

Proximity Sensors

Section 17



Photoelectric Sensors

Section 18



IEC Limit Switches

Section 19



Encoders

Section 20



Current Sensors

Section 21



**NEW
Product!**

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Overview

The ACUAMP series is a family of high performance current sensors offering outstanding features, flexibility and durability at an incredible price. Choose from a wide selection of Current Transducer and Current Switch models, all designed in a rugged industry standard feed-through package, consisting of both fixed core and split core models. Each model

has multiple input ranges (set by movable jumpers) for maximum flexibility across many current ratings. The current transducer output choices include 4-20 mA, 24 VDC loop-powered and 0-10 volt self-powered analog outputs. The Current Switch outputs are isolated solid state switches and are available in Normally Open configurations. A unit featuring

field adjustable time delay is also offered in the Current Switch series. All models are panel-mountable as standard, and convenient DIN-rail adapter accessories are available. Use the selection guide to find the best sensor module for your requirements.



ACUAMP Specifications by Model Type					
Specifications	Transducer	Transducer with True RMS	Switch	Switch	Switch
Model	ACT	ACTR	ACS150	ACS200	ACSX
Input Range	Jumper selectable: ACT005: 0 to 2 A, 0 to 5 A ACT050: 0 to 10 A, 0 to 20 A, 0 to 50 A ACT200: 0 to 100 A, 0 to 150 A, 0 to 200 A	Jumper selectable: ACTR005: 0 to 2 A, 0 to 5 A ACTR050: 0 to 10 A, 0 to 20 A, 0 to 50 A ACTR200: 0 to 100 A, 0 to 150 A, 0 to 200 A	-F core: 1 to 150 A -S core: 1.75 to 150 A	Jumper Selectable: -F core: 1 to 6 A, 6 to 40 A, 40 to 175 A -S core: 1.75 to 6 A, 6 to 40 A, 40 to 200 A	Jumper Selectable: -F core: 1 to 12 A, 12 to 55 A, 55 to 175 A -S core: 2 to 12 A, 12 to 55 A, 55 to 200 A
Output Range	-10 models: 0 - 10 VDC -42L models: 4 - 20 mA, loop-powered	4 - 20 mA, loop-powered true RMS	0.15 A @ 240 VAC or VDC	-AA Model: 1A @ 240 VAC -AD Model: 0.15A @ 30 VDC	-AA Model: 1A @ 240 VAC -AE Model: 0.15A @ 240 VAC/VDC
Frequency Range	-10 models: 50 to 60 Hz sinusoidal waveforms only -42L models: 20 - 100 Hz	10 to 400 Hz non-sinusoidal waveforms	6 to 100 Hz	6 to 100 Hz	50 to 100 Hz
Response Time	-10 models: 100 ms -42L models: 300 ms	600 ms	120 ms	40 to 120 ms	Field adjustable time delay: 0.2 to 15 seconds
Sensing Aperture	-F core: 0.75" (19mm) dia. -S core: 0.85" (21.6mm) sq.	-F core: 0.75" (19mm) dia. -S core: 0.85" (21.6mm) sq.	-F core: 0.75" (19mm) dia. -S core: 0.85" (21.6mm) sq.	-F core: 0.75" (19mm) dia. -S core: 0.85" (21.6mm) sq.	-F core: 0.75" (19mm) dia. -S core: 0.85" (21.6mm) sq.

Switches and Transducers Application Guide

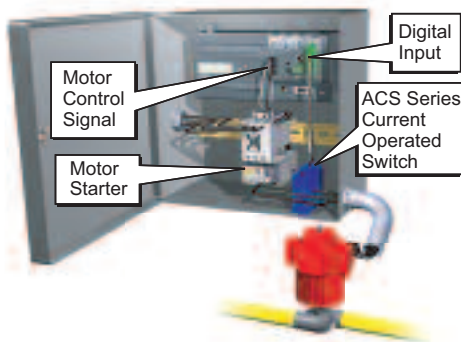
Application Guide

ACUAMP Current Sensors are a great fit for many applications, including material handling, fan and pump applications, and heating systems. With two basic models, Current Transducers and Current

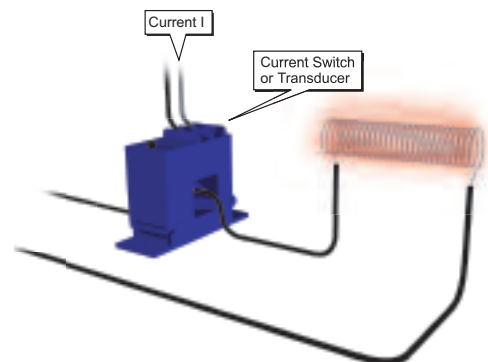
Switches, this sensor family is a great fit for almost any current sensor need, ranging from monitoring loads to preventive maintenance. Models with the ability to read True RMS non-sinusoidal waveforms

make it easy to monitor applications containing variable frequency drives. Use the application examples to help choose the best sensor model for your application.

