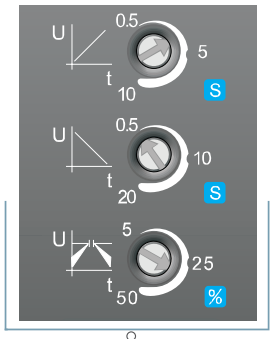
User's Manual

HPISE
Motor Controller
AC Semiconductor Motor Controller

HPISE03...16



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HPISE1116-C10 HPISE2216-C10 HPISE4O16-C10

- Soft starting and stopping of 1-phase squirrel cage motors
- Rated operational voltage: up to 400V AC RMS, 50/60Hz
- Rated operational current: up to 16A 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 and operation wrong phase sequence(C-10)
- 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 16 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 16 - 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 E-series motor controller	22: 127/220 VAC rms, 50/60 Hz 40: 230/400 VAC rms, 50/60 Hz 48: 277/480 VAC rms, 50/60 Hz	6: 6 A 10: 10 A 16: 16 A	D: 24 V DC C: 100-240 V AC	10: For norma Applicationsl S:Single phase R1:For fan and pump

Selection Guide

Rated operational current Ie	Motor Rating	
	1.1kW / 1.5HP	2.2kW/3HP
6 AAC 53b	HPS2E2206 - C10	HPS2E4006 - C10
Rated operational current Ie	Motor Rating	
	2.2kW/3HP	4 kW/5HP
10 AAC 53b	HPS2E2210 - C10	HPS2E4010 - C10
Rated operational current Ie	Motor Rating	
	4kW/ 5HP	7.5 kW/10HP
16 AAC 53b	HPS2E2216 - C10	HPS2E4016 - C10

Input Specifications (Control Input)

Control voltage Ue L3-N	Passive contact terminal 100 - 240 VAC ± 10%, 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 (1.2/50us)

Output Specifications

Utilization	Category	AC-53b Integral bypassing of semiconductors
Overload current profile (overload relay trip class)		6 A: AC-53b: 4-3: 60 10 A: AC-53b: 4-3: 100 16 A: AC-53b: 4-3: 160

HPISE1116-C10 HPISE2216-C10 HPISE4016-C10

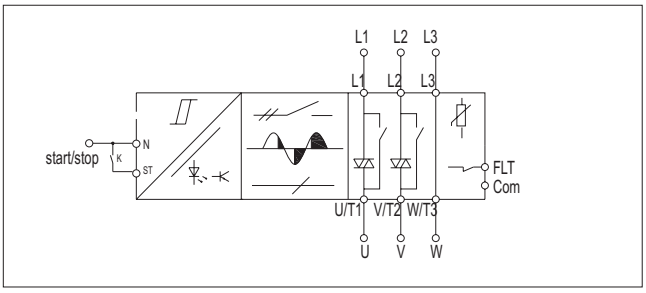
Supply Specifications

Power supply	Overvoltage cat. III (IEC60664) (IEC 60038)
Rated operational volt. (Ue) through terminals L1 - L2 -L3	110VAC rms ±15%
11	50/60 Hz -5/+5 Hz
	127/220VAC rms ±15%
22	50/60Hz -5/+5Hz
	230/400 VAC rms ±15%
40	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 L3-N

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 HPS2E 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).

