



# AIM & THURLBY THANDAR INSTRUMENTS

## MX Series



**Multi output dc power supplies - 315 watts or 375 watts**

*Three high performance outputs each with multiple ranges*

*70V max. and 6A max. (MX100T), 120V max. and 20A max. (MX180T)*

*Ultra-compact size for bench or rack mounting*

*Graphic LCD with simultaneous display of outputs*

*Advanced features including sequenced on/off control*

*USB, RS-232, GPIB and LAN (LXI) interfaces (-P versions)*

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**Aim-TTi**

# MX Series multi-output power supplies

## *in a word "versatility"*

### MX Series Key Features

- ▶ Three high performance outputs each with full functionality
- ▶ Range switching gives variable voltage/current combinations
- ▶ Shared power mode provides double power from a single output
- ▶ Low output noise and ripple via linear final regulation
- ▶ High setting resolution of up to 1mV and 0.1mA
- ▶ Variable OVP and OCP trips on all outputs
- ▶ 50 setting memories per output plus 50 linked memories
- ▶ Selectable voltage tracking (isolated tracking)
- ▶ Selectable current meter averaging
- ▶ Switchable remote sense capability
- ▶ Graphic LCD provides simultaneous output metering
- ▶ Numeric or spin-wheel control of all parameters
- ▶ Individual or combined output on/off control with programmable delay sequencing.
- ▶ 3U half-rack case for bench or rack mounting
- ▶ GPIB, RS-232, USB and LAN (LXI) interfaces (-P models)
- ▶ Duplicate power & sense terminals at rear (-P models)

### *The MX Series - a new power supply generation*

The MX Series represents a new generation of multiple output laboratory power supplies from Aim-TTi.

Offering high power within a compact format they use ranged switched mixed-mode regulation with display and control via a large backlit graphic LCD with soft keys.

The first models in the MX Series to be launched are the 315 watt triple output MX100T and 375 watt triple output MX180T.

### *Three full-performance outputs*

All outputs of an MX Series power supply have fully variable voltage and current setting and are able to operate in both constant voltage and constant current modes.

High resolution metering is incorporated and variable OVP and OCP trips are provided. Each output has its own DC On/Off switch.

### *Mixed-mode regulation*

To provide its impressive power density the MX series combines high frequency switch-mode pre-regulation with linear post-regulation to offer performance that comes close to that of an all-linear design.

Excellent line and load regulation is matched by low noise and good transient response.

### *Range switching and power control*

To increase its ability to match a variety of applications, each output has more than one range.

This enables higher currents to be provided when the voltage requirement is lower, or higher voltages when the current requirement is lower.

When higher power is required, a shared power mode is available in which twice the power is available from a single output..



### Typical Application Areas

- ▶ Medium power bench-top applications requiring multiple outputs
- ▶ Situations where voltage and current requirements may vary widely between projects
- ▶ Repetitive testing applications requiring multi-output settings memories
- ▶ High density system applications requiring multiple outputs from limited rack space
- ▶ Remote control applications where bus interface requirements may change

### MX100T & MX100TP

- 315 watts total power
- Three outputs of equal power, each capable of 35V at 3A
- Range switching provides up to 70 volts and up to 6 amps
- MX100TP includes full bus remote control

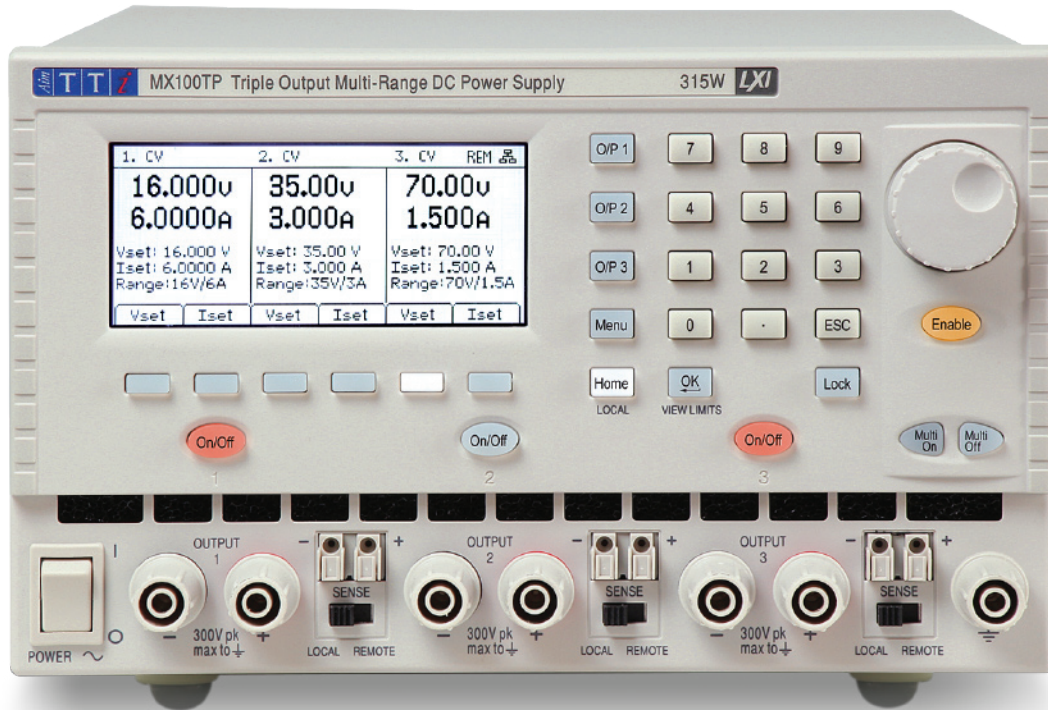
### MX180T & MX180TP

- 375 watts plus of total power
- Two high power outputs plus one low power output
- High power outputs each capable of 30 volts at 6 amps
- Range switching provides up to 120 volts or up to 20 amps
- Low power output provides up to 12 volts or up to 3 amps
- MX180TP includes full bus remote control

