

Installation Manual for dc Injection Brake Units

HHI Drives Europe
INJ Series DC brake modules



Installation Manual for dc Injection Brake Units

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HHI Drives Europe.
PO Box 2091.
Bolton
BL5 2ZS
U.K.

Tel. 08452 300 501
Email <http://www.hhidrives.com/contact.htm>
Web www.hhidrives.com

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1. Safety.

Modification of any machine may require a safety risk assessment. As a result of the risk assessment additional safety systems or interlocks may be required. Safety relays are available if required. Please contact us if you require help with a risk assessment or any other safety equipment.

Read this manual fully before installation. The assembly is an electrical system which must be installed by a competent person. Ensure all authorised persons are aware of the dangers and safe working practices.

1.1. Safety Electrical.

The voltage at some of the terminals is high enough to endanger life. The terminals have only protection against accidental contact. The module must be installed in a panel to which unauthorised access is denied.

Semiconductor fuses should be fitted to protect only the brake module. Upstream BS88 fuses must be provided to protect the wiring. The wiring should conform with the latest IEE regulations, or local regulations whichever are more stringent.

1.2. Safety Mechanical.

Rotating and moving machinery can cause injury or endanger life. Installation of any additional control to a machine must be carried out by a competent person.

Consideration must be taken of any potential hazards. These may be couplings: threaded couplings which may unscrew if the motor is stopped, couplings fixed by shear-pins would need to be checked to see if these stand the stopping torque, friction couplings would need to be checked to see if these stand the torque. The machine mountings must be checked to see if they can stand the forces during stopping.

2. Installation.

The brake module is intended to be wired downstream of the machine isolator and any motor overload relay. The module may require an auxiliary contactor of its own in some starter circuits. Please refer to the typical installation diagrams at the back of this manual. A cursory view of the diagrams will show that the brake significantly alters the starter circuit

2.1. Earth Connection.

The brake assembly must have an earth connection. The earth cable cross section should be as big as the cable used for the power wiring.

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3. Setting Up.

3.1 General.

The minimum equipment required is a dc clip-on ammeter. Be sure to measure the current in one of the motor windings which are to carry the dc injection current. One of the motor connections does not carry any current during braking.

Ensure that the set up is carried out with the maximum moment of inertia (load) coupled to the motor shaft. And that any friction is removed, e.g. no work piece in the machine.

A series of test start-stop cycles will be made during setting up. If the installation has been done correctly, be aware that the brake unit should deny re-starting during braking.

Also be aware that the duty is limited by the braking current, and the ambient temperature. Too many stop / start cycles in close succession may damage the unit. See the specifications for some idea of permissible duty.

The procedure requires the machine to be run up to normal speed, and the brake (stop) applied. During the braking period the current is monitored, and adjusted up to the maximum permitted by the motor, and the maximum permitted by the duty of the application.

3.2. Current. B

The front panel of the module has a screw-driver adjustment for current.. Minimum current is fully *anticlockwise*. The current must be measured with a dc meter. The rated current of the unit will be achieved at somewhere below 100% depending on the motor.

The current is proportional to the braking torque. Consistent with duty and module rating the DC current may be set up to 2 x the motor full load current (flc). Above 2 x flc the braking torque will begin to fall. If the dc current is applied to one winding or to windings in series, the flc is the star current. If the dc current is applied to the motor in delta configuration then the flc is the delta current.

3.2. Time. A

The front panel of the module has a screw-driver adjustment for time. The duration of the braking can be adjusted between 1 and 10 seconds. The adjustment is logarithmic with 2s at 50%, and 3s at 75%. Minimum time is fully *clockwise*. (Not the same as the current control.)

3.3. Procedure.

1. Initially set the time for about 4 seconds (50%). The time is long enough to allow the current meter to get a good indication, and short enough to keep the duty low during repeated stop / starts.
2. Set the current adjustment to about 20% and start the machine. Stop the machine and observe the current in a motor line which is carrying the DC injection. It is not necessary to attain full speed before stop is applied.
3. Adjust the current setting and repeat the stop / start until the desired current is attained.
4. Start the machine, and allow it to get to operating speed. Stop the machine and observe the residual speed when the braking has stopped. If the machine is still running, the brake time should be increased. If the machine has stopped, it may be possible to reduce the brake time. It does no harm to have the brake applied for half a second after the machine has reached standstill.

