

## Proportional Pressure Relief Valves

### KCG-3, 1\* Series; KACG-3, 1\* series

#### Basic Characteristics

Max. pressure . . . . . 350 bar (5075 psi)  
 Max. flow . . . . . 5 L/min (1.3 USgpm)  
 Mounting face to ISO 4401 size 03

#### General Description

An electro-hydraulic proportional relief valve designed to regulate pressure in a hydraulic system in proportion to an applied electrical input.

These open-loop, single-stage valves can be used for direct control of pressure in low flow systems, or for pilot control of larger pressure controls, and for such applications as pressure-controlled pumps.

#### KCG-3

The valve responds to variations in current supply to its solenoid; separate Vickers amplifiers, with PWM output stage and output current control, are available for driving this model, see "Operating Data".

#### KACG-3

The addition of an integral amplifier allows the pressure to be controlled from a 0 to +10V, or 0 to -10V command signal range. The amplifier is mounted in a robust metal housing and electrical connections are via an industry standard 7-pin plug. Factory-set adjustments ensure high reproducibility valve -to-valve.

#### Other Models

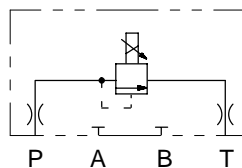
For proportional pressure relief valves with flow ratings up to 400 L/min (106 USgpm), see catalog 2324 (model types KCG, sizes 6 and 8)

#### Features and Benefits

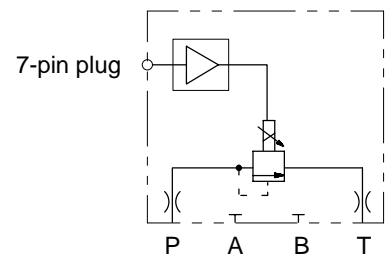
- Valve design ensures low hysteresis and good repeatability.
- Self-bleeding design simplifies installation and ensures consistent performance.
- When used for piloting a large pressure relief or reducing valve, a low minimum pressure is obtainable combined with fast and stable response to step input signals.

#### Functional Symbol

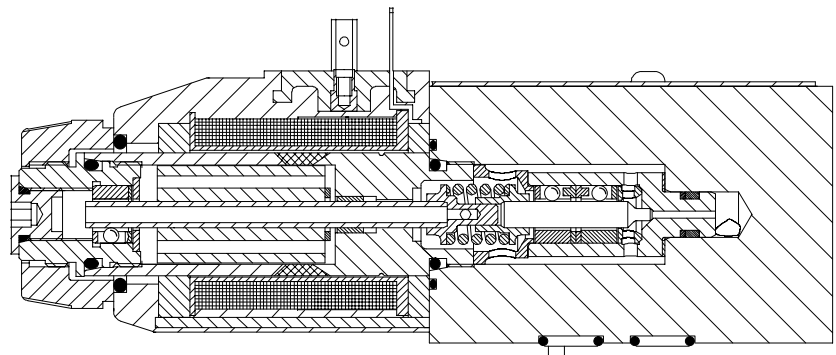
KCG-3



KACG-3



#### Typical Section: KCG-3 Valve with Type "U" Coil Connection



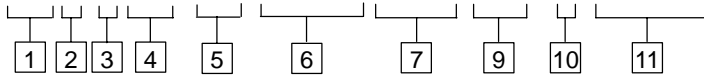
This product has been designed and tested to meet specific standards outlined in the European Electromagnetic Compatibility Directive (EMC) 89/336/EEC, amended by 91/263/EEC, 92/31/EEC and 93/68/EEC, article 5. For instructions on installation requirements to achieve effective protection levels, see this leaflet, the Installation Wiring Practices for Vickers Electronic Products leaflet 2468 and leaflet 02-123931A which is packed with every KA valve. Wiring practices relevant to this Directive are indicated by Electromagnetic Compatibility (EMC).

# Model Code

Features in brackets ( ) may be omitted. All other features must be specified.

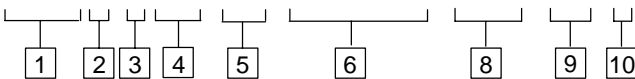
Models requiring separate amplifier

## KCG-3(-L)- \*\*\* -D-Z-M-\*\*\*\*\* - \*\*\* -1\* (-EN46)



Models with integral amplifier

## KACG-3(-L)- \*\*\* -D-Z-M- 2- PD7- H1-1\*



### 1 Valve type

KC = Proportional pressure relief  
KAC = Proportional pressure relief with integral amplifier

### 2 Mounting type

G = Subplate mounted

### 3 Interface

3 = ISO 4401, size 03 (NFPA D03)

### 4 Solenoid location

Blank = At port B end  
L = At port A end

### 5 Controlled pressure range

(All coils except type HJ, see position 9 footnote ▼)

At rated flow of 1 L/min (0.26 USgpm)

