



Catalog CA.G5HHP.01
G5HHP Drives for Industrial Automation

Date: 9/15/09

YASKAWA

Table of Contents



	Page
G5HHP Drive (G5HHP)	
Description	3
Standard Drives	4
Control Options	6
Communications Options	8
Custom Options	9
Dimensions and Data	10
Software, Drawings, Manuals	12
Technical Training	13
Terms and Conditions	14

This catalog may describe trademarked equipment, which is the property of other companies. These trademarks are the property of the registered owner companies and may include the following:

DeviceNet™, trademark of ODVA.
Profibus®, trademark of PROFIBUS International
Modbus®, trademark of Schneider Automation, Inc.

Other Documents and Manuals are available to support special use or installation of this product. These documents may be provided with the product or upon request. Contact Yaskawa Electric America, Inc. or visit www.yaskawa.com, as required. Documents may include the following:

TM.G5HHP.01... Drive Technical Manual
TM.AFD.12, Profibus-DP Manual
TM.AFD.17, Modbus Plus Manual
DriveWizard, Software and Manual
Option Installation Guides

REVISIONS

Change	Page
Changed revision date	all pages
Deleted Dual Encoder (PG) Feedback option	7
Added Line Regeneration option	9
Revised model numbers	10



The G5HHP drive is a high performance product that produces an output of adjustable voltage and frequency to control the speed of a squirrel cage induction motor. These modular design units have separate converter and inverter sections installed in a common enclosure. Sections can be paralleled to increase capacity. This PWM design provides high starting torque by use of IGBT transistors. The drive provides 3 modes of control and speed accuracy to suit application requirements; V/Hz (2%), sensorless vector (0.1%), or flux vector control (0.01% / motor-mounted PG and drive-mounted PG-X2 card required). Programmability, network capability, and flexibility are outstanding.

Performance Features

- Ratings:
350 to 1500 HP at 460 VAC,
400 to 1750 HP at 600 VAC
- Overload capacity:
150% for 60 sec CT
120% for 60 sec VT
- Starting torque: 150%
- Electronic reversing
- Adjustable accel/decel: 0.1 to 6000 sec
- Controlled speed range:
(1) 40:1, (2) 100:1, (3) 1000:1
- Drive efficiency: 96 to 98%
- Displacement power factor: 0.98
- Output frequency: 0.1 to 150 Hz
- Jog forward and reverse
- Power loss ride-thru: 2 sec
- Inertia ride-thru
- Selectable auto restart after momentary power loss
- Programmable auto restart
(0 to 10 attempts) on resettable fault
- Critical frequency rejection:
3 selectable, adjustable bands

Protective Features

- DC bus CHARGE indicator
- Optically-Isolated controls
- Phase-to-phase / phase-to-neutral short circuit protection
- Ground fault protection
- Electronic motor overload (UL)
- Current and torque limit
- Overtorque/undertorque detection
- Fault circuit: overcurrent, overvoltage, and overtemperature
- Input/output phase loss

Standards and Reliability

- CSA listed
- IEC: 146A
- MTBF: Exceeds 28 years
- Circuit burn-in: 96 hours at 85°C
- Surface mount devices

Control Methods

- Volts/Frequency
- Open Loop Vector
- Closed Loop Flux Vector

Service Conditions

- Ambient service temperature:
-10°C to 40°C (104°F)
- Humidity: non-condensing 95%
- Altitude: to 3300 feet
- Service factor: 1.0
- Input voltage: +10%/-15%, 380 to 460 VAC, 575 to 600 VAC
- Enclosure: NEMA 12 FVFF
- Input frequency: 50/60 Hz \pm 5%
- 3-phase, 3-wire, phase insensitive

Design Features

- 32-bit logic, including 16-bit DSP dependent on rating
- Alpha-numeric operator, removable, multi-lingual, 2 lines x 16 character
- 24 VDC control logic
- Programmable outputs. One form A and two open collector
- Timer function
- RS-232 communication port
- Multi-speed settings: 9 available
- Remote speed reference:
-10 to +10 VDC (20K ohms) or 4 to 20 mA (250 ohms)
- Setpoint (PID) control
- Signal follower: bias and gain
- Analog monitor output:
-10 to +10 VDC proportional to output parameters
- DC bus reactor
- Dual motor parameter sets
- Auto-tune to motor characteristics
- Easy access, parameter groups
- Common bus capability
- Programmable flash ROM, via RS232C, for custom applications
- Run and fault contacts (1A)
- Up / down / hold reference

