YASKAWA

SUBMITTAL DRAWINGS FOR APPROVAL

TO:
ATTN:

Date: 3/17/2025

Quote #:
Job Name:

The enclosed drawings are submitted for approval.

A SIGNED COPY OF THIS COVER SHEET MUST BE RETURNED TO YASKAWA TO RELEASE UNITS TO PRODUCTION

Via Email: - insidesales@yaskawa.com

Via Fax: - 800-541-0940

Via Mail: - Yaskawa America, Inc.
2121 Norman Drive South
Waukegan, IL 60085
Attn: Inside Sales

Please contact your Inside Sales Rep for estimated delivery after submittals are signed, approved, and returned.

Engineering, mechanical, electrical drawings, and equipment shipping schedules are based on receipt of customer signed drawings. Any delay in approval, modifications to original contract and/or specifications, or drawing changes made during or after “print approval” could result in a price increase and extension of any previously mentioned schedules.

CUSTOMER APPROVAL: _____ **DATE:** _____

(Signature Represents Drawing Approval)

YASKAWA

Submittal Schedule Details

Details, Features and Reference Drawings	H6C2B007PF
Horsepower (HP)	5.0
Voltage (V)	480
Amperage (A)	7.6
Quantity	1
Enclosure	UL Type 12
Input Impedance (%)	5
Input Disconnect Switch	✔
Input Fuses	✔
SCCR (kA)	100*
Dimensions (H" x W" x D")	27.10 x 18.30 x 18.80
Weight (lbs)	100.0
Specification	SG.H6C2QW.10
Print Size	8.5" x 11.0"
Submittal Page	4
Electrical Schematic	DS.H6C2.01
Print Size	17.0" x 11.0"
Submittal Page	11
Wiring Requirements	UDE00652
Print Size	11.0" x 17.0"
Submittal Page	13
Outline Drawing	DD.HWF.12.W0.01
Print Size	8.5" x 11.0"
Submittal Page	14

*** Capable of the specified symmetrical amperes shown in the SCCR field with sufficient branch circuit short circuit protection installed as specified by applicable codes.**

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Table of Contents

Variable Frequency Drive (VFD)

HV600 Mechanical Specification Submittal

For Enclosed Configured UL Type 12 Rated (H6C2) Packages

GENERAL

The HV600 is a high performance PWM (pulse-width-modulated) AC drive. Three-phase input line power is converted to a sine-coded, variable frequency output, which provides optimum speed control of any conventional squirrel cage induction motor. The use of IGBTs (Insulated Gate Bipolar Transistors), with a carrier frequency range of 2 kHz to 12.5 kHz, permits quiet motor operation.

This drive has one control logic board for all horsepower ratings. Printed circuit boards employ surface-mount technology, providing both high reliability, and small physical size of the printed circuit assemblies. The microprocessor delivers the computing power necessary for complete three-phase motor control in building automation systems.

Operating Principle: Input three-phase AC line voltage is first rectified to a fixed DC voltage. Using pulse width modulation (PWM) inverter technology, the DC voltage is processed to produce an output waveform in a series of variable-width pulses. Unique firmware algorithms optimize motor magnetization through control of voltage, current, and frequency applied to generate a nearly sinusoidal output waveform.

STANDARDS

UL 508A (Industrial Control Panels)
BTL Listed
UL, cUL listed
CBC, IBC, ASCE7, ICC-ES 156
HCAI (OSHPD)

ENVIRONMENTAL & SERVICE CONDITIONS

Ambient service temperature: Enclosed Configured UL Type 12: -10°C to 40°C

Ambient storage temperature: Enclosed Configured UL Type 12: -20°C to 70°C

Humidity: 0% to 95%, non-condensing

Altitude: to 1,000 meters (3,300 feet); higher by derating

Service factor: 1.0

RoHS 2 Compliant

QUALITY ASSURANCE

In-circuit testing of all printed circuit boards is conducted to ensure proper manufacturing.

Final printed circuit board assemblies are functionally tested via computerized test equipment.

All fully assembled controls are computer tested with induction motor loads to assure unit specifications are met.

The average MTBF (Mean Time Between Failure) is 28 years.

CONSTRUCTION

VFD power input stage converts three-phase AC line power into a fixed DC voltage via a solid-state full-wave diode rectifier with MOV (Metal Oxide Varistor) surge protection. An internal 5% split choke built in both positive and negative DC bus reduces harmonics for cleaner power.

Intermediate Section of the VFD - DC bus maintains a fixed DC voltage with filtering and short circuit protection as a DC supply to the VFD output section. It is interfaced with the VFD diagnostic logic circuit to continuously monitor and protect the power components.

Output Section of the VFD - Insulated Gate Bipolar Transistors (IGBTs) convert DC bus voltage to a variable frequency and voltage, utilizing a PWM sine-coded output to the motor. Motor noise at 60 Hz is less than 2 dB above the motor noise from across-the-line operation when measured at a distance of one meter.

POWER AND CONTROL ELECTRONIC HOUSINGS

UL Type 12 full enclosure: 208 V, 0.5 thru 100 HP; 240 V, 0.5 thru 100 HP; 480 V, 0.5 thru 250 HP

Microprocessor-based control circuit

Non-volatile memory (EEPROM); all programming memory is saved when the VFD is disconnected from power.

