

# Power Amplifiers with Strip Guidance Controller Modules

## EEA-PAM-5\*\*-E-32 Series

### General Description

A strip guidance controller serves to control the position of an electro-hydraulic actuator, using optical sensors.

The controller can be used for strip-edge or strip-center guidance or stack height control.

It consists of a power amplifier for proportional valves, and an integrated module for strip guidance control.

### Features and Benefits

- Includes all features of "A" amplifiers
- Input offset compensation
- Strip guidance control
- Voltage or current input sensor interface
- Built-in test feature

For full description of operation, see next page.

### Front Panel

#### LEDs

- [1] 24V power supply input, green
- [2] 15V control supply output, green
- [3] Drive (solenoid) enabled, yellow
- [4] Overload, red
- [5] LVDT failure, red
- [6] Drive level to solenoid, yellow

#### Potentiometers

- [7] Deadband compensation, flow P to B
- [8] Deadband compensation, flow P to A

#### LED

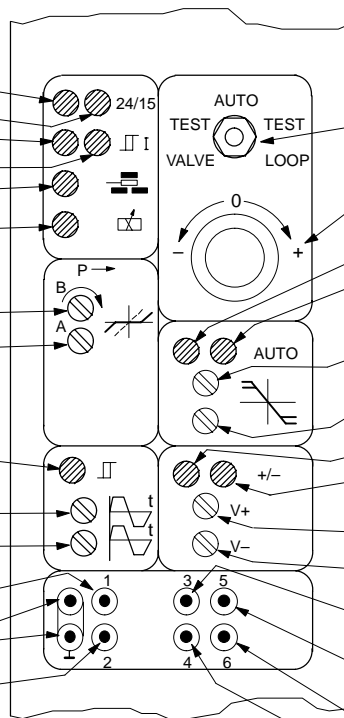
- [9] Ramps enabled, yellow

#### Potentiometers

- [10] Acceleration ramp
- [11] Deceleration ramp

#### Monitor points ■

- [12] MP1: Conditioned input signal
- [13] Common ground (0V)
- [14] MP2: LVDT (spool) position ▲



- [15] Mode switch
  - TEST VALVE setting
  - AUTO function setting
  - TEST LOOP setting

- [16] Test potentiometer

#### LEDs

- [17] Controller active, yellow
- [18] Sensor out of range, red

#### Potentiometers

- [19] Maximum closed-loop velocity +
- [20] Maximum closed-loop velocity –

#### LEDs

- [21] Open-loop command (+) active
- [22] Open-loop command (–) active

#### Potentiometers

- [23] Open-loop command +
- [24] Open-loop command –

#### Monitor points ■

- [25] MP3: Output signal of sensor with current output, non-inverting
- [26] MP5: Conditioned sensor signal, ±10V full scale
- [27] MP6: Controller output
- [28] MP4: Output signal of sensor with current output, inverting

▲ Solenoid current for EEA-PAM-523/525-E models.  
 ■ Ø2,0 mm (0.0787" dia.) sockets.

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

Non-contact optical sensors measure the position of the strip edge. The output from a sensor is an electrical signal, which is fed to the strip guidance controller (signal ranges 0 to 20 mA, 4 to 20 mA, 0 to +10V, or 0 to +24V). When activated, the strip guidance controller maintains the strip edge exactly in the center of the measuring range.

If the position of the strip edge deviates from the center of the measuring range, the controller causes the actuator to move the strip edge back into position.

When closed-loop control is activated by the digital input signal "Automatic", the strip edge is moved from its current position into the measuring range of the

sensor. The maximum actuator velocity (forwards and reverse) can be set on the front panel. Whenever the strip edge leaves the measuring range of the sensor, the controller generates a digital output signal which can be processed by the machine controller.

If closed-loop control is not activated, the controller can be operated open-loop. In this case the actuator travels at the velocity set by potentiometer "V+" when digital input "set +" is activated. "V –" and digital input "set –" are used for movements in the reverse direction.

A built-in test function together with front panel monitor points, considerably simplify start-up and fault diagnosis.

