

KBDA SERIES

ADJUSTABLE FREQUENCY DRIVES FOR 3-PHASE AC MOTORS NEMA-4X / IP-65

Washdown and Watertight for Indoor and Outdoor use

MULTI-FUNCTION KEYPAD WITH 4-DIGIT LED DISPLAY

- Simplified Group Programming
- 8 LED Status Indicators

Models KBDA-24D, 27D, 29, 45, 48

Rated for 208 – 230 and 400/460 Volt 50* & 60 Hz

3-Phase AC Induction Motors from Subfractional thru 5 HP

Operates from 115, 208/230, and 400/460 Volt 50/60 Hz AC Line¹

TYPICAL APPLICATIONS

- Conveyors • Feeders • HVAC • Pumps
- Portable Equipment used with GFCIs⁴



STANDARD FEATURES

- **Industrial Duty Die-Cast Aluminum Enclosure with Hinged Cover:** Available in dark gray finish or FDA approved white finish.
- **Multi-Function Keypad:** The keys are used to operate the drive, change operating parameters, reprogram functions, and change the display output (Run/Stop, Forward/Reverse, Up, Down, Shift/Reset, Jog-Local/Remote, Program/Display, Read/Enter).
- **4-Digit LED Display:** Provides readout of drive operating parameters and programming functions. Displays Output Frequency, Motor RPM, Output Current, Output Voltage, Bus Voltage, Function Codes and Values, Fault Codes, and Custom Units.
- **LED Status Indicators:** The LEDs provide indication of the drive's status and operating mode (Hz, PGM, LCL/REM, STOP, FWD, REV, OL, JOG/REM).
- **Multi-Function Output Relay Contacts:** Can be used to turn on or off equipment or to signal a warning if the drive is put into various modes of operation. (The optional IODA Input/Output Multi-Function Board contains 9 digital and analog inputs, 4 digital and analog outputs, and 2 additional relay outputs. See Table 4, on page 3).
- **Motor Current Selection:** Programmable motor current allows the drive to be used on a wide range of motor horsepower.
- **Compatible with GFCIs.**⁴

PERFORMANCE FEATURES

- **Power Start™:** Provides more than 200% starting torque which ensures startup of high frictional loads.
- **Programmable Flux Vector Compensation with Static Auto-Tune and Boost:** Provides excellent load regulation and dynamic response over a wide speed range.
- **Speed Range:** 60:1

PROTECTION FEATURES

- **Motor Overload (I²t) with RMS Current Limit:** Provides motor overload protection which prevents motor burnout and eliminates nuisance trips.⁵
- **Electronic Inrush Current Limit (EICL™):** Eliminates harmful inrush AC line current during startup.
- **Short Circuit:** Shuts down the drive if a short circuit occurs at the motor (phase-to-phase).
- **AC Line Phase Loss Detection** (Models KBDA-29⁶, 45, 48 only.)
- **Decel Extend:** Eliminates tripping due to bus overvoltage caused by rapid deceleration of high inertial loads.
- **Undervoltage and Overvoltage:** Shuts down the drive if the AC line input voltage goes below or above the operating range.
- **MOV Input Transient Suppression.**
- **Microcontroller self monitoring and auto-reboot.**



DESCRIPTION

The KBDA Adjustable Frequency Drives are variable speed controls housed in a rugged NEMA-4X / IP-65 washdown and watertight die-cast aluminum enclosure. They are designed to operate 208 – 230 and 400/460 Volt 50 & 60 Hz 3-phase AC induction motors from subfractional thru 5 HP. The sine wave coded Pulse Width Modulated (PWM) output provides high motor efficiency and low noise. Adjustable Linear Acceleration and Deceleration make the drive suitable for soft-start applications.

Due to its user-friendly design, the KBDA is easy to install and operate. Setting the drive to specific applications is accomplished using the Multi-Function Keypad, which provides easy operation and programming of the drive. To facilitate programming, all similar functions are presented in common groups. For more advanced programming, PC based Drive-Link™ software is available.

The 4-Digit LED Display provides readout of drive operating parameters and programming functions and displays Output Frequency, Motor RPM, Output Current, Output Voltage, Bus Voltage, Function Codes and Values, Fault Codes, and Custom Units. In addition to operating the drive, the Multi-Function Keypad is used to change drive operating parameters, reprogram functions, and change the display output. The LEDs provide indication of the drive's status and operating mode (Hz, PGM, LCL/REM, STOP, FWD, REV, OL, JOG/REM).

Main features include: adjustable RMS Current Limit and I²t Motor Overload Protection.⁵ Flux Vector Compensation with Static Auto-Tune and Boost provides high torque and excellent load regulation over a wide speed range. Power Start™ delivers over 200% motor torque to ensure startup of high frictional loads. Programmable Injection Braking provides rapid motor stop. Electronic Inrush Current Limit (EICL™) eliminates harmful AC line inrush current, which allows the drive to be line switched. A Multi-Function Output Relay is provided, which can be used to turn on or off equipment or to signal a warning if the drive is put into various modes of operation. Models KBDA-29⁶, 45, 48 also contain AC Line Phase Loss Detection. The drive is suitable for machine or variable torque (HVAC) applications.

Standard front panel features include: 4-Digit LED Display, Multi-Function Keypad, Status Indicator LEDs, and a Main Speed Potentiometer.

Optional accessories include: On/Off AC Line Switch, Class "A" AC Line Filter, Input/Output Multi-Function Board, Programming Kit, Modbus Communication Module, and Liquidtight Fittings.

Notes: 1. Models KBDA-24D, 27D contain an AC line input voltage selection jumper. 2. All models are UL Listed for USA and Canada. 3. Requires CE approved RFI filter. See AC Line Filters, in Optional Accessories. 4. May cause increased audible motor noise. 5. UL approved as an electronic overload protector for motors. 6. When used on 3-phase AC line input set for 7.0 Amps or higher (3 HP (2.25 kW)).

*The drive is factory set for 60 Hz motors. For 50 Hz motors, set Function No. 0.00 to "0001".