Digital operator keypad and display provide local control and readout capability:

- Hand/Off/Auto commands
- Speed Reference command
- Reset command

Easy to remove heat sink cooling fan with programmable on/off control

USB mini-B port for quick and easy PC connection

PROTECTION

Output current overload rating of 110% for 60 seconds, 140% for 2 seconds, 175% instantaneous

Output short circuit protection

Current limited stall prevention (overload trip prevention) during acceleration, deceleration, and run conditions

Optically isolated operator controls

Fault display

“Hunting” prevention logic

Electronic ground fault protection

Electronic motor overload relay protects the motor while in operation

Motor current display as well as verification that the motor is running

Proof of flow/loss of flow detection

DC bus charge indication

Heatsink overtemperature protection

Cooling fan operating hours recorded

Input/output phase loss protection

Line voltage sensors to monitor for brownout and blackout conditions with adjustable fault levels to ensure the proper settings pursuant to each application.

Reverse prohibit selectability

Short circuit withstand rating of 100 KA RMS with customer provided branch circuit protection.

Two emergency override modes (across-the-line or speed selectable via the drive)

OPERATION

Output frequency and speed display can be programmed for other speed-related and control indications, including: RPM, CFM, GPM, PSI, in WC, % of maximum RPM, or custom.

Power loss ride-through (2 seconds capable)

Time delay on start; peak avoidance for smooth generator switchover

VFD accepts either a direct acting or a reverse acting speed command signal.

Bi-directional “Speed Search” capability to start into a rotating load. Two types: current detection and residual voltage detection

DC injection braking, to prevent fan “windmilling”

Remote Run/Stop command input

Eight programmable HVAC specific application presets

Over 100 programmable functions, resettable to factory HVAC presets

User parameter initialization to re-establish project specific parameters

Ramp-to-stop or coast-to-stop selection

Auto restart capability: 0 to 10 attempts with adjustable delay time between attempts

One custom selectable Volts/Hertz pattern and multiple preset Volts/Hertz patterns

Auto speed reference input signal, adjustable for bias and gain

While the VFD is running, operational changes in control and display functions are possible, including:

Acceleration time (0 to 6000 seconds)
Deceleration time (0 to 6000 seconds)
Frequency reference command
Hand/Off/Auto commands
Monitor display
Removable digital operator

Automatic energy saving, reduced voltage operation

PRODUCT FEATURES

Displacement power factor of .98 throughout the motor speed range

Internal EMI/RFI filter complies with EN 61800-3

Built-In real time clock for time and date stamping events along with timer functions for starting, stopping and speed changes without the need for external controls

Voltmeter, ammeter, kilowatt meter, elapsed run time meter, and heatsink temperature monitoring functions

Two internal (PI) controls

Drive internal PI closed-loop control with selectable engineering units

Independent PI control for use with external device

Sleep function in both closed loop and open loop control

Feedback signal low pass filter

Feedback signal loss detection and selectable response strategy

Feedback signal inverse and square root capability

24 VDC, 150 mA transmitter power supply

Seven programmable multi-function input terminals (24 VDC) providing 60+ programmable features, including:

Customer Safeties
BAS / Damper Interlock
Emergency Override – BAS interlock mode, min/max
speed setting, 16 preset speeds, and more
Preset Speed
PI control enable / disable

One Dedicated Fault Form C relay (30 VDC/250 VAC, 2 Amp), and 3 programmable Form A relays for: “Motor Run,” “Damper Actuator,” “Auto Transfer,” “Drive Run,” “Hand Mode,” “Auto Mode,” “System Fault,” ”Serial Com Run,” and numerous other options.

Two programmable 0 to 10 VDC or 4-20 ma analog outputs, proportional to drive monitor functions including output frequency, output current, output power, PI feedback, output voltage and others

Remote speed reference (speed command) signal:

0 to 10 VDC (20 kΩ)
4 to 20 mA DC (250 Ω)

Nine preset speeds

Input and output terminal status indication

Diagnostic fault indication

VFD efficiency: 96% at half-speed; 98% at full-speed

“S-curve” soft start / soft stop capability

Run/Fault output contacts

Serial communication loss detection and selectable response strategy

“Up/Down” floating point control capability

Output Frequency 0 to 400 Hz

Controlled speed range of 40:1

Critical frequency rejection capability: three selectable, adjustable bandwidths

140% starting torque capability, available from 3 Hz to 60 Hz

Adjustable carrier frequency, from 2 kHz to 12.5 kHz

Analog/Digital Virtual I/O – internally sends an output to an input (no wiring needed)

Dynamic noise control for quiet motor operation

Programmable security code

Cloud service (Yaskawa Drive Cloud) for product registration and parameter storage

Store up to four additional parameter sets in keypad

Integrated PLC (DriveWorks EZ)

Rotational as well as Stationary motor auto-tuning

“Kinetic Energy Braking” (KEB) function stops the motor in up to half the time it would take without this function.

Control Methods Include:
- V/F Control
- Enhanced PM Motor control
- SynRM Motor Control

Motor Types:
- Induction
- Permanent Magnet
- Synchronous Reluctance

Temperature controlled fans

LCD keypad with Hand/Off/Auto and Copy keypad functions.

