AIM & THURLBY THANDAR INSTRUMENTS

CPX400 Series

Single & dual output PowerFlex dc PSUs - 420 watts per output

high performance autoranging outputs, 60V and 20A maximum

true analog controls with digital functionality including S-Lock

isolated tracking for easy series/parallel use - up to 120V or 40A

GPIB, RS-232, USB and LAN interfaces; LXI class C compliance

aimtti.com

aimtti.co.uk | aimtti.us

Aim-TTi

CPX400D - Dual 420 watt PowerFlex dc power supply (840W total)

View and adjust setting limits at any time.

High accuracy four digit meters have a fixed resolution for consistent readings at-a-glance.

Range Control gives a choice of PowerFlex (60V/20A) or fixed range operation (60V/7A or 20V/20A).

<u>True</u> analog controls make adjustment quick and simple.

Voltage sensing can be changed between local and remote at the flick of a switch.

Safety binding post terminals can accept fixed-shroud 4mm plugs** as well as normal plugs, bare wires, and fork connectors.
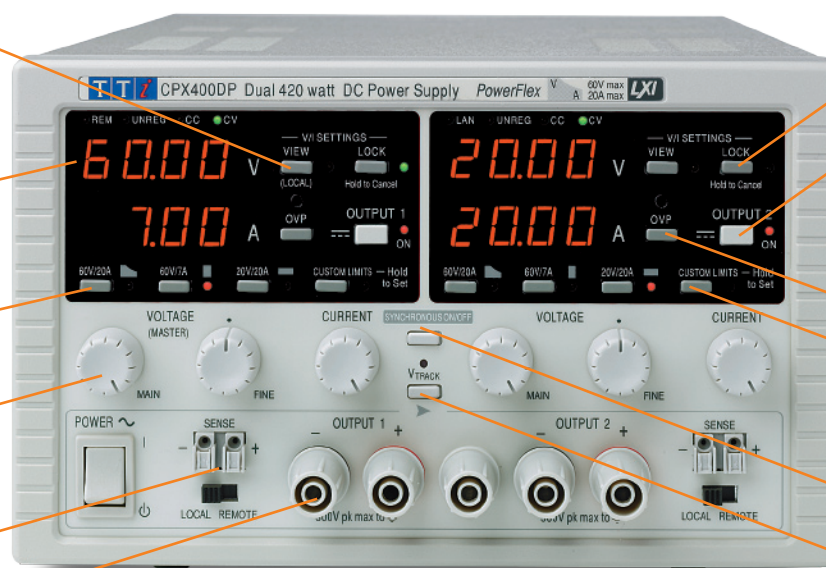
S-Lock digitally locks voltage and current settings at the touch of a button.

DC output switches enable voltage and current to be set up <u>before</u> connecting the load.

Individual over-voltage protection for each output.

Custom Limits enables the analogue controls to cover any voltage or current range.

Both On/Off provides synchronous switching of the outputs.

Isolated voltage tracking facilitates tracking voltage rails or control for series or parallel wiring (120V max. or 40A max.).

Choose voltage and current combinations to suit your applications !

The CPX series is a different type of laboratory power supply designed to meet the need for flexibility in the choice of voltage and current.

A conventional PSU has a fixed current limit giving a power capability that reduces directly with the output voltage.

The TTi PowerFlex design of the CPX series enables higher currents to be generated at lower voltages within an overall power limit envelope.

Each output can provide considerably higher current than a conventional PSU of the same maximum voltage and power (see power curve).

Example voltage & current combinations include 60V/7A, 42V/10A, 28V/15A, and 20V/20A.

Building upon success

The CPX400 series, now comprising five models, was developed from the CPX400A - one of the most successful power supplies ever.

Analog controls with digital stability

As technology has changed, many products have moved from analog controls to digital ones. Although digital controls suit many instruments, they do not necessarily suit a bench power supply.

Customer research shows that many users prefer the speed and simplicity of conventional analog controls for setting voltage and current. Digital controls may offer greater precision, but often at the expense of ease-of-use. With this in mind, the CPX400 series retains the true analog controls of its predecessor.

Lock your settings at the touch of a button !