The brake is now set for use.

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3.4. Alternative Procedure.

The previous set-up was dominated by the current setting. In some applications you may wish to stop a little less quickly. Set the brake time first, and then increase the current until standstill is achieved within the desired time as follows

1. Initially set the current for about 30%. The current is high enough to allow the current meter to get a good indication, and short enough to keep the duty low during repeated stop / starts.
2. Set the time adjustment to the desired amount and start the machine. Allow the machine to reach full speed and stop the machine. Observe the current in a motor line which is carrying the DC injection. Check that the brake action is sustained over the desired stopping time.
3. Adjust the current setting and repeat the stop / start until the machine stops within the desired stopping time.

The brake is now set for use.

3.5. Monitoring Brake Activity.

Detecting brake activity can be done in several ways as follows

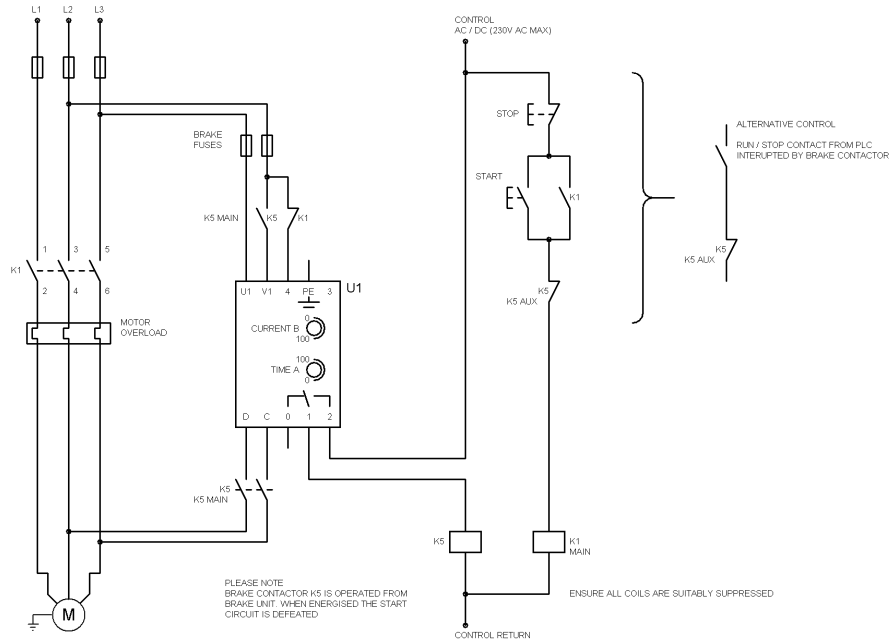
- 1 Observe the current meter. Braking only occurs when current is flowing. The current ceases about 1 second before the brake cycle is ended.
- 2 Where fitted, listen for the brake contactor to drop out. Current ceases about 1 second earlier.
- 3 Listen to the sound of the motor. During braking the motor noise may be heard as a low "growl". The harmonic currents in the motor during braking are predominantly 50Hz. The characteristic hum of domestic equipment by comparison is an octave higher.

