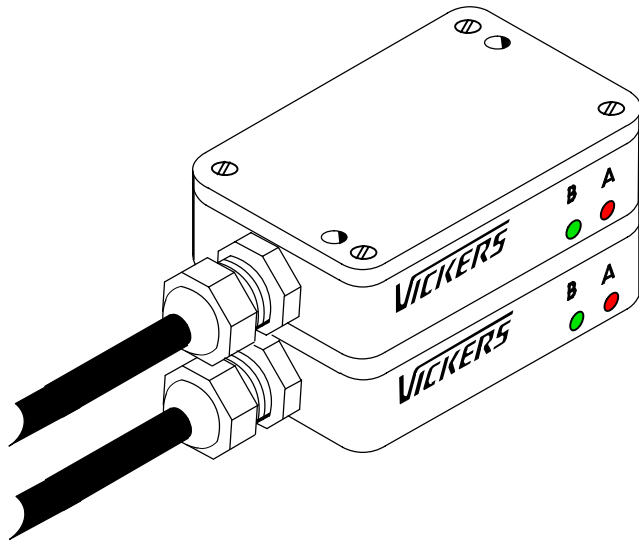


Mobile Open Loop Amplifier

EHD-AMP-73*-***-1*



- The basic amplifier is an analog device that uses state of the art digital technology.
- A diecast aluminium case is used for the weatherproof housing and multiple amplifiers can be stacked to form one easily mountable assembly.
- A proportional version, featuring cable break detection, is available for use with a joystick.
- A softswitch version is offered for use with switched inputs. In conjunction with a Vickers CMX valve this amplifier can provide a “float condition” for attached actuators.
- The amplifier design is adaptable to specific OEM requirements should these not be covered in the basic specification.

General Description

This product has been designed to provide manufacturers of mobile and industrial equipment with a modern, inexpensive and robust electronic amplifier suitable for driving most non-feedback proportional valves. These include the following Vickers valves:

KTG4V-3 and
KTG4V-5 Throttle valves
EPV 16 Valvistor® throttle valves
EPFR1-10 and
EPFR1-16 Flow control valves

KDG4V-3 and
KDG4V-5 Directional valves
KDG5V-5, KDG5V-7
and KDG5V-8 Directional valves
CMX 100 and
CMX 160 Directional valves
KCG-3, KCG-6
and KCG-8 Relief valves
KXG-6 and
KXG-8 Pressure reducing valves
ERV1-10, ERV1-16
and ERV2-10 Cartridge pressure
relief valves

Features

- Modern digital power technology with low heat generation.
- Environmental protection to IEC 529 IP 67 specification.
- Vibration tested as a complete unit.
- Full electromagnetic compatibility (EMC) to EN 50081-2 and EN 50082-2.
- Wide temperature range.
- Built-in diagnostics using LEDs.
- Reverse polarity and short circuit protected.
- Internal user adjustments for:
 - Gain
 - Deadband Compensation
 - Ramps
 - Dither (amplitude).
- Cable break detection for joysticks.
- Design for easy custom packaging.
- Double and single solenoid versions.
- 12 volt and 24 volt versions.



This product has been designed and tested to meet specific standards outlined in the European Electromagnetic Compatibility Directive (EMC) 89/336/EEC, amended by 91/263/EEC, 92/31/EEC and 93/68/EEC, article 5. For instructions on installation requirements to achieve effective protection levels, see this leaflet and the Installation Wiring Practices for Vickers Electronic Products leaflet 2468. Wiring practices relevant to this Directive are indicated by Electromagnetic Compatibility (EMC).

Operation, Diagnostics and Installation

Operation

The amplifier has outputs for two solenoids each providing pulse width modulated (PWM) current drives of up to 3.5A depending on supply voltage.

The magnitude of the output current is determined by the input command signals and the gain setting. It is maintained constant by the amplifier at the command level even though the solenoid coil resistance varies due to temperature changes.

Frequency generation for the PWM and the dither is provided by the digital circuitry at the core of the amplifier. Adjustments for gain, deadband compensation, ramps and dither are made by operating the internal potentiometers which are accessible to the user by removing the cover from the housing.

The two gain and deadband adjustments can be used to tune the amplifier to match the spool overlaps in the valves being used. Dither amplitude can also be adjusted for optimum performance in the actual application.