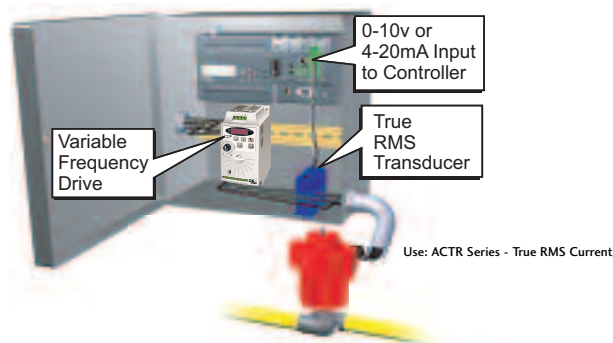
Pump Jam & Suction Loss Protection



Heater Life Prediction



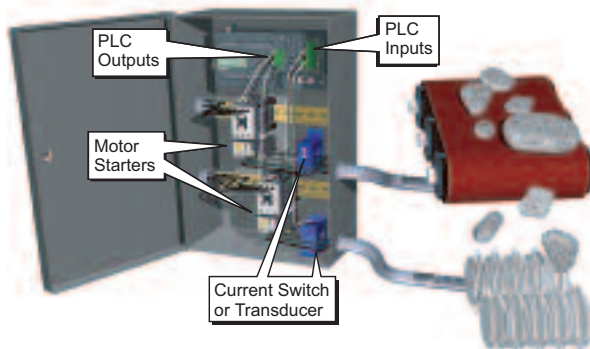
Pump Load Monitoring



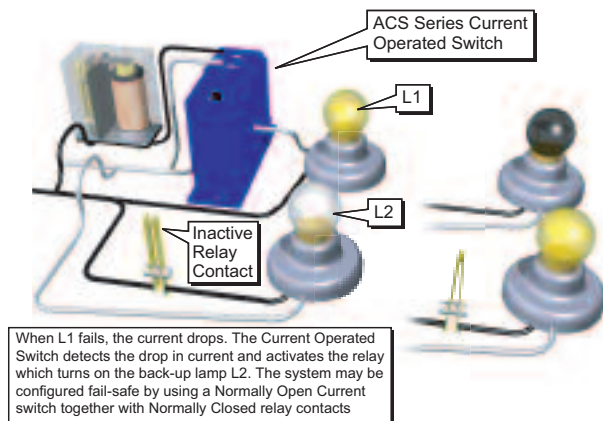
Crusher/Grinder/Shredder Motor Interlocks

The performance of size reduction equipment like crushers or grinders can be optimized by controlling the in-feed in order to

- Help prevent jamming
- improve the uniformity of the resultant product
- Enhance overall production efficiency



Lamp Failure Detection





ACT current transducers combine a current transformer and signal conditioner into a single package. The ACT series has jumper-selected current input ranges and industry standard 4-20 mA or 0-10 VDC outputs. The ACT series is designed for application on 'linear' or sinusoidal AC loads and is compatible with most PLCs, data loggers and SCADA systems. Full-scale input ranges are user-selectable from 2A to 200 A. This series is available in split-core or fixed-core models.

Applications

Automation Systems

- Analog current reading for remote monitoring and software alarms

Data Loggers

- Self-powered transducer helps conserve data logger batteries
- Split-core enclosures make using portable data loggers easy

Panel Meters

- Simple connection displays power consumption or other motor status

Features

- Five-year Warranty
- 4-20 mA or 0-10 VDC outputs
- Use up to 14 AWG copper wires
- Factory matched and calibrated single piece transducer is more accurate than traditional two-piece field installed products
- Average responding algorithm gives an RMS output on pure sine waves. Perfect for constant speed (linear) loads or On/Off loads
- Jumper-selectable input ranges allow end-users to tailor sensing ranges and improves the odds of having the right range for the job
- Output is magnetically isolated from the input for safety and to eliminate voltage drop

Agency Approvals

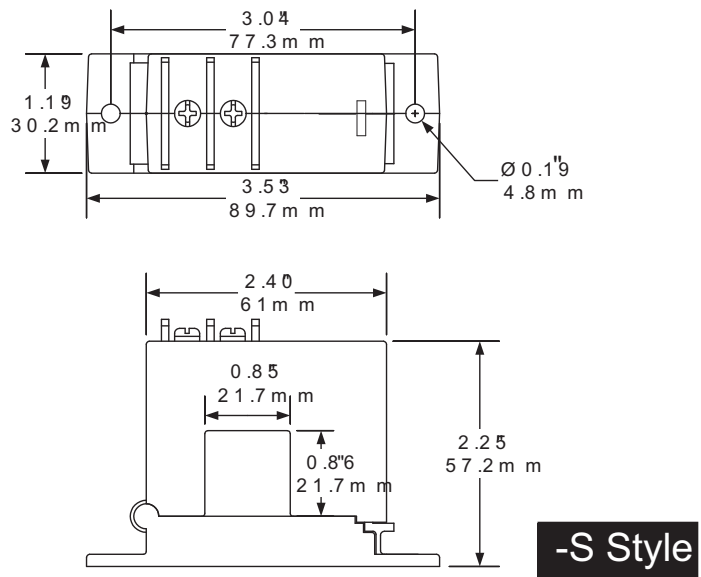
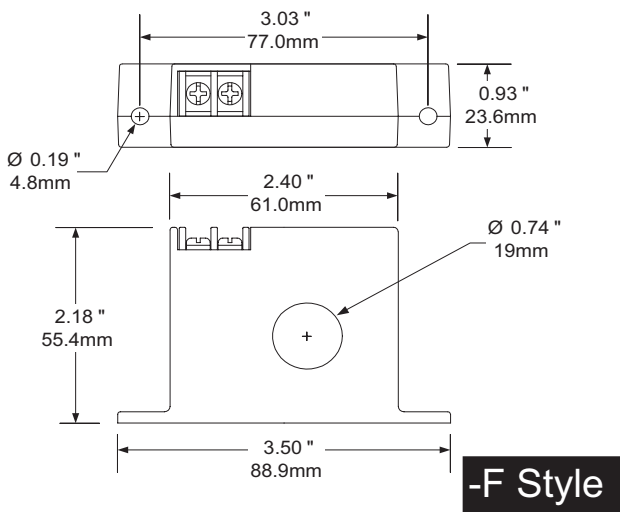
UL, cUL, CE approvals accepted worldwide

ACT Series Current Transducers				
Part Number	Description	Pcs/Pkg	Wt/lb	
ACT050-10-F	AC current transducer, 0-10 VDC output, fixed core	1	0.30	
ACT050-10-S	AC current transducer, 0-10 VDC output, split core	1	0.38	
ACT200-10-F	AC current transducer, 0-10 VDC output, fixed core	1	0.30	
ACT200-10-S	AC current transducer, 0-10 VDC output, split core	1	0.38	
ACT005-42L-F	AC current transducer, 4-20mA output, fixed core	1	0.30	
ACT005-42L-S	AC current transducer, 4-20mA output, split core	1	0.35	
ACT050-42L-F	AC current transducer, 4-20mA output, fixed core	1	0.30	
ACT050-42L-S	AC current transducer, 4-20mA output, split core	1	0.35	
ACT200-42L-F	AC current transducer, 4-20mA output, fixed core	1	0.30	
ACT200-42L-S	AC current transducer, 4-20mA output, split core	1	0.35	
Accessories				
DRA-2	DIN rail adapters, 1.69"x0.39"x0.75" (43x10x19 mm)	2	0.40	