Additional V/Hz Features

- DC injection braking: ramp or coast to stop, adjustable current limited to 60% motor rating
- Frequency resolution:
0.01 Hz w/ digital ref., 0.06 Hz w/ analog ref.
- Frequency regulation: (15° to 35°C)
0.01% w/ digital ref., 0.1% w/ analog ref.
- Torque boost: full range, auto
- Current limited stall prevention during accel, decel and run
- Synchronized start into rotating motor via speed search
- Volts/hertz ratio: 15 preset and one infinitely-adjustable pattern
- Slip compensation

Additional Vector Control Features

- Speed resolution:
0.01% with digital reference
0.1% with analog reference
- Speed regulation: (15° to 35°C)
(2) 0.1% with digital reference
(3) 0.01% with digital reference
(3) 0.1% analog reference
- (3) Encoder response: 300kHz
- (3) Stall torque: to 150% at zero speed for 1 minute. 100% continuous

Options

- Remote operator stations
- Pressure to electrical transducer
- Input breaker, disconnect, fuses
- Many control interface devices
- RS-485 communication port
- Isolation transformer
- Analog monitor, precision
- Digital or pulse monitor output
- Additional form C contacts (2)
- Dynamic braking
- Dual PG card (digital follower)
- Upload/download software
- (3) Motor-mounted encoder
- (3) PG card, A/B/Z phase line driver, +5 or +12v supply

G5HHP Drives - 350-1750HP, 460 and 600V, 3-phase input, NEMA 12, FVFF enclosure. Model numbers define non-regenerative diode converter or fully regenerative IGBT converter; with or without circuit breaker; Constant Torque (CT) or Variable Torque (VT) ratings (150% or 120% overload respectively for 60 secs).

Rated Input Voltage	Drive Model Number G5HHP____	Converter Type	Circuit Breaker	Rated Output Current (Amps)		Nominal HP ⁽¹⁾	Drive List Price \$
				CT	VT	CT/VT	
460V	BB0400	Diode Non-Regen	None	414	450	350/400	
	BB0800			800	900	700/800	
	BB1200			1200	1350	1000/1000	
	BB1600			1600	1800	1250/1500	
	BB0400PC		Included	414		350	
	BB0800PC			800		700	
	BB1200PC			1200		1000	
	BB1600PC			1600		1250	
	BB0450PC		Included		450	400	
	BB0900PC				900	800	
	BB1350PC				1350	1000	
	BB1800PC				1800	1500	
	BB0400PZ	IGBT Regen	None	414	450	350/400	
	BB0800PZ			800	900	700/800	
	BB1200PZ			1200	1350	1000/1000	
	BB1600PZ			1600	1800	1250/1500	
	BB0400PCZ		Included	414		350	
	BB0800PCZ			800		700	
	BB1200PCZ			1200		1000	
	BB1600PCZ			1600		1250	
	BB0450PCZ		Included		450	400	
	BB0900PCZ				900	800	
	BB1350PCZ				1350	1000	
	BB1800PCZ				1800	1500	

(1) Horsepower rating is based on standard NEMA B 4-pole motor design as represented in NEC table 430.150 Full-Load Current, Three-Phase Alternating Current Motors



G5HHP Drives (Continued)

Rated Input Voltage	Drive Model Number G5HHP ____	Converter Type	Circuit Breaker	Rated Output Current (Amps)		Nominal HP ⁽¹⁾	Drive List Price \$
				CT	VT	CT/VT	
600V	BC0400	Diode Non-Regen	None	414	450	400/450	
	BC0800			800	900	800/900	
	BC1200			1200	1350	1250/1250	
	BC1600			1600	1800	1500/1750	
	BC0400PC		Included	414		400	
	BC0800PC			800		800	
	BC1200PC			1200		1250	
	BC1600PC		1600		1500		
	BC0450PC		Included		450	450	
	BC0900PC				900	900	
	BC1350PC			1350	1250		
	BC1800PC			1800	1750		
	BC0400PZ	IGBT Regen	None	414	450	450	
	BC0800PZ			800	900	900	
	BC1200PZ			1200	1350	1250	
	BC1600PZ			1600	1800	1750	
	BC0400PCZ		Included	414		400/450	
	BC0800PCZ			800		800/900	
	BC1200PCZ			1200		1250/1250	
	BC1600PCZ		1600		1500/1750		
BC0450PCZ	Included			450	450		
BC0900PCZ				900	900		
BC1350PCZ			1350	1250			
BC1800PCZ			1800	1750			

(1) Horsepower rating is based on standard NEMA B 4-pole motor design as represented in NEC table 430.150 Full-Load Current, Three-Phase Alternating Current Motors



Control Options

Control Options - These cards, cables and devices add control functionality to the standard drive. Items are factory mounted and wired.

