TCI

KRF 3-Phase RFI Power Line Filters

Performance and Protection for Drives

Phone: 800.894.0412 - Fax: 888.723.4773 - Web: www.clrwtr.com - Email: info@clrwtr.com

TCI's KRF Series 3-Phase RFI Power Line Filters Offer Exceptional EMI And RFI Protection

The KRF Series 3-Phase Power Line Filters have been designed as engineered solutions for equipment malfunctions due to unwanted high frequency electrical noise. These frequencies can be from either noise conducted through power lines or radiated through the air onto the power lines. Designed to be installed at the input terminals of variable frequency or variable speed drives, KRF Series Filters provide simple installation, convenient accessibility, and enhanced drive performance and durability. Available in 480 Volt and 600 Volt designs, these products provide the outstanding performance that our customers have come to expect from TCI.

Manufacturer's Warranty

KRF Series Filters are warranted against Manufacturer's defect for three years from the date of original purchase.

Performance Guarantee

Properly applied and sized for the application, a KRF Series Filter is guaranteed to limit the generated EMI noise and reduce the interference problems of related equipment. If a KRF fails to reduce EMI, TCI will take back the filter and pay shipping both ways. (Offer valid for 60 days from purchase date.)

Harmful High Frequency Noise

EMI (Electro Magnetic Interference) and RFI (Radio Frequency Interference)

The terms EMI and RFI are often used interchangeably. EMI is actually any frequency of electrical noise, whereas RFI is a specific subset of electrical noise on the EMI spectrum. There are two types of EMI. Conducted EMI is unwanted high frequencies that ride on the AC wave form. Radiated EMI is similar to an unwanted radio broadcast being emitted from the power lines. There are many pieces of equipment that can generate EMI, variable frequency drives included. In the case of variable frequency drives, the electrical noise produced is primarily contained in the switching edges of the PWM controller. As the technology of drives evolves, switching frequencies increase. These increases also increase the effective edge frequencies produced, thereby increasing the amount of electrical noise.

Common Mode (CM) and Differential Mode (DM)

Common mode noise is the electrical noise on all power lines with respect to ground. Differential mode noise is the electrical noise on one line with respect to another line. When considering a filter for use in a variable speed drive application, it is important to note that common mode noise reduction is the most important factor. Variable frequency drives produce very little differential mode, or line to line, electrical noise due to the presence of DC bus capacitors.

World-wide Noise Standards

International agencies agree that a certain threshold of electrical noise, typically in the 150kHz to 30MHz band, is likely to cause interference problems. Generally, these standards allow 1 to 10mV of noise on any AC line with respect to ground. It is important to note these standards are all based on noise on a power line with respect to ground, or common mode noise. In the United States and Canada, it may be necessary to adhere to the standards set forth by FCC Regulation 15, Subpart J which covers electronic devices unintentionally emitting RF energy. In Europe, EMC directives may require limits to be within the standards set forth in CISPR 11 A and B.

UTILITY

Typical Problems, Superior Solutions with KRF Filters

Equipment Interference and Failure

The power line noise emissions associated with variable frequency and variable speed drives can cause disturbances in nearby equipment. Typical disturbances include:

- Dimmer and ballast instability
- Lighting disturbances such as flashing
- Poor radio reception
- Poor television reception
- Instability of control systems
- Flow meter totalizing
- Flow metering fluctuation
- Computer system failures including the loss of data
- Thermostat control problems
- Radar disruption
- Sonar disruption

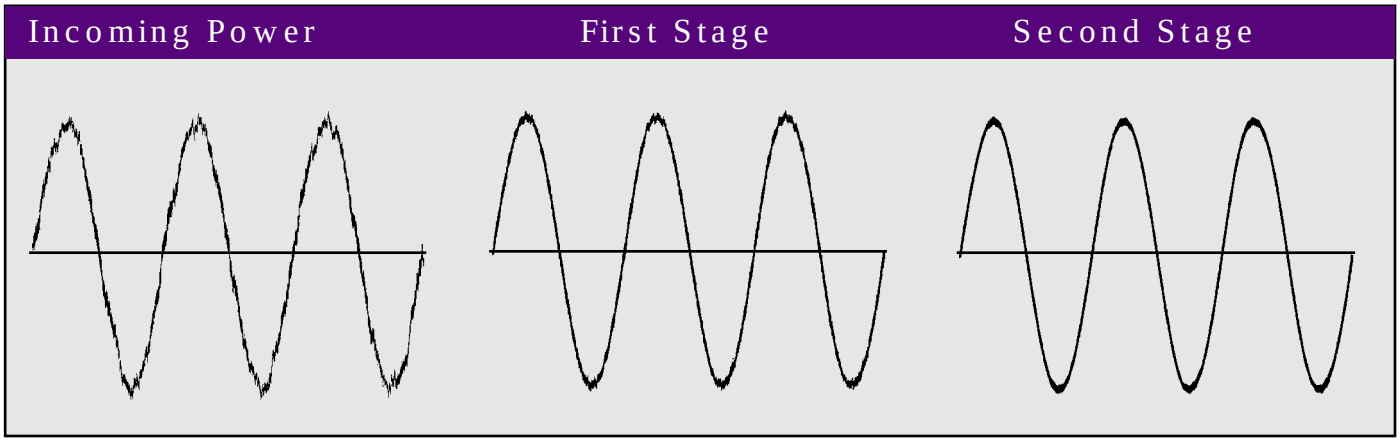
KRF Series 3-Phase RFI Power Line Filters

