

Absolute accuracy

The stated figure refers to the absolute deviation of the DVM, or of the monitors of the analog programming. They are independent of the stability data of the individual series.

For all families with standard data the following absolute accuracy values apply:

- for all nominal voltages:
< $\pm 0,2\%$ of the nominal value
- for all nominal currents within the range > 5mA up to < 200A:
< $\pm 0,2\%$ of the nominal value
- without this range:
< $\pm 0,5\%$ of the nominal value
- additional error of the DVM:
< ± 2 Digits

Active pull-down control

Available on demand especially for the NLN series: Power transistors parallel to the output acting as a current sink.

Autoranging power supply

Power supply with automatic ranging of the operating point without steps. These power supplies can provide any combination of the rated current and voltage - limited only by the rated maximum available output power.

Bipolar power supply

A bipolar power supply can be adjusted from positive output voltage and current to negative with continuous zero crossing. All bipolar power supply units of FuG Elektronik GmbH are designed for restricted 4-quadrant operation. The electrical power stored within the load can be subsequently reabsorbed by the power supply. On request the units can be equipped for full 4-quadrant capability.

CE mark

All FuG- power supplies have a CE label - a guarantee of compliance with the current EMC and safety standards.

Certificate of calibration

All FuG- power supplies can be calibrated at the factory. The certificate of calibration, which can be supplied on request, confirms the compliance of the output data with the catalogue data:

- Indication on the DVM
- Monitor voltages*)
- Computer output data*)
- Reference voltage*)
- Linear coherence between control voltage and output value*)

*) Options

Charging current

FuG- capacitor charging power supplies operate with constant current. It is adjustable to every value up to the nominal value. On request, units are available with enhanced charging current at low voltage.

Charging power

Power specification for capacitor charging power supplies. The data is in J/s, and is valid for charging from "0" to the nominal voltage. For charging of a partially discharged capacitor a considerably higher charging power, up to double, can be supplied.

Chopper controlled

See Switch mode power supply.

Deviation (Stability data)

This term is always referred to the nominal parameter value and is valid for operation under constant operating conditions. Constant operating conditions means that, in each case, all other conditions such as the load, ambient temperature and mains voltage are constant:

- a) Deviation of the output voltage (or output current when specified) for $\pm 10\%$ variation of the line voltage.
- b) Deviation of the output voltage (or output current when specified) over a period of 8 hours, after an appropriate warm up time.
- c) Deviation of the output voltage at load changes from full load to no load.

Discharge time constant

This data always relates to the unconnected output. It is the time taken for the output voltage to decay to approx. 37% of the adjusted voltage after the output has been switched off.

Double stabilized power supply

Such units are equipped with a thyristor pre-regulator followed by a linear transistor regulator

stage. The high efficiency of the thyristor pre-regulator stage is combined with the high regulation characteristics of a linear regulator.

Dump switch

Rapid discharge switch for the controlled discharging of internal and external capacitors. (see also Interlock)

Efficiency

The efficiency of the units depends on the respective operating point. At full load a figure of 85 -95% will be reached with switched and thyristor regulated power supplies, whilst 70 -90% is achievable with linear regulated power supplies with thyristor pre-regulation.

Electronic load

A unit, which has the behaviour of an adjustable load resistor. Usually, it is used for testing power supplies. Depending on the design, it is possible to adjust and regulate the resistance, the load power or the load current. FuG offers customized electronic loads on request.

EMC

Electro Magnetic Compatibility. See Regulations and Standards.

EURO-size

19" cassette system cases, 3U

Fast de-energizing

Option for super conductor supplies for controlled de-energization of super conducting coils/magnets at quench.

Final charging voltage

Preset voltage for capacitor charging power supplies up to which the capacitor shall be charged.

Floating output

The specified output terminals have no DC connection to other parts of the unit or to ground. The maximum potential difference (isolation voltage) is indicated.

IMS-size

Older size of plug-in cases, 4U

Interlock

Loop for switching off the output voltage when disconnected. Mains disconnection of the power stage, but without any forced discharging of the output or load. (see also dump switch)

ISO 9001

Since 1994 FuG has maintained this quality assurance system. All supplied units are tested (using calibrated measuring instruments) and the results are recorded in our test department, so as to ensure that all units shipped are fully in accordance with their specification.

Linear regulation

Control of energy flow by one or more of bipolar or field effect transistors which are switched in series to the load and operated with the linear part of their characteristic.

Mains connection

Stated is the mains voltage, the permissible tolerance ($\pm 10\%$), the line frequency range and the type of mains connection, e.g. single phase, two-phase or three-phase. Connection of N (neutral) and PE (protective earth) are always necessary.

Nominal current

Maximum available current.

Nominal power

Maximum available power from the power supply. No higher power is available - even for a short time. For FuG- power supplies the first number in the type name is the power class or the main component of the power supply. This value is approximately (but may be not exactly) the nominal power.

