DVR1

Precision Temperature-Regulated DC Voltage Reference

Triple Reference Output
10V (3 outputs) or tripple voltages 10V, 1V and 0,1V

Temperature Stabilized
Includes internal oven for low temperature drift

Cost Efficient Design

High Precision
Calibrated against low tolerance standards

Low Drift
Based on low drift burried zener diodes

Temperature Sensor
Integral PT100 sensor for temperature surveillance

Options
Versions e.g. with binding posts on request

Input Power Conditioning
Power input with reverse polarity protection, voltage regulation and EMI filtering

Output Protection
Short circuit proof output
Output EMI filtering

The DVR1 is a very cost efficient, yet precision voltage reference assembly, capable of generating three precise and low-drift, buffered reference voltages of 10V (single voltage version) or 10V, 1V and 0,1V (triple voltage version). It incorporates a temperature-controlled oven to stabilize the output voltages, thus limiting the impact of ambient temperature fluctuations and is intended as an OEM product to be incorporated in equipment where precise reference voltages are needed, such as e.g. in industry electronics, physics applications or for calibration purposes.

The use of burried zener diodes in hermetic package (LT1021) in combination with other low drift components and a precision temperature control circuitry is the prerequisit of a precision voltage standards. The design, which does not require continuous operation to achieve stable output voltages, results in a very attractive price/performance ratio. Other cost efficient, yet temperature compensated standards often use thermistors to compensate thermal drifts and non-hermetic reference chips, resulting in sub-optimal temperature compensation and higher aging related drifts. This, amongst other reasons, is because exact trimming of the thermistor to each specific reference temperature gradient is essentially impossible for production units. Non-hermetic reference chips show higher aging drift rates due to environmental impacts. Therefore this reference assembly uses an internal precision heater working on component level and a hermetic voltage reference chip. A PT100 temperature sensor enables monitoring of the reference device temperature.

Every product is factory calibrated, traceable to national standards after a minimum of 500 hours of pre-aging for the references and an additional 100 hours for the complete unit. The calibration includes the adjustment of the 10V output and the precision measurement of the 1V and 0.1V output (for the tripple voltage version). The single output version supports 3 outputs with 10V each. The first output is adjusted to exactly 10V by use of a trimmer, the remaining two are calibrated (measured). The trimmer is accessible by the user from outside to support readjustment. The unit is accompanied by factory calibration data including specification of the absolute tolerances. Its high off state stability also makes it ideal as a voltage travel standard.

Versions can be made available, e.g. with 10V, 2V and 0.2V output voltages or with four brass or copper-tellurium binding posts as output terminals (depending on the thermal EMF requirements).

Please contact us. For further details see also www.ab-precision.com.

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IMPORTANT NOTE: Power GND and Output GND are NOT on same potential, do NOT connect together

All values are typical specifications at 23°C, K=2, unless otherwise specified:

Parameter	Condition	Specification
Ambient Conditions	Operation, per specification Operation, no damage Storage, transport	18 - 28°C 10 – 35°C 5 – 45°C
Output 1 Voltage 10V	Absolute calibration uncertainty 30 day drift *)6 1 year drift *)6	< 2 ppm max. *)1 < 2 ppm < 8 ppm
Output 2 Voltage 1V *)2	Absolute calibration uncertainty 180 day drift *)6	< 8 ppm max. *)1 < 50 ppm
Output 3 Voltage 0.1V *)2	Absolute calibration uncertainty 180 day drift *)6	< 15 ppm max. *)1 < 0.025 %
Thermal Drift	10V output, T=18–28 °C *)6	0.1 ppm/K typ. *)4 < 0.25 ppm/K max. *)4
Output Noise Voltage	10V output, 0.1-10Hz	< 1 ppm peak-peak
PT100 temperature tolerance	4 wire measurement	< 0.5K
Warmup Time	10V output	30 min. to ∂U < 1ppm of nominal output voltage
Output Impedance	all outputs	< 2 Ohms
DC Supply Voltage *)5	Specification / no damage Peak startup current Average current (heated up)	17.5–18.5V / 17.0-24.0V < 150mA *)7 < 50mA
Output Current	Short circuit, any output Recommended output current	Indefinite *)3 <1 µA
I/O Connectors	All standard versions (mating Connector supplied)	9 pin D-Sub female; Four 4mm posts optionally
Weight	All standard versions	Appr. 150g

IMPORTANT Notes:

*)1: Relative to National Standards (PTB) at time of calibration; Output 1 is adjusted to a nominal 10V by trimmer on item top side (see marking) and is user-adjustable; calibration is lost on all channels if trimmer is adjusted by user. Use non-conductive screw driver only!