ACT Series Specifications		
	-10 Models	-42L Models
Power Supply	Self-powered	24 VDC loop nominal, (40 VDC max) Loop-powered
Output Signal	0 - 10 VDC	4 - 20 mA, Loop-powered
Output Limit	15 VDC	32 mA
Accuracy	1% full scale	1% full scale
Response Time (10-90% step change)	100 ms	300 ms
Input Ranges	Field selectable from 0 - 200 A	
Sensing Aperture	-F core: 0.75" (19 mm) diameter; -S core: 0.85" (21.6 mm) sq.	
Isolation Voltage	UL listed to 1,270VAC. Tested to 5,000 VAC (1 minute max)	
Frequency Range (for sinusoidal waveforms)	50 to 60 Hz	20 to 100 Hz
Case	UL 94V-0 flammability rated	
Environmental	Temperature	-4 to 122°F (-20 to 50°C)
	Humidity	0 to 95% RH, non-condensing
Agency Listings	UL listed 508, UL file E222847, CE approved	

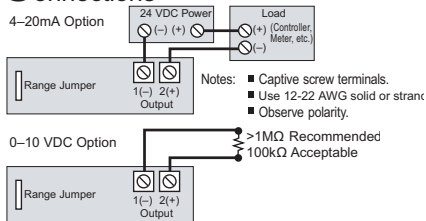
Maximum Input Ranges				
Model	Range	Maximum Input Amps		
		Continuous	6 Sec max	1 Sec max
ACT005	0 to 2A	80	125	250
	0 to 5A	100	125	250
ACT050	0 to 10A	80	125	250
	0 to 20A	110	150	300
	0 to 50A	175	215	400
ACT200	0 to 100A	200	300	600
	0 to 150A	300	450	800
	0 to 200A	400	500	1000

Dimensions (in/mm)



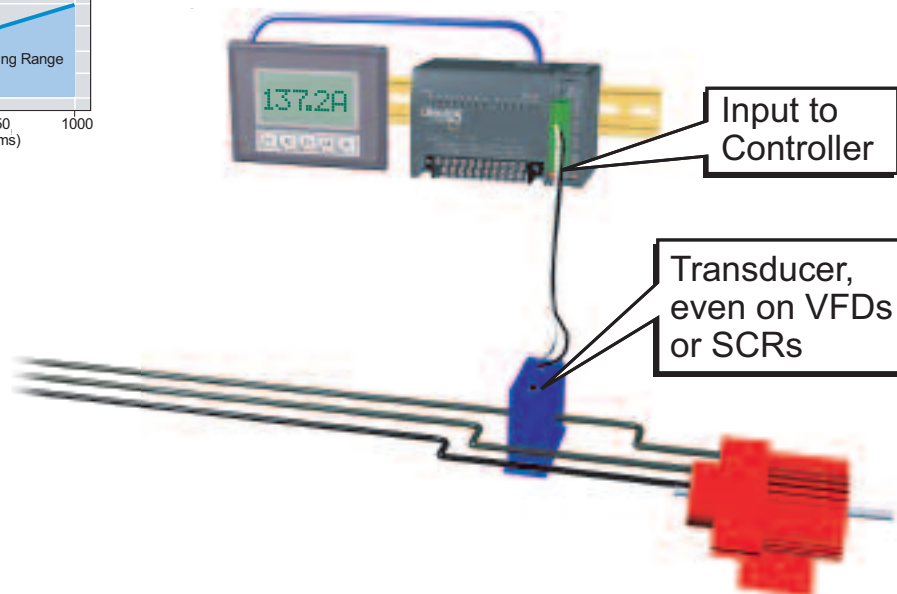
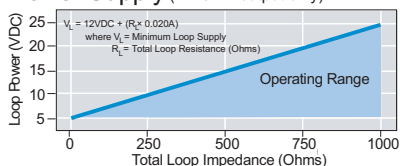
Connections

Connections



Terminals are #6 screws.

Power Supply (4-20mA output only)



ACUAMP[™] ACTR Series Current Transducers



The ACTR transducers combine a current transformer and a True RMS signal conditioner into one. These transducers are available in 4 to 20 mA output only.

The ACTR Series provides True RMS output on distorted waveforms found on VFD or SCR outputs, and on linear loads in “noisy” power environments. Choose from fixed or split-core style.

Applications

VFD Controlled Loads

- VFD output indicates how the motor and attached load are operating

SCR Controlled Loads

- Accurate measurement of phase angle fired or burst fired (time proportioned) SCRs. Current measurement gives faster response than temperature measurement

Switching Power Supplies and Electronic Ballasts

- True RMS sensing is the most accurate way to measure power supply or ballast input power

Features

- Five-year Warranty
- 4-20 mA output only
- True RMS technology is accurate on distorted waveforms like VFD or SCR outputs
- Choice of jumper-selectable ranges reduces inventory and eliminates zero and span pots.
- Output is magnetically isolated from the input for safety and eliminates voltage drop

Agency Approvals

UL, cUL, CE approvals accepted worldwide

Why use ACTR transducers?

The current waveform of a typical linear load is a pure sine wave. In VFD and SCR applications, however, output waveforms are rough approximations of a sine wave, and are non-sinusoidal.

There are numerous spikes and dips in each cycle. ACTR transducers use a mathematical algorithm called “True RMS,” which integrates the actual waveform over time. The output is the amperage component of the true power (heating value) of the AC current waveform.

