

# THURLBY THANDAR INSTRUMENTS

## TSP3222



*Programmable dual DC power supply*

GPIB Series

# TSP3222 & TSP3222H

## GPIB dual DC power supply

### As a bench instrument

- Dual isolated outputs (0-32V at 0-2A each)
- Constant voltage or constant current operation
- Full internal control of output configuration
- Independent, Tracking, Series, Parallel modes
- Simultaneous voltage and current metering
- Set points and actual values shown together
- Fully variable OVP setting, thermal protection
- True linear operation, remote sense terminals
- Direct keyboard setting of all parameters
- Setting resolution of 10mV and 1mA
- 25 non-volatile setting memories

### Advanced digital control

The TSP3222 incorporates full keyboard setting of all parameters. Voltage and current levels can be entered directly in floating point notation or stepped up and down using increment/decrement keys. Non-volatile memory is provided for the storing of up to 25 complete settings of the instrument as well as the power-down settings.

A 48 character backlit display provides menu driven operation for the setting of other parameters such as overvoltage trip point, output configuration, meter damp-



### Easy and convenient rack mounting

The compact case is half-rack width and 3U height. Output terminals are provided front and rear and all controls are available on the front panel. The optional rack mount kit can accommodate one or two units.



### No-compromise performance

The all-linear design of the TSP3222 gives it excellent performance in terms of low output noise, good transient response, and minimal RFI. The high stability and accuracy of the units is matched by a setting resolution of 0.01 volts and 0.001 amps. Remote sense terminals are incorporated at the rear for the elimination of voltage drops in the connecting leads.

Both outputs are fully protected against forward and reverse voltages and thermal shutdown protection is also built in. User definable over-voltage trip protection is available independently for each output.

### Comprehensive metering

The display shows the voltage and current set levels for both outputs simultaneously. The output current is also metered and displayed when in constant voltage mode and this changes automatically to show the output voltage when in constant current mode.

Meter damping can be selected for either output to cope with rapidly fluctuating loads.

# the state-of-the-art in programmable PSU design



## Fully configurable outputs

The two identical 0 to 32V, 0 to 2A outputs of the TSP3222 are fully independent and are isolated to 300V. Each output can operate in constant voltage or constant current with automatic crossover and mode indication.

Programmable internal switching can link the two outputs in series or parallel to provide voltages of up to 64V or currents of up to 4A. Output Two can be made to track Output One when in isolated mode.

## Active output sink (TSP3222H)

For some applications, speed of response is an important consideration. A series regulated power supply relies upon the load current to discharge the output when the voltage is being reduced. An internal bleed resistor is normally incorporated to pull the output down if the load current is small or zero. This results in a slower response to a 'down' step than to an 'up' step at small load currents.

The TSP3222H incorporates active circuitry which sinks current when necessary to ensure fast 'down' steps regardless of the load current.

## As an ATE component

- GPIB interface fitted as standard
- Conforms fully with IEEE-488.2
- Single GPIB address controls both outputs
- All functions can be controlled from the GPIB
- Fast response and slew (active sink on 3222H)
- Output voltage and current readback to 12 bits
- Full serial and parallel poll capabilities
- Comprehensive status and error reporting
- Monitoring of GPIB commands for debugging
- Compact half-rack 3U size
- Optional rack mount kit available

## A total GPIB capability

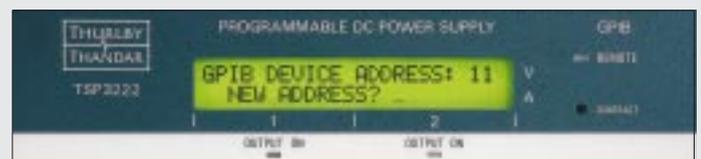
A GPIB interface is fitted as standard. Every function of the instrument can be controlled via the GPIB. This includes the output configuration, over-voltage trip points, meter damping etc. In fact everything that can be controlled from the front panel can be controlled from the GPIB.

The output voltage and current levels can be read back via the GPIB to a resolution of 12 bits. Service request can be exercised for a variety of conditions. GPIB messages can be sent to the display for debugging of programs.

## Simple and consistent GPIB control

The interface conforms fully with the IEEE-488.2 standard. The .2 standard contains many enhancements which are essential for consistency when programming a system comprising several instruments.

A National Instruments Labwindows\* device driver is available as an option. Labwindows is an interactive software package which permits fast, simple GPIB program



\* Labwindows is a trademark of National Instruments Corporation.