Motor preheat function

Self-regulating lead/lag control for multiple drives (up to 4)

Drive/motor alternation control (share motor run time for lead drive/motor)

Up to four PID setpoints

SG.H6C2QW.10

Draw down level selection for PID setpoint

Anti-no-flow control for deadhead protection

Pre-charge pump functionality

Low city alarm digital input

State/de-state control – add/remove drive based on feedback or output frequency

Single phase foldback

Flash upgradeable firmware

Heatsink overtemperature speed fold-back feature

“Bumpless” transfer between Hand and Auto modes

Emergency override can be used as “smoke purge” function

Fan failure detection and selectable drive action

Programming and firmware upgrade without three-phase main power DriveWizard Mobile

Programming Application

LED Status Ring

Conformal coating (IEC 60721-3-3, 3C2, 3S2)

Complete package is factory assembled.

Input disconnect switch with a lockable, through-the-door operating mechanism

BACnet, Siemens APOGEE FLN, Metasys N2, and Modbus RTU communication protocols as standard, with the ability to configure controller parameters, view controller monitors, control I/O, clear faults, and view controller status. EtherNet/IP, Modbus TCP/IP and LonWorks are optionally available.

BACnet Health monitors including Net Health, Tokens Received/Transmitted, Messages Received/Transmitted, Next/Previous Node Address, Max/Min Master Found, number of Nodes on Network, COV, MSTP Loop Time, CRC Errors, MSTP Tokens Lost/Retry, Deadtime Average.

Door mounted control keypad with LCD display for “Control Power,” “Drive Ready,” “Drive Run,” “Drive Selected,” “Drive Fault,” “Drive Test,” “Motor OL”, ”Safety Open” “BAS Interlock,” “Auto Run”, “Emergency Override,” “Hand Mode,” “Off Mode”, and “Auto Mode.”

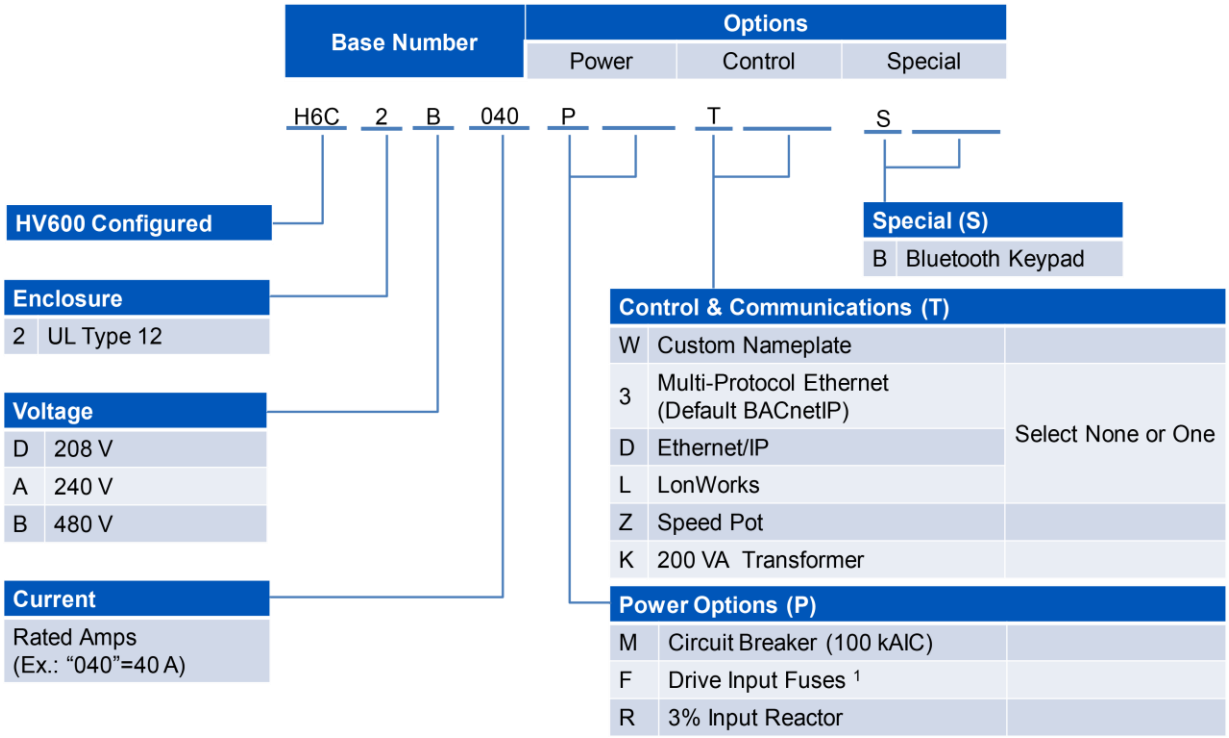
Damper control circuit with end-of-travel feedback capability including two adjustable wait time functions. One is a run delay time, where the drive will operate at a preset speed before the damper opens to pressurize the system. The other time function is an interlock wait time, so if the damper has not fully opened within the specified time, a fault will be declared.

Selectable energy savings and harmonic reduction mode.

Model Number Configuration (H6C2)

Step 1. Complete the Base Number for the voltage and current rating.

Step 2. Add the Option Code letter for each required option. If an option is not wanted, no character is inserted in that position.



