VICKERS®

Proportional Valves

Proportional Pressure Relief Valves

K(A)CG-6/8, 1* Series

Basic Characteristics

Max. pressure . . . . . 350 bar (5000 psi)
Max. flow rate . 400 L/min (106 USgpm)
Mounting face to ISO 6264:
For K(A)CG-6 . . . . . AR-06-2-A
For K(A)CG-8 . . . . . AS-08-2-A

General Description

These two-stage pressure relief valves (based on Vickers type CG2V valves featured in catalog 2323) offer extensive application possibilities through their ability to control the pressure setting in proportion to an applied electrical input (up to a pressure limit which is manually adjustable and lockable).

Two model types are available

KCG-6/8
The valve responds to variations of current input to its solenoid, for which separate Vickers drive amplifiers, with PWM output stage and output current control, are available.

The proportional pilot control stage is a Vickers type KCG-3 valve, described in catalog 2162.

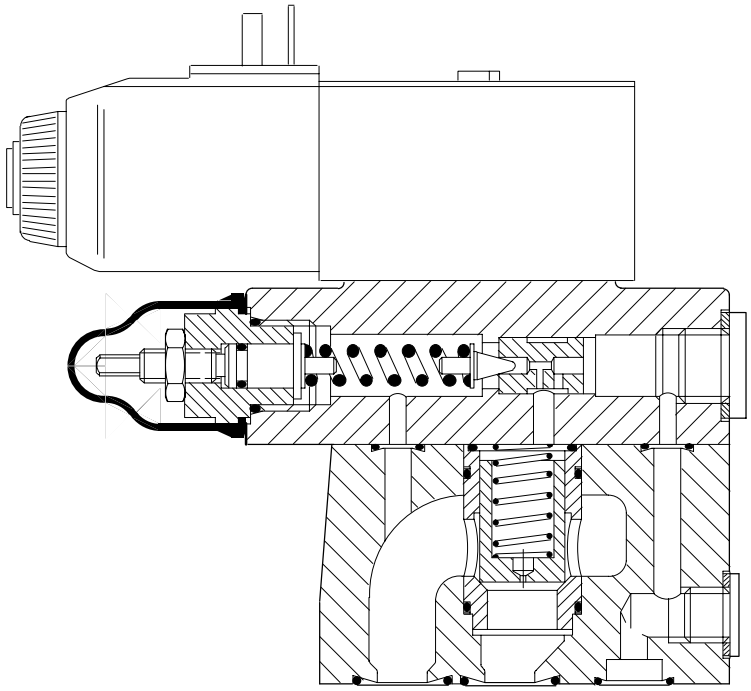
KACG-3

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.

Features and Benefits

- With or without integrated electronics.
- Remote electrical proportional control of pressure from a choice of five pressure ranges per valve size.
- Excellent repeatability and stable performance results from cartridge design of mainstage elements.
- Low installed cost and space requirement from high power/size ratios (more than double that of many conventional designs).

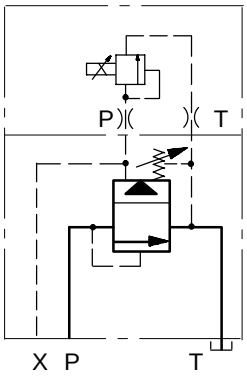
KCG-6 Valve with Type “U” Coil Connection



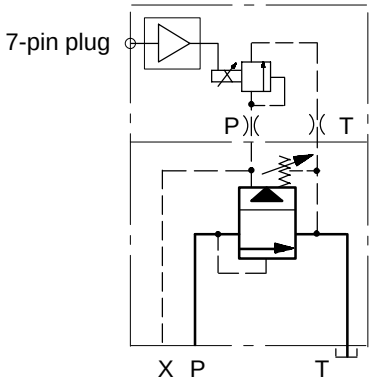
This product has been designed and tested to meet specific standards outlined in the European Electromagnetic Compatibility Directive (EMC) 89/336/EEC, amended by 91/263/EEC, 92/31/EEC and 93/68/EEC, article 5. For instructions on installation requirements to achieve effective protection levels, see 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).

Functional Symbols

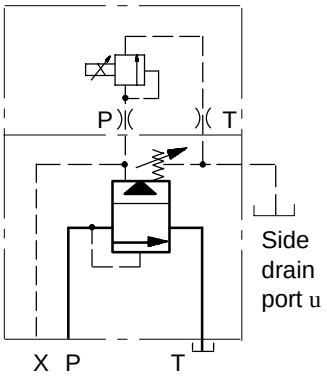
KCG-6/8 with manual and electrical pilots internally drained to port T:
Model code 5 = Blank



KACG-6/8 with manual and electrical pilots internally drained to port T:
Model code 5 = Blank

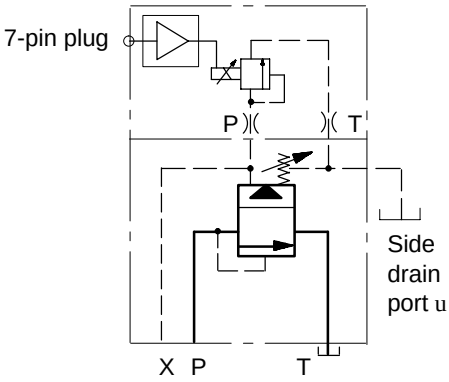


KCG-6/8 with manual and electrical pilots drained to side drain port ◆:
Model code 5 = 1



