



Powering Business Worldwide

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## Coils and Electronic Controls

Solenoid valve and Proportional valve coils and electronic controls for proportional valves



# Coils and Electronic Controls

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### ToughCoils™

Eaton/IH ToughCoils™ have been designed to provide industry leading environmental protection and solenoid performance in a compact and rugged package. ToughCoils™ with integrated connectors are rated up to IP69K environmental protection. ToughCoils™ are available with a variety of popular integrated connection options and with wire leads.

The best in class, one-piece, shell encapsulated, design meets the most stringent environmental requirements for mobile and industrial applications.

The exclusive compact coil design from Eaton/IH, offers the advantage of field retrofitability on all existing, and new, applications.

### ToughCoils™ Features

**IP69K Environmental Protection** - This rating provides protection against the ingress of dust and high pressure jet stream. The IP69K test was designed specifically for rating protection against a high-pressure jet stream, high liquid temperature and close nozzle distance from the enclosure surface. IP69K protection is standard on coils with MetriPac or Deutsch, integrated connectors.

### "Thermal Shock Dunk"

**Test** - Eaton/IH ToughCoils have been qualified to withstand the toughest Mobile Equipment "Thermal Shock Dunk" tests. Integrated Deutsch, MetriPack<sup>1</sup> and Leadwire<sup>2</sup> connectors exceed "Thermal Shock Dunk" test qualifications at 140°C. The "Thermal Shock Dunk" test requires coils to be heated, reaching a stabilized temperature of 100°C, then immediately immersed in a solution at 0°C. The thermal shock is repeated five times with the coil monitored for dielectric strength in the solution and functional performance is verified.

In addition, ToughCoils™ passed a more severe powered dunk test conducted from 100° C to 0° C with 115% rated voltage applied.

<sup>1</sup>MetriPack® 150 and MetriPack® 280 are registered trade marks of Delphi Packard Electric Systems

<sup>2</sup>Coils with integrated connectors are recommended for applications in harsh environments.

### Field Retrofittable -

ToughCoils™ replace all current Eaton coils used on D Frame and Shell type coils. Compact coil dimensions allow substitution in all existing applications. ToughCoils are available for most 8, 10, 12, 16 and 20 series valves. No additional water/weather proofing is required.

### Steel Shell Encapsulated

**Design** - ToughCoils™ provide protection against physical and environmental damage.

Eaton/IH ToughCoils™,  
with rated connector,  
meet or exceed  
all major OEM  
environmental  
protection requirements



Shown with deutsch connection options

# ToughCoils

Model Code S,P,J and H Series Coils

## Model Code

**MCSC** - \* - \*\*\* - \* - \*\* - \* - \*\* - **10**

1 2 3 4 5 6 7 8

### 1 Function

**MCSC** - Solenoid coil

### 2 Series

**S** - Size 8 (210 Bar)  
**P** - Size 8 (350 Bar)  
**J** - Size 10, 12, 16, 20 (210 Bar)  
**H** - Size 10, 12, 16, 20 (350 Bar)

### 3 Voltage Rating

**012** - 12 volt  
**024** - 24 volt  
**036** - 36 volt  
**048** - 48 volt  
**115** - 115 volt  
**230** - 230 volt

### 4 Voltage Type

**D** - DC  
**B** - DC/with flyback diode  
**A** - AC/with full bridge rectifier

### 5 Connector

**G0** - ISO 4400 DIN 43650  
**Q0** - Spade Terminals  
**W0** - Flying lead  
**N0** - Deutsch Male, DT04-2P, Integrated (DC Only)  
Mating Connector: Deutsch DT06-2S  
**Y0** - Amp Jr (DC Only)  
Mating Connector: AMP 963040-3 or equivalent  
**D0** - MetriPack® 150 Male, Integrated (DC Only)  
Mating Connector: Delphi 12052641

**J0** - MetriPack® 280 Male, Integrated (DC Only)  
Mating Connector: Delphi 15300027  
**E0** - Weather-Pack (Packard) female on wire leads  
Mating Connector: Delphi 12010973  
**F0** - Weather-Pack (Packard) male on wire leads  
Mating Connector: Delphi 12015792

**Note:** Auxillary parts for mating connectors may be required.

### 6 Lead Length

**0** - None  
**A** - 152mm [6.0 in] (Standard length with connector)  
**B** - 610mm [24.0 in] (Standard length without connector)

