### KBAC Adjustable Frequency Drives

**ADJUSTABLE FREQUENCY DRIVES**

**FOR 3-PHASE AC MOTORS**

**NEMA-4X / IP-65**

*Washdown and Watertight for Indoor and Outdoor use*

Models KBAC-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 Line

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#### STANDARD FEATURES

- **Industrial Duty Die-Cast Aluminum Case with Hinged Cover:** Available in dark gray finish or FDA approved white finish.
- **Simple to Operate:** Does not require programming. Uses trimpots and jumpers, which are factory set for most applications.
- **Motor HP Selection Jumper:** Allows the drive to be used on a wide range of motor horsepower without recalibration.
- **Diagnostic LEDs:** Power on (POWER) and drive status (STATUS).
- **Run/Fault Relay Output Contacts:** Can be used to turn on or off equipment or to signal a warning if the drive is put into the Stop Mode or a fault has occurred.
- **Start/Stop Switch:** Provides electronic start and stop functions.
- **Barrier Terminal Block:** Facilitates wiring of motor, AC line, and Run/Fault Relay Output Contacts.
- **Jumper Selection of Drive Output Frequency:** Increases the motor speed up to two times the rated RPM.
- **Ride-Through:** Provides smooth recovery to the previous set speed during a momentary power loss (of less than 2 seconds).
- **Holding Torque at Zero Speed:** Resists motor shaft rotation when the drive is in Stop Mode.
- **GFCl Operation.**

#### PERFORMANCE FEATURES

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

#### PROTECTION FEATURES

- **Motor Overload (I^2t) with RMS Current Limit:** Provides motor overload protection which prevents motor burnout and eliminates nuisance trips.
- **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).
- **Regeneration:** Eliminates tripping due to high bus voltage caused by rapid deceleration of high inertial loads.
- **Undervoltage and Overvoltage:** Shuts down the drive if the AC line input voltage goes above or below the operating range.
- **MOV Input Transient Suppression:**
- **Microcontroller Self Monitoring and Auto-Reboot:**

#### TRIMPOT ADJUSTMENTS

- **Minimum Speed (MIN)**
- **Deceleration (DECEL)**
- **Boost (BOOST)**
- **Maximum Speed (MAX)**
- **Slip Compensation (COMP)**
- **Current Limit (CL)**
- **Acceleration (ACC)**
- **Jog (JOG)**

#### DESCRIPTION

The KBAC 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 operates at a carrier frequency of 16 kHz, which 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 KBAC is easy to install and operate. Tailoring to specific applications is accomplished with selectable jumpers and trimpots, which eliminate the computer-like programming required on other drives. However, for most applications no adjustments are necessary. For more advanced programming, PC based Drive-Link™ software is available.

Main features include adjustable RMS Current Limit and I^2t Motor Overload Protection. In addition, Adjustable Slip 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. Electronic Inrush Current Limit (EICL™) eliminates harmful AC line inrush current. A Run/Fault Relay is provided, which can be used to turn on or off equipment or to signal a warning if the drive is put into the Stop Mode or if a fault has occurred. The drive is suitable for machine or variable torque (HVAC) applications. Also, a jumper is provided for selection of Regenerative or DC Injection Braking.

Standard front panel features include diagnostic LEDs for “Power On” and “Drive Status”, a Start/Stop Switch, and a Main Speed Potentiometer. Other features include a Barrier Terminal Block to facilitate wiring of the AC line and motor, adjustable trimpots for selection of Regenerative or DC Injection Braking.

Optional accessories include: Forward-Stop-Reverse Switch, On/Off AC Line Switch, Run-Stop-Jog Switch, Signal Isolator, Auto/Manual Switch, Class “A” AC Line Filter, Multi-Speed Board, Programming Kit, Modbus Communication Module, and Liquidtight Fittings. A connector is provided for easy installation of accessories.

Custom software: All models can be factory programmed for applications which require special timing, PLC functions, and GFCI operation – Contact our Sales Department.

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* Requires CE approved RFI Filter: See AC Line Filters, in Optional Accessories.