3.6. Temperature.

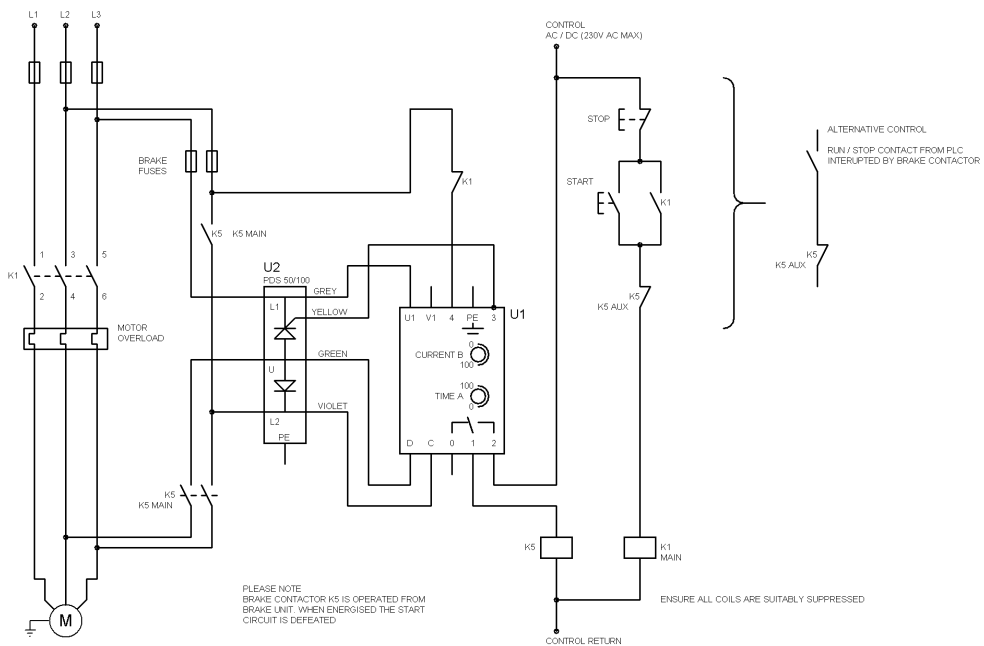
On initial setting add some extra time or current in excess the setting which just stops the machine. Add 15% for example. After initial setting-up check the braking during a normal work period. As the motor heats up during use, the resistance of the windings will rise a little. The machine may come to rest a little later than it did during setting-up

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4. Diagrams.