Analog Input Options

Analog Input (14 Bit). This option provides for the interface of 2 high resolution analog inputs to the drive.

Signal levels (fixed):

- 1 channel, 0 to 10VDC (20kOhm)
- 1 channel, 4 to 20mADC (250Ohm)

Mounts at option connector 2CN

Model No. AI-14U..... List \$

Analog Input (13 Bit + Sign). This option provides for the interface of 3 high resolution analog inputs to the drive.

Signal levels (individually selectable):

- 0 to ±10VDC (20kOhm),
- 4 to 20mADC (250Ohm)

Mounts at option connector 2CN

Model No. AI-14B..... List \$

Analog Output Options

Analog Output (8 Bit). This option provides 2 signals for remote metering of any two of the drive's "U1" monitors. These are in addition to the two standard analog outputs.

Signal levels (fixed):

- 0 to 10VDC (20kOhm)

Mounts at option connector 3CN

Model No. AO-08 List \$

Analog Output (11 Bit + Sign). This option provides 2 signals for remote metering of any two of the drive's "U1" monitors. These are in addition to the two standard analog outputs.

Signal levels (individually selectable):

- 0 to ±10VDC (20kOhm)

Mounts at option connector 3CN

Model No. AO-12 List \$

Analog Output, Isolated (11 Bit + Sign). This option provides 2 isolated signals for remote metering of any two of the drive's "U1" parameters. These are in addition to the two standard analog outputs.

Signal levels (individually selectable):

- 0 to ±10VDC (20kOhm),
- 0 to 20mADC (500Ohm max),
- 4 to 20mADC (500Ohm max)

Mounts at option connector 3CN

Model No. AO-001 (formerly AO-12B2) List \$

Digital Input Options

Digital Input (8 Bit). This option provides for the interface of an 8 bit digital input (binary or BCD) to the drive.

Mounts at option connector 2CN

Model No. DI-08..... List \$

Digital Input (12 or 16 Bit). This option provides for the interface of a 12 or 16 bit digital input (binary or BCD) to the drive.

Mounts at option connector 2CN

Model No. DI-16H2 List \$



Control Options (continued)

Digital Output Options

Digital Output (2 Channel). This option provides 2 additional digital outputs for use in monitoring the status outputs of the drive. Signal levels:

2 channels, Form C, 250VAC, 30VDC, 1A

Mounts at option connector 3CN

Model No. DO-02C.....List \$

Digital Output (8 Channel). This option provides 8 additional digital outputs for use in monitoring the status outputs of the drive. Signal levels:

2 channels, Form A, 250VAC, 30VDC, 1A

6 channels, PHC, 48VDC, 50mA, Shared Common

Mounts at option connector 3CN

Model No. DO-08List \$

Encoder Feedback Options

Single Encoder (PG) Feedback - Line Driver. This option provides velocity and direction feedback from an encoder. This is primarily used for motor speed feedback in closed loop flux vector control. A 5VDC buffered output is also included.

Signal levels:

5 or 12VDC differential line driver with compliments

Maximum input frequency: 300kHz

Phases A and B (Z required with some custom software)

Mounts at option connector 4CN

Model No. PG-X2.....List \$

Single Encoder (PG) Feedback - Open Collector. This option provides velocity and direction feedback from an encoder. This is primarily used for motor speed feedback in closed loop flux vector control. A 24DC buffered output (open collector) is also included.

Signal levels:

12VDC differential open collector with compliments

Maximum input frequency: 32kHz

Phases A and B (No marker pulse capability)

Mounts at option connector 4CN

Model No. PG-B2.....List \$



Communications Options

Communications Options - These communications options are provided mounted and wired. Network communications are available for most popular protocols.