**Notes:**
1. Requires optional software.
2. UL approved as an electronic overload protector for motors.
3. When the drive is set for DC Injection Braking, the DECEL Trimpot is used to adjust the braking intensity and time.
### TABLE 1 – GENERAL PERFORMANCE SPECIFICATIONS

<table>
<thead>
<tr>
<th>Description</th>
<th>Specification</th>
<th>Factory Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>115 Volt AC Line Input Voltage Operating Range (Volts AC)</td>
<td>115 (±15%)</td>
<td>—</td>
</tr>
<tr>
<td>208/230 Volt AC Line Input Voltage Operating Range (Volts AC)</td>
<td>208 (–15%) / 230 (±15%)</td>
<td>—</td>
</tr>
<tr>
<td>400/460 Volt AC Line Input Voltage Operating Range (Volts AC)</td>
<td>380 (–15%) – 460 (±15%)</td>
<td>—</td>
</tr>
<tr>
<td>Maximum Load (% Current Overload for 2 Minutes)</td>
<td>150</td>
<td>—</td>
</tr>
<tr>
<td>Carrier, Switching Frequency (kHz)</td>
<td>16, 8</td>
<td>—</td>
</tr>
<tr>
<td>Signal Following Input Voltage Range (Volts DC)</td>
<td>0 – 5</td>
<td>—</td>
</tr>
<tr>
<td>Output Frequency Resolution (Bits, Hz)</td>
<td>10, 06</td>
<td>—</td>
</tr>
<tr>
<td>Minimum Speed Trimpot (MIN) Range (% Frequency Setting)</td>
<td>0 – 40</td>
<td>—</td>
</tr>
<tr>
<td>Maximum Speed Trimpot (MAX) Range (% Frequency Setting)</td>
<td>70 – 110</td>
<td>100</td>
</tr>
<tr>
<td>Acceleration Trimpot (ACCEL) and Deceleration Trimpot (DECEL) Range (Seconds)</td>
<td>.3 – 20</td>
<td>1.5</td>
</tr>
<tr>
<td>Boost Trimpot (BOOST) Range (Volts/Hz)</td>
<td>0 – 30</td>
<td>5</td>
</tr>
<tr>
<td>Slip Compensation Trimpot (COMP) Range at Drive Rating (Volts/Hz)</td>
<td>0 – 3</td>
<td>1.5</td>
</tr>
<tr>
<td>Current Limit Trimpot (CL) Range (% Full Load)</td>
<td>40 – 200</td>
<td>160</td>
</tr>
<tr>
<td>Motor Frequency Setting (Hz) (Jumper J5)</td>
<td>50, 60</td>
<td>60</td>
</tr>
<tr>
<td>Output Frequency Multiplier (1X, 2X) (Jumper J4)²</td>
<td>1, 2</td>
<td>1</td>
</tr>
<tr>
<td>Minimum Operating Frequency at Motor (Hz)</td>
<td>1</td>
<td>—</td>
</tr>
<tr>
<td>Speed Range (Ratio)</td>
<td>60:1</td>
<td>—</td>
</tr>
<tr>
<td>Speed Regulation (30:1 Speed Range, 0 - Full Load) (% Base Speed)³</td>
<td>2.5</td>
<td>—</td>
</tr>
<tr>
<td>Overload Protector Trip Time for Stalled Motor (Seconds)</td>
<td>6</td>
<td>—</td>
</tr>
<tr>
<td>Undervoltage/Overvoltage Trip Points for 115 Volt AC Line Input (±5%) (Volts AC)⁴</td>
<td>76 – 141</td>
<td>—</td>
</tr>
<tr>
<td>Undervoltage/Overvoltage Trip Points for 208/230 Volt AC Line Input (±5%) (Volts AC)⁴</td>
<td>151 – 282</td>
<td>—</td>
</tr>
<tr>
<td>Undervoltage/Overvoltage Trip Points for 400/460 Volt AC Line Input (±5%) (Volts AC)⁴</td>
<td>302 – 567</td>
<td>—</td>
</tr>
<tr>
<td>Run/Fault Relay Output Contact Rating (Amps at 30 Volts DC, 250 Volts AC)</td>
<td>1, 0.5, 0.25</td>
<td>—</td>
</tr>
<tr>
<td>Operating Temperature Range (ºC / ºF)</td>
<td>0 – 45 / 32 – 113</td>
<td>—</td>
</tr>
</tbody>
</table>