Ramp adjustments can be set to limit the maximum rate of change for the output currents. These are usually necessary with the switched inputs of the softswitch version but can also be effectively used to prevent rapid joystick movements producing unacceptable jumps in the outputs.

Overloads - All Types

When operating solenoids A or B any overload is detected by the amplifier, which turns off. Removal of the fault results in the amplifier re-setting itself immediately.

Proportional Version for Joysticks

To take advantage of the cable break safety feature, a joystick with an operating range of 5% to 95% of the total resistance should be used. The reference voltage for the joystick is provided by the amplifiers on pins 1 and 2. Any input voltage from the joystick on pin 3 which is less than 5% of V_{ref} or more than 95% of V_{ref} is treated by the amplifier as a fault condition and it will switch itself off. A cable break or short

circuit could give rise to these two conditions. Immediately the input voltage returns within the 5% to 95% range, the amplifier will continue working as normal.

An additional deadband is built into the input circuitry so that variations of $\pm 10\%$ from the centre position do not produce any outputs. This is done to prevent small joystick movements which may be caused by vibration, etc., causing unwanted movement of the actuator.

The true input voltage operating range for solenoid B input is from 40% to 5% of V_{ref} and for solenoid A from 60% to 95% V_{ref} .

Softswitch Version

Switched input signals at supply voltage level are used to drive the amplifier. When applying voltage to the switching inputs A or B, the solenoids A or B are energized. The current jumps to the deadband value and then rises with the set ramp time to an adjustable maximum current. When removing the voltage from the switching inputs, the current ramps down to the deadband value and then shuts off completely. Solenoid A has to be used for the raising, solenoid B for the lowering function to take advantage of a built-in safety feature (see below). It is possible to use the floating position of the CMX valve with this amplifier. The floating position is reached when applying supply voltage on both switching inputs A and B simultaneously. If one solenoid was energized before, the current in this solenoid will first be ramped down to zero. No ramp time is used to enter or leave the float position.

Built-in Safety Features when Using the Softswitch Amplifier with CMX Valves

1. When both inputs are switched on to move the valve to the float position, solenoid B is turned on first. The amplifier then checks that current is flowing in solenoid B before turning on solenoid A. This ensures that any short output during the transition period can only divert fluid to the B port, never to the A port.

2. When the amplifier is in the float position the current in both solenoids is monitored continuously and if they vary from the preset level both outputs are turned off and the red LED is illuminated. After approximately 2 seconds the amplifier will try to re-set itself to the float position as described in 1. above.

Diagnostics

Two LEDs are used to show the operating status of the amplifier. LED B lights up green when the supply voltage is applied. LED A and/or LED B light up yellow when solenoid A/B is energized.

LED A lights up red on joystick or cable errors.

Installation

The following notes will be found useful when installing the amplifiers

- Use shielded cable for maximum EMI rejection.
- Connect the joystick directly to the amplifier. Do not use external ground or supply.
- If joysticks with operation range less than 5% to 95% are used (for example 25% to 75%) the gain setting can be adjusted to more than 100% to allow maximum current.
- To protect the amplifier from damage in case of a load dump, an external fuse must be used.
- To prevent the potentiometer settings from changing, it is recommended to seal the adjusting screws (e.g. Loctite Screwlock 222).

Connections

The following cables are required and they should be 1 mm² (18 AWG) minimum.

Proportional Version

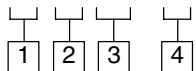
Joystick input 3 leads
Solenoid A+B 2 leads
Power supply 2 leads

Softswitch Version

Switching inputs A+B 2 leads
Solenoid A+B 2 leads
Power supply 2 leads

Model Code

EHD - AMP - 73 * - * ** - 1*



1 Supply voltage

0 = 24V
1 = 12V

2 Function

C = Softswitch-switching inputs
(double solenoids)
D = Joystick-input (double solenoids)
E = Joystick input (single solenoids)
F = Softswitch (single solenoid)

3 Current rating

08 = 0,8 A (Type 730 only)
16 = 1,6 A
35 = 3,5 A (Type 731 only)

4 Design number, 1* series

Subject to change. Installation dimensions unaltered for design numbers 10 to 19.