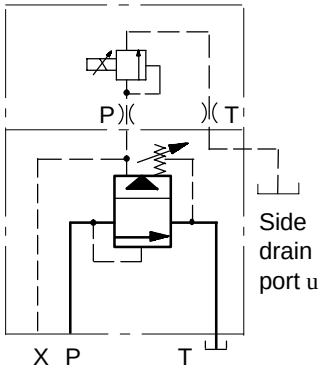
◆ *Tapped port on side of pilot head.*

KACG-6/8 with manual and electrical pilots drained to side drain port ◆:
Model code 5 = 1



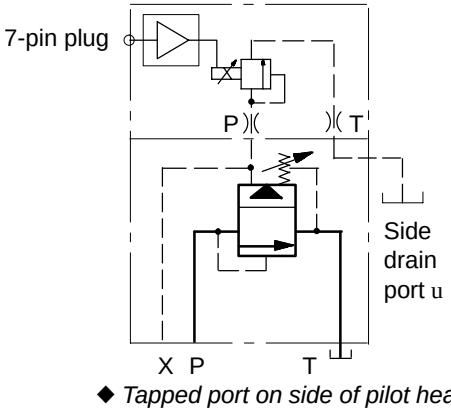
◆ *Tapped port on side of pilot head.*

KCG-6/8 with manual pilot internally drained to port T; electrical pilot drained to side drain port ◆:
Model code 5 = 3



◆ *Tapped port on side of pilot head.*

KACG-6/8 with manual pilot internally drained to port T; electrical pilot drained to side drain port ◆:
Model code 5 = 3



◆ *Tapped port on side of pilot head.*

Model Code

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

Models requiring separate amplifiers

(F3-)KCG-* - * * -*- Z-M- *** - *** -1* (-EN46)**

1 2 3 4 5 6 7 8 9 11 12 13

Models with integral amplifier

(F3-)KACG-* - * * -*- Z-M- PD7- H1 -1***

1 2 3 4 5 6 7 8 10 11 12

1 Fluid compatibility

Blank = Antiwear hydraulic oil (class L-HM)
F3 = As above or phosphate ester (class L-HFD)

2 Valve type

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

3 Mounting type

G = Subplate mounted

4 Mounting surface, ISO 6264

6 = AR-06-2-A
8 = AS-08-2-A

5 Type of manual adjustment

K = Micrometer with keylock
M = Micrometer without keylock
W = Screw/locknut

6 Pressure adjustment control range

(All coils except type HJ, see position 11, footnote ■)
40 = 6 - 40 bar (87 - 580 psi)
100 = 7,75 - 100 bar (112 - 1450 psi)
160 = 8,5 - 160 bar (125 - 2300 psi)
250 = 8,5 - 250 bar (125 - 3600 psi)
350 = 9,0 - 350 bar (130 - 5000 psi)

7 Pilot drain options

See also “Functional Symbols”

Code	Drain routing: Manual pilot stage	Electrical pilot stage
Blank	Port T	Port T
1	Side port	Side port
3	Port T	Side port

8 Standard features

Z-M = For KCG-6/8 and KACG-6/8

9 Coil connection type (KCG only)

U = ISO 4400 (DIN43650) 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”

▼ *Female connector to be supplied by user.*

10 Connections (KACG only)

PD7 = 7 pin connector with plastic plug.
See **Warning** note regarding CE compliance on pageNO TAG

11 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 = 1,0 x 14,25■
HL1 = 0,80 x 29●
◆ *Resistance at 20°C (68°F).*
▼ *KACG valves must have H1 coils*
l *For valves replacing CGEV models.*
■ *This lower power coil is limited to the following maximum controlled pressures. Valves supplied with type HJ coils will be stamped with the applicable maximum controlled pressure.*

Model code position 6	*Max. pressure with HJ coil*
40	*35 bar (500 psi)*
100	*85 bar (1100 psi)*
160	*140 bar (2000 psi)*
250	*210 bar (3000 psi)*
350	*315 bar (4500 psi)*

12 Design number, 1* series

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

13 Special features

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

Operating Data

Standard test conditions are with antiwear hydraulic oil at 36 cSt (168 SUS) and 50°C (122°F)

Maximum pressures: Ports P and X▲ Port T▲ in K(A)CG-*-****-Z- valves Port T▲ in K(A)CG-*-****-1/3-Z- valves Side drain port▲ s *Back pressure at these ports additive to the pressure setting of the valve.*	 350 bar (5000 psi) 2 bar (30 psi) 350 bar (5000 psi) 2 bar (30 psi)
Rated flow at Δp = 6 bar (87 psi): K(A)CG-6 K(A)CG-8	 200 L/min (52.8 USgpm) 400 L/min (105.7 USgpm)
Vent◆ flow with valve at rated flow ◆ *See "Venting", page 6.*	1 L/min (0.26 USgpm)
Pilot control drain flow, when valve is limiting system pressure, i.e. flow P to T occurring: K(A)CG-6 K(A)CG-8	 1,3 L/min (0.34 USgpm) 2,0 L/min (0.53 USgpm)
Coil or amplifier rating: KCG models KACG models	 See 11 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 cpommand 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, KACG models 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 when relieving and when off-load	See graphs
Hysteresis KCG models KACG models	 <5% (with 100 mA pk.-to-pk. dither) <6% (with factory-set dither)
Linearity, between 10% and 100% of rated pressure: K(A)CG-6 models at 100 L/min (26 USgpm) K(A)CG-8 models at 200 L/min (52 USgpm)	 <6% <6%

