HARMONICGUARD®
LOW CAPACITANCE

HarmonicGuard® Series Drive-Applied Harmonic Filter

Installation, Operation, and Maintenance Manual

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Performance Guarantee

Select and install the appropriate HarmonicGuard® Low Capacitance Harmonic Filter in a variable torque, variable frequency AC drive application, within our published technical specifications and we guarantee that the input current distortion will be less than or equal to 5% THID for standard HGL Series filters at full load. If a properly sized and installed filter fails to meet its specified THID level, TCI will provide material for necessary modifications or replacement filter at no charge.

HG filters can also provide similar performance in other drive applications such as constant torque, DC drives and other phase controlled rectifiers, but actual THID levels can vary by load and/or speed and therefore cannot be guaranteed.

Consult factory for assistance when applying HGL filters on these types of equipment.

MINIMUM SYSTEM REQUIREMENTS:

The guaranteed performance levels of this filter will be achieved when the following system conditions are met:

Frequency: 60Hz ± 0.75Hz

System Voltage: Nominal System Voltage (line to line) ±10%

Balanced Line Voltage: Within 0.5%

Background Voltage Distortion: < 0.5% THVD

The input VFD current waveform shall be consistent with that of a VFD with 5% AC line reactance at full load and a 5% source impedance.

NOTE: The presence of background voltage distortion will cause motors and other linear loads to draw harmonic currents.

Additional harmonic currents may flow into the HGL filter if there is harmonic voltage distortion already on the system.

Revision	Description	Date
A	Release	10/19/2017
B	Added Additional Options Updated Part Number	11/22/2017
C	Updates to Watts loss table	12/12/2018

Table of Contents

Introduction

Safety Instructions Overview

This section provides the safety instructions which must be followed when installing, operating, and servicing the HarmonicGuard® Low Capacitance (HGL) filter. If neglected, physical injury or death may follow, or damage may occur to the filter or equipment connected to the HGL filter. The material in this chapter must be read and understood before attempting any work on, or with, the product.

The HGL filter is intended to be connected to the input terminals of one or more VFDs. Three-phase power is connected to the input terminals of the HGL and power is supplied to the VFD or VFDs through the HGL. The instructions, and particularly the safety instructions, for the VFDs, motors, and any other related equipment must be read, understood, and followed when working on any of the equipment.

Warnings and Cautions

This manual provides two types of safety instructions. Warnings are used to call attention to instructions that describe steps that must be taken to avoid conditions that can lead to a serious fault condition, physical injury, or death.

Cautions are used to call attention to instructions that describe steps that must be taken to avoid conditions that can lead to a malfunction and possible equipment damage.

Warnings

Readers are informed of situations that can result in serious physical injury and/or serious damage to equipment with warning statements highlighted by the following symbols:

Warning 	Dangerous Voltage Warning: warns of situations where high voltage can cause physical injury and/or damage equipment. The text next to this symbol describes ways to avoid the danger.
Warning 	General Warning: warns of situations that can cause physical injury and/or damage equipment by means other than electrical. The text next to this symbol describes ways to avoid the danger.
Warning 	Electrostatic Discharge Warning: warns of situations in which an electrostatic discharge can damage equipment. The text next to this symbol describes ways to avoid the danger.

Cautions

Readers are informed of situations that can lead to a malfunction and possible equipment damage with caution statements:

Caution 	General Caution: identifies situations that can lead to a malfunction and possible equipment damage. The text describes ways to avoid the situation.

General Safety Instructions

These safety instructions are intended for all work on the HGL. Additional safety instructions are provided at appropriate points on other sections of this manual.

Warning 	Be sure to read, understand, and follow all safety instructions.
Warning 	Only qualified electricians should carry out all electrical installation and maintenance work on the HGL filter.
Warning 	All wiring must be in accordance with the National Electrical Code (NEC) and/or any other codes that apply to the installation site.
Warning 	Disconnect all power before working on the equipment. Do not attempt any work on a powered HGL filter.
Warning 	The HGL filter, drive, motor, and other connected equipment must be properly grounded.
Warning 	After switching off the power, always allow 5 minutes for the capacitors in the HGL filter and in the drive to discharge before working on the HGL, the drive, the motor, or the connecting wiring. It is a good idea to check with a voltmeter to make sure that all sources of power have been disconnected and that all capacitors have discharged before beginning work.

Receiving Inspection and Storage

Thank you for selecting the HarmonicGuard® Low Capacitance (HGL) filter. TCI has produced this filter for use in many variable frequency drive (VFD) applications that require input power line harmonic current reduction. This manual describes how to install, operate and maintain the HGL filter.

Receiving Inspection

The HGL filter has been thoroughly inspected and functionally tested at the factory and carefully packaged for shipment. When you receive the unit, you should immediately inspect the shipping container and report any damage to the carrier that delivered the unit. Verify that the part number of the unit you received is the same as the part number listed on your purchase order.