Technical Data

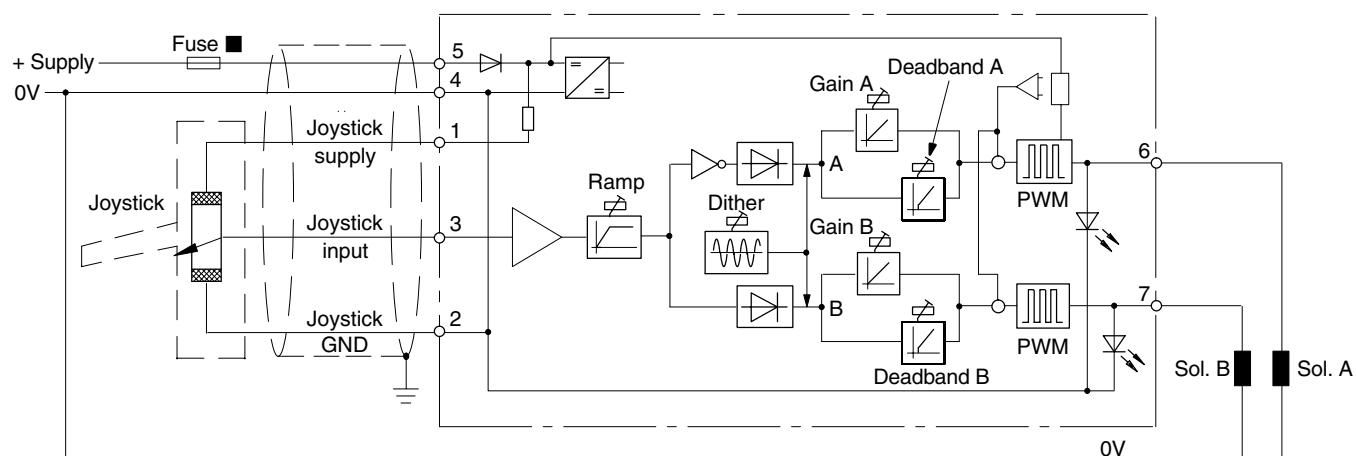
Power (input) supply	24 volt version: 19 to 32V DC including 10% ripple 24V DC nominal 12 volt version: 9 to 16V DC including 10% ripple 12V DC nominal
Load dump protection on supply voltage	150V DC x 150 Hz AC (must have external fuse fitted)
Absolute maximum voltage	72V absolute max. for less than 1,5 ms
Fuse (necessary for load dump protection)	0,8 amp rated current: 2A (fast) 1,6 amp rated current: 2A (fast) 3,5 amp rated current: 4A (fast)
Max. power consumption incl. solenoid	45W (one solenoid energized)
Reverse polarity protected	Yes
Short circuit protected	Yes
Output current per solenoid: 12V version 24V version	1,6A / 3,5A 0,8A / 1,6A
Max. output voltage: Typical, at 1,6A output current	Typically 1,5V below supply voltage
Deadband compensation (Min. A & Min. B) Trigger level	0% to 50% of max. current ± 10% of max. input command
Gain	0% to 110% of max. current
Float current	50 to 80% of max. (adjustable)
Ramp time	50 ms to 5s, for all 4 quadrants
PWM frequency	500 Hz
Dither: Frequency Amplitude	100 Hz 0 to 25% of max. current
Joystick: Resistance Operation range	5 k Ω (0,3W max. power dissipation) 1 k Ω (1W max. power dissipation) "D" version: solenoid "A", 40% to 5%; solenoid "B", 60% to 95% "E" version: 10% to 95%
Max current from pin 1	30 mA
Input impedance on pin 5	45 k Ω
Vickers environmental specification	Class II; product for mobile market
Electromagnetic compatibility (EMC): Emission Immunity	EN-50081-2 EN-50082-2
ASAE-standard	EP455, Level 2 (pressurized cabs)
Temperature range: Operating Storage	-30 to 70°C (-22 to 158°F) -40 to 85°C (-40 to 185°F)
Cable clamp size Max. cable diameter Wire size	PG11 11 mm (0.43 in) 0,5 to 2,5 mm ² (22 AWG to 12 AWG)
Mechanical vibration	0,54 mm (0.02 in): 10 to 55 Hz 5g: 55 Hz to 20 kHz
Protection class	IP 67, IEC 529
Housing material	Die cast aluminium
Size, approx.	95 x 65 x 35 mm (3.74 x 2.56 x 1.38 in)