40 = 2-40 bar (29-580 psi)  
100 = 3-100 bar (44-1450 psi)  
160 = 4-160 bar (58-2300 psi)  
250 = 5-250 bar (73-3625 psi)  
350 = 6-350 bar (87-5000 psi)

### 6 Standard features

DZM = For KCG-3  
DZM2 = For KACG-3

### 7 Coil connections (KCG only)

U = ISO 4400 (DIN 43650) interface  
FW = Flying-leads in wiring box tapped 1/2" NPT  
FTW = As "FW" plus terminal strip  
FJ = Flying-leads in wiring box tapped M20  
FTJ = As "FJ" plus terminal strip  
P = Plug-in coil (type "H" only)  
Use with "EN46"

### 8 Connections (KACG only)

PD7 = 7 pin connector with plastic plug.  
See **Warning** note below.

### 9 Coil rating

Code = amps x ohms ▲  
G1 = 3,5 x 1,65  
GP1 = 3,0 x 2,0  
H1 = 1,6 x 7,3 ●  
HA1 = 0,94 x 22  
HJ1 = 1,00 x 14,25 ▼  
HL1 = 0,80 x 29 ◆

▲ Resistance at 20° C (68° F).

● KACG valves must have H1 coils

◆ For valves replacing ECG-02 models.

▼ This low power coil is limited to the following maximum controlled pressures.

Valves supplied with type HJ1 coils will be stamped with the applicable maximum controlled pressure.

Model code position 5	Max. pressure with HJ1 coil
40	35 bar (500 psi)
100	85 bar (1230 psi)
160	140 bar (2000 psi)
250	210 bar (3000 psi)
350	315 bar (4500 psi)

### 10 Design number, 1\* series

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

### 11 Special features

EN46 used with P-type coil connection and Uniplug connector. Omit if not required.



### Warning

To conform to the EC Electromagnetic Compatibility directive (EMC) this KACG valve must be fitted with a metal 7-pin plug. The screen of the cable must be securely connected to the shell of the metal connector. A suitable IP67 rated connector is available from Vickers, part no. 934939. Alternatively a non IP67 rated connector is available from ITT-Cannon, part no. CA 02 COM-E 14S A7 P.

Additionally the cable must be fitted with a ferrite EMC suppression core not more than 4cm from the connector referred to above. Suitable types include Farnell 535-898 or Farnell 535-904 which snap fit over the cable.

The plastic plug, part number 694534, is only suitable for use in a sealed electromagnetic environment or outside of the European Community.

## Operating Data

Standard test conditions are with antiwear hydraulic oil at 36 cSt (168 SUS) and 40°C (104°F)	
Maximum pressures: Port P: Operating Static Port T: Operating Static	See [5] in "Model Code" 350 bar (5075 psi)  2 bar (29 psi). See "Back pressure at port T" under "Installation and start-up" on next page. 210 bar (3000 psi)
Flow limits: Rated flow Maximum flow	1 L/min (0.26 USgpm) 5 L/min (1.3 USgpm)
Coil or amplifier rating: KCG models KACG models	See [9] in "Model Code" 24V x 40W max. (22 to 36V including 10% pk.-to-pk. max. ripple)
Command signal ranges, KACG models	0 to +10V DC, or 0 to -10V DC
Dither, KACG models	Factory set, not user adjustable
Monitor point signal, KACG models	0,5V per amp. solenoid current
Power stage PWM, KACG models	2kHz nominal
7-pin plug connections, KACG models: A B C D E F G	Power supply +ve Power 0V Signal 0V +ve voltage command signal -ve voltage command signal Monitor output Protective ground
Electro-magnetic compatibility (EMC) KACG models only: Emission (10V/m) Immunity (10V/m)	EN 50081-2 EN 50082-2
Pressure gain Factory setting - Maximum with 10V command signal. User adjustment - 30 to 120% of factory setting. Note that altering this setting will affect valve to valve interchangeability.	See graph
Pressure override	See graph
Minimum-pressure adjustment	50% of maximum pressure limit of model
Pressure step response: KCG-3-250-D-Z-M-****-H1 model using EEA-PAM-513-A-1* amplifier: 0 to 100% step 100 to 0% step 25 to 100% step 100 to 25% step KACG-3-250 model: 0 to 100% step 100 to 0% step 25 to 100% step 100 to 25% step	Typical times to reach 90% of commanded step:  48 ms 9 ms 37 ms 18 ms  40 ms 18 ms 26 ms 30 ms
Linearity, between 10% and 100% of controlled pressure range	<4%