The main disadvantage of analog controls is stability and security. The settings of analog potentiometers can drift over time. More importantly, the settings can be changed accidentally with potentially serious consequences.

The CPX400 series incorporates S-Lock. One press of the Lock button transfers control of voltage and current from the analog controls to internal digital circuitry. This offers not just complete security, but exceptional stability as well with each setting controlled by an instrumentation quality DAC.

PowerFlex
Power Envelope
(420W max. per output)
CPX400S, CPX400D
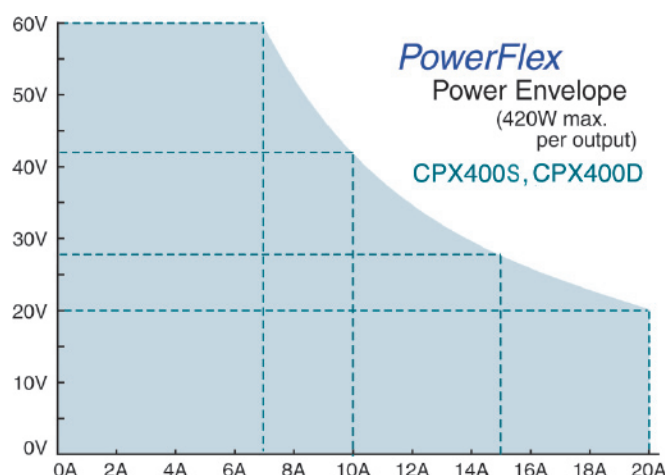
Isolated voltage tracking for maximum flexibility

The two outputs of the CPX400D are completely independent and electrically isolated from each other.

With V-Track selected, the two outputs remain electrically isolated, but the voltage control of the Master output sets an identical voltage on the Slave output.

This enables the user to create two rails of either polarity and to reference them to different grounds if necessary (e.g. digital ground and analog ground). Alternatively the outputs can be wired in series or parallel to create a voltage capability up to 120V or a current capability up to 40A with the voltage set using a single control.
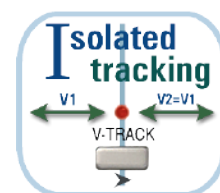
Independent and simultaneous output control

The Both On/Both Off button is in addition to the individual switches for each output, and allow both outputs to be turned on or off synchronously by a single button press.

Synchronous switching of the outputs is of increasing importance for circuitry which can be damaged if one voltage rail is present without the other.

- PowerFlex design gives variable voltage and current combinations within a maximum power envelope
- Up to 60V and up to 20A per output (420W maximum)
- Constant voltage or constant current operation
- Low output noise and good transient response
- PowerFlex or fixed-range operation plus custom limits
- True analogue controls with digital settings locking
- Independent outputs or isolated voltage tracking (dual)
- Outputs can be wired in series or parallel for 120V or 40A
- Variable OVP trips; safety binding-post terminals
- 4 digit fixed resolution meters; selectable remote sensing
- Compact ½ rack 3U case (dual) or ¼ rack 3U case (single)
- Duplicate terminals at rear on CPX400SA, SP & DP
- Isolated analogue control interface (CPX400SA only)
- GPIB, RS-232, USB and LAN interfaces with LXI class C compliance (CPX400SP & CPX400DP only)

New CPX400SP single output with digital remote control

Low noise and good dynamic response

The PowerFlex regulation system used on the CPX400 series combines a high frequency pre regulator with a linear post regulator to give both low noise and good transient response. Each output can operate in constant voltage or constant current mode with automatic crossover and mode indication.

Precision metering and remote sense

Separate voltage and current meters on each output give a resolution of 10mV and 10mA. The fixed resolution avoids the misinterpretation of readings that can occur with auto-ranging 3 or 3½ digit meters where the decimal point position moves as the reading changes.

Coarse and fine voltage controls are provided. The current control is logarithmic enabling low current levels to be set accurately. A View Settings button enables limit settings to be checked and adjusted at any time.

Each output incorporates remote sense terminals that can be enabled or disabled at the flick of a switch. Remote sensing is essential for maintaining precise regulation at the load and true metering of the load voltage.