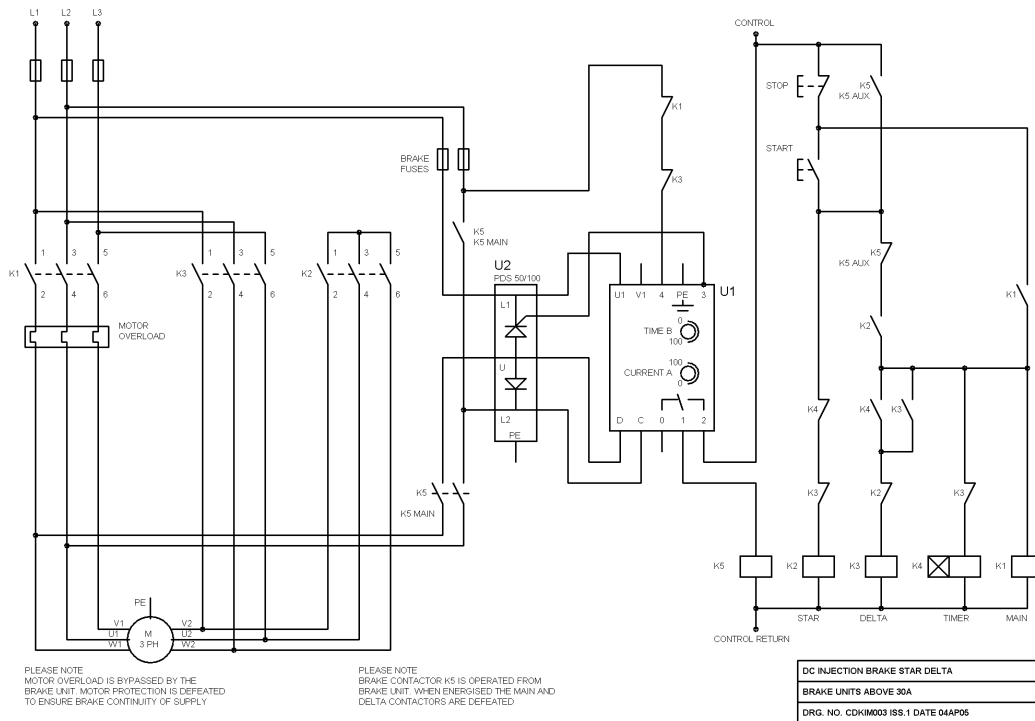
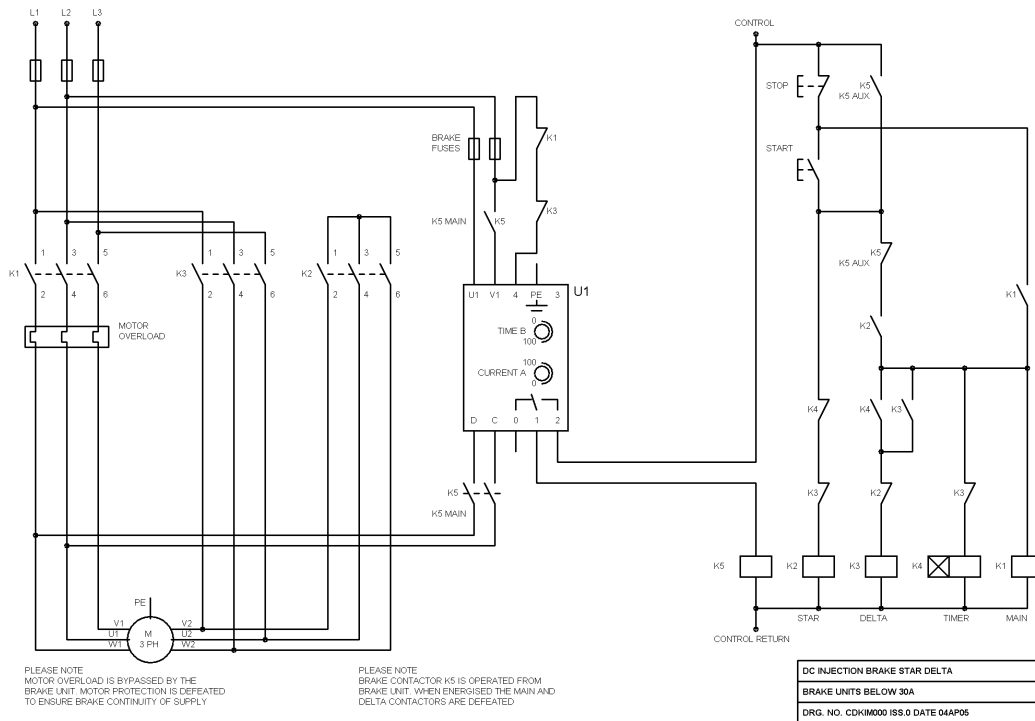