KRF Filters use a combination of high frequency inductors and capacitors to reduce noise in the critical 150kHz to 30MHz frequency range. The inductors act as open circuits and the capacitors act as short circuits at high frequencies while allowing the lower power line frequencies to pass untouched. KRF Filters assist with cost effective compliance to EMC directives, in a compact, efficient, light-weight design. The high common mode and differential mode reduction in the critical 150kHz to 30MHz frequency assures that potential interference from AC drives is reduced or eliminated.

KRF Series Filters are current-rated devices. In order to properly size a filter, it is necessary to know the operating voltage, and the input current rating of the drive. *No de-rating or re-rating is necessary when applying the filter at voltages that are less than or equal to the maximum voltage listed on the filter.*

Advanced Two-Stage Filtering

KRF Filters use advanced two-stage filtering to improve performance. Single stage filters use one set of inductors and capacitors, where as two-stage filters use a second set in order to provide further reduction in high frequency noise.



240 Volt

H.P.	PART NUMBER	MAX AMPS	WATTS LOSS	STD. TERMS	Frequency (MHz) / Insertion Loss (dB)						DIMENSIONS					
					0.15 CM/DM	0.5 CM/DM	1 CM/DM	5 CM/DM	10 CM/DM	30 CM/DM	L	W	D	MTG. W	MTG. L	LBS
2	KRF9ATB	9	9	TB	60/30	80/45	80/50	70/50	60/50	50/50	8.10	4.50	2.00	3.88	4.00	4
3	KRF16ATB	16	10.5	TB	50/10	70/50	80/50	75/40	65/40	50/40	8.10	4.50	2.00	3.88	4.00	4
5	KRF16ATB	16	10.5	TB	50/10	70/50	80/50	75/40	65/40	50/40	8.10	4.50	2.00	3.88	4.00	4
7.5	KRF32ATB	32	17	TB	60/10	70/45	80/50	75/50	65/50	45/40	10.10	5.75	2.25	5.125	5.00	7
10	KRF32ATB	32	17	TB	60/10	70/45	80/50	75/50	65/50	45/40	10.10	5.75	2.25	5.125	5.00	7
15	KRF50ATB	50	21	TB	60/10	75/40	80/50	75/50	70/50	50/40	10.10	5.75	2.25	5.125	5.00	7
20	KRF60APT	60	15	PT	60/15	70/25	70/45	65/40	55/40	45/30	16.00	4.75	4.25	4.12	7.00	13
25	KRF80APT	80	25	PT	60/15	70/25	70/45	65/40	55/40	45/30	16.00	4.75	4.25	4.12	7.00	13
30	KRF80APT	80	25	PT	60/15	70/25	70/45	65/40	55/40	45/30	16.00	4.75	4.25	4.12	7.00	13
40	KRF112APT	112	25	PT	60/25	65/35	70/45	60/30	50/30	40/20	16.00	4.75	4.25	4.12	7.00	15
50	KRF136APT	136	22	PT	60/25	65/35	70/45	60/30	50/30	40/20	16.00	4.75	4.25	4.12	7.00	15
60	KRF160APT	160	15	PT	60/30	70/35	70/35	65/45	55/40	45/30	20.25	4.75	4.25	4.12	10.00	20
75	KRF322APT	322	30	PT	60/30	70/40	70/40	65/40	55/35	45/20	23.50	6.00	4.63	5.25	8.00	35
100	KRF322APT	322	30	PT	60/30	70/40	70/40	65/40	55/35	45/20	23.50	6.00	4.63	5.25	8.00	35
125	KRF322APT	322	30	PT	60/30	70/40	70/40	65/40	55/35	45/20	23.50	6.00	4.63	5.25	8.00	35
150	KRF608APT	608	60	PT	60/30	70/40	70/40	60/35	45/30	30/20	41.25	7.09	5.93	5.25	16.00	65
200	KRF608APT	608	60	PT	60/30	70/40	70/40	60/35	45/30	30/20	41.25	7.09	5.93	5.25	16.00	65

