USER MANUAL

KOLORROL TECHNOLOGIES PVT. LTD.

KLE series
AC DRIVES

Table of Content

Thank you for choosing Kolorrol's high performance ac drives. These drives are manufactured using high quality components and tested rigorously for harsh industrial environments.

This manual will guide you through installation, operation and maintenance of Kolorrol ac drives.

⚠ <u>Always read this manual before using Kolorrol ac drives.</u>

Safety guidelines
The following safety signs have been used in this manual.

⚠ **DANGER** A high risk situation may result due to violation of instruction leading to fatal or major injuries

⚠ **WARNING** A medium risk situation may arise due to violation of instruction leading to minor injuries or physical damage.

Important Precautions

⚠ Danger

⚠ AC input power must be disconnected before performing any maintenance.

⚠ After turning off power, some voltage remains on the DC bus. It takes about 1min for the dc bus voltage to discharge completely, after which maintenance can be performed.

⚠ The ac drive may be damaged beyond repair due to wrong connections at connectors marked **Input**(R,S,T) and **Motor**(U,V,W). Never connect ac supply mains to connectors marked **Motor**.

⚠ Warning

⚠ No voltage withstand test should be taken on any part of the unit. Such a test can damage the unit.

⚠ Do not touch electronic components on printed circuit board.

⚠ Provide ground to the ac drive at the earth terminal. The grounding method must comply with the laws of the country where the drive is to be installed.

⚠ Heatsink temperatures may go up to 70°C. Do not touch the heatsink.

⚠ The drive cover must be closed before giving power to the unit.

CHAPTER : 01   RECEIVING AND INSPECTION

KOLORROL ac drives have gone through rigorous quality control tests at the factory before shipment.

After receiving the AC DRIVE, please check for the following;

- Check to make sure that package includes an AC DRIVE and user manual.
- Inspect unit to ensure it was not damaged during shipment.
- Make sure that the part number indicated on the name plate corresponds with the part number of your order.

Name plate Information

Model : KLE750 A 43 H	AC Drive Model
Input : 3 PH, 12.0A, 350-460V, 50/60 Hz	Input Specification
Output : 3 PH, 0-460VAC, 12 A, 7.5 HP	Output Specification
Frequency Range : 0.1Hz-600Hz	Output Frequency range
Sr. No. 43H-11-02-XXX	Serial No.

MODEL EXPLANATION :

KLE	300	A	43	H
Series Name	Applicable Motor Capacity	Series	Input Voltage 43=Three phase 415 VAC	Version type
eg. :	500 [5 HP, 3.7 kW]			

SERIAL NO. EXPALANATION

KLE 300 :- Model and HP

43H – 12 – 02 – XXX

Month Year Serial No.

415VAC
3Phase System

CHAPTER : 02   STORAGE AND INSTALLATION

The AC DRIVE should be stored properly when it is not be used for an extended period of time.

Ambient Conditions :

Operation : * Air temperature   : -10^{0}C to + 40^{0}C
             * Atmospheric pressure   : 85 to 105 kPa
             * Installation site Altitude : below 1000m
             * Vibration   : Max. 9.86 m/s^2 at below 20 Hz
                                            Max 5.88 m/s^2 at 20 Hz to 50 Hz

Storage :   * Temperature   : -20^{0}C to + 60^{0}C
             * Relative Humidity   : Less than 90%, non condensing
             * Atmospheric pressure   : 85 to 105 kPa

Transporation :

             * Temperature   : -20^{0}C to + 60^{0}C
             * Relative Humidity   : Less than 90%, non condensing
             * Atmospheric pressure   : 85 to 105 kPa
             * Vibration   : 9.8m/s^2 at less than 20Hz, 5.8 m/s^2 at 20
                                            to 50Hz

Pollution degree :   2 : good for a factory type environment

Installation

Mounting and Installation

> ### ⚠ Warning
>
> ⚠ Always install the drive vertically.
>
> ⚠ Mount the drive in such a way that air flow through the heat sink fins is not restricted.
>
> ⚠ When mounting inside an enclosure or a panel, ensure that the enclosure is appropriately cooled so that the maximum ambient temperature rating of the drive is not exceeded.
>
> ⚠ Avoid installing the drive in the following environments:
>
>   - Near vibrating sources.
>
>   - In direct sunlight.
>
>   - In atmosphere with conductive dust , cotton lint.
>
>   - In places with corrosive gases, high humidity levels or explosive gases.

Drive mounting figure.
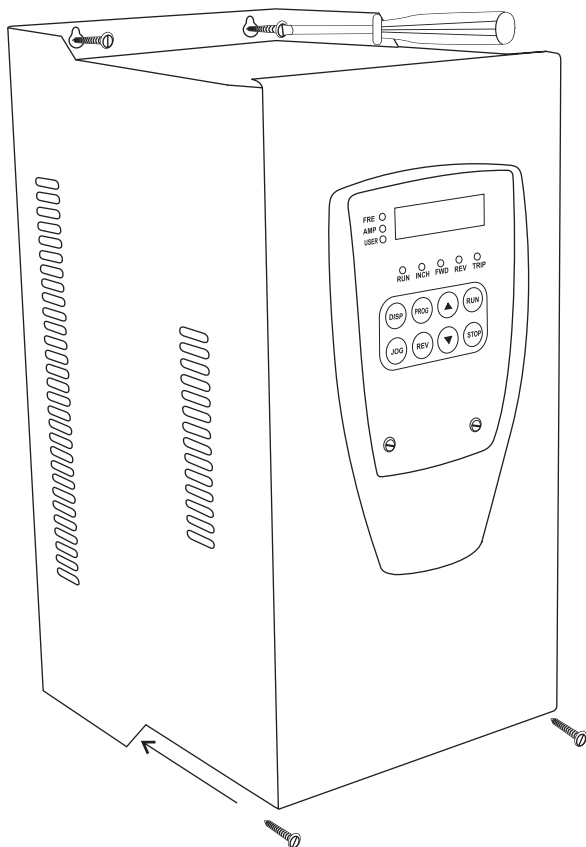
⚠ **Warning**

- The control, AC input power supply and motor cables should be laid separately.

- Always use recommended wire sizes for power terminals as listed on page 37

- Always mount the drive properly before doing wiring.

- Confirm that the voltage and frequency ratings of the drive match the ratings of the ac input power supply.

- Tighten the terminal screws with the torque specified in the manual.

- Protective devices such as fuses or MCCB of appropriate rating should always be connected between the drive and ac input power supply. Recommended input line fuses are specified on page 37

- Do not remove wiring when power is applied to the drive.

- Route the power and control wires separately or at 90^0 to each other.

- Make sure that the power source is capable of supplying the correct voltage and required current to the drive.

- When multiple ac drives are to be installed in one location, all units should be grounded to a common ground terminal.

- The ac drive may be damaged beyond repair due to wrong connections at connectors marked **Input**(R,S,T) and **Motor**(U,V,W). Never connect ac supply mains to connectors marked **Motor**.

- Provide ground to the ac drive at the earth terminal. The grounding method must comply with the laws of the country where the drive is to be installed.

General wiring instructions

Remove the front cover as shown and detach the keypad cable from the control board.

Complete control and power wiring and replace front cover after connecting keypad cable to the control board.

Diagram indicating front cover removal
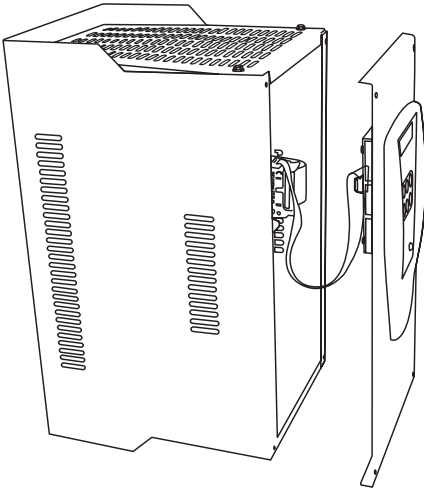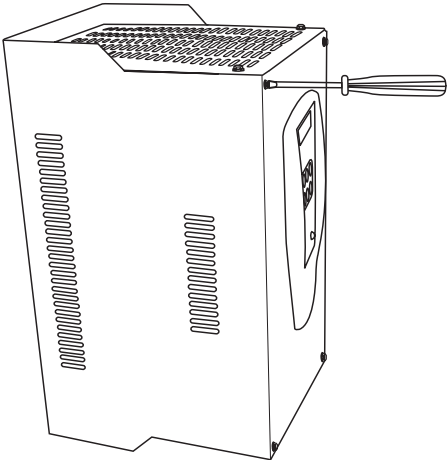
• TERMINAL EXPLANANTION