ENCLOSURE TYPE

[2] UL Type 12 Enclosure

VOLTAGE

[D] 208 volt model for nominal, 200 or 208 VAC (+10/-15%); 60 or 50 Hz (+/-5%) systems

[A] 240 volt model for nominal, 230 or 240 VAC (+10/-15%); 60 or 50 Hz (+/-5%) systems

[B] 480 volt model for nominal, 380, 400, 415, 440, 460 or 480 VAC (+10/-15 %); 60 or 50 Hz (+/-5%) systems

[P] POWER OPTIONS

MAIN INPUT DISCONNECT *(Default)*

Input disconnect switch with a lockable, through-the-door operating mechanism, no branch short circuit protection.

[M] Circuit Breaker Option is a 100 kAIC rated circuit breaker with fuses. When option (M) is specified, the configured drive package will be rated at 100 kAIC.
(Replaces default input disconnect)

[P] POWER OPTIONS (Continued)

[F] Drive Input fusing is available as a selection when the Circuit Breaker option is not already being used. Use this selection when drive input fusing is desired with the default input disconnect switch.

[R] 3% AC Input Line Reactor

[T] CONTROL & COMMUNICATION OPTIONS

[W] Engraved nameplate

[Z] Speed Pot

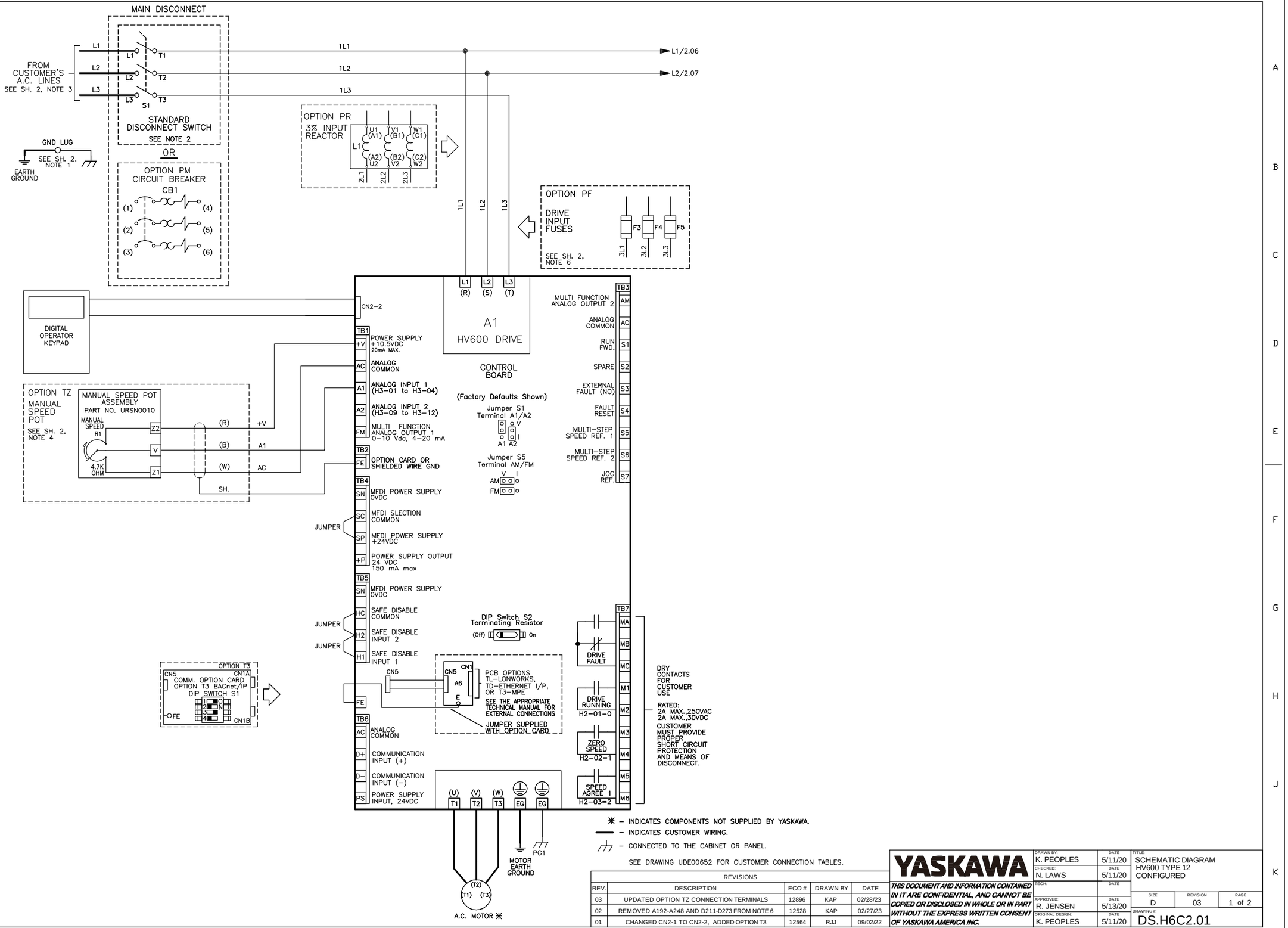
[K] 200 VA Transformer

One or None:

[3] Multi-Protocol Ethernet (Default BACnetIP)
[D] Ethernet/IP
[L] LonWorks

[S] Special

[B] Bluetooth Keypad



✳ – INDICATES COMPONENTS NOT SUPPLIED BY YASKAWA.

— – INDICATES CUSTOMER WIRING.

⏚ – CONNECTED TO THE CABINET OR PANEL.

SEE DRAWING UDE00652 FOR CUSTOMER CONNECTION TABLES.