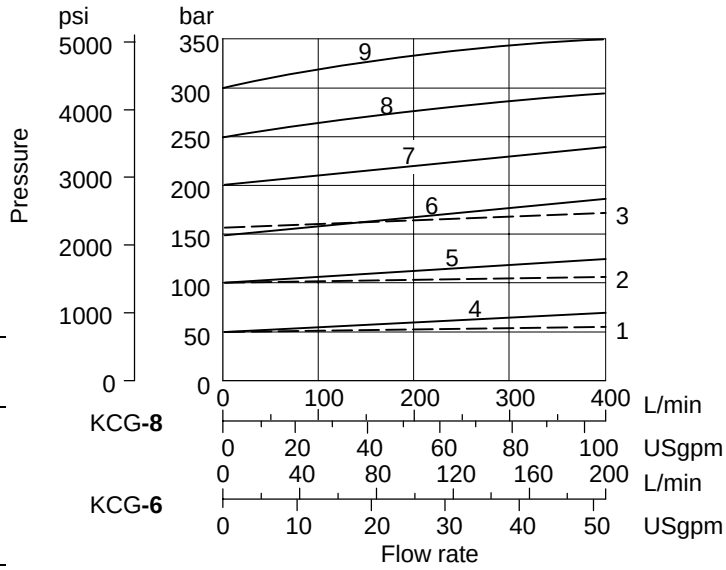
Operating Data

Repeatability	<1,3% of rated pressure
Protection, Electrical (KACG models)	Reverse-polarity protected
Mass (weight) KCG-6 KACG-6 KCG-8 KACG-8	 4,9 kg (10.8 lb) 5,3 kg (11.7 lb) 5,8 kg (12.8 lb) 6,2 kg (13.7 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■ ■ *Note: If not using Vickers recommended bolt kits, bolts must be to ISO 898 grade 12.9 or stronger.*	 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 Mounting attitude	 ML-B-9133B (Multi-lingual English, German, French and Italian), shipped with each product and also available separately on request. No restriction, provided that the valve is kept full of fluid through port T.
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

Typical with oil at 36 cSt (168 SUS) and at 50°C (122°F)

Pressure Override when Relieving



Model	Curve number 1 2 3 4 5 6 7 8 9
K(A)CG-**-40	●
K(A)CG-**-100	● ●
K(A)CG-**-160	● ● ●
K(A)CG-**-250	● ● ● ● ● ●
K(A)CG-**-350	● ● ● ● ● ●

Pressure Override Off-Load

Graphs show the minimum pressures obtainable:

a) With 0 mA current to the solenoid coil

b) When the valve is vented (see following explanation).

Venting

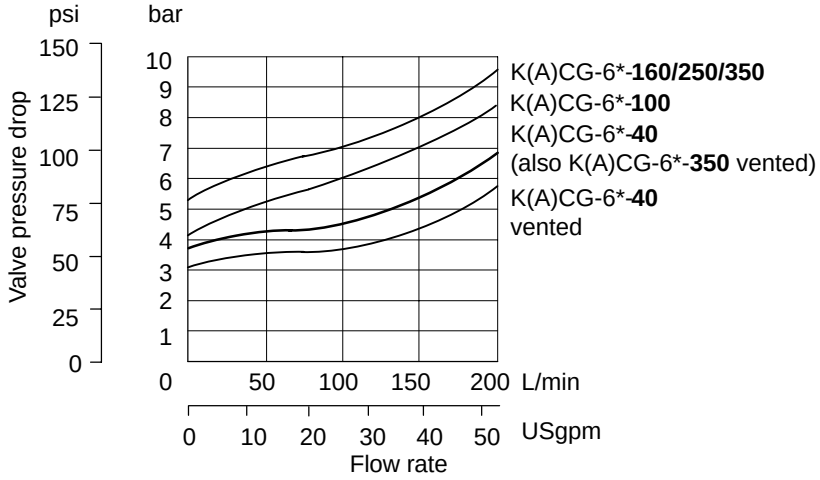
When the vent port X (or alternative vent port in the valve body) is connected to the reservoir via a suitable 2-way pilot valve, the mainstage of the relief valve opens to allow full flow from P to T at low pressure drop. The minimum pressure drop is obtained when the pilot valve is also de-energized. The total pressure drop through the venting 2-way valve and pipework is additive to the pressure at P.

While the valve is vented the system pressure cannot be controlled via the proportional solenoid.

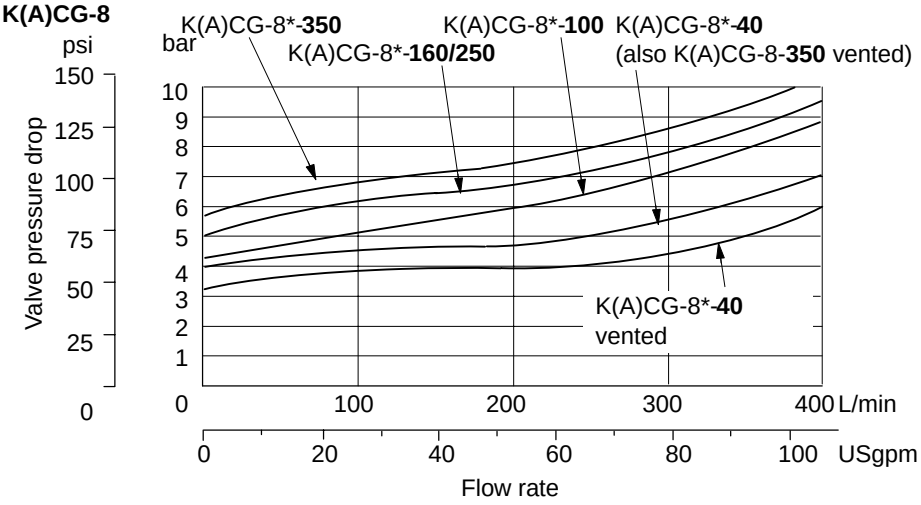
This control feature is frequently used during off-load periods in machine cycle times. If lower off-load system pressures are required then additional full flow unloading valves are recommended, e.g. Vickers CV series cartridge valves.