Terminal Symbol	Explanation of Terminal Function
R, S, T	AC line Input Terminals
U, V, W	AC drive output terminal [Motor Connection]
B1, B2	Connection for braking Resistor [Optional]
E	Earth
DC+	DC bus positive
DC-	DC bus negative
L	Connection for DC choke between L & DC+

Power Terminal Connections
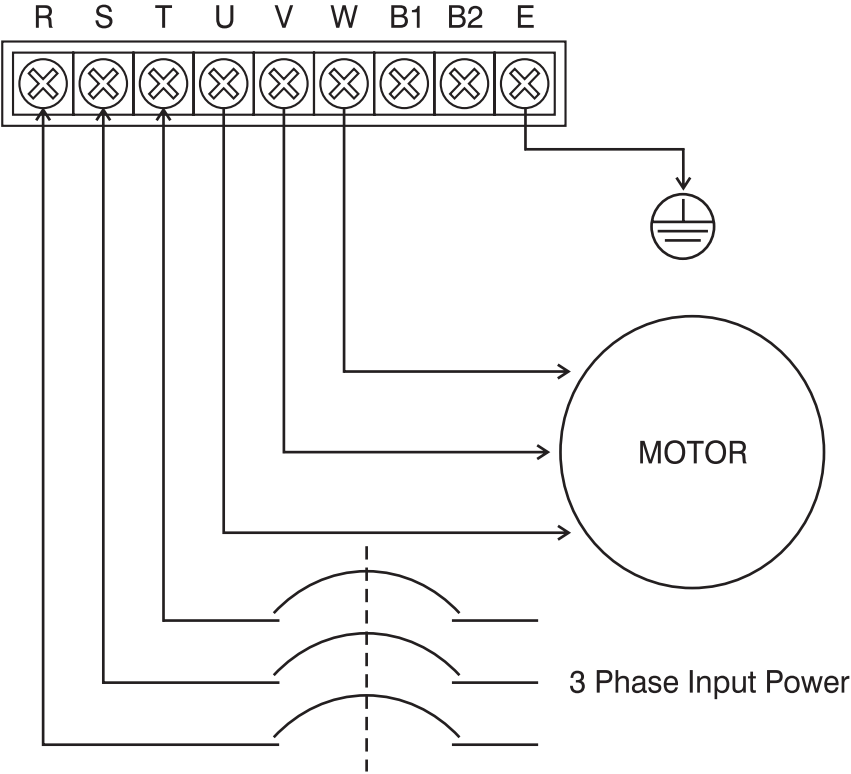
Note: Exact terminal configuration may vary with drive rating.

Power terminal layout KLE300

⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗
R	S	T	U	V	W	B1	B2	E
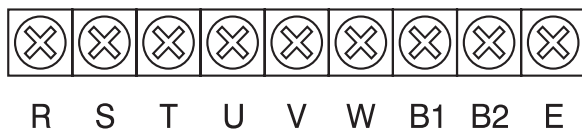
Power terminal layout for KLE750 to KLE1500

⊗	⊗	⊗		⊗	⊗	⊗		⊗	⊗	⊗
R	S	T		U	V	W		B1	B2	E
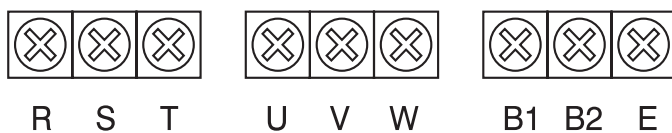
Power terminal layout (KLE2000 and above)

⊗	⊗	⊗		⊗	⊗	⊗		⊗	⊗	⊗	⊗
R	S	T		L	DC+	DC-		U	V	W	E
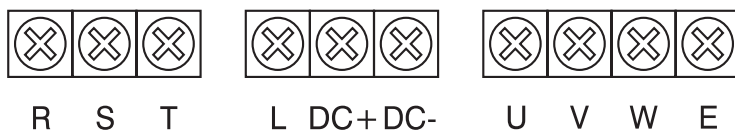
Control Terminals

FOR	REV	JOG	EMR	IN1	+24	Com	+10	Pot	ACM	AVO	ACM

- Use any multi strand wire between AWG15 and AWG26 for control wiring.
- Use a twisted pair or twisted pair shielded wire for analog signals. Wire shield should be connected to ACM.

Terminal	Operation
For	Forward start, non latching in modes 0 and 1(see page 17) Forward start, latching(momentary activation) in mode 2
Rev	Reverse start, non latching in mode 0 (see page 17) Reverse command, in modes 1 and 2 (see page 17)
Jog	Jog command
Emr	External fault
In1	Multi function inputs (see page 18)
+24	DC voltage source
Com	Digital input common
+10	+10Vdc for potentiometer
Pot	Potentiometer wiper or 0-10Vdc voltage input
Acm	Analog common
Avo	Analog voltage output 0 – 10Vdc
Acm	Analog common

Basic Wiring scheme
(KLE300 to KLE1500)

Braking resistor

3ph ac supply

MCB

EMI filter(optional)

B1 B2

R
S
T

U
V
W
E

M

Sinking inputs only

For
Rev
Jog
EMR
IN1
+24

Potentiometer 5K or 0-10VDC

+10
Pot
Acm

Shielded cable

AVO
ACM

0-10V analog output

shielded cable
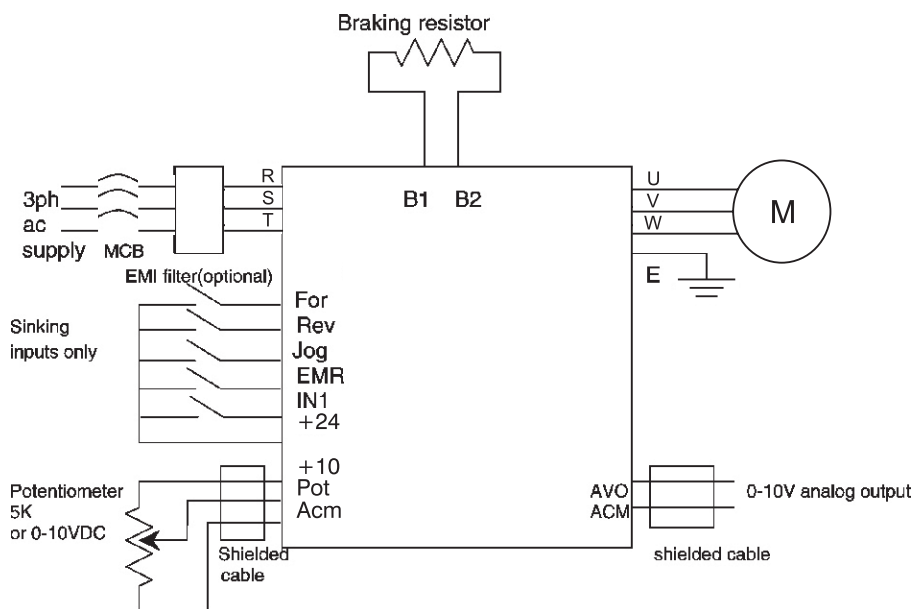
Basic Wiring scheme
(KLE 2000 Above)

DC Choke (Optional)

Optional braking unit

3ph ac supply — MCB

R S T — L DC+ — DC+ DC-

EMI filter(optional)

U V W E — M

Sinking inputs only

For
Rev
Jog
EMR
IN1
+24

Potentiometer
5K
or 0-10VDC

+10
Pot
Acm

AVO
ACM

0-10V analog output

Shielded Cable

Shielded Cable
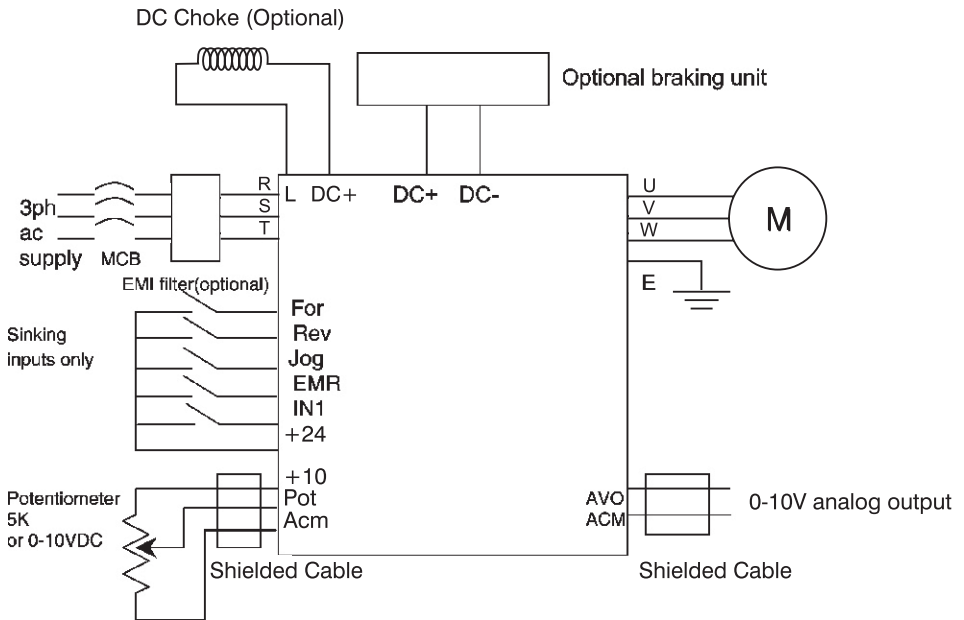
Maintenance
- Vacuum clean the drive regularly in power off condition. Do not use water or organic solvents to clean the drive.
- Contact Kolorrol for any part replacement . Part replacement and repairs should be carried out by qualified / trained personnel only.