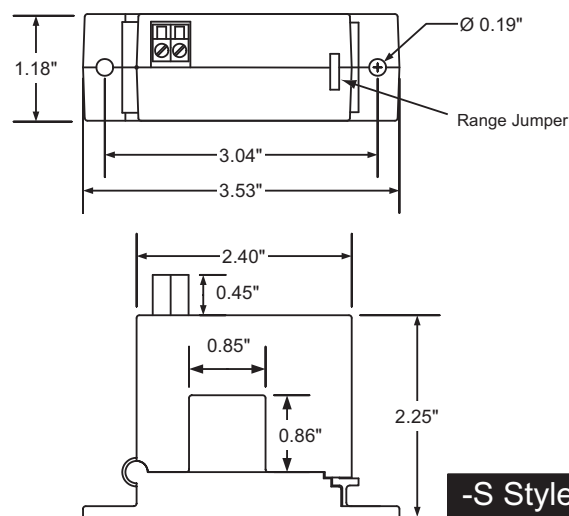
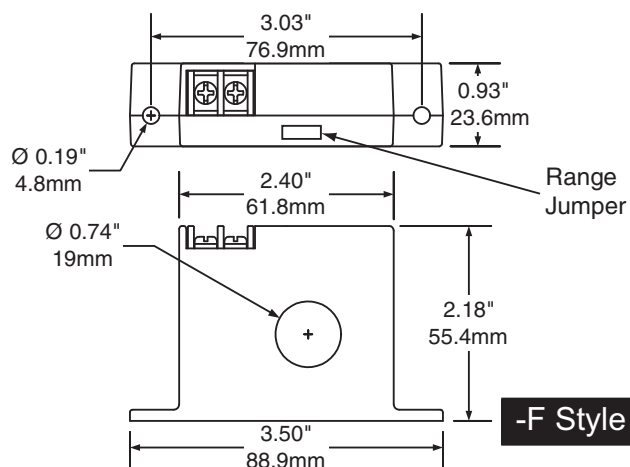
True RMS is the only way to accurately measure distorted AC waveforms. Select ACTR transducers for nonlinear loads or in “noisy” power environments.

ACTR Series Current Transducers				
Part Number	Description	Pcs/Pkg	Wt/lb	
ACTR005-42L-F	AC current transducer with true RMS, 4-20mA output, fixed core	1	0.30	
ACTR005-42L-S	AC current transducer with true RMS, 4-20mA output, split core	1	0.36	
ACTR050-42L-F	AC current transducer with true RMS, 4-20mA output, fixed core	1	0.30	
ACTR050-42L-S	AC current transducer with true RMS, 4-20mA output, split core	1	0.36	
ACTR200-42L-F	AC current transducer with true RMS, 4-20mA output, fixed core	1	0.30	
ACTR200-42L-S	AC current transducer with true RMS, 4-20mA output, split core	1	0.36	
Accessories				
DRA-2	DIN rail adapters, 1.69"x0.39"x0.75" (43x10x19 mm)	2	0.40	

Maximum Input Ranges				
Model	Range	Maximum Input Amps		
		Continuous	6 Sec max	1 Sec max
ACTR005	0 to 2A	80	125	250
	0 to 5A	100	125	250
ACTR050	0 to 10A	80	125	250
	0 to 20A	110	150	300
ACTR200	0 to 50A	175	215	400
	0 to 100A	200	300	600
	0 to 150A	300	450	800
	0 to 200A	400	500	1000

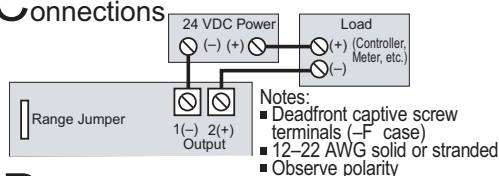
ACTR Series Specifications		
-42L Models		
Power Supply		24 VDC nominal, (12 - 40 VDC) Loop-powered
Output Signal		4 -20 mA, loop-powered, true RMS
Output Limit		23 mA
Accuracy		1% full scale
Response Time (10-90% step change)		600 ms
Input Ranges		Field selectable from 0 - 200 A
Sensing Aperture		-F core: 0.75" (19 mm) dia. -S core: 0.85" (21.6 mm) sq.
Isolation Voltage		UL listed to 1,270VAC. Tested to 5,000 VAC (1 minute max)
Frequency Range		10 to 400 Hz
Case		UL 94V-0 flammability rated
Environmental	Temperature	-4 to 122°F (-20 to 50°C)
	Humidity	0 to 95% RH, non-condensing
Agency Listings		UL listed 508, UL file E222847, CE approved

Dimensions (in/mm)

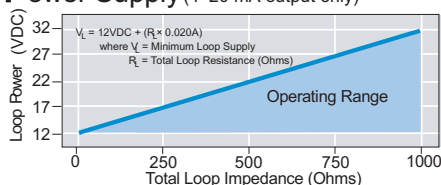


Connections

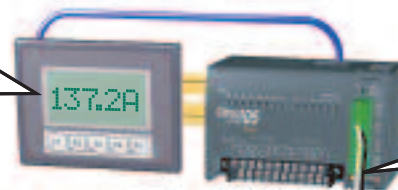
Connections



Power Supply (4-20 mA output only)



Operator Interface Panel

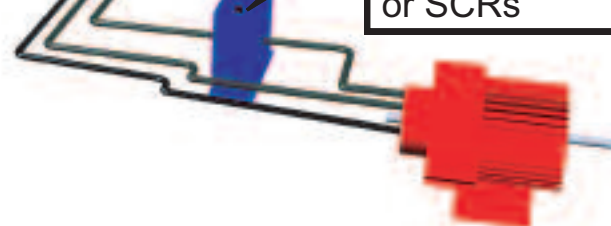


Input to Controller

Variable Frequency Drive



True RMS Transducer, even on VFDs or SCRs



ACUAMP™ ACS150 Series Switches



ACS150 Series current operated switches combine a current transformer, signal conditioner and limit alarm into a single package for use in monitoring or proof of operation applications. Offering an adjustable setpoint range of 1 to 150 amps and universal, solid-state outputs, the self-powered ACS150 can be tailored to provide accurate and dependable digital indication of over-current conditions across a broad range of applications. The ACS150 is available in fixed-core and split-core models.