480 Volt

H.P.	PART NUMBER	MAX AMPS	WATTS LOSS	STD. TERMS	Frequency (MHz) / Insertion Loss (dB)						DIMENSIONS					
					0.15 CM/DM	0.5 CM/DM	1 CM/DM	5 CM/DM	10 CM/DM	30 CM/DM	L	W	D	MTG. W	MTG. L	LBS
2	KRF9ATB	9	9	TB	60/30	80/45	80/50	70/50	60/50	50/50	8.10	4.50	2.00	3.88	4	4
3	KRF9ATB	9	9	TB	60/30	80/45	80/50	70/50	60/50	50/50	8.10	4.50	2.00	3.88	4	4
5	KRF9ATB	9	9	TB	60/30	80/45	80/50	70/50	60/50	50/50	8.10	4.50	2.00	3.88	4	4
7.5	KRF16ATB	16	10.5	TB	50/10	70/50	80/50	75/40	65/40	50/40	8.10	4.50	2.00	3.88	4	4
10	KRF16ATB	16	10.5	TB	50/10	70/50	80/50	75/40	65/40	50/40	8.10	4.50	2.00	3.88	4	4
15	KRF32ATB	32	17	TB	60/10	70/45	80/50	75/50	65/50	45/40	10.10	5.75	2.25	5.125	5	7
20	KRF32ATB	32	17	TB	60/10	70/45	80/50	75/50	65/50	45/40	10.10	5.75	2.25	5.125	5	7
25	KRF50ATB	50	21	TB	60/10	75/40	80/50	75/50	70/50	50/40	10.10	5.75	2.25	5.125	5	7
30	KRF50ATB	50	21	TB	60/10	75/40	80/50	75/50	70/50	50/40	10.10	5.75	2.25	5.125	5	7
40	KRF60APT	60	15	PT	60/15	70/25	70/45	65/40	55/40	45/30	16.00	4.75	4.25	4.12	7	13
50	KRF80APT	80	25	PT	60/15	70/25	70/45	65/40	55/40	45/30	16.00	4.75	4.25	4.12	7	13
60	KRF80APT	80	25	PT	60/15	70/25	70/45	65/40	55/40	45/30	16.00	4.75	4.25	4.12	7	13
75	KRF112APT	112	15	PT	60/25	65/35	70/45	60/30	50/30	40/20	16.00	4.75	4.25	4.12	7	15
100	KRF136APT	136	22	PT	60/25	65/35	70/45	60/30	50/30	40/20	16.00	4.75	4.25	4.12	7	15
125	KRF160APT	160	15	PT	60/30	70/35	70/35	65/45	55/40	45/30	20.25	4.75	4.25	4.12	10	20
150	KRF185APT	185	20	PT	60/30	70/35	70/35	65/45	55/40	45/30	20.25	4.75	4.25	4.12	10	20
200	KRF322APT	322	30	PT	60/30	70/40	70/40	65/40	55/35	45/20	23.50	6.00	4.63	5.25	8	35
250	KRF322APT	322	30	PT	60/30	70/40	70/40	65/40	55/35	45/20	23.50	6.00	4.63	5.25	8	35
300	KRF608APT	608	60	PT	60/30	70/40	70/40	60/35	45/30	30/20	41.25	7.09	5.93	5.25	16	65
350	KRF608APT	608	60	PT	60/30	70/40	70/40	60/35	45/30	30/20	41.25	7.09	5.93	5.25	16	65
400	KRF608APT	608	60	PT	60/30	70/40	70/40	60/35	45/30	30/20	41.25	7.09	5.93	5.25	16	65
450	KRF608APT	608	60	PT	60/30	70/40	70/40	60/35	45/30	30/20	41.25	7.09	5.93	5.25	16	65
500	KRF608APT	608	60	PT	60/30	70/40	70/40	60/35	45/30	30/20	41.25	7.09	5.93	5.25	16	65