TCI Limited Warranty Policy

TCI, LLC ("TCI") warrants to the original purchaser only that its products will be free from defects in materials and workmanship under normal use and service for a period originating on the date of shipment from TCI and expiring at the end of the period described below:

Product Family	Warranty Period
KLR, KDR	For the life of the drive with which they are installed.
KLC, KLCUL, KMG, V1k	One (1) year of useful service, not to exceed 18 months from the date of shipment.
HGP, HGL, KH, 3H, KRF	Three (3) years from the date of shipment.
KCAP, KTR, KMP	Five (5) years from the date of shipment.
All Other Products	One (1) year of useful service, not to exceed 18 months from the date of shipment.

The foregoing limited warranty is TCI's sole warranty with respect to its products and TCI makes no other warranty, representation, or promise as to the quality or performance of TCI's products. THIS EXPRESS LIMITED WARRANTY IS GIVEN IN LIEU OF AND EXCLUDES ANY AND ALL EXPRESS OR IMPLIED WARRANTIES INCLUDING, WITHOUT LIMITATION, ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

This warranty shall not apply if the product was:

a) Altered or repaired by anyone other than TCI;
b) Applied or used for situations other than those originally specified; or
c) Subjected to negligence, accident, or damage by circumstances beyond TCI's control, including but not limited to, improper storage, installation, operation, or maintenance.

If, within the warranty period, any product shall be found in TCI's reasonable judgment to be defective, TCI's liability and the Buyer's exclusive remedy under this warranty is expressly limited, at TCI's option, to (i) repair or replacement of that product, or (ii) return of the product and refund of the purchase price. Such remedy shall be Buyer's sole and exclusive remedy. TCI SHALL NOT, IN ANY EVENT, BE LIABLE FOR INCIDENTAL DAMAGES OR FOR CONSEQUENTIAL DAMAGES INCLUDING, BUT NOT LIMITED TO, LOSS OF INCOME, LOSS OF TIME, LOST SALES, INJURY TO PERSONAL PROPERTY, LIABILITY BUYER INCURS WITH RESPECT TO ANY OTHER PERSON, LOSS OF USE OF THE PRODUCT OR FOR ANY OTHER TYPE OR FORM OF CONSEQUENTIAL DAMAGE OR ECONOMIC LOSS.

The foregoing warranties do not cover reimbursement for removal, transportation, reinstallation, or any other expenses that may be incurred in connection with the repair or replacement of the TCI product.

The employees and sales agents of TCI are not authorized to make additional warranties about TCI's products. TCI's employees and sales agent's oral statements do not constitute warranties; these shall not be relied upon by the Buyer, and are not part of any contract for sale. All warranties of TCI embodied in this writing and no other warranties are given beyond those set forth herein.

TCI will not accept the return of any product without its prior written approval. Please consult TCI Customer Service for instructions on the Return Authorization Procedure.

Storage Instructions

If the HGL filter is to be stored before use, be sure that it is in a location that conforms to published storage humidity and temperature specifications stated in the HarmonicGuard® Low Capacitance Filter Technical Specifications. Store the unit in its original packaging.

Pre-installation Planning

Verify the Application

HGL Ratings

Make sure that the HGL filter is correct for the application. The voltage rating of the filter must match the input voltage rating of the connected drive. The horsepower and current ratings of the filter must be appropriate for the connected load.

Select a Suitable Location

Environment

Locating the HGL in a suitable environment will help ensure proper performance and a normal operating life. Refer to the environmental specifications listed in Table 2 and/or noted on the drawings furnished with the unit.

Warning 	Unless specifically labeled as approved for such use, this equipment is not suitable for use in an explosive atmosphere or in a "Hazardous (Classified) Location" as defined in article 500 of the National Electrical Code (NEC).

The unit must be installed in an area where it will not be exposed to:

- Direct sunlight
- Rain or dripping liquids (unless filter is in a Type 3R enclosure)
- Corrosive liquids or gasses
- Explosive or combustible gases or dust
- Excessive airborne dirt and dust
- Excessive vibration

Working Space

Provide sufficient access and working space around the unit to permit ready and safe installation, operation and maintenance. Make sure that the installation conforms to all working space and clearance requirements of the National Electrical Code (NEC) and/or any other applicable codes. Provide sufficient unobstructed space to allow cooling air to flow through the unit. Keep the widest or deepest portion of the unit enclosure having ventilation openings a minimum of six inches from adjacent walls or other equipment. The unit enclosure sides that do not have ventilation openings should be kept a minimum of three inches from adjacent walls or other equipment.

Mounting an Open Panel Unit

If you are mounting an open panel unit in your own enclosure, you must provide an enclosure that is adequately sized and ventilated sufficiently to prevent overheating. The rating and dimension tables for open panel units list the watts of heat loss dissipated by the HGL filter. The maximum temperature of the air around the HGL filter capacitors, line reactor, and tuning reactor should not exceed 50°C (122°F).