Profibus DP. This option complies with the Profibus DP protocol specification. All parameters, diagnostics and operational commands are accessible via Profibus. The option board provides convenient Phoenix-type terminations for landing the shielded, twisted-pair wiring. Each Profibus network supports up to 99 drives. This option supports all of the Profibus data rates from 9.6 Kbps to 12 Mbps. Up to 32 bytes of input data and 32 bytes of output data are provided per message transaction. GSD files may be downloaded from www.yaskawa.com to assist with network configuration and drive setup.

Mounts at option connector 2CN.

Model No. CM061 List \$

Modbus Plus. This option complies with Modicon's ModConnect Partners program and provides a seamless interface to Quantum, 984 and Compact PLCs. All parameters, diagnostics and operational commands are accessible via Modbus Plus. The option board provides a 9-pin D-shell connector for easy wiring and communicates via a 1 Mbps, twisted-pair, Local Area Network. Each Modbus Plus network supports up to 63 drives.

Mounts at option connector 2CN. Covers 3CN.

Model No. CM071 List \$

Modbus RTU RS232 to RS485 Interface. This option converts the standard RS232 port to RS485 for Modbus RTU communications.

Mounts at option connector 2CN.

Model No. CM085 List \$

DeviceNet. This option complies with the ODVA (Open DeviceNet Vendor Association) specification and AC drive profile. All parameter, diagnostics, and operational commands are accessible via DeviceNet. The option board provides a DeviceNet standard open tap connector. Each DeviceNet network supports up to 63 drives. Controllers are available from many PLC and/or PC suppliers. Electronic Data Sheets may be downloaded from www.yaskawa.com to assist with network configuration and drive setup.

Mounts at option connector 2CN.

Model No. CM059 List \$

Modbus TCP/IP. This option complies with the Modbus TCP/IP protocol specification. This allows for communication over 10/100 Mbps Ethernet networks. This option has the ability to configure the IP Address from a user specified IP address, from a DHCP host or from a BootP host. All parameters, diagnostics and operational commands are accessible via Modbus TCP/IP. Auto-tuning the motor is also possible through this option using the DriveWizard PC program. This option supports up to 10 simultaneous PLC/PC connections.

Mounts at option connector 2CN.

Model No. CM090 List \$

EtherNet/IP. This option complies with the EtherNet/IP protocol specification. This allows for communication over 10/100 Mbps Ethernet networks. This option has the ability to configure the IP Address from a user specified IP address, from a DHCP host or from a BootP host. All parameters, diagnostics and operational commands are accessible via EtherNet/IP. Auto-tuning the motor is also possible through this option using the DriveWizard PC program.

Mounts at option connector 2CN.

Model No. CM092 List \$

Custom Options - The following items can be engineered to add value to the drive. Contact Factory for price and impact on package size.

Input Fusing: Input fuses are 600 V rated and are of the current limiting, time delay type, rated at 300,000 RMS amps, symmetrical, interrupting capacity. Fuses are provided for protection of semiconductor devices.

Contactors: These 3-pole, non-reversing, magnetic contactors are suitable for use on the input or output of the drive. Coils are rated 110 Vac, 50/60 Hz and conform to IEC158-1 standard.

Reactor, 3% and 5% Impedance: May be used on either the input or output of a drive to reduce the effect of load or line side transients on the drive.

Drive Input Isolation Transformers: Stand alone input drive isolation transformers isolate the drive from the incoming power source.

Control Transformers: This option is available to provide auxiliary power for support of specific options or to support customer supplied auxiliary equipment. Control Transformers are available rated at 460 V or 575 V primary, 120 V secondary, 50/60 Hz. The Control Transformer is provided with fuse block and fuses.

Metering and Operator Devices: A wide variety of metering and operator devices is available to address customer specific requirements. Specify functions and operation to meet requirements.

Relays: Specific functions may require configuration through use of relays. Please define desired functions.

Line Regeneration: This option is used when the application requires full regeneration of the load back to the AC line. This option will replace the standard converter (diode) modules on the drive. When this option is used, the drive will meet IEEE-519 harmonic specifications.

Model Number G5HHPBB ____ or G5HHPBC ____	Physical Dimensions ⁽¹⁾ (inches)			Heat Loss (watts)	Weight (Approx. lbs) ⁽²⁾
	H	W	D		
BB0400 BB0400PC BB0450PC	102.6	40	40	4800	900
BC0400 BC0400PC BC0450PC	102.6	40	40	5820	
BB0800 BB0800PC BB0900PC	102.6	55	40	11,020	1350
BC0800 BC0800PC BC0900PC	102.6	55	40	13,060	
BB1200 BB1200PC BB1350PC	102.6	77.5	40	16,610	1900
BC1200 BC1200PC BC1350PC	102.6	77.5	40	19,670	
BB1600 BC1600	102.6	77.5	40	21,910	2300
				25,990	
BB1600PC BB1800PC	102.6	92.5	40	21,910	
BC1600PC BC1800PC	102.6	92.5	40	25,990	

(1) These dimensions are for reference only. Contact factory for exact dimensions.