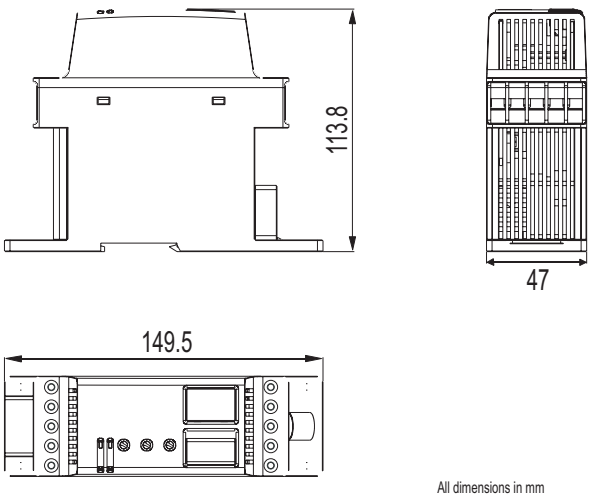
Functional Diagram



General Specifications

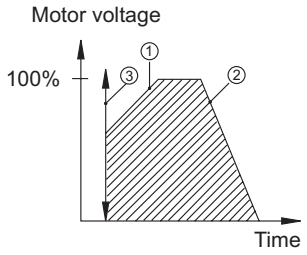
Accuracy	
Ramp up	10 ± 10% on max. ⩽ 0.5 s on min.
Ramp down	20 ± 10% on max.in. ⩽ 0.5 s on min.
Initial torque	50% ± 5% on max. < 5% on min.
EMC Immunity	Electromagnetic Compatibility acc.to EN 50 082-2
Indication for Power supply ON	LED, green
Ramping	LED, yellow (flashing)
Bypassing relay	LED, yellow (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
Mounting torque max.	0.5 mm², AWG 20 0.6 Nm
Power terminals nominal Min.	10 mm², or 2 x 6 mm²; AWG 6 or 2 x AWG 10
Mounting torque max.	1 mm², AWG 16 2.0 Nm
CE-marking	Yes

Dimensions



Specifications are subject to change without notice (2011.07.01)

Operation Diagram 1

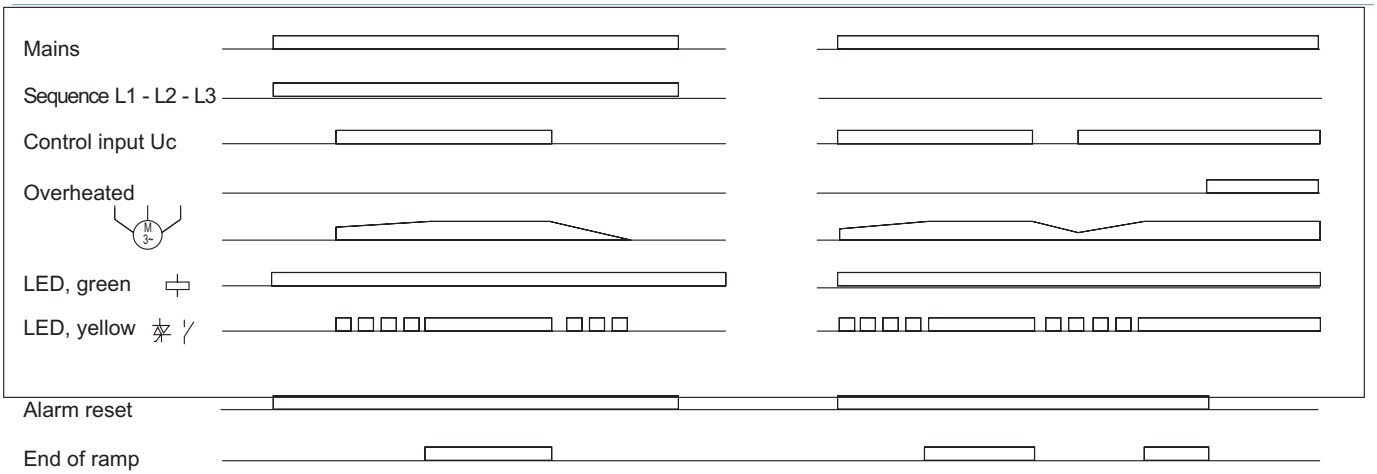


① Ramp-up time 0.5 to 10 s. Time from zero load voltage to full load voltage.