DC INJECTION BRAKE DOL
BRAKE UNITS UP TO 6kW
DRG. NO. CDKIM001 ISS.0 DATE 27JAO5

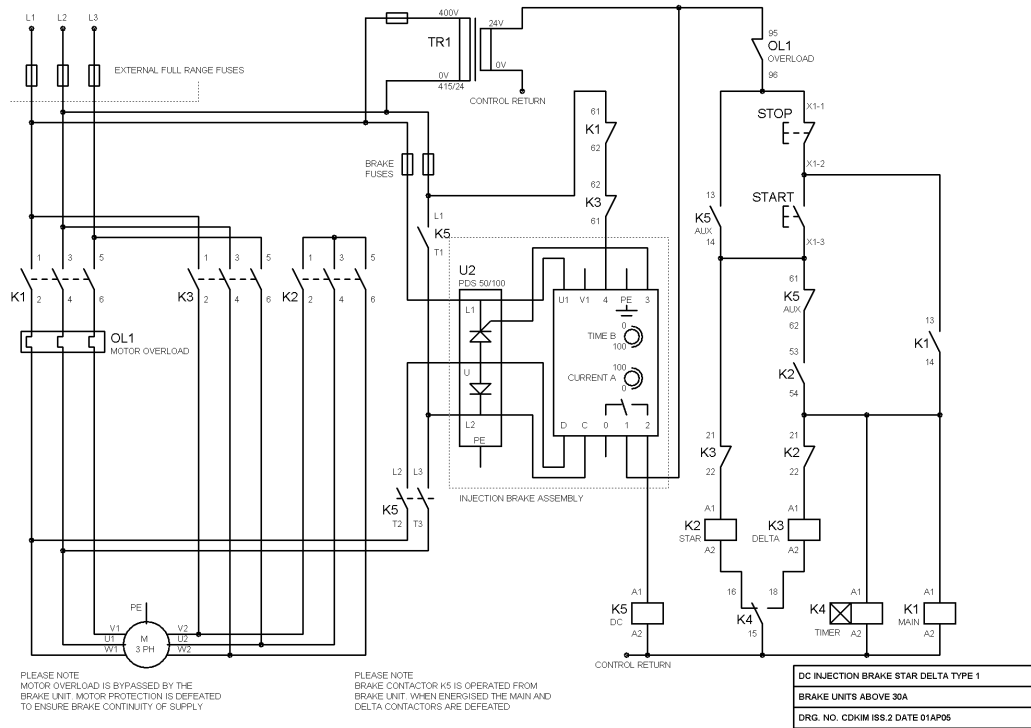


DC INJECTION BRAKE DOL
BRAKE UNITS OVER 60A
DRG. NO. CDKIM003 ISS.1 DATE 14MR06

Installation Manual for dc Injection Brake Units



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5. Specifications.

5.1. General Function.

- U1,U2. Ac power and control
- D,C. Dc output to motor.
- 3 Gate drive for 50A / 100A assemblies
- 4 Enable input, referenced to U2.
- 1,0,2. Isolated changeover contacts energised when braking.
- A Brake time adjustment.
- B Brake current adjustment.

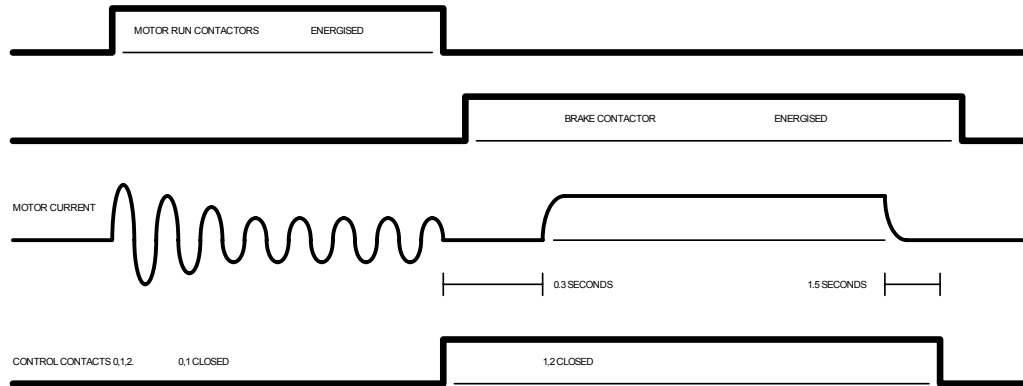
An external contactor connects the unit to the motor. When an enable signal is given dc current is generated from the ac supply. The unit allows for manual adjustment of the current. The time for which the current is applied is also manually set on the unit. An internal contact set is energised during braking so that the motor is disconnected from the external start circuit, and the start circuit is defeated.

5.2. Ratings.

Models	INJ-[]-[][][]-[][][]							
	H-11A	H-30A	H-36A	L-30A	L-36A	H-75A -ASS	H-100A -ASS	
Motor kW	2.2	5.5	7.5	3	4	18.5	37	
Voltage ac	400V	400	400	230	230	400	400	Vac 50-60Hz
Current dc	11	30	36	30	36	75	120	Adc output
Voltage dc max	150	150	150	85	85	150	150	Vdc output
Duty 40°C	10	3	15	3	15	50	50	% side by side
	15	5	15	5	15	50	50	% 10mm clearance.
Terminals	Accept wire 1.0mm ² -2.5mm ² .					16	25	mm ²
Protection	IP20							
Height mm	75	75	75	75	75	135	135	
Width mm	45	45	60	45	60	130	215	
Depth mm	120	120	120	120	120	125	125	
Contacts 0,1,2.	AC 250V, 2A, 250VA							
Time control	1 to 10 seconds							
Current control	0 to 100% output voltage rating. Current should not be allowed to exceed rating of unit. Maximum attainable current depends on motor resistance.							
Input Fuses	16	16	16	16	16	25	50	Amps aR Semiconductor type
Contactor	Motor current rating at AC3							