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TABLE 1 – GENERAL PERFORMANCE SPECIFICATIONS

Description	Specification	Factory Setting
115 Volt AC Line Input Voltage Operating Range (Volts AC)	115 (±15%)	—
208/230 Volt AC Line Input Voltage Operating Range (Volts AC)	208 (-15%) / 230 (+15%)	—
400/460 Volt AC Line Input Voltage Operating Range (Volts AC)	380 (-15%) – 460 (+15%)	—
Maximum Load (% of Current Overload for 2 Minutes)	150	—
Switching Frequency (kHz)	8, 10, 12	8
Signal Following Input Voltage Range ¹ (Volts DC)	0 – 5	—
Output Frequency Resolution (Bits, Hz)	10, .06	—
Minimum Operating Frequency at Motor (Hz)	0.3	—
Acceleration Time (Seconds)	0.1 – 180.0	1.5
Deceleration Time (Seconds)	0.3 – 180.0	1.5
Speed Range (Ratio)	60:1	—
Speed Regulation (30:1 Speed Range, 0 – Full Load) (% Base Speed) ²	2.5	—
Overload Protector Trip Time for Stalled Motor (Seconds)	6	—
Undervoltage / Overvoltage Trip Points for 115 Volt AC Line Input (±5%) (Volts AC) ³	76 / 141	—
Undervoltage / Overvoltage Trip Points for 208/230 Volt AC Line Input (± 5%) (Volts AC) ³	151 / 282	—
Undervoltage/Overvoltage Trip Points for 400/460 Volt AC Line Input (± 5%) (Volts AC) ³	302 / 567	—
Run/Fault Relay Output Contact Rating (Amps at 30 Volts DC, 125 Volts AC, 250 Volts AC)	1, 0.5, 0.25	—
Operating Temperature Range (°C / °F)	0 – 45 / 32 – 113	—

Notes: 1. IODA option board required. 2. Dependent on motor performance. 3. Do not operate the drive outside the specified AC line input voltage operating range.

TABLE 2 – ELECTRICAL RATINGS¹

Model	Part No. (Gray / White ²)	AC Line Input			Fuse or Circuit Breaker Rating (Amps)	Output			Net Weight	
		Volts AC (50/60 Hz)	Phase (φ)	Maximum Current (Amps AC)		Voltage Range (Volts AC)	Maximum Continuous Load Current ³ (RMS Amps/Phase)	Maximum Horsepower (HP (kW))	Lbs.	kg
KBDA-24D ⁴	9536 / 9537	115	1	16	20	0 – 230	3.6	1 (.75)	5.9	2.7
		208 / 230	1	10	15					
KBDA-27D ^{4,5}	9543 / 9544	115	1	22	25	0 – 230	5.5	1½ (1.13)	10.3	4.7
		208 / 230	1	15	20	0 – 230	6.7 ³	2 (1.5)		
KBDA-29 ^{6,7}	9545 / 9546	208 / 230	1	15	20	0 – 230	6.7	2 (1.5)	10.3	4.7
			3	10.8	15	0 – 230	9.0 ³	3 (2.25)		
KBDA-45 ^{7,8}	9659 / 9660	400 / 460	3	5.3	10	0 – 400 / 460	4.6	3 (2.25)	10.3	4.7
KBDA-48 ^{7,8}	9661 / 9662	400 / 460	3	9.6	15	0 – 400 / 460	8.3	5 (3.75)	10.3	4.7

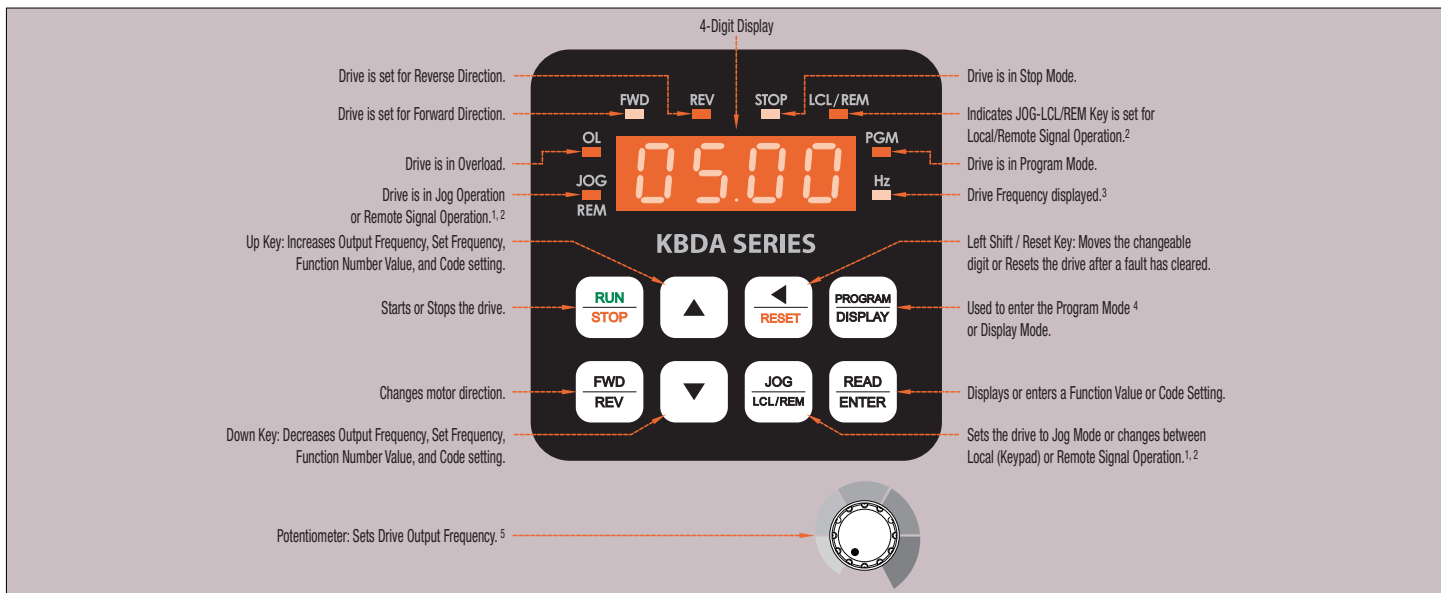
Notes: 1. Bold indicates factory setting. 2. White FDA approved finish. 3. Bold indicates factory setting of Motor Current (Function No. 0.01). 4. Models KBDA-24D, 27D contain an AC line input voltage selection jumper. 5. Model KBDA-27D is rated 1½ HP with 115 Volt AC line input and 2 HP with 208/230 Volt AC line input. 6. Model KBDA-29 is rated 3 HP with 3-phase AC line input and 2 HP with single-phase AC line input. 7. Also contain AC Line Phase Loss Detection (Model KBDA-29: when used on 3-phase AC line input set for 7.0 Amps or higher (3 HP (2.25 kW)). 8. Models KBDA-45, 48 are rated 0 – 400 Volts AC for 50 Hz motor operation and 0 – 460 Volts AC for 60 Hz motor operation. Also contain AC Line Phase Loss Detection.