MX series output comparison table		
	MX100T	MX180T
Max. Power Total	315 watts	378 watts
Max. Power per Output	105W + 105W + 105W or 105W + 210W	180W + 180W + 18W or 360W + 18W
Max. Volts/Amps from a single output	70V 6A	120V 20A
Output 1 Ranges	16V/6A, 35V/3A	15V/10A, 30V/6A, 60V/3A, 15V/20A*, 30V/12A*, 60V/6A*, 120V/3A*
Output 2 Ranges	16V/6A, 35V/3A, 35V/6A*	15V/10A, 30V/6A, 60V/3A
Output 3 Ranges	35V/3A, 70V/1.5A, 70V/3A*	5.5V/3A, 12V/1.5A

\* range available subject to another output being disabled (shared power mode).

# MX100T - triple output 315 watt dc power supply - 3 x 35V/3A (70V or 6A max.)



- ▶ Three high performance outputs of 105 watts each 3 x (0 to 35V at 0 to 3A)
- ▶ Total power of 315 watts in a highly compact package
- ▶ Range switching gives up to 70 volts and up to 6 amps
- ▶ Twelve range combinations for maximum flexibility
- ▶ Up to 210 watts from a single output
- ▶ Low output noise and ripple via linear final regulation
- ▶ High setting resolution of 1mV and 0.1mA (output 1)
- ▶ Variable OVP and OCP trips on all outputs
- ▶ 50 setting memories per output plus 50 linked memories
- ▶ Selectable voltage tracking (isolated tracking)
- ▶ Selectable current meter averaging
- ▶ Switchable remote sense on all outputs
- ▶ Graphic LCD provides simultaneous output metering
- ▶ Numeric or spin-wheel control of all parameters
- ▶ Individual or combined output on/off control with programmable delay sequencing.
- ▶ 3U half-rack case for bench or rack mounting
- ▶ GPIB, RS-232, USB and LAN (LXI) interfaces (MX100TP)
- ▶ Duplicate power & sense terminals at rear (MX100TP)

## Multiple ranges and power sharing

Each output of the MX100T has more than one range enabling it to cover a wider variety of applications.

Outputs two and three can also be combined internally to provide up to 210 watts of power as either 35V/6A or 70V/3A from a single output.

A Total of 12 range combinations are available.

MX100T Range Choices	Output 1	Output 2	Output 3
Range 1	35V/3A	35V/3A	35V/3A
Range 2	16V/6A	16V/6A	70V/1.5A
Range 3	--	35V/6A*	70V/3A**

\* = output 3 disabled; \*\* = output 2 disabled

## Three full-performance outputs

The MX100T differs from most other triple output power supplies in having three outputs of equal power, each with the ability to provide 35V at 3A.

Each output features CV or CI operation, simultaneous high resolution metering, switchable remote sense, and an individual output switch.

## Mixed-mode regulation

To provide its impressive power density the MX series combines high frequency switch-mode pre-regulation with linear post-regulation to offer performance that comes close to that of an all-linear design.

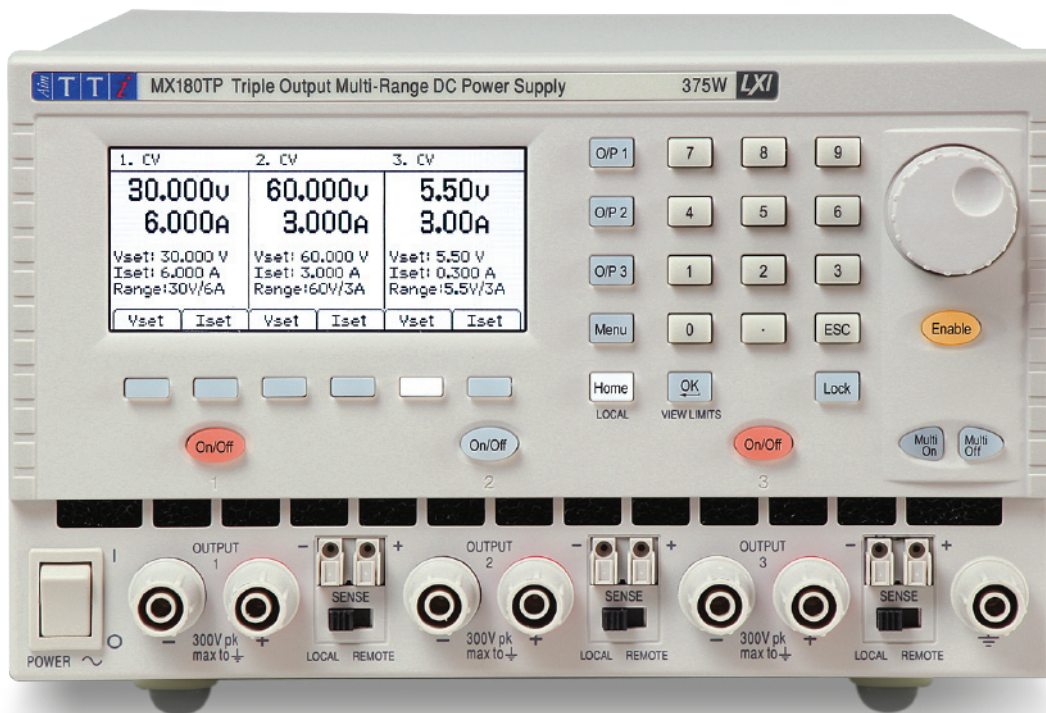
Excellent line and load regulation is matched by low noise and good transient response.