*)2: Only tripple voltage versions support this output voltage

*)3: One 10V output ONLY at a time, for 2 or 3 damage will occure! After removal of short circuit, allow 30 min temperature stabilisation.

*)4: Averaged over a 10K temperature range, total is <2.5ppm over a 10K temperature range

*)5: We recommend to use a linear regulated, low noise supply. Avoid switchmode regulators to minimize noise and wrong voltage readings.

*)6: To calculate total output uncertainties, add calibration uncertainty, aging- and temperature-drift. Aging spec. related to 99% off-state. Note that for continuous operation the drift rate is typically 15ppm/√(t/1000h), non cumulative. Thermal EMF voltages may add.

*)7: Although an internal fuse is installed, use external fuse 500mA slow blow to limit supply current

- For specified values, ambient temperature gradient shall be < 1K/h and item shall be operated in horizontal position
- 'K' denotes temperature changes, relative to absolute values indicated in °C. Hence e.g. a 1K increase equates a delta of x °C to x+1 °C

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Circuit Description:

The DRV1 consists of the following functional blocks to achieve the performance specified:

- Input reverse voltage protection and power filtering, ESD protection
- Dual, separate, voltage regulator stage for reference circuitry and heater circuitry
- LT1021 burried zener voltage reference, hermetic, for low aging drift, voltage adjustable
- Precision voltage divider stages (3-voltage version only) with ultra low temp. coefficient
- Output amplifier (per output) with output protection (ESD, short circuit, EMI-filtering)
- Reference chip noise filter
- Precision PI heater control circuitry for reference (and related circuitry)
- PT100 temperature sensor for internal reference temperature monitoring
- Metal case for improved ESD/EMI shielding

Operation Recommendations and Precautions:

This reference assembly is a precision device and special care must be taken when operating it to achieve optimum performance. Handle carefully and ensure a temperature stabilized environment as specified. During operation avoid any direct air drafts, device movement, direct infrared radiation and other heat sources in proximity to the unit. Take the usual precautions to minimize thermal EMF voltages when connecting cables. Note that the brass binding post output version has increased EMF. Avoid temperature extremes whenever possible (also in storage). Do not exceed specified storage and operating conditions. Use short, twisted shielded cables for each output. Connect shield to GND. Avoid ground loops. Switch item off if not in use to minimize aging whenever possible. See aging rate data.

Please note: The power input negative pin and the output GND pins are **NOT** on the same potential and **MUST NOT** be connected together. Unit generates its own output reference GND level, to be used as the output reference potential (pins 1 and 6 of output connector).

D-Sub I/O Connector (9 pin female):

Pin 5, 9:	PT100 (use 4-wire connection at connector terminals)
Pin 8:	Positive DC supply input, 18V nominal, protect with external fuse 500mA/slow
Pin 4:	Negative DC supply input (do NOT connect to chassis or GND, Pins 1 and 6!)
Pin 1, 6:	Output GND (connected to chassis, use signal also for cable shield connection)
Pin 3:	Output 1 (10V; adjusted to nominal, see page 2)
Pin 7:	Output 2 (1V; respectively 10V with single output version)
Pin 2:	Output 3 (0.1V; respectively 10V with single output version)

Note: The DVR1-x-A-N assembly ships with a mating D-Sub connector (with solder cups) and a D-Sub shell

Ordering Information:

Order Number	Description
DVR1-1-A-N	Precision DC Voltage Reference Assembly, 10V output (3 separate 10V outputs); NOT designed for ROHS compliance
DVR1-3-A-N	Precision DC Voltage Reference Assembly, three output voltages, 10V, 1V, 0,1V output; ; NOT designed for ROHS compliance

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