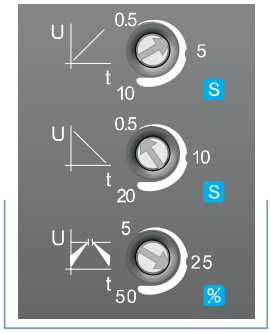
User's Manual

HPISE
Motor Controller
AC Semiconductor Motor Controller

HPISE31...45



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HPISE2245-C10 HPISE4045-C10 HPISE4845-C10

- Soft starting and stopping of 3-phase squirrel cage motors
- Rated operational voltage: up to 480V AC rms, 50/60Hz
- Rated operational current: up to 45A AC-53b
- Potential free control input
- LED-indications for power supply, ramping, bypassing relays
- Self protection against overheating
- Auxiliary relay output for end of ramp and overheating alarm
- Transient overvoltage protection built in
- Integral bypassing of semiconductors

Product Description

Compact easy-to-use AC semiconductor motor controller. With this controller 3-phase motors with nominal load currents up to 45 A can be soft started and/or soft stopped.

Starting time as well as initial torque and stopping can be independently adjusted by built-in potentiometers.

Ordering Key

HP IS E 40 45 - C 10

- Enterprise code
- Design Serial No:
- E-line housing
- Rated operational voltage code
- Rated operational current
- Control voltage
- Applications

Type Selection

Type	Rated operational voltage Ue	Rated operational current Ie	Control voltage Uc	Applications
HPISE:	22: 127/220 VAC rms, 50/60 Hz	37: 37 A	D: 24 V DC	10: For norma Applicationsl
E-series	40: 230/400 VAC rms, 50/60 Hz	45: 45 A	C: 100-240 V AC	S:Single phase
motor controller	48: 277/480 VAC rms, 50/60 Hz			R1:For fan and pump

Selection Guide

Rated operational current Ie	Motor Rating		
	11 kW /15HP	18.5 kW / 30HP	
37 AAC 53b	HPISE2237 - C10	HPISE4037 - C10	HPISE4837 - C10
Rated operational current Ie	Motor Rating		
	11kW /15HP	22 kW / 35HP	
45A AC 53b	HPISE2245 - C10	HPISE4045 - C10	HPISE4845 - C10

Input Specifications (Control Input)

Control voltage Ue A1-A2: A2-A3:	Passive contact terminal 100 - 240 VAC Approx. 5 mA
Rated insulation voltage	630 V rms Overvoltage cat. III (IEC 60664)
Dielectric strength Dielectric voltage Rated impulse withstand volt.	 2kVAC (rms) 4kV (1.2/50 μ s)

Output Specifications

Utilization Category	AC-53b Integral of semiconductors
Overload current profile (overload relay trip class)	37 A: AC-53b: 4-5: 80 45 A: AC-53b: 4-5: 115

Supply Specifications

Power supply	Overvoltage cat. III
Rated operational volt. (Ue)	(IEC60664)
through terminals L1 - L2 - L3	(IEC 60038)
22	127/220 VAC rms ±15% 50/60 Hz -5/+5 Hz
40	230/400 VAC rms ±15% 50/60 Hz -5/+5 Hz
48	277/480 VAC rms ±15% 50/60 Hz -5/+5 Hz
Voltage interruption	⩽40ms
Dielectric voltage	2 kV (rms)
Rated impulse withstand volt.	4 kV (1.2/50 μ s)
Rated operational power supplied from	5 VA A2-A3

