DUAL CHANNEL LINEAR AMPLIFIER

WITH PHASE INVERTER

Model A400DI

HIGH VOLTAGE	FIXED GAIN	BROADBAND
±200V 150mA	20x	DC to ca 1 MHz

LOW OUTPUT IMPEDANCE	HIGH SLEW RATE
<0.1 Ω	300 V/µs

FLC Electronics AB
Sippedalsvägen 8
S - 433 31 Partille, Sweden

Tel. +46 31 741 2631
Fax +46 31 44 61 10
Fax +46 31 41 75 30

VAT No. SE556506606401
Email flce@flce.se
Web http://flce.se

GENERAL DESCRIPTION

The **A400DI** is a general purpose linear amplifier designed for laboratory use. It is based on a fast high-voltage operational amplifier with a feedback network chosen to give a voltage amplification of 20 times. Any function or arbitrary waveform generator with low output impedance and output voltage up to ±10 V can be used as an input device.

The instrument contains two identical amplifiers that share a single power supply and a common ground reference. It also includes a low voltage phase inverter that facilitates driving the two high voltage outputs in counter-phase.

The amplifier outputs high voltage signals at high frequency. It is, thus, imperative for the safe operation that the user understands the possibilities and limitations of the instrument.

INPUT AMPLITUDE

The amplitude of the input signal should normally be kept within ±10 V. The input protection network limits the signal amplitude delivered to the power amplifier to a safe value. It also effectively cuts accidental spikes and overshoots. However, large and prolonged overvoltage at the input may blow the microfuse in the input protection circuit.

TROUBLESHOOTING:

You should suspect a blown input microfuse if the output is about zero or the amplifier is producing a very low voltage, distorted copy of the input signal (due to the capacitive coupling through the blown fuse).

Spare microfuses are provided inside the instrument. They look like small metal cans and are placed in white holders. The resistance of a good fuse is in the order of 46 ohm. It is imperative to disconnect the power cable and wait at least a minute before opening the case. If possible, contact info@flce.se for advice.

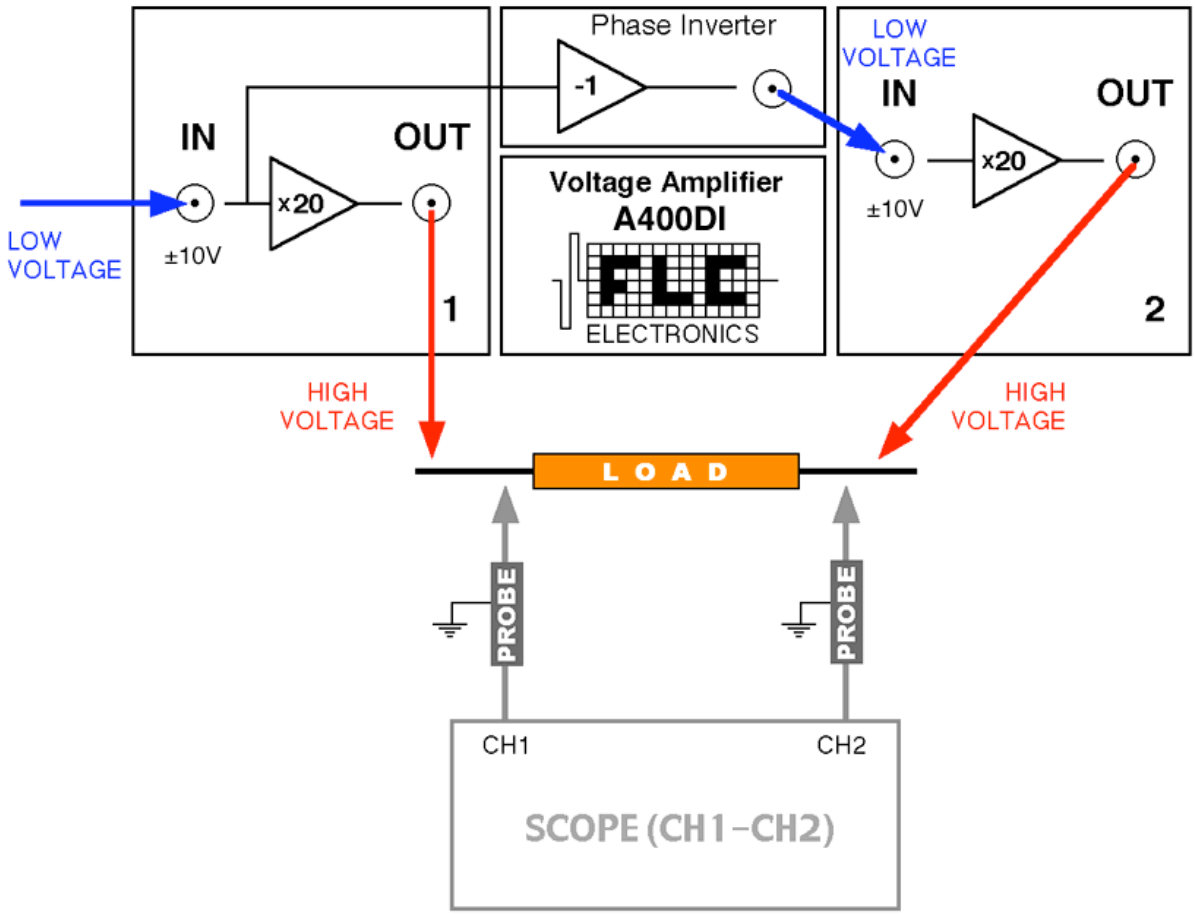
PLEASE NOTE:

