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INSTRUCTION MANUAL

Type APS 125

POWER AMPLIFIER



CE

APS Dynamics

Systems for Generating Controlled Vibration

a subsidiary of SPEKTRA

APS Dynamics, INC. c/o SPEKTRA Schwingungstechnik und Akustik GmbH Dresden
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2 Technical Specifications APS 125

Max. Power Output

500 VA into a 4 Ohm exciter or resistive load,
at 25 °C (77 °F),
at 1 kHz
nominal mains voltage (8-pin Speakon® socket at back panel)

Max. Voltage Output

45 V RMS,.....DC to 15 kHz (open circuit)

Max. Current Output

5 A DC
5 A RMS,..... 0.1 Hz ... 1 Hz
9 A RMS,..... 1 Hz ... 20 Hz
11 A RMS,..... 20 Hz ... 15 kHz
(9 A RMS, ...into 1.25 Ohm at 1 Hz limited to 30 minutes)

Frequency Range

Full power ..... 20 Hz ... 15 kHz
Small signal voltage (-20 dB).....DC to 150 kHz

Frequency Response

Voltage Mode

DC Input

..... DC to 15 kHz ± 0.5 dB
..... DC to 150 kHz ± 3.0 dB

AC Input

..... 5 Hz ... 15 kHz ± 0.5 dB
..... 2 Hz ... 150 kHz ± 3.0 dB

Current Mode

DC Input

..... DC ... 15 kHz ± 0.5 dB
..... DC ... 60 kHz ± 3.0 dB

AC Input

..... 5 Hz ... 15 kHz ± 0.5 dB
..... 2 Hz ... 60 kHz ± 3.0 dB

NOTES

Total Harmonic Distortion (THD) and Noise

Voltage Mode

..... < 0.1 % (40 Hz ... 5 kHz)
..... < 0.2 % (5 kHz ... 15 kHz)

Current Mode

..... < 0.2 % (40 Hz ... 2 kHz)
..... < 0.8 % (2 kHz ... 15 kHz)

Input Impedance ..... > 10 kOhm

DC Stability

Less than ± 100 mV drift from 0 V for ± 10 % variation of mains supply from nominal and 10 °C to 40 °C (50 °F to 104 °F) variation in ambient temperature

Controls

Power on/off switch
Continuously variable gain control with integral RESET switch
Continuously variable current limit control, 1 A to 11 A (RMS)
Switch for voltage mode or current mode operation
Switch for phase inversion (0° or 180°) between input and output

Gain

Voltage Mode ..... 18 V/V (± 2 dB) at 1 kHz
Current Mode ..... 5.5 A/V (± 2 dB) at 160 Hz

Monitor Output

Voltage Mode ..... 0.1 V/V ± 3 %, 0.1 Hz ... 15 kHz
Current Mode ..... 0.1 V/A ± 3 %, 0.1 Hz ... 15 kHz

Indicator Lamps (LED)

CLIPPING
TEMPERATURE OVERLOAD
CURRENT OVERLOAD
STATE
VOLTAGE MODE
CURRENT MODE
INTERLOCK
PHASE (0° OR 180°)

NOTES

Multifunction Display (LCD)

Voltage, ... RMS, read-out accuracy ± 5 % ± 2 digit,
..... 40 Hz ... 10 kHz
Current, ... RMS, read-out accuracy ± 5 % ± 2 digit,
..... 40 Hz ... 10 kHz

Protection

Input signal is removed and an indicator lamp is lit when the following parameters exceed preset limits:
Output Current – limit adjustable from 1 A to 11 A (RMS) by control on the front panel or limit encoded in the SPEAKON® plug connected to the output
Power Transistor Temperature
Heat Sink Temperature
Signal from overtravel switch input
Signal from air pressure sensor / temperature sensor input

Status LED
Output Signal Distortion – Indicates output signal clipping, does not provoke INTERLOCK state
Other Features ..... Electronic peak current limiting

Power Requirements

Single phase 100 V/ 120 V / 230 V RMS, ± 10 %, 50 Hz – 60 Hz.
Power consumption approx. 1,000 VA at full load
Power input socket with fuse cartridge and voltage selector at rear

Fuses

100 V or 120 V ..... T10.0 A slow blow
230 V ..... T4.0 A slow blow

Dimensions

Height ..... 2 U equivalent of 88 mm (3.5 in.)
Width ..... 482.6 mm (19 in.)
..... with flanges for standard 19" rack mounting
Depth ..... 450 mm (13.8 in.)
Weight ..... 21 kg (46 lb.)