Power Wiring

When selecting a mounting location for the HGL filter, plan for the routing of the power wiring.

Route the conduit and wiring from the power source to the filter and then to the VFD.

The HGL is provided with internal fuses.

Installation Guidelines

Mounting

The HGL must be mounted vertically on a smooth, solid surface, free from heat, dampness, and condensation.

Wiring

Cable Entry Locations

The enclosed HGL filters are not provided with enclosure wiring knockouts. A location can be selected at the time of installation. Typical or recommended cable entry locations are shown in the drawings section of this manual.

Field Wiring Connection Terminals

Compression type terminals are provided for all field wiring connections. The wire size capacity ranges and tightening torques for all field wiring connections are listed in the drawings and other information shipped with the unit.

Grounding

The HGL panel equipment-grounding lug must be connected to the ground of the wiring system. The equipment-grounding connection must conform to the requirements of the National Electrical Code (NEC) and/or any other codes that apply to the installation site. The ground connection must be made using a wire conductor. Metallic conduit is not a suitable grounding conductor. The integrity of all ground connections should be periodically checked.

Power Wiring

Caution 	Use copper wire that is appropriate for the voltage and current rating of the equipment. The wire selection must conform to the requirements of the National Electrical Code (NEC) and/or other applicable electrical codes. For units rated less than 100 amps, use wire with an insulation temperature rating of 60°C or higher. For units rated 100 amps or more, use wire with an insulation temperature rating of 75°C or higher.

Connect three-phase power of the appropriate voltage and current capacity to the circuit protective device to the HGL input power terminals.

Note: in large units, the input power conductors are connected directly to the input terminals on the line reactors.

Connect the output terminals of the HGL to the input power terminals of the VFD.

Note: in large units, the output power conductors are connected directly to the output terminals on the line reactors. Refer to the VFD installation instructions for additional information.

HGL Filter Operation

Caution	Thoroughly check the installation before applying power and operating the equipment for the first time.

Before Applying Power for the First Time

Inspect the installation to make sure that all equipment has been completely and correctly installed in accordance with the ***Installation Guidelines*** section of this manual.

- Check to see that the cooling fan(s) are operating in units so equipped.
- Check to make sure power connections are torqued to recommended torque value.

Operation

Since the HGL is a passive filter, it is always operating whenever the drive is operating.

Installation

Intended Audience

This manual is intended for use by all personnel responsible for the installation, operation and maintenance of the HGL filters. Such personnel are expected to have knowledge of electrical wiring practices, electronic components and electrical schematic symbols.

Additional Information

Caution	This manual provides general information describing your HGL filter. Be sure to carefully review the more specific information that is provided by the drawings shipped with the unit. Information provided by the drawings takes precedence over the information provided in this manual. The ratings, dimensions and weights given in this manual are approximate and should not be used for any purpose requiring exact data. Contact the factory in situations where certified data is required. All data is subject to change without notice.

Installation Checklist

The following are the key points to be followed for a successful installation. These points are explained in detail in the following sections of this manual.

- ☐ Make sure that the installation location will not be exposed to direct sunlight, corrosive or combustible airborne contaminants, excessive dirt or liquids.
- ☐ Select a mounting area that will allow adequate cooling air and maintenance access.
- ☐ Make sure that all wiring conforms to the requirements of the National Electrical Code (NEC) and/or other applicable electrical codes.
- ☐ Connect the HGL equipment-grounding lug to the system ground of the premises wiring system. Use a properly sized grounding conductor.
- ☐ Connect three-phase power to the input terminals of the HGL, L1, L2 & L3.
- ☐ Connect the output power terminals, of the HGL, T1, T2 & T3, to the input power terminals of the VFD.

Maintenance and Service

HGL Filter Reliability and Service Life

The HGL has been designed to provide a service life that equals or exceeds the life of the VFD. It has been thoroughly tested at the factory to assure that it will perform reliably from the time it is put into service. It is recommended that the following maintenance is performed once a year to ensure that the HGL filter will always operate reliably and provide the expected service life.

Periodic Maintenance

Warning	Only qualified electricians should carry out all electrical installation and maintenance work on the HGL filter. Disconnect all sources of power to the drive and HGL before working on the equipment. Do not attempt any work on a powered HGL.

Check to see that the installation environment remains free from exposure to excessive dirt and contaminants. Refer to the ***Pre-installation Planning*** section of this manual.

Check to make sure that the enclosure ventilation openings are clean and unobstructed.

Clean the air filter in units that have filtered air inlets. Clean as often as necessary to prevent dirt build-up from impeding air flow.

Check the operation of the cooling fan

Inspect the interior of the enclosure for signs of overheated components. Clean the interior of the enclosure whenever excess dirt has accumulated.

Torque all power wire connections, loose connections can overheat and damage the filter.