## Model Codes

Amplifier model	For valves
EEA-PAM-523-E-32	KDG4V-3
EEA-PAM-525-E-32	KDG4V-5
EEA-PAM-533-E-32	KFDG4V-3
EEA-PAM-535-E-32	KFDG4V-5
EEA-PAM-541-E-32	KHDG5V-5/7/8 zero-lap
EEA-PAM-553-E-32	KSDG4V-3
EEA-PAM-561-E-32	KFDG5V-5/7
EEA-PAM-568-E-32	KFDG5V-8
EEA-PAM-581-E-32	KHDG5V-5/7/8

## Operating Data

Power supply	zbd32	See appropriate base amplifier, e.g. for EEA-PAM-535-E-32 see EEA-PAM-535-A-32
Control (output) supplies	z22	+15V for LVDTs only
Differential inputs for sensor:		
Voltage input, non-inverting	d2	+24V max., $R_i = 100\text{ k}\Omega$
Voltage input, inverting	d6	24V max., $R_i = 100\text{ k}\Omega$
Current input, non-inverting	d8	20 mA max., $R_i = 100\Omega$
Current input, inverting	d12	20 mA max., $R_i = 100\Omega$
Digital inputs (opto-isolated):		
Set +	d22	24V DC nom., 20 to 40V DC max., $R_i = 2,7\text{ k}\Omega$
Set –	d20	24V DC nom., 20 to 40V DC max., $R_i = 2,7\text{ k}\Omega$
Automatic	d18	24V DC nom., 20 to 40V DC max., $R_i = 2,7\text{ k}\Omega$
Drive enable	z24	Enable = 9,8 to 40V Disable = 0 to 4,8V or open, $R_i = 47\text{ k}\Omega$
Ramp enable	b24	Enable = 9,8 to 40V Disable = 0 to 4,8V or open, $R_i = 47\text{ k}\Omega$