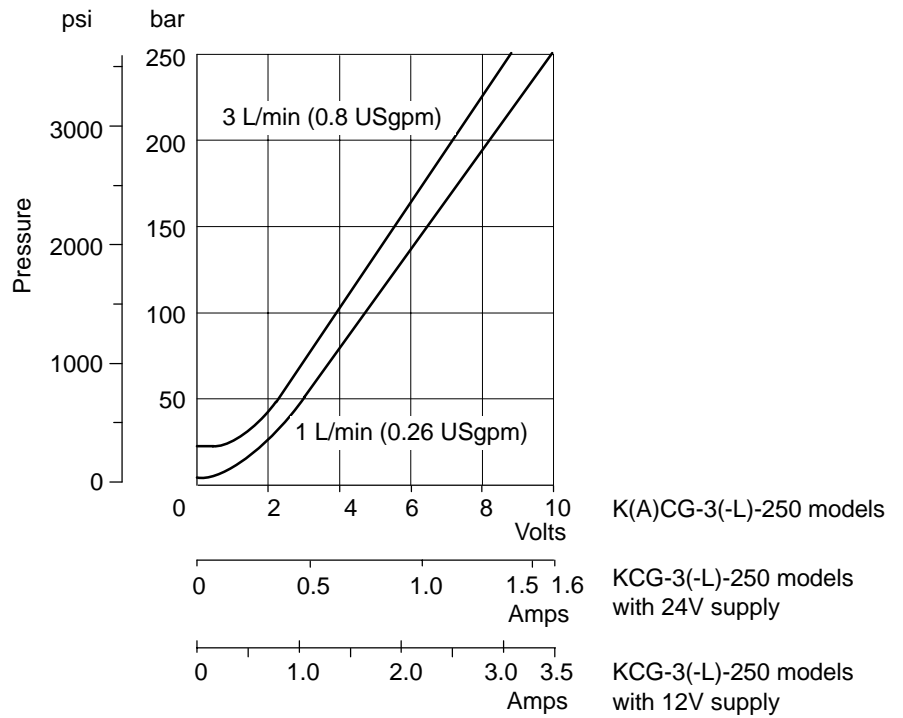
Hysteresis KCG models KACG models	<4% (with 100 mA pk.-to-pk. dither) <5% (with factory-set dither)
Repeatability KCG models KACG models	< ± 0,5% of rated pressure for a constant coil current < ± 1.0% of rated pressure for a constant amplifier supply voltage and constant command signal
Reproducibility (valve to valve) KACG models only	<3% at factory settings
Protection, Electrical (KACG models)	Reverse-polarity protected
Mass (weight) KCG KACG	1,7 kg (3.8 lb) 2,1 kg (4.6 lb)
Supporting products: Amplifiers for KCG valves with "H" type coils only: EHH-AMP-724-C/D-10 (Uniplug) EHH-AMP-7*2 series (power plug) EEA-PAM-513-A-14 (1 adjustable ramp) EEA-PAM-513-A-3* (2 adjustable ramps) Auxilliary electronic modules (Din-rail mounting) for KACG models: EHA CON 201 A 2* signal converter EHD DSG 201 A 1* command signal generator EHA RMP 201 A 2* ramp generator EHA PID 201 A 2* PID controller EHA PSU 201 A 1* power supply ISO 4400 (DIN 43650) electrical connector: Black, marked "B" Gray, marked "A" Subplates, size 03 Mounting bolts ■ ■ <i>Note: If not using Vickers recommended bolt kits, bolts must be to ISO 898 grade 12.9 or stronger.</i>	See catalog 2367 See catalogs 2114, 2115 and 2282 See catalog 2137 See catalog 2464  See catalog 2410B See catalog 2470 See catalog 2410B See catalog 2427 See catalog 2410B  Part number 710775 Part number 710776 See catalog 2425 See catalog 2314A
Installation and start-up (commissioning): Installation and start-up (commissioning) guide  Electrical data Electromagnetic capability Mounting attitude  Back pressure at port T	ML-B-9133B (Multi-lingual English, German, French and Italian), shipped with each product and also available separately on request. See under that heading on previous page. See under that heading on previous page. No restriction, provided that the valve is kept full of fluid through port T. Port T should be piped directly to reservoir with minimum restriction. Any back pressure at this port is additive to the controlled pressure at port P. The recommended max. pressure at port T when the valve is controlling pressure is 2 bar (29 psi); the max. pressure at T under static conditions is 210 bar (3000 psi).
Ordering procedure	Valves, subplates, bolt kits and Vickers amplifiers should be ordered by full model code designation. Order ISO (DIN) electrical connectors by part number.