Keep input signals within ±10 V range.

Never connect any high voltage output to any input or output of the instrument!

PHASE INVERTER

The **A400DI** contains a phase inverter which shares the input with amplifier "1" (see drawing). It is intended to allow a bridge connection of the amplifiers and the load to achieve double amplitude of the output signal. In such a case, the output of the phase inverter should be connected to the input of the second amplifier, an external signal supplied to the input of the first amplifier and the load connected between the outputs of both amplifiers as in the example below:



Observe, that both sides of the connected load are actively driven and must be isolated from the ground. The voltage over the load is in this case $U_1 - U_2 = U_1 - (-U_1) = 2U_1$ since $U_2 = -U_1$.

It is, of course, possible to supply separate signals to the low voltage inputs of both amplifiers and still use the differential connection of the load, as in the drawing. The amplifiers can also be used as two independent units sharing the common ground reference.

PLEASE NOTE:

In the differential configuration - isolate the load from ground and use two separate oscilloscope probes to monitor the voltage over the load.

LOAD

The amplifier is intended to drive resistive and/or small capacitive loads. The maximum capacitive load depends on the slew rate of the amplifier. This is normally set at the factory to 300 V/µs which yields the load limit of 400 pF. This limit includes the capacitance of the connection cable (ca 100 pF/m for a standard coaxial cable). Increasing the capacitive load causes overshoot to appear. If a larger capacitive load is required, and the overshoot is not acceptable, then the slew should be reduced accordingly. Such an adjustment may be performed by qualified personnel and the factory should be contacted for advice (preferably by email info@flce.se). Inside the cabinet exist hazardous voltage levels and the amplifier circuit is sensitive to static discharge.

FLC Electronics AB recommends to monitor the output signal of the amplifier with an oscilloscope. It is then important to use a low capacitive probe with a division factor of at least 1/10.

Overloading the output may cause an overshoot which might be dangerous for connected devices.

The amplifier output is equipped with fast-recovery diodes for protection against high energy flyback and can be used to drive small (mH) inductances in series with resistance.