Note: All valves are with pilot valve de-energized.

K(A)CG-6

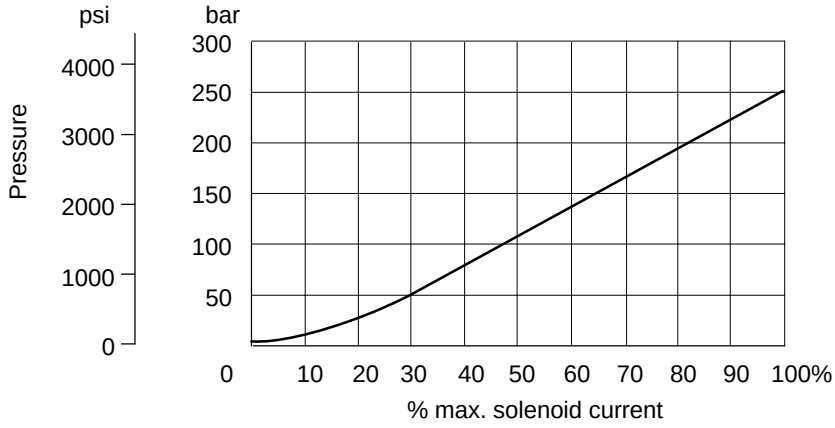


K(A)CG-8



Valid for models driven from Vickers amplifier with appropriate settings of gain and offset

Pressure Gain



Step Response

KACG models with factory settings of gain and offset.
KCG models driven from Vickers amplifier with appropriate settings of gain and offset.

Test method

1. Trapped volume between pump and test valve, as in table.
2. Flow rate set at pump, as in table.
3. Response = time from step input signal until pressure reaches 90% of step change, as measured by transducer.

Valve size	Test conditions: Trapped volume	Flow rate	Step size: Pressure demand	Response time (ms)
6	2,0 liters (0.53 USg)	100 L/min (26 USgpm)	0 to 100% 100% to 0 25 to 100% 100 to 25%	100 70 40 50
8	4,0 liters (1.06 USg)	200 L/min (52 USgpm)	0 to 100% 100% to 0 25 to 100% 100 to 25%	110 70 50 65

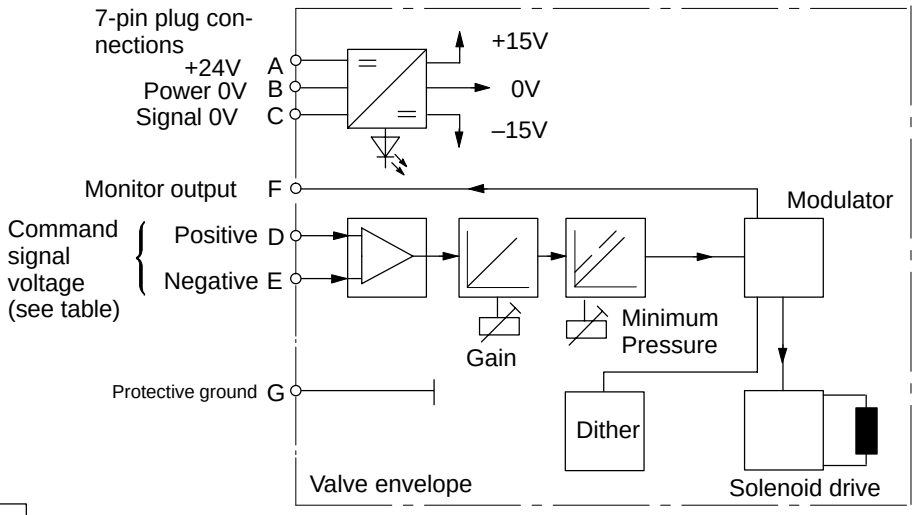
KACG-6/8 Electrical Block Diagram

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^2 (18 AWG) up to 20m (65 ft)
1,00 mm^2 (17 AWG) up to 40m (130 ft)

Signal cables:
0,50 mm^2 (20 AWG)