Applications

Electronic Proof of Flow

- Current operated switch eliminates the need for multiple pipe or duct penetrations
- More reliable than electromechanical pressure or flow switches

Conveyors

- Detect jams and overloads; useful when interlocking multiple conveyor sections

Heating Circuits

- Detect ON/OFF status; faster response times than with temperature sensors

Loss of Load Detective

- Detect belt or coupling breaks with fast response times

Lighting Circuits

- Easier and faster than photocells

Features

- Five-year warranty
- N.O. Universal Outputs
0.15 A @ 240 VAC/VDC
- Status LED provides visual indication of setpoint trip and contact action
- Self-powered operation cuts installation time and operating costs
- Field-adjustable trip points speed start-up and allow for tailored operation
- Choose either split-core or fixed-core enclosure style. Split-core packages allow easy installation on existing systems; fixed-core enclosures offer more compact package for OEM or new installations
- Integral mounting feet offer secure mounting

Agency Approvals

UL, cUL, CE approvals accepted worldwide

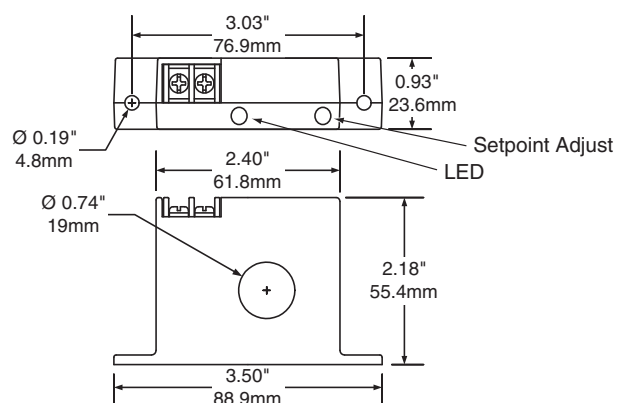
ACS150 Current Operated Switches				
Part Number	Description	Pcs/Pkg	Wt/lb	
ACS150-AE-F	N.O. AC/DC adjustable current switch in fixed core enclosure	1	0.30	
ACS150-AE-S	N.O. AC/DC adjustable current switch in split core enclosure	1	0.35	
Accessories				
DRA-2	DIN rail adapters, 1.69"x0.39"x0.75" (43x10x19 mm)	2	0.40	

ACS150 Series Specifications		
Power Supply		None - Self-powered
Output		Isolated solid-state switch
Output Rating		N.O. 0.15 A @ 240 VAC or VDC
Response Time		120 ms
Off State Leakage		< 10 μA
Input Ranges		Fixed-core: 1 to 150 A. Split-core: 1.75 to 150 A
Hysteresis		5% of Setpoint
Overload (1 second duration)		1,000 A
Isolation Voltage		UL listed to 1,270VAC. Tested to 5,000 VAC (1 minute max)
Frequency Range		6 to 100 Hz
Case		UL 94V-0 flammability rated
Environmental	Temperature	-58 to 149°F (-50 to 65°C)
	Humidity	0 to 95% RH, non-condensing
Agency Listings		UL listed 508, UL file E222847, CE approved

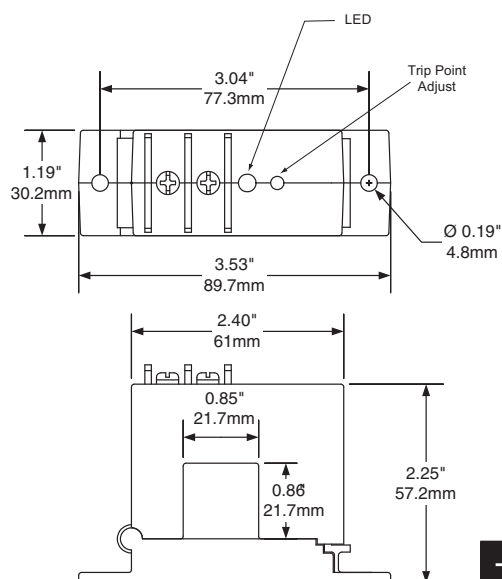
ACS150 Maximum Input Ranges				
Type	Range - Adjustable	Maximum Input Amps		
		Continuous	6 Sec max	1 Sec max
Fixed Core	1 - 150 A	150	400	1000
Split Core	1.5 - 150 A	150	400	1000

ACS150 Minimum Load/MTBF	
Minimum Load Operating Current	MTBF (Mean Time Between Failure) x 10 ⁶
**	4.33 hours
**	4.33 hours
** The AC/DC switch output has no specified minimum load required to operate the output. There is a maximum resistance of 5 ohms across the output when the switch is "on"	

Dimensions (in/mm)