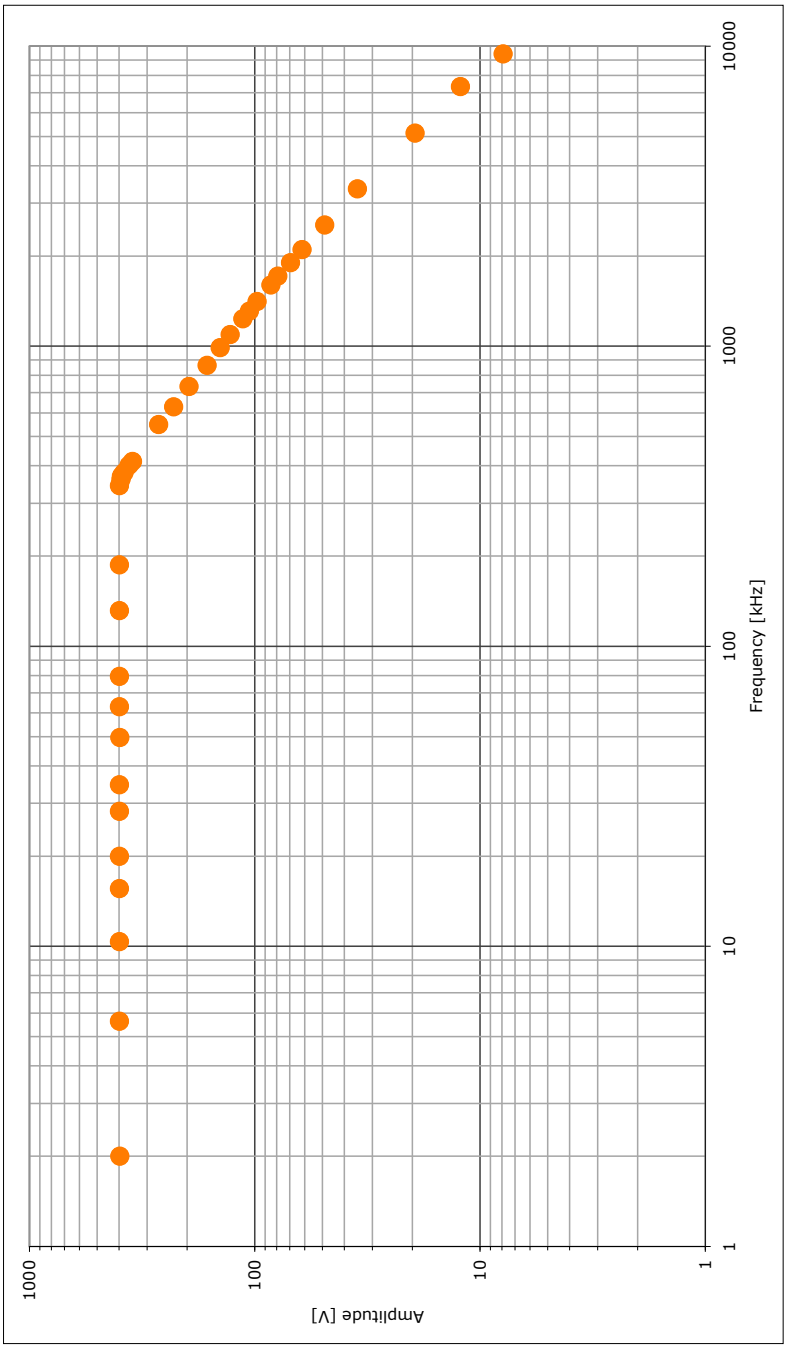
The amplifier cannot be used to drive a purely inductive load.

The continuous output current limit is 150 mA and the output power limit is 30 W. The output is equipped with a current limiting circuit that withstands accidental short-circuits. Prolonged short-circuiting may result in overheating the amplifier.

The amplifier may be overheated when the output is short-circuited for a long time.

FREQUENCY RESPONSE

The frequency response to 100% of the input amplitude and with 300 pF load is shown in the following diagram:



SUMMARY OF TECHNICAL DATA

Bandwidth:		DC to about 1 MHz
Amplification:		20 times
Load:	type	resistive || capacitive
Impedance:	input	1 MΩ || 30 pF, custom values possible
	output	<0.1 Ω in the linear mode
Voltage:	input	nominal ±10 V
Current:	output	maximum 150 mA each channel
Slew Rate:	output	ca 300 V/µs at up to 400 pF load
		(different adjustments available on request)
Input protection fuse		15 mA (Littelfuse, part number 272.015)
		one spare fuse provided inside the instrument,
		additional fuses available from Littelfuse
		resellers or from FLC Electronics AB.