Electrical Block Diagrams

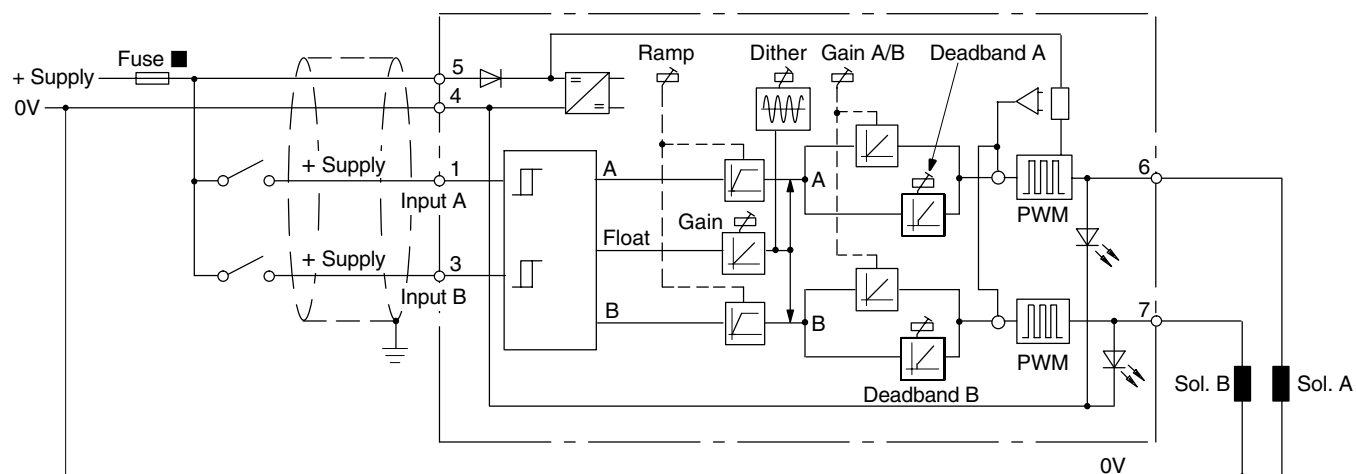
Additional Data for Softswitch Version

Switching input voltage level 24 volt supply version	-3V to 5V 13V to 30V 5V to 13V	Off On Signal at previous level (hysteresis)
Switching input voltage level 12 volt supply version	-3V to 5V 7V to 30V 5V to 7V	Off On Signal at previous level (hysteresis)
Input modes (C version)	Input A = ON Input B = OFF Input A = OFF Input B = ON Input A = ON Input B = ON	Solenoid A operating Solenoid B operating Float position (CMX only)

