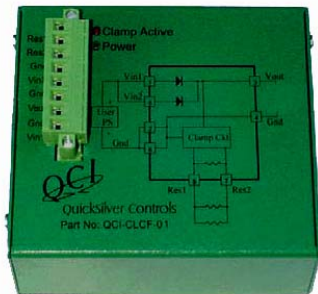


Clamp Module

This document is for the following 12A Clamp Modules:

- Clamp Module, Open Frame (QCI-CLOF-01)
- Clamp Module, Closed Frame (QCI-CLCF-01)

Closed Frame: QCI-CLCF-01 Open Frame - QCI-CLOF-01



Product Description

The Clamp Module is an active voltage clamping circuit that decouples the DC power supply from the excess power generated by DC motors (regeneration) during the deceleration of large inertial loads. Switched mode power supplies respond very poorly to back driving voltages which causes their over-voltage shutdown circuitry to trip.

The Clamp Module has an internal diode that isolates the controller/driver(s) from the power supply. If the controller/driver side of the Clamp Module exceeds the power supply voltage by approximately 1.5 Volts, the clamping power MOSFET is switched on, routing the excess voltage into one or more power resistors. This voltage routing continues until the output voltage reduces to 0.5 Volts over the input supply voltage. The power MOSFET is then switched off. The Clamp Modules can be used with any input voltage range from +12 to +48 Volts. It is strongly recommended to use only Regulated Power Supplies.

The closed frame version includes a metal box around the clamp's electronic circuit board. The open frame version has no external metal box, but does take up a smaller profile. The closed frame version has a 50W, 8ohm resistor built inside, while the open frame includes that same resistor but relies on the user for mounting. Each unit has DIN rail mounting brackets.

Why Should The Clamp Module Be Used?

When a servomotor is decelerating an load, the motor is acting as a generator, converting kinetic energy into electrical energy. This power is returned to the power supply. If the power supply cannot "absorb" the extra power, the total DC line voltage becomes greater than what was originating from the DC power supply. Most DC power supplies allow the voltage to rise

unabated. In some cases, this can cause failure of the controllers, drivers, motors and power supplies.

Specific Conditions

- High inertial loads (e.g. Flywheels, Vertical loads, Very efficient slider assemblies).
- Rapid deceleration of any load.
- Multiple servos operating from the same supply.
- Using power supplies with low capacitance regulation circuits.
- Operation of the motor as a brake/clutch to resisting an external mechanical drive.
- Use of 34 frame or larger motors.

What happens if the Clamp Module is required but not used?

Typically the controller will “Shut Down” when an over-voltage occurs. This may cause an abrupt halt of the move and may end the currently executing program (depending on the “Kill Motor Condition/Recovery” settings). In many cases, this over-voltage will damage the controller/driver and even the power supply.

Hardware

Input Connections

Note: Rated @ 12 Amps Continuous
Power supply input is connected to Pins 1 & 2.

- Pin 1 = Vin1 = + Volts DC input
- Pin 2 = Input ground

Output Connections

Note: Rated @ 12 Amps Continuous
Clamp module output voltage is on Pins 3 & 4.

- Pin 3 = Vout = + Volts DC output to servo
- Pin 4 = Output ground to servo(s)

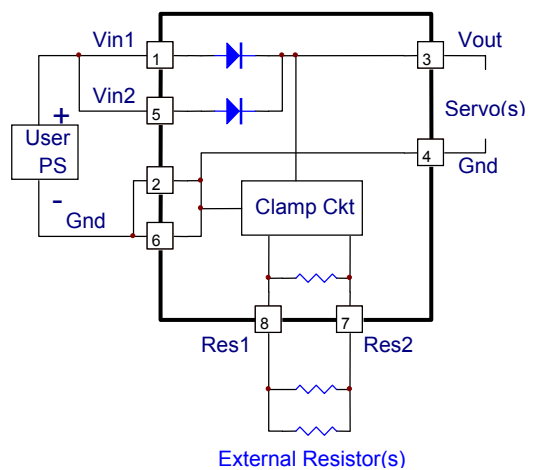
Secondary Input

NOTE: Rated @ 12-Amps Continuous

A second input power supply connection is provided on Pins 5 & 6.

NOTE: This can be utilized as a low voltage (Vin2 > +7.5 VDC) supply input (e.g. +9 VDC) to provide the SilverNugget N2 control electronics power to remain active if the main power supply is disconnected. This will allow communication & data tracking (i.e. position) while the driver circuit is disabled (Vin1 < +10.5 VDC). It operates parallel to Vin1 (Pins 1 & 2) and is diode protected.


- Pin 5 = Vin2 = + Volts DC secondary input
- Pin 6 = secondary input ground



Connector Description

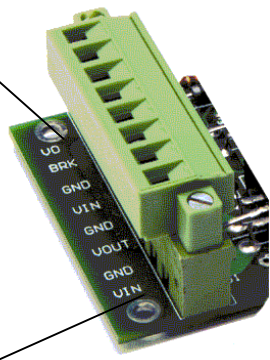
The open frame clamp modules have the same screw terminal connector as the closed frame modules. However, the bare PC board of the Open Frame Module has silkscreen labels with different connection descriptions than that of the Closed Frame Clamp Module. Resistor

Closed Frame Connector



Closed Frame Label (CLCF)	Pin	Connection Description	Open Frame Label (CLOF)
Res 1	8	Resistor	VO
Res 2	7	Resistor	BRK
Gnd	6	Ground Input 1	GND
Vin1	5	Voltage Input 1	VIN
Gnd	4	Output Ground	GND
Vout	3	Output Voltage	VOUT
Gnd	2	Ground Input 2	GND
Vin2	1	Voltage Input 2	VIN

Open Frame Connector



Pin 8 -
Pin 7 -
Pin 6 -
Pin 5 -

External Clamp Resistors

As the Closed Frame Clamp Module has a built in 8 ohm resistor, external clamp resistors are optional. For the Open Frame Clamp Module, at least one external clamp resistor is required. Add external clamp resistors in to achieve the desired resistance using the following equation.

Total resistance should be calculated as follows:

$$R = V/I;$$

Where V is the supply voltage and I is the max regenerative current required. Select for no greater then 12 amps clamping current.

No Less Than
4 ohms @ 48 volts
3 ohms @ 36 volts
2 ohms @ 24 volts
1 ohm @ 12 volts



Design Considerations

- More than one controller/driver may be connected to a Clamp Module as long as the regeneration current of all the units does not exceed that of the Clamp Module.
- Locate the Clamp Module as close to the controller/driver as possible to reduce voltage drop in the line.
- Open switches (i.e. ESTOP) between the controller/driver and the Clamp Module defeat the Clamp Module. If a switch needs to be installed between the Clamp Module and the controller/driver, install a diode biased to allow the servo to dump current to the clamp.