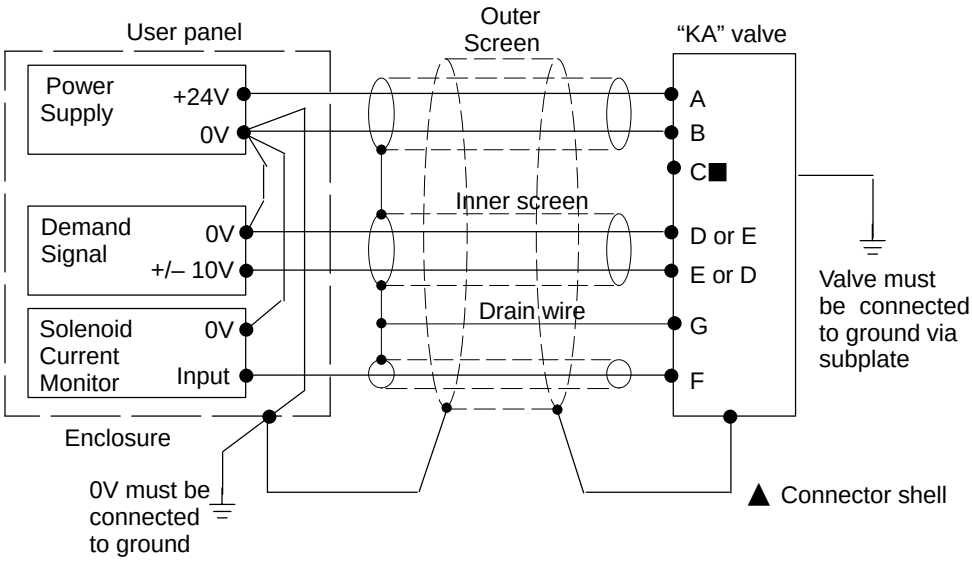
Screen:
A suitable cable would have 7 cores, a separate screen for the signal wires and an overall screen.
See wiring connection diagram on page NO TAG



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

KACG-6/8 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)

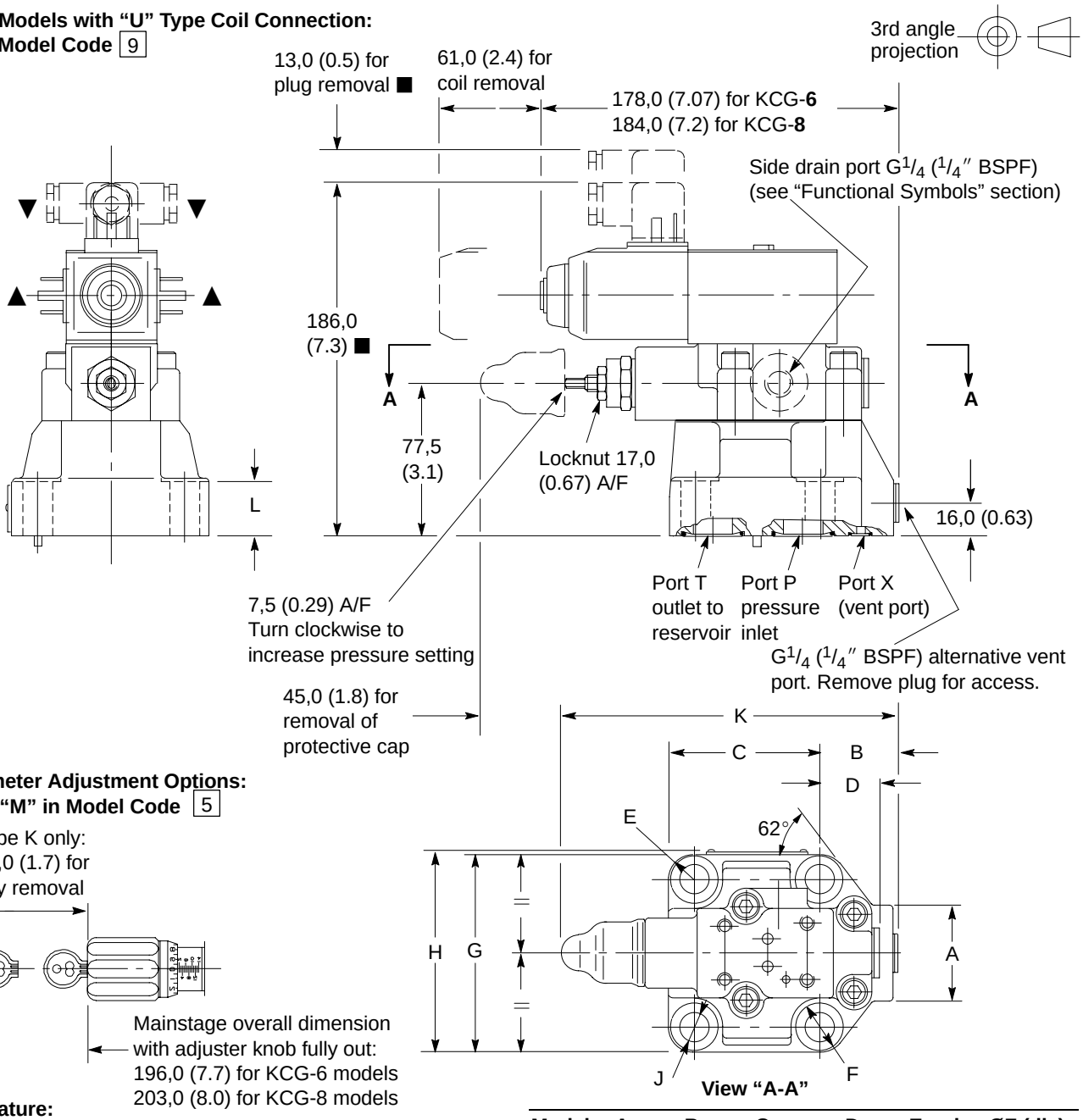
It is necessary to ensure that the valve is wired-up as above. For effective protection, the user electrical cabinet, the valve subplate or manifold, and the cable screens should be connected to efficient ground points. The metal 7-point connector, part no. 934939, should be used for the integral amplifier.

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.