Continued on next page

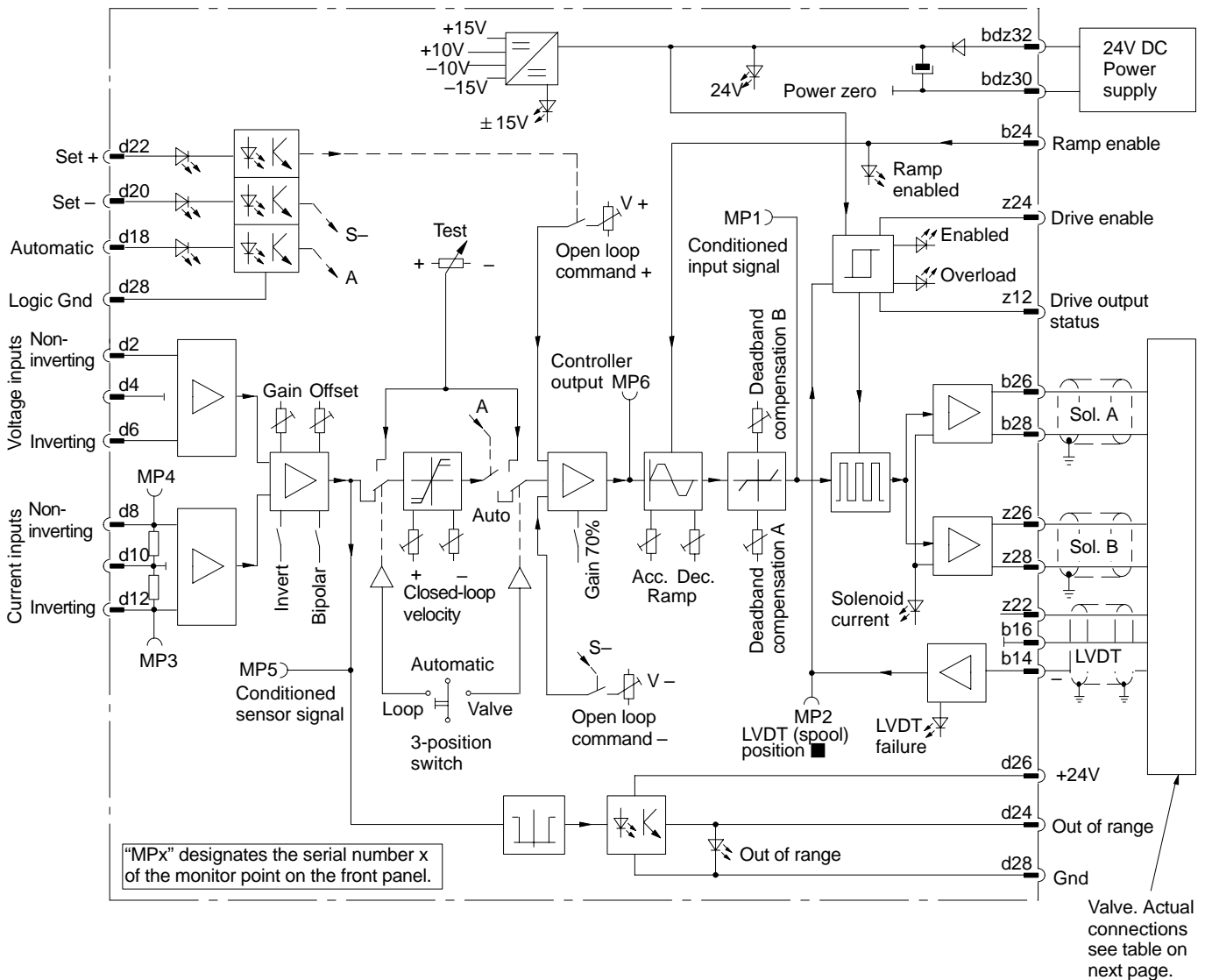
Digital output (opto-isolated): Out of range	d24	24V DC nom. Short-circuit proof. $I_{max} = 100 \text{ mA}$
Potentiometers: Deadband compensation		Separate controls for each direction from spool-centered position 0 to 50% of max. current
Ramp time adjustment		Separate controls for acceleration and deceleration 50 ms to 5 sec
Closed-loop velocities		Separate controls for forward and reverse 5 to 100%
Open-loop command		Separate controls for forward and reverse 0 to 100%
Monitor points (Numbers corresponding to the numbering on the front panel and in the circuit diagram)		MP1: Conditioned input signal, $\pm 10V$ MP2 LVDT (spool) position, $\pm 10V$ ▲ MP3: Output signal of sensor with current output, non-inverting 0 to 2V = 0 to 20 mA MP4: Output signal of sensor with current output, inverting 0 to 2V = 0 to 20 mA MP5: Conditioned sensor signal, $\pm 10V$ MP6: Controller output, $\pm 10V$ All monitor points are short-circuit proof. In all cases: $R(out) = 10 \text{ k}\Omega$
Alarm output: Set alarm Signal	z12	Enable amplifier (on pin z24) when switching power on HIGH when alarm is activated Output = Supply volts minus 2 volts $I = 50 \text{ mA max.}$ LOW when solenoid overload has occurred. (Maintained until reset) Output = 0 to +/-2 volts Output resistance = 50 ohms
Reset after failure		Disable and re-enable on pin z24
Test facilities		3-position switch for: – Valve test mode – Controller test mode – Automatic operation mode <b>Caution:</b> Before setting the mode switch to either “Test valve” or “Test loop” ensure that the test potentiometer is set to “0”, otherwise sudden movements of the actuator may occur.
Operating temperature		0 to 50°C (32 to 122°F)
Storage temperature		-25 to +85°C (-13 to +185°F)
Mass		0,4 kg (0.88 lb) approx.
Installation and start-up guidelines (supplied with product)		9170
Installation wiring requirements for Vickers electronic products		2468
Application notes (available on request)		9062
Supporting products: Power unit options		See catalogs: 2419
Electronic accessories		2460
Portable test equipment		2462 and 2315

▲ Solenoid current for EEA-PAM-523/525-E models.