TABLE 3 – OPTIONAL ACCESSORIES

Description	Model KBDA-24D	Model KBDA-27D	Model KBDA-29	Model KBDA-45	Model KBDA-48
On/Off AC Line Switch: Disconnects the AC line. Mounts on the enclosure cover and is supplied with a switch seal to maintain liquidtight integrity.	9482	9523	9532	9532	9532
AC Line Filter¹: Provides Class A Industrial Standard RFI (EMI) suppression. Installs onto the drive's PC board with quick-connect terminals. Suffix "S": Filter must be used with built-in On/Off AC Line Switch. Suffix "NS": Filter must be used without On/Off AC Line Switch.	Suffix "S"	9507	9512	9479	9479
	Suffix "NS"	9507	9512	9515	9515
IODA Input/Output Multi-Function Board: Provides a variety of functions, which include preset frequency, Up/down frequency, signal isolation, isolated output voltage for controlling auxiliary devices, open collector outputs, and output relay contacts. Mounts on the drive's PC board with two snap-ins (located on the bottom of the mounting base) and two screws (provided). All of the IODA inputs and output are isolated from the AC line.	9668	9668	9668	9668	9668
Programming Kit: Includes DownLoad Module™ (DLM) handheld programming device which uploads and downloads drive programs, PC to DLM serial and USB communication cables, DLM to inverter communication cable, and PC Windows® based Drive-Link™ communication software.	9582	9582	9582	9582	9582
DIAC Modbus Communication Module: Allows direct communication between drive and Modbus ² protocol.	9517	9517	9517	9517	9517
Liquidtight Fittings: Provide a liquidtight seal for wiring the drive. Kit includes three 1/2" and one 3/4" liquidtight fittings.	9526	9526	9526	9526	9526

Notes: 1. Complies with CE Council Directive 89/336/EEC Industrial Standard. 2. Other protocols available, contact our Sales Department.

FIGURE 1 – KEYPAD LAYOUT



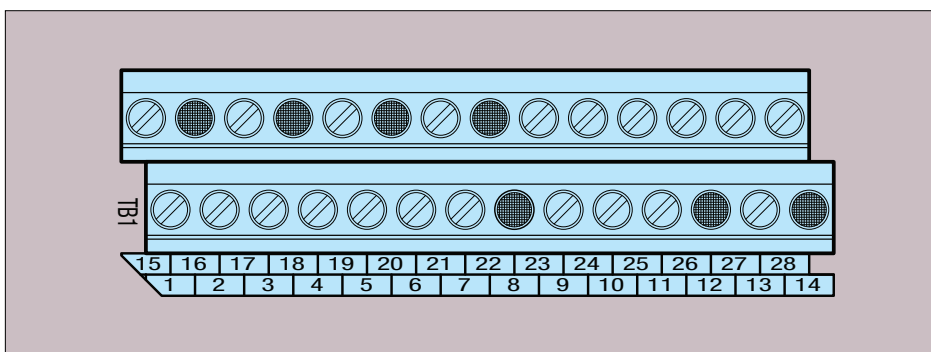
Notes: 1. The JOG-LCL/REM Key is factory programmed to function as a Jog Key. When the JOG-LCL/REM Key is pressed, the "JOG/REM" LED will illuminate and the display will show the Jog Frequency Setting (see Function No. 3.13).
 2. If the JOG-LCL/REM Key is reprogrammed for Local (Keypad) and Remote Signal Operation (see Function No. 2.02), the "LCL/REM" LED will illuminate. Pressing the JOG-LCL/REM Key will toggle between Local (Keypad) and Remote Signal Operation. When Remote Signal Operation is selected, the "JOG/REM" LED will flash. The optional IODA (Part No. 9668) is required for remote signal operation. 3. The "Hz" LED will illuminate when the display is set to show Output Frequency.
 4. If the PROGRAM/DISPLAY Key is pressed while Set Frequency is displayed, the previously entered Function Number will be shown. If the PROGRAM/DISPLAY Key is pressed while Function Number is displayed, the Set Frequency will be shown. When more than one display function is enabled, the PROGRAM/DISPLAY Key is used to toggle between displays. 5. To change the Keypad for Potentiometer Operation, set Function No. 2.00 to "0001".

TABLE 4 – OPTIONAL IODA INPUT/OUTPUT MULTI-FUNCTION BOARD FUNCTION & FEATURES

Multi-Function Input Terminal Codes	Terminal Assignment					
	Multi-Function Input Terminals ¹ (Digital Inputs)	Power Supply ²	Multi-Function Outputs ²	Analog Outputs ²	Analog Inputs ²	Relay Outputs ³
0000: Preset Frequency Operation ¹ 0001: Preset Frequency Operation ¹ 0002: Preset Frequency Operation ¹ 0003: Up Frequency Command (See Function No. 7.14) 0004: Down Frequency Command (See Function No. 7.14) 0005: Accel/Decel 2 (See Function No. 7.16) 0006: Forward/Stop Command 0007: Reverse/Stop Command 0008: External Fault 0009: Reset 0010: N.O. Start (2-Wire or 3-Wire Start/Stop) 0011: N.C. Stop (3-Wire Start/Stop)	1 – 7	8: Common 9: +5 Volts 10: -5 Volts	11: Open Collector 1 12: Common 13: Open Collector 2 14: Common	15: Analog Out 1 16: Common 17: Analog Out 2 18: Common	19: Analog In 1 20: Common 21: Analog In 2 22: Common	23: RY1 N.O. 24: RY1 Common 25: RY1 N.C. 26: RY2 N.O. 27: RY2 Common 28: RY2 N.C.