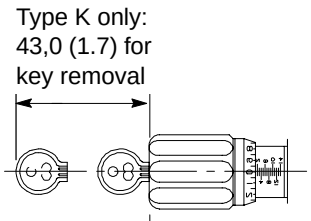
It is important to connect the 0V lines as shown above. The multi-core cable should have at least two screens to separate the demand signal and monitor output from the power lines.

Installation Dimensions in mm (inches)

KCG-* Models with "U" Type Coil Connection:
"U" at Model Code 9



Micrometer Adjustment Options:
"K" or "M" in Model Code 5



"K" Feature:
To adjust pressure setting, insert key and turn clockwise. Turn micrometer knob clockwise to increase pressure setting; counter-clockwise to decrease setting. When the key is removed the knob can spin freely without affecting the pressure setting.

▲ *Alternative plug positions by loosening knurled nut counter-clockwise, turning coil and re-tightening nut.*
■ *Dimensions may vary according to source of plug.*
▼ *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).*

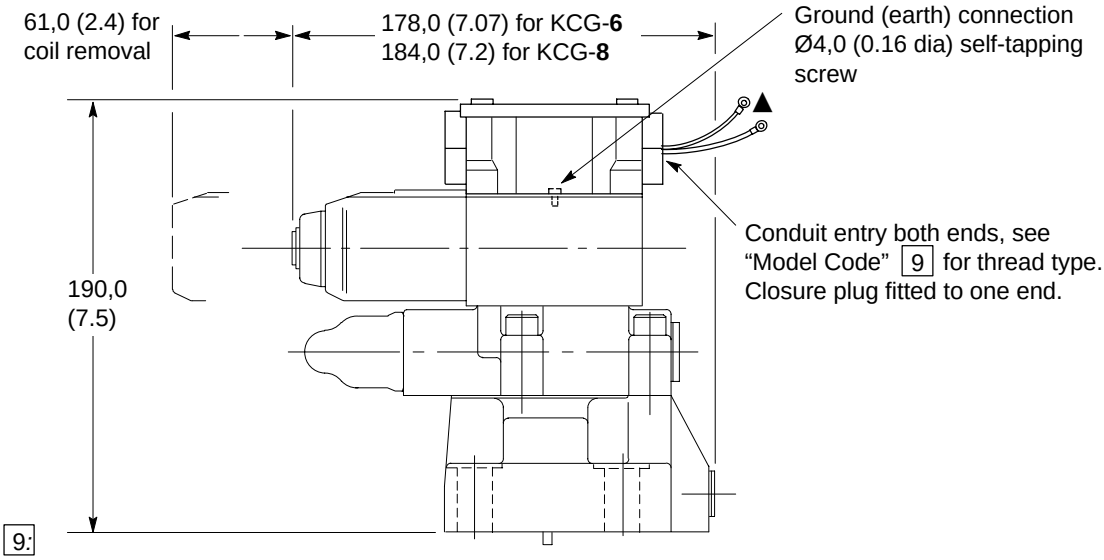
Model	A	B	C	D	E rad	ØF (dia)
KCG-6	58,0 (2.3)	35,0 (1.4)	68,0 (2.7)	35,0 (1.4)	12,0 (0.5)	20,0 (0.78)
KCG-8	42,0 (1.7)	39,0 (1.54)	83,0 (3.3)	30,0 (1.2)	16,0 (0.63)	26,0 (1.02)

Model	G	H	ØJ (dia)	K	L
KCG-6	79,0 (3.1)	82,0 (3.23)	13,5 (0.53)	176,0 (7.0)	20,0 (0.78)
KCG-8	103,0 (4.1)	106,0 (4.2)	17,0 (0.7)	183,0 (7.2)	25,0 (1.0)

KCG-* Models with “F” Type Coil Connection:
“F(T)W” or“F(T)J” at Model Code 9

3rd angle projection

For dimensions not shown see page 10.



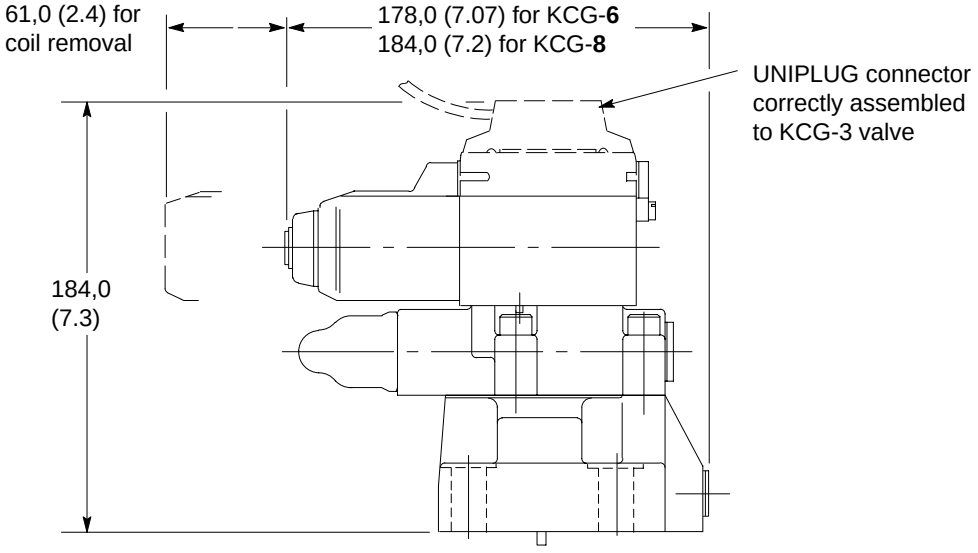
▲ *Ref. Model Code* 9:
Codes “FJ” and “FW”: 2 lead wires approx. 150.0 (6.0) long. M3 terminals provided for customer connection.
Codes “FTJ” and “FTW”: Lead wires connected into terminal strip suitable for M3 terminals on customer connection.

