

APPLICATION NOTE - 1005

Topic: COMMONLY USED TERMS with
SCR POWER CONTROLS

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INTRODUCTION

Over the years HDR has been asked many times to compile a list of commonly used terms associated with SCR Power Controls. We have tried to think of the terms you hear most often. If there are any you would like to have added, just let us know. We hope this list helps.

AMBIENT TEMPERATURE - the temperature in which an SCR Power Control is expected to operate, usually 0° to 50°C.

ANODE - the negative power terminal of an SCR or Diode.

CATHODE - the positive power terminal of an SCR or Diode.

COMMAND SIGNAL - a variable input to an SCR Power Control that determines it's output setting. It can be a current, voltage or potentiometer input.

CSA - Canadian Standards Association's mark for 3rd party certification of a product to Canadian Standards.

cUL - Underwriters Laboratories' mark for 3rd party certification of a product to Canadian Standards.

CURRENT LIMITING - the means for limiting or setting the maximum current level applied to the load. Should be RMS for best results.

CURRENT REGULATION - the means for regulating the current in an ever-changing load resistance or linearizing the input command signal to the output current.

CURRENT TRANSFORMER - commonly referred to as a CT. It is used to sense the AC current. It's output is isolated and linear to the measured current, the output is normally 0-5A.

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di/dt - rate of rise of applied current to an SCR as it turns on.

DIODE - a semiconductor that allows current to flow in only one direction.

dv/dt - refers to the maximum rate of rise of applied voltage across an "OFF" SCR that will not cause a false turn-on.

ENCLOSURE - the "box" in which an SCR Power Control will be installed. Usually a NEMA type such as a NEMA 1.

FORWARD DROP - the voltage drop across an SCR or Diode during conduction in the normal forward direction. This voltage drop times the current determines the watt loss of the SCR or Diode.

GATE - the signal terminal of an SCR used to turn it on.

HEATING ELEMENT - the electrical device that produces heat when electrical current is passed through it. It is selected by the temperature requirements, voltage & current ratings and the mechanical shape.

HEATSINK - a mechanical device used to transfer heat away from a semiconductor. Can be convection, fan or water-cooled.

HYBRID - refers to an SCR and Diode combination in an SCR Power Control; normally a 3-phase unit, 3 SCRs and 3 Diodes. It has limitations in certain applications such as unbalanced loads. A 6 SCR unit will work in any application that a hybrid was previously used.

I²T - amperes squared times seconds. Refers to the subcycle current characteristics of a SCR or Semiconductor Fuse. These must be coordinated for the fuse to protect the SCR.

INRUSH CURRENT - the current that surges when a low resistance load is energized or the current drawn by a transformer during saturation.

LED - Light Emitting Diode. Used as diagnostic indicators on HDR Power Controls.

MOV - Metal Oxide Varistor. A device used in conjunction with an R-C Snubber circuit to protect the SCR or Diode from voltage transients.

OVERCURRENT TRIP - a circuit which monitors and "shuts down" an SCR if the peak current has exceeded a preset level.

PEAK - the maximum instantaneous value of voltage or current.

PHASE-ANGLE - one of two firing modes for SCRs. Each SCR is turned on for a portion of each half of an AC cycle. Can cause a poor power factor.

PHASE LOCK LOOP - an electronic circuit that automatically adjusts itself to maintain synchronization with the line frequency. It can also be used as a line frequency noise filter.

PIV - Peak Inverse Voltage, the voltage rating of an SCR or Diode. Should be approximately 2.3 times the operating voltage.

POTENTIAL TRANSFORMER - usually referred to as a PT, used to isolate or change a voltage level.

R-C SNUBBER - series connected resistor capacitor network connected across an SCR to slow down the rate of applied voltage (dv/dt) to prevent it from falsely turning on. Used in conjunction with a MOV for maximum protection.

RFI - Radio Frequency Interference, high frequency interference generated by the chopping action of phase-fired SCRs.

RMS - Root Mean Squared, refers to the heating value of current or voltage.

SCR - Silicon Controlled Rectifier, a device used to switch the power to the load in an SCR Power Control.

SEMICONDUCTOR FUSE - the protective device used to save an SCR in the case of an overcurrent condition. It is usually a very fast fuse (see I²T). Not to be used for cable protection.

SOFT-START - a ramping effect of voltage or current to the load to minimize or eliminate inrush current.

SPAN ADJUSTMENT - a multi-turn potentiometer for matching an SCR Power Control's output to its command signal. Usually adjusted with the command signal at 100%.

SSR - Solid State Relay, a module which contains two SCRs with it's own isolation circuitry built in.

THYRISTOR - see SCR.

UL - Underwriters Laboratories' mark for 3rd party certification of a product. It indicates the product meets stringent specifications. Commonly required for installation in large cities such as Chicago or New York City.

VARIABLE TIME BASE - a control mode for zero-fired SCR Power Controls. The number of AC cycles on and off are constantly changing to minimize power fluctuations to the load. Minimizes thermal shock in heating elements which helps increase life expectancy.

VOLTAGE REGULATION - a means for regulating the output voltage of an SCR Power Control or for compensating for a changing input line voltage.

ZERO ADJUSTMENT - a multi-turn potentiometer for matching an SCR Power Control's output to its command signal. Usually adjusted for zero output when the command signal is at zero.

ZERO-FIRING - a method of controlling power to the load with full sinewave outputs, maintains a high power factor. The SCR is always turned on at its zero crossing.