.5 x 41.9 x 49.5	445
720	600	S060F720A20MA00	26.0 x 26.0 x 21.6	11.0 x 8.9 x 12.1	302	S060F720A20PA00	26.0 x 26.0 x 24.4	302	S060F720A20RA00	30.5 x 41.9 x 49.5	464
840	700	S060F840A20MA00	26.0 x 26.0 x 21.6	21.5 x 8.9 x 8.6	339	S060F840A20PA00	26.0 x 26.0 x 24.4	339	S060F840A20RA00	30.5 x 41.9 x 49.5	501

<sup>1</sup> Motor HP estimated based on typical conditions. Actual HP will vary with application. Size filter based on drive FLA.

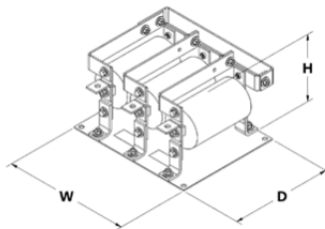
<sup>2</sup> Use part number table (bottom right) for additional options.

## MODULAR PANEL:

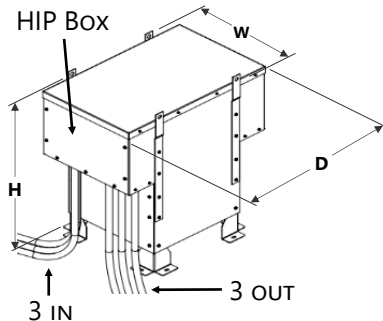
### REACTOR:



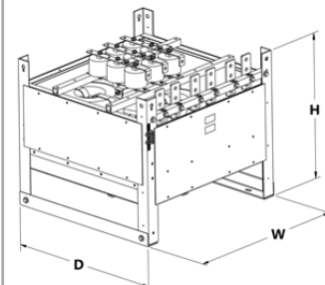
### CAPACITOR PANEL:



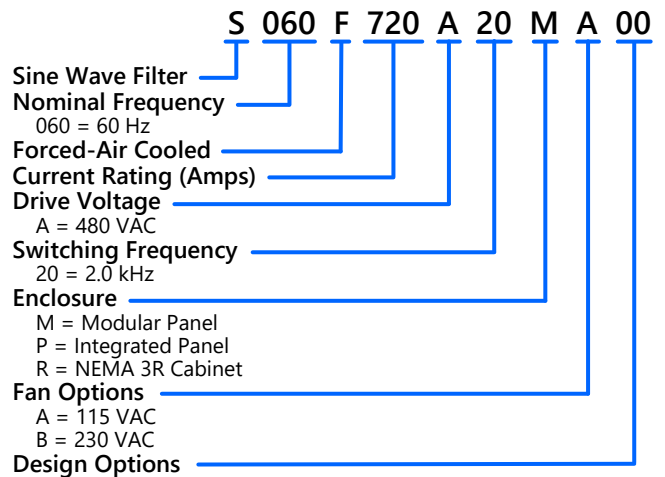
## NEMA 3R CABINET:



## INTEGRATED PANEL:



## PART NUMBER SYSTEM



Note: Information is for reference only. Data subject to change without notice.

# ELECTRICAL SPECIFICATIONS (LIQUID):

Size filter based on the Full Load Amps (FLA) of the drive. The filter current rating must be greater than or equal to the FLA. Order filters by CTM Part Number online at [ctmmagnetics.com/contact-us](http://ctmmagnetics.com/contact-us), or call us directly at [480.967.9447](tel:480.967.9447).