REVISIONS				
REV.	DESCRIPTION	ECO #	DRAWN BY	DATE
03	UPDATED OPTION TZ CONNECTION TERMINALS	12896	KAP	02/28/23
02	REMOVED A192-A248 AND D211-D273 FROM NOTE 6	12528	KAP	02/27/23
01	CHANGED CN2-1 TO CN2-2, ADDED OPTION T3	12564	RJJ	09/02/22

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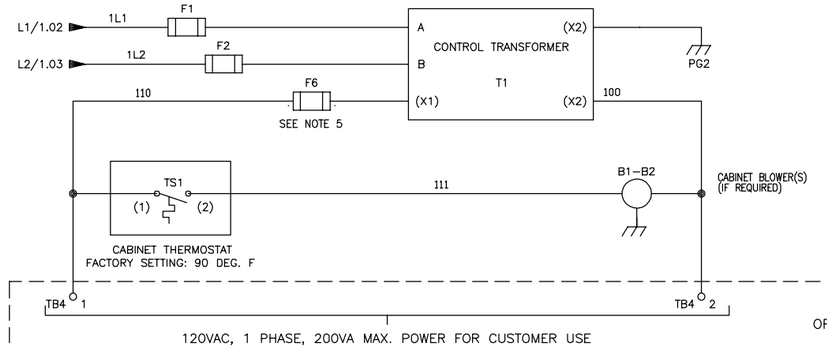
DRAWN BY: K. PEOPLES	DATE 5/11/20	TITLE: SCHEMATIC DIAGRAM HV600 TYPE 12 CONFIGURED
CHECKED: N. LAWS	DATE 5/11/20	
TECH:	DATE	
APPROVED: R. JENSEN	DATE 5/13/20	SIZE D / REVISION 03 / PAGE 1 of 2
ORIGINAL DESIGN: K. PEOPLES	DATE 5/11/20	DRAWING #: DS.H6C2.01

CONTROL TRANSFORMER AND
CABINET BLOWER(S)
IF REQUIRED

CONTROL TRANSFORMER PRIMARY CONNECTIONS			
INPUT VOLTS	TERMINALS		JUMPER LOCATION
	A	B	
208	(H1)	(H2)	NONE
240	(H1)	(H4)	(H1) TO (H3) AND (H2) TO (H4)
460/480	(H1)	(H4)	(H2) TO (H3)



NOTES:
1. CUSTOMER TO CONNECT THE CABINET GROUND LUG TO EARTH GROUND.
2. WHEN INPUT CIRCUIT BREAKER OPTION PM IS NOT PROVIDED, BRANCH CIRCUIT PROTECTION MUST BE SUPPLIED BY THE INSTALLER.
3. FOR 208VAC APPLICATIONS SET PARAMETERS E1–01 AND E1–05 TO 208.
4. FOR SPEED POT OPTION TZ, SET H3–02 TO 2E, L4–05 TO 0, AND S5–01 TO 0
5. WITH A CONTROL POWER TRANSFORMER T1, POWER RATING 350VA OR GREATER, SECONDARY FUSE F6 IS ADDED.
6. DRIVE INPUT FUSES F3, F4, F5 ARE INCLUDED WITH OPTION PM FOR BASE NUMBERS B180–B302.
7. CONDUIT FITTINGS/HUBS SHALL COMPLY WITH THE 'STANDARD FOR CONDUIT, TUBING, AND CABLE FITTINGS, UL 514B'. OR CONDUIT FITTINGS HAVING THE SAME ENVIRONMENTAL RATING AS THE ENCLOSURE SHALL BE USED.

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DRAWN BY: K. PEOPLES	DATE 5/11/20	TITLE: SCHEMATIC DRAWING HV600 TYPE 12 CONFIGURED	
CHECKED: N. LAWS	DATE 5/11/20		
TECH:	DATE	SIZE D	REVISION 03
APPROVED: R. JENSEN	DATE 5/13/20	PAGE 2 of 2	
ORIGINAL DESIGN: K. PEOPLES	DATE 5/11/20	DRAWING #: DS.H6C2.01	

CUSTOMER WIRING REQUIREMENTS

• FOR 0 TO 100 AMPS, USE A MINIMUM OF 60° - 75° C COPPER WIRE. (USE COPPER CONDUCTORS ONLY)

• FOR ABOVE 100 AMPS, USE A MINIMUM OF 75° C COPPER WIRE. (USE COPPER CONDUCTORS ONLY)