# Circuit and Connections

## EEA-PAM-533/535-E example ▲

Read circuit in conjunction with that for relevant base amplifier EEA-PAM-5\*\*A



⏏ Customer's protective ground connection.

▲ See footnote at bottom of "Application Examples".

■ Solenoid current for EEA-PAM-523/525-E models.



### Warning: Electromagnetic Compatibility (EMC)

It is necessary to ensure that the valve is wired up in accordance with the connection arrangements shown in this leaflet. For effective protection, the user's electrical cabinet, the valve subplate or manifold and the cable screens should be connected to efficient earth (ground) points. The metal 7-pin connector part no. 934939 should be used for the integral amplifier.

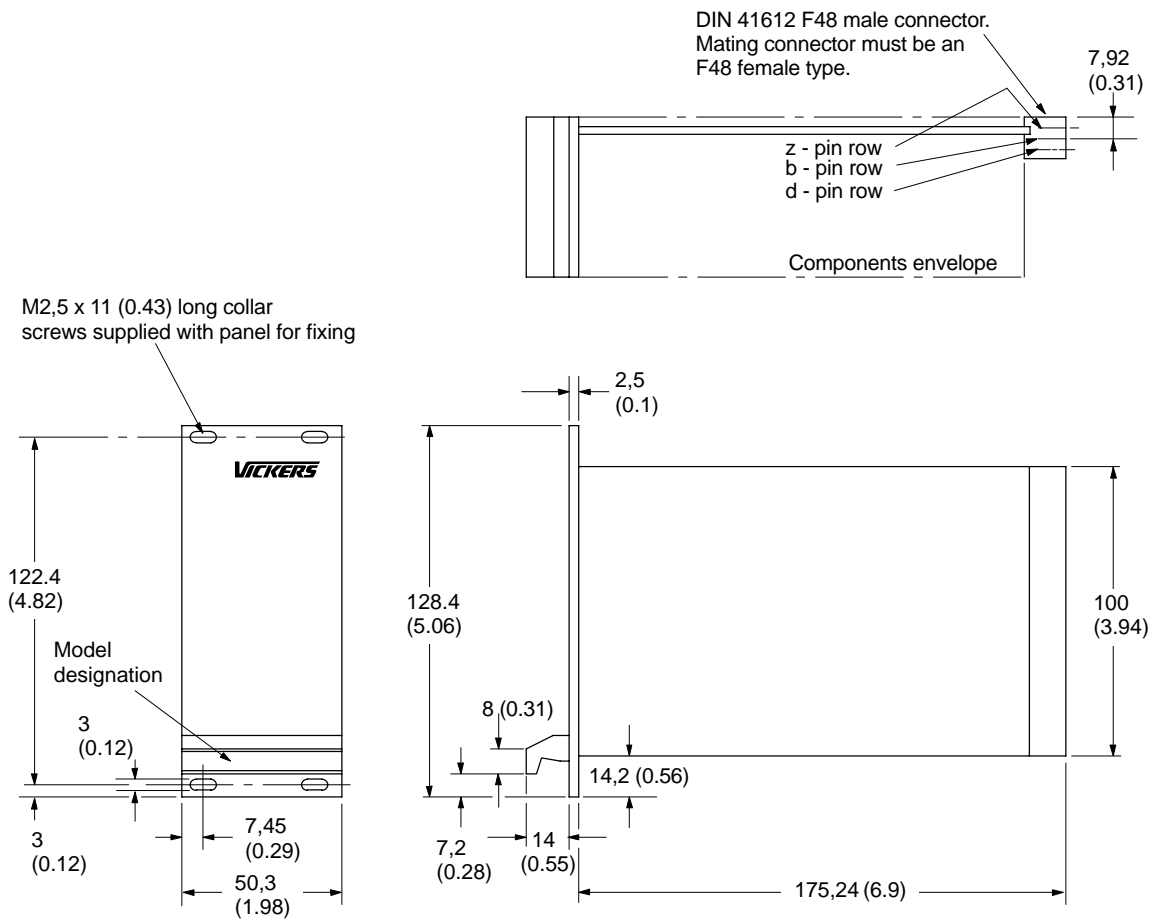
In all cases, both valve and cable should be kept as far away as possible from any source of electromagnetic radiation such as cables carrying heavy current, relays and certain kinds of portable radio transmitters, etc. Difficult environments could mean that extra screening may be necessary to avoid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