## Advanced user interface

See page 5 of this brochure for details of the user interface.



# MX180T - triple output 375 watt dc power supply - 2 x 30V/6A (120V or 20A max.)



- ▶ Two high power outputs plus one low power output  
2 x 180 watts plus 1 x 18 watts
- ▶ Total power of over 375 watts in a highly compact package
- ▶ Range switching gives up to 120 volts and up to 20 amps
- ▶ Twenty six range combinations for maximum flexibility
- ▶ Up to 360 watts from a single output
- ▶ Low output noise and ripple via linear final regulation
- ▶ High setting resolution of 1mV and 1mA
- ▶ Variable OVP and OCP trips on all outputs
- ▶ 50 setting memories per output plus 50 linked memories
- ▶ Selectable voltage tracking (isolated tracking)
- ▶ Selectable current meter averaging
- ▶ Switchable remote sense on all outputs
- ▶ Graphic LCD provides simultaneous output metering
- ▶ Numeric or spin-wheel control of all parameters
- ▶ Individual or combined output on/off control with programmable delay sequencing.
- ▶ 3U half-rack case for bench or rack mounting
- ▶ GPIB, RS-232, USB and LAN (LXI) interfaces (MX180TP)
- ▶ Duplicate power & sense terminals at rear (MX180TP)

## Multiple ranges and power sharing

Each output of the MX180T has more than one range enabling it to cover a wider variety of applications.

Outputs one and two can also be combined internally to provide up to 360 watts of power as either 15V/20A, 30V/12A, 60V/6A or 120V/3A from a single output.

MX180T Range Choices	Output 1	Output 2	Output 3
Range 1	30V/6A	30V/6A	5.5V/3A
Range 2	15V/10A	15V/10A	12V/1.5A
Range 3	60V/3A	60V/3A	--
Range 4	30V/12A*	--	--
Range 5	15V/20A*	--	--
Range 6	60V/6A*	--	--
Range 7	120V/3A*	--	--

\* = output 2 disabled (shared power mode)

## Three full-performance outputs

The MX180T differs from most other triple output power supplies in having three full function outputs with fully variable voltage and current along with OVP and OCP trips.

Each output features CV or CI operation, simultaneous high resolution metering, switchable remote sensing, and an individual output switch.

## Mixed-mode regulation

To provide its impressive power density the MX series combines high frequency switch-mode pre-regulation with linear post-regulation to offer performance that comes close to that of an all-linear design.

Excellent line and load regulation is matched by low noise and good transient response.

## Advanced user interface

See page 5 of this brochure for details of the user interface.

# MX100T and MX180T - advanced user interface

## Clarity and ease-of-use

Unlike some other multi-output power supplies, the MX Series displays voltage, current and other essential information for all outputs simultaneously using its backlit graphic LCD.

1. CV	2. CV	3. CV	REM
35.000V 3.0000A	35.00V 3.000A	35.00V 3.000A	
Vset: 35.000 V Iset: 3.0000 A Range:35V/3A	Vset: 35.00 V Iset: 3.000 A Range:35V/3A	Vset: 35.00 V Iset: 3.000 A Range:35V/3A	
Vset Iset	Vset Iset	Vset Iset	

Illustration shows MX100T display  
MX180T display is similar

The illuminated keypad includes six soft keys via which voltage or current can be instantly set for any output, or which can be used to set up other functions using a menu system.

Values can be set numerically direct from the keypad or can be adjusted in a quasi-analog manner using the spin wheel.

## Individual output display

Each output also has an individual display mode which provides larger digits and enables OVP, OCP, current meter averaging and range to be viewed and changed.

Access to 50 memory stores for the output is also available from this screen.

Illustration shows MX100T display  
MX180T display is similar

Output 1	SET	V Track OFF	REM
15.898V	5.9435A		
USET 15.898	Vset 15.898V	Iset 5.9435A	
	OVP 40.0 V	VxA 0.000 W	
	OCP 7.000 A	Range 16V/6A	
Vset Iset	Iavg	OVP/OCP	Range Stores

## Up to 1mV and 1mA/0.1mA resolution

For applications requiring the highest accuracy and resolution, 5 digit setting and metering is provided for voltage and current on output 1 of the MX100T, and for voltage on outputs 1 and 2 of the MX180T.

Best resolution is 1mV/0.1mA (MX100T) and 1mV/1mA (MX180T).

## Double power from a single output

When a higher power level is needed, two outputs can be combined internally to provide 210 watts (MX100T) or 360 watts (MX180T) from a single output.

1. CV	2. SET	3. CV	REM
35.000V 3.0000A	Output 2 is not available when output 3 range is 70V/3A	70.00V 3.000A	
Vset: 35.000 V Iset: 3.0000 A Range:35V/3A		Vset: 70.00 V Iset: 3.000 A Range:70V/3A	
Vset Iset		Vset Iset	

Illustration shows MX100T display  
MX180T display is similar

## Current meter averaging

When measuring rapidly varying loads it can become difficult to get useful readings from a digital current meter.