TABLE 1 — A.C. LINE WIRING

HV600 CONFIGURED MODEL NO. BASE NUMBER H6C2XXXX			WITH OPTION PM CIRCUIT BREAKER CB1				STANDARD NON-FUSED INPUT DISCONNECT SWITCH S1			
208V	240V	480V	MFG. PART NUMBER	CURRENT RATING (AMPS)	WIRE SIZE RANGE (AWG)	TIGHTENING TORQUE (LB.-IN.)	MFG. PART NUMBER	CURRENT RATING (AMPS)	WIRE SIZE RANGE (AWG)	TIGHTENING TORQUE (LB.-IN.)
D002	A002	B1P1	H_ _36015	15	14 - 10 OR 8 - 3/0	50 OR 120	OT30F3	30	14 - 4	55
D003	A003	B001								
D004	A004	B002								
D007	A006	B003								
	A009	B004								
		B007								
		B011								
D010			H_ _36020	20						
D016	A015	B014	H_ _36025	25						
D024	A022	B021	H_ _36030	30						
	A028	B027	H_ _36040	40			OT60F3	60		
D030	A042	B034	H_ _36050	50						
		B040								
D046			H_ _36060	60						
		B052	H_ _36080	80			OT100F3	100	8 - 1/0	
D059	A054	B065	H_ _36110	110						
D074	A068	B077								
D088	A080		H_ _36150	150						
D114	A104	B096					H_ _36000S15	150	8 - 3/0	120
		B124								
D143	A130	B156	J_ _36200LY	200	4 - 4/0	225	OT200U12	200	4 - 300	275
D169	A154	B180	J_ _36250	250	3/0 - 350 kcmil					
D211	A192						J_ _36000S25	250	3/0 - 350 kcmil	225
D273	A248	B240	L_ _36400U31X	400	(1-2) x (2/0 - 500 kcmil)	(1-2) x 442	L_ _36000S40X	400	(1-2) x (2/0 - 500 kcmil)	(1-2) x 442
		B302								

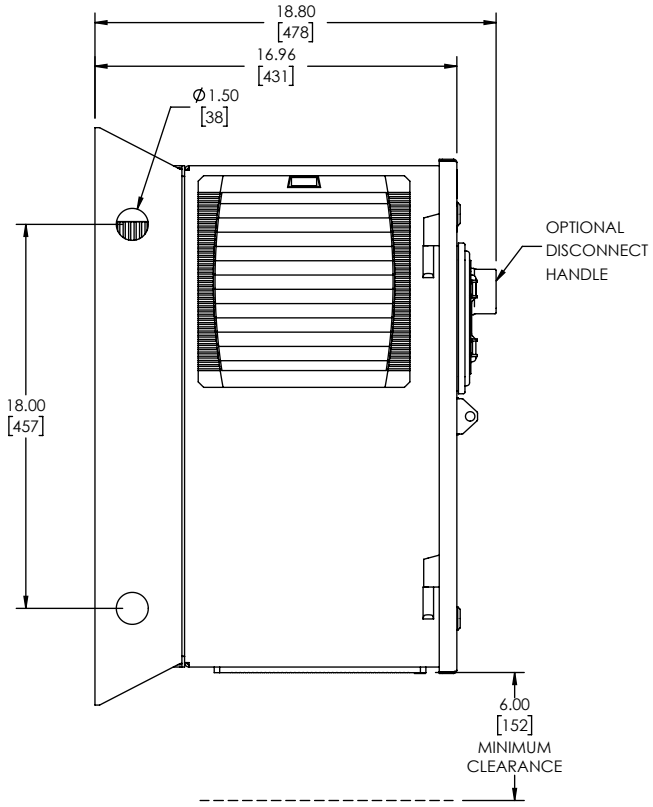
TABLE 2 — A.C. MOTOR WIRING / EARTH GROUND WIRE / CONTROL WIRING

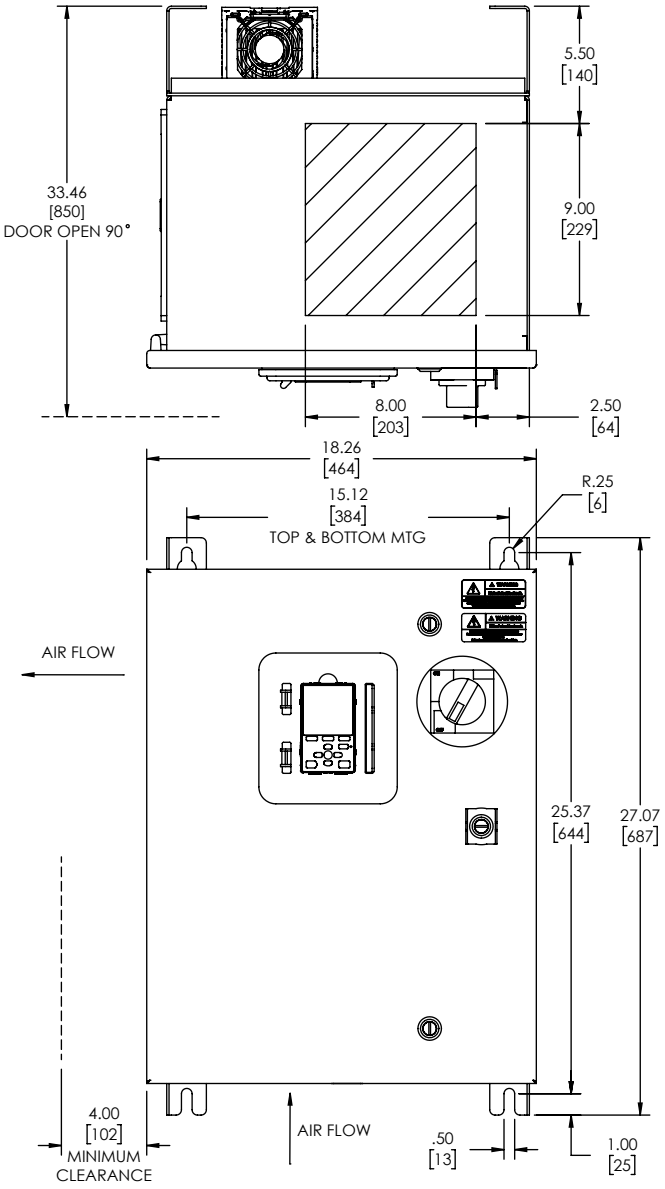
HV600 CONFIGURED MODEL NO. BASE NUMBER H6C2XXXX			A1 DRIVE TERMINAL (T1,T2,T3)		A1 DRIVE TERMINAL (GND)		GROUND LUG		A1 TERMINAL BLOCKS TB1,TB3-TB7		A1 TERMINAL BLOCK TB2 (FE)		PANEL TERMINAL BLOCK TB4	
208V	240V	480V	WIRE SIZE RANGE (AWG)	TIGHTENING TORQUE (LB.-IN.)	WIRE SIZE RANGE (AWG)	TIGHTENING TORQUE (LB.-IN.)	WIRE SIZE RANGE (AWG)	TIGHTENING TORQUE (LB.-IN.)	WIRE SIZE RANGE (AWG)	TIGHTENING TORQUE (LB.-IN.)	WIRE SIZE RANGE (AWG)	TIGHTENING TORQUE (LB.-IN.)	WIRE SIZE RANGE (AWG)	TIGHTENING TORQUE (LB.-IN.)
D002	A002	B1P1	CUSTOMER TO WIRE PER THE AC DRIVE TECHNICAL MANUAL. USE 75 ºC COPPER WIRE ONLY		CUSTOMER TO SUPPLY A UL LISTED CLOSED-LOOP CONNECTOR, PER THE AC DRIVE TECHNICAL MANUAL. USE 75 ºC COPPER WIRE ONLY.		14 - 10 OR 8 OR 6 - 4 OR 2	35 OR 40 OR 45 OR 50	24 - 16	4.4 - 5.3	24 - 18	4.85 - 10.62	26 - 10	5.3 - 7.1
D003	A003	B001												
D004	A004	B002												
D007	A006	B003												
D010	A009	B004												
D016	A015	B007												
D024	A022	B011												
D030	A028	B014												
D046	A042	B021												
D059	A054	B027												
		B034												
		B040												
		B052												
		B065												
D074	A068	B077	CUSTOMER TO SUPPLY A UL LISTED CLOSED-LOOP CONNECTOR, PER THE AC DRIVE TECHNICAL MANUAL. USE 75 ºC COPPER WIRE ONLY											
D088	A080	B096												
D114	A104	B124												
D143	A130	B156					14 - 2/0	120						
D169	A154	B180												
D211	A192	B240												
D273	A248	B302												