# Technical Specifications

## Output Voltage (each output)

Range:	0V to 32V (2V to 64V in series mode).
Resolution:	10mV.
Accuracy:	0.05% ±10mV.
Temp. coefficient:	<50ppm/°C (typically 20ppm/°C).
Line regulation:	0.001% for 10% line change
Load regulation:	0.005% for 50% load change
Ripple and noise:	Typically <1mV.
Transient response:	<100us to within 50mV of setting for 50% load change.
Output impedance:	Typically <10mΩ at 1kHz.

## Remote Sensing

Corrects for up to 0.5V of drop per lead.

## Output Current (each output)

Range:	1mA to 2A (1mA to 4A in parallel mode),
Resolution:	1mA.
Accuracy:	0.1% ±1mA.
Temp. coefficient:	<75ppm/°C (typically 40ppm/°C).
Ripple and noise:	Typically <0.2mA.
Output impedance:	Typically 50kΩ w/ voltage limit at max.

## Output Mode

Each output can operate in constant voltage or constant current mode with automatic crossover. A display annunciator (flashing delta sign) indicates constant current mode.

## Output Configuration

Isolated:	Two independently set isolated supplies (0 to 32V, 1mA to 2A).
Isolated tracking:	Two isolated supplies as above, voltage setting of one tracks the other.
Series:	Provides one higher voltage output (2V to 64V, 1mA to 2A).
Parallel:	Provides one higher current output (0V to 32V, 1mA to 4A).

## Isolation

±300V DC max. output to output or output to ground.

## Voltmeter (each output)

Resolution:	10mV.
Accuracy:	±(0.05% of reading + 10mV).

## Current Meter (each output)

Resolution:	1mA.
Accuracy:	±(0.1% of reading + 1mA).

## Over-voltage Protection (each output)

Range:	1V to 35V (3.2V to 70V in series mode).
Resolution:	0.2V,
Accuracy:	±(2% +0.2V).

## Output Protection (each output)

Forward Voltage:	Inherently protected up to OVP setting. Output trips off above OVP setting (70V max.)
Reverse Voltage:	Diode clamped (0.7V) for reverse voltages. Max. reverse current 3A continuous.

## Output Terminals

Front panel:	4mm terminals for output on 19mm (0.75") spacing.
Rear panel:	Screw terminals for output and sense.

## Output On/Off

Independent switches for each output isolate the terminals and allow voltage and current limits to be set before connecting to load. Master on/off connects/isolates both outputs simultaneously

## Non-Volatile Memory

25 memory locations are provided, Each location can store the full instrument set-up including voltage, current, OVP, output configuration etc. The power down settings are also stored and are restored when the unit is turned back on.

## GPIB Response Times

Interface:	<15ms (single command, buffer empty).
Output TSP3222:	Up - <5ms for a 10V step. Down - <5ms for a 10V step at full load, <200ms for a 10V step at zero load.
Output TSP3222H:	Up - <5ms for a 10V step. Down - <5ms for a 10V step at any load.

Note that the total response time to a GPIB command is the sum of the interface and output response times.

## GPIB Implementation

(conforms to IEEE-488.1 and IEEE-488.2)

Multiline commands:	DCL, LLO, SDC, GTL, UNT, UNL, SPE, SPD, PPU, PPC
Interface functions:	SH1, AH1, T6, L4, SR1, RL1, PP1, DC1, DT0, C0, E2
Programmable params.:	Set volts, set current, set OVP, set output on/off, set master on/off, set mode (series/parallel etc.), set meter damping, store/recall instrument settings, read back set volts/set current/set OVP/output volts/output current, up/down load learn string, up/down load all stores, set SRQ response, configure parallel poll response, execute self-test.
SRQ modes:	Event registers and SRQ mask as defined by IEEE-488.2
SRQ available on:	Command error, execution error, time-out error, query error, OPC, change of output mode CV to CI or CI to CV, MAV, FAULT.
PP configurations:	ist, bit position and sense of response bit.

## Power Requirements

Input voltage:	Internally set for 110V, 120V, 220V, 230V or 240V ±10%, user resettable.
Power consumption:	300VA max.

## Environmental & Safety

Electrical safety:	Complies with EN61010-1
EMC:	Complies with EN50081-1 and EN50082-1
Operating range:	5°C to 40°C, 20% to 80% RH. Thermal trips for each output to protect against over temperature.
Storage range:	-20°C to +60°C.

## Mechanical Details

Size:	210mm x 129 mm x 380mm (W x H x D)
Weight:	11 kg.
Rack mount:	

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

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