Notes: 1. Multi-Function Input Terminals "1" – "7" can be programmed for: 7 Preset Frequencies*, Up or Down Frequency Command, Accel/Decel 2, Forward/Stop, Reverse/ Stop, External Fault, Reset, and 2-Wire/3-Wire Start/Stop.
 2. Common Terminals 8, 12, 14, 16, 18, 20, and 22 are all internally wired together and can be used with any of the Multi-Function Input Terminals "1" – "7". 3. RY1 Common (Terminal 24) is the contact common only for Relay 1. RY2 Common (Terminal 27) is the contact common only for Relay 2.
 *The 7 Preset Frequencies are obtained using a combination of Terminals 1, 2, 1+2, 3, 1+3, 2+3, 1+2+3.

FIGURE 2 – IODA TERMINAL BLOCK TB1 LAYOUT

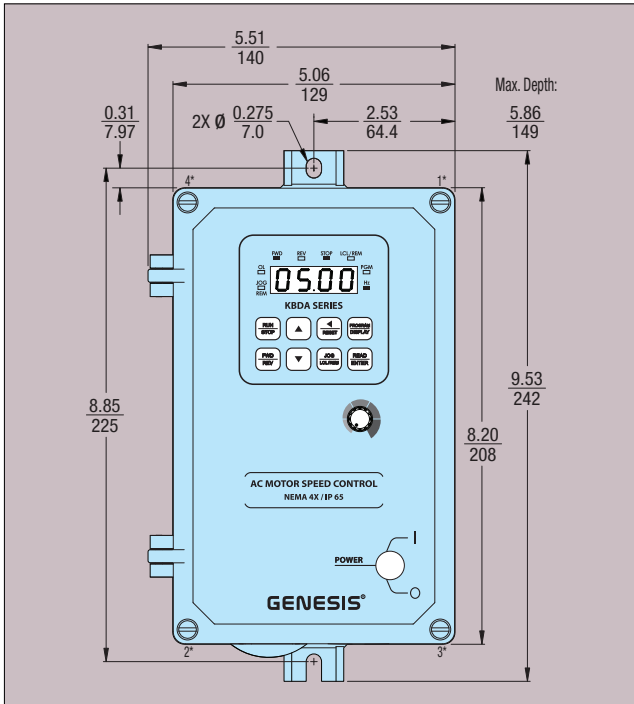


Common Terminals 8, 12, 14, 16, 18, 20, and 22 are all internally connected and are shown shaded.

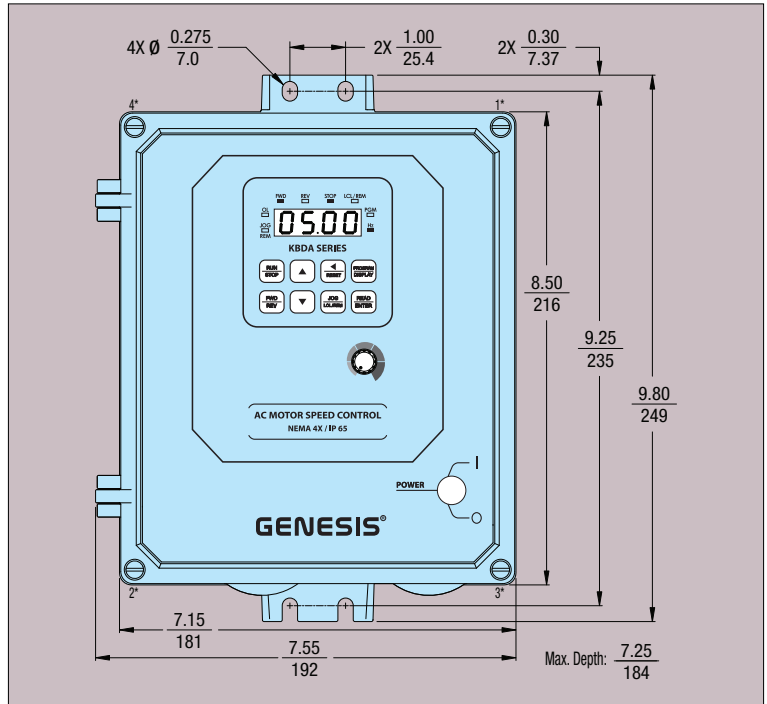


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**FIGURE 3 – MODEL KBDA-24D
MECHANICAL SPECIFICATIONS (Inches/mm)**

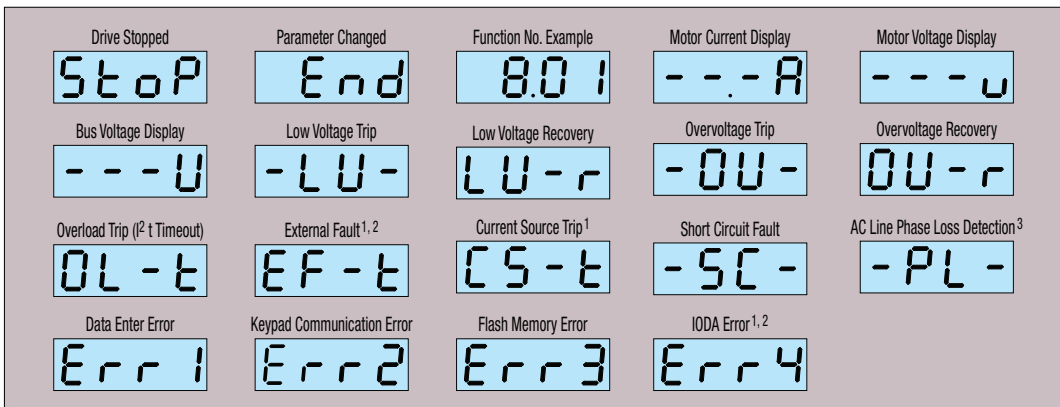


**FIGURE 4 – MODELS KBDA-27D, 29, 45, 48
MECHANICAL SPECIFICATIONS (Inches/mm)**



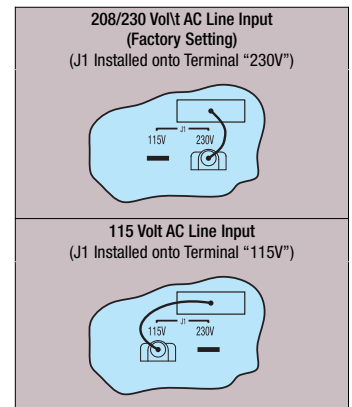
Model KBDA-24D contains mounting holes for standard 1/2" liquidtight fittings. Models KBDA-27D, 29, 45, 48 contain two mounting holes for standard 1/2" liquidtight fittings and one mounting hole for standard 3/4" liquidtight fitting. The recommended mounting screw size is 1/4" (M6). *Tighten the 4 enclosure cover screws, in the sequence shown, to 12 in-lbs (14 kg-cm).