Compact design uses minimum bench or rack space

Despite the high power output of 840 watts, the CPX400D & DP has a small bench footprint taking up less space on a crowded bench.

For rack-mount applications the half-rack by 3U case size enables two units (providing four outputs) to be fitted into a single rack slot.

Range control offers even more flexibility

As an alternative to PowerFlex operation (60V/20A subject to a power limit), the CPX400 series can be used as conventional fixed range power supplies of either 60V/7A or 20V/20A at the press of a button.

Fixed range mode ensures that, whatever the load, the output can only be in constant voltage or constant current mode and never in power limit. Additionally finer resolution is provided on the current or voltage controls respectively.

A further button offers full customisation of voltage and current limits which can be set to suit the users application. This has the advantage that the controls cover the exact voltage and current range required, providing easier setting and reduced risk of error.

For example, the range could be set to 30V and 14A to create a 30 volt PSU of maximum current capability. Alternatively it could be set to 5V and 3A if this was all that was required for a particular application.

Single output, ultra compact design

The new CPX400S is a single output version of the CPX400D providing up to 60 volts and 20 amps within its 420 watt power envelope.

It is housed in a ¼ rack width 3U high case that uses the minimum possible space for either bench use or rack mounting.

Three variants

The single output version of the CPX400 is available in three variants. The CPX400S has manual control only, for conventional bench-top use. The CPX400SA adds isolated analogue remote control plus duplicate rear terminals. The CPX400DP has digital remote control via USB, RS-232, GPIB and LAN (LXI) along with duplicate rear terminals (see next page).

CPX400SA - isolated analogue remote control

Some applications require analogue remote control rather than digital. The CPX400SA has fully galvanically isolated voltage driven remote control for both voltage and current. In addition, voltage and current front panel settings are provided as non-isolated control voltages, enabling master-slave configurations to be used.

CPX400SP - digital remote control

(see next page)

Safety binding-post terminals

All CPX series power supplies are fitted with the new TTi designed output terminals. As well as acting as conventional binding posts for bare wires, spade connectors, or standard 4mm plugs, these can accept a 4mm safety plug with rigid insulating sleeve, a requirement specified by an increasing number of laboratories for safety reasons.

Limited opening length combined with raised insulated shoulders also make these terminals "touch proof" for voltages up to 250V.

CPX400SP and CPX400DP

Remote control via GPIB, RS-232, USB and LAN interfaces

CPX400DP Rear Panel

Bench and System use

The CPX400SP and DP are a bus programmable version of the CPX400S and CPX400D respectively, and include all of their manual control features plus comprehensive digital interfaces and rear terminals.

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.

Digital remote control

To meet the varying needs of today's engineers, a comprehensive array of interfaces is provided. RS-232, USB, GPIB and LAN (Ethernet) with LXI support are provided as standard. Each of the digital bus interfaces provides full control of voltage, current, and output on/off, plus read-back of voltage, current and status. The interfaces are at ground potential and are opto-isolated from the output terminals.

GPIB

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

RS-232

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

USB

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, XP , Vista and Windows 7.

LAN (Ethernet)

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.

LXI Compliance

The LAN interface is compliant with LXI-C. 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.tti-test.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*.

OUTPUT SPECIFICATIONS (each output)

Voltage/Current/Power Levels

Voltage Range:	0V to 60V.
Current Range:	0A to 20A.

Note: Actual maxima for voltage and current are typically 1% greater than the figures given above.

Power Range:	Up to 420W subject to power envelope.

POWER ENVELOPE

The maximum current atany voltage settings is limited by the power envelope which is set to give 7A at 60V rising to 20A at 20V under all ac supply conditions (both outputs loaded). At lower output voltages the power is restricted by the 20 amps current maximum.
See PowerFlex power envelope graph on previous page.

Output Setting & Control

Voltage Setting:	By coarse and fine controls.
Current Setting:	By single logarithmic control.
Output Mode:	Constant voltage or constant current with automatic cross-over. CC indicator lit in constant current mode.
Output Switch:	Electronic, non isolating. Preset voltage and current limit displayed when Output is off. Output rise time no load <10ms.
View Settings:	With the output On, the meters show actual voltage and current. The preset levels can be viewed and adjusted at any time by pressing the View Settings button.
Status Indication:	LED indication of Output On, V/I Limits, CV, CI, Power Limit, Remote, LAN status. Message on meter display for trip condition.