All electrical connections must be re-torqued annually.

Troubleshooting

Warning 	Only qualified electricians should carry out all electrical installation and maintenance work on the HGL filter. Disconnect all sources of power to the drive and HGL before working on the equipment. Do not attempt any work on a powered HGL filter. The harmonic filter contains high voltages and capacitors. Wait at least five minutes after disconnecting power from the filter before you attempt to service the harmonic filter. Check for zero voltage between all terminals on the capacitors. Also, check for zero voltage between all phases of the line side of the fuses, Fu1(a)–Fu2(a)–Fu3(a), and all input terminals L1, L2 and L3 of the line reactor (KDR). All setup, maintenance, and troubleshooting must be done by a qualified electrician. Failure to follow standard safety procedures may result in death or serious injury.

Note: when disconnecting wires from components and terminations, mark the wires to correspond to their component and terminal connection.

Replacement Parts

If replacement parts are needed, please contact your TCI representative. To ensure that the HGL filter continues to perform to its original specifications, replacement parts should conform to TCI specifications.

Fuse Specifications

Always refer to the drawings and other information shipped with your unit. Consult applicable wiring codes, UL and NEC, for current limiting and disconnect requirements.

100 kA SCCR Fusing Requirements

See Table 1 for line fusing requirements that must be supplied to comply with the 100kA SCCR.

Table 1 – Customer Installed Line Fuse Requirements to comply with the 100kA SCCR

Voltage	Size	Customer Installed Line Fuse Requirements to Comply with the 100 kA SCCR
600	≤ 40	Use appropriately rated Class J, T, or L fuse less than or equal to 60 A
600	> 40	No requirement for SCCR
480	≤30	Use appropriately rated Class J, T, or L fuse less than or equal to 60 A
480	> 30	No requirement for SCCR

Provisional 480V Fuse Table

The fuse tables, provided below (Tables 2 and 3), show the fuse ratings of the included branch circuit fuse internal to the HGL unit as a fuse replacement reference.

The fuse tables also show a typical line fuse or circuit breaker current rating for overcurrent protection, given the unit's nameplate power rating, if necessary, based on the installation. The line current fuses listed below are typical values given the unit power rating, not required values. Line fusing ratings are determined by the installer, based on input conductor sizing and protection required for downstream equipment. Any drawings or documentation included with the unit literature kit take precedence over the fuse tables below.

Note that to achieve a 100kA SCCR, the customer provided line fuse must be installed as per the requirements in Table 1 and sized following NEC (National Electrical Code) guidelines for the source conductors selected by the installer. The branch fuses are required to be installed at the shown ratings.

Table 2 – Fuse Table for HGL 480 Volt, 60Hz Models

HGL Rating (HP)	Branch Circuit Fuse Current Rating (Included Internal to HGL Unit) (J or T)	Typical Line Current Fuse or Circuit Breaker Rating (Customer Supplied)
20	20	60
25	20	60
30	20	60
40	20	60
50	25	80
60	30	90
75	30	125
100	45	150
125	60	200
150	70	225
200	90	300
250	125	350
300	150	450
350	175	500
400	175	600
450	200	600
500	225	750
600	250	800
700	300	1000
800	350	1200
900	400	1300

Table 3 – Fuse Table for HGL 600 Volt, 60Hz Models

HGL Rating (HP)	Branch Circuit Fuse Current Rating (Included Internal to HGL Unit) (J or T)	Typical Line Current Fuse or Circuit Breaker Rating (Customer Supplied)
20	20	30
25	20	60
30	20	60
40	20	60
50	20	70
60	30	80
75	40	100
100	40	125
125	50	175
150	60	200
200	70	250
250	90	300
300	110	350
350	125	400
400	150	450
450	175	500
500	175	550
600	200	650
700	250	750
800	300	900
900	300	1000

Factory Contacts and Tech Support

For technical support, contact your local TCI distributor or sales representative. You can contact TCI directly at 800-TCI-8282. Select "Customer Service" or "Tech Support" and have your HGL filter nameplate information available.

Product Description

HGL Drive-Applied Filter

The HGL is a drive-applied harmonic filter designed and developed by TCI to reduce the harmonic currents drawn from the power source by VFDs. The published HGL voltage, Power (Hp or kW) and current ratings apply to matching power (Hp or kW) rated standard VFDs with six-pulse diode bridge rectifiers. The HGL may also be sized to filter other loads such as SCR six-step drives, SCR Direct Current (DC) motor drives, thyristor furnaces, battery chargers, electroplating supplies or other types of non linear loads. In many cases, the filter power rating (Hp or kW) will differ from load power rating (Hp or kW). Please contact TCI Technical Support for additional information and support on sizing HGL harmonic filters for your non six-pulse diode front end VFD applications.