MOTOR GUIDELINES

- Avoid running a standard induction motor at low speed. Under these condition the motor temperature may rise above the rated value due to limited airflow produced by motor's fan.

- If 100% output torque is required at low speed, it may be necessary to use a special " INVERTER-DUTY" motor.

- When using the AC DRIVE to operate a standard 3 Phase induction motor, notice that energy losses are greater than for inverter duty motor.

- When the standard motor operates at low speed, the output load current rating of the drive must be derated.

Digital Keypad Operation
Keypad diagram

Digital Keypad Operation
Keypad diagram
Paramter entry :
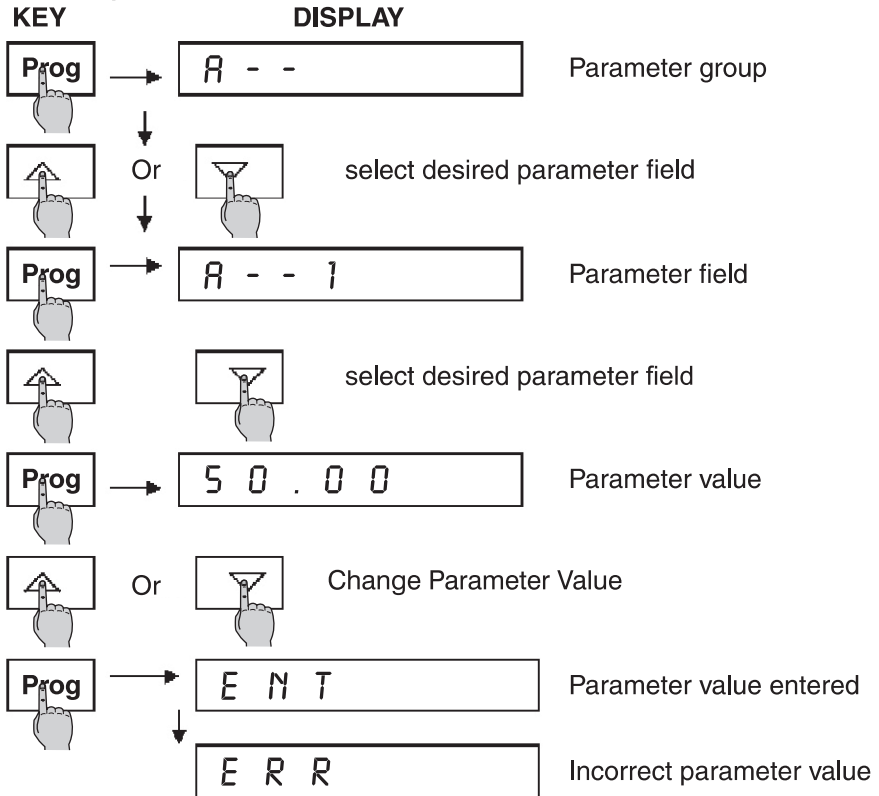
KEY	DISPLAY	
Prog →	$A - -$	Parameter group
▲ Or ▽		select desired parameter field
Prog →	$A - - 1$	Parameter field
▲ ▽		select desired parameter field
Prog →	$5\ 0\ .\ 0\ 0$	Parameter value
▲ Or ▽		Change Parameter Value
Prog →	$E\ N\ T$	Parameter value entered
	$E\ R\ R$	Incorrect parameter value

Display selection :

KEY	DISPLAY	
	$5\ 0\ .\ 0\ 0$	Set frequency
Disp	$A\ 1\ 0\ .\ 0\ 0$	Output Amps
Disp	$5\ 0\ .\ 0\ 0$	Current frequency
Disp	1500.00	User (Ref. Page 26)
Disp	$5\ 0\ .\ 0\ 0$	Set frequency

Parameter description:

** All parameters marked ▶ can be changed while drive is running.

Group A:

| **A-0:** | **Acceleration time 1** | **Factory setting: 10.0s** | ▶ |
| **A-7:** | **Acceleration time 2** | **Range: 0.1 to 6000.0s** | |

This is the time required to accelerate from 0hz to maximum frequency(**G-1**). Acceleration is linear provided that s curve (**A-6**) is 0.

| **A-1:** | **Deceleration time 1** | **Factory setting: 10.0s** | ▶ |
| **A-8:** | **Deceleration time 2** | **Range: 0.1 to 6000.0s** | |

This is the time required to decelerate from maximum frequency(**G-1**) to 0hz. Deceleration is linear provided that s curve (**A-6**) is 0.

Selection between accel /decel time 1 and accel/decel time 2 is done by multi function inputs (see page 16)

A-2:   **Jog frequency**   **Factory setting: 5.00hz**

Range: 0.1hz to 400.0hz

On pressing the inch key on the keypad or actuating the jog input on the control terminals the drive accelerates as per jog accel/decel time(**A-3**)from minimum frequency(**G-6**) to the jog frequency. On releasing the inch key the drive decelerates or coasts to a stop. Only reverse and stop commands are accepted when drive is in jog mode.

A-3:   **Jog acceleration/deceleration time**   **Factory setting:2.0s**   ▶
Range: 0.1s to 1000.0s

This is the acceleration / deceleration time in jog mode.

A-4:   **Frequency reference upper limit**   **Factory setting:100%**
Range: 1% – 110%

This parameter clamps maximum set frequency to a percentage of max frequency(**G-1**)**.**

Max set frequency = **A-4** * **G-1**
                              100

This parameter should be greater than **A-5** – frequency reference lower limit.

A-5:   **Frequency reference lower limit**   **Factory setting:1%**
Range: 0% – 100%

This parameter clamps minimum set frequency to a percentage of max frequency (**G-1**)**.**

Min set frequency = **A-5** * **G-1**
                              100

This parameter should be less than **A-4**- frequency reference upper limit.

A-6: **S curve**   **Factory setting: 0**
                                                                  Range: 0 – 10
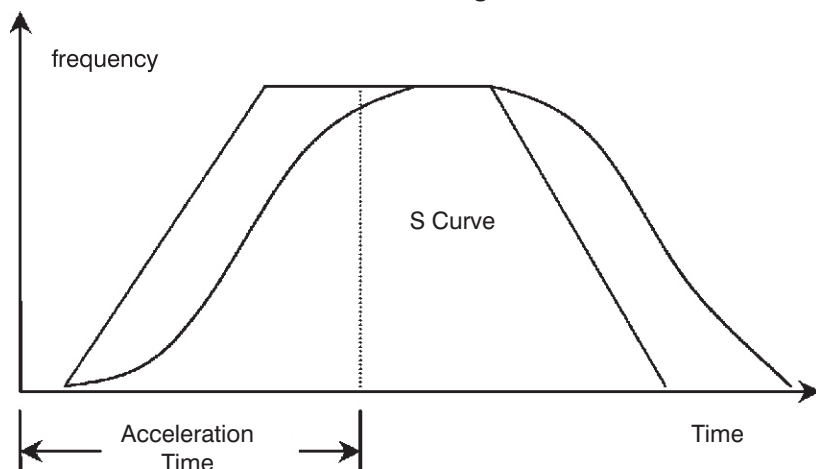
The S curve is for smooth acceleration and deceleration of the drive. If set to 0 it is deactivated. For a higher value, the speed time curve is no longer linear. With s curve the acceleration and deceleration times are higher than their set values.

Group B:

B-0: **Frequency reference select**   **Factory setting: 0**
                                                                  Range: 0 to 1

By setting this parameter , source of set frequency can be selected.