# Solenoid and LVDT Connections for Proportional Valves

Amplifier type	Solenoid with LVDT and/or for flow P to B	Solenoid without LVDT, or on pilot valve	Pilot-stage LVDT, (black plug):				Main-stage LVDT, (gray plug):			
			Pin 1	Pin 2	Pin 3	Pin 4	Pin 1	Pin 2	Pin 3	Pin 4
EEA-PAM-523-E-32	b26/b28	z26/z28	-	-	-	Not connected	-	-	-	Not connected
EEA-PAM-525-E-32	b26/b28	z26/z28	-	-	-	Not connected	-	-	-	Not connected
EEA-PAM-533-E-32	b26/b28	z26/z28	-	-	-	Not connected	b14	z22	b16	Not connected
EEA-PAM-535-E-32	b26/b28	z26/z28	-	-	-	Not connected	b14	z22	b16	Not connected
EEA-PAM-541-E-32	-	z26/z28	z14	z22	z16	Not connected	b14	z22	b16	Not connected
EEA-PAM-553-E-32	-	z26/z28	-	-	-	Not connected	b14	z22	b16	Not connected
EEA-PAM-561-E-32	-	z26/z28	-	-	-	Not connected	b14	z22	b16	Not connected
EEA-PAM-568-E-32	-	z26/z28	-	-	-	Not connected	b14	z22	b16	Not connected
EEA-PAM-581-E-32	-	z26/z28	z14	z22	z16	Not connected	b14	z22	b16	Not connected

