

SenDEC *Soft Start controller* for Electric Clutches

- For Gas, Diesel, or Electric powered equipment.
- Remove damaging jolt during clutch engagement
- Tachometer closed loop feedback (inductive or alternator input)

Does your *BANG-BANG* Electric Clutch cause these problems?

BOLT SHEAR!

BROKEN~ BELTS

LINK BREAKAGE- -

~BELT SCREECH

RPM DROOP ~

ENGINE STALL-

CUSTOMER JOLT ✨

MECHANICAL SLAM!

SenDEC's patented Softstart Clutch Controller is the solution!



Experience *smooth* electric clutch engagement for your equipment and customers!

- **Mechanical Life:**
The Softstart lessens forces to mechanical parts and improves the life of bolts, decks, brackets and other mechanical parts
- **Belt Life:**
Reduce wear and breakage for belts and improve the quality & reputation of the equipment.
- **Engine Stall:** The Softstart eliminates engine stalling and RPM droop by utilizing closed loop RPM monitoring while engaging the electric clutch.
- **Engine Cost Savings:**
The Softstart Clutch enables OEMs to reduce equipment engine size to save money.
- **Mechanical Jolt:**
Smooth engagement means less jolt to the equipment and customers.

Electromagnetic clutches inherently engage abruptly. For many applications with inertial loads, high stresses are produced, potentially shortening the life of components, bearings, mechanical mounts etc. The advantages of electromagnetic clutches are such that the stress problem has traditionally been tolerated by adding cost, either by over designing components, increasing engine size, or simply accepting a higher failure rate.

The patented SenDEC SoftStart controller senses the exact point at which the friction surfaces contact, then rapidly reduces the current to a level that allows the clutch to safely slip, but not release. Using engine RPM feedback, the patented controller adjusts the clutch current in a manner that drives the engine RPM to fit a desired profile.

Features:

- Closed loop control for consistent performance throughout the entire clutch life.
- Precise current measurement for accurate and repeatable pull-in detection.
- Closed loop PWM current control unaffected by charging system voltage.
- One controller part number:
 - Ratiometric RPM control automatically scales to RPM at time of engagement.
 - On-the-fly current calibration automatically adapts to different sized clutches.
- Default to open loop control if RPM signal is unavailable
- Optional fixed current calibration possible for special applications.
- Optional open loop available (no tachometer feedback)
- Short circuit protected
- Load dump protected

Models: Model SS808-8I for Gas Powered equipment
 Model SS808-8D for Diesel, Electric, or other powered equipment
 ** Other OEM options below

Operating and environment specs.

Environmental:

- Operating Temperature Range: -40 to +70C
- *Vibration: 20g's @ 10 – 80 Hz SAE J-1378
- *Shock: 55g's SAE J-1378 (tested and passed to 150gs., which is nearly 3 times the SAE specification)
- *Humidity: 95% H SAE J-1378
- *Salt Spray Test: MIL-STD-202G, Method 101E (5% NaCl @ 35C, 48 hrs)
- *Dust: Unit is 100% encapsulated - dust can not enter
- * Immersion: ASAE EP455 5.6 level 2
 Immerse controller in tap water at a temperature of 18C +/- 5C to a component top surface depth of 460mm. Orient in each of 3 orthogonal planes for 5 min in each plane. Upon removal, immediately subject to a cold soak of 019C for 30 min. Return to dry atmosphere of 25C for 60 Min. No impaired function, no water entry
- Ultraviolet: SenDEC's Q-Sun Xe-1- UV Chamber - 720 Hours
- *Thermal Shock: Controller stabilized at 70°C for 30 minutes. Removed from oven and immediately immersed into 0°C water mixed with UV sensitive dye for a minimum of 5 minutes - repeated for a total of 10 cycles. Controller stabilized at -40°C for 30 minutes. Removed from chamber and immediately immersed into 25°C water mixed with UV sensitive dye for a minimum of 5 minutes - repeated for a total of 10 cycles. No functional failures or ingress of water.
- *Chemical: ASAE EP455.5.8.2 chemicals brush exposure
 Chemical test: Apply with a brush over the normally exposed surface area. Repeat once per day for three days. Check for impaired function or detrimental corrosion during the test and at the end of a 100 hour min interval following exposure to test condition. No defect from wiping the surface with the following chemicals at room temperature: engine oil, Transmission Fluid, Gasoline

Gas Version, Absolute Maximum Ratings

	<u>Min</u>	<u>Nom</u>	<u>Max</u>	<u>Units</u>
Max On resistance:			0.05	Ohms
"On" Response Time:	220	250	280	mS
Soft Start Ramp Time:	900	1000	1100	mS

Tachometer Input (for closed loop versions)

	<u>Min</u>	<u>Nom</u>	<u>Max</u>	<u>Units</u>
Impedance:		1.5		Mohms
Input Range:	1000		4000	RPM*
*Note: RPM Input spark pattern 1:1 (1 Pulse per Revolution, other patterns available)				

Protection (Reverse Voltage),
 Load Dump JDQ 53.3 A<55A

	<u>Min</u>	<u>Nom</u>	<u>Max</u>	<u>Units</u>
Over current (13.8 VDC): Load between Pin C "Out: and Pin D "RTN"	10.0	12.5	15	Amps
Over current (13.8 VDC): Load between Pin C "Out: And Pin D "GND"	47	89	131	Amps

Diesel & Electric Version, Absolute Maximum Ratings

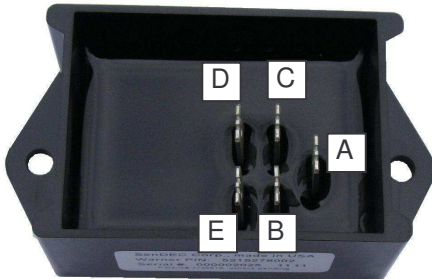
	<u>Min</u>	<u>Nom</u>	<u>Max</u>	<u>Units</u>
Max On resistance:			0.05	Ohms
"On" Response Time:	220	250	280	mS
Soft Start Ramp Time:	900	1000	1100	mS

Alternator Tachometer Input (for closed loop versions)

	<u>Min</u>	<u>Nom</u>	<u>Max</u>	<u>Units</u>
Impedance:		100		Kohms
Trigger (VIL)			3.3	Volts
Trigger (VIH)	4.7			Volts
Frequency Range:	170		700	Hz*
*Note: Other frequency ranges available				

Protection (Reverse Voltage),
 Load Dump JDQ 53.3 A<55A

	<u>Min</u>	<u>Nom</u>	<u>Max</u>	<u>Units</u>
Over current (13.8 VDC): Load between Pin C "Out: and Pin D "RTN"	10.0	12.5	15	Amps
Over current (13.8 VDC): Load between Pin C "Out: And Pin D "GND"	47	89	131	Amps



HOOKUP: Gas Powered, Diesel or Electric Versions PIN OUT

- A Ground
- B +12VDC Supply
- C Clutch OUT+
- D Clutch RETURN
- E RPM Tachometer trigger (for closed loop versions). Inductive for Gas equipment, Alternator Output for Diesel, Other pickup options available



Example: One wire Inductive Hookup to Gas Engine spark plug wire

OEM Options:

- Other Tachometer feedback (rotating shaft, controller interface, etc)
- Open loop Soft Start version with no Tachometer feedback.
- Voltage input options
- Multiple Clutch engagement and Tachometer profiles

Patented 7,746,619, Patent pending 10155746.3