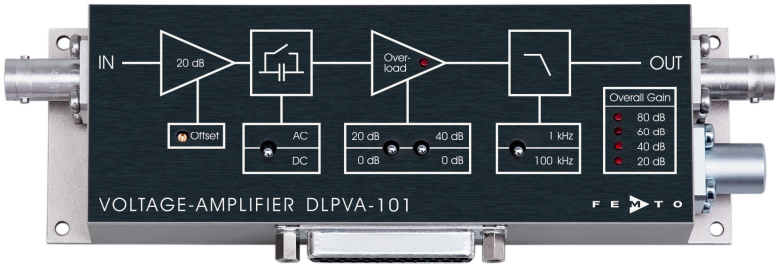
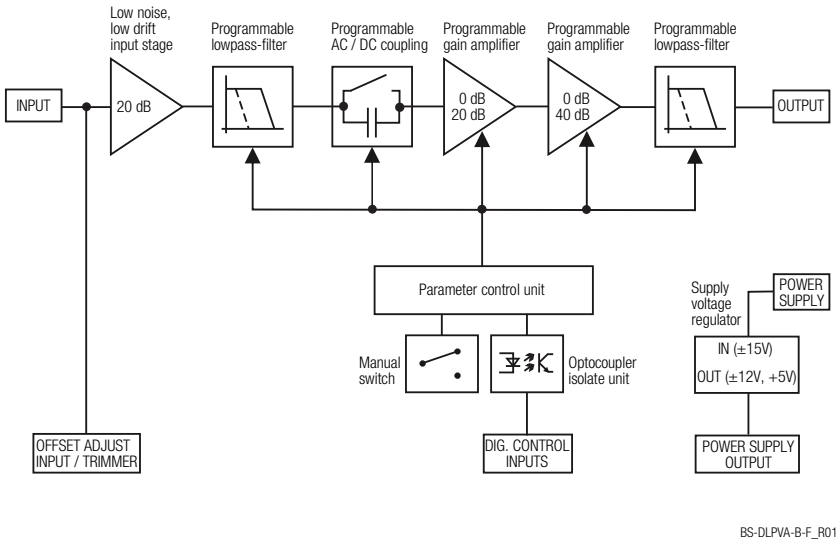
Variable Gain
Low-Frequency Voltage Amplifier



The picture shows model DLPVA-101-F-S with BNC input

Features	• **Variable gain 20 to 80 dB, switchable in 20 dB steps** • **FET input stage, 1 TΩ impedance** • **Protection against ±3 kV transients** • **Single ended and true differential input models** • **Bandwidth DC – 100 kHz, switchable to 1 kHz** • **1.3 µV/°C DC-drift** • **120 dB CMRR** • **Down to 5 nV/√Hz input noise** • **Switchable AC/DC-coupling** • **Local and remote control**
Applications	• **Universal laboratory amplifier** • **Automated measurements** • **Industrial sensors** • **Detector preamplifier** • **Integrated measurement systems**
Block Diagram	

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Intended Use

The DLPVA-101-F voltage amplifiers are variable gain voltage amplifiers. They are designed for fast amplification of small voltage signals. Operation is largely self-explanatory. If in doubt, consult this document or contact support@femto.de.

For safe operation, please refer to the damage thresholds specified in the "Absolute Maximum Ratings", "Temperature Range" and “Power Supply” sections of this document.

The operating environment must be free of smoke, dust, grease, oil, condensing moisture, and other contaminants that could affect the operation or performance.

Application Notes

The DLPVA-101-F amplifiers are designed for use with high resistance sources up to 100 MΩ. A higher source resistance causes significant increase of the input offset voltage and may trigger overload status. See “Overload LED” section for details.

The source resistance (R), in combination with the amplifier's input capacitance (C) of 18 pF, forms a low-pass filter. Therefore, a source resistance above 80 kΩ limits the transmission bandwidth. A coax cable between source and amplifier increases the amplifier input capacitance (typical 1 pF/cm). Long input cables should therefore be avoided. The upper cut-off frequency (f_c) of the input signal can be estimated by $f_c = 1/(2\pi RC)$.