By selecting meter averaging, the reading is stabilised by displaying the average of several readings to reduce the speed and extent of the variation.

## Voltage Tracking

The three outputs of the are completely independent and isolated. However it is possible to set the power supply up so that the voltage on an output automatically tracks the voltage on another output.

Because the outputs are isolated, tracking can be used to set equal voltage of the same polarity or opposite polarities. It can be useful when outputs have been wired in parallel or series where control can be made by adjusting a single output voltage.

For the MX180T the tracking arrangement is simply V2 tracks V1.

For the MX100T, three voltage tracking arrangements can be set: V2 tracks V1, V3 tracks V2 or V2 and V3 both track V1.

## Low noise cooling

The MX series uses an intelligent fan controller which monitors both ambient temperature and power loading.

Under normal operating conditions the fan is quiet.

## 200 settings stores

Non-volatile stores are incorporated for rapid recall of voltage and current settings (along with Range, OVP and OCP).

Illustration shows MX100T display  
MX180T display is similar

	Range	Voltage	Current	OVP	OCP
00.	35V/3A	12.84	1.800	15.00	7.000
01.	35V/3A	13.20	1.800	15.00	7.000
02.	35V/3A	18.15	1.800	25.00	7.000
03.	35V/3A	19.05	1.800	25.00	7.000
04.	35V/3A	20.10	1.800	25.00	7.000
05.	35V/3A	21.25	1.800	25.00	7.000
06.	35V/3A	22.00	1.800	30.00	7.000
	Store	Recall	+1	Del	Del All
					Exit

Each output has its own set of 50 stores, but an additional set of 50 linked stores is provided that contain values for all three outputs to be recalled simultaneously.

## OVP and OCP trips

Variable trips for over-voltage and over-current are provided on each output. Unlike a limit setting, the trip setting turns the output off and provides a different level of protection.

For example, when repetitively testing a unit which normally takes a peak current of 4A, the current limit could be set to 5A and the OCP to 4.1A to ensure that a faulty unit will trip the supply off and not be damaged by over dissipation.

## Front panel locking

An illuminated front panel key locks out the keypad to guard against accidental mis-setting.

For even greater security, as might be required when the PSU is incorporated into a fixed system, the keypad can optionally be locked using a pass code chosen by the user.



SET PASS CODE FOR KEYPAD LOCK					
Enter a 4 digit code:					
Caution: Unlocking will only be possible using this code or the Master Code provided in the Instruction Manual					
					Cancel



## On/Off Synchronism and Sequencing



A unique capability of the product is synchronous on/off switching and programmable on/off sequencing.

Many circuits can be damaged if one voltage rail is present without the other, or if voltage rails are not applied in the correct order.

In addition to the individual output on/off buttons of the MX Series, there are further buttons for Multi-On and Multi-Off.

SET PROGRAMMED ON/OFF		
	MultiOn Action	MultiOff Action
Output 1	Quick	Off after 250ms
Output 2	On after 400ms	Off after 500ms
Output 3	On after 880ms	Quick

Tab <   Tab >   Quick   None   Delay   OK/Exit

By default these turn all three outputs on or off simultaneously, but they can also be set to operate any combination of outputs in a user defined sequence with delays between 10 milliseconds and 20 seconds.

The Multi-On button is slightly recessed to avoid the possibility of it being pressed accidentally.

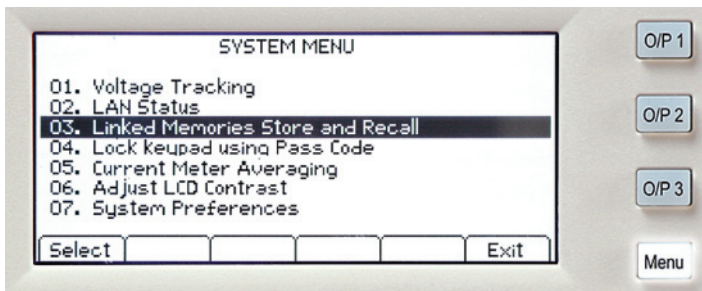
## Multi-output Linked Memories

In addition to the individual memories for each output, 50 further memories are provided that store settings for all three outputs together.

	Range	Voltage	Current	OVP	OCP
01.	1 16V/6A	7.850	2.7500	40.00	7.000
	2 35V/3A	12.62	1.800	40.00	7.000
	3 35V/3A	31.50	2.000	80.00	3.500
02.	1 16V/6A	10.000	2.7500	40.00	7.000
	2 35V/3A	12.84	1.800	40.00	7.000
	3 35V/3A	32.50	2.000	80.00	3.500

Store   Recall   +1↓   Del   Del All   Exit

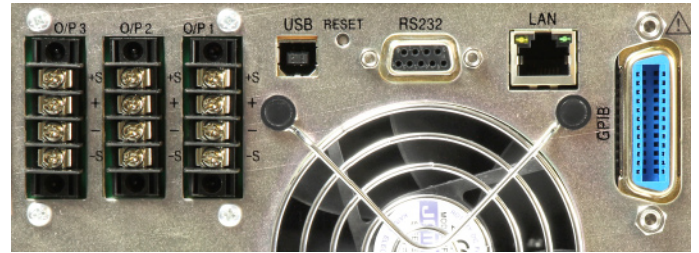
Advanced Functions are accessed using the Menu key.