**Notes:**
1. Requires an isolated signal. If a non-isolated signal is used, or if using 0 to ±2.5 thru 0 to ±25 Volts DC, or 4 – 20 mA DC signal inputs, install the SIAC – Signal Isolator (Part No. 9600).
2. Allows the motor to operate up to two times the rated RPM. Constant horsepower will result when operating the drive in the "X2" mode above the motor rated frequency.
3. Dependent on motor performance.
4. Do not operate the drive outside the specified AC line input voltage operating range.

### TABLE 2 – ELECTRICAL RATINGS

<table>
<thead>
<tr>
<th>Model No.</th>
<th>Part No.</th>
<th>AC Line Input</th>
<th>Drive Output</th>
<th>Motor Horsepower Selection² (Jumper J2)</th>
<th>Net Wt.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Volts AC (50/60 Hz)</td>
<td>Phase (φ)</td>
<td>Maximum Current (Amps AC)</td>
<td>Fuse or Circuit Breaker Rating (Amps)</td>
</tr>
<tr>
<td>KBAC-24D</td>
<td>9987</td>
<td>9988</td>
<td>115</td>
<td>16</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>115</td>
<td>115</td>
<td>10</td>
<td>0 – 230</td>
<td>5.5</td>
</tr>
<tr>
<td>KBAC-27D</td>
<td>9520</td>
<td>9521</td>
<td>115</td>
<td>10</td>
<td>25</td>
</tr>
<tr>
<td>KBAC-29</td>
<td>9528</td>
<td>9529</td>
<td>208/230</td>
<td>1</td>
<td>15</td>
</tr>
<tr>
<td>KBAC-45³</td>
<td>9530</td>
<td>9531</td>
<td>400/600</td>
<td>3</td>
<td>5.3</td>
</tr>
<tr>
<td>KBAC-48³</td>
<td>9540</td>
<td>9541</td>
<td>400/800</td>
<td>3</td>
<td>9.8</td>
</tr>
</tbody>
</table>

**Notes:**
1. White FDA approved finish.
3. Model KBAC-29 is rated 2 HP maximum with single-phase AC line input and 3 HP maximum with 3-phase AC line input.
FIGURE 1 – MODEL KBAC-24D
MECHANICAL SPECIFICATIONS (Inches/mm)

Contains 3 mounting holes for standard 1/2" liquidtight fittings
* Tighten these screws, in the sequence shown, to 12 in-lbs (14 kg-cm).

FIGURE 2 – MODELS KBAC-27D, 29, 45, 48
MECHANICAL SPECIFICATIONS (Inches/mm)

Contains 2 mounting holes for standard 1/2" liquidtight fittings and 1 mounting hole for standard 3/4" liquidtight fitting.
* Tighten these screws, in the sequence shown, to 12 in-lbs (14 kg-cm).

FIGURE 3 – CONTROL LAYOUT 1

Diagnostic LEDs
- yellow high (P3)
- orange alright (P2)
- white low (P1)

Main Speed Potentiometer
- Black
- White
- Red

Normally Closed
- TO
- NF
- NO

Normally Open
- COM

Start/Stop Switch
- Run/Stop
- Fault

Run/Fault Relay Contacts

All jumpers and trimpots are shown in factory set positions.

- J1: AC Line Input Voltage
  - Models KBAC-24D, 27D only. (See Fig. 5.)

- J2: Motor Horsepower selection
  - Models KBAC-24D, 27D only. (See Fig. 5.)

- J3: Automatic Ride-Through or Manual Start

- J4: 1X or 2X Rated Motor RPM Operation
  - Models KBAC-24D, 27D only. (See Fig. 5.)