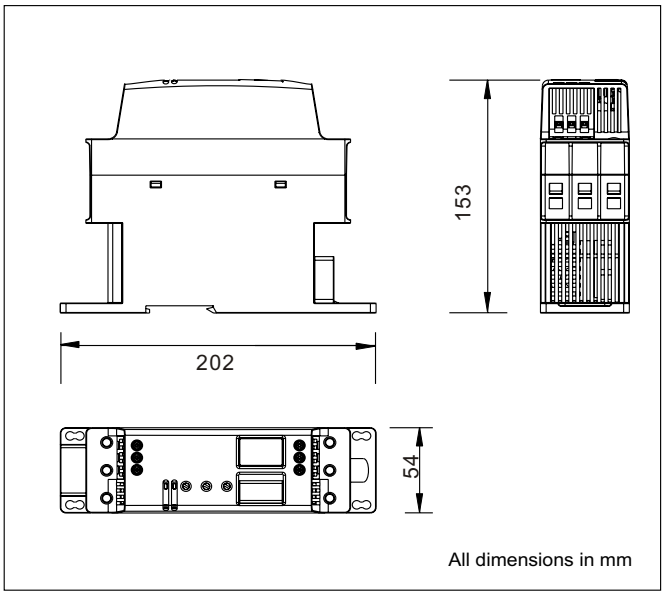
General Specifications

Accuracy	
Ramp up	10 ± 10% on max. ⩽ 0.5 s on min.
Ramp down	20 ± 10% on max.in. ⩽ 0.5 s on min.
Initial torque	50% ± 5% on max. < 5% on min.
EMC Immunity	Electromagnetic Compatibility acc.to EN 50 082-2
Indication for	
Power supply ON	LED, green
Ramping	LED, yellow (flashing)
Bypassing relay	LED, yellow (constant ON)
Environment	
Degree of protection	IP 20
Pollution degree	3
Operating temperature	-20℃ to +50℃ (-4°F to +122°F)
Storage temperature	-50℃ to +85℃ (-58°F to+185°F)
Terminals	Screw with captive wire clamp
Control terminals nominal Min.	2.5 mm², AVG 14 0.5 mm², AWG 20
Mounting torque max.	0.6 Nm 10 mm², or 2 x 6 mm² AWG 6 or 2 x AWG 10
Power terminals nominal Min.	1 mm², AWG 16
Mounting torque max.	2.0 Nm
CE-marking	Yes

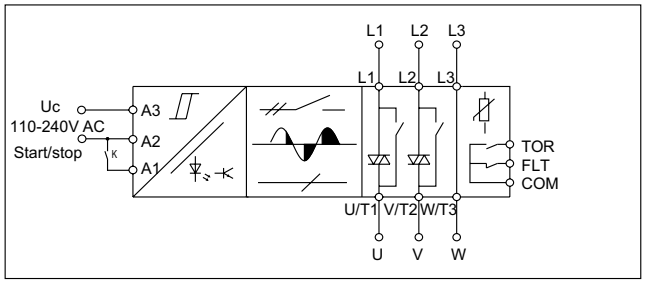
Mode of Operation

This motor controller is intended to be used to soft start/stop 3-phase squirrel cage induction motors and thereby reduce the stress or wear on gear and belt/chain drives and to give smooth operation of machines. Soft starting and or stopping is achieved by controlling the motor voltage. During running operation the semiconductor is bypassed by an internal electromechanical relay. The initial torque can be adjusted from 5 to 50% of the nominal torque.
The soft-start time can be adjusted from 0.5 to 10 s and 0.5 to 20 s for the soft-stop respectively A green LED indicates supply. The yellow LED is flashing during the ramping up or down. After the ramping when the semiconductors are bypassed the yellow LED lights constantly.
Alarm handling:
Over temperature: The HPISE will not start if the heatsink has an internal temperature which is exceeding approx 100%.
When over temperature occurs while the softstarter is not ramping (1) or while the bypass relays are activated
(2) the following will happen:
1) The softstarter will not ramp up and alarm relay is deactivated (contact open) - Reset takes place when the temperature drops below the critical level and only if the supply is interrupted and reapplied.
2) The alarm relay will deactivate (open) to indicate fault and when the softstarter is not ramping, the softstarter will react as described in 1).

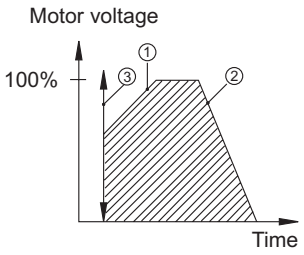
Dimensions



Functional Diagram



Operation Diagram 1

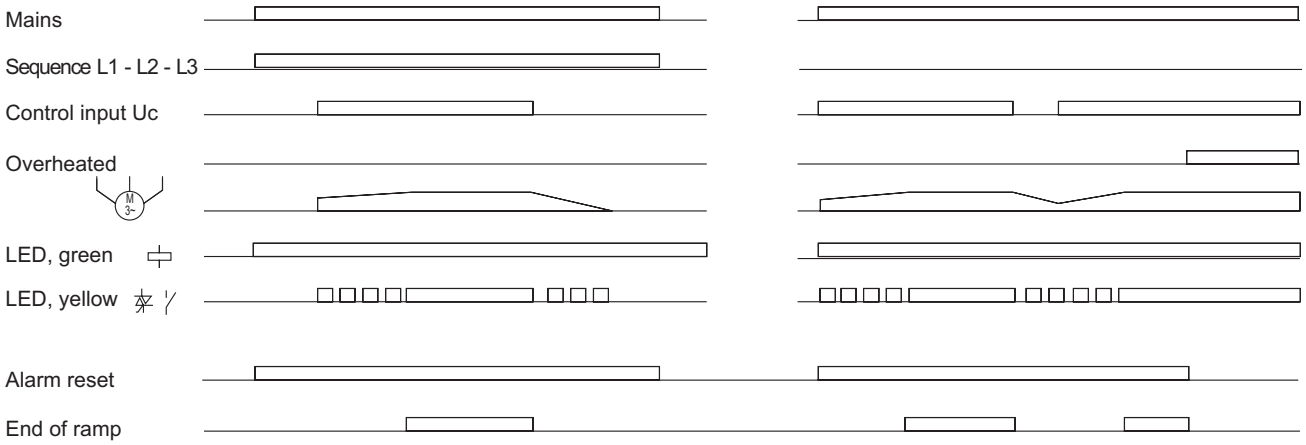


① Ramp-up time 0.5 to 10 s. Time from zero load voltage to full load voltage.

② Ramp-down time 0.5 to 20 s. Time from full load voltage to zero load voltage.

③ Initial torque 5 to 50% voltage at the start of the ramp-up function.