For changing set frequency by inc/dec
push buttons or inc/dec keys   = 0
Potentiometer or 0-10 VDC   = 1

B-1: **Operator select**   **Factory setting:0**
                                                                  Range: 0 to 1

Operator or command source can be one of the following:
Keypad   =   0
Control terminals   =   1

B-2: **Stop method**   **Factory setting:0**
                                                                  Range: 0 to 1

For coasting stop   = 0
For ramp to stop (on giving stop command)   = 1

B-3: **Stop key operation**   **Factory setting:0**
                                                                  Range: 0 to 1

Stop key(on keypad) always functional
regardless of operator (**B-1**) = 0
Stop key functional only if keypad
selected as operator **(B-1 = 0)** = 1

B-4: **Reverse operation** **Factory setting: 0**
  Range: 0 to 1

This parameter is used to enable or disable reverse operation.
Disable reverse operation = 0
Enable reverse operation = 1

B- 5: **Control method** **Factory setting: 0**
  Range: 0 to 1

This parameter is used to select the mode of operation of ac drive.
V/f control = 0
Sensorless vector open loop = 1

B-6: **2 wire 3 wire selection** **Factory setting:0**
  Range: 0 to 2

Mode 0: (B-6 = 0)

Fwd start/stop

For

Rev
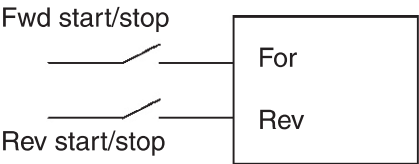
Rev start/stop

Both inputs are non latching type.

Mode 1: (B-6 = 1)

Start/Stop

For

Rev

Fwd/rev
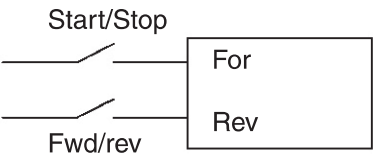
Start / stop input is non latching type.

Mode 2: (B-6 = 2)

Stop   Start

For

Emr

Rev
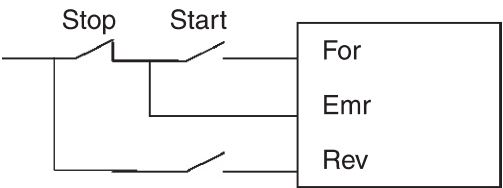
Start /stop input require momentary actuation.

B-7: **Set frequency resolution**   **Factory setting: 0**
                                                Range: 0 to 1

This parameter sets resolution of set frequency.
For 0.1 hz resolution = 0
0.01 hz resolution   = 1

B-8: **Set frequency storage**   **Factory setting:0**
                                                Range: 0 to 1

With this parameter set frequency , if changed, can be stored without pressing PROG key. This operation is valid only for **B-0** = 0

Normal operation.   =   0
Store set frequency
without pressing PROG key   =   1

B-9: **Switching frequency**   **Factory setting: 8khz**
                                                Range: 3 to 15khz

This is the switching frequency of the output PWM voltage.

Higher switching frequency results in higher heat dissipation and lower acoustic noise.

Recommended values of switching frequency:

| 3hp to 20hp | — | b-9 = 8khz |
| 20hp onwards | — | b-9 = 4khz |

↑	↓	↑
Switching Frequency	Accoustic Noise	Heat Dissipation
↓	↑	↓
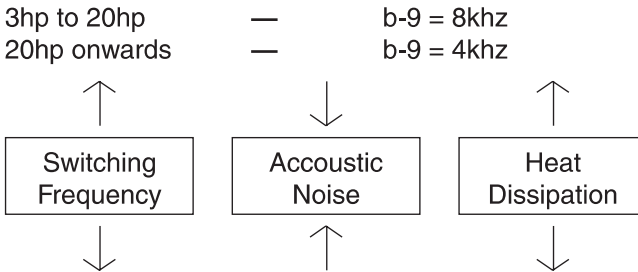
Group C

User programmable opto isolated inputs.

C-0:   **Factory setting:1**
                                                Range: 0 to 9

C-0	Function
0	Disable input. No function.
1	Increase set frequency.
2	Decrease set frequency.
3	Multi step speed 1
4	External fault reset

5	Select keypad or terminal as command source. Selection by B-1 is bypassed.
6	Acceleration/deceleration inhibit
7	Select 1st or 2nd acceleration/deceleration times
8	Emergency stop NO
9	Emergency stop NC

C-1: **Multi function input delay time**   **Factory setting: 1**
                                                      Range: 1 ms to 10 ms

This is the time delay in recognizing a multi function input. It is similar to debouce time. A higher value provides better noise immunity.

C-2: **Analog input bias polarity**   **Factory setting: 0**
                                                 Range: 0 to 1

Positive bias polarity   =   0
Negative bias polarity   =   1

C-3: **Analog input inverse enable**   **Factory setting: 0**
                                                  Range: 0 to 1

C-4: **Analog input gain**   **Factory setting: 100**
                                        Range: 0 to 200

C-5: **Analog input bias frequency**   **Factory setting: 0**
                                                  Range: 0 to 300.0hz
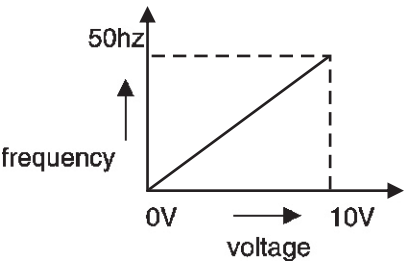
Adjustment method :

Example

Pot = 0V $\longrightarrow$ Frequency = 0.5hz
Pot = 10V $\longrightarrow$ Frequency = 50hz

With pot input = 0V, set bias so that frequency = 0.5hz (bias polarity C-2 = 0)

With pot input = 10V, set gain so that frequency = 50hz
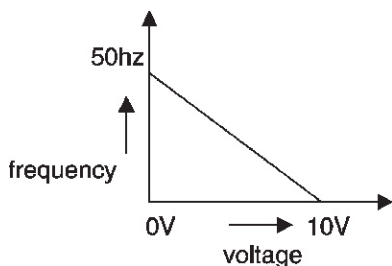
Adjustment method (inverse):

Example

Pot = 0V   ⟶   Frequency = 50hz
Pot = 10V   ⟶   Frequency = 0.5hz

Analog input bias polarity C-2 = 1 (negative bias polarity)
Analog input inverse enable C-3 = 1

With pot input = 0V, set bias so that frequency = 50hz
With pot input = 10V, set gain so that frequency = 0.5hz

C-6: **Analog input filter time constant**   **Factory setting: 0.1s**
     Range: 0.01s to 2.00s

This is the time constant of the built in analog input filter.
Higher the value of this parameter, more is the noise immunity.

GROUP D

D-2: **Multi function analog output**   **Factory setting: 0**
     Range: 0 to 3

D-3: **Multi function analog output gain**   **Factory setting: 100**
     Range: 0 to 100

Analog output voltage(0-10 Vdc) proportional to the selected parameter is available.

This output can be scaled by setting appropriate value of gain.

D-2	Operation
0	Output proportional to frequency
1	Output proportional to drive output voltage
2	Output proportional to drive output current
3	Output proportional to set frequency

E-0: **Overcurrent stall prevention during acceleration**

Factory setting:150%
Range: 20% to 200%
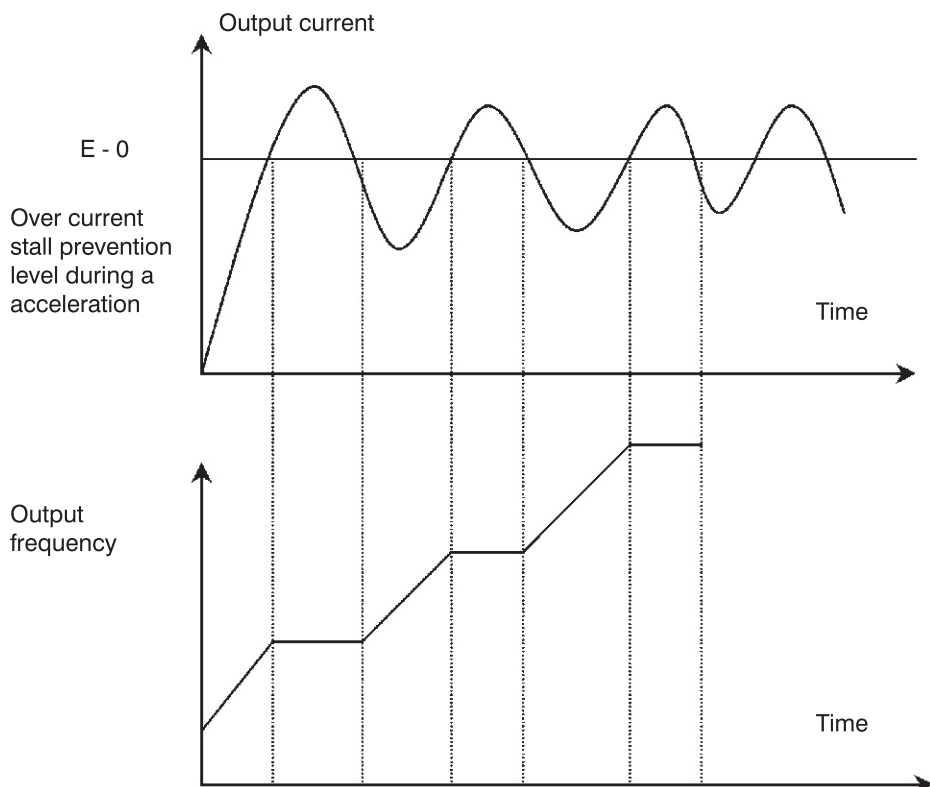
During acceleration if drive output current exceeds this limit, acceleration stops and drive continues to run at the same speed. Acceleration resumes when current falls below the stall prevention limit. Above value is a percentage of drive output current rating.

