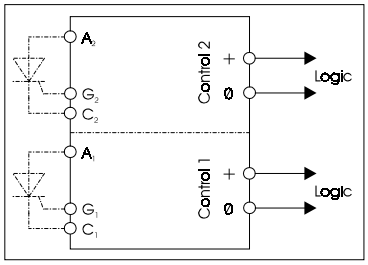
Thyristor Trigger module AS400X

Features
Reliably triggers small and very large thyristors
Can be driven directly from control logic, with < 12mA
No power supply required
1.2A gate current (2A upon request)
High rate of rise of gate current typically 2A/us
Very reliable
Compact design, ideal for heatsink and PCB mounting
Leads no longer have to be short
Better isolation than pulse transformers
Economical
User friendly - reducing design time and space

Photograph



Applications
Controlled rectifiers
AC controllers
Zero crossing switches

Specification
Each unit triggers 2 thyristors. Different units are available for the more popular applications - such as controlled rectifiers, AC controllers and zero crossing switches.

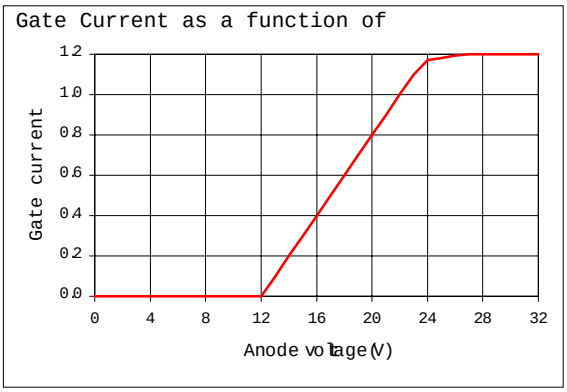
Absolute maximum ratings

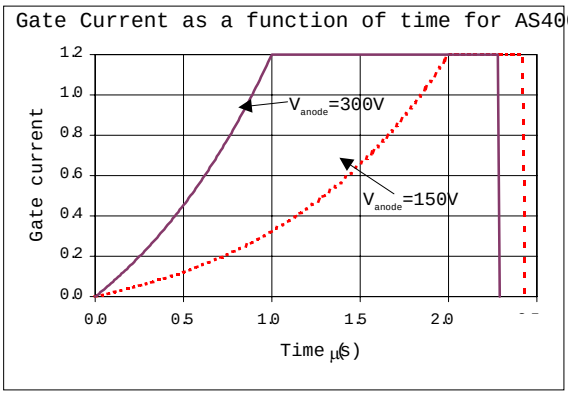
Peak operating voltage	-1200V version	1200V
	-2000V version	2000V
Maximum rms AC voltage	-1200V version	400V_{RMS}
	-2000V version	660V_{RMS}
Maximum operating frequency		60Hz
Ambient temperature		-25°C - 85°C

Technical data

Maximum anode to cathode dv/dt with 80% rated voltage	>2000V/µs
Maximum input-output dv/dt with 2000V	>5000V/µs
Peak isolation voltage	>7. 5kV
Anode - cathode current for 2000V version at 660V	1. 1mA
Anode - cathode current for 1200V version at 400V	1. 3mA
Maximum gate leakage current	<50µA
Peak gate current	1. 2A 5%
Rate of rise of gate current with anode voltage = 300V	>1A/µs
Control current to trigger thyristor	<6mA
Control input voltage at 12mA	<1. 5V
Trigger delay with control current = 12mA	<50µs

Units with a maximum voltage rating of 2200V and or a trigger current of 2A can be supplied upon request.





Specifications are subject to change without notice.

Description of operation

The thyristor is triggered by deriving the gate current from the anode of the device. Current flow is initiated by an opto-coupler which provides the electrical isolation. By maintaining the gate current long enough to reach the latching current, the system can be safely used in applications with large inductive loads. The anode voltage of the thyristor must be at least 14V before the gate current reaches 200mA. The full gate current is maintained until the thyristor triggers and is terminated when the anode voltage goes below 14V. The rise time of the gate current is approximately proportional to the supply voltage. Because the di/dt rating of the thyristor does not decrease linearly with a reduction in gate current rise time, the device is always triggered safely. The diode in the gate allows triggering of amplifying-gate devices. The only requirement is a 12mA signal at the control terminals. There is a small turn-on delay of approximately 30μs and the full dv/dt can only be re-applied 100μs after removing the trigger signal from the control terminals .

Application information

The trigger units use the anode voltage of the thyristor as a supply for the gate trigger current. Therefore no power supply is needed for generating the trigger pulses. As long as there is a control current flowing into the control terminals of the trigger unit, the thyristor remains triggered. This is a useful feature when the thyristor is required to control highly inductive loads. It is therefore recommended that the unit be driven by a continuous pulse instead of a train of pulses as is the case with pulse transformers. It must be noted that there is a small delay of about 30μs from the time of applying the control signal until the thyristor is actually triggered. The unit can also trigger amplifying gate thyristors.

Because the anode voltage of the thyristor is used as the power supply for the trigger pulses, the anode to cathode voltage applied to the thyristor must be greater than the onset voltage of about 12V before a trigger current can be produced. The trigger current increases with the anode voltage until it reaches its maximum of 1. 2A at about 25V. Since the onset voltage is small it can be ignored for sinusoidal mains operation.

The unit produces a trigger pulse with a rise time of 1A/μs at 300V which is more than adequate for all applications. Note that this figure is reached at 150V with a 1200V unit and increases about linearly with the anode voltage.

Upon application of the control current the thyristor receives a fast rising gate current which is fully maintained until the anode voltage of the thyristor collapses. This kind of operation accounts for the low power dissipation of the trigger unit. On the other hand if the gate - cathode terminals are short circuited, while a current is fed into the control terminals, the trigger unit will be destroyed due to excessive power dissipation.

The gate of the thyristor is current driven from a voltage source of 30V. This eliminates the need for very short gate leads in order to achieve a high rise of gate current and reduces the possibility of undesired triggering. Twisted gate leads in the order of 1m can be used, even in very hostile environments. It is good engineering practice to twist gate and cathode leads anyway, and the anode lead as close to the twisted pair as much as possible. If the snubber network is also to be accommodated by the same leads, the loop inductance and wire resistance needs to be kept small to ensure reliable triggering.

The voltage rating of the trigger unit follows the same guidelines as those applicable to the thyristor. For example in the case of the 1200V unit, the recommended maximum AC voltage should not exceed $400V_{RMS}$ while the peak transient voltage can not go above 1200V. Voltages in excess of 1200V will destroy the unit. Similarly the 2000V and 2200V units can handle a mains voltage not exceeding $660V_{RMS}$.

Triggering is generally initiated by a control current less than 6mA. In order to accommodate the aging effect of the opto-coupler and its temperature dependence at elevated temperatures, it is good engineering practice to drive the unit with 12mA. The input consists of the light emitting diode of the opto-coupler in parallel with a reverse polarity protection diode. It is good practice to connect the (0) terminals for the control signal to the zero-volt line of the logic control.

In some applications it may be desirable to trigger the thyristor when the anode voltage exceeds a predetermined value. This voltage can for example be tailored to suite the ratings of the MOV connected across the thyristor. In such an event, slow rising large energy transients can be diverted by triggering the thyristor, thus avoiding damage to the MOV. This feature may also be useful in some controlled rectifier applications. This version is supplied on request only and exact details about the application will be required.