The HGL is a passive filter connected in series with the input terminals of a VFD or several VFDs that operate as a group. It is designed to provide a low impedance path for the major harmonic currents demanded by the drive. The filter is a stand-alone device that can be furnished in its own enclosure and mounted adjacent to the drive. It is also available on an open panel for mounting within an enclosure with the drive or other equipment.

The HGL filters consist minimally of the following features and components:

- A KDR tuned series reactor to prevent system interaction and improve filter performance
- An L-C-L filter circuit with:
- A TCI 3-phase tuning reactor specifically designed for the HGL filter
- High-endurance, harmonic-rated capacitors
- Larger filters may have multiple tuned circuits. Consult fuse tables to determine if the filter in question has “parallel” branches.
- Bleeder resistors to ensure safe capacitor discharge upon filter shutdown
- Cooling fans (on select models) to ensure adequate cooling and safe operating temperatures
- Compression terminals for ease and integrity of all power and control wiring
- Fuses, sized to protect the capacitor wiring

Nameplate Data

The following information is marked on the nameplate:

- Part number: encoding is explained on the following page
- FLA: the rated continuous operating current (RMS amps)
- System Voltage: the rated 3-phase line voltage (RMS volts)
- Hz: the rated frequency
- Phase: 3 – The HGL filter is designed for use only with 3-phase power.
- Drawing #: outline and mounting dimension drawing number
- Schematic #: schematic diagram drawing number
- Manufacturing #: for TCI internal use
- Enclosure Type: UL designation or "Open" panel construction

Part Number Encoding

Figure 1 identifies the significance of each character in the HGL part number. The example part number, HGL0150AW1S0000 designates an HGL filter that is rated 150 HP, 480 volts, 60 Hz. It includes a line reactor, tuning reactor, and capacitors in a UL Type 1 enclosure. It is designed for use with a 150 HP drive.