## Bench or rack mounting

The MX100T and MX180T are housed in a compact case that uses minimum bench space. It is half-rack width by 3U high and a rack kit capable of mounting one or two units is available as an option. Front input ventilation ensures that no additional space is needed top or bottom.

On the -P version, output and remote sense terminals are mounted both on the front and rear panels.



## MX100TP and MX180TP - comprehensive bus remote control

To meet a wide variety of needs, the MX100TP and MX180TP add a comprehensive array of digital bus interfaces. RS-232, USB, GPIB and LAN (Ethernet) with LXI support are all provided as standard.

Each of the digital bus interfaces provides full control of voltage, current, output on/off and set-up, plus read-back of voltage, current and status. The interfaces are at ground potential and are opto-isolated from the output terminals.

The GPIB interface is compliant with IEEE-488.1 and IEEE-488.2. Currently GPIB remains the most widely used interface for system applications.

An RS-232/RS-423 interface is provided for use with legacy systems. This type of serial interface remains in common usage and is perfectly satisfactory for the control of power supplies because data speed is not an issue.

USB provides a simple and convenient means of connection to a PC and is particularly appropriate for small system use. A USB driver is provided which supports Windows 2000 and above including Win 8.

The LAN interface uses a standard 10/100 base-T Ethernet hardware connection with ICMP and TCP/IP Protocol for connection to a Local Area Network or direct connection to a single PC. This interface supports LXI and is highly appropriate for system use because of its scalable nature and low cost interconnection.

The LAN interface is LXI compliant. LXI (LAN eXtensions for Instrumentation) is the next-generation, LAN-based modular architecture standard for automated test systems managed by the LXI Consortium, and is expected to become the successor to GPIB in many systems.

For more information on LXI and how it replaces GPIB, or operates along side it, go to: [www.aimtti.com/go/lxi](http://www.aimtti.com/go/lxi)

## IVI Driver

An IVI driver for Windows is included. This provides support for common high-level applications such as LabView\*, LabWindows\*, and HP/Agilent VEE\*.

\* LabView and LabWindows are trademarks of National Instruments.

HPVEE (now Agilent VEE) is a trademark of Agilent Technologies.

\* Windows is a trademark of Microsoft.

## Rear output terminals

Power and sense terminals are duplicated on the rear panel for rack mount applications or other situations where rear connection is more appropriate.

# MX100T & MX100TP - Technical Specifications

## OUTPUT SPECIFICATIONS

### Output 1

Ranges: Range 1 - 0V to 35V at 1mA to 3A; Range 2 - 0V to 16V at 1mA to 6A  
Operating Mode: Constant voltage or constant current with automatic cross-over and mode indication.

Voltage Setting: By direct numeric entry or quasi-analog rotary wheel; resolution 1mV.  
Current Setting: By direct numeric entry or quasi-analog rotary wheel; resolution 0.1mA.  
Setting Accuracy: Voltage - 0.05% of reading  $\pm$  3mV;  
Current - 0.3% of reading  $\pm$  3mA to 3A, 0.5% of reading  $\pm$  3mA to 6A

Setting Stores: Up to 50 set-ups can be saved and recalled via the keyboard (or the digital interfaces on MX100TP).

Load regulation: <0.01% +5mV (CV mode) for any load change using remote sense.  
Line regulation: <0.01% +5mV (CV mode) for a 10% line voltage change.  
Ripple & Noise: Typically <0.5mV rms, <5mV pk-pk, 1mV rms max. (20MHz bandwidth).  
Transient Response: <100us to within 50mV of set level for 5% to 95% load change.  
Over Voltage Trip: Settable 1V to 40V in 0.1V steps  
Over Current Trip: Settable 0.1A to 7A in 0.01A steps  
Sensing: Selectable local or remote sensing.

### Output 2

Ranges: Range 1 - 0V to 35V at 1mA to 3A; Range 2 - 0V to 16V at 1mA to 6A  
Range 3 - 0V to 35V at 1mA to 6A\* (available when output 3 is disabled).  
Operating Mode: Constant voltage or constant current with automatic cross-over and mode indication.

Voltage Setting: By direct numeric entry or quasi-analog rotary wheel; resolution 10mV.  
Current Setting: By direct numeric entry or quasi-analog rotary wheel; resolution 10mA.  
Setting Accuracy: Voltage - 0.1% of reading  $\pm$  10mV;  
Current - 0.3% of reading  $\pm$  3mA to 3A, 0.5% of reading  $\pm$  3mA to 6A

Setting Stores: Up to 50 set-ups can be saved and recalled via the keyboard (or the digital interfaces on MX100TP).

Load regulation: <0.01% +5mV (CV mode) for any load change using remote sense.  
Line regulation: <0.01% +5mV (CV mode) for a 10% line voltage change.  
Ripple & Noise: Typically <0.5mV rms, <5mV pk-pk, 1mV rms max. (20MHz bandwidth).  
Transient Response: <100us to within 50mV of set level for 5% to 95% load change.  
Over Voltage Trip: Settable 1V to 40V in 0.1V steps  
Over Current Trip: Settable 0.1A to 7A in 0.01A steps  
Sensing: Selectable local or remote sensing.

### Output 3

Ranges: Range 1 - 0V to 35V at 1mA to 3A; Range 2 - 0V to 70V at 1mA to 1.5A  
Range 3 - 0V to 70V at 1mA to 3A\* (available when output 2 is disabled).  
Operating Mode: Constant voltage or constant current with automatic cross-over and mode indication.