NOTES

3 Description

FRONT PANEL



DISPLAY

The display shows output AC current and voltage on a LCD display.

The LED indicator

TEMPERATURE	lights red if the power MOS output transistors overheat. The power amplifier then goes into RESET state.
CURRENT	lights red if output current exceeds the chosen current limit. Power amplifier changes to INTERLOCK state. RESET required.
STATE	lights green if the amplifier power is switched on.
VOLTAGE MODE	lights green if voltage mode was chosen.
CURRENT MODE	lights green if current mode was chosen.
INTERLOCK	lights red if amplifier is in INTERLOCK state. RESET required to start operation again.
0°	lights green indicating the same phase from input to output.
180°	lights green indicating 180° phase from input to output.
DISTORTION	lights yellow in case of output voltage or current clipping.

NOTES

CURRENT LIMIT

Single-turn potentiometer for limiting RMS current output from 1 A to 11 A. Additional a current limiter encoded in the output plug can be used to set a vibration exciter specific maximum current limit overriding the potentiometer setting.

V/C MODE

Push-button switch for selection of feedback and output impedance modes. The positions are:

Voltage Mode:
Provides constant input/ output voltage ratio, independent of changes of the test object on the vibration exciter. Allows the best acceleration waveform and is therefore preferable for most vibration tests.

Current Mode:
Provides constant input voltage / output current ratio, keeping the generated force independent of changes of the test object on the vibration exciter. This is the preferred setting for most modal test applications. The operation in current mode requires a good knowledge of the physical background.

* CAUTION *

A CHANGE BETWEEN VOLTAGE AND CURRENT MODE DURING OPERATION OF THE AMPLIFIER CAN DAMAGE THE VIBRATION EXCITER OR OTHER CONNECTED EQUIPMENT.

TURN THE GAIN KNOB ANTICLOCKWISE TO THE RESET POSITON (CLICK) BEFORE YOU CHANGE THE MODE.

PHASE

Push-button switch to set the phase shift, output/input, 0 or 180 degrees.

POWER

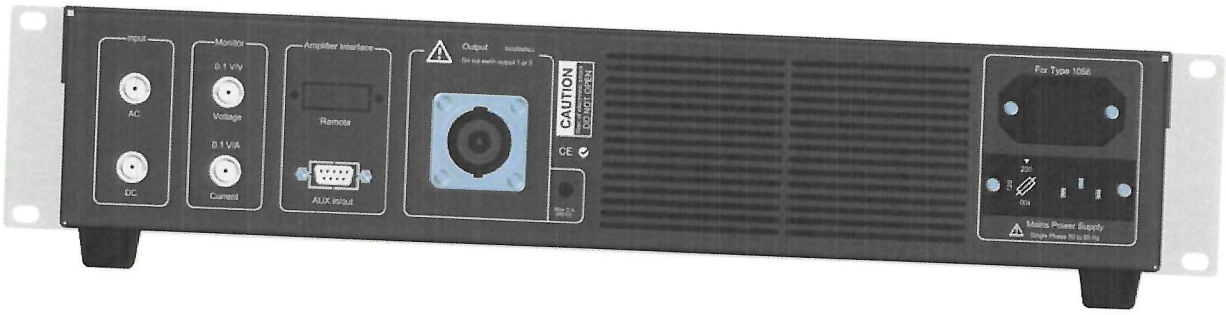
Mains On/Off button.

VARIABLE GAIN

Single-turn, logarithmic potentiometer for continuous adjustment of output signal level.
To prevent a voltage surge when power is switched on, turn the knob fully anticlockwise to RESET position (CLICK) before you press the power button. After power is switched on, turn the gain control to the required gain setting.

NOTES

BACK PANEL



SIGNAL INPUT "AC"

BNC socket providing a capacitive coupled input to the amplifier.

SIGNAL INPUT "DC"

BNC socket providing a direct-coupled input to the amplifier. The input impedance is > 10 kOhm.

MONITOR OUTPUT

VOLTAGE MONITOR:
BNC socket providing an output of the amplifier voltage waveform (including DC component) for display on an oscilloscope. The monitor signal is the amplifier output voltage attenuated 20 dB or 0.1 V/V.
CURRENT MONITOR:
BNC socket providing output of the amplifier output waveform (including DC component) for display on an oscilloscope. The monitor signal is the amplifier output current in 0.1 V/A.

MAIN POWER

Input socket accepting the power cable provided. Mains Voltage Selector and Fuse:
Voltage selector for operation of the amplifier from a 100 V, 120 V or 230 V ± 10 % (50 Hz to 60 Hz) single phase, AC mains supply.