E-1: **Overcurrent stall prevention during deceleration**

Factory setting: 150%
Range: 20% to 200%

During deceleration if drive output current exceeds this limit, deceleration stops and drive continues to run at the same speed. Deceleration resumes when current fall below the stall prevention limit. Above value is a percentage of drive output current.

E-2: **Overcurrent stall prevention**
while running

Factory setting: 100%
Range: 20% to 200%

Current

Stall prevention
level during a
deceleration

Time

Frequency
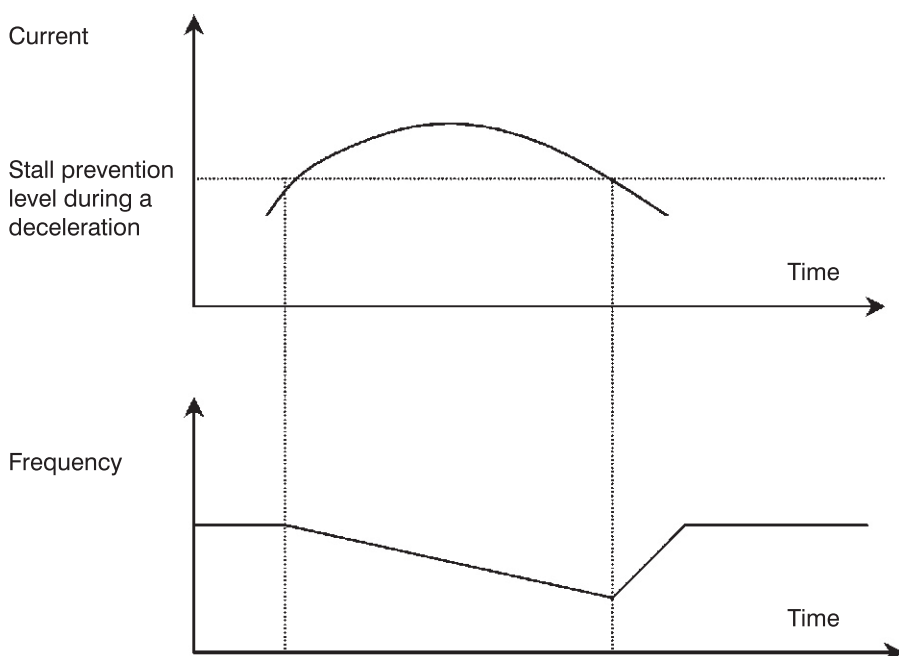
Time

While running (no acceleration, no deceleration) if drive output current exceed this limit, drive begins decelerating (as per the set deceleration time) till current falls below this limit. When the current drops below the stall prevention limit, drive accelerates to set speed.

Fault history

E-5: **last fault**
E-6: **one fault before last fault**
E-7: **two faults before last fault**

Faults are stored in e2prom and are displayed at the above locations.

Fault display	Fault	Fault code
Oc	Overcurrent	1 or 4096
Sc	Short circuit	2
Uv	Dc under voltage	8
Ee	E2prom error	16xxx
Ot	Over temperature	32768
Ov	Dc overvoltage	4

Group G

G-0: **Motor rotation**   **Factory setting: 0**
                                      Range: 0 to 1

Default motor direction of rotation can be set with this parameter.
Set to 0 or 1 depending upon the desired direction.

G-1: **Maximum output frequency**   **Factory setting: 50.00hz**
                                        Range: 0.1 – 600.00hz

This is the drive's maximum output frequency.

This is the reference frequency for acceleration, deceleration times, frequency reference upper limit, frequency reference lower limit.

G-2: **Maximum voltage frequency**   **Factory setting:50.00hz**
                                         Range:0.1- 600.00hz

This is the frequency at which drive's output voltage becomes maximum.
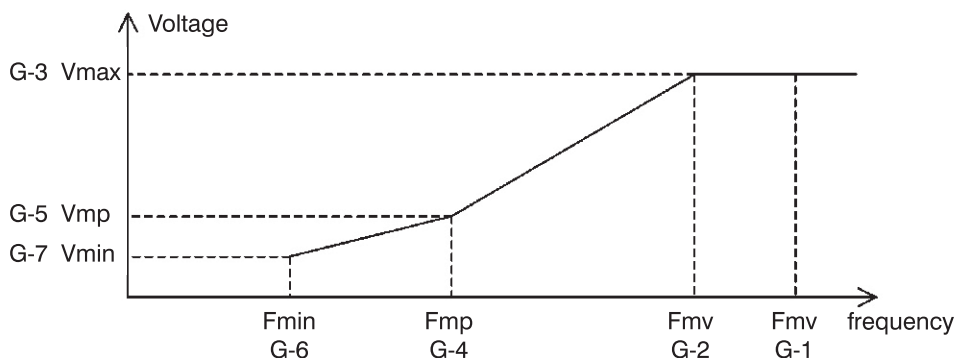
G-3: **Maximum voltage**   **Factory setting: 440.0V**
                                       Range: 0.1 to 510V

This is the maximum output voltage of the ac drive.

G-4: **Mid point frequency**   **Factory setting:0.5hz**
                                       Range: 0.1 – 600.00hz

G-5: **Mid point voltage**   **Factory setting: 16.0V**
                                       Range: 0.1 – 510.0V

G-6: **Min frequency**   **Factory setting: 0.5hz**
                                       Range: 0.1 – 600.00hz

G-7: **Min voltage**   **Factory setting:16.0V**
                                       Range: 0.1 – 510.0V

The following conditions must be met:
Fmax ≥ Fmv ≥ Fmp ≥ Fmin

Vmax ≥ Vmp ≥ Vmin

If Fmp = Fmin the V/f curve is a straight line and the setting of Vmp is disregarded.

G-8: **Rated current**   **Factory setting: 8.0A**
                                              Range: 1.0A to 200.0A

This is the rated current of the drive. It can be reduced for motors with lower current rating.

G-9: **Torque compensation**   **Factory setting: 2.0**
                                              Range: 0 to 10.0V

IR compensation is required at low speeds.

Low speed voltage can be increased by increasing this parameter, resulting in higher torque.

If this parameter is set too high it can cause the motor to saturate and the drive can trip in overcurrent.

G-10: **Rated slip**   **Factory setting: 2.50hz**
                                              Range: 0 to 20.00hz

Rated slip frequency =

$$\frac{\text{(synchronous speed of IM - rated speed (as on name plate))*No of poles}}{120}$$

G-11: **Motor no load currect**   **Factory setting: 40%**
                                              Range: 0 to 90%

This is the motor no load current as a percentage of rated current (G-8).

G-12: **Motor Stator resistance**   **Factory setting: 0**
                                              Range: 0 to 655.35E

This is the stator resistance of motor.
This parameter can be set manually or auto tuned.

G-13: **Auto Tune**   **Factory setting: 0**
                                              Range: 0 to 1

   0 : Drive runs normally on giving start command

   1 : Drive performs auto tuning on giving start command.

Run led is on at the time of auto tuning. After auto tuning is completed Run led turns off.

After auto tuning, stator resistance value is stored and G-13 is reset to 0.

Any start command after auto tuning will start the drive normally.

Auto tuning should only be perfomed with motor of rating equal to or less than that of the drive.

G-14: **Maximum slip compensation**   **Factory setting: 200%**
                                             Range: 0 to 250%

This is the maximum slip compensation expressed as a percentage of rated slip (G-10).