# Performance Data

## Pressure Gain, Typical

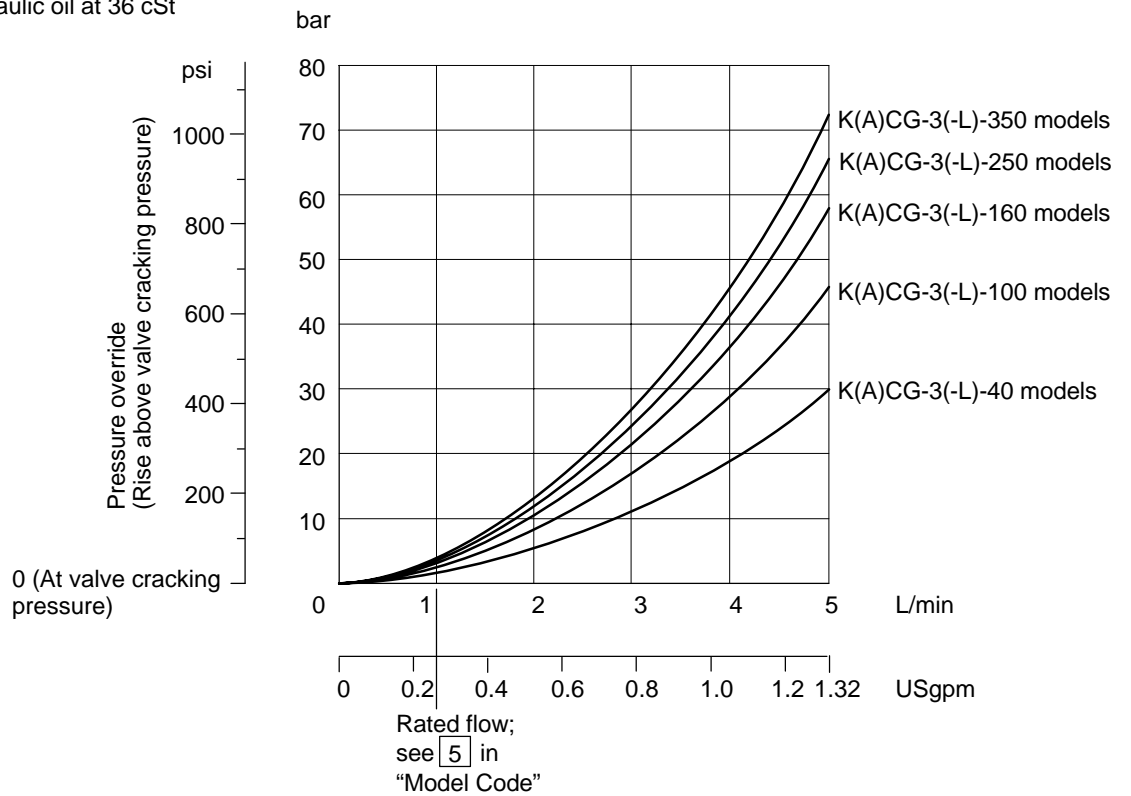
Typical pressure v. command signal response of K(A)CG-3-250 models

Test conditions:  
 Fluid = Antiwear hydraulic oil at 36 cSt (168 SUS)



## Pressure Override, Typical

Test conditions:  
 Fluid = Antiwear hydraulic oil at 36 cSt (168 SUS)



# KACG-3 Electrical Block Diagram

## Wiring

Connections must be made via the 7-pin plug mounted on the amplifier.  
Recommended cable sizes are:

Power cables:

For 24V supply

0,75 mm<sup>2</sup> (18 AWG) up to 20m (65 ft)

1,00 mm<sup>2</sup> (17 AWG) up to 40m (130 ft)

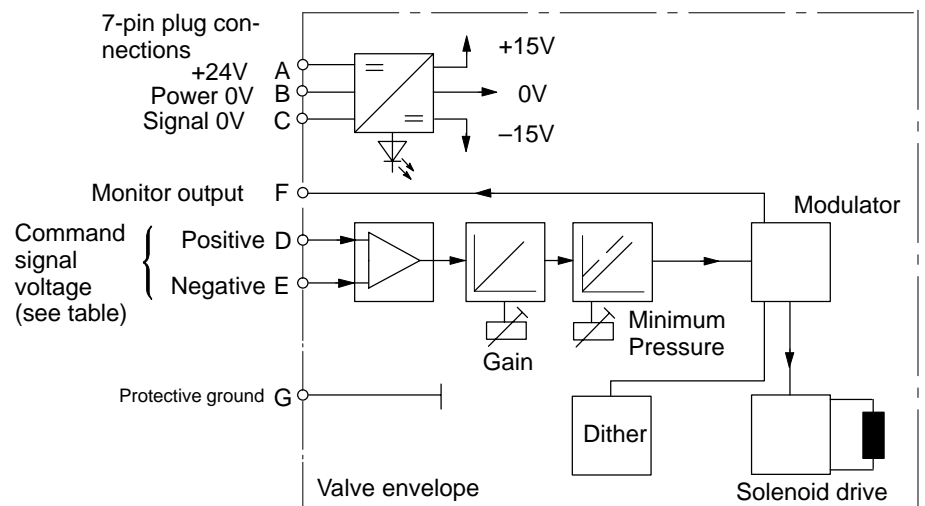
Signal cables:

0,50 mm<sup>2</sup> (20 AWG)

Screen:

A suitable cable would have 7 cores, a separate screen for the signal wires and an overall screen.