NOTES

OUTPUT

1– : Shaker Output Amplifier – / GND
1+ : Shaker Output Amplifier +
2– : Current Control Rx input A
2+ : Earth do not connect with GND !
3– : Temp / Air control input at "High" amplifier shutdown (note 1)
3+ : overtravel control input at "High amplifier shutdown (note 1)
4– : Current Control Rx input B
4+ : +15 V / 150 mA --> GND

Note 1 Display comments

3– if shutdown "Air control" and Interlock LED lights red
3+ if shutdown "Overtr. Control" and Interlock LED lights red
if V/C Mode switch activated "Switch Mode"
(to deleate interlock and display – with RESET)



Output
500 VA at 4 Ohm
Neutrik 8 MPR plug

Power output Speakon® socket accepting an 8-pin Speakon® plug or connecting cable for connection of an exciter. For a full power output of 500 VA, the moving coil of the exciter or load should have a nominal load impedance of 4 Ohm.

NOTES

PROGRAMMABLE CURRENT LIMITER

By connecting a resistor between the pins 2– and 4– in the SPEAKON® plug of the vibration exciter cable the maximum output current can be limited in order to protect the shaker from a current overload. This current limit overrides the maximum limit that can be adjusted by the controller on the front plate. The table below shows the resistor values recommended for current limits for certain vibration exciters.

R_{OCP}	I max.	Vibration Exciter
∞	3 A RMS	
27.4 kOhm	4 A RMS	APS 113, APS 113-AB, APS 129
5.62 kOhm	8 A RMS	APS 113-LZ, APS 129-LZ
5.11 kOhm	9 A RMS	APS 113-HF, APS 113-AB-HF, APS 113-AB-LA, APS 129-HF, APS 500
0 Ohm	11.3 A RMS	APS 400

* HINT *

IF THE PINS 2- AND 4– ARE LEFT OPEN, THE CURRENT WILL BE LIMITED TO THE LOWEST LIMIT 3 A. CHOSE AN APPROPRIATE RESITOR TO PROVIDE THE FULL POWER FOR YOUR EXCITER.

4 Operation

PRELIMINARY

Environment:
Power amplifier type APS 125 is designed for operation at ambient temperatures between 5 °C and 40 °C (41 °F to 104 °F). Operation at full power will cause the power MOS output transistors´ heat sink to heat up. This is normal. However, it is important to ensure a free flow of cooling air through the input vent in the front panel to the output vent in the back panel, otherwise the input drive signal will be automatically blocked and the amplifier will go into RESET state to prevent overheating of the transistors.

Rack Mounting:
Power amplifier type APS 125 is designed to fit into a 19" standard rack system. It can be used free standing on its four rubber feet, or, with rubber feet removed, it can be fitted into a 19" instrumentation rack.

MAINS SUPPLY CONNECTIONS

Mains Voltage Setting:
Type APS 125 can be powered from a 100 V, 120 V or 230 V ± 10 % (50 Hz to 60 Hz), single phase AC mains supply. To select the correct mains voltage setting, use a small screwdriver to remove the voltage selector with integrated fuse holder from the combined voltage selector and mains inlet, and then put it back again so that the white arrow is aligned with the appropriate voltage printed on the selector.

Fuse Check and Replacement:
The mains fuse is contained in the fuse holder, immediately beneath the voltage selector. It can be replaced using a screwdriver. For 100 V and 120 V operation, the fuse should be a T10.0 A slow blow, whilst for 230 V operation it should be a T4.0 A slow blow. Make sure that only fuses of the required rated current and of the specified type are used for replacement. Do not use mended fuses or short-circuit the fuse holder.

Mains Socket Connection:
Once the mains voltage setting and fuse are correct, use the power cable provided to connect the mains to the mains input socket of the amplifier. Note, that for maximum operating safety the protective (green/yellow) conductor of the cable should be connected to a suitable earth, such as the earth contact of a mains outlet socket. The

NOTES

use of an extension cable without protective conductor should be avoided for safety reasons. In countries where use of mains socket outlets without protective conductor is standard, the mains supply should incorporate an authorized earth leakage current circuit breaker.