S-Lock

(Settings Lock) Voltage and current settings can be locked by a single button press. Lock accuracy is equal to the meter accuracy (see Meter Specifications).

Output Performance

Ripple & Noise:	Typically <3mV rms, <15mV pk-pk, (5mV rms max.) in CV mode.
Load Regulation:	Voltage - <0·01% of maximum output for any load change within the PowerFlex envelope (remote sense connected). Current - <0·05% of maximum output for any load change within the PowerFlex envelope.
Line Regulation:	Voltage - <0·01% of maximum output for a 10% line change. Current - <0·01% of maximum output for a 10% line change.
Transient Response:	<250μs to within 50mV of setting for a 5% to 95% load change.
Temp. Coefficient:	Typically <100ppm/°C

Output Protection

Output Protection:	Forward protection by Over-voltage Protection (OVP) trip. Reverse protection by diode clamp for currents to 3A.
OVP Setting/Range:	Via screwdriver adjustable preset on front panel. Range 1V to 66V
Over-temperature:	Output trips off for over-temperature.
Safety Interlocks:	Operations that could cause an unexpected change in voltage or current settings are interlocked with the output switch.

Output Connections

Output Terminals:	Universal 4mm safety binding posts on 19mm (0·75″) spacing at front. Screw terminals at rear (CPX400SA, SP & DP only).

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

Remote Sense

Sense Selection:	Voltage sensing is selected as Local or Remote by front panel switch.
Sense Terminals:	Sprung loaded screw-less terminals at front. Screw terminals at rear (CPX400SA, SP & DP only).

METER SPECIFICATIONS (each output)

Display Type:	Dual 4-digit meters, 10mm (0·39″) LED.

Voltage Meter

Resolution/ Accuracy: 10mV / ± 0·1% of reading ± 2 digits

Current Meter

Resolution/ Accuracy: 10mA / ± 0·3% of reading ± 20mA

VOLTAGE TRACKING (CPX400D & DP)

Independent Mode

In the normal mode of operation, each output is fully independent and isolated. Operation is equivalent to two single output power supplies.

Voltage Tracking Mode

The two outputs remain isolated, but the Slave voltage controls are disabled and the Slave voltage is set equal to the Master voltage. This can be used to generate tracking bipolar voltages, or tracking unipolar voltages relative to different grounds.
When voltages greater than 60V are required, the outputs can be wired in series to generate 0 to 120V with the voltage controlled from the Master.
When currents greater than 20A are required, the outputs can be wired in parallel to create the equivalent of a 40A power supply with the voltage controlled from the Master.

Track Accuracy:	Slave voltage = ± (0·1% of Master voltage setting + 10mV)

BOTH ON / BOTH OFF (CPX400D & DP)

Each output has an independent DC On/Off control, however, an additional control button is provided which turn both outputs on or off simultaneously.

ANALOGUE REMOTE INTERFACE (CPX400SA only)

The CPX400SA offers galvanically isolated analogue remote control of voltage and current from control voltages. Voltage and current front panel settings generate non-isolated analogue output voltages that can be used to control slave power supplies.

Input Scaling:	0 to 100% control of voltage or current from 0 to 5V or 0 to 10V (selectable)
Input Accuracy:	Voltage: 0.3% ±20mV. Current: 0.5% ±50mA. Input impedance 10kΩ
Output Scaling:	Set values of 0 to 100% of rated output voltage and current generate 0 to 5V (not isolated)
Output Accuracy:	Voltage: 0.3% ±20mV. Current: 0.5% ±50mA. Output impedance 125Ω
Remote On/Off:	Output On/Off can be controlled by external switch closure (not isolated)

DIGITAL BUS INTERFACES (CPX400SP & CPX400DP only)

The CPX400SP & CPX400DP offers full remote control and read-back using RS-232, USB, GPIB or LAN (compliant with LXI class C). All interfaces are at ground potential and opto-isolated from the output terminals. *Note: Remote/Local Sense, is manually selectable only.*

RS-232
Standard 9-pin D connector. Baud rate 9,600.