**FIGURE 5
DIGITAL READOUT CODES**



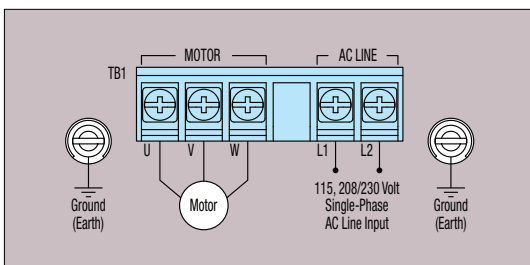
Notes: 1. IODA option board required. 2. See Function Nos. 7.00 – 7.06 code "0008". 3. Models KBDA-29, 45, 48 contain AC Line Phase Loss Detection (Model KBDA-29: when used on 3-phase AC line input set for 7.0 Amps (3 HP (2.25 kW))).

**FIGURE 6 – MODELS KBDA-24D*, 27D
AC LINE INPUT VOLTAGE SELECTION**



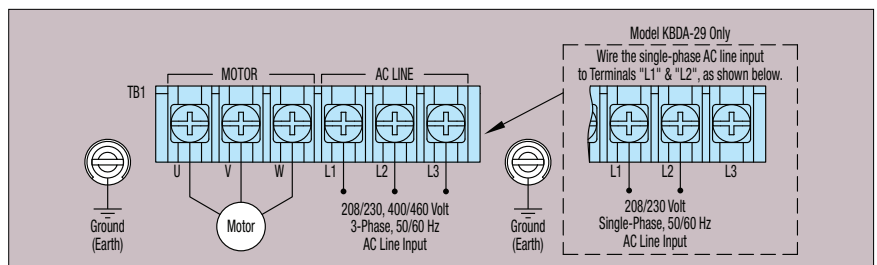
*Model KBDA-27D shown. Layout of Model KBDA-24D varies slightly.

**FIGURE 7 – MODELS KBDA-24D, 27D*
MOTOR, AC LINE INPUT & GROUND CONNECTIONS**



*Model KBDA-27D is rated for 1 1/2 HP maximum with 115 Volt AC line input and 2 HP maximum with 208/230 Volt AC line input.

**FIGURE 8 – MODELS KBDA-29¹, 45², 48²
MOTOR, AC LINE INPUT & GROUND CONNECTIONS**



Notes: 1. Model KBDA-29 is rated for 2 HP maximum with single-phase AC line input and 3 HP maximum with 3-phase AC line input. 2. Models KBDA-29, 45, 48 contain AC Line Phase Loss Detection. (Model KBDA-29: when used on 3-phase AC line input set for 7.0 Amps or higher (3 HP (2.25 kW))).



KBDA PROGRAMMABLE FUNCTION LIST*

PROGRAMMABLE FUNCTION GROUPS

Function Group No.	Description
0	Motor and Drive Parameters
1	Run/Stop Mode
2	Frequency Control
3	Drive Operating Parameters
4	Digital Display Modes
5	Onboard Multi-Function Output Relay Operating Mode

Function Group No.	Description
6	Drive Status and Reset
7	Multi-Function Input Terminals ⁽¹⁾
8	Multi-Function Output Relays and Output Signal Operation ⁽¹⁾
9	Analog Input Signal Operation ⁽¹⁾
10	Communication Mode ⁽²⁾
11	Reserved Functions

Note: (1) IODA Option Board required. (2) DIAC Option Board required.

0–MOTOR AND DRIVE PARAMETERS

Function No.	Description	Range/Code			Factory Setting
0.00*	Rated Motor Frequency (Hz)	0000: 60 Hz	0001: 50 Hz	0002: Special (Set by Function No. 0.05)	0000
0.01*	Motor Nameplate Current (Amps)	—			(1)
0.02*	Motor Type	0000: Inverter Duty, TEFC	0001: External Fan Cooled		0000
0.03*	Torque Mode	0000: Constant Torque (Machinery)	0001: Variable Torque (HVAC)		0000
0.04*	GFCI Operation ⁽²⁾	0000: GFCI Operation Disabled	0002: GFCI Operation with Sensitive GFCI		0000
		0001: GFCI Operation with Standard GFCI			
0.05*	Motor Frequency (Hz) ^{(3),(4)}	30 – 240			60, 50
0.06*	Motor Nameplate Voltage (% Drive Output) ⁽⁵⁾	0 – 100.0			100 ⁽⁶⁾

Notes: (1) Factory Setting is the drive rated output current. (2) GFCI operation overrides the Switching Frequency set by 3.15. (3) When the drive is set for 50 Hz motors (0.00 set to "0001"), the Motor Frequency factory setting will automatically reset to 50 Hz. (4) The Motor Frequency for standard 50 Hz or 60 Hz motors is set by 0.00. For custom motors (e.g., 100 Hz) set 0.00 to "0002" and 0.05 to the Motor Nameplate Rated Frequency. (5) This function is used for motors with non-standard nameplate rated voltage (e.g., 80 Volts AC). (6) The factory set output of the drive is 100% of the AC line input voltage. In 60 Hz Mode (0.00 set to "0000") the drive output will be 230 Volts, maximum, for 230 Volt motors and 460 Volts, maximum, for 460 Volt motors. In 50 Hz mode (0.00 set to "0001") the drive output will be 220 Volts, maximum, for 220 Volt motors and 400 Volts, maximum, for 400 Volt motors.

*Functions which can only be changed while the drive is in the Stop Mode.