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	10
72	2.5 min	5 min	40 min	N/A
60	1.5 min	3 min	13 min	17 min
48	50Sec	1.5 min	5 min	10 min
36	30Sec	1 min	3 min	7 min
24	15Sec	40Sec	1.5 min	2.5 min
18	15Sec	30Sec	1.5 min	2.5 min
15	12Sec	20Sec	60Sec	1.5 min
12	10Sec	20Sec	50Sec	70Sec
9	8Sec	12Sec	30Sec	50Sec
6	5Sec	9Sec	25Sec	40Sec
3	2Sec	5Sec	20Sec	35Sec

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 block	PBTP
Colour	Black
Bottom clips	POM
Colour	Light grey
Diode cover	PC
Colour	Grey Transparent
Front knob	PC
Colour	Black

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

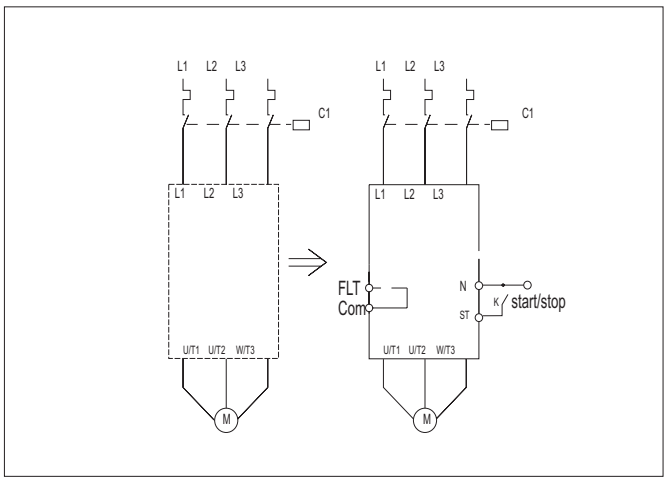


Fig. 1

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.

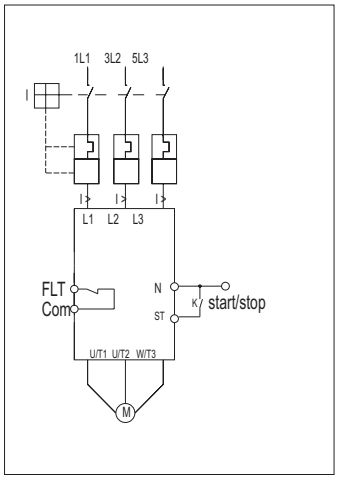


Fig. 2

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.

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 theincoming lines. Set initial torque to minimum and ramp up and down to maximum.

3) Power up again - adjust the start torque so the motorstarts 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 service switch for the motor.

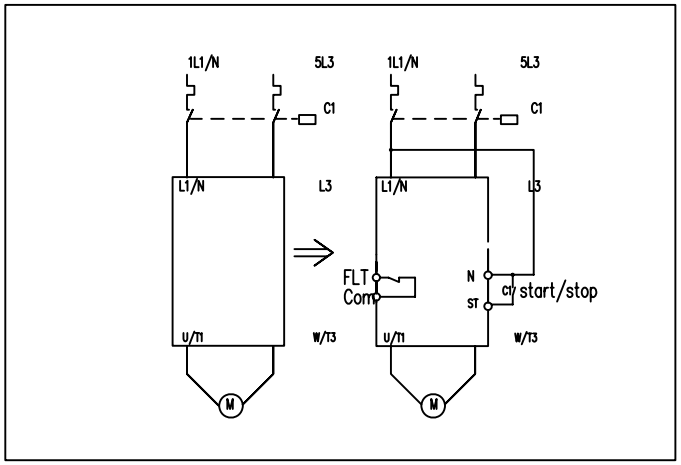


Fig. 1

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

When C1 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 S1 is opened, soft-stop will be performed according to the setting of the ramp-down potentiometer.

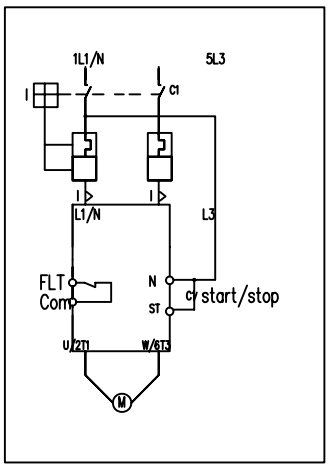


Fig. 2

Fusing Considerations
The motor controller provides by - passing 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.

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