Voltage Setting: By direct numeric entry or quasi-analog rotary wheel; resolution 10mV.  
Current Setting: By direct numeric entry or quasi-analog rotary wheel; resolution 1mA.  
Setting Accuracy: Voltage - 0.1% of reading  $\pm$  10mV;  
Current - 0.3% of reading  $\pm$  3mA

Setting Stores: Up to 50 set-ups can be saved and recalled via the keyboard (or the digital interfaces on MX100TP).

Load regulation: <0.01% +5mV (CV mode) for any load change using remote sense.  
Line regulation: <0.01% +5mV (CV mode) for a 10% line voltage change.  
Ripple & Noise: Typically <0.5mV rms, <5mV pk-pk, 1mV rms max. (20MHz bandwidth).  
70V range - typically <1mV rms, <10mV pk-pk, 1.5mV rms max.

Transient Response: <100us to within 50mV of set level for 5% to 95% load change.  
Over Voltage Trip: Settable 1V to 80V in 0.1V steps  
Over Current Trip: Settable 0.1A to 3.5A in 0.01A steps  
Sensing: Selectable local or remote sensing.

### Output Protection

External Voltage: Output will withstand forward voltages of up to 50V (O/Ps 1 and 2) or 80V (O/P 3). Reverse protection by diode clamp, 3A max..  
Fault Trip: The output will be shut down if a trip conditions listed below occurs.  
OVP or OCP: Exceeding over-voltage or over-current settings for the output.  
Over Temperature: Monitors internal temperature rise to protect against excess ambient temperature or blocked ventilation slots.

### Connection

Output Terminals: Universal 4mm safety binding posts on 19mm (0.75") spacing at front. Screw terminals at rear (MX100TP only).

*Terminals can accept fixed shroud 4mm plugs, standard 4mm plugs, fork terminals and bare wires.*

Sense Terminals: Sprung loaded screw-less terminals at front. Screw terminals at rear (MX100TP only).

## OUTPUT ON/OFF SWITCHING

Individual On/Off: Individual keys for each output. On state indicated by key illumination.  
Multi-On/Multi-Off: Separate keys enable any combination of outputs to be turned on or off either simultaneously (default) or with timed delays from 10ms and 20s. Delayed operation indicated by flashing key illumination.

## VOLTAGE TRACKING

The power supply can be set so that the voltage of an output is automatically set equal to that of another output and tracks any changes.

Tracking Modes: None, V2 tracks V1, V3 track V2, V2 and V3 both track V1.

## SETTING MEMORIES

### Individual Output Memories

No. of Stores: 50 per output  
Parameters Stored: Range, Set Volts, Set Current, OVP, OCP

### Linked Output Memories

No. of Stores: 50  
Parameters Stored: Range, Set Volts, Set Current, OVP, OCP, Output On/Off status (for all three outputs)

## METERING (each Output)

Meter Function: 5 digit voltage and current meters (O/P 1), 4 digit voltage and current meters (O/Ps 2 & 3). Simultaneous display of actual and set values.

Meter Resolution: 1mV/0.1mA (O/P 1), 10mV/1mA (O/Ps 2 & 3).

Meter Accuracy: As per setting accuracy (CV mode).

### Additional Metering Functions

V x A Calculated power in watts. Resolution 0.01W. Accuracy 0-5%  $\pm$  3 digits

## DIGITAL BUS INTERFACES (MX100TP only)

The MX100TP offers full remote control and read-back using USB, RS-232, GPIB or LAN (compliant with LXI). All interfaces are at ground potential and opto-isolated from the output terminals.

### RS-232

Standard 9-pin D connector.

### USB

USB 2.0 connection (backwards compatible with USB 1.x). Operates as a virtual COM port.

### GPIB (IEEE-488)

The interface conforms with IEEE-488.1 and IEEE-488.2.

### Ethernet (LAN)

Standard 10/100 base-T hardware connection. ICMP and TCP/IP Protocol for connection to Local Area Network or direct connection to a single PC.

### LXI Compliance

LAN interface is compliant with LXI Core 2011. (LXI is the abbreviation for Lan eXtensions for Instrumentation). For more information visit: [www.aimtti.com/go/lxi](http://www.aimtti.com/go/lxi)

## DIGITAL PROGRAMMING PERFORMANCE (MX100TP only)

### Programming Speed

Command Delay: Typically <120ms between receiving the command terminator for a step voltage change at the instrument and the output beginning to change.

### Output Response

Range	Direction	90% load	No load	Direction	90% load	No load
16V/6A	Up	10ms	10ms	Down	10ms	350ms
35V/3A	Up	10ms	10ms	Down	35ms	550ms
35V/6A	Up	10ms	10ms	Down	20ms	550ms
70V/3A	Up	25ms	12ms	Down	60ms	600ms

*The above figures are indicative only and will be affected by load capacitance.*

## DRIVER SOFTWARE SUPPLIED (MX100TP only)

### IVI Driver

An IVI driver for Windows is supplied. This provides support for common applications such as LabView\*, LabWindows\*, HPVee\* etc.

### USB Driver

An installation file is supplied which calls a standard Windows\* USB driver.

*\* LabView and LabWindows are trademarks of National Instruments.*

*HPVee (now Agilent VEE) is a trademark of Agilent Technologies.*

*\* USB interface is supported for Windows 2000, XP, Vista, 7 and 8 (including 64 bit versions). Windows is a trademark of Microsoft.*

## GENERAL SPECIFICATIONS

### Input

AC Input: 110V to 240V AC  $\pm$ 10%, 50/60Hz. Installation Category II.