When using a DLPVA-101-F-D with differential input, ensure that the common mode voltage, relative to the amplifier case, does not exceed the allowable range of ±8 V. A floating source, such as an induction coil, without any connection to the amplifier ground will trigger the overload status as well.

Available Versions

DLPVA-101-F-S	Variable gain voltage amplifier, gain settings 20/40/60/80 dB, single ended (FET), typical source resistance <1 MΩ, input 1 TΩ (BNC), bandwidth DC/1.5 Hz – 1/100 kHz
DLPVA-101-F-D	Variable gain voltage amplifier, gain settings 20/40/60/80 dB, true differential (FET), typical source resistance <1 MΩ, input 1 TΩ (LEMO®), bandwidth DC/1.5 Hz – 1/100 kHz

Related Models

DLPVA-101-BLN-S	Variable gain voltage amplifier, gain settings 40/60/80/100 dB, single ended (bipolar), typical source resistance <100 Ω, input 1 MΩ (BNC), bandwidth DC/1.5 Hz – 1/100 kHz
DLPVA-101-B-S	Variable gain voltage amplifier, gain settings 20/40/60/80 dB, single ended (bipolar), typical source resistance <1 kΩ, input 1 MΩ (BNC), bandwidth DC/1.5 Hz – 1/100 kHz
DLPVA-101-B-D	Variable gain voltage amplifier, gain settings 20/40/60/80 dB, true differential (bipolar), typical source resistance <10 kΩ, input 1 MΩ (LEMO®), bandwidth DC/1.5 Hz – 1/100 kHz
DLPVA-100-BUN-S	Ultra-low-noise variable gain voltage amplifier, gain settings 40/60/80/100 dB, single ended (bipolar), typical source resistance <50 Ω, input 1 kΩ (BNC), bandwidth 1.5 Hz – 1/100 kHz

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Available Accessories

PS-15-25-L

Power Supply
Input: AC 100 – 240 V
Output: DC ±15 V

LUCI-10

Compact digital I/O interface for USB remote control, supports opto-isolation of amplifier signal path from PC USB port, 16 digital outputs, 3 opto-isolated digital inputs, bus-powered operation

Specifications

Test conditions	V_S = ±15 V, T_A = 25 °C, output load impedance 1 MΩ, warm-up 20 minutes (min. 10 minutes recommended), source impedance 50 Ω	
Gain		
Gain values	20, 40, 60, 80 dB, indicated by LEDs, (@ output load ≥100 kΩ)	
Gain accuracy	± 0.05 dB	
Frequency Response		
Lower cut-off frequency	DC / 1.5 Hz, switchable	
Upper cut-off frequency (–3 dB)	100 kHz / 1 KHz, switchable	
Upper cut-off frequency roll-off	12 dB/oct	
Time Response		
Rise/fall time (10 % - 90 %)	3.5 µs (@ bandwidth 100 kHz) 350 µs (@ bandwidth 1 kHz)	
Input		
Input impedance	1 TΩ ‖ 18 pF	
Input voltage drift	1.3 µV/°C	
Equ. input noise voltage	gain settings	DLPVA-101-F-S / DLPVA-101-F-D
	20 dB	6.5 nV/√Hz / 7.5 nV/√Hz
	40, 60, 80 dB	5.0 nV/√Hz / 6.5 nV/√Hz
Equ. input noise current	1.6 fA/√Hz	
1/f-noise corner	80 Hz	
Input bias current	3 pA typ.	
Input bias current drift	Factor 2.3 / 10 °C	
Input offset voltage	±5 mV, adjustable by offset trimmer and external contr. voltage	
True differential input, model “DLPVA-101-F-D” only:		
Common mode voltage range	±8 V	
CMRR	120 dB (@ 100 Hz) 100 dB (@ 10 kHz) 80 dB (@ 60 kHz)	
Output		
Output voltage range	±10 V (@ ≥100 kΩ output load)	
Output impedance	50 Ω (terminate with ≥100 kΩ load for best performance)	
Max. output current	±20 mA (short-circuit proof)	
Output overload recovery time	0.5 ms (after 20 x overload)	

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Specifications (continued)

Overload LED

The amplifier features a LED to indicate an overload condition. The Overload LED will turn on if the signal level within the signal path exceeds the linear operating range. In order to ensure the correct operation of the amplifier without signal distortions reduce the gain setting until the Overload LED turns off.

