

THYCON

Est.1968



Constant Current Regulator

MC2 | 3kW - 30kW

Concept

Thycon Constant Current Regulators are designed to provide high-quality, regulated, single phase power to achieve maximum performance and lifetime of airfield lighting systems.

Application

Airfield lighting systems consist of large groups of tungsten-halogen lamps that are suitable for high-intensity applications such as:

- approach lighting
- taxiway lighting
- visual approach slope indicators (VASI)
- stop bars
- runway edge lighting
- centre line lighting

MC2 features and benefits

- true constant current source
- continuous, accurate regulation of intensity
- microprocessor-based diagnostics and controls
- soft-start and intensity transition (extends lamp life)
- robust technology
- fuseless design
- long lamp life
- long cable life
- high efficiency
- high reliability
- cost effective
- substantial system application savings
- designed for 3rd party maintenance
- compact, modular construction
- indoor or outdoor enclosures
- Australian made
- conforms to and exceeds relevant FAA and ICAO standard

Principle of operation

Accurate control of lamp current is essential for maintaining long lamp life and maximum brightness. A 6.6A, 200W lamp has an expected lifetime of 1000

hours at rated current. Increasing the current by 6% can reduce the lamp lifetime to 600 hours, whereas a 6% decrease in current can increase the lamp life to 2500 hours but reduce the luminous flux by 30 - 40%.

Thycon regulators control lamp current using current rather than voltage source. The advantage is that load changes directly adjust the loop voltage. The loop current remains unaffected, therefore extending the lifetime of the lamps (see figs. 4–5). Using voltage source is undesirable because high current surges occur during load and intensity change (see fig. 2), thus reducing lamp lifetime. Lamp resistance is also highly dependent on filament temperature. The resistance variation from no load to full load can be up to 14 times and affects the current supplied from a voltage-sourced system. Constant current is not affected by the number of failed lamps or type of lamp, such as fluorescent and tungsten-halogen lamps.



Fig. 1 30kW MC2

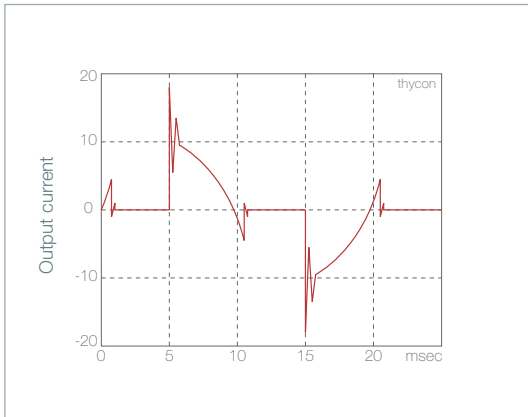


Fig. 2 Traditional voltage source CCR at 3.3A

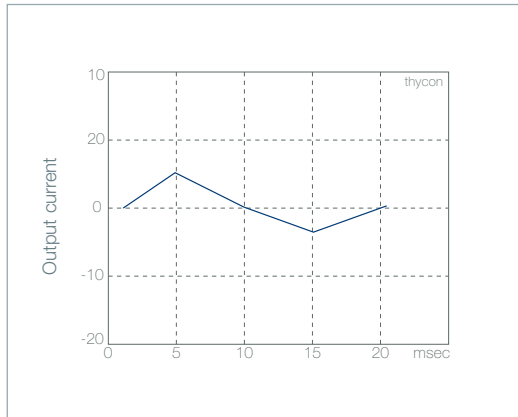


Fig. 3 MC2 current source CCR at 3.3A



The standard MC2 provides:

- sinusoidal output current and voltage throughout the load range and for all intensity settings (see fig. 6)
- input power factor >0.95 at all loads (see fig. 6)
- supply harmonic injection of <3%
- soft-start and intensity transition facility (extends lamp life)
- local and remote control
- individually pre-settable lamp currents with accuracy of $\pm 0.5\%$
- comprehensive protection:
 - open circuit
 - over-voltage
 - over-current

Installation and testing

The MC2 offers modular design for quick and easy site installation and testing. All that is required is the installation of power cables and control and monitoring cabling. The MC2 is tested comprehensively prior to delivery and needs minimal site commissioning.

Reliability and maintenance requirements

Thycon has been supplying current regulators for 40 years and has demonstrated their high reliability and low maintenance demands

Sinusoidal current source ensures smooth regulation that extends life time of airfield lights and cables.

in critical applications such as defence and commercial aviation.