See wiring connection diagram on page 7

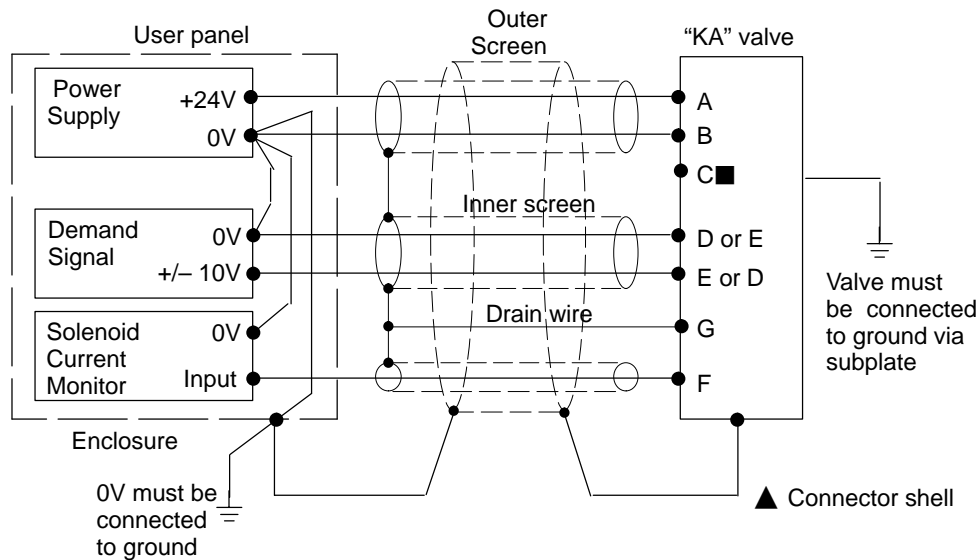


### Warning

All power must be switched off before connecting or disconnecting any plugs.

# KACG-3 Typical Connection Arrangements

## Wiring Connections for Valves with integral Amplifier



■ Solenoid current monitor voltage (pin F) will be referenced to the KA valve local ground. A "local ground" (pin C) is provided for optional use by differential input customer supplied electronics.

▲ Note: In applications where the valve must conform to European RFI/EMC regulations, the outer screen (shield) must be connected to the outer shell of the 7-pin connector and the valve body must be fastened to the earth ground. Proper earth grounding practices must be observed in this case, as any differences in command source and valve ground potentials will result in a screen (shield) ground loop.



### Warning

Do not ground pin C. If the local ground (pin C) is not used for differential monitor electronics, do not use. Read monitor pin F with respect to ground.



### Warning

Electromagnetic Compatibility (EMC)

It is necessary to ensure that the valve is wired-up as above. For effective protection, the user electrical cabinet, the valve subplate or manifold, and the cable screens should be connected to efficient ground points. The metal 7-point connector, part no. 934939, should be used for the integral amplifier.

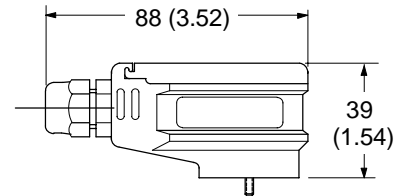
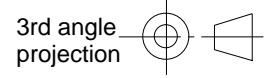
In all cases, both valve and cable should be kept as far as possible from any sources of electromagnetic radiation such as cables carrying heavy current, relays and certain kinds of portable radio transmitters, etc. Difficult environments could mean that extra screening may be necessary to avoid the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

It is important to connect the 0V lines as shown above. The multi-core cable should have at least two screens to separate the demand signal and monitor output from the power lines.