- J5: 60 Hz or 50 Hz

- J6: Fixed or Adjustable Boost

- J7: Regenerative or Injection Braking

- J8: "Run" or "Fault" Output Relay Operation

Notes: 1. Layout of Model KBAC-24D varies slightly. 2. On Model KBAC-24D, the JOG and COMP trimpots are located vertically, along the right edge of the PC board (below the mounting screws). 3. On Model KBAC-24D, Jumper J2 is labeled "1", "3/4", "1/2", "1/4", "1/8" (factory set to the "1" position). On Model KBAC-27D, Jumper J2 is labeled "2", "1 1/2", "1", "3/4", "1/2" (factory set to the "1 1/2" position). On Models KBAC-29, 45, 48, Jumper J2 is labeled "A", "B", "C", "D", "E" (factory set according to Table 2, on page 2). 4. On Model KBAC-24D, Jumper J3 is labeled "AUTO" and "MAN".
TABLE 3 – OPTIONAL ACCESSORIES

<table>
<thead>
<tr>
<th>Description</th>
<th>Model KBAC-24D</th>
<th>Model KBAC-27D</th>
<th>Model KBAC-29</th>
<th>Model KBAC-45</th>
<th>Model KBAC-48</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forward-Stop-Reverse Switch – Provides motor reversing and stop functions. Mounts on the enclosure cover and is supplied with a switch seal to maintain liquidtight integrity.</td>
<td>9480</td>
<td>9480</td>
<td>9480</td>
<td>9480</td>
<td>9480</td>
</tr>
<tr>
<td>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.</td>
<td>9482</td>
<td>9523</td>
<td>9532</td>
<td>9532</td>
<td>9532</td>
</tr>
<tr>
<td>Run-Stop-Jog Switch – Selects speed setting from either the Main Speed Potentiometer or the JOG Trimpot. Mounts on the enclosure cover and is supplied with a switch seal to maintain liquidtight integrity.</td>
<td>9340</td>
<td>9340</td>
<td>9340</td>
<td>9340</td>
<td>9340</td>
</tr>
<tr>
<td>Signal Isolator – Provides isolation between a non-isolated signal source and the drive. Mounts on the drive’s PC board with four snap-ins.</td>
<td>9600*</td>
<td>9600*</td>
<td>9600*</td>
<td>9600*</td>
<td>9600*</td>
</tr>
<tr>
<td>Auto/Manual Switch – When used with the Signal Isolator, it selects remote process signal or the Main Speed Potentiometer. Mounts on the enclosure cover and is supplied with a switch seal to maintain liquidtight integrity.</td>
<td>9481</td>
<td>9481</td>
<td>9481</td>
<td>9481</td>
<td>9481</td>
</tr>
<tr>
<td>AC Line Filter1 – Provides Class A RFI (EMI) suppression. Installs onto the drive’s PC board with quick-connect terminals. Suffix “S”: Filter is used when On/Off AC Line Switch is installed. Suffix “NS”: Filter is used when On/Off AC Line Switch is not installed.</td>
<td>9507</td>
<td>9512</td>
<td>9479</td>
<td>9479</td>
<td>9479</td>
</tr>
<tr>
<td>Multi-Speed Board – Provides multi-speed operation using external contacts or a PLC. Mounts on the drive’s PC board with four snap-ins.</td>
<td>9489</td>
<td>9489</td>
<td>9489</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Programming Kit2 – Includes DownLoad Module™ (DLM) handheld programming device which uploads and downloads drive programs, PC to DLM serial communication cable, DLM to drive communication cable, and PC Windows® based Drive-Link™ communication software.</td>
<td>9582</td>
<td>9582</td>
<td>9582</td>
<td>9582</td>
<td>9582</td>
</tr>
<tr>
<td>Modbus Communication Module – Allows direct communication between drive and Modbus3 protocol.</td>
<td>9517</td>
<td>9517</td>
<td>9517</td>
<td>9517</td>
<td>9517</td>
</tr>
<tr>
<td>Liquidtight Fittings – Provide a liquidtight seal for wiring the drive. Kit includes three 1/2” and one 3/4” liquidtight fittings.</td>
<td>9526</td>
<td>9526</td>
<td>9526</td>
<td>9526</td>
<td>9526</td>
</tr>
</tbody>
</table>


* Warning! It is highly recommended that the Signal Isolator (Part No. 9600) be installed when using the drive with external control signals.