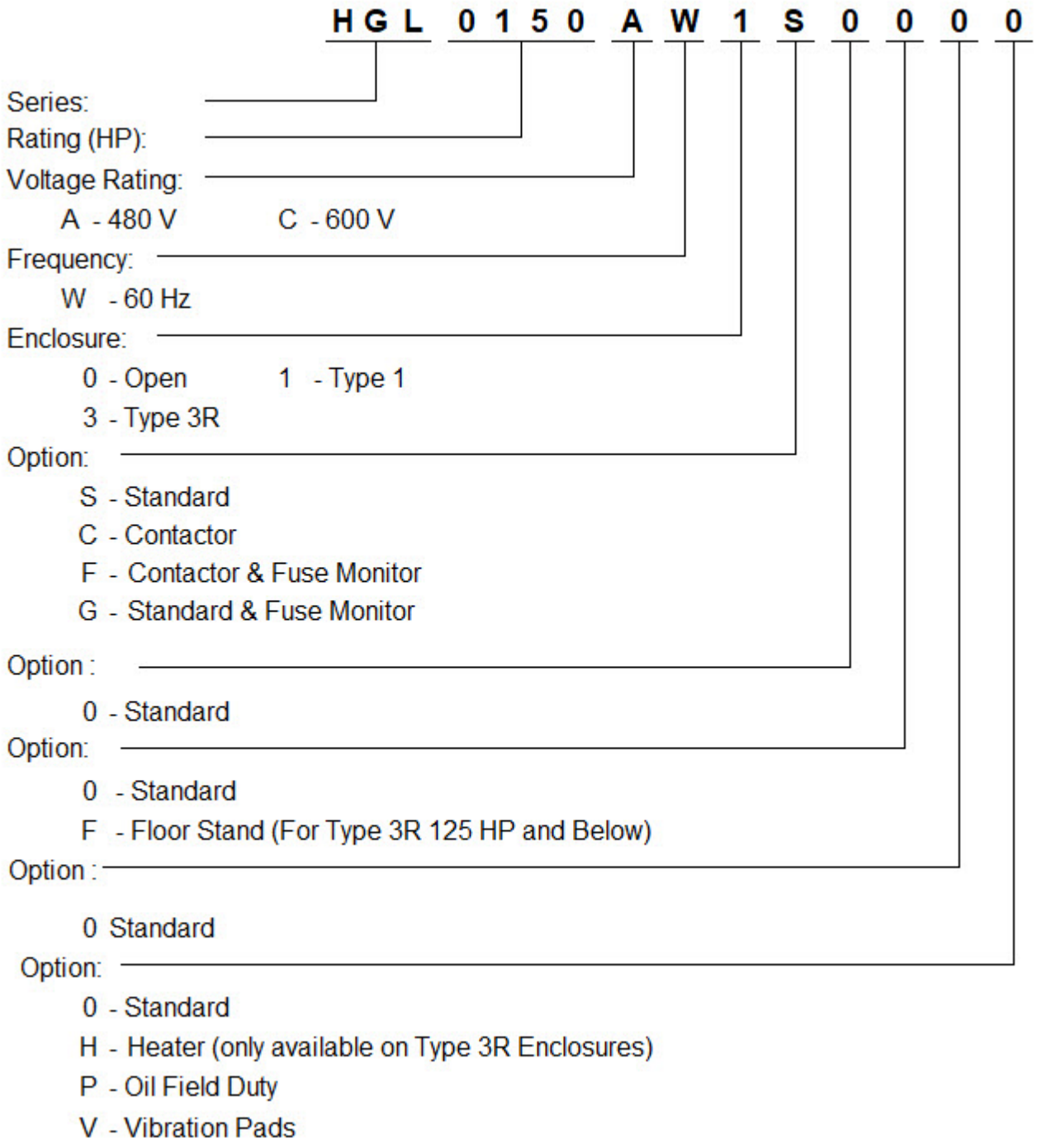

Figure 1 – HGL Part Number Encoding

Product Technical Specifications

Table 4 lists the major technical specifications for the HGL Filter.

Table 4 – HGL Technical Specifications

Voltage ratings	60 Hz, 3 Phase: 480V/600 VAC
kVar ratings	0.15 kVAR/HP
Load types	3-phase diode bridge rectifier loads such as PWM AC drives
Load power range	20-900HP for 480V/600V units. Power range varies depending on system voltage
Current ratings	The included series reactors can tolerate 200% of rated current for no more than 3 minutes.
SCCR (short circuit current rating)	Standard rating is 100kA.
Maximum elevation	6,500 feet (2,000 meters) as standard.
Maximum ambient operating temperature	50°C (122°F) – Open Panel; 40°C (104°F) – Enclosed Panel. Product must be equipped with special cooling provisions for operation above this temperature.
Maximum ambient storage temperature	60°C (140°F)
Maximum humidity, operating or storage	95%, non-condensing.
Enclosure options	UL Type 1 enclosure UL Type 3R enclosure Open Panel
Agency approvals or certifications	c UL US UL and cUL Listed to UL508A
Insertion Impedance	10% at full load current
Fusing and protection:	All units have internal fuse protection for the capacitor branch circuit
Performance Guarantee	
To meet the requirements for the Performance Guarantee the minimum system conditions must conform to the following: • At least a 5% Source inductance • The input VFD current waveform shall be consistent with that of a VFD with 5% AC line reactance at full load	

Table 5 – 480V HGL Watts loss

HP	Open	Type 1	Type 3R
20	205	208	208
25	341	346	346
30	239	242	242
40	447	54	454
50	518	525	525
60	608	617	617
75	560	569	569
100	760	771	771
125	871	884	884
150	1046	1062	1062
200	907	921	921
250	1217	1235	1235
300	1454	1476	1476
350	1411	1432	1432
400	1548	1571	1571
450	1842	1869	1869
500	2053	2083	2083
600	1976	2005	2005
700	2225	2258	2258
800	2419	2455	2455
900	2577	2616	2616

Table 6 – 600V HGL Watts loss

HP	Open	Type 1	Type 3R
20	338	343	343
25	304	309	309
30	293	297	297
40	341	346	346
50	511	519	519
60	600	609	609
75	734	745	745
100	736	747	747
125	920	934	934
150	1182	1200	1200
200	976	991	991
250	1306	1325	1325
300	1452	1474	1474
350	1766	1792	1792
400	1566	1589	1589
450	2079	2110	2110
500	1984	2014	2014
600	2034	2064	2064
700	2341	2376	2376
800	2726	2766	2766
900	3080	3126	3126

Standard Option (S)

The Standard Option includes high quality harmonic-grade capacitors and line reactors. This filter will meet the majority of application requirements found today. This cost effective product is available as an open panel version, in a UL Type 1, UL Type 12, or in an UL Type 3R enclosure. The open panel is perfect for inclusion in a MCC section or easy installation into industry standard enclosures. The UL Type 1 enclosed units maintain the same vertical profile as the open panel design. This design is perfect for applications where floor space is at a premium. The UL Type 3R enclosure protects the filter from harsh conditions.

Product Description

HGL S Option Filter

The HGL is a drive-applied harmonic filter designed and developed by TCI to reduce the harmonic currents drawn from the power source by VFDs. The published HGL voltage, Power (Hp or kW) and current ratings apply to matching power (Hp or kW) rated standard VFDs with six-pulse diode bridge rectifiers. The HGL may also be sized to filter other loads, such as SCR six-step drives, SCR Direct Current (DC) motor drives, thyristor furnaces, battery chargers, electroplating supplies or other types of non linear loads. In many cases, the filter power rating (Hp or kW) will differ from load power rating (Hp or kW). Please contact TCI Technical Support for additional information and support on sizing HGL harmonic filters for your non six-pulse diode front end VFD applications.

The HGL harmonic filter is a passive filter connected in series with the input terminals of a VFD or several VFDs that operate as a group. It is designed to provide a low impedance path for the major harmonic currents demanded by the VFD. The filter is a stand-alone device that can be furnished in its own enclosure and mounted adjacent to the VFD. It is also available on an open panel for mounting within an enclosure with the VFD or other equipment.