(2) This data represents the drive weight only, not shipping weight.

This page intentionally left blank

Software, Drawings, Manuals

Software

DriveWizard Software Kit. This software package allows uploading and downloading of parameters via a PC for data storage and for programming of a drive. The software includes graphing and monitoring tools. It is a Windows-based program designed to make startup, commissioning, and troubleshooting of Yaskawa drives as simple as possible. Refer to our website at www.yaskawa.com for more information, including minimum system requirements. This kit includes the DriveWizard program on CD and a PC interface cable.

Model No. DWST616-C4 \$

DriveWizard Software. Software CD only. The software can also be downloaded for free on our website www.yaskawa.com.

Model No. CD.DW.01

PC Interface Cable. This 6 foot cable interconnects the drive keypad port to the 9-pin communications port on a PC. This cable is used in conjunction with DriveWizard software.

Model No. UWR00103-1 \$

Drawings

Approval/Special Drawings. Pricing for drives and options is based on standard documentation, which consists of one Technical Manual, standard Instruction Sheets, Wiring Diagrams and Outline Drawings. When approval or special drawings must be prepared and submitted to the customer, a Drawing Price Addition must be made for each different drive being offered. Material procurement and manufacture will not commence until written drawing approval is received by the factory.

Manuals/CDs

Technical Manuals. One manual is included with each drive at no charge when shipped from the factory.

Additional copies of Manual:

Part No. TM.G5HHP.01 \$

Technical Training

In today's world of global competition, it is impossible for a company to survive without “state-of-the-art” technically trained associates and customers. Yaskawa Technical Training Services (TTS) is comprised of engineers who are specialists in their field.

Yaskawa Electric America has three training facilities in the United States. The primary training facility is in Yaskawa Electric America’s North American Headquarters in Waukegan, Illinois (45 miles north of Chicago, 50 miles south of Milwaukee). This facility has six training rooms; two lecture halls, two training rooms and two training labs.

Besides the possibility of attending training classes in Waukegan and Los Angeles, Yaskawa Electric America can also bring training to the customer. On-site classes are available in two varieties. The first is to duplicate the official training classes at the customer’s location. Full functioning demo units, data projector, computer and documentation can be shipped to recreate the official class on-site. The second variety is road show training. Road show training is a one-day training class that is specifically tailored to the students’ needs and questions. Only basic demos are used and the topics covered in class are generated by the students in attendance.

The Yaskawa Virtual Training Room is another training option. All you need is an Internet connection and a telephone. This is a live, interactive training class, which gives you the ability to talk to the instructor as well as other students. The Internet connection allows us to show slides and demonstrate software packages. The telephone is for the audio portion of the training class. Web classes can be found on the Yaskawa formal training schedule and can also be done on-demand, per the time and preference of the customer.

To enroll, contact Technical Training Services.

Phone: 1-800-Yaskawa (1-800-927-5292) and (then dial 2 for “Drives” and 4 for “Training”)

Fax: 847-785-2724

E-mail: [**training@yaskawa.com**](mailto:training@yaskawa.com)

Check out the latest class schedule and cut sheets at [**www.yaskawa.com**](http://www.yaskawa.com)

Terms and Conditions

YASKAWA ELECTRIC AMERICA, INC. - STANDARD TERMS AND CONDITIONS OF SALE

1. GENERAL:

- (a) Any sale of products or services by Yaskawa Electric America, Inc. ("YEA") is governed exclusively by these Standard Terms and Conditions of Sale ("Standard Terms") and shall supersede any inconsistent or additional terms on Buyer's purchase order or any other document. These Standard Terms constitute the final, complete and exclusive agreement between YEA and the Buyer as to the subject matter hereof. YEA hereby objects to any inconsistent or additional terms. This Agreement may be amended only in writing signed by an authorized representative of YEA.
- (b) Any order placed with YEA must be in the form of a written purchase order or letter from Buyer ("Order") and shall set forth all information necessary for YEA to fill the Order, if accepted. All proposals, quotations or similar communications from YEA will be considered invitations to Buyer to submit an Order. A binding sales contract will result only when YEA accepts Buyer's Order, at YEA's office in Waukegan, Illinois or such other place as designated by YEA. YEA reserves the right to bill any Order at a minimum of \$100, plus any additional charges provided for herein.
- (c) All products shall be packaged for domestic shipment in accordance with YEA's standard specifications. If special packaging is required, it must be clearly requested on Buyer's Order. The price for any special packaging shall be billed to Buyer.