Rated Current (A <sub>RMS</sub> )	Est. Motor HP <sup>1</sup>	Part Number <sup>2</sup>	Total Filter Power Losses (Watts)			
			At 60 Hz Only <sup>3</sup>		60 Hz / 2 kHz <sup>4</sup>	
			Liquid	Air	Liquid	Air
100	75	S060L100A20MA00	535	17	678	21
130	100	S060L130A20MA00	611	19	800	25
160	125	S060L160A20MA00	754	23	1,036	32
200	150	S060L200A20MA00	751	23	1,027	32
240	200	S060L240A20MA00	876	27	1,199	37
300	250	S060L300A20MA00	1,059	33	1,504	47
360	300	S060L360A20MA00	1,115	34	1,560	48
420	350	S060L420A20MA00	1,502	46	1,973	61
480	400	S060L480A20MA00	1,528	47	2,025	63
540	450	S060L540A20MA00	1,729	53	2,296	71
600	500	S060L600A20MA00	1,804	56	2,375	73
720	600	S060L720A20MA00	2,078	64	2,849	88
840	700	S060L840A20MA00	2,313	72	3,178	98
960	800	S060L960A20MA00	2,680	83	3,099	96
1080	900	S060L1K1A20MA00	2,791	86	3,169	98
1200	1000	S060L1K2A20MA00	3,029	94	3,480	108
1320	1100	S060L1K3A20MA00	3,137	97	3,629	112
1440	1200	S060L1K4A20MA00	3,376	104	3,838	119

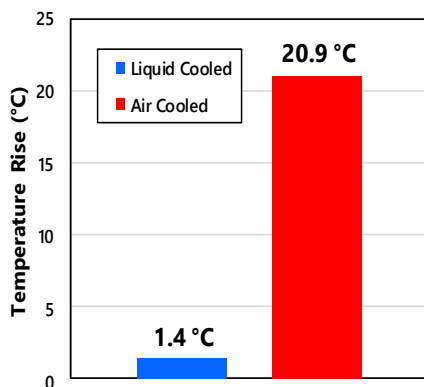
<sup>1</sup> Motor HP estimated based on typical conditions. Actual HP will vary with application. Size filter based on drive FLA.

<sup>2</sup> Use part number table (bottom right) to select options. Unspecified options will be assumed to carry the default "-MA00" option number.

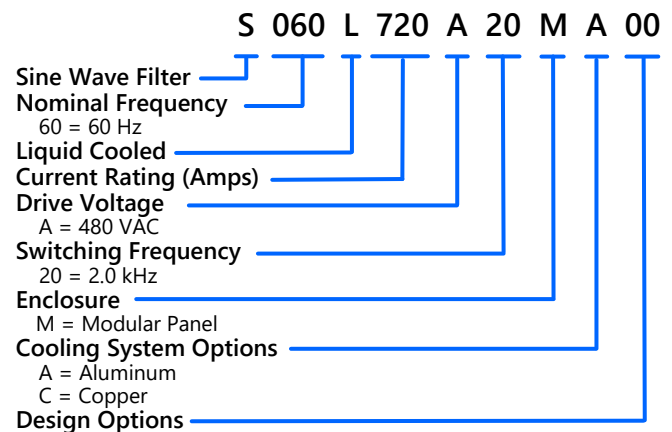
<sup>3</sup> Loss calculations performed at rated current, 60 Hz, and 20°C coolant.

<sup>4</sup> Loss calculations performed at rated current, 60 Hz with 2 kHz switching frequency, and 20 °C coolant. THD-i is 14.7%.

## LIQUID COOLED VS. AIR COOLED CABINET AIR TEMPERATURE RISE



## PART NUMBER SYSTEM



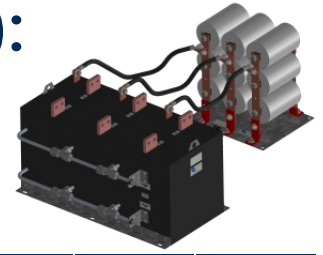
## REDUCED CABINET AIR TEMPERATURE:

CTM liquid cooled filters will have negligible temperature effects when installed in an existing cabinet. Liquid cooled inductors are thermally isolated from their enclosures, meaning a majority (97%) of the heat is removed directly through the liquid coolant. This results in increased reliability for all electronics within the cabinet.