Input Power: 500VA max.

### Temperature & Environmental

Operating Range: +5°C to +40°C, 20% to 80% RH

Storage Range: -40°C to +70°C

Environmental: Indoor use at altitudes up to 2000m, Pollution Degree 2.

Cooling: Intelligent variable-speed fans.

### Safety & EMC

Safety: Complies with EN61010-1

EMC: Complies with EN61326

### Physical

Size: 212 x 130 x 375mm (WxHxD) (half rack x 3U height).

Weight: 4.8kg (MX100T); 4.9kg (MX100TP).

## OPTIONS

### Rack Mount

19 inch rack mount for one or two power supplies.

*Thurlby Thandar Instruments Ltd. operates a policy of continuous development and reserves the right to alter specifications without prior notice.*

*Accuracy specifications apply for the temperature range 18°C to 28°C after 1 hour warm-up.*

# MX180T & MX180TP - Technical Specifications

## OUTPUT SPECIFICATIONS

### Output 1

**Ranges:** Range 1 - 0V to 15V at 1mA to 10A; Range 2 - 0V to 30V at 1mA to 6A  
Range 3 - 0V to 60V at 1mA to 3A;  
Range 4\* - 0V to 15V at 1mA to 20A; Range 5\* - 0V to 30V at 1mA to 12A  
Range 6\* - 0V to 60V at 1mA to 6A; Range 7\* - 0V to 120V at 1mA to 3A  
(ranges marked \* are only available with output 2 disabled)

**Operating Mode:** Constant voltage or constant current with automatic cross-over and mode indication.

**Voltage Setting:** By direct numeric entry or quasi-analog rotary wheel; resolution 1mV.

**Current Setting:** By direct numeric entry or quasi-analog rotary wheel; resolution 1mA.

**Setting Accuracy:** Voltage - 0.05% of reading  $\pm$  3mV; ( $\pm$  30mV on 120V range)  
Current - 0.3% of reading  $\pm$  3mA to 3A, 0.5% of reading  $\pm$  3mA to 10A;  
0.5% of reading  $\pm$  4mA to 20A

**Setting Stores:** Up to 50 set-ups can be saved and recalled via the keyboard (or the digital interfaces on MX180TP).

**Load regulation:** <0.01% +5mV (CV mode) for any load change using remote sense.

**Line regulation:** <0.01% +5mV (CV mode) for a 10% line voltage change.

**Ripple & Noise:** Typically <2mV rms, <15mV pk-pk, 3mV rms max. (20MHz bandwidth); (120V range: <4mV rms, <30mV pk-pk, 6mV rms max.)

**Transient Response:** <150us to within 50mV of set level for 5% to 95% load change. (ranges 4, 5 and 6 <400us)

**Over Voltage Trip:** Settable 1V to 130V in 0.1V steps

**Over Current Trip:** Settable 0.1A to 21A in 0.01A steps

**Sensing:** Selectable local or remote sensing.

### Output 2

**Ranges:** Range 1 - 0V to 15V at 1mA to 10A; Range 2 - 0V to 30V at 1mA to 6A  
Range 3 - 0V to 60V at 1mA to 3A

**Operating Mode:** Constant voltage or constant current with automatic cross-over and mode indication.

**Voltage Setting:** By direct numeric entry or quasi-analog rotary wheel; resolution 1mV.

**Current Setting:** By direct numeric entry or quasi-analog rotary wheel; resolution 1mA.

**Setting Accuracy:** Voltage - 0.05% of reading  $\pm$  3mV; ( $\pm$  30mV on 120V range)  
Current - 0.3% of reading  $\pm$  3mA to 3A, 0.5% of reading  $\pm$  3mA to 10A;  
0.5% of reading  $\pm$  4mA to 20A

**Setting Stores:** Up to 50 set-ups can be saved and recalled via the keyboard (or the digital interfaces on MX180TP).

**Load regulation:** <0.01% +5mV (CV mode) for any load change using remote sense.

**Line regulation:** <0.01% +5mV (CV mode) for a 10% line voltage change.

**Ripple & Noise:** Typically <2mV rms, <15mV pk-pk, 3mV rms max. (20MHz bandwidth).

**Transient Response:** <150us to within 50mV of set level for 5% to 95% load change.

**Over Voltage Trip:** Settable 1V to 70V in 0.1V steps

**Over Current Trip:** Settable 0.1A to 11A in 0.01A steps

**Sensing:** Selectable local or remote sensing.

### Output 3

**Ranges:** Range 1 - 0V to 5.5V at 10mA to 3A;  
Range 2 - 0V to 12V at 10mA to 1.5A.

**Operating Mode:** Constant voltage or constant current with automatic cross-over and mode indication.

**Voltage Setting:** By direct numeric entry or quasi-analog rotary wheel; resolution 10mV.

**Current Setting:** By direct numeric entry or quasi-analog rotary wheel; resolution 10mA.

**Setting Accuracy:** Voltage - 0.3% of reading  $\pm$  20mV;  
Current - 0.3% of reading  $\pm$  20mA

**Setting Stores:** Up to 50 set-ups can be saved and recalled via the keyboard (or the digital interfaces on MX180TP).

**Load regulation:** <0.1% +5mV (CV mode) .

**Line regulation:** <0.1% +5mV (CV mode) for a 10% line voltage change.

**Ripple & Noise:** Typically <2mV rms, <15mV pk-pk, 3mV rms max. (20MHz bandwidth).

**Transient Response:** <150us to within 50mV of set level for 5% to 95% load change.

**Over Voltage Trip:** Settable 1V to 14V in 0.1V steps

**Over Current Trip:** Settable 0.1A to 3.5A in 0.01A steps

**Sensing:** Selectable local or remote sensing.

### Output Protection

**External Voltage:** Output will withstand forward voltages of up to 140V (O/P 1), 70V (O/P 2) or 20V (O/P 3). Reverse protection by diode clamp, 3A max..