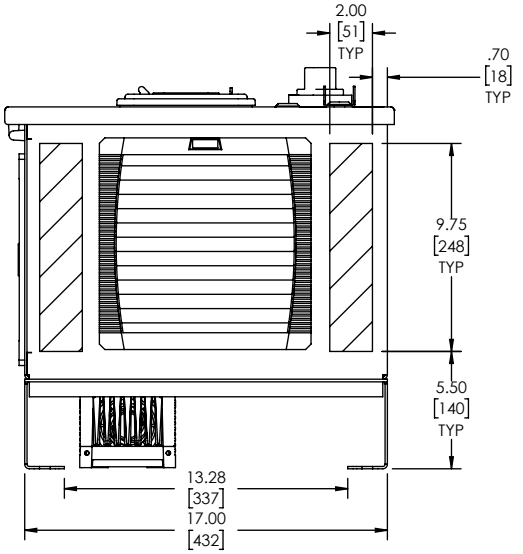
REVISIONS

REV.	DESCRIPTION	ECO #	DRAWN BY	DATE
01	ADDED B1P1 MODEL	12039	RJJ	05/20/22
00	INITIAL RELEASE	-	KAP	7/29/20

DRAWN BY: K. PEOPLES	DATE: 7/29/20	TITLE: CUSTOMER CONNECTION HV600 CONFIGURED TYPE 12	
CHECKED: N. LAWS	DATE: 7/29/20		
TECH:	DATE:		
APPROVED: R. JENSEN	DATE: 7/29/20	SIZE: C	REVISION: 01 / PAGE: 1 of 1
ORIGINAL DESIGN: K. PEOPLES	DATE: 7/29/20	DRAWING #: UDE00652	







NOTES:

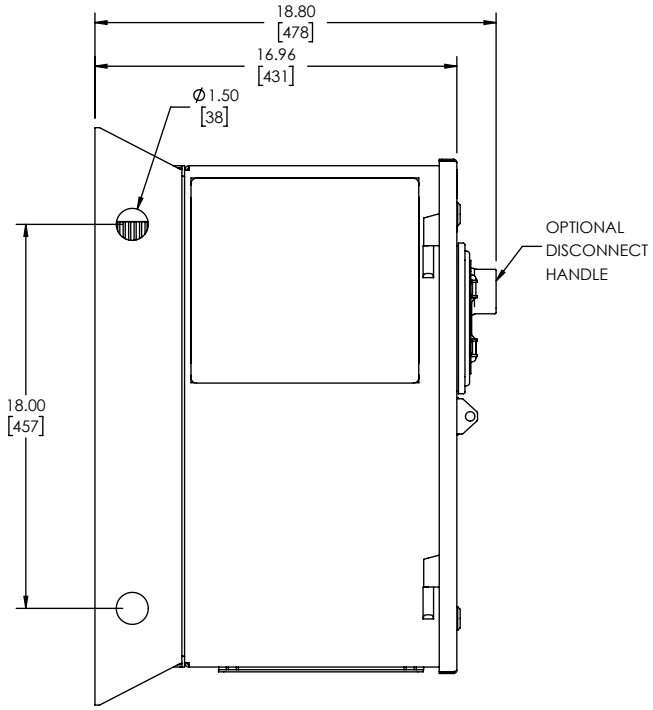
A. FOR REFERENCE UNLESS PROPERLY ENDORSED. FOR ADDITIONAL DETAILS AND SPECIFICATIONS, CONSULT YASKAWA AMERICA, INC.