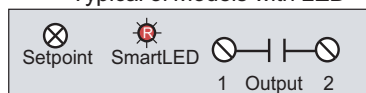
-F Style



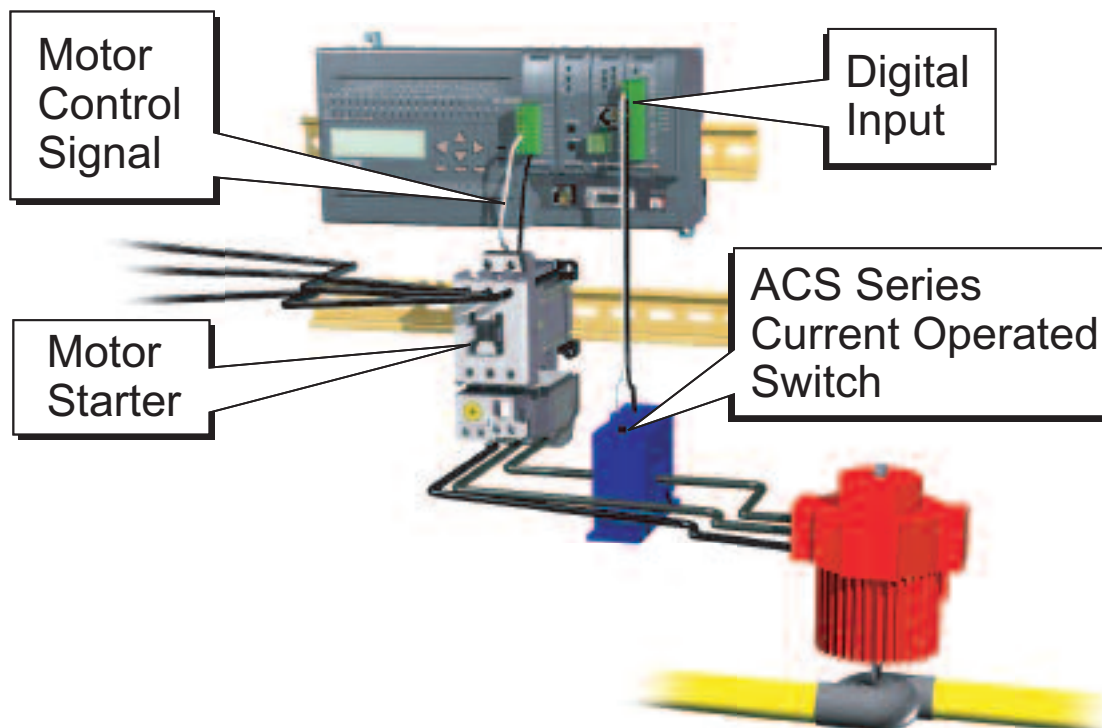
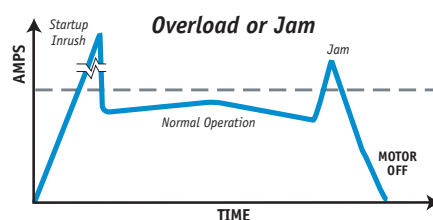
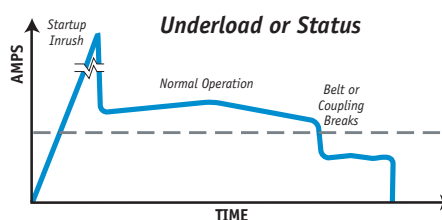
-S Style

Connections

Typical of Models with LED



Terminals are #6 screws.
Use up to 14 AWG copper wire



ACUAMP[™] ACS200 Series Switches



ACS200 series current operated switches provide the same dependable status indication as the ACS150 series, but with added resolution. A choice of three jumper-selectable input ranges allows the ACS200 to be tailored to an application and provides more precision in setpoint adjustment. Self-powered, isolated solid-state relay outputs and multiple input ranges are standard features.

Applications

Electronic Proof of Flow

- Current operated switch eliminates the need for multiple pipe or duct penetrations, lowering installed costs
- Solid-state technology more reliable than electromechanical pressure or flow switches

Conveyors

- Detect jams and overloads; useful when interlocking multiple conveyor sections

Lighting, Heating Circuits

- Detect ON/OFF status, easier to install and less expensive than photocell or temperature sensor alternatives

Features

- Five-year warranty
- N.O. Universal Outputs
1A @ 240 VAC or 0.15 A @ 30 VDC
- Status LED provides visual indication of setpoint trip and contact action
- Self-powered operation cuts installation time and operating costs
- Field-adjustable trip points speed start-up and allow for tailored operation
- Choose fixed-core or split-core enclosure style. Split-core allows easy installation on existing systems; fixed-core offers more compact package for OEM or new installations
- Integral mounting feet provide secure mounting

Agency Approvals

UL, cUL, CE approvals accepted worldwide

ACS200 Current Operated Switches				
Part Number	Description	Pcs/Pkg	Wt/lb	
ACS200-AA-F	N.O. AC adjustable current switch, fixed core	1	0.40	
ACS200-AA-S	N.O. AC adjustable current switch, split core	1	0.40	
ACS200-AD-F	N.O. DC adjustable current switch, fixed core	1	0.40	
ACS200-AD-S	N.O. DC adjustable current switch, split core	1	0.40	
Accessories				
DRA-2	DIN rail adapters, 1.69"x0.39"x0.75" (43x10x19 mm)	2	0.40	

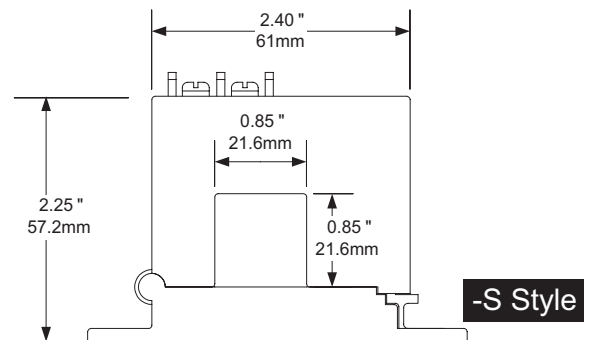
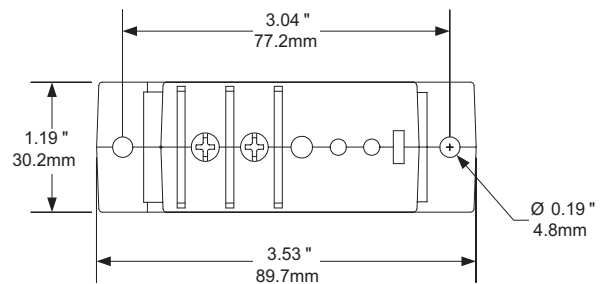
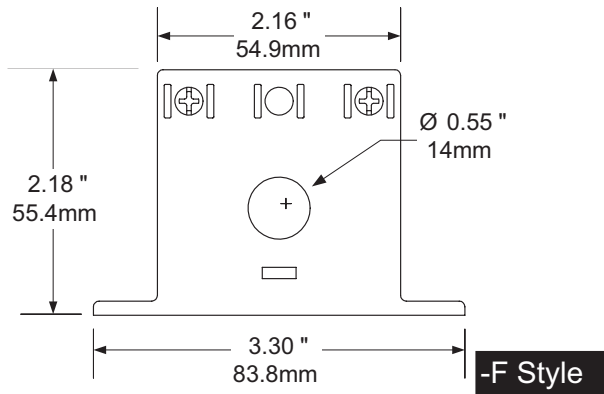
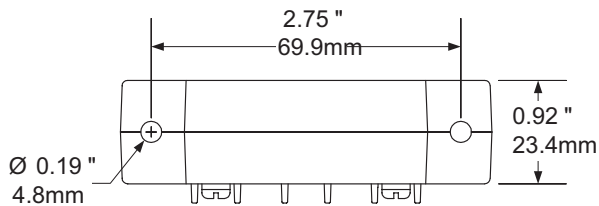
ACS200 Series Specifications	
Power Supply	None - Self-powered
Output	Isolated solid-state switch
Output Rating	N.O. AC: 1A @ 240 VAC N.O. DC: 0.15A @ 30 VDC
Response Time	40 - 120 ms
Off State Leakage	< 10 μ A
Input Ranges	Jumper selectable: Fixed-core: 1 to 175 A. Split-core: 1.75 to 200 A
Hysteresis	low: 0.15A; mid: 0.3; high: 0.9A
Overload (1 second duration)	low: 600 A; mid: 800 A; high: 1,200 A
Isolation Voltage	UL listed to 1,270VAC. Tested to 5,000 VAC (1 minute max)
Frequency Range	6 to 100 Hz
Case	UL 94V-0 flammability rated
Environmental	Temperature
	Humidity
Agency Listings	