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Rated Current (A <sub>RMS</sub> )	Est. Motor HP <sup>1</sup>	Modular Panel				Reference Figure	Flow Rate (GPM) <sup>3</sup>
		Part Number <sup>2</sup>	Size (W x D x H)		Approx. Weight (lb)		
			Reactor (in)	Cap Panel (in)			
100	75	S060L100A20MA00	9.7 x 9.3 x 9.6	11.0 x 8.9 x 5.9	72	F1	0.6
130	100	S060L130A20MA00	12.0 x 9.3 x 9.6	11.0 x 8.9 x 5.9	88	F1	0.7
160	125	S060L160A20MA00	12.6 x 10.1 x 10.3	11.0 x 8.9 x 5.9	109	F1	0.9
200	150	S060L200A20MA00	12.6 x 10.1 x 10.3	11.0 x 8.9 x 5.9	111	F1	0.9
240	200	S060L240A20MA00	12.6 x 10.1 x 10.3	11.0 x 8.9 x 5.9	112	F1	1.0
300	250	S060L300A20MA00	15.3 x 10.1 x 10.3	11.0 x 8.9 x 5.9	138	F1	1.2
360	300	S060L360A20MA00	15.3 x 10.1 x 10.3	11.0 x 8.9 x 12.1	144	F1	1.3
420	350	S060L420A20MA00	17.0 x 11.3 x 11.7	11.0 x 8.9 x 8.6	198	F1	1.5
480	400	S060L480A20MA00	17.0 x 11.3 x 11.7	11.0 x 8.9 x 8.6	200	F1	1.6
540	450	S060L540A20MA00	20.9 x 12.5 x 11.9	11.0 x 8.9 x 8.6	226	F2	1.8
600	500	S060L600A20MA00	20.9 x 12.5 x 11.9	11.0 x 8.9 x 12.1	233	F2	2.1
720	600	S060L720A20MA00	22.0 x 14.0 x 13.3	11.0 x 8.9 x 12.1	314	F2	2.4
840	700	S060L840A20MA00	22.0 x 14.0 x 13.3	21.5 x 8.9 x 8.6	338	F2	2.7
960	800	S060L960A20MA00	22.0 x 14.0 x 13.3	21.5 x 8.9 x 8.6	338	F2	2.4
1080	900	S060L1K1A20MA00	22.0 x 14.0 x 13.3	21.5 x 8.9 x 12.1	349	F2	2.4
1200	1000	S060L1K2A20MA00	23.1 x 15.5 x 15.1	21.5 x 8.9 x 12.1	439	F2	2.7
1320	1100	S060L1K3A20MA00	23.1 x 15.5 x 15.1	21.5 x 8.9 x 12.1	449	F2	2.7
1440	1200	S060L1K4A20MA00	23.1 x 15.5 x 15.1	21.5 x 8.9 x 12.1	465	F2	3.0

## MECHANICAL FIGURES (MODULAR PANEL)

CAPACITOR PANEL:

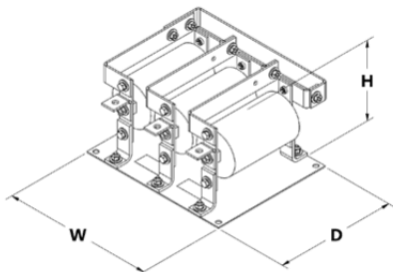


FIGURE F1:

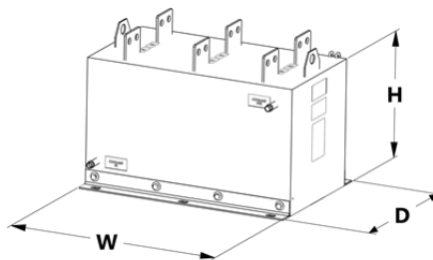
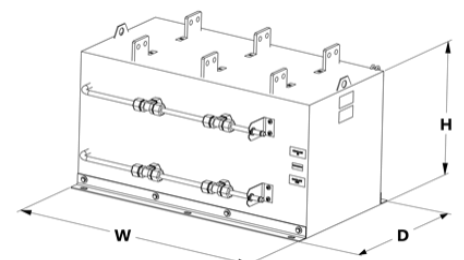


FIGURE F2:



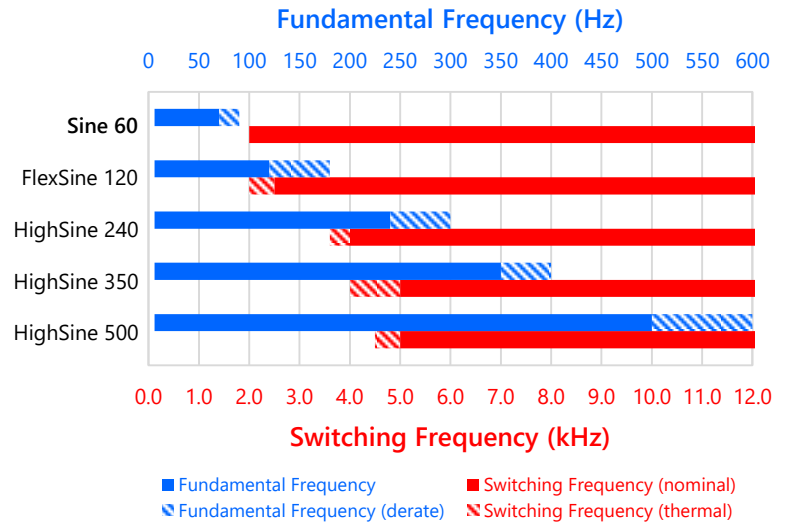
# THE IDEAL FILTER FOR EVERY APPLICATION

## SINE WAVE FILTERS

CTM Magnetics offers a broad portfolio of sine wave filters to meet all your motor filtering needs.

- **Sine 60** - The optimal choice for 60 Hz motor protection. Designed for up to 70 Hz fundamental and 2+ kHz switching frequency.
- **FlexSine 120** - For both induction and PM motor applications. Designed for up to 120 Hz fundamental (180 Hz with derate) and 2.5+ kHz switching frequency.
- **HighSine 240** - Perfect for high-speed, PM motor applications (240 Hz). Designed for up to 240 Hz fundamental and 4+ kHz switching frequency.
- **HighSine 350** - Perfect for high-speed, PM motor applications (350 Hz). Designed for up to 350 Hz fundamental and 5+ kHz switching frequency.
- **HighSine 500** - Perfect for high-speed, PM motor applications (500 Hz). Designed for up to 500 Hz fundamental and 5+ kHz switching frequency.

## Filter Operating Ranges



## GRIDHAWK® FILTERS

CTM Magnetics offers cutting edge GridHawk Harmonic filters to meet all your front end needs. CTM also provides a 5 year capacitor warranty on all GridHawk products.

- **GridHawk** - The optimal choice for grid protection. Designed to handle input voltage distortion of  $\leq 5\%$  THVD.
- **GridHawk HD** - For applications where the voltage distortion is  $\leq 15\%$  THVD, GridHawk HD is your choice for grid protection. GridHawk HD beats any other passive harmonic filter, AFE (Active front end), or 18 pulse drive available on the market. Where everyone else fails, we succeed.
- **GridHawk XD** - For applications where the voltage distortion is  $\leq 25\%$  THVD, contact CTM for XD solutions.



Additional information is available online:

[ctmmagnetics.com](http://ctmmagnetics.com)

Contact us online at:

[ctmmagnetics.com/contact-us](http://ctmmagnetics.com/contact-us)



Scan for CTM



Final product specifications subject to change