600 Volt

H.P.	PART NUMBER	MAX AMPS	WATTS LOSS	STD. TERMS	Frequency (MHz) / Insertion Loss (dB)						DIMENSIONS					
					0.15 CM/DM	0.5 CM/DM	1 CM/DM	5 CM/DM	10 CM/DM	30 CM/DM	L	W	D	MTG. W	MTG. L	LBS
2	KRF8CTB	8	7	TB	55/5	70/10	80/50	70/40	60/40	45/40	8.10	4.50	2.00	3.88	4	4
3	KRF8CTB	8	7	TB	55/5	70/10	80/50	70/40	60/40	45/40	8.10	4.50	2.00	3.88	4	4
5	KRF8CTB	8	7	TB	55/5	70/10	80/50	70/40	60/40	45/40	8.10	4.50	2.00	3.88	4	4
7.5	KRF16CTB	16	7.5	TB	50/5	70/5	80/35	70/40	60/40	45/40	8.10	4.50	2.00	3.88	4	4
10	KRF16CTB	16	7.5	TB	50/5	70/5	80/35	70/40	60/40	45/40	8.10	4.50	2.00	3.88	4	4
15	KRF25CTB	25	10	TB	60/5	60/5	80/30	70/50	60/40	45/30	10.10	5.75	2.25	5.125	5	7
20	KRF25CTB	25	10	TB	60/5	60/5	80/30	70/50	60/40	45/30	10.10	5.75	2.25	5.125	5	7
25	KRF45CTB	45	16	TB	60/10	60/10	80/15	70/50	60/40	45/30	10.10	5.75	2.25	5.125	5	7
30	KRF45CTB	45	16	TB	60/10	60/10	80/15	70/50	60/40	45/30	10.10	5.75	2.25	5.125	5	7
40	KRF45CTB	45	16	TB	60/10	60/10	80/15	70/50	60/40	45/30	10.10	5.75	2.25	5.125	5	7
50	KRF60CPT	60	11	PT	60/15	60/25	60/25	60/40	50/40	40/30	16.00	4.75	4.25	4.12	7	13
60	KRF80CPT	80	20	PT	60/15	60/25	60/25	60/40	50/40	40/30	16.00	4.75	4.25	4.12	7	13
75	KRF80CPT	80	20	PT	60/15	60/25	60/25	60/40	50/40	40/30	16.00	4.75	4.25	4.12	7	13
100	KRF180CPT	180	22	PT	60/20	60/30	60/35	60/45	50/40	40/30	20.25	4.75	4.25	4.12	10	20
125	KRF180CPT	180	22	PT	60/20	60/30	60/35	60/45	50/40	40/30	20.25	4.75	4.25	4.12	10	20
150	KRF180CPT	180	22	PT	60/20	60/30	60/35	60/45	50/40	40/30	20.25	4.75	4.25	4.12	10	20
200	KRF300CPT	300	30	PT	60/20	55/30	55/35	50/35	40/30	30/20	26.50	7.09	5.93	5.25	8	35
250	KRF300CPT	300	30	PT	60/20	55/30	55/35	50/35	40/30	30/20	26.50	7.09	5.93	5.25	8	35
300	KRF300CPT	300	30	PT	60/20	55/30	55/35	50/35	40/30	30/20	26.50	7.09	5.93	5.25	8	35
350	KRF600CPT	600	70	PT	20/10	60/25	60/35	50/30	40/25	30/20	41.25	7.09	5.93	5.25	16	65
400	KRF600CPT	600	70	PT	20/10	60/25	60/35	50/30	40/25	30/20	41.25	7.09	5.93	5.25	16	65
450	KRF600CPT	600	70	PT	20/10	60/25	60/35	50/30	40/25	30/20	41.25	7.09	5.93	5.25	16	65
500	KRF600CPT	600	70	PT	20/10	60/25	60/35	50/30	40/25	30/20	41.25	7.09	5.93	5.25	16	65

The Watts Loss information listed in the above charts is based on unit operation at maximum current.

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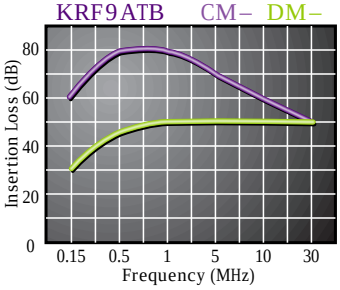
Insertion Loss Data

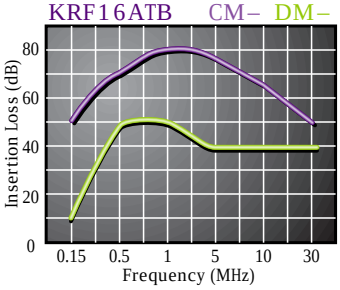
The graphs below illustrate the *minimum* insertion loss performance of each filter. The data displayed is based upon the standard test circuit of a 50 ohm source and a 50 ohm load.