NOTES

GROUNDING CONSIDERATIONS

The signal ground line of type APS 125 is permanently connected to its chassis. This is done at one point only, so as to give the best possible immunity to mains-carried noise. Nevertheless, when using the amplifier in complex measurement setups, indiscriminate grounding of the instrument signal ground lines may introduce mains hum. This can be avoided by ensuring that the signal ground line of the entire measurement setup is grounded at one point only. To do this without prejudicing the operating safety of the instruments involved:

1. Connect the signal ground lines of all instruments.
   This is done automatically through the screens of the input and output cables used to interconnect the instruments.

2. If instruments equipped with a mains socket chassis terminal are employed in the measurement arrangement then check that:

   a. only one of these instruments has its signal ground line connected via chassis to mains ground
   b. the housing of the measurement transducer is isolated from grounded measurement sources.

3. If the measurement arrangement is used free-standing without instrument cabinets touching, then ensure that each of the other instruments in the measurement arrangement has its chassis connected to mains ground only or chassis only. Mains ground is preferred for instruments with a mains socket chassis terminal.

4. You must not connect the vibration exciter grounding to Pin 1- GND of the amplifier output. If necessary connect the vibration exciter grounding to Pin 2+ earthing (see pages 3-4).

OPERATING PROCEDURE

1. Connect the power amplifier to an exciter with a 8-pin Speakon® plug or connecting cable.

2. Connect the output of a signal generator to the AC or DC input on the back panel of the amplifier.

3. Turn the VARIABLE GAIN (dB) control knob fully anticlockwise.

4. On the amplifier set POWER ON button to ON. The STATUS, MODE and PHASE LED in the display unit will light up green.

5. Set the generator to the required frequency. Then slowly increase the output voltage (Voltage Mode) or current (Current Mode) with the VARIABLE GAIN (dB) control knob until the exciter reaches the required level of Vibration. With set-ups where the vibration level is controlled by a feedback circuit, the voltage level will be increased automatically.
If the amber DISTORTION lamp lights or the maximum displacement limit of the exciter is exceeded, causing the armature to knock against its end-stops, reduce the generator output voltage to a lower level in order to resume operation. For frequency sweep vibration testing, adjust the generator to the lowest frequency of interest to check that the exciters low frequency limit is not exceeded.

6. To set the amplifier to stand-by during a test, turn the AMPLIFIER GAIN (dB) to RESET. At the end of the test, switch the POWER OFF.

TROUBLE SHOOTING

Warning Lamps:
If one of the red warning lamps lights up, a fault has occurred in the system. Under such circumstances, the operation is automatically stopped to protect the amplifier and exciter. To help establish the cause of the shutdown, some probable faults are given below.

Warning lamp CURRENT:
- Input drive level too high for Current Limit A (RMS) setting
- Wrong output connections to exciter

Warning lamp TEMPERATURE:
- Overdrive at low frequencies
- Wrong output connections to exciter
- Vibration laboratory temperature
- Forced air cooling system of amplifier blocked

LCD display AIR CONTROL:
- air pressure for exciter air bearings too low
  (if pressure sensor is connected via SPEAKON® plug)
- vibration exciter coil temperature too high
  (if temperature sensor is connected via SPEAKON® plug)

INTERLOCK state:
If incorrect amplifier control settings or exciter connections send amplifier in INTERLOCK state, then turn the GAIN control to RESET and make the necessary adjustments. Normal operation can then be resumed by returning GAIN control to the position used for operation. If a INTERLOCK is caused by an internal fault, stop the operation by setting GAIN control to RESET and switch the amplifier off. Then consult your service representative.

NOTES

Power amplifier seems to provide insufficient power for the exciter:

1. Check if the APS 125 is an appropriate amplifier for your vibration exciter
2. Check if the current limiter control knob at the front panel is set to an appropriate limit.
3. Check if the current limit encoded in the SPEAKON® connector is too low for your vibration exciter (see page 3-4)

* HINT *

IF YOU USE ORIGINAL APS CABLE PROVIDED WTIH YOUR VIBRATION EXCITER, THE CURRENT LIMIT ENCODED IN THE SPEAKON® PLUG IS ALREADY SET TO A VALUE THAT PROTECTS THE EXCITER FROM OVERLOAD. DO NOT CHANGE THE RESISTOR IN THE PLUG IN THIS CASE.

NOTES

5 Service and Repair

Power amplifier type APS 125 is designed and constructed to provide many years of safe, reliable operation. However, if the correct function or operating safety of the instrument is impaired, immediately disconnect it from the mains source and secure it against unintended operation.

For repair contact
- your local representative or
- APS Dynamics Inc. (US customers)
- SPEKTRA GmbH Dresden. (worldwide service)

Under no circumstances should repair be attempted by persons not qualified in electronic instrumentation service.

NOTES

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