KCG-*---EN46 Models for Use with Vickers UNIPLUG, Single Cable Connector:
“P” at Model Code 9 **; “H” at Model Code** 11

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 pilot 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.

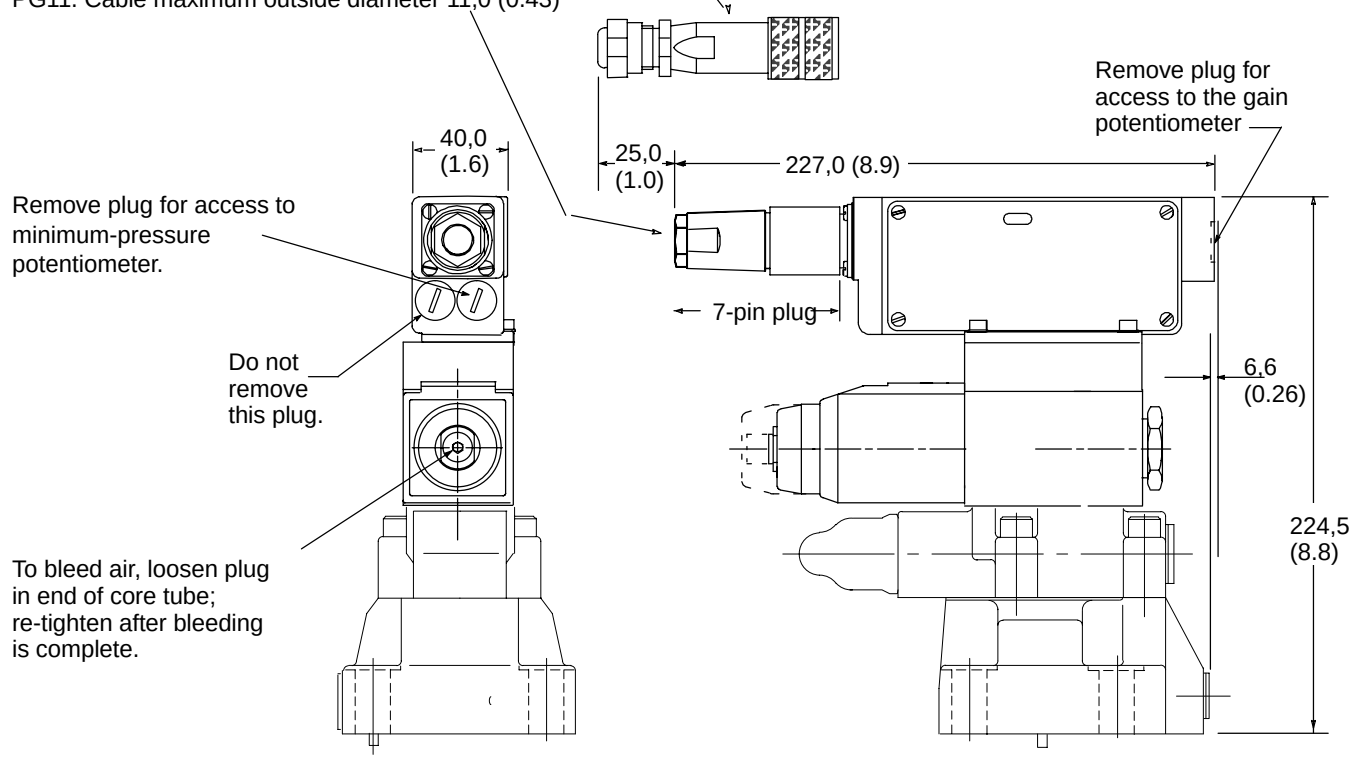
For dimensions not shown see page 10.



KACG-* Models (With integrated amplifier)

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 below

Plastic plug 694534
PG11. Cable maximum outside diameter 11,0 (0.43)

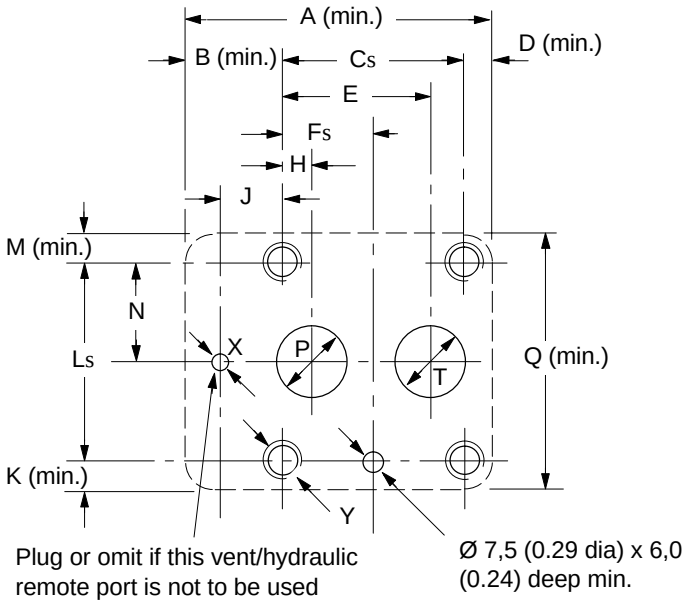


Warning
To conform to the EC Electromagnetic Compatibility directive (EMC) this KACG valve must be fitted with a metal 7-pin plug. The screen of the cable must be securely connected to the shell of the metal connector. A suitable IP67 rated connector is available from Vickers, part no. 934939. Alternatively 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.