Maximum Input Ranges				
Range Jumper	Range - Fixed Core	Range Split Core	Maximum Input Amps	
			6 Sec max	1 Sec max
NONE	1 to 6 A	1.75 to 6 A	400	600
MID	6 to 40 A	6 to 40 A	500	800
HIGH	40 to 175 A	40 to 200 A	800	1200

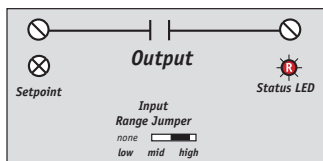
Switching Delay			
Delay	LOW Range	MID Range	HIGH Range
ON Delay	0.23 sec max	0.05 sec max	0.03 sec max
OFF Delay	0.02 sec max	0.02 sec max	0.01 sec max
Hysteresis			
	6%	4%	3%

ACS200 Minimum Load/MTBF		
Part Number	Min. Operating Current	MTBF (Mean Time Between Failure) x 10 ⁶
ACS200-AA-F	20 mA	4.29 hours
ACS200-AA-S	20 mA	4.29 hours
ACS200-AD-F	1 mA	4.39 hours
ACS200-AD-S	1 mA	4.39 hours

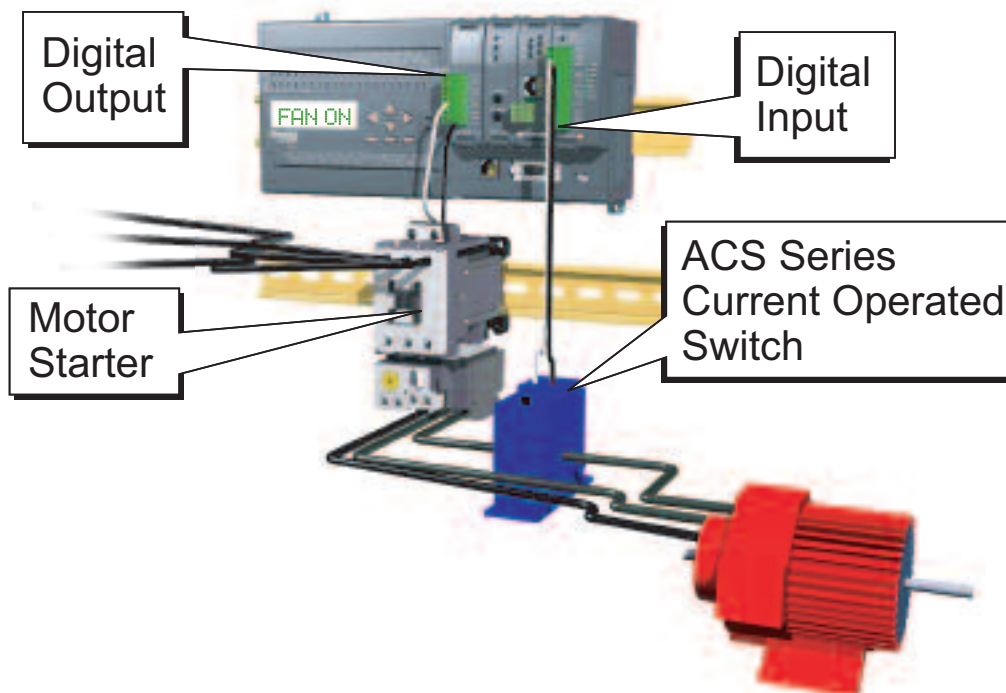
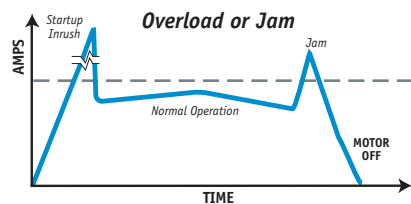
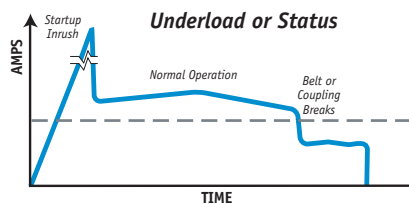
Dimensions (in/mm)



Connections



Terminals are #6 screws
Use up to 14 AWG copper wire





The ACSX series high-performance current-operated switch has a field-adjustable time delay feature that minimizes nuisance trips during start-up and operation. These switches are designed for motor status applications where setpoint accuracy and repeatability are critical and offer a linear setpoint characteristic and constant hysteresis.