The HGL Standard Option consists of the following standard features and components:

- A KDR tuned series reactor.
- A TCI 3-phase tuning reactor specifically designed for the HGL filter.
- High-endurance, harmonic-rated capacitors.
- Bleeder resistors to ensure safe capacitor discharge upon filter shutdown, located on capacitors.
- Cooling fans (on select models) to ensure adequate cooling and safe operating temperatures.
- Control Power transformer on enclosed units requiring auxiliary cooling fans.
- Compression terminals for ease and integrity of all power and control wiring.
- Fuses

Contactor Option (C)

The contactor option shall allow the user to open and close a contact that will remove the capacitors from the circuit. Operation shall be controlled through a contact input on the customer's equipment.

The Contactor Option includes a contactor, control power transformer and connection terminals in the filter circuit which allows the VFD user to control the insertion of this circuit through the use of a relay contact in the VFD. It is recommended that the VFD contact be programmed to open the contactor below 33% motor power. For variable torque (fan) loads this will be approximately below 70% speed, so the at-speed contact may be used. This reduces the possibility of leading power factor interacting with other devices on the power system. Contactor logic should also maintain the contactor closed in cases where the VFD is bypassed and the filter is not bypassed.

Product Description

HGL C Option Filter

The HGL is a drive-applied harmonic filter designed and developed by TCI to reduce the harmonic currents drawn from the power source by VFDs. The published HGL voltage, Power (Hp or kW) and current ratings apply to matching power (Hp or kW) rated standard VFDs with six-pulse diode bridge rectifiers. The HGL may also be sized to filter other loads such as SCR six-step drives, SCR Direct Current (DC) motor drives, thyristor furnaces, battery chargers, electroplating supplies or other types of non linear loads. In many cases, the filter power rating (Hp or kW) will differ from load power rating (Hp or kW). Please contact TCI Technical Support for additional information and support on sizing HGL harmonic filters for your non six-pulse diode front end VFD applications.

The HGL harmonic filter is a passive filter connected in series with the input terminals of a VFD or several VFDs that operate as a group. It is designed to provide a low impedance path for the major harmonic currents demanded by the VFD. The filter is a stand-alone device that can be furnished in its own enclosure and mounted adjacent to the VFD. It is also available on an open panel for mounting within an enclosure with the VFD or other equipment.

The HGL Contactor Option consists of the following standard features and components:

- A KDR tuned series reactor.
- A TCI 3-phase tuning reactor specifically designed for the HGL filter.
- High-endurance, harmonic-rated capacitors.
- Bleeder resistors to ensure safe capacitor discharge upon filter shutdown, located on capacitors.
- Filter enable/disable contactor with protection and drive interlock provisions.
- Cooling fans (on select models) to ensure adequate cooling and safe operating temperatures.
- Control power transformer
- Compression terminals for ease and integrity of all power and control wiring.
- Fuses

Fuse Monitor without Contactor Option (G)

The Fuse Monitor without Contactor Option includes a voltage monitor module and relay that can be connected to a VFD or other device. The fuse monitor will indicate a fuse failure and communicate this condition through the relay to a connected device.

Product Description

HGL G Option Filter

The HGL is a drive-applied harmonic filter designed and developed by TCI to reduce the harmonic currents drawn from the power source by VFDs. The published HGL voltage, Power (Hp or kW) and current ratings apply to matching power (Hp or kW) rated standard VFDs with six-pulse diode bridge rectifiers. The HGL may also be sized to filter other loads such as SCR six-step drives, SCR Direct Current (DC) motor drives, thyristor furnaces, battery chargers, electroplating supplies or other types of nonlinear loads. In many cases, the filter power rating (Hp or kW) will differ from load power rating (Hp or kW). Please contact TCI Technical Support for additional information and support on sizing HGL harmonic filters for your non six-pulse diode front end VFD applications.

The HGL harmonic filter is a passive filter connected in series with the input terminals of a VFD or several VFDs that operate as a group. It is designed to provide a low impedance path for the major harmonic currents demanded by the VFD. The filter is a stand-alone device that can be furnished in its own enclosure and mounted adjacent to the VFD. It is also available on an open panel for mounting within an enclosure with the VFD or other equipment.

The HGL G Option consists of the following standard features and components:

- A KDR tuned series reactor
- A TCI 3-phase tuning reactor specifically designed for the HGL filter
- High-endurance, harmonic-rated capacitors
- Bleeder resistors to ensure safe capacitor discharge upon filter shutdown, located on capacitors
- Cooling fans (on select models) to ensure adequate cooling and safe operating temperatures
- Control Power transformer on enclosed units requiring auxiliary cooling fans
- Compression terminals for ease and integrity of all power and control wiring
- Fuses
- Voltage monitor module to report status of fuses to control

Filter and Fuse Monitor Operation

HGL Filter Overview

The HarmonicGuard® Low Capacitance (HGL) Filter provides a low impedance path for the major harmonic currents demanded by Variable Frequency Drives (VFDs). This greatly reduces the amount of harmonic currents flowing through the electrical power distribution system, bringing those harmonic currents in line with the IEEE-519 standard for harmonic distortion mandated by an increasing number of utilities.