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 class C. (LXI is the abbreviation for Lan eXtensions for Instrumentation). For more information visit: www.tti-test.com/go/lxi

DIGITAL PROGRAMMING PERFORMANCE (CPX400SP & DP only)

Voltage Setting
Resolution/Accuracy: 1mV / ± (0.05% +10mV)

Current Setting
Resolution/Accuracy: 1mA / ± (0.3% +5mA)

Programming Speed
Command Delay:	Typically <25ms (this must be added to any of the figures below)
Voltage Up Time:	<10ms* to 1%
Voltage Down Time:	<80ms* to 1% (full load); <1.5s* to 1% (no load)

* The up and down times vary with range and voltage step size. More information is contained in the operating manual which can be downloaded from our web site.

GENERAL SPECIFICATIONS

Input
AC Input:	110 to 240 volts ±10% 50/60Hz. Installation Category II.
Input Power:	Single - 625VA, Dual - 1250VA max.

Temperature & Environmental
Operating Range:	+5ºC to +40ºC, 20% to 80% RH
Storage Range:	-40ºC to + 70ºC
Environmental:	Indoor use at altitudes up to 2000m, Pollution Degree 2.
Cooling:	Rear discharge variable speed fan.

Safety & EMC
Safety:	Complies with EN61010-1
EMC:	Complies with EN61326

Physical
Size:	Single - 107 x 130 (¼ rack 3U) x 398mm Dual - 210 x 130 mm (½ rack 3U) x 377mm (size excludes feet, knobs and terminals).
Weight:	Single - 4.25kg (9.35lb), Dual - 6.3kg (13.9lb)

DRIVER SOFTWARE SUPPLIED (CPX400SP & DP)

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, and Vista. Windows is a trademark of Microsoft.*

OPTIONS

Rack Mounts
RM460 19 inch 4U rack mount suitable for up to four single or two dual power supplies. Dual output units can also be fitted into the RM300A 3U rack

Accuracy specifications apply for the temperature range 18ºC to 28ºC after one hour warm-up. Thurlby Thandar Instruments Ltd. operate s a policy of continuous development and reserves the right to alter specifications without prior notice.

Model Table		Interfaces				
Model	Outputs	Analogue	RS-232	USB	LAN (LXI)	GPIB
CPX400S	1					
CPX400SA	1	•				
CPX400SP	1		•	•	•	•
CPX400D	2					
CPX400DP	2		•	•	•	•

AIM & THURLBY THANDAR INSTRUMENTS

Product Summary

Laboratory Power Supplies

Bench and system power supplies from 30 watts up to 1200 watts using linear, mixed-mode and PowerFlex regulation technologies.

Waveform Generators

Analog and digital (DDS) function generators, true arbitrary generators, arbitrary/function generators and pulse generators.

Precision Measurement Instruments

Benchtop DMMs, frequency counters, component measurement instruments (LCR), electronic dc loads, current probes.

RF and EMC Test Equipment

Spectrum analyzers, signal generators, frequency counters, power meters, emc measurement instruments.

Company name and product brands

Thurlby Thandar Instruments Ltd. (TTi) is one of Europe's leading manufacturers of test and measurement instruments.

Products have been sold under two brand names: TTi and Aim.

In the future, however, the full product range will be branded Aim-TTi.

This changeover will be gradual and many products will continue to carry the TTi or Aim brands for some time to come.

Web Addresses (URLs)

The preferred URL for obtaining information concerning Aim-TTi products is:
www.aimtti.com (international customers)

Customers in the UK should use the URL:
www.aimtti.co.uk

Customers in the USA should use the URL:
www.aimtti.us

Note that previous URLs such as www.tti-test.com will continue to operate for the time being.

Designed and built in Europe by:

Thurlby Thandar Instruments Ltd.
Glebe Road, Huntingdon, Cambridgeshire PE29 7DR England (United Kingdom)
Tel: +44 (0)1480 412451 Fax: +44 (0)1480 450409
Email: info@aimtti.com   **Web: www.aimtti.com**