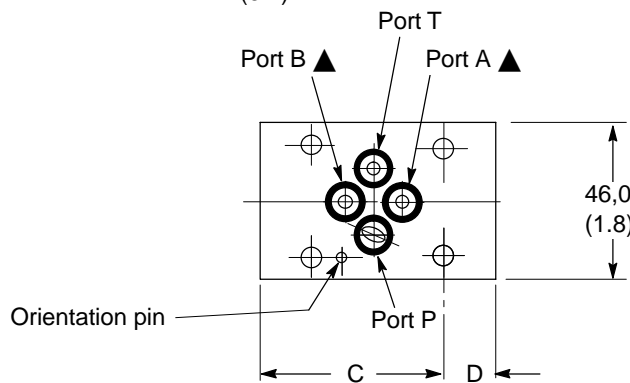
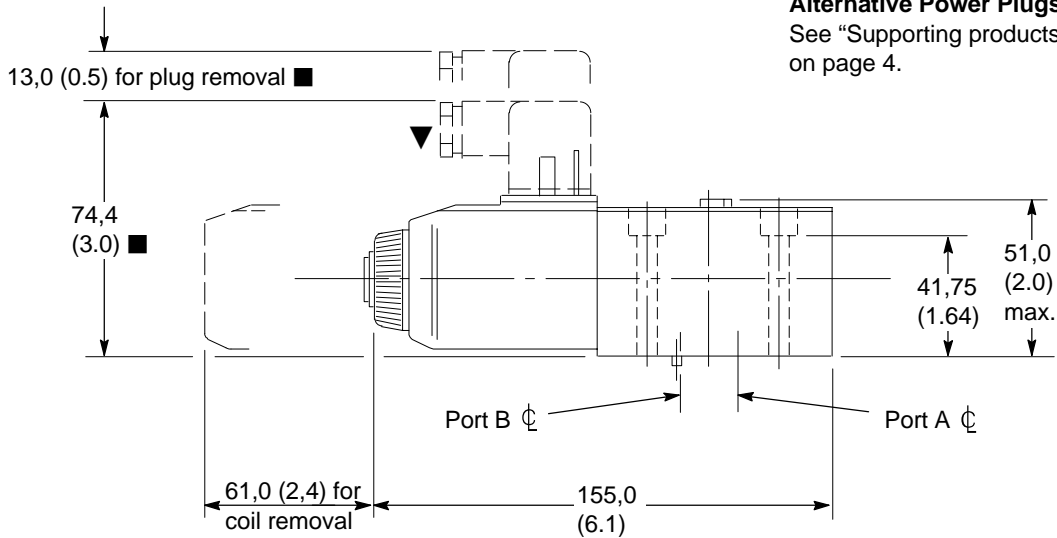
# Installation Dimensions in mm (inches)

## KCG-3-\*\*\*-D-Z-M-U-10 models

For KCG-3-L-\*\*\*-D-Z-M-U models the solenoid is mounted at port A-end of body, which then has C and D dimensions as in table.



**Alternative Power Plugs**  
See "Supporting products" on page 4.



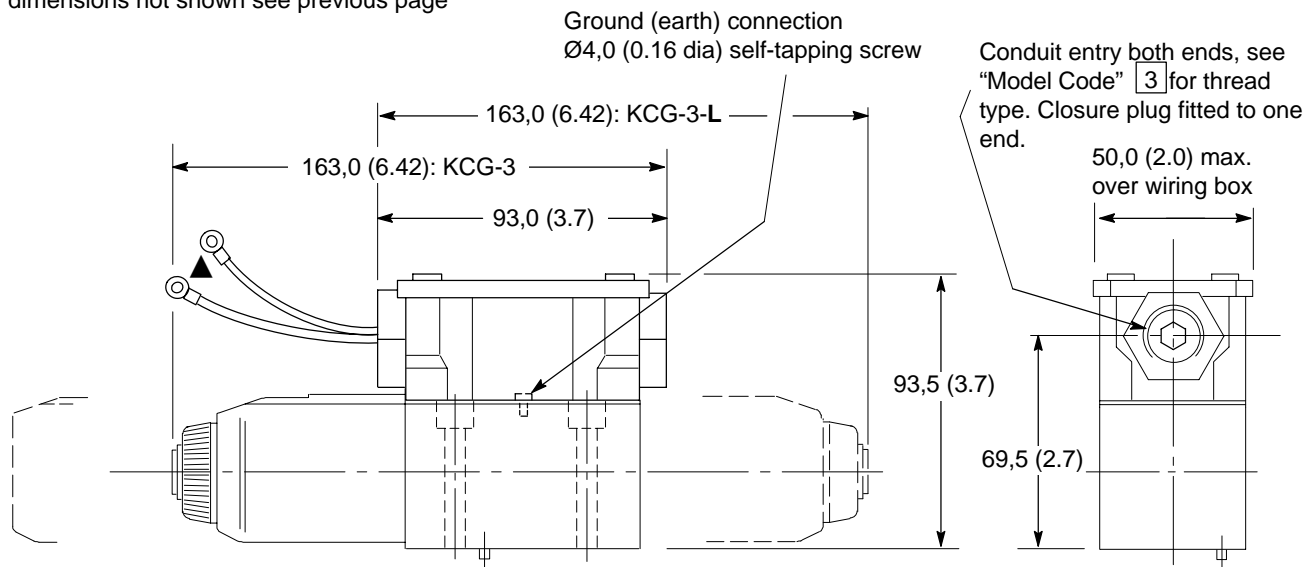
Model	C	D
KCG-3-***	57,3 (2.26)	20,5 (0.81)
KCG-3-L-***	61,2 (2.41)	16,8 (0.66)

- KCG-3-(L)-\*\*\*-D-Z-M-U models.  
Dimensions may vary according to source of plug.
- ▲ Ports A and B are blind holes with O-ring recesses.
- ▼ The cable entry on this plug can be repositioned at 90° intervals by reassembly of the contact holder relative to the plug housing. The cable entry is Pg 11 for cables Ø6-10 mm (0.24-0.4" dia).