Operation Diagrams 2 and 3



Time between Rampings

Ramp time [sec.] / I ramp [A]	1	2	5	7	10
175	4 min	8 min	20 min	N/A	N/A
150	3 min	6 min	14 min	19 min	N/A
125	2 min	4 min	9 min	12 min	18 min
100	1 min	2 min	5 min	7 min	10 min
75	27sec	53sec	2 min	3 min	4 min
50	7sec	13sec	33sec	47sec	67sec

To prevent the semiconductors from overheating, a certain time between ramping should be allowed. The time between rampings depends on the motor current during ramping and ramp time(see table).

Note:

Table is valid for ambient temperature 25 ℃ . For higher ambient temperature add 5% ℃ to values in the table. The shaded areas in the table are for blocked rotor. Do not repeat rampings with blocked rotor.

Housing Specifications

Housing material	PC/ABS Blend
Colour	Black
Terminal cover	PBTP
Colour	Grey
Diode cover	PC
Colour	Transparent

Applications

Changing from Direct-on-line start to soft start (Line controlled softstart)

(Fig.1)
Changing a direct-on-line start into a soft start is very simple with the HPISE soft-starting relay:

1) Cut the cable to the motor and insert the HPISE relay.

2) Connect control input to two of the in coming lines. Set initial torque to minimum and ramp up and down to maximum.

3) Power up again - adjust the start torque so the motor starts turning immediately after power is applied,and adjust ramp time to the appropriate value.

When C1 is operated, the motor controller will perform soft-start of the motor. When C1 is switched off, the motor will stop, the motor controller will reset and after 0.5 s a new soft-start can be performed.

Please note that the controller does not insulate the motor from the mains. Contactor C1 is therefore needed as a serice switch for the motor.

Recommended thermal-magnetic overload relay
Selection Chart
Thermal-magnetic overload relay and motor controller

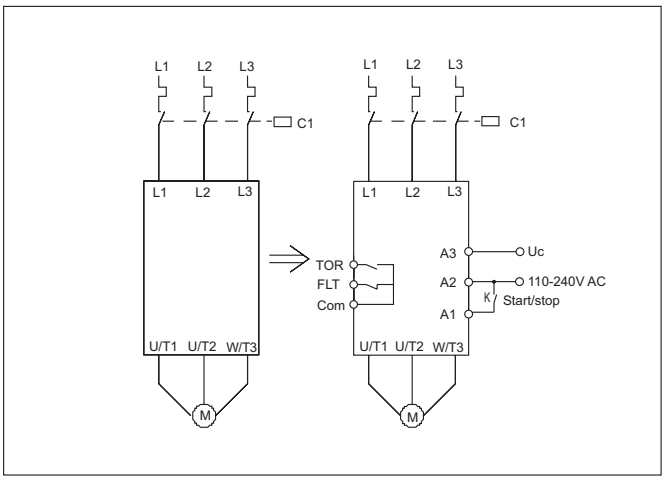


Fig. 1

Soft-start and soft-stop
(Fig. 2)

When K is closed, soft-start of the motor will be performed according to the setting of the ramp-up potentiometer and the setting of the initial torque potentiometer. When K is opened, soft-stop will be performed according to the setting of the ramp-downpotentiometer.

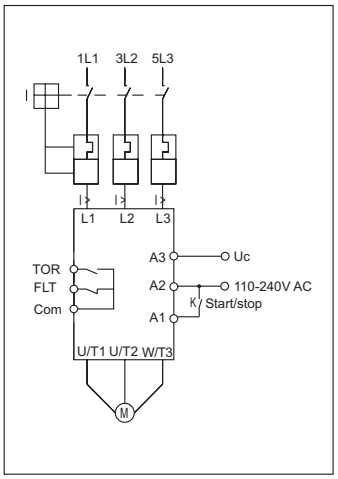


Fig. 2

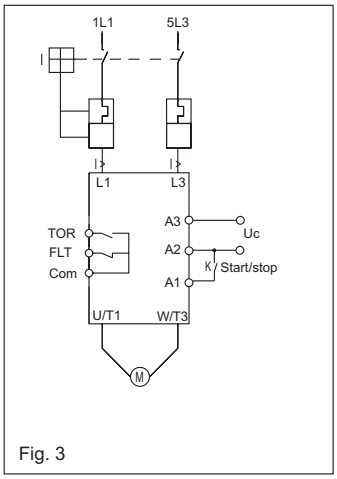


Fig. 3

Fusing Considerations

The motor controller provides bypassing of the semicon - ductors during running operation. Therefore the semiconductors can only be damaged by short-circuit currents during ramp-up and ramp-down function.

A 3-phase induction motor with correctly installed and adjusted overload protection does not short totally between lines or directly to earth as some other types of loads, eg: heater bands. In a failing motor, there will always be some part of a winding to limit the fault current. If the motor is installed in an environment where the supply to the motor cannot be damaged, the short circuit protection can be considered to be acceptable if the controller is protected by a 3-pole thermal-magnetic overload relay.

(Fig. 3)

The wiring diagram of the single-phase main circuit.