The MC2 is cooled naturally which contributes to high reliability and low ongoing maintenance. The power components (capacitors, switchgear and instrument transformers) are all standard commercial products of proven reliability and long life expectancy.

Thycon MC2 maintenance requirements are dependent on environmental and application conditions. We accommodate customer requirements from basic to full warranty maintenance. Each maintenance plan ensures the equipment operates in top condition with maximum availability of engineers and parts at minimum cost to the customer. Qualified engineers perform the maintenance with the full back up and resources of Thycon.

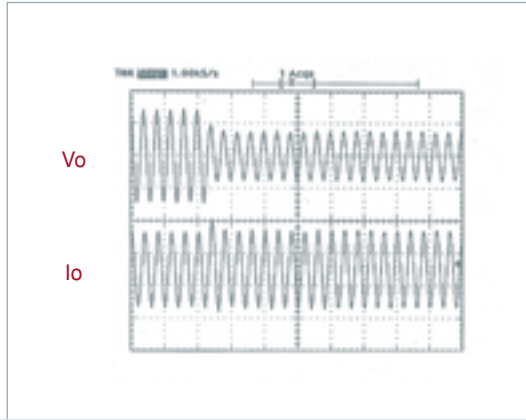
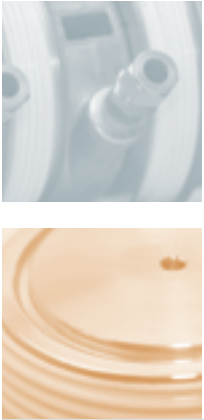


Fig. 4 MC2 output response to 100 - 50% load change

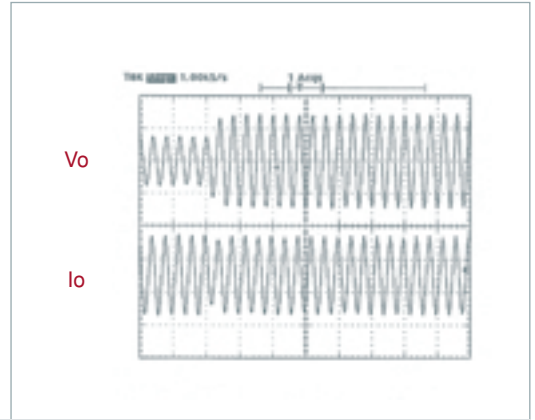
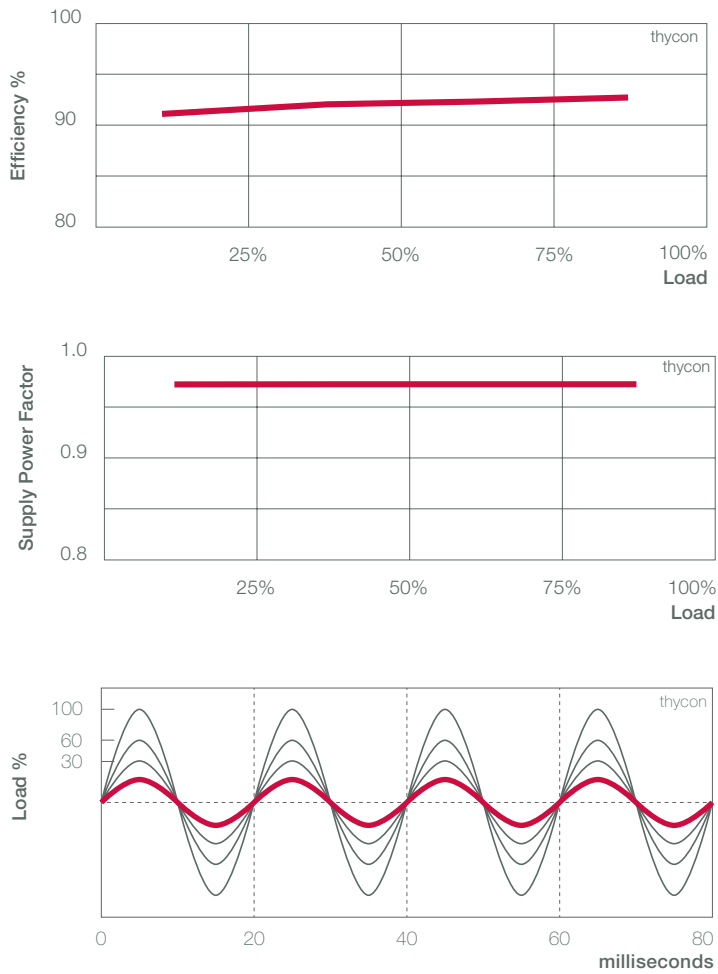
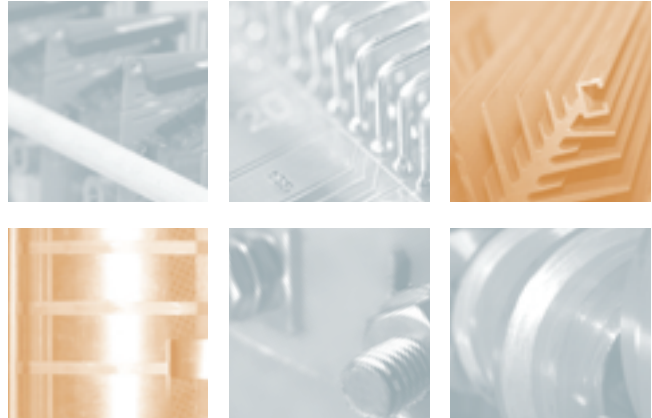