1–RUN/STOP MODE

Function No.	Description	Range/Code			Factory Setting
1.00*	Run/Stop-Forward/Reverse Control	0000: Keypad	0001: External Contacts ⁽¹⁾	0002: Communication ⁽²⁾	0000
1.01*	Forward/Reverse Control	0000: Instant Reverse	0002: Reverse Command Disabled		0000
		0001: Stop Command Must be Given Prior to Reverse Command	0003: Forward Command Disabled		
1.02*	Motor Direction	0000: Forward	0001: Reverse		0000
1.03*	Start Command	0000: Accelerates to Last Set Frequency			0000
		0001: Accelerates to Lower Frequency Limit (See Function No. 3.01)			
1.04*	Start Mode	0000: Spin Start	0001: Stop Before Restart		0000
1.05*	Auto/Manual Start Mode	0000: Manual Start Mode			0000
		0001: Manual Start with Ride-Through (Set by Function No. 1.06)			
		0002: Auto Start After Undervoltage Fault Clears			
		0003: Auto Start All Faults (Except Short Circuit Fault) ⁽³⁾			
		0004: Auto Start All Faults (Except I ² t, I•t, and Short Circuit Faults)			
1.06*	Ride-Through Time (Seconds)	0.0 – 2.0			0.5
1.07*	Number of Restart Attempts	0 – 10			3
1.08*	Auto Start Delay Time (Seconds)	0 – 240			0
1.09*	Stop Mode	0000: Regenerate-to-Stop	0002: Regeneration with Injection Brake-to-Stop (Set by Function Nos. 1.11 – 1.14)		0000
		0001: Coast-to-Stop			
1.10*	Holding Torque in Stop Mode (%)	0 – 10			1
1.11	Injection Brake Start Frequency (Hz)	0.00 – 240.0			0.00
1.12	Injection Brake Level (%)	0 – 30			0
1.13	Injection Brake Time (Seconds)	0.0 – 25.5			0.0

Notes: (1) IODA Option Board required. (2) DIAC Option Board required. (3) For Auto Start, 1.07 must be set to greater than "0".

*Functions which can only be changed while the drive is in the Stop Mode.

2–FREQUENCY CONTROL

Function No.	Description	Range/Code			Factory Setting
2.00*	Frequency Control	0000: Keypad	0002: Analog Signal 1 ⁽¹⁾	0004: Communication ⁽²⁾	0000
		0001: Built-In Potentiometer	0003: Analog Signal 2 ⁽¹⁾	0005: Up/Down Using MFITs ⁽¹⁾	
2.01*	Up Key, Down Key Operation Mode	0000: Frequency Change Requires Enter Command			0000
		0001: Direct Frequency Change	0002: Keypad Disable		
2.02*	Jog-Local/Remote ^{(3),(4)}	0000: Jog Enabled	0001: Jog Disabled	0002: Jog Disabled; Local/Remote Enabled ⁽¹⁾	0000

Notes: (1) IODA Option Board required. (2) DIAC Option Board required. (3) See 3.12 (Jog Mode), 3.13 (Jog Frequency), and 3.14 (Jog Accel/Decel Time). (4) The Jog function can be reprogrammed for Local/Remote (LCL/REM) Operation. When in Remote Mode Operation, the "JOG/REM" LED will flash.

*Functions which can only be changed while the drive is in the Stop Mode.

* This Programmable Function List is applicable to the software revision codes, listed by Model No., on page 8.



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3- DRIVE OPERATING PARAMETERS

Function No.	Description	Range/Code			Factory Setting
3.00	Stored Set Frequency (Hz)	0.00 – 240.0			5.00
3.01	Lower Frequency Limit (Hz)	0.00 – 240.0			0.00
3.02	Upper Frequency Limit (Hz) ⁽¹⁾	0.00 – 240.0			60.0, 50.0
3.03	Accel Time (Seconds) ⁽²⁾	0.1 – 180.0			1.5
3.04	Decel Time (Seconds) ⁽²⁾	0.3 – 180.0			1.5
3.05	S-Curve Time Accel (Seconds) ⁽²⁾	0.0 – 30.0			0.0
3.06	S-Curve Time Decel (Seconds) ⁽²⁾	0.0 – 30.0			0.0
3.07*	Skip Frequency (Hz)	0.00 – 240.0			0.00
3.08*	Skip Frequency Bandwidth (\pm Hz)	0.00 – 2.00			0.00
3.09*	Motor Overload Protection	0000: I ² t with Current Limit 0001: I•t with Current Limit			0000
3.10*	I•t with Current Limit Trip Time (Seconds)	1.0 – 20.0			6.0
3.11	Boost Value (%)	0.0 – 28.0			7.0
3.12*	Jog Mode	0000: Momentary 0001: Latching			0000
3.13	Jog Frequency (Hz)	0.00 – 240.0			5.00
3.14	Jog Accel/Decel Time (Seconds)	0.3 – 10.0			1.0
3.15*	Switching Frequency (kHz)	0000: 8	0001: 10	0002: 12	0000
3.16	Flux Vector Compensation (%)	0.0 – 10.0			5.0

Notes: (1) When the drive is set for 50 Hz motors (0.00 set to "0001"), the Upper Frequency Limit factory setting will automatically reset to 50 Hz. **(2)** Time set for 3.03 and 3.04 must be equal to or greater than the time set for 3.05 and 3.06, respectively.

*Functions which can only be changed while the drive is in the Stop Mode.

4- DIGITAL DISPLAY MODES

Function No.	Description	Range/Code			Factory Setting
4.00	Display Mode	0000: Frequency	0001: RPM ⁽¹⁾	0002: Custom Units	0000
4.01	Custom Units Significant Digits	0 – 9999			100
4.02	Custom Units Display	0000: Whole Numbers	0002: Two Decimal Places	0001: One Decimal Place 0003: Three Decimal Places	0000
4.03	Display in Stop Mode	0000: Displays Last Run Setting 0001: Displays "StoP" when in Stop Mode 0002: Displays "0000"			0000
4.04	Motor Current Display ^{(2), (3)}	0000: Disabled	0001: Enabled		0000
4.05	Motor Voltage Display ^{(2), (3)}	0000: Disabled	0001: Enabled		0000
4.06	Bus Voltage Display ^{(2), (3)}	0000: Disabled	0001: Enabled		0000

Notes: (1) Based on 4-pole motor. **(2)** The Display Key is used to toggle between displays. **(3)** If Motor Current Display is enabled, the display will show "XX.XA". If Motor Voltage Display is enabled, the display will show "XXXu". If Bus Voltage Display is enabled, the display will show "XXXU".