The HGL Filter includes branch fuses on the harmonic trap circuit capacitors. These fuses are included in the design to prevent damage to the capacitors in the event of excessive harmonic trap current if the filter is misapplied.

HGL Fuse Monitor Overview

The HGL Fuse Monitor Option is used in conjunction with the HGL filter to monitor the status of the HGL branch circuit capacitor fuses and optional contactor. If three-phase power with correct phase sequence is presented to sense terminals of fuse monitor, the SPDT relay contact will change state as illustrated in Table 2. Additionally, the Fuse Monitor Option is used to indicate the state of the optional contactor that allows users to remove the capacitors from the circuit, eliminating the possibility of leading power factor. The HGL Fuse Monitor Option will energize a SPDT relay contact if line power is applied to the filter, the fuses are intact, and the optional contactor was energized and closed. Finally, the Fuse Monitor Option provides the additional benefit of detecting drive input voltage phase reversal and loss of phase.

The HGL Fuse Monitor can be connected to a programmable digital input available on most modern VFDs and/or Programmable Logic Controllers (PLCs). Once the status of the HGL Fuse Monitor is routed to a programmable digital input, the status of the Fuse Monitor can be relayed on the VFDs or PLCs integrated communications field bus or Industrial Ethernet network interface. The Fuse Monitor is available on 480V and 600V HGL filters.

Fuse Monitor Operation and Relay Specifications

The fuse monitor relay contact is a single pole, double throw (SPDT) dry type contact. Terminal Block connection TBa-7 is the common connection, TBa-6 is the Normally Closed (NC) connection, and TBa-8 is the Normally Open (NO) Connection. If three-phase power with correct phase sequence is presented to sense terminals of fuse monitor, the SPDT relay contact will change state as illustrated in Table 2 below.

Table 2 – Fuse Monitor Operation Modes and Output Table

Operating State	Input Voltage	HGL Filter	N.C. Relay Contact (TBa-6 TBa-7)	N.O. Relay Contact (TBa-7 TBa-8)	Monitor Status LED
No Input Line Voltage	Not Present	X*	Closed	Open	Off
Input Line Voltage has Missing Phase	Phase Loss	X*	Closed	Open	Blinking Red
Input Line Voltage has Phase Reversal	Phase Reversal	X*	Closed	Open	Solid Red
HGL Filter has Blown Trap Fuse	Nominal	Blown Trap Fuse	Closed	Open	Blinking Red or Off
HGL Fuse Monitor has Blown Fuse	Nominal	Blown Monito r Fuse	Closed	Open	Blinking Red or Off
HGL Filter Contactor is Open	Nominal	Contactor Open	Closed	Open	Off
Nominal	Nominal	Contactor Closed	Open	Closed	Solid Green
Nominal	Nominal	No Contactor Option Installed	Open	Closed	Solid Green

*X = don't care condition

** During unit power on / restart monitor LED will be blinking green

Table 3 – HGL Filter Fuse Monitor Relay Contact Specifications

Relay Contact	Location	Contact Rating
Normally Open Contact	(TBa-7 TBa-8)	10A @ 277V AC/ 7A @ 30VDC 1 HP @ 250V AC, 1/2HP @125V AC, C300 Pilot Duty
Normally Closed Contact	(TBa-6 TBa-7)	10A @ 277V AC/ 7A @ 30VDC 1 HP @ 250V AC, 1/2HP @125V AC, C300 Pilot Duty

Vibration Pad Option (V)

The Vibration Pad Option is intended for use in applications which require environmental noise protection. The resilient mounting material is placed between the reactor and the interior of the enclosure and dampens noise produced by the reactor.

The Vibration Pad option is available for all enclosure types.

Floor Stand Option (F)

The Floor Stand Option is intended for use in applications which require the HGL enclosure to be elevated from the floor. The Floor Stand option consists of 12" steel feet available for Type 3R enclosures 125hp and below.

Oilfield Duty Option (P)

The Oilfield Duty Option features components designed specifically for oil and gas field applications to handle the additional electrical stress. Designed for cyclical loads these units will be available in Type 3R enclosures and will be for use with HP ranges from 40 to 200HP.

Heater Option (H)

The Heater Option is intended for use in applications which require the environmental protection of a NEMA 3R enclosure. The heater is mounted to the interior of the enclosure and protects sensitive electronic equipment from the harmful effects of corrosion and condensation.

The Heater option is available for all 3R enclosures.

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