G-15: **Motor number of poles**   **Factory setting: 4**
                                        Range: 2 to 10

G-16: Vector control current compensation limit   **Factory setting: 1.0**
                                                        Range: 0 to 2.0

The output current during vector control is limited by this parameter.

The output current is a percentage of rated current (G-8).

For example is G-16 = 1.0, maximum current with vector control = 1.0x rated current.

Group H

H-0: **Drive identification number**   **Factory set**

This is a unique identification number and is read only.

H-1: **Default parameters**   **Factory setting: 1**
          Range: 0 to 1

If set to 0 all parameters are initialized to factory setting.

If set to 1 all parameters are initialized from the non volatile memory on power up.

H-2: **Power up display**   **Factory setting: 0**
          Range: 0 to 3

On power up , the display can be initialized to the following parameters:

H-2	Display
0	Set frequency
1	Any parameter as per H-3 selection
2	Drive output frequency
3	User parameter as per coefficient H-4

H-3: **Parameter selection**   **Factory setting:0**
          Range: 0 to 5

Any one of the following parameters can be displayed when AMP led is on.

H-3	Display (AMP Led on)
0	Output current (A)
1	DC link voltage (VDC)
2	Output voltage (V)
3	Power (Watts)
4	Energy (KW-hr)
5	Total run time (hours)

For display selection see page 14.

H-4: **User selection**   **Factory setting:0**
          Range: 0 to 5

Any one of the following parameters can be displayed when USER led is on.

H-4	Display (USER LED on)
0	User value
1	DC link voltage (VDC)
2	Output voltage (V)
3	Power (Watts)

4	Energy (KW-hr)
5	Total run time (hours)

For display selection see page 14.

H-5: **User coefficient**   **Factory setting:30.00**
                                                Range: 0 to 200.00

The user coefficient can be set to display any process parameter as multiple of drive output frequency. See Page 14.

User value = User coefficient * current frequency

After value can be displayed by setting H-4=0

H-6: **software version**   **Factory set**
 This is a version number of the drive software.

H-7: **Password**   **Factory setting:0**
                                                Range: 0 to 1

It set to 0 all the drive parameters can be changed.
It set to 1, all the drive parameters except set frequency are locked and no change is possible.

Group I

I-0 : Skip frequency1 upper limit
I-1 : Skip frequency1 lower limit
I-2 : Skip frequency2 upper limit
I-3 : Skip frequency2 lower limit
I-4 : Skip frequency3 upper limit
I-5 : Skip frequency3 lower limit   **Range : 0 to 400.00hz**
                                                         Factory setting : 0

Three skip frequency bands are available. Freqencies in these bands are skipped while accelerating, decelerating or running.

Following condition condition should be met : $I1 \geq I3 \geq I5$

Group J

J-0: **PID mode**   **Range : 0 to 4**
                                                Factory setting : 0

J-0	Mode of operation
0	PID disabled
1	PID enabled
2	Inverse PID
3	PID + reference
4	Inverse PID + reference

The Proportional, Integral and derivative control provides closed loop control of a system process variable(pressure, temperature, etc). The feedback signal is compared with a reference signal which results in an error signal. This signal after being processed by the PID parameters is the new frequency reference.

J-1: **PID feedback gain** **Range: 0 to 10.00**
Factory setting: 1.00

The feedback value is multiplied by PID feedback gain before being compared to set point value.

J-2: **PID feedback selection**

Pot input is used to provide feedback. No feedback selection is available in the KLE series.

J-3: **PID offset** **Range: 0 to 100%**
Factory setting: 0

This parameter adds a fixed offset (polarity is determined by J-4) to the PID output.

The offset is a percentage of maximum frequency(G-1).

It is used to remove small system noise.

J-4: **PID offset polarity** **Range: 0 to 1**
Factory setting: 0

This parameter determines the polarity of PID offset (J-3).

0: positive PID offset polarity

1: negative PID offset polarity

J-5: **Proportional gain** **Range: 0 to 10.0**
Factory setting: 1.0

Proportional gain P is specified by this value.
A higher value will result in a more responsive system.
A lower value will result in a more stable system.

J-6: **Integral time** **Range: 0 to 100.00s**
Factory setting: 1.00s

This time determines how fast the PID controller will seek to eliminate steady state error.

Steady state error will be eliminated faster with a lower setting. Effect of this parameter can be eliminated completely by making it 0.

J-7: **Derivative time** **Range: 0 to 1.00s**
Factory setting: 0

This parameter can be used to increase system response to fast load or reference changes.

The effect of this parameter can be eliminated completely by making it 0.

J-8: **Integral gain upper limit** **Range: 0 to 100%**
Factory setting: 100%

This parameter limits the output of integrator. It is used to prevent integrator 'windup'.

J-9: Feedback loss time   Range: 0 to 3600.0s
                                               Factory setting: 60.0s

If feedback signal value is less than feedback detection level for a time interval equal to feedback loss time, feedback loss mechanism is activated.

J-10: Feedback loss response: Range: 0 to 2
                                               Factory setting: 0

In case of feedback signal less than feedback loss level(J-11), the response is :

0   No response

1   Warn and keep operating

2   Stop

J-11: Feedback loss detection level   Range: 0 to 100%
                                               Factory setting: 0

J-12: PID output filter time constant   Range: 0 to 2.5s
                                               Factory setting: 0

This parameter adds a filter to the PID output. This filter can be utilized to remove noise at PID output.
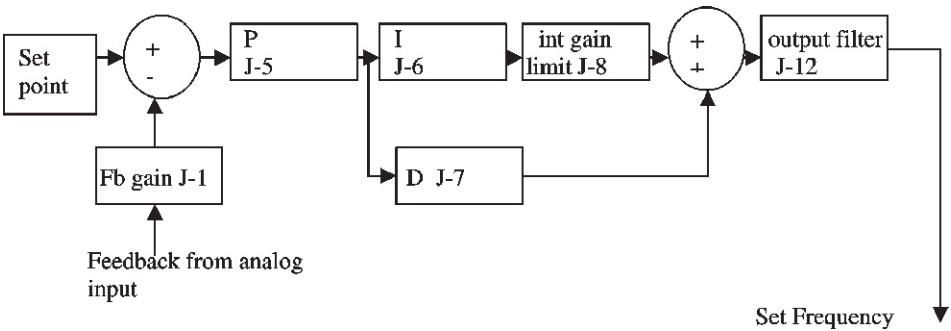
Group L

L-0: Multi speed input   Factory setting:2.00hz
                                               Range: 0.1 to 600.00hz

By setting C-0 = 3, one preset speed can be selected.

Multi step speed should be within the minimum frequency(**G-6**) and maximum frequency(**G-1**) band.

L-1: Speed search initiating level   Range: 1 to 200%
                                               Factory setting: 100%

This is the current at which the entire speed search operation takes place.

L-2: **Speed search scan time**
Range: 0.1 to 10.0s
Factory setting: 2.0s

This is the deceleration time during speed search.

L-3: **Speed search**
Range: 0 to 1
Factory setting: 0

If the drive is to be started on a spinning motor, speed search should be enabled.

Speed search starts from maximum frequency G-1.

0: Speed search disabled

1: Speed search enabled

L-4: **Power loss ride through**
Range: 0 to 2
Factory setting: 0

0: Power loss ride through disabled

1: Power loss ride through for a period of 2secs. If power loss exceeds 2secs, drive trips

2: Power loss ride through for indefinite period provided control power is maintained.

L-5: **Auto restart**
Range: 0 to 10
Factory setting: 0

This is the number of reset attempts made by the drive in case of a fault. If set to 0, no fault reset is attempted. No auto reset attempts are made in case of short circuit trip(Sc).

Auto restart counter is reset after 10mins of occurrence of last trip.
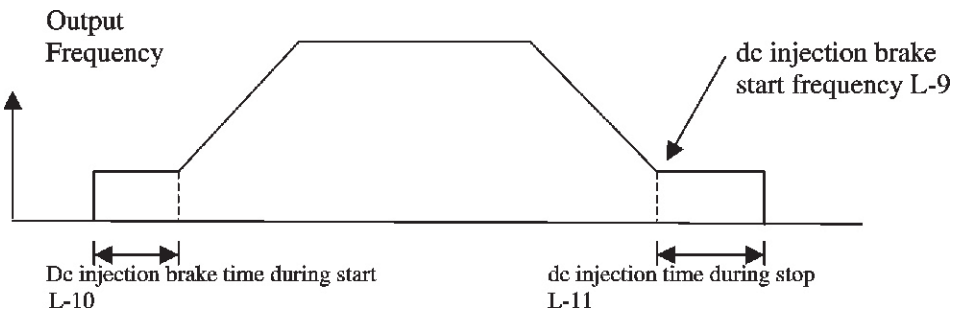
L-9: DC injection brake start frequency
Range: 0 to 20.00hz
Factory setting: 0

This is the frequency at which dc braking starts.