5- ONBOARD MULTI-FUNCTION OUTPUT RELAY OPERATING MODE

Function No.	Description	Range/Code			Factory Setting
5.00	Relay Operation Mode	0000: Run 0001: Fault ⁽¹⁾ 0002: Target Frequency (Function No. 5.01 \pm Function No. 5.02) 0003: Frequency Threshold Level (> Function No. 5.01 – Function No. 5.02) ⁽²⁾ 0004: Frequency Threshold Level (< Function No. 5.01 + Function No. 5.02) ⁽²⁾ 0005: I ² t or I•t Fault 0006: Load Loss (See Function No. 5.03)			0000
5.01	Frequency Reached (Hz)	0.00 – 240.0			0.00
5.02	Frequency Bandwidth (Hz)	0.00 – 30.00			1.00
5.03	Load Loss Threshold ⁽⁴⁾ (% Motor Current, set by 0.01)	25 – 90			60

Note: (1) The Output Relay contacts will change state due to all Faults and Recovered Faults. **(2)** The relay will activate above the setting in 5.01 and deactivate below the setting of 5.01 – 5.02. **(3)** The relay will activate below the setting in 5.01 and deactivate above the setting of 5.01 + 5.02. **(4)** The Load Loss Threshold function is not operational during acceleration / deceleration or Stop Mode.

6- DRIVE STATUS AND RESET

Function No.	Description	Range/Code			Factory Setting
6.00*	Software Version	—			—
6.01*	Drive Horsepower	—			—
6.02*	Fault Log 1	—			—
6.03*	Fault Log 2	—			—
6.04*	Fault Log 3	—			—
6.05**	Reset Drive to Factory Setting	1110: 50 Hz Operation 1111: 60 Hz Operation			0000

*Read only.

**Functions which can only be changed while the drive is in the Stop Mode.



Automation and Control

7- MULTI-FUNCTION INPUT TERMINALS (IODA OPTION BOARD REQUIRED)

Function No.	Description	Range/Code		Factory Setting
7.00*	Multi-Function Input Terminal 1 ⁽¹⁾	0000: Preset Frequency Operation ⁽²⁾	0007: Reverse/Stop Command ⁽⁴⁾	0000
7.01*	Multi-Function Input Terminal 2 ⁽¹⁾	0001: Preset Frequency Operation ⁽²⁾	0008: External Fault	0000
7.02*	Multi-Function Input Terminal 3 ⁽¹⁾	0002: Preset Frequency Operation ⁽²⁾	0009: Reset	0000
7.03*	Multi-Function Input Terminal 4 ⁽¹⁾	0003: Up Frequency Command (See Function No. 7.14) ⁽³⁾	0010: N.O. Start (2-Wire or 3-Wire Start/Stop) ⁽⁴⁾	0000
7.04*	Multi-Function Input Terminal 5 ⁽¹⁾	0004: Down Frequency Command (See Function No. 7.14) ⁽³⁾	0011: N.C. Stop (3-Wire Start/Stop) ⁽⁴⁾	0000
7.05*	Multi-Function Input Terminal 6 ⁽¹⁾	0005: Accel/Decel 2 (See Function No. 7.16)		0000
7.06*	Multi-Function Input Terminal 7 ⁽¹⁾	0006: Forward/Stop Command ⁽⁴⁾		0000
7.07	Preset Frequency 1 (Hz)	0.00 – 240.0		5.00
7.08	Preset Frequency 2 (Hz)	0.00 – 240.0		10.00
7.09	Preset Frequency 3 (Hz)	0.00 – 240.0		20.00
7.10	Preset Frequency 4 (Hz)	0.00 – 240.0		25.00
7.11	Preset Frequency 5 (Hz)	0.00 – 240.0		30.00
7.12	Preset Frequency 6 (Hz)	0.00 – 240.0		35.00
7.13	Preset Frequency 7 (Hz)	0.00 – 240.0		40.00
7.14	Up/Down Frequency Control Mode	0000: Free-Running ⁽⁵⁾ 0001: Incremental Change (See Function No. 7.15)		0000
7.15	Increment of Up/Down Frequency (Hz)	0.01 – 30.00		1.00
7.16	Accel/Decel 2 Time (Seconds)	0.3 – 180.0		1.5

Note: (1) Each of the 7 Multi-Function Input Terminals can be programmed for any of the respective function codes (0000 – 0011). **(2)** Preset Frequencies 1 – 7 are obtained by selecting a specific combination of 3 Multi-Function Input Terminals. The specific frequencies are programmed in Functions 7.07 – 7.13. **(3)** For Up/Down Frequency Commands (codes “0003” and “0004”), Frequency Control (Function No. 2.00) must be set to Up/Down using MFI’s (code “0005”). **(4)** For Forward/Reverse Stop Commands (codes “0006” and “0007”) and N.O. Start / N.C. Stop (codes “0010” and “0011”), Run/Stop-Forward/Reverse Control (Function No. 1.00) must be set to External Contacts (code “0001”). **(5)** The incremental rate of change of the “UP” Control for frequency setting, using external contacts, is proportional to the Accel Time setting (3.03). The incremental rate of change of the “DOWN” Control for frequency setting, using external contacts, is proportional to the Decel Time Setting (3.04).

*Functions which can only be changed while the drive is in the Stop Mode.

8- MULTI-FUNCTION OUTPUT RELAYS AND OUTPUT SIGNAL OPERATION (IODA OPTION BOARD REQUIRED)

Function No.	Description	Range/Code			Factory Setting
8.00*	Multi-Function Output Relay 1 (Terms. 23 – 25)	0000: Run 0001: Fault ⁽¹⁾			0000
8.01*	Multi-Function Output Relay 2 (Terms. 26 – 28)	0002: Target Frequency (Function No. 8.04 ± Function No. 8.05) 0003: Frequency Threshold Level (> Function No. 8.04 – Function No. 8.05) ⁽²⁾ 0004: Frequency Threshold Level (< Function No. 8.04 + Function No. 8.05) ⁽³⁾			0001
8.02*	Multi-Function Open Collector Output 1 (Terms. 11, 12)	0005: I ² t or I•t Fault 0006: Load Loss (See Function No. 5.03)			0002
8.03*	Multi-Function Open Collector Output 2 (Terms. 13, 14)	0007: External Fault 0008: Motor Overload ⁽⁴⁾			0004
8.04	Frequency Set Point (Hz)	0.00 – 240.0			0.00
8.05	Frequency Bandwidth (± Hz)	0.00 – 30.00			1.00
8.06	Analog Output 1 Mode (Terms. 15, 16) (0 – 5 VDC)	0000: Motor Frequency 0001: Set Frequency	0002: Motor Voltage 0003: Bus Voltage	0004: Motor Current	0000
8.07	Analog Output 1 Gain (%)	0 – 200			100
8.08	Analog Output 2 Mode (Terms. 17, 18) (See Function No. 8.09)	0000: Motor Frequency 0001: Set Frequency	0002: Motor Voltage 0003: Bus Voltage	0004: Motor Current	0000
8.09	Analog Output 2 Type ⁽⁵⁾	0000: 0 – 5 VDC	0001: 0 – 20 mA DC	0002: 4 – 20 mA DC	0000
8.10	Analog Output 2 Gain (%)	0 – 200			100