2. WARRANTY:

- (a) YEA warrants that each new and unused product sold by YEA shall be free of defects in material workmanship for a period of one (1) year from the date the product is first used by Buyer, or 18 months from the date of shipment, whichever occurs first. YEA warrants that its services shall be free of defects in workmanship for a period of ninety (90) days from the date they are first provided. Within the applicable warranty period, YEA will, at its sole discretion, either repair, replace or return the purchase price paid to YEA for any product, part or service found by YEA to be defective; provided that the subject product is used under normal conditions for which it was designed and installed, operated and maintained in accordance with YEA's instructions and (subject always to such instructions) in accordance with generally accepted industrial practices.
- (b) YEA's warranty obligation shall be conditioned upon receipt by YEA of written notice of any alleged defects within sixty (60) days after discovery. YEA will not be responsible or accept invoices for unauthorized repairs to any products, even if defective. YEA shall not be responsible for any products which have been altered, abused, misused, or improperly installed or repaired, or for any loss, damage, defect, claim or non-performance resulting from or attributable to Buyer's specifications.
- (c) Where Buyer requests that YEA supply non-stock products or component parts manufactured by a third-party, YEA will, to the extent permitted, pass through to Buyer any warranty of the manufacturer. As to such items, Buyer's sole remedy for breach of warranty shall be the remedy offered by and available from the manufacturer. YEA shall have no liability, whether in contract, tort or otherwise, for such products.
- (d) YEA does not guarantee production rates or the quality of goods made using YEA's products or services, nor shall any longer warranty periods apply, except as agreed in writing signed by an authorized YEA representative.
- (e) YEA's WARRANTY HEREIN IS IN LIEU OF AND EXCLUDES ALL OTHER WARRANTIES OF YEA AND ALL PARENT OR AFFILIATED COMPANIES OF YEA. ALL OTHER WARRANTIES, WHETHER EXPRESS, IMPLIED OR STATUTORY, INCLUDING, BUT NOT LIMITED TO, ANY IMPLIED WARRANTIES OF MERCHANTABILITY AND/OR FITNESS FOR A PARTICULAR PURPOSE OR USE, ARE HEREBY EXCLUDED.
- (f) UNDER NO CIRCUMSTANCES SHALL YEA, OR ANY PARENT OR AFFILIATED COMPANY OF YEA, BE LIABLE TO

BUYER OR ANY ENTITY FOR ANY SPECIAL, INDIRECT OR CONSEQUENTIAL DAMAGES, WHETHER ARISING FROM BREACH OF CONTRACT, TORT, NEGLIGENCE, MISREPRESENTATION, STRICT LIABILITY OR OTHERWISE, INCLUDING FOR LOST PROFITS, IMPAIRMENT OF GOODS, WORK STOPPAGE OR OTHERWISE, IN ANY WAY ARISING OUT OF OR RELATED TO GOODS OR SERVICES SUPPLIED BY YEA OR ANY TRANSACTION TO WHICH THESE STANDARD TERMS APPLY. THE MAXIMUM LIABILITY OF YEA, INCLUDING, BUT NOT LIMITED TO, WITH RESPECT TO THE DESIGN, MANUFACTURE, SALE, DELIVERY, RESALE, INSPECTION, ASSEMBLY, INSTALLATION, TESTING, REPAIR, REPLACEMENT, MAINTENANCE OR USE OF ANY PRODUCT OR THE PERFORMANCE OF ANY SERVICE, SHALL NOT EXCEED THE PURCHASE PRICE PAID TO YEA FOR THE DEFECTIVE PRODUCT OR SERVICE.

3. DRAWINGS/MEASUREMENTS:

All drawings, tables, graphs and the like submitted by YEA or contained in YEA's publications shall be regarded as approximations only. Weights, measurements, capacities and all other particulars of products or services offered by YEA are approximations only. YEA is not responsible for such approximations, including, in particular, based on data supplied by Buyer.