L-10: DC injection brake time during start
Range: 0 to 60.0secs
Factory setting: 0

This is the time for which dc injection brake is active during start up.
After this time has elapsed motor starts accelerating to set speed.

L-11: DC injection brake time during stop   **Range:0 to 60.0 secs**
                                                   Factory setting: 0

This is the time for which dc injection brake is active during stop.

Ramp stop (B-3 = 1) must be selected.

L-12: DC injection brake current: **Range: 0 to 100%**
                                          Factory setting: 0

This is the output current level at which dc injection braking takes place. It is a percentage of the rated current (G-8).

L-13: Automatic voltage regulation   **Range: 0 to 1**
                                            Factory setting: 0

0: The output voltage of the drive is regulated to rated value against input voltage variations.

1: The output voltage of the drive is not regulated.

Reduced voltage
in energy saving mode

Output voltage

Output frequency
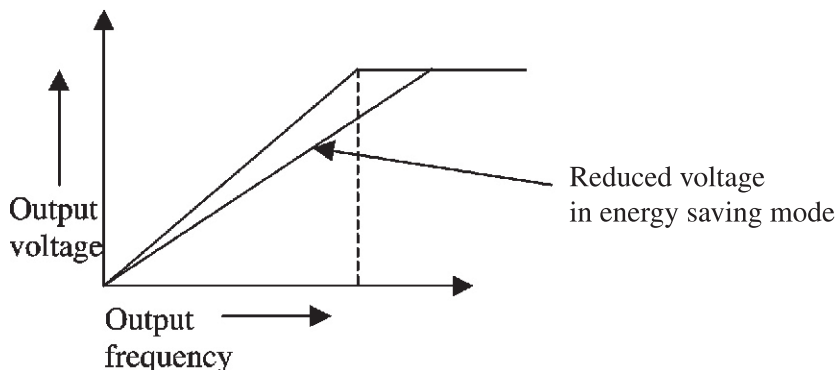
L-14: Energy saving mode   **Range: 0 to 1**
                                  Factory setting: 0

0: Energy saving mode is disabled
1: Energy saving mode is enabled. The output voltage of the drive is reduced according to load torque. Maximum reduction in voltage is 30% of rated voltage.

No.	Parameter	Default	Settings	
	BASIC A			
0	Acceleration time 1	10.0s	0.1 - 6000s	►
1	Deceleration time 1	10.0s	0.1 - 6000s	►
2	Jog Frequency	5.00hz	0.1hz - 400Hz	►
3	Jog accel/decl time	2.0s	0.1 - 1000s	►
4	Frequency ref upper limit	100%	1-110%	
5	Frequency ref lower limit	1%	1-100%	
6	S curve	0	0-10	
7	Acceleration Time 2	10.0s	0.1-6000s	►
8	Deceleration time 2	10.0s	0.1-6000s	►
	OPERATING MODES B			
0	Frequency reference select	0	0: keypad / 1: 0-10V at POT	
1	Operator	0	0: keypad / 1: terminals	
2	Stop method	0	0: coasting stop / 1: ramp stop	
3	Stop key function	0	0: stop key on keypad always enabled	
			1: stop key enabled if keypad selected	
4	Reverse operation	0	0: reverse disabled / 1: reverse enabled	
5	Control method------v/f, sensorless vector	0	0: V/f control	
			1: open loop sensorless vector	
6	2 wire/3 wire selection	0	0: fwd start/stop rev start/stop	
			1: start/stop fwd/rev	
			2: start stop emr	
7	Display selection for frequency ref 0.1hz, 0.01 hz	0	0: 0.1hz display format	
			1: 0.01hz display format	
8	Frequency set : Must be entered to be stored	0	0: no frequency storage	
	or can be store by inc/dec also.		1: set frequency saved	
9	Switching freq.	8khz	3-15khz	
	INPUT FUNCTIONS C			
0	MI terminal 1	1	0: disabled	
			1: increase set frequency	
			2:decrease set frequency	
			3: Multi step speed 1	
			4: fault reset	
			5: keypad/terminal selection	
			6: acceleration/deceleration inhibit	
			7:acc1/dec1, acc2/dec2 select	
			8: emergency stop NO	
			9: emergency stop NC	

1	MI terminal input delay time	1ms	1-10ms	
2	analog input bias polarity	0	0: positive / 1: negative	▶
3	analog input inverse enable	0	0: inverse disabled	
			1: inverse enabled	
4	analog input gain.	100%	0 - 200%	▶
5	analog input bias	0hz	0-300hz	▶
6	analog input filter TC	0.10s	0.01s - 2s	
	OUTPUT FUNCTIONS D			
0	reserved	50.00		
1	reserved	1.00		
2	MAO selection	0	0: output a frequency	
			1: output a output voltage	
			2: output a motor current	
			3: output a set frequency	
3	MAO gain	100	0 - 100	
	PROTECTION E			
0	Over current stall prevention level during acceleration	150%	20 - 200%	
1	Over current stall prevention level during deceleration	150%	20 - 200%	
2	Stall prevention level at set speed.	100%	20 - 200%	
3	Thermal overload protection 0-2	0	0-2	
4	Thermal overload time constant 30-300secs	30s	30-300s	
5	Fault record 1	0		
6	Fault record 2	0		
7	Fault record 3	0		
	MOTOR G			
0	Motor rotation	0	0-1	
1	Max output frequency	50.00hz	0.1 - 600hz	
2	Max voltage frequency	50.00hz	0.1 - 600hz	
3	Max voltage	440.0V	0.1 - 510V	
4	Mid point frequency	0.50hz	0.1-600hz	
5	Mid point Voltage	16.0V	0.1 - 510V	
6	Min frequency	0.50hz	0.1 - 600hz	
7	Min voltage	16.0V	0.1 - 510V	
8	Reserved for rated current	8.0A	1 - 200A	
9	Torque compensation	0	0 - 10	▶
10	Rated slip	2.50hz	0 - 20hz	
11	Motor no load current	40%	0 - 90%	
12	Motor stator resistance	0E	0 - 65535E	
13	Auto tune	0	0: auto tune off / 1: auto tune on	
14	Max slip compensation	200%	0 - 250%	

15	Motor no of poles	4	2-10	
16	Vector control current compensation limit	1.0	0-2	
	SYSTEM H			
0	Drive identification no	0		
1	Default parameters enable/disable	1	0: Default parameters / 1: Set Parameters	
2	Power up display	0	0: Set Frequency / 1: as per H-3	▶
			2: Output frequency / 3: User	
3	Parameter selection	0	0: Output Current	▶
4	Parameter selection1	0	1: DC Bus voltage / 2: Output voltage	▶
			3: Power(KW) / 4: Energy (KW-hr)	
			5: Total run time(hrs)	
5	User coefficient	30.00	0-200	
6	Software version	0		
7	Password enter		0: all parameters can be changed	
			1:parameters locked	
8	Reserved for password	0		
9	Reserved for display current gain	5.0		
	SKIP FREQUENCY I			
0	Skip frequency 1 Upper limit	0hz	0-400hz	
1	Skip frequency 1 Lower limit	0hz	0-400hz	
2	Skip frequency 2 Upper limit	0hz	0-400hz	
3	Skip frequency 2 Lower limit	0hz	0-400hz	
4	Skip frequency 3 Upper limit	0hz	0-400hz	
5	Skip frequency 3 Lower limit	0hz	0-400hz	
	PID J			
0	PID mode	0	0:PID disabled / 1:PID enabled	
			2: inverse PID / 3: PID + reference	
			4: inverse PID + reference	
1	PID feedback gain	1.00	0-10	
2	PID feedback selection	0	0-10V feedback at POT	
3	PID offset	0	0-100	
4	PID offset polarity	0	0: +ve polarity / 1: -ve polarity	
5	P gain	1.0	0-10	
6	I time	0s	0-100s	
7	D gain	0.00s	0-1s	
8	integral gain upper limit	100	0-100	
9	Feedback loss time	60.0s	0-3600s	
10	Feedback loss response	0	0-2	
11	Feedback loss detection level	0	0-100	
12	PID output filter TC	0.0s	0-2.5s	

	MISC L			
0	Multi Step speed 1	2.00hz	0.1-600hz	
1	Speed search initiating level	100%	1-200%	
2	Speed search scan time	2.0s	0.1-10s	
3	Flying start	0	0: speed search disabled	
			1: speed search enabled	
4	Power loss ride through	0	0-2	
5	Auto restart	0	0-10	
6	Reserved power calib constant	192		
7	KWH counter			
8	Run time counter			
9	DC injection brake start frequency	0hz	0-20hz	
10	DC injection brake time during start	0s	0-60s	
11	DC injection brake time during stop	0s	0-60s	
12	DC injection brake current	0%	0-100%	
13	Automatic voltage regulation	0	0: voltage regulation enabled	
			1: voltage regulation disabled	
14	Energy saving mode	0	0: energy saving mode enabled	
			1: energy saving mode disabled	

Trouble shooting

T-1 The ac drive has fault diagnostic features which will be displayed when activated.