CM – Common Mode DM – Differential Mode

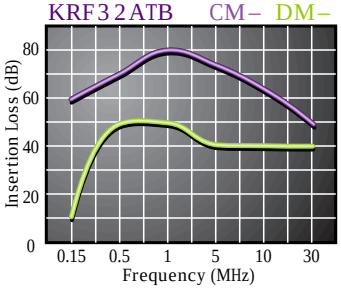
KRF9ATB CM– DM–



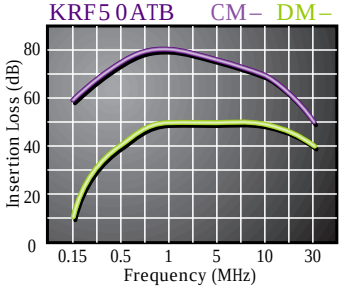
KRF16ATB CM– DM–



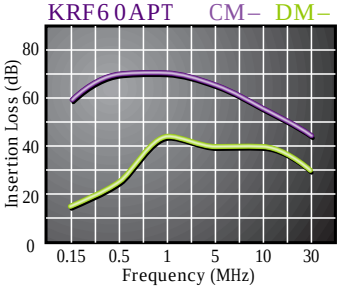
KRF32ATB CM– DM–



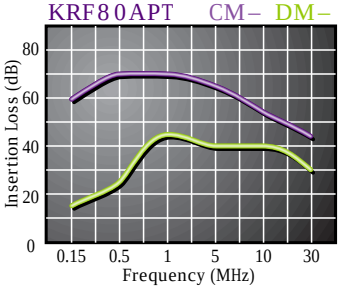
KRF50ATB CM– DM–



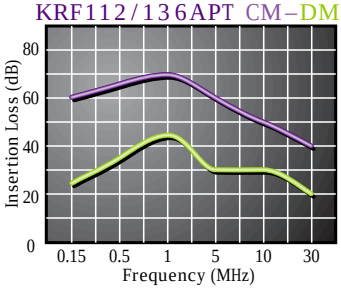
KRF60APT CM– DM–



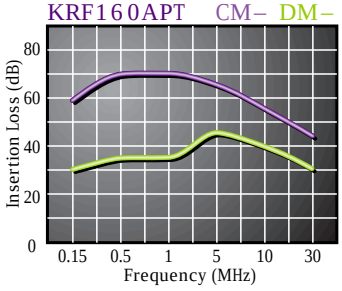
KRF80APT CM– DM–



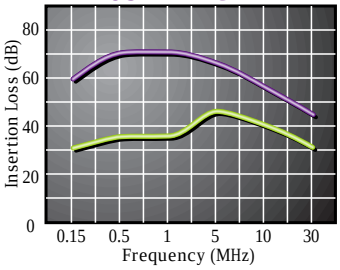
KRF112/136APT CM–DM–



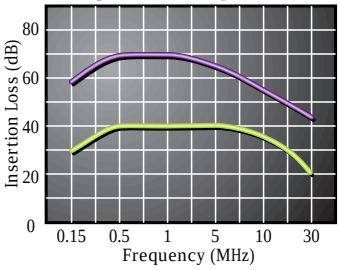
KRF160APT CM– DM–



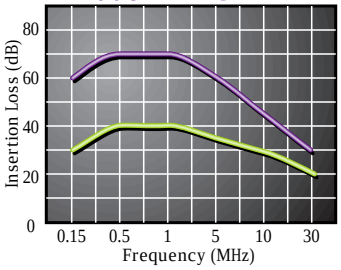
KRF185APT CM– DM–



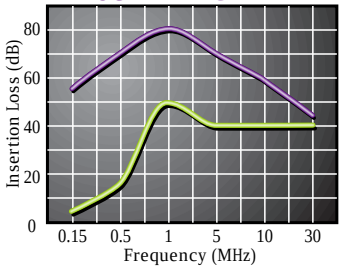
KRF322APT CM– DM–



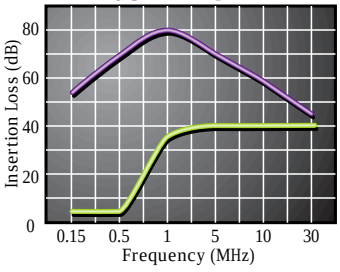
KRF608APT CM– DM–



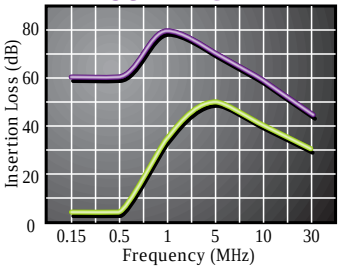
KRF8CTB CM– DM–



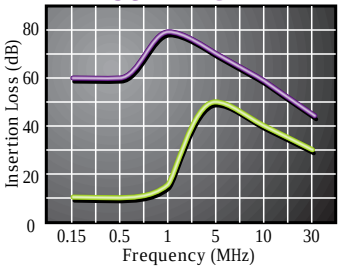
KRF16CTB CM– DM–