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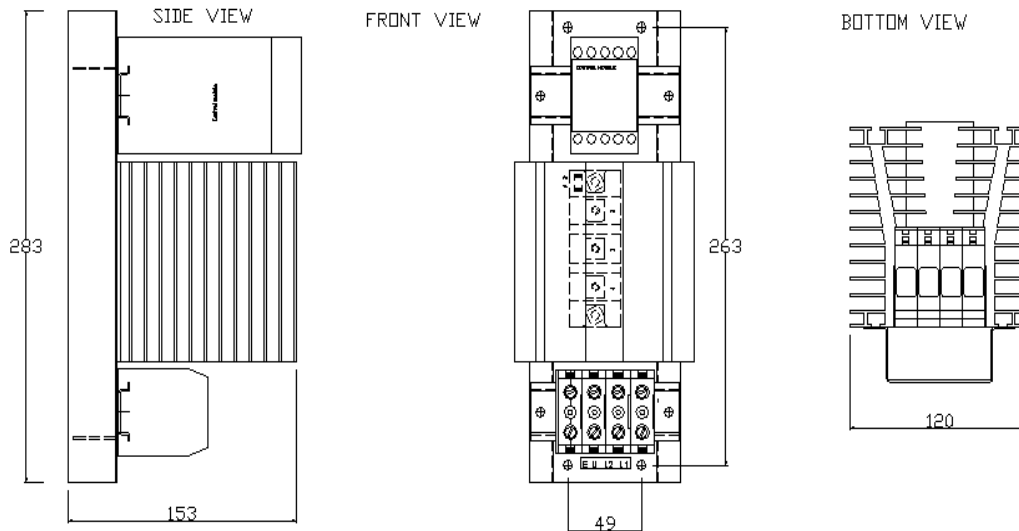
6. Timing Diagram



DC INJECTION BRAKE TIMING
BRAKE UNITS UP TO 5kW
DRG. NO. CDKIM002 ISS.0 DATE 27JA05

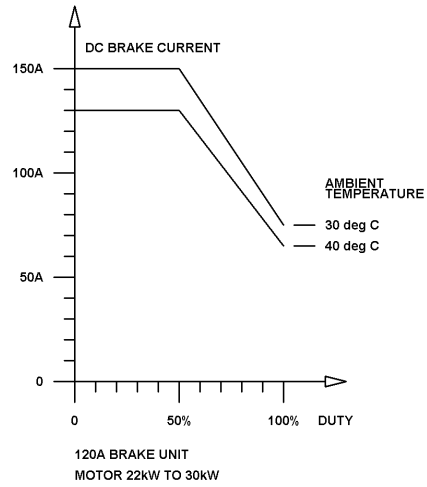
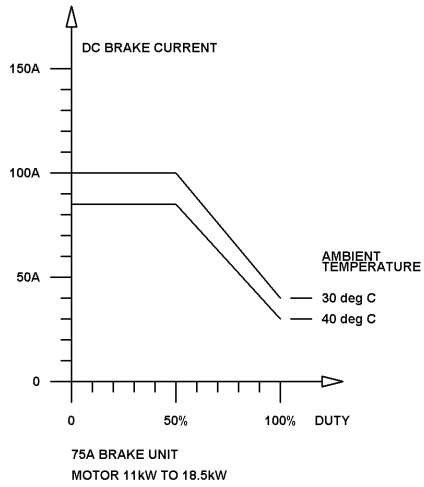
7 Outlines

Mount units with heatsink fins running vertically.



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8 Thermal Ratings.



$$\text{DUTY} = \frac{\text{BRAKING TIME IN SECONDS}}{\text{TIME BETWEEN BRAKES IN SECONDS}}$$

DC INJECTION UNITS
CURRENT RATINGS
DRG. NO. 27AP06 ISS.0 DATE 27AP06