## Installation Dimensions in mm (inches)

Plug-in Unit of 3U Height, to IEC 297

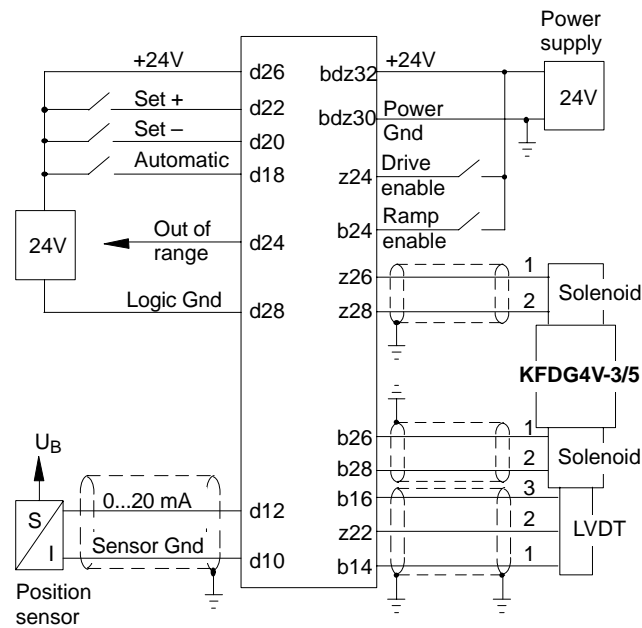


# Application Examples

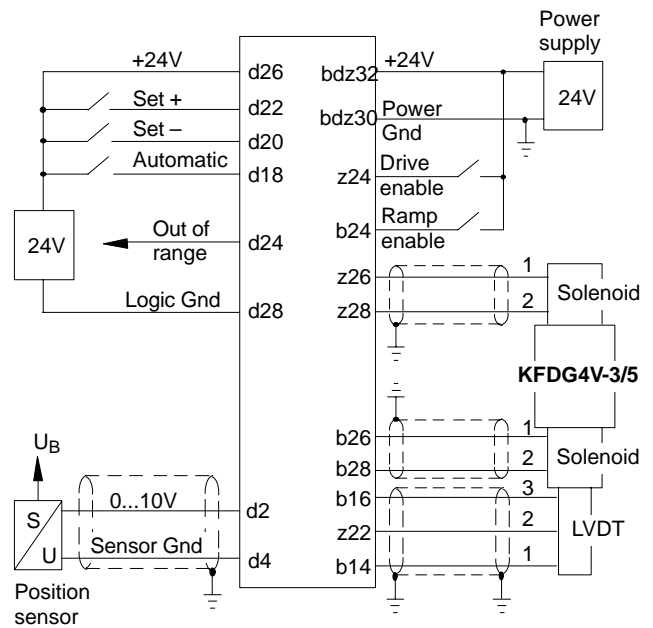
EEA-PAM-533/535-E amplifiers with KFDG4V-3/5 valves ▲

## Strip guidance control, stack height control

Position sensor with current output

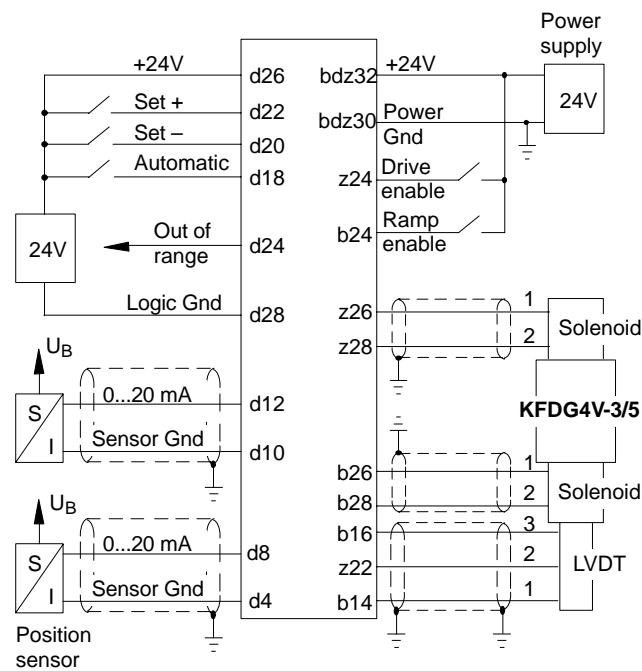


Position sensor with voltage output

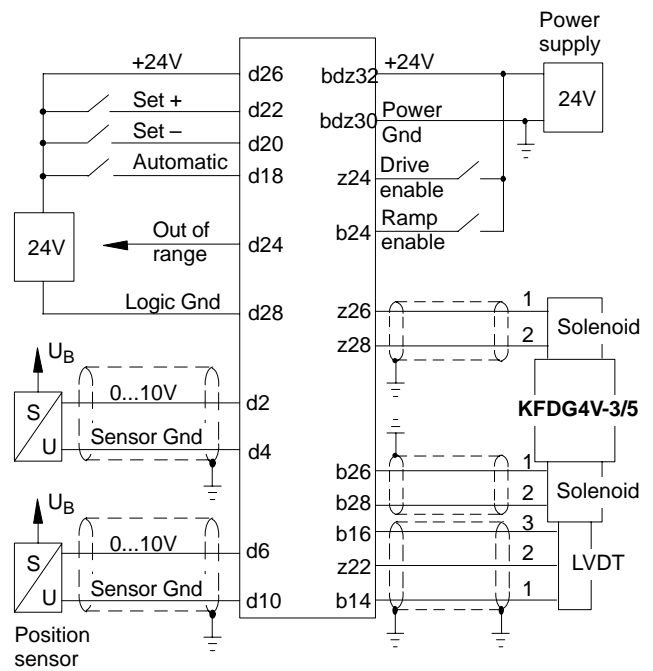


## Strip-center guidance control

Position sensor with current output



Position sensor with voltage output



▲ Other amplifier/valve combinations differ in respect to the LVDT and solenoid connections; see catalog 2464 for the relevant base amplifier EEA-PAM-5\*\*\*-A-32.

⊥ Customer's protective ground connection.