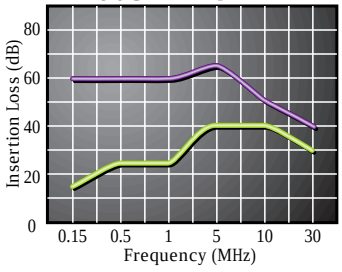
KRF25CTB CM– DM–



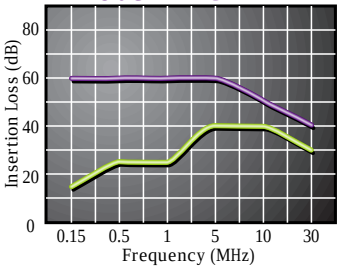
KRF45CTB CM– DM–



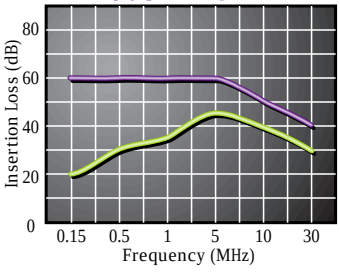
KRF60CPT CM– DM–



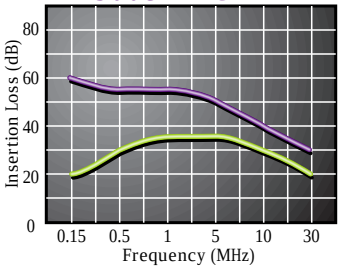
KRF80CPT CM– DM–



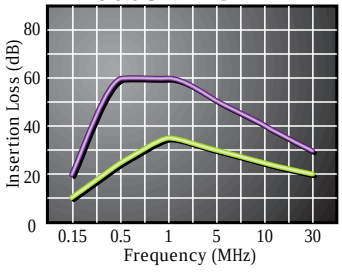
KRF180CPT CM– DM–



KRF300CPT CM– DM–



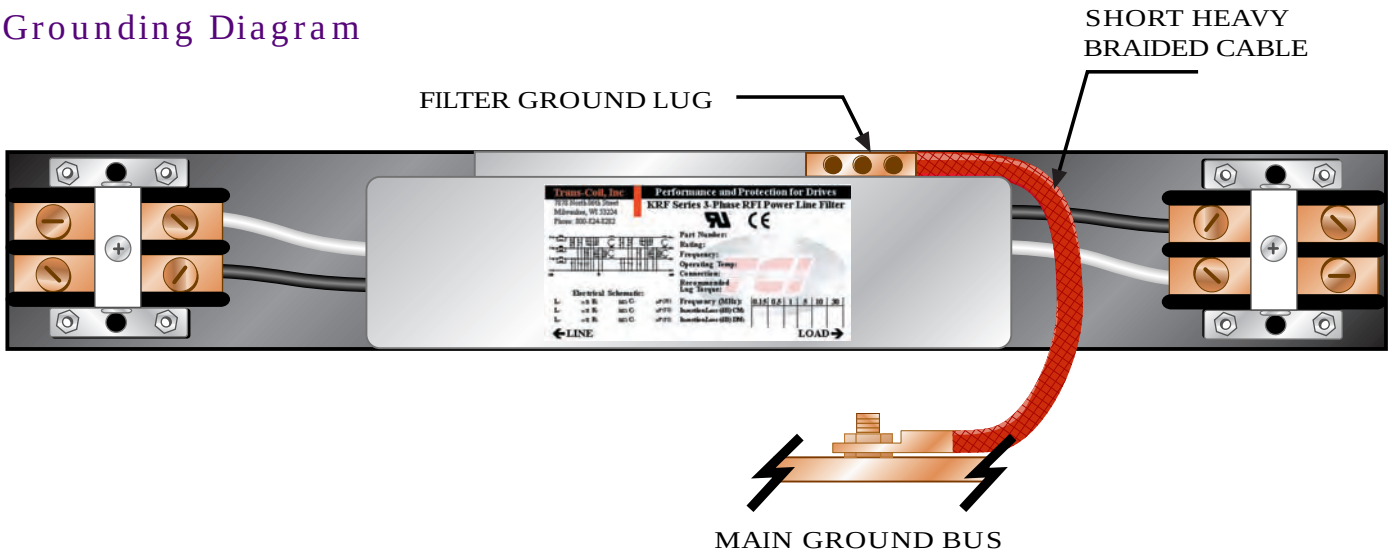
KRF600CPT CM– DM–



Considerations when Applying KRF Series Filters

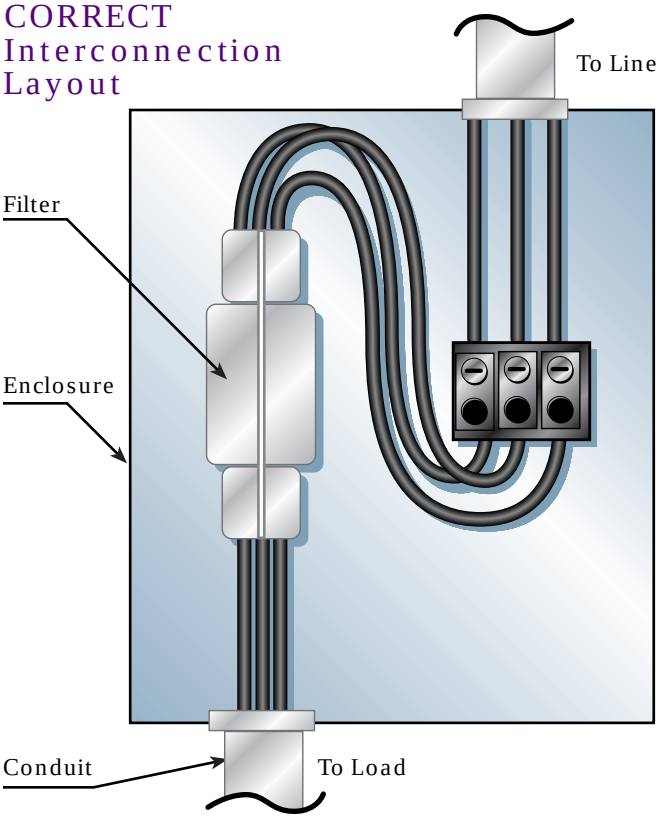
Proper installation of the KRF Series Filters can have a dramatic effect on overall performance. Although the filter reduces electrical noise on the power lines (conducted emissions), it should be located as close as possible to the variable frequency drive to reduce broadcasting of the noise (radiated emissions) from the power lines themselves. The