Fig. 5 MC2 output response to 50 - 100% load change

Fig. 6 MC2 performance at rated current



Constant current output (red), airfield cable and load voltage (grey)



15kW output transformer

Training and support

Training and support can be provided to on-site personnel to ensure that they are fully versed in the operation, maintenance and fault rectification of the Thycon MC2.

The MC2 is designed to accommodate third party maintenance.

Control and monitoring

Smart digital signal processing provides current regulation of the MC2. The control is automatic, continuous and linear about the set-point selected by the user. This ensures an inherently fast transient response. A soft-start mechanism at turn-on and smooth regulation throughout the operating range eliminates the typical switching effects of traditional current regulation methods and extends the lifetime of airfield lights - as many of our customers have observed - up to 15 years.

The MC2 can be controlled and monitored from the unit itself and remotely via serial or TCP/IP. The system is totally automatic and does not require manual restarting for fault-initiated supply disturbances.

Control and status

The standard MC2 has a simple user interface. *Start*, *Stop*, *Local*, *Remote* and *Intensity Setting* control allow you to operate and control the equipment. LEDs indicate the standby, on-line, regulating and alarm status of the MC2. A *Cancel* button is used as an alarm acknowledge.

Monitoring

The MC2 system monitor is a smart LCD panel featuring a simple and effective user interface that incorporates advanced diagnostic facilities enabling immediate access to:

- output power monitoring - voltage, current, power (kW), power factor
- operating status, alarms, % lamp fail, earth leakage (100kohm, 1Mohm)
- event history
- password protected user defined settings
- service control and test options

The system monitor stores the last 200 system events in a non-volatile information buffer for fast, efficient fault diagnosis and status indication even after a re-start or a complete power outage.



Low-level interface

Low voltage control inputs to select current intensity level and 8 standard voltage-free contacts to indicate operating status of the equipment to a remote monitoring system can be performed.

High-level interface

Real-time performance monitoring of the MC2 is performed via serial or TCP/IP connection. A basic hardcopy of operating events and data can be obtained by connecting a printer. An optional high-level interface via Modbus, SNMP or web HTML can be provided for immediate performance monitoring and analysis. Additional features enable you to notify your network server of alarm conditions and send emails to designated recipients.

MC2 data such as real-time waveforms, alarms and system events can be stored in solid state, non-volatile memory holding up to 500 MBs of information. Connecting the MC2 to a PC using any of the available ports allows you to maintain a full history of the equipment over its lifetime.

Options

Remote monitoring

Modem connection enables the MC2 to dial and notify Thycon or a remote user automatically whenever an alarm condition arises. Thycon's Service Centre automatically logs data, performs analysis and diagnostics and then alerts our 24-hour service staff if further intervention is required. All MC2 utilisation and incidents found or reported are logged and a full report is provided for each occurrence. The report highlights remedial actions, cautions and follow up recommendations. Alternatively, the remote user can interrogate the MC2 at will.