Notes: (1) The Output Relay contacts will change state due to all Faults and Recovered Faults. **(2)** The relay will activate above the setting in 8.04 and deactivate below the setting of 8.04 – 8.05. **(3)** The relay will activate below the setting in 8.04 and deactivate above the setting of 8.04 + 8.05. **(4)** The Output Relay will change state when the I²t or I•t Timer starts. **(5)** Analog Output 2 Type: For 0 – 5 VDC (code “0000”), set Jumpers J2 and J3, on the IODA, to the “VOLT” Position (factory setting). For 0 – 20 mA DC (code “0001”) or 4 – 20 mA DC (code “0002”), set Jumpers J2 and J3, on the IODA, to the “CUR” position.

*Functions which can only be changed while the drive is in the Stop Mode.

9- ANALOG INPUT SIGNAL OPERATION (IODA OPTION BOARD REQUIRED)

Function No.	Description	Range/Code		Factory Setting
9.00	Analog Input 1 Gain (%) ⁽¹⁾	0 – 500		100
9.01	Analog Input 1 Slope ⁽¹⁾	0000: Positive 0001: Negative		0000
9.02	Analog Input 1 Offset ⁽¹⁾	0 – 100		0
9.03	Analog Input 1 Type ⁽¹⁾	0000: Unidirectional 0001: Bidirectional		0000
9.04	Analog Input 1 Response Time (mSec) ⁽¹⁾	2 – 100		2
9.05	Analog Input 2 Gain (%) ⁽²⁾	0 – 500		100
9.06	Analog Input 2 Slope ⁽²⁾	0000: Positive 0001: Negative		0000
9.07	Analog Input 2 Offset ⁽²⁾	0 – 100		0
9.08	Analog Input 2 Type ⁽²⁾	0000: Analog Voltage or Current ⁽³⁾ 0001: PWM ⁽⁴⁾		0000
9.09	Analog Input 2 Response Time (mSec) ⁽²⁾	2 – 100		2

Notes: (1) For Analog Input 1 (Function Nos. 9.00 – 9.04), Frequency Control (Function No. 2.00) must be set to Analog Signal 1 (code “0002”). **(2)** For Analog Input 2 (Function Nos. 9.05 – 9.09), Frequency Control (Function No. 2.00) must be set to Analog Signal 2 (code “0003”). **(3)** For Current Signal Input, set Jumper J1, on the IODA, to the “CUR” position. **(4)** 0.15 – 1 kHz (0 – 100% duty cycle).



10- COMMUNICATION MODE (DIAC OPTION BOARD REQUIRED)

Function No.	Description	Range/Code		Factory Setting		
10.00*	Assigned Communication Station Number	1 – 247		30		
10.01	Communications Watchdog Timer	0000: Disabled	0001: Enabled	0000		
10.02	Watchdog Timeout (Seconds)	0.50 – 2.00		0.50		
10.03	Operational Command	0	0: Stop 1: Run	—		
		1	0: Forward 1: Reverse			
		2	0: N/A 1: Fault Reset			
		3	0: JOG-LCL/REM Command Off 1: JOG-LCL/REM Command On			
		4	0: N/A 1: Preset Frequency 1			
		5	0: N/A 1: Preset Frequency 2			
		6	0: N/A 1: Preset Frequency 3			
		7	0: N/A 1: Preset Frequency 4			
		8	0: N/A 1: Preset Frequency 5			
		9	0: N/A 1: Preset Frequency 6			
		10	0: N/A 1: Preset Frequency 7			
11 – 15		Reserved				
10.04	Drive Status	0	0: Stop 1: Run	—		
		1	0: Forward 1: Reverse			
		2	0: Normal 1: Fault			
		3	0: JOG-LCL/REM Command Off 1: JOG-LCL/REM Command On			
		4	0: N/A 1: Preset Frequency 1			
		5	0: N/A 1: Preset Frequency 2			
		6	0: N/A 1: Preset Frequency 3			
		7	0: N/A 1: Preset Frequency 4			
		8	0: N/A 1: Preset Frequency 5			
		9	0: N/A 1: Preset Frequency 6			
		10	0: N/A 1: Preset Frequency 7			
		11	0: Jog Momentary Mode 1: Jog Latching Mode			
		12			Reserved	
		13	0: Local 1: Remote			
14, 15		Reserved				
10.05	Drive Status Description	00	Normal Operation	—		
		01	Short Circuit Trip			
		02	Current Limit			
		03	Current Limit Trip			
		04	Undervoltage Trip			
		05	Recovered Undervoltage Trip			
		06	Overvoltage Trip			
		07	Recovered Overvoltage Trip			
		08	Stop Mode			
		09	Flash Error			
		10	External Fault Trip (IODA)			
		11	IODA Error			
		12	Phase Loss Trip			
13	Current Source Trip (IODA)					
10.06 **	Communications Error Count	—		—		
10.07 **	Motor Voltage	—		—		
10.08 **	Motor Current	—		—		
10.09 **	Bus Voltage	—		—		
10.10 **	Motor Frequency	—		—		

*Functions which can only be changed while the drive is in the Stop Mode.

**Read only.

11- RESERVED FUNCTIONS

Function No.	Description	Range/Code	Factory Setting
11.00	Current Limit Multiplier (%)	0 – 200	105
11.01 – 11.09	Reserved	—	—

THE PROGRAMMABLE FUNCTION LIST (REV. 100.1)
IS APPLICABLE TO THE FOLLOWING* SOFTWARE REVISION CODES

Model No.	Software Revision Code
KBDA-24D	29/1.02
KBDA-27D	35/1.02
KBDA-29	37/1.01
KBDA-45	38/1.01
KBDA-48	39/1.01

* Or higher.