capacitors within the filter short the noise to ground, so it is imperative that the filter maintains a good ground. A short, heavy, stranded conductor from the filter chassis to the main ground bus is recommended for top performance. A battery braid, litz wire, or flexible welding cable with many fine strands is recommended for best grounding performance. The multiple strand cabling provides more surface area in order to conduct the high frequencies that are on the grounding cable.

Grounding Diagram

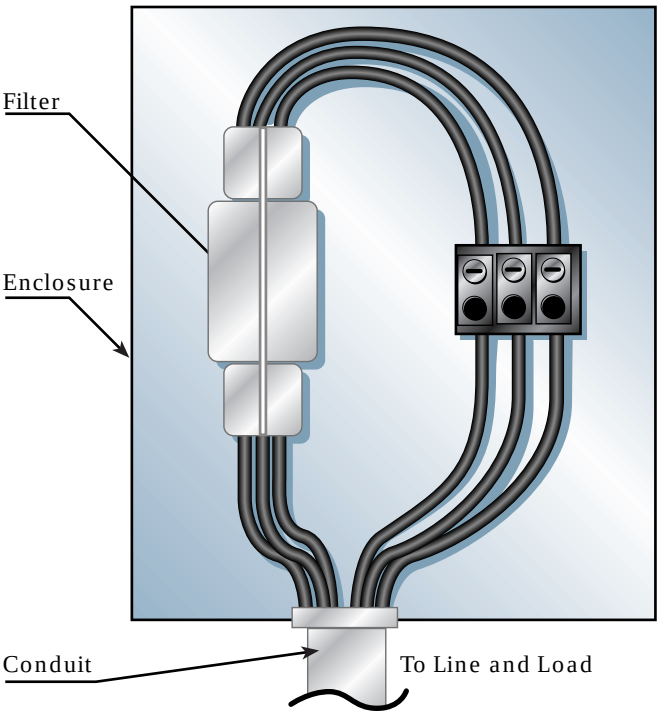


Radiation of noise is also a concern for power line routing, as it can effectively bypass the filter. Input and output filter leads should be separated by a maximum practical distance within enclosures and should be routed separately in interconnecting conduits when used.