**KCG-3-(L)-\*\*\*-D-Z-M-F\*\*-\*\*1-10 models**

For dimensions not shown see previous page



▲ Ref. Model Code [7]:

Codes "FJ" and "FW": 2 lead wires approx. 150,0 (6.0) long.

M3 terminals provided for customer connection.

Codes "FTJ" and "FTW": Lead wires connected into terminal strip suitable for M3 terminals on customer connection.

**KCG-3-(L)-\*\*\*-D-Z-M-P-H1-10-EN46**

For use with Vickers single-cable UNIPLUG connectors:

**For "Soft Switch" Control:**

Use UNIPLUG model type EHH-AMP-724-C\*\*-1\*

**For Proportional Control:**

Use UNIPLUG model type EHH-AMP-724-D\*\*-1\*

UNIPLUG connectors should be ordered separately;  
see catalog 2367.

To fit UNIPLUG connector to KCG-3 valve:

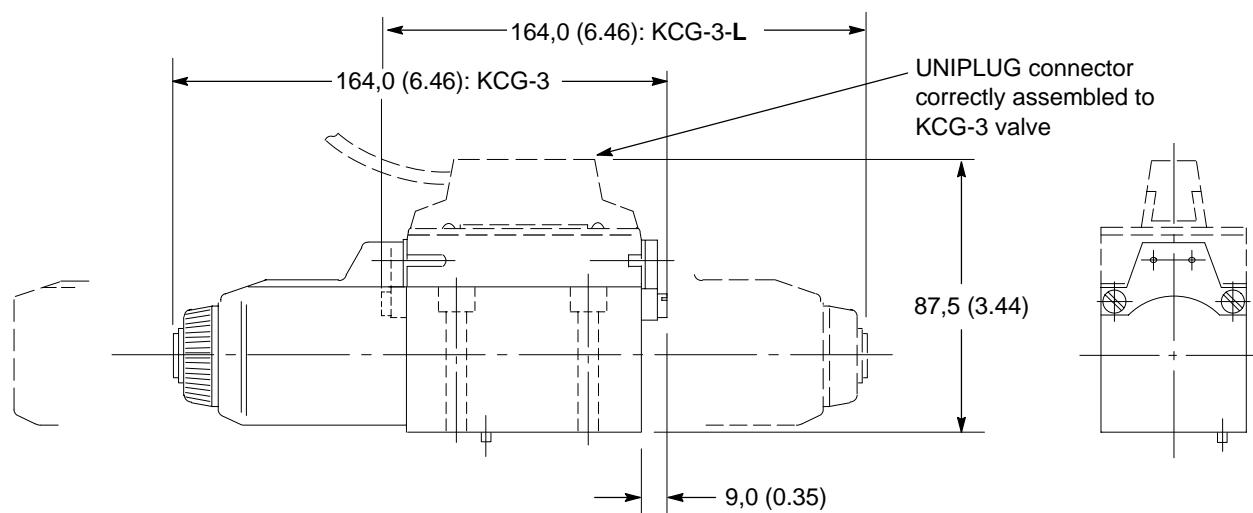
Unscrew coil retention nut and remove coil.

Slide UNIPLUG connector onto dummy pins (at non-solenoid

end) then replace coil, ensuring pins are fully engaged.

Replace and tighten coil retention nut.

For dimensions not shown see previous page.