4. INFRINGEMENT:

YEA's liability for infringement (and the liability of any parent or affiliated company of YEA) is limited to YEA's defense of any suit or proceeding brought against Buyer based on a claim that products sold hereunder, when employed in the manner intended by YEA, constitutes an infringement of any patent of the United States. If Buyer's use of the products in the manner intended by YEA is finally enjoined in such action, YEA shall, at its option, procure for Buyer the right to continue using the products, replace the same with non-infringing products, modify the products so that they become non-infringing equivalent products, or refund the purchase price (less allowance for use, damage or obsolescence). YEA makes no warranty against patent infringement resulting from portions of the products made to Buyer's specifications or the use of products in combination with any other products or in the practice of any process, and if a claim, suit or action is brought against YEA or any parent or affiliate of YEA, Buyer shall defend, indemnify and save YEA (and its parent/affiliates) harmless from and against any and all claims, losses or damages arising therefrom.

5. SHIPMENT, FORCE MAJEURE, PRICES AND ERROR:

- (a) Shipment/delivery dates are approximations only. YEA shall not be liable to pay any penalty or damages, including consequential damages, for any delay in shipment.
- (b) In no event shall YEA be liable for any damages, including consequential damages, caused by delays or non-performance resulting from or related to force majeure or other causes beyond YEA's reasonable control, including, but not limited to, war, blockade, civil disturbances, strikes and lockouts, labor shortages, fire and other casualties, acts of nature, accidents and governmental acts (including regulations concerning export and import licensing and currency exchange). In case of non-delivery, YEA's obligation shall be limited to the refund of any advance payment received from Buyer.
- (c) All claims for loss of or damage to products, whether concealed or obvious, must be made, in writing, to the carrier and to YEA by Buyer as soon as possible after receipt of shipment, and in no case beyond 30 days of shipment, or such claims shall be deemed waived. YEA will render reasonable assistance in providing information necessary for Buyer to process such damage claims with the carrier or any insurance company.

Terms and Conditions

(d) YEA's quoted prices are firm for thirty (30) days from the date of YEA's written proposal. Thereafter, the applicable prices are those in effect at the time Buyer's Order is placed with YEA. YEA will notify Buyer of any price changes for incorporation into a revised Order prior to acceptance by YEA. Pricing based on volume discounts is subject to adjustment by YEA if actual shipping volumes do not meet minimum volume requirements of agreement. Clerical errors in any element of a proposal, purchase order, invoice or contract are subject to correction by YEA.

(e) (1) Buyer agrees to accept delivery within fifteen (15) days following the anticipated date of delivery. If Buyer refuses to take delivery within the fifteen (15) day period, YEA reserves the right to charge Buyer for storage charges plus interest.

(f) (2) All shipments are F.O.B. YEA's (or its suppliers') manufacturing plant or warehouse. YEA will, at Buyer's expense, arrange for the transportation of the products from the manufacturing plant or warehouse designated by YEA. Buyer is responsible to timely procure all necessary export and import licenses and all permits required for the consummation of the transaction.

6. TERMS OF PAYMENT:

(a) All payments are due within thirty (30) days of YEA's invoice. YEA reserves the right to require payment in advance, or satisfactory security, for any shipment or sale. YEA may cancel any shipment or Order for any Buyer which has failed to make payment or comply with any other provision of these Standard Terms. YEA reserves the right to seek any other remedy available at law or equity. Payment shall be made at the agreed time, to the place specified, and in the currency indicated on YEA's invoice. Buyer's failure to pay at the agreed time and place constitutes a waiver of Buyer's right to demand YEA's performance under the contract.

(b) When an account becomes past due according to its payment terms, Buyer shall pay interest on the balance due, at the greater of 1.50% per month (18% per annum) or the maximum permitted by law, until paid in full.

(c) If delivery and/or payment in installments are accepted by YEA, Buyer's failure to pay any installment when due shall give YEA the right to suspend work or delivery until such payment is made. In the event that any such default by Buyer continues for more than fifteen (15) days, YEA may then cancel the contract by written notice to Buyer. Upon cancellation of an installment contract, all items already delivered to and paid for in full by Buyer will be transferred to Buyer "AS IS, WHERE IS," without any warranty.