Type EHD-AMP-73*-D/E**-10



Type EHD-AMP-73*-C/F**-10



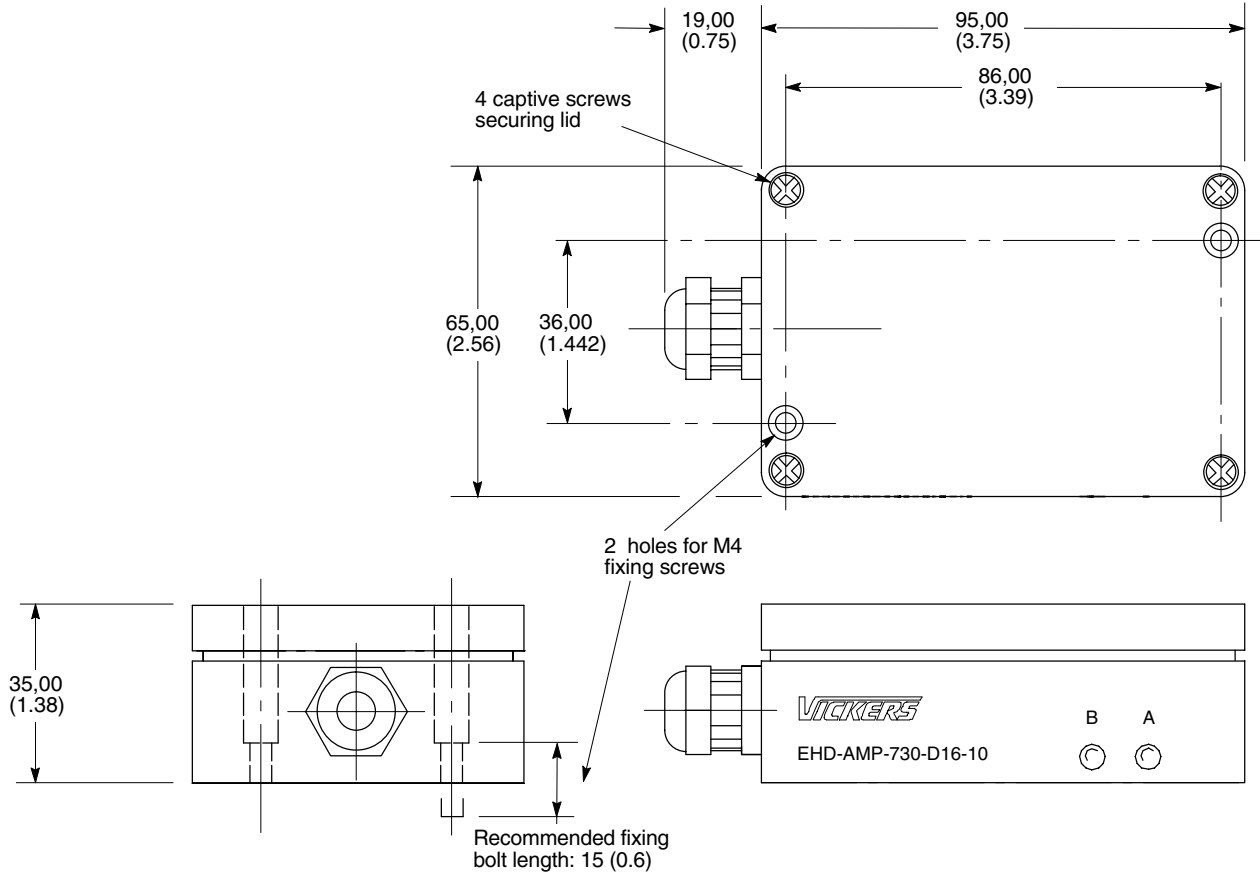
Note: Models E and F operate the "A" solenoid only. The "B" channel components are not fitted.

■ Fuse, see Technical Data.

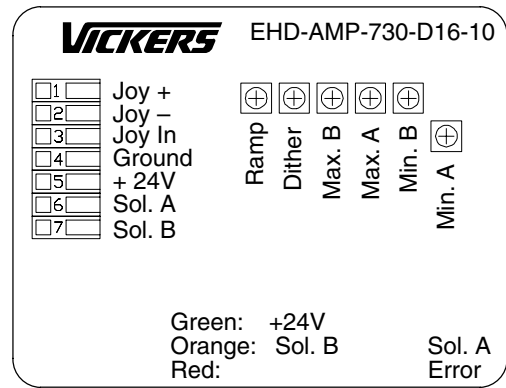
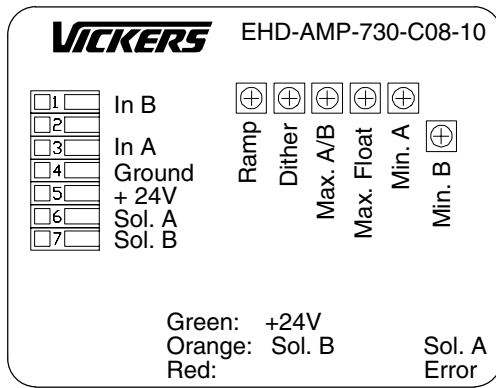
⊥ Chassis ground connection.

Installation Dimensions in mm (inches)

3rd angle projection 



Technical Identification and Potentiometer Locations



Note: Models E and F operate the "A" solenoid only. The "B" channel components are not fitted.



Warning: Electromagnetic Compatibility (EMC)

It is necessary to ensure that the amplifier is wired up in accordance with the connection arrangements shown in this leaflet. For effective protection, the user's electrical enclosure, the valve subplate or manifold and the cable screens should be connected to the main chassis of the machine.

In all cases, valve, amplifier and cable should be kept as far away as possible from any source of electromagnetic radiation such as cables carrying heavy current, relays and certain kinds of portable radio transmitters, etc. Difficult environments could mean that extra screening may be necessary to avoid the interference.