Thycon power system monitor

The MC2 monitor offers the user a web-based interactive diagnostic tool and database management system for continuous real-time monitoring of MC2 system utilisations, alarms, events and variables. The database management logs data to your PC's hard disk for future analysis and display.

Thycon MC2 advantages

Design advantages

Compatibility	Designed for the airfield environment, the control panel provides the operator with an efficient, user-friendly interface.
Environment	No special ventilation or air conditioning is required. The equipment is at home in computer rooms or in harsher environments without de-rating. Thycon equipment can be containerised and installed in the extremes of Australian environments.
Fuseless design	No power fuses are required. Power components are liberally over-rated so that simple and reliable methods of circuit breaker protection can be used. This greatly reduces down time and eliminates the need for stock control of spare fuses.
Isolation between input and output	Incorporation of full galvanic isolation using an earth screened transformer provides greater safety levels.
Modular construction	Construction from standardised components and modules ensures high mean time between failures (MTBF) and low mean time to repair (MTTR).
Robust technology	Robust construction achieves reliable performance and long equipment life, as proven by over 35 years of Thycon installations.
Simple, reliable design	Uncomplicated design facilitates high strength, durability and reliability. The power circuit uses simple, robust switches to regulate sine wave output by line commutation control technology. This method of control eliminates the switching stresses, losses and interference that traditional technology experiences.
Surge protection	Built in surge protection increases the attenuation of over-voltages caused by load faults and lightning.
Thyristor technology	Use of thyristors (SCRs) eliminates the need for special high speed semiconductor fuses resulting in a simpler design with increased reliability. Thyristors have the highest power and fault tolerance of all semiconductor devices and can withstand faults of up to 10 times the current for 1000 times the period of IGBT and transistor switching technologies.
Input power factor	Power factor of >0.95 remains stable under varying loads and intensities and contributes to input cable and electricity bill savings.
Input current harmonics	High input impedance reduces voltage notching and input harmonics. A fast dynamic response enables correction of transient step load changes within one power cycle period without the over voltage spikes experienced with voltage-controlled technology.
Transient response	This technology eliminates lamp damaging over-current issues experienced during load and intensity changes by traditional voltage controlled systems.
True current source technology	Substantial savings in cable costs are due to the sinusoidal output current. Traditional systems produce high switching voltage spikes that require high-voltage rating cable.
Significant runway cable cost savings	The significantly lower low crest factor of the MC2 enables the use of lower voltage and less costly cable. Significant savings can be made in the large cable requirements of runways.
Significant lamp lifetime extension	Steep temperature transition of filaments is the main cause of lamp failure. Substantial lifetime extension and replacement savings of lamps can be made due to the sinusoidal, soft-start and smooth intensity transition characteristics of the MC2.

Technical specification

Performance

Input:	Power factor >0.95 at all loads (see fig. 6) Optional power factor >0.95 at all intensities Harmonic injection <3%
Output:	True RMS output current regulation to an accuracy of 0.5%

Options

Remote control:	Modbus / Jbus protocol over RS232 & RS422 / 485 Modbus TCP / IP over ethernet Web browser over ethernet Printer / modem port Direct connection I/O via wiring terminals:
	Inputs: 8 isolated control inputs, 12-24V DC current sinking / sourcing
	Outputs: 16 isolated, voltage-free, changeover contacts. Contacts rated for 30VDC 4A max, 240VAC 6A max
Real-time performance data:	True RMS output current, true RMS output voltage, kW, kVA and power factor
Additional options:	Alarm history Indication of failed lamps (2%, 5% levels) Earth fault detection (100k Ω , 1M Ω levels) Lightning arrestors Hours run meter 8 position local / remote / current selector switch

General data

Model:	MC2 (MC square)						
Input:	415 V, Single Phase, 50 Hz						
Output:	0 - 6.6A, \pm 0.5%						
Efficiency:	Up to 93%						
Electrical safety:	To AS3250						
Interference:	To AS1044						
Response time:	Less than 1 cycle (20ms)						
Cooling:	Natural air cooled						
Operational temperature:	-40°C to +55°C						
Operational humidity:	Up to 95%						
Altitude:	0 to 2000 meters above sea level						
Rating kW:	3	5	10	15	20	25	30
Dimensions:							
Height (mm):	800	800	1200	1200	1200	1200	1200
Width (mm):	600	600	600	600	600	800	800
Depth (mm):	400	650	800	800	800	800	800

Specification is subject to change without prior notice

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