(d) All duties, tariffs, fees, costs and other charges connected with shipment, insurance, exportation and importation of the products are the responsibility of Buyer, and, if paid by YEA, such expenses may be recovered by YEA from Buyer, and Buyer shall indemnify YEA against claims for the same. Buyer is responsible for all taxes applicable or related to this transaction, including all sales, use and excise taxes.

7. RISK OF LOSS:

Risk of loss and/or damage to the products shall pass to Buyer upon delivery thereof to Buyer or its representative, or to a carrier for shipment to Buyer or its designated customer, as the case may be, at the manufacturing plant or warehouse of YEA or its supplier. Buyer is responsible to obtain insurance coverage on all shipments of products supplied by YEA.

8. RETURNS/CANCELLATION CHARGES:

Buyer shall not return any product to YEA without the written consent of, and upon terms agreed to, by YEA. If Buyer refuses to accept delivery, or improperly revokes acceptance of product, Buyer shall be responsible for YEA's cancellation charges and expenses.

Before returning products, a Return Merchandise Authorization ("R.M.A.") number must be obtained from YEA. Products returned without an R.M.A. number clearly marked on the outside of the shipping carton will be refused. Except for approved warranty returns, YEA will only accept for return and credit new, unused, current stock items, in the original packaging and undamaged. Buyer shall be responsible for all freight charges, import/export charges, duties, tariffs, taxes, insurance and risk of loss/damage regarding return shipment to YEA.

9. SECURITY INTEREST:

To secure any indebtedness due and owing from Buyer from time to time, Buyer hereby grants to YEA, and YEA hereby reserves, a continuing purchase money security interest in all Yaskawa-brand and other products heretofore or hereafter sold and delivered to Buyer by YEA, and all related parts, components and accessories therefor, and all proceeds arising from the sale or other disposition of the foregoing, including, but not limited to, cash, accounts, contract rights, accounts receivable, instruments and chattel paper. Buyer shall at no time grant any security interest that conflicts with that granted to YEA herein. Buyer shall cooperate with YEA, and hereby appoints YEA as its attorney-in-fact, to execute and file, on Buyer's behalf, any documents necessary to evidence and perfect YEA's security interest.

10. GOVERNING LAW, FORUM AND JURY WAIVER:

These Standard Terms and the relationship of the parties hereto shall be governed by the internal laws of the State of Illinois, U.S.A., without regard to its choice of law rules. For all claims or disputes arising out of or relating to the sale of products or services by YEA and/or the relationship of Buyer and YEA, Buyer shall file any and all lawsuits or claims exclusively in the state or federal courts located in Cook County, Illinois. Buyer hereby submits to the personal jurisdiction of said courts and waives any claim of improper or inconvenient venue. To the fullest extent permitted by law, Buyer hereby agrees to waive the right to trial by jury for all claims or disputes arising out of or relating to the sale of products or services by YEA and/or the relationship of Buyer and YEA. The parties agree that U.N. Convention of Contracts for the International Sale of Goods shall not apply to their relationship or the sale of products by YEA.

11. MISCELLANEOUS:

(a) Failure on the part of YEA to enforce any of its rights derived from this contract shall never be construed as a waiver of any of YEA's rights.

(b) The invalidity of one or more of the clauses herein shall not affect the validity of the other clauses, which for this purpose are considered severable.

(c) Any use by Buyer of any YEA trademark must be approved by YEA in writing.

(d) Buyer may not delegate its performance or assign its rights under this Agreement except upon the express written consent of YEA. In any case, these Standard Terms shall be binding upon the successors and legal representatives of Buyer.

(e) Buyer shall comply with all applicable laws and regulations regarding the use, import and export of the products sold hereunder. The products and services to be sold hereunder are not intended for use in any nuclear, chemical or weapons production or environmental damage. If Buyer uses the products or services for such or other impermissible purposes, it shall indemnify, hold harmless and defend YEA, all parent and affiliated companies of YEA, from and against all related claims and damages.

(f) All rights and remedies available to YEA under the Uniform Commercial Code and other applicable law are reserved to YEA as remedies in the event of Buyer's default.

G5HHP Drives Catalog

Data Subject to change without notice.



Yaskawa Electric America, Inc.
2121 Norman Drive South
Waukegan, IL 60085

(800)YASKAWA (927-5292) Fax (847) 887-7310
DrivesHelpDesk@yaskawa.com - www.yaskawa.com

YEA Document Number: CA.G5HHP.01 9/15/09 © Yaskawa Electric America, Inc.