The Overload LED may also turn on under the following operating conditions:

- The amplifier is operated with open input or with a high source resistance, e. g. external AC coupling. Due to the near infinite input resistance a charge present at the input will persist. For proper operation please use a source resistance of less than 100 MΩ or switch to a lower gain setting.
- When using a DLPVA-101-F-D with differential input stage the Overload LED may turn on if the common mode input voltage exceeds the common mode voltage range. This is likely to happen when the source is floating with respect to the amplifier ground. For proper operation make sure that the common mode voltage stays within the allowed common mode voltage range with respect to the amplifier ground. Provide an electrical connection between the source ground and the amplifier ground to ensure the inputs cannot drift outside the tolerable common mode range.

Digital Control	Control input voltage range	Low: –0.8 ...+0.8 V High: +1.8 ... +12 V, TTL / CMOS compatible
	Control input current	0 mA @ 0 V, 1.5 mA @ +5 V, 4.5 mA @ +12 V
	Overload output	Non active: +5 V, max. 1 mA, active: 0.8 V, max. –10 mA
Ext. Offset Control	Offset control voltage range	±10 V (+10 V corresponds to +5 mV input offset voltage)
	Offset control input impedance	200 kΩ
Power Supply	Supply voltage	DC ±15 V (±14.5 V to ±16 V)
	Supply current	±75 mA typ. (depends on operating conditions, recommended power supply capability min. ±150 mA)
Case	Weight	320 g (0.7 lbs)
	Material	AlMg4.5Mn, nickel-plated
Temperature Range	Storage temperature	–40 °C ... +80 °C
	Operating temperature	0 °C ... +60 °C

Absolute Maximum Ratings

Digital control input voltage	–5 V/+16 V relative to digital ground DGND (pin 9)
Analog control input voltage	±15 V relative to analog ground AGND (pin 3)
Power supply voltage	±20 V
Signal Input voltage	±15 V
Transient input voltage	±3 kV (discharge from 5 nF source)

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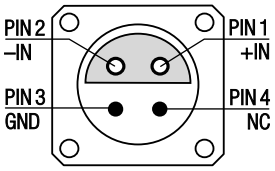
Connectors

Input

Model DLPVA-101-F-S
BNC jack (female)

Model DLPVA-101-F-D
LEMO® series 1S, 4-pin fixed socket
(mating plug type: FFA.1S.304.CLAC52)



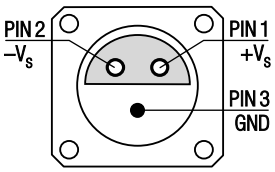
Pin 1: non inverting input
Pin 2: inverting input
Pin 3: ground (GND)
Pin 4: not connected (NC)

Output

BNC jack (female)

Power supply

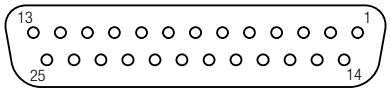
LEMO® series 1S, 3-pin fixed socket
(mating plug type: FFA.1S.303.CLAC52)



Pin 1: +15 V
Pin 2: –15 V
Pin 3: ground (GND)

Control port

Sub-D 25-pin, female, qual. class 2



Pin 1:	+12 V (stabilized power supply output*)
Pin 2:	–12 V (stabilized power supply output*)
Pin 3:	AGND (analog ground for pins 1 – 8)
Pin 4:	+5 V (stabilized power supply output*)
Pin 5:	digital output: overload (referred to pin 3)
Pin 6:	NC
Pin 7:	NC
Pin 8:	input offset control voltage
Pin 9:	DGND (ground for digital control pins 10 – 14)
Pin 10:	NC
Pin 11:	digital control input: gain, LSB
Pin 12:	digital control input: gain, MSB
Pin 13:	digital control input: AC/DC
Pin 14:	digital control input: 100kHz / 1 kHz
Pin 15 – 25:	NC

*stabilized power supply output current
±12 V: max. ±100 mA
+5V: max. 50 mA

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Remote Control Operation

General

Remote control input bits are opto-isolated and connected by logical OR function to local switch settings. For remote control set the corresponding local switches to “0 dB”, “AC” and “1 kHz” and select the wanted setting via a bit code at the corresponding digital inputs.