**KACG-3-\*\* models**

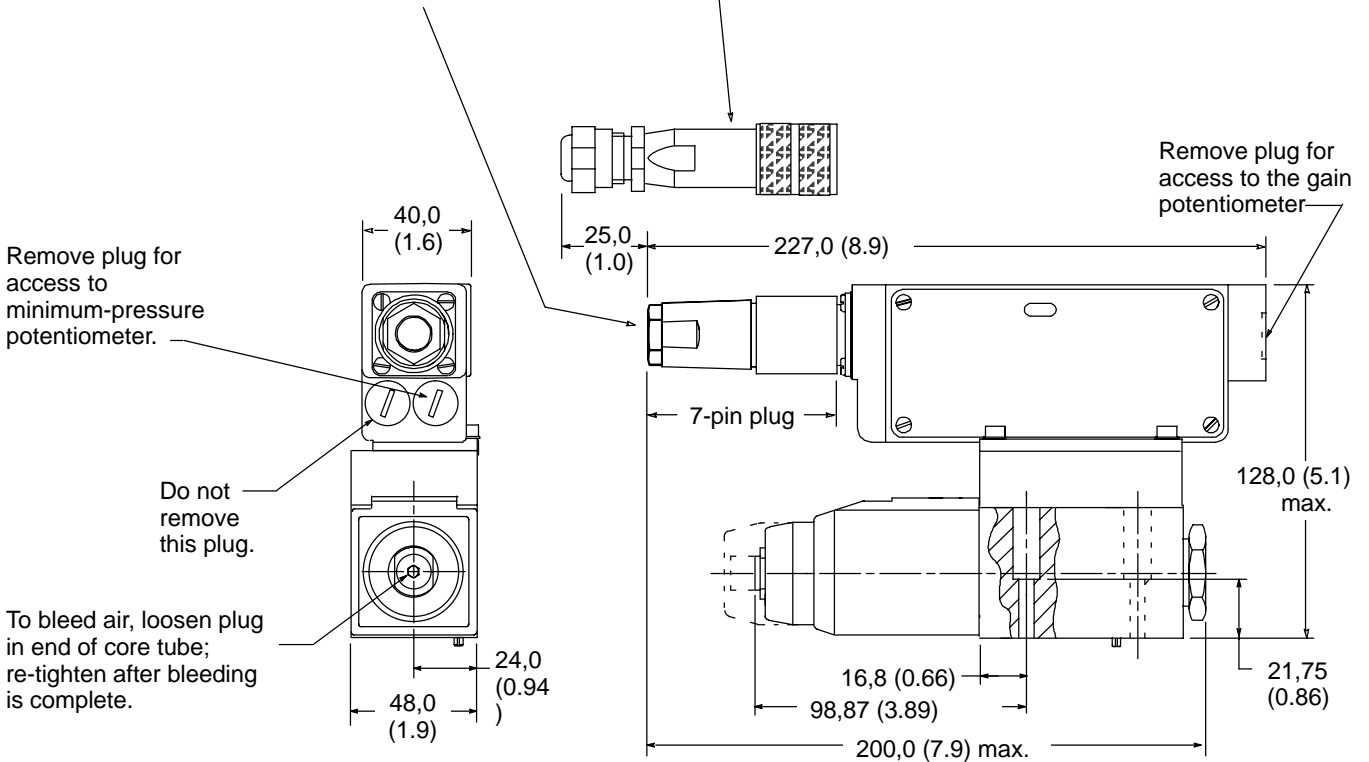
For KACG-3-L-\*\*\* models the solenoid is mounted at port A-end of body (both versions have C and D dimensions as in table on page 8 ) and the amplifier turned through 180°

**Metal plug 934939**

Cable outside diameter 8,0 to 10,5 (0.31 to 0.41)  
Must be used for full EMC protection. See also warning note on page 2

**Plastic plug 694534**

PG11. Cable maximum outside diameter 11,0 (0.43)



See **Warning** note on page 2 regarding the use of 7-pin plugs.

## Further Information

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### Hydraulic Fluids

Materials and seals used in these valves are compatible with:

Anti-wear petroleum oils ..... L-HM  
Non-alkyl based  
phosphate esters ..... L-HFD

The extreme operating range is 500 to 13 cSt (270 to 70 SUS) but the recommended running range is 54 to 13 cSt (245 to 70 SUS). For further technical information about fluids see 694.

### Contamination Control Requirements

Recommendations on contamination control methods and the selection of products to control fluid condition are included in Vickers publication 9132 or 561, "Vickers Guide to Systemic Contamination Control". The book also includes information on the Vickers concept of "ProActive Maintenance". The following recommendations are based on ISO cleanliness levels at 2 µm, 5 µm and 15 µm.

For products in this catalog the recommended levels are:

Up to 210 bar (3000 psi) ..... 18/16/13  
Above 210 bar (3000 psi) .... 17/15/12

### Installation and Start-up Guidelines

The proportional valves in this catalog can be mounted in any attitude but it may be necessary, in certain demanding applications, to ensure that the solenoids are kept full of hydraulic fluid.

If this proves to be the case any accumulated air can be bled from the solenoid bleed screw. This task is easier if the valve has been mounted base downwards. Good installation practice dictates that the tank port, and any drain port, are piped so as to keep the valve full of fluid once the system start-up has been completed.

### Temperatures

For petroleum oil:

Min. .... -20°C (-4°F)

Max.\* ..... +70°C (158°F)

\* *To obtain optimum service life from both fluid and hydraulic system, 65°C (150°F) normally is the maximum temperature.*

For other fluids where limits are outside those of petroleum oil, consult fluid manufacturer or Vickers representative. Whatever the actual temperature range, ensure that viscosities stay within those specified under "Hydraulic Fluids".

Ambient for:

Valves at full performance specification:

-20 to +60°C (-4 to +140°F).

Valves, as above, will operate at temperatures of 0 to -20°C (32 to -4°F) but with a reduced dynamic response.

Storage:

-25 to +85°C (-13 to +185°F)

Eurocard electronics:

0 to 50°C (32 to 122°F)

### Seal Kits

K(A)CG-3 (KA + DIN) ..... 02-138201

KCG-3 ('F' & 'P' versions) .. 02-145869