**Fault Trip:** The output will be shut down if a trip conditions listed below occurs.

**OVP or OCP:** Exceeding over-voltage or over-current settings for the output.

**Over Temperature:** Monitors internal temperature rise to protect against excess ambient temperature or blocked ventilation slots.

### Connection

**Output Terminals:** Universal 4mm safety binding posts on 19mm (0.75") spacing at front. Screw terminals at rear (MX180TP only).

*Terminals can accept fixed shroud 4mm plugs, standard 4mm plugs, fork terminals and bare wires.*

**Sense Terminals:** Sprung loaded screw-less terminals at front. Screw terminals at rear (MX180TP only).

## OUTPUT ON/OFF SWITCHING

**Individual On/Off:** Individual keys for each output. On state indicated by key illumination.

**Multi-On/Multi-Off:** Separate keys enable any combination of outputs to be turned on or off either simultaneously (default) or with timed delays from 10ms and 20s. Delayed operation indicated by flashing key illumination.

## VOLTAGE TRACKING

The power supply can be set so that the voltage of output two is automatically set equal to that of output one and tracks any changes. The outputs remain isolated.

## METERING (each Output)

**Meter Function:** 5 digit voltage and 4 digit current meters (O/P 1 and O/P 2), 3.5 digit voltage and current meters (O/P 3). Simultaneous display of actual and set values.

**Meter Resolution:** 1mV/1mA (O/P 1 and O/P 2), 10mV/10mA (O/P 3).

**Meter Accuracy:** As per setting accuracy (CV mode).

### Additional Metering Functions

**V x A** Calculated power in watts. Resolution 0.01W. Accuracy 0.5%  $\pm$  3 digits

## SETTING MEMORIES

### Individual Output Memories

**No. of Stores:** 50 per output

**Parameters Stored:** Range, Set Volts, Set Current, OVP, OCP

### Linked Output Memories

**No. of Stores:** 50

**Parameters Stored:** Range, Set Volts, Set Current, OVP, OCP, Output On/Off status (for all three outputs)

## DIGITAL BUS INTERFACES (MX180TP only)

The MX180TP offers full remote control and read-back using USB, RS-232, GPIB or LAN (compliant with LXI). All interfaces are at ground potential and opto-isolated from the output terminals.

### RS-232

Standard 9-pin D connector.

### USB

USB 2.0 connection (backwards compatible with USB 1.x). Operates as a virtual COM port.

### GPIB (IEEE-488)

The interface conforms with IEEE-488.1 and IEEE-488.2.

### Ethernet (LAN)

Standard 10/100 base-T hardware connection. ICMP and TCP/IP Protocol for connection to Local Area Network or direct connection to a single PC.

### LXI Compliance

LAN interface is compliant with LXI Core 2011. (LXI is the abbreviation for Lan eXtensions for Instrumentation). For more information visit: [www.aimtti.com/go/lxi](http://www.aimtti.com/go/lxi)

## DIGITAL PROGRAMMING PERFORMANCE (MX180TP only)

### Programming Speed

**Command Delay:** Typically 120ms between receiving the command terminator for a step voltage change at the instrument and the output beginning to change.

### Output Response (O/P 1)

Range	Direction	90% load	No load	Direction	90% load	No load
30V/6A	Up	6ms	6ms	Down	50ms	3s
15V/10A	Up	6ms	6ms	Down	20ms	2s
60V/3A	Up	15ms	10ms	Down	220ms	5s

*The above figures are indicative only and will be affected by load and load capacitance.*

## DRIVER SOFTWARE SUPPLIED (MX180TP only)

### IVI Driver

An IVI driver for Windows is supplied. This provides support for common applications such as LabView\*, LabWindows\*, HPVEE\* etc.

### USB Driver

An installation file is supplied which calls a standard Windows\* USB driver.

*\* LabView and LabWindows are trademarks of National Instruments.*

*HPVEE (now Agilent VEE) is a trademark of Agilent Technologies.*

*\* USB interface is supported for Windows 2000, XP, Vista, 7 and 8 (including 64 bit versions).*

*Windows is a trademark of Microsoft.*

## GENERAL SPECIFICATIONS

### Input

**AC Input:** 110V to 240V AC  $\pm$ 10%, 50/60Hz. Installation Category II.

**Input Power:** 600VA max.

### Temperature & Environmental

**Operating Range:** +5°C to +40°C, 20% to 80% RH

**Storage Range:** -40°C to +70°C

**Environmental:** Indoor use at altitudes up to 2000m, Pollution Degree 2.

**Cooling:** Intelligent variable-speed fans.

### Safety & EMC

**Safety:** Complies with EN61010-1

**EMC:** Complies with EN61326

### Physical

**Size:** 212 x 130 x 375mm (WxHxD) (half rack x 3U height) .

**Weight:** 5.0kg (MX180T); 5.1kg (MX180TP).

## OPTIONS

### Rack Mount

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Designed and built in Europe by:



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