Mounting Surfaces, ISO 6264
AR-06-2-A
AS-08-2-A

When a subplate is not used, a raised pad must be provided for mounting. The pad must be flat within 0,001 mm/ 100 mm (0.0001″/10″) and smooth within 0,8 μm (32 μin). Dimensional tolerances are ±0,2 mm (± 0.008″) except where indicated.

Port functions:
P = Pressure inlet
T = Outlet to reservoir
X = Vent, or remote control port

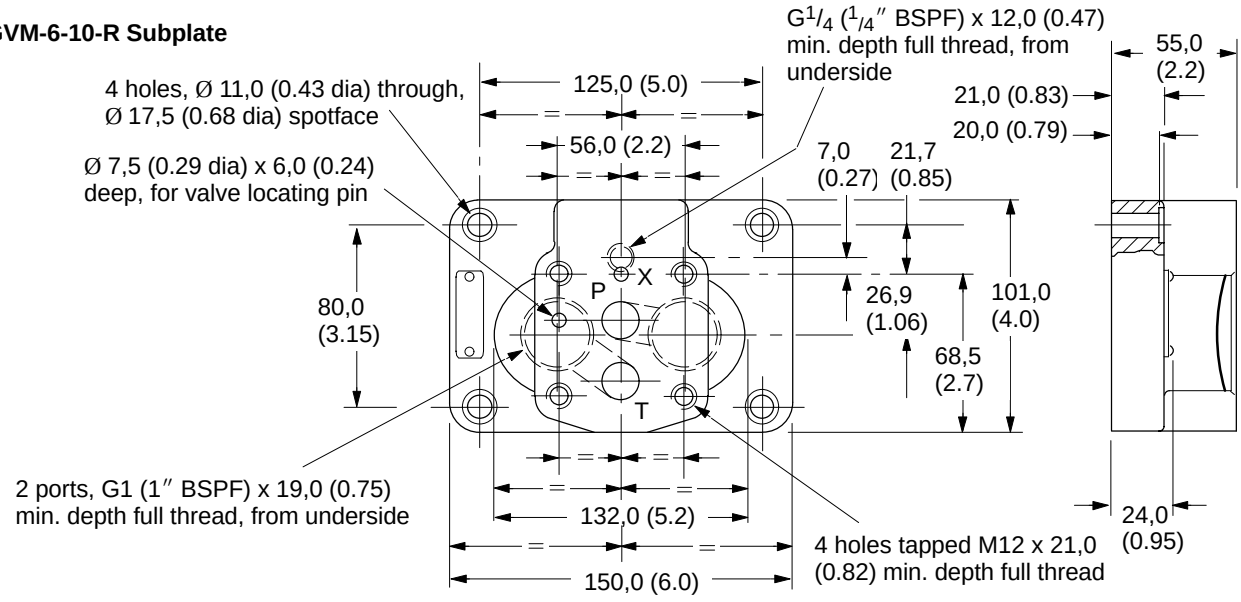


Size	A	B	C	D	E	F	H	J	K	L
AR-06	80 (3.2)	13,1 (0.5)	53,8 (2.12)	13,1 (0.5)	47,5◆ (1.87)	22,1 (0.87)	22,1◆ (0.87)	0	13,1 (0.5)	53,8 (2.12)
AS-08	118 (4.7)	35,0 (1.4)	66,7 (2.63)	16,3 (0.7)	55,6 (2.19)	33,4 (1.35)	11,1 (0.44)	23,8 (0.94)	16,0 (0.63)	70,0 (2.76)

Size	M	N	ØP (dia)	Q	ØT (dia)	ØX (dia)	Y thread x min. full thread depth
AR-06	13,1 (0.5)	26,9 (1.06)	14,7 (0.58)	80 (3.2)	14,7 (0.58)	4,8 (0.19)	M12 x 21 ($^{7}/_{16}$″ UNF x 0.83)▼
AS-08	16,0 (0.63)	35,0 (1.38)	23,4 (0.92)	102 (4.0)	23,4 (0.92)	6,3 (0.25)	M16 x 30 ($^{5}/_{8}$″ UNF x 1.2)▼

▲ *Tolerance on bolt and pin locations ±0,1 mm (±0.004″).*
◆ *These ISO standard dimensions can be used, but improved flow paths to and from valve are obtained by using 48,0 (1.89) instead of 47,5 (1.87), and 22,6 (0.89) instead of 22,1 (0.87).*
▼ *ISO standard does not give UNC bolt sizes. These are recommended equivalents to metric sizes specified in the standard.*

CGVM-6-10-R Subplate



Further Information

Hydraulic Fluids
Materials and seals used in these valves are compatible with:
Anti-wear petroleum oils . . . . . L-HM
For use with non-alkyl based phosphate esters, L-HFD, use F3 version in model code.
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
Pilot valves:

K(A)CG-3 (KA + DIN)	02-138201
KCG-3 (’F’ & ’P’ versions) . .	02-145869

Mainstage valves:

K(A)CG-6	614824
K(A)CG-8	614931