To reset a drive after occurrence of a fault , press stop/reset key.

Stop/reset can also be activated from the user terminals. (see page   )

Fault display	Fault description	Fault correction
No display	No display on keypad	1. Check supply voltage at input terminals. 2. Check whether keypad cable is damaged or accidentally removed.
Oc Sc	Output over current Output Short circuit	1. Check whether mechanical load on motor is abnormal. 2. Check drive and motor wiring. 3. Check whether motor hp corresponds to drive hp. 4. Check parameters : acceleration time. deceleration time, torque compensation and V/f characteristics. 5. if Sc is displayed even after motor connections have been removed, send unit to factory.
Ov	Dc bus voltage has exceeded its allowable value	1. Check whether input supply voltage is within specified range. 2. Increase deceleration time. Ov can be casued by regeneration from the motor while decelerating. 3. Dynamic braking might be required if load inertia is high. Use recommended dynamic brake resistors or brake units.
Uv	Dc bus voltage is below allowable value.	1. Check whether input voltage is within specified limits. 2. It can be caused by internal fault within the unit. In that case return unit to factory.
Ot	Over temperature of ac drive heatsink.	1. Ensure that ambient temperature is within specified range. 2. Check whether drive cooling fans are working properly. 3. Ensure that heatsink fins are not obstructed or deposited with dirt or debris. 4. If the unit is mounted inside a panel, ensure that it is properly ventilated.

EE	E2prom error	1. This error occurs if one or more drive parameters is not within its specified range. Check whether all parameters are within specified range. This error can also be removed by setting H1=0. This sets all parameters to default factory settings. H1 can now be set to I and drive powered up again. If error persists return unit to factory.

Specifications
Voltage class: 460V

Model : KLE	300	500	750	1000	1500	2000	2500	3000	4000	5000	6000	7500	10000
Max applicable motor output (HP)	3	5	7.5	10	15	20	25	30	40	50	60	75	100
Max applicable motor output (KW)	2.2	3.7	5.5	7.5	11	15	18	22	30	37	45	55	75
Rated output (KVA)	3,6	6,5	9.9	13.7	18.3	24.4	28.9	34.3	45.7	55.6	69.3	87	116
Rated output current (A)	4.9	8.5	11.6	16	23	32	38	44	60	73	91	110	150
Rated input current (A)	4.7	8	11	15.2	21.8	30.4	36.1	41.8	57	69.3	86.4	104	142.5
Maximum output voltage	Proportional to input Voltage												
Rated input voltage	340 - 500V AC												
Rated input frequency	48-63hz												
Output frequency resolution	0.01hz												
Overload limit	150% rated current for 1 minute												
Output switching frequency	1-15khz												
Input output wire size AWG 1)	10-18 standed		12-8 copper standed			8-2 copper standed			4	3	2	2/0	3/0
Torque (kg - cm)	10	18	18	18	18	30	30	30	30	60	60	60	60
Input line fuse (A) 2)	10	15	20	25	35	50	50	70	90	110	130	160	220
Ambient temperature	-10 to 40°C												
Ambient humidity	Below 90% RH Non condensing												
Weight (kg)	1.8	5.7	5.7	7.3	7.3	11	11	20	20	30	50	50	80
vibration	$9.80665 m/s^2$ (IG) less that 20hz, $5.88 m/s^2$ (0.6G) at 20 to 50hz												

1)   Use 60°C rated power cable
2)   Input line fuse type : UL class CC or T For non UL installation IEC269gG

Dynamic brake resistor values and brake units

The brake resistor values mentioned below are minimum values.
Any value selected below this value can damage internal brake transistor.

Drive model	Resistor value	Brake unit		
KLE300	250E, 300W			
KLE500	150E, 400W			
KLE750	100E, 500W			
KLE1000	75E, 1000W			
KLE1500	50E, 1000W	BRK150		
KLE2000		BRK200		
KLE2500		BRK250		
KLE3000		BRK300		
KLE4000		BRK400		
KLE5000		BRK500		
KLE6000		BRK600		
KLE7500		BRK750		
KLE10000		BRK1000		

EMI filters

Drive model	EMI filter
KLE300	KEM300
KLE500	KEM500
KLE750	KEM750
KLE1000	KEM1000
KLE1500	KEM1500
KLE2000	KEM2000
KLE2500	KEM2500
KLE3000	KEM3000
KLE4000	KEM4000
KLE5000	KEM5000
KLE6000	KEM6000
KLE7500	KEM7500
KLE10000	KEM10000

Input line reactors

Drive model	Input line choke (3%)
KLE300	KLI300
KLE500	KLI500
KLE750	KLI750
KLE1000	KLI1000
KLE1500	KLI1500
KLE2000	KLI2000
KLE2500	KLI2500
KLE3000	KLI3000
KLE4000	KLI4000
KL5000	KLI5000
KLE6000	KLI6000
KLE7500	KLI7500
KLE10000	KLI10000

Dimensions (mm)
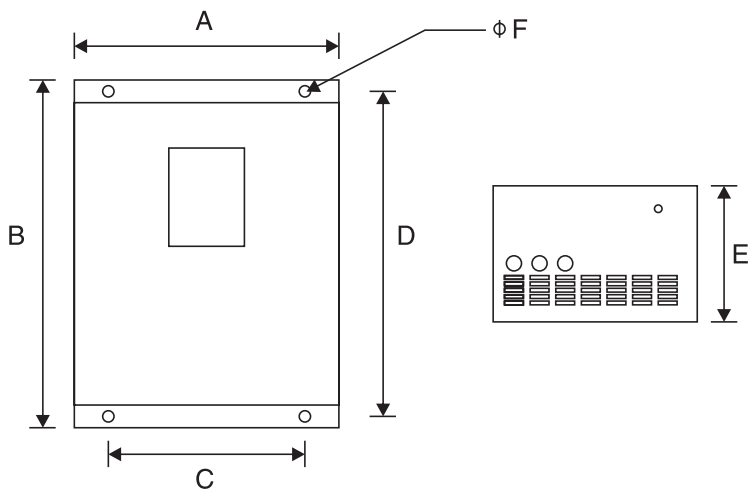
Model	A	B	C	D	E	F
KLE 300	124	192	104	183	191	5.5
KLE 500?	147	313	65	292	225	10
KLE 750	147	313	65	292	225	11
KLE 1000	173	360	100	345	233	10
KLE 1500	173	360	100	345	233	11
KLE 2000	263	380	161	360	245	10
KLE 2500	263	380	161	360	245	11
KLE 3000	243	595	140	570	283	12
KLE 4000	243	595	140	570	283	11
KLE 5000	278	706	175	675	332	12
KLE 6000	278	706	175	675	332	11
KLE 7500	270	785	200	760	421	12
KLE 10000	570	860	464	813	415	12

Note : For drives above 100hp, consult factory for dimension .

W A R R A N T Y

Kolorrol Technologies Pvt. Ltd. warrants the product delivered in Kolorrol Technologies Pvt. Ltd. package to be free from defects in material and workmanship, under normal use and service, for 12 months from the date of initial delivery despatch. Products that fail during this period will be repaired or replaced at Kolorrol Technologies Pvt. Ltd.'s discretion provided the original purchaser returns the product and provides proof of original date of purchase. This warranty does not apply, in the judgement of Kolorrol Technologies Pvt. Ltd., to damage caused during shipment, handling, storage or accidental misuse of the product.

The maximum liability of this warranty is limited to the purchase price of the product. Under no circumstances, regardless of cause, shall Kolorrol Technologies Pvt. Ltd. be liable for

1. Penalty or penalty clauses of any description

2. For certification not otherwise specifically provided herein and / or indemnification of purchase or others for costs, damages, or expenses, each arising out of or related to the product or services.

3. For any damages resulting from loss of profits, use of products or for any incidental, indirect or consequential damages.

MODEL NO.: _____

SERIAL NO.: _____

DATE OF DISPATCH: _____

KOLORROL TECHNOLOGIES PVT. LTD.