Mixed operation, e.g. local gain setting and remote controlled bandwidth setting, is also possible.

Gain setting

Gain	Pin 11 LSB	Pin 12 MSB
20 dB	low	low
40 dB	high	low
60 dB	low	high
80 dB	high	high

AC/DC setting

Coupling	Pin 13
AC	low
DC	high

Bandwidth setting

Bandwidth	Pin 14
1 kHz	low
100 kHz	high

Scope of Delivery

DLPVA-101-F, LEMO® 3-pin connector, LEMO® 4-pin connector (model DLPVA-101-F-D only), datasheet, transport package

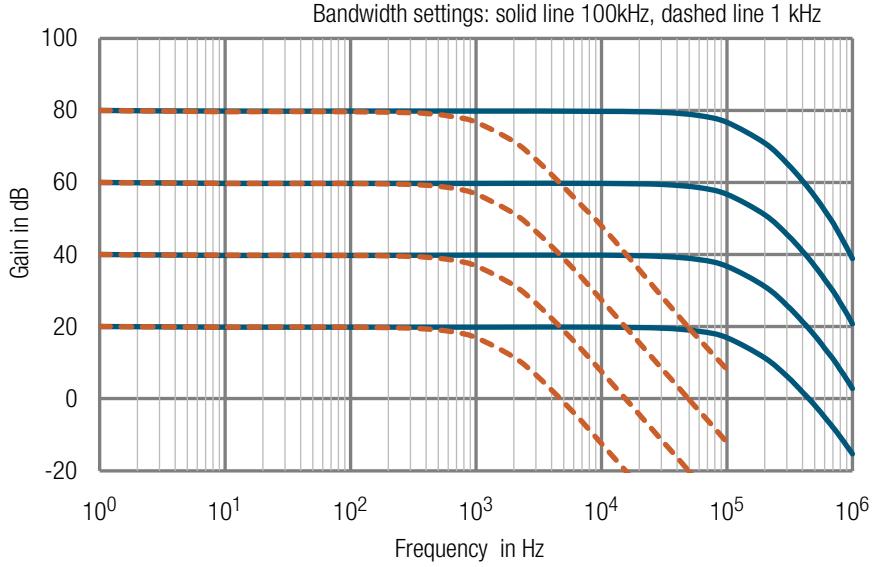
Ordering Information

DLPVA-101-F-S	Variable gain voltage amplifier, single ended (FET)
DLPVA-101-F-D	Variable gain voltage amplifier, true differential (FET)