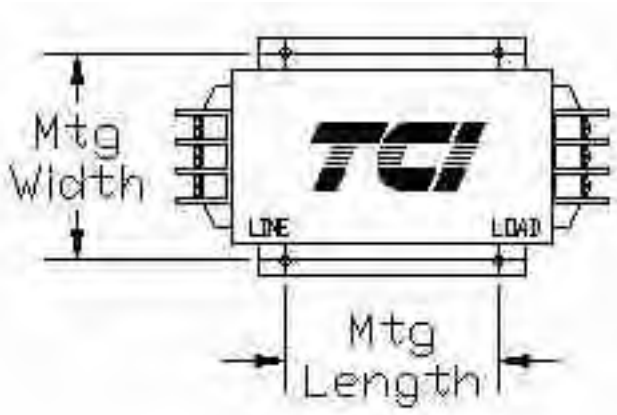
CORRECT Interconnection Layout

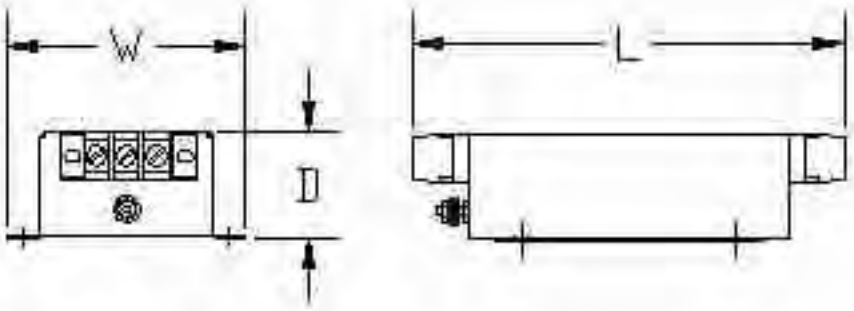


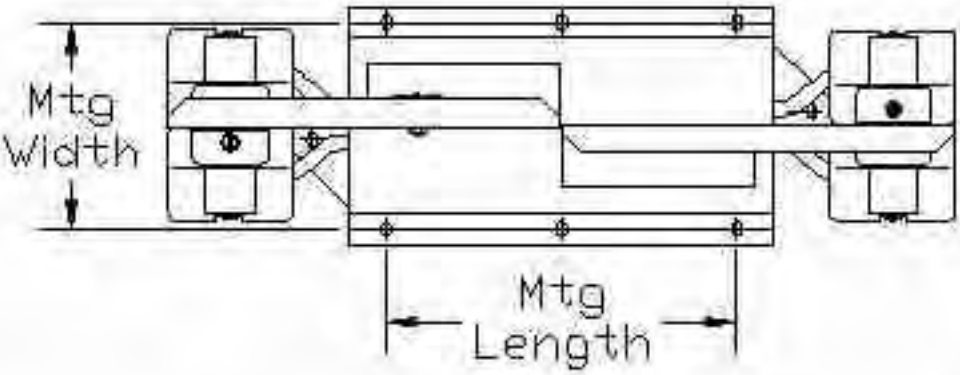
INCORRECT Interconnection Layout

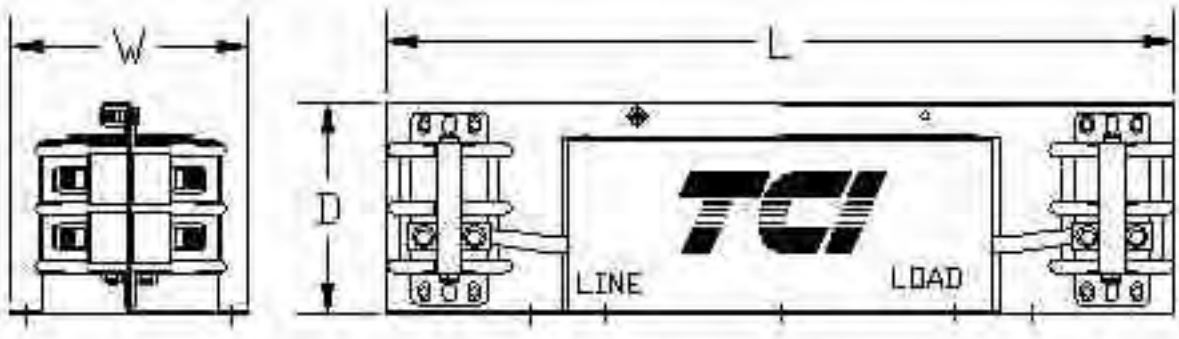


Mounting Diagrams









SPECS

KRF Product Specifications

- Available in 480V and 600V designs
- Recognized to UL 1283
- 480 Volt design is CE approved
- 3 Year Warranty
- Available in sizes from 8 - 608 Amps
- Advanced 2-stage filtering
- Lightweight and compact
- Common mode attenuation within critical 150kHz to 30MHz frequency range
- 100% tested for Hipot, Leakage Current, Ground Continuity and Component Value
- Ambient temperature range: 0° C to 40°C (operating @ rated I)
- Humidity range: 0 - 95% RH

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