Applications

Motor Protection

- Serves as an electronic proof-of-operation; detects current draw changes in motors when they encounter problems such as pumps running dry or impending bearing failure
- Non-intrusive; less expensive to install than differential pressure flow sensors or thermal switches
- Much quicker response time than Class 10 overload relays

High Inrush or Temporary Overload Current

- Adjustable start-up/delay timer allows 0-15 second delay to eliminate nuisance trips from high inrush or short overload conditions

Features

Standard features include self-powering, jumper-selectable ranges and a choice of outputs and core styles

- Five-year warranty
- Adjustable start-up/delay timer is field-adjustable from 0.2 to 15 seconds to eliminate nuisance alarms caused by start-up inrush or temporary overcurrent conditions.
- Choice of N.O. AC or AC/DC outputs: Contact ratings of 1.0A @ 240 VAC or universal outputs of 0.15A @ 240 VAC/VDC for use with most standard motor control systems.
- Improved ease of installation and use:
 - 1.0A rating eliminates need for time delay relay
 - Self-powered, split-core models simplify installation
 - Status LED provides visual indication of setpoint trip and contact action
- Industrial grade performance - constant hysteresis and linear setpoint response for greater accuracy

Agency Approvals

UL, cUL Listed
CE approval pending

ACSX Current Operated Switches				
Part Number	Description	Pcs/Pkg	Wt/lb	
ACSX200-AA-F	N.O. AC adjustable current switch, fixed core	1	0.30	
ACSX200-AA-S	N.O. AC adjustable current switch, split core	1	0.40	
ACSX200-AE-F	N.O. AC/DC adjustable current switch, fixed core	1	0.30	
ACSX200-AE-S	N.O. AC/DC adjustable current switch, split core	1	0.40	
Accessories				
DRA-2	DIN rail adapters, 1.69"x0.39"x0.75" (43x10x19 mm)	2	0.40	

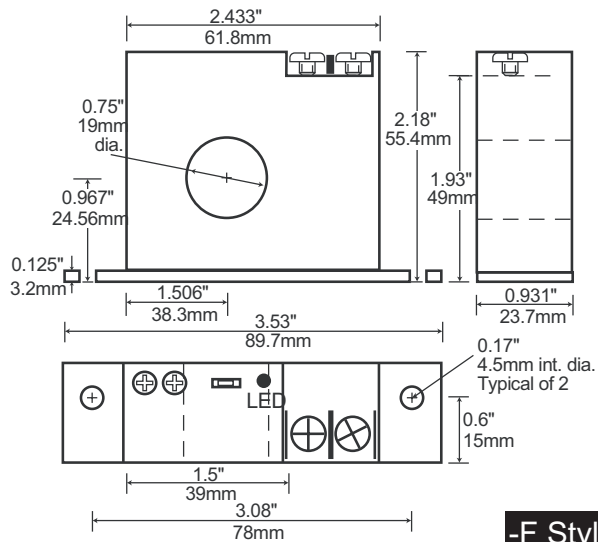
ACSX Series Specifications	
Power Supply	None - Self-powered
Output	Isolated solid-state switch
Output Rating	N.O. AC: 1A @ 240 VAC N.O. AC/DC: 0.15 A @ 240 VAC/VDC
Response Time	Adjustable 0.2 to 15 seconds
Off State Leakage	< 10 μ A
Input Ranges	Jumper Selectable: Fixed core: 1 to 175 A Split core: 2 to 200 A
Hysteresis	5% constant
Overload (1 second duration)	2 to 12 A Range: 600 A; 12 to 55 A Range: 800 A; 50 to 200 A Range: 1200 A
Isolation Voltage	UL listed to 1,270VAC. Tested to 5,000 VAC (1 minute max)
Frequency Range	50 to 100 Hz
Case	UL 94V-0 flammability rated
Environmental	Temperature
	Humidity
Agency Listings	
UL listed 508, UL file E222847, CE approval pending	

Maximum Input Ranges				
Type	Range - Adjustable	Maximum Input Amps		
		Continuous	6 Sec max	1 Sec max
Fixed Core	1-175 A	150	400	1000
Split Core	2-200 A	150	400	1000

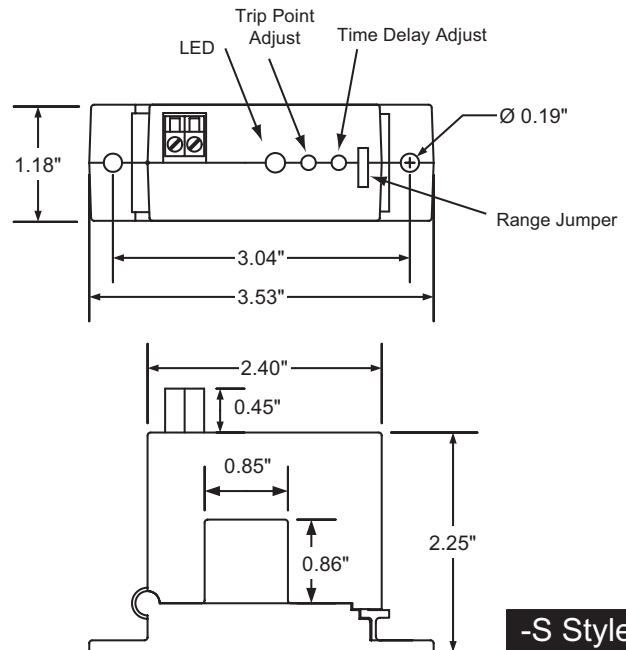
ACSX200 Minimum Load/MTBF		
Part Number	Minimum Load Operating	MTBF (Mean Time Between Failure) x 10 ⁶
ACSX200-AE-F	**	4.33 hours
ACSX200-AE-S	**	4.33 hours
ACSX200-AA-F	20 mA	4.29 hours
ACSX200-AA-S	20 mA	4.29 hours
** The AC/DC switch output has no specified minimum load required to operate the output. There is a maximum resistance of 5 ohms across the output when the switch is "on."		

ACUAMP™ ACSX Series Switches

Dimensions (in/mm)



-F Style



-S Style

Connections



Use up to 14 AWG copper wire