Typical Performance Characteristics

DLPVA-101-F frequency response

Bandwidth settings: solid line 100kHz, dashed line 1 kHz



DG_DLPVA-101-F_R01

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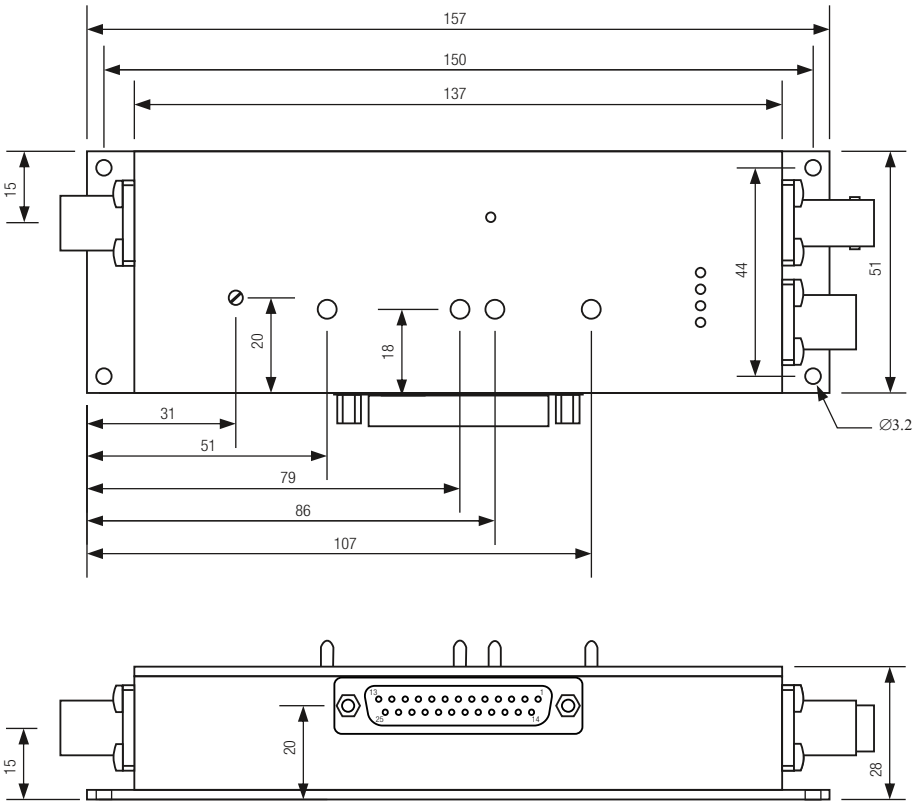
Dimensions

DLPVA-101-F-D



DZ-DLPVA-101-B-F-D_R01

all dimensions in mm unless otherwise noted

Variable Gain
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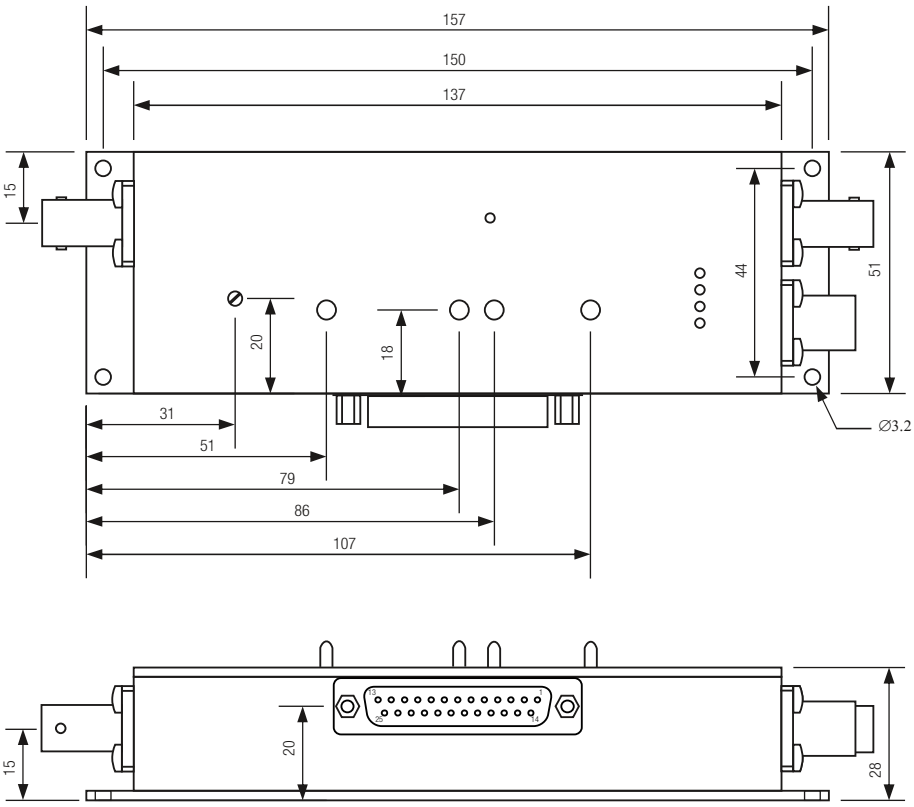
Dimensions continued

DLPVA-101-F-S



DZ-DLPVA-101-BLN-B-F-S_R01

all dimensions in mm unless otherwise noted

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