Nominal voltage

Maximum adjustable voltage. For FuG- power supplies the second number in the type name is usually the nominal voltage of the power supply.

Operational conditions

As far as not otherwise stated in the manual, for Fug power supplies the following conditions are valid:

Temperature: 0 to +40 °C
Humidity: 0 to 85% not condensing
Height over sea level: max. 2000m

Output isolation

On units where the "0V" terminal is not firmly connected to earth (or may be optionally disconnected from earth), it is always shown up to which maximum voltage the terminal may be allowed to float with respect to earth.

For units with floating output (all low and medium voltage power supplies up to 2kV - except cassettes) this value is valid for either of the output terminals.

PROBUS

FuG name for our system of computer interfaces.

PWM-Regulator

Regulator utilising Pulse Width Modulation. Such regulators are used in switch mode power supplies and in drives.

Quench

The transition of a super conducting coil / magnet from super conducting to normally conducting condition. If no special measures are taken, the energy, stored in the magnetic field, will be converted into thermal energy, within a short time, when quench occurs.

Quench detector

Circuit to detect a quench.

Recovery time

This characteristic is stated independently for voltage and current:

For voltage control, it is the time which the power supply requires to return to the adjusted voltage after a load variation from 10% to 100%, or from 100% to 10%.

For current control, it is the time which the power supply requires to return to the adjusted current after a load variation where the output voltage does not change by more than 10% of the nominal voltage.

Regulation mode

Standard power supplies can be operated in constant voltage mode or constant current mode. Switching over takes place automatically with sharp transition. For FuG power supplies the regulation mode is displayed on the front plate by LEDs.

Regulations and standards

The design and production of our power supplies is in accordance with the latest standards for EMC and safety. Depending on the type of the respective unit, different standards are valid:

EMC:

EN61000-6-1 and EN61000-6-3 (single-phase mains connection)

EN61000-6-2 and EN61000-6-4 (two- and three-phase mains connection)

Safety:

EN 61010

Repetition frequency

This frequency corresponds to the repetitive charge and discharge of a capacitor by a capacitor charging power supply. The reproducibility of the end-of-charge voltage depends on the repetition frequency.

Reproducibility

Repeatability of setting of a desired output value under constant conditions - it is always referred to the nominal value of the supply.

Residual Ripple

If not otherwise stated the residual voltage ripple is the referred-to parameter. It is always referred to the nominal value independent of the set value. The frequency of the ripple is the frequency of the mains rectifier and its harmonics. For chopper controlled units there is also a component of the switching frequency (usually 20kHz/40 kHz). For capacitor charging power supplies the value of the charging current is the referred-to parameter.

For FuG- power supplies the residual ripple usually is stated as "Peak to peak". ("p-p") value. It is different to the "RMS" value since this measurement also takes into account the short term voltage peaks on full scale.

RMS

The energetically equivalent DC value (also effective value) to an alternating voltage. It corresponds to the square root of the integral of squares (Root Mean Square). For a purely sinusoidal voltage the rms value corresponds to about 36% ($1/(2\sqrt{2})$) of the "peak-to-peak" value. At a pulse range consisting of narrow peaks (which is typically the case for the residual ripple of a switched mode power supply) the difference can be considerably larger.

Safety

See Regulations and Standards.

Sense terminals

For low voltage power supplies, sense lines can be connected to these terminals to measure the voltage immediately at the load and by this to compensate for any voltage drop on the load-lines. The nominal output voltage always refers to the actual output terminals and does not take account of any voltage drop on the load-lines. The compensation of the voltage drop on the load-lines is restricted to a maximum of 5% of the nominal voltage (minimum of 1V) and has to be considered when choosing a supply.

Setting resolution

Smallest possible steps for the adjustment of voltage or current - always referred to the nominal value.

Setting time

The time required before the output value of a power supply reaches the set value in the limits of the stated tolerance.

Stability

See deviation.

Standards

See Regulations and Standards.

Switch mode power supply

Power supply where the transmission of energy is performed by high frequently alternating voltage.

Temperature coefficient (Tc)

In addition to the value for long-term stability (see deviation), we also refer to the 'drift' of an output value as a function of the variation in the ambient temperature whilst the supply is operating under otherwise constant conditions. The data is specified as 'per Kelvin' and is only valid within the stated operating temperature range. The Tc is always referred to the nominal value. When the option "higher stability" is integrated, then the Tc figure improves.

Thyristor regulation

Control of energy flow by a phase cutting circuit with thyristors, operating at the frequency of the mains input.

Unipolar power supply

Units with only one polarity and with no regulation through zero.

Warm-up time

Stability data is only valid after a warm-up time of min. 30 minutes.

2-quadrant operation

The unit operates as a current source and also as current sink (electronic load) with only one polarity of the output voltage. (See active pull-down.)

4-quadrant operation

The unit operates as a current source and also as current sink (electronic load) with both polarities of the output voltage. (See also bipolar power supply.)