Operating Ambient Temperature:	0°C to 30°C
Storage Temperature:	0°C to 60°C
Relative Humidity:	up to 90% (operation)
	30% to 50% (storage)
Power Requirements:	100/110 V or 220/230 V, 50/60 Hz
Fuse:	100/110 V: 3.15 A (slow),
	220/230 V: 2 A (slow)
Dimensions (H/W/L):	112 x 255 x 316 (mm)
Weight:	4 kg
Country of Origin:	Sweden

Note: Specifications apply to instruments operating at 23°C±5°C ambient temperature after 15 min. warm-up time. Due to ongoing product development, specifications are subject to change without notice.

WARNING It is not allowed to connect the 100...230V AC line power input of the amplifier to DC-AC converters or solid state AC generators with non-sinusoidal output.

WARRANTY

FLC Electronics warrants that this product will be free from defects in materials and workmanship for a period of two years from the date of the shipment.

If any such product proves defective during this warranty period, FLC Electronics, at its option, either will repair the defective product without charge for parts and labour, or will provide a replacement for the defective product. In order to obtain service under this warranty, Customer must notify FLC Electronics of the defect before the expiration of the warranty period and make suitable arrangements for the performance of the service. Customer shall be responsible for packing and shipping the defective product to the service center designed by FLC Electronics, with shipping charges prepaid. FLC Electronics shall pay for the return of the product to the Customer if the shipment is to a location within the country in which the FLC Electronics service center is located. Customer shall be responsible for paying all shipping charges, duties, taxes, and any other charges for products returned to any other locations.

This warranty shall not apply to any defect, failure or damage caused by improper use or inadequate maintenance and care. FLC Electronics shall not be obligated to furnish service under this warranty:

- to repair damage resulting from attempts by personnel other than FLC Electronics representatives to install, repair or service the product;
- to repair damage resulting from improper use or connection to incompatible equipment;
- to service a product that has been modified or integrated with other products when the effect of such modification or integration increases the time or difficulty of servicing the product.

This warranty is given by the FLC Electronics with respect to this product in lieu of any other warranties, expressed or implied. FLC Electronics and its vendors disclaim any implied warranties of merchantability or fitness for a particular purpose. FLC Electronics' responsibility to repair or replace defective products is sole and exclusive remedy provided to the customer for breach of this warranty. FLC Electronics and its vendors will not be liable for any indirect, special, advance notice of the possibility of such damages.

The instrument may generate hazardous voltage levels! It should be operated by qualified personnel only. The instrument is to be used in normal room temperature and humidity.

The manufacturer cannot be held responsible for damage to any device connected to the instrument. It is recommended that samples or equipment sensitive to voltage spikes are disconnected from the high-voltage outputs when turning the power to the instrument ON or OFF.

I M P O R T A N T

Inside the amplifier case exist dangerous voltage levels.

The instrument cannot be powered from a DC-AC converter nor from a solid-state AC generator with non-sinusoidal output.

Loads sensitive to voltage transients should be disconnected from the amplifier during power-up and power-down.

Never connect the output to the input of the amplifier!

The amplifier may be overheated if the output is short-circuited for a long time.

The maximum allowable capacitive load depend on the internal setting of the slew rate. Overloading the output is likely to cause overshoot. Slow down the amplifier to accommodate a larger load.

It is recommended to monitor the output signal of the amplifier on the oscilloscope.

EC Declaration of Conformity

We

FLC Electronics AB
Sippedalsvägen 8
SE-43331 Partille
Sweden

declare under sole responsibility that the

Voltage Amplifier A400DI

meets the intent of Directive 89/336/EEC for Electromagnetic Compatibility (EMC) and Low Voltage Directive 73/23/EEC (LVD). Compliance was demonstrated to the following standards as listed in the official Journal of the European Communities:

EN 50081-1	**Generic Emissions**
EN 55022	Conducted emission (interference voltage), class B
EN 55022	Radiated emission (electric field), class B
EN 50082-1	**Generic Immunity**
EN 61000-4-4	Electrical fast transient/burst
EN 61000-4-2	Electrostatic discharge
EN 61000-4-3	Radiated E-fields (radio frequency)
EN 61010-1:2001	**Electrical Safety**

Tomasz Matuszczyk, PhD
Technical Director
FLC Electronics AB