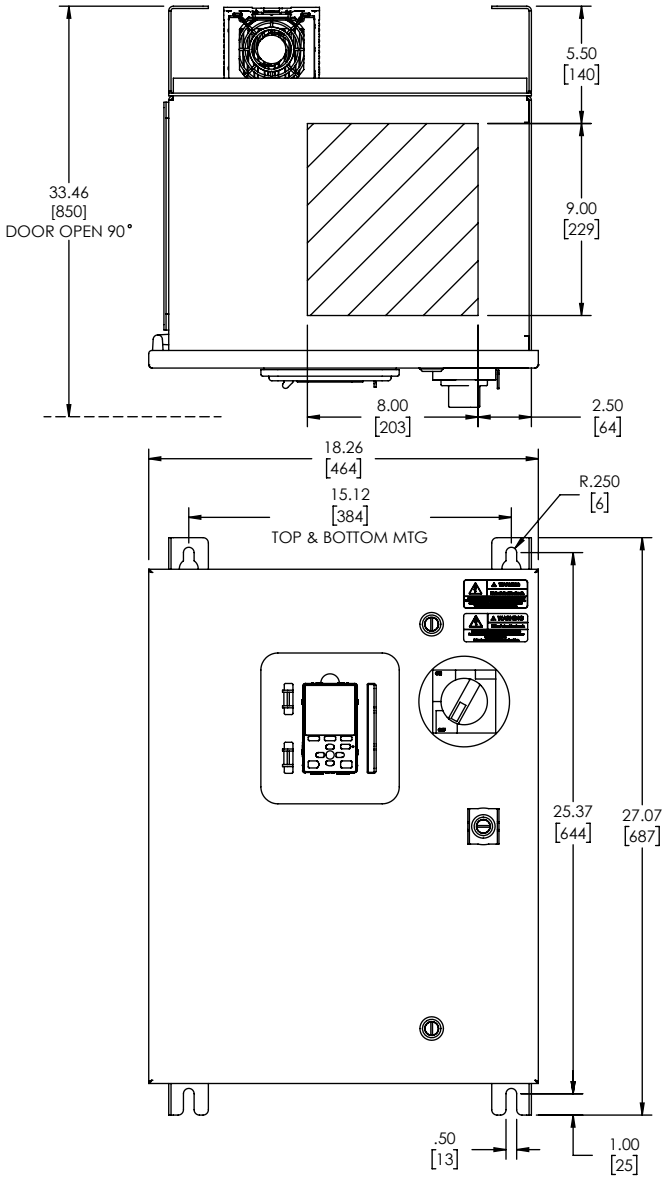
B. DIMENSIONS ARE IN INCHES[MILLIMETERS]

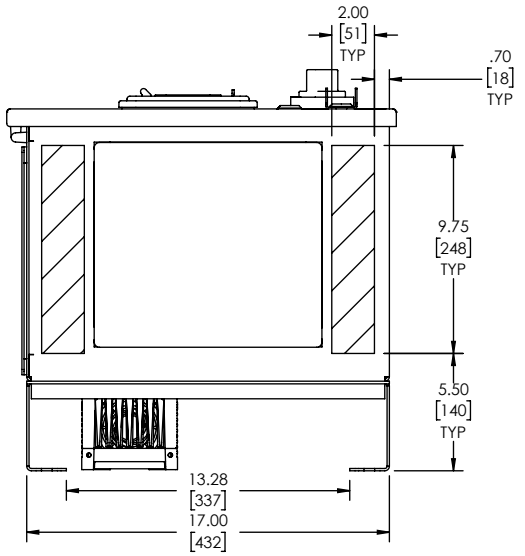
C. USE APPROPRIATE TYPE RATED HUBS OR FITTINGS TO MAINTAIN ENCLOSURE RATING.

D. HATCHED AREA INDICATES PERMISSIBLE CONDUIT ENTRANCE AREA.

YASKAWA	ORIGINAL DESIGN: **A. Jandrin**	DATE: **11/5/2019**	TITLE: **DIMENSION DRAWING, HWF, T12, W0**
	DRAWN: **A. Jandrin**	DATE: **1/17/2020**	
	CHECKED: **D. Guckenberger**	DATE: **1/17/2020**	SIZE: **A** / REVISION: **00** / PAGE: **1** OF **2**
UNITS: **INCHES** / SCALE: **NONE**	APPROVED: **K. Flierl**	DATE: **1/17/2020**	DRAWING #: **DD.HWF.12.W0.01**







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	CHECKED: **D. Guckenberger**	DATE: **1/17/2020**	SIZE: **A** / REVISION: **00**	PAGE: **2** OF **2**
UNITS: **INCHES** / SCALE: **NONE**	APPROVED: **K. Flierl**	DATE: **1/17/2020**	DRAWING #: **DD.HWF.12.W0.01**	