### 7 Special Features

**00** - None  
(Only required if valve has special features, omitted if "00.")

### 8 Design Code

**10** - Design code

## Specifications

### Ratings and Specifications

Duty Rating	Continuous from 85% to 110% of nominal voltage
Operating temperature	100°C (212°F) continuous @ nominal voltage
Lead Wires	18 gauge, standard 610 mm (24") long, UL style 3173 CSA CL 1251 (meets SAE J1128 XLPE style SXL)
Power Rating	S Series: 20W P Series: 23W J Series: 23W H Series: 29W
Encapsulant	Glass filled nylon
Magnet Wire	U.L. class N, 200°C (392°F) NEMA pub. No. MW 1000, section MW 35 - C (single)
Flyback diode (arc suppressor)	Maximum recurrent peak reverse voltage - 800 V (optional)

## Environmental Protection

Connector	Ip65	Ip67	Ip69k	Thermal Shock Dunk
G0: DIN 43650	X*			
Q0: Spade				
Y0: Amp Jr.	X	X <sup>1</sup> *		
W0: Wire Leads	X	X		X <sup>1</sup>
N0: Deutsch	X	X	X	X
D0: Metri-Pack 150	X	X	X	X
J0: Metri-Pack 280	X	X	X	X



### CAUTION

Coils may be hot to touch if used in continuous duty applications.

<sup>1</sup>Passed environmental testing, but not as robust as other connectors

\*Rating dependent on mating connector

# ToughCoils

For 8 Size Solenoid Valves  
S & P Series Coils

## S Series ToughCoils part numbers - 300AA00\_\_\_\_\_ (Complete Part number is 11 Digits)

Voltage	G0** Connector	O0 Connector	W0 Connector	N0 Connector	Y0 Connector	D0 Connector	J0 Connector
12VDC	001A	009A	015A	021A	026A	031A	036A
24VDC	002A	010A	016A	022A	027A	032A	037A
36VDC	003A	011A	017A	023A	028A	033A	038A
24VAC	004A	012A	018A	—	—	—	—
115VAC	005A	—	—	—	—	—	—
230VAC	006A	—	—	—	—	—	—
12VDC*	007A	013A	019A	024A	029A	034A	039A
24VDC*	008A	014A	020A	025A	030A	035A	040A

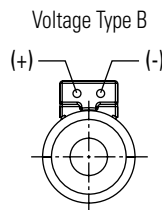
\*With flyback diode. (Voltage Type B)

\*\*DIN 43560 mating connector for "G0" style coil – 02-166796.

For other voltages and connectors contact your Eaton representative.

Std. Voltages	Amperes*
12 DC	1.67
24 DC	0.83
36 DC	0.56
24 AC	0.93
115 AC	0.19
230 AC	0.10

\*Nominal voltage 25°C (77°F).



## P Series ToughCoils part numbers - 300AA00\_\_\_\_\_ (Complete Part number is 11 Digits)

Voltage	G0** Connector	O0 Connector	W0 Connector	N0 Connector	Y0 Connector	D0 Connector	J0 Connector
12VDC	041A	049A	055A	061A	066A	071A	076A
24VDC	042A	050A	056A	062A	067A	072A	077A
36VDC	043A	051A	057A	063A	068A	073A	078A
24VAC	044A	052A	058A	—	—	—	—
115VAC	045A	—	—	—	—	—	—
230VAC	046A	—	—	—	—	—	—
12VDC*	047A	053A	059A	064A	069A	074A	079A
24VDC*	048A	054A	060A	065A	070A	075A	080A

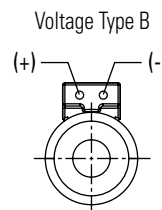
\*With flyback diode. (Voltage Type B)

\*\*DIN 43560 mating connector for "G0" style coil – 02-166796.

For other voltages and connectors contact your Eaton representative.

Std. Voltages	Amperes*
12 DC	1.92
24 DC	0.96
36 DC	0.64
24 AC	1.06
115 AC	0.22
230 AC	0.11

\*Nominal voltage 25°C (77°F).



# ToughCoils

For 10, 12, 16 and 20 Size Solenoid Valves  
J & H Series Coils

**300AA00**\_\_\_\_ (Complete Part number is 11 Digits)

Voltage	G0** Connector	Q0 Connector	W0 Connector	N0 Connector	Y0 Connector	D0 Connector	J0 Connector
12VDC	081A	089A	095A	101A	106A	111A	116A
24VDC	082A	090A	096A	102A	107A	112A	117A
36VDC	083A	091A	097A	103A	108A	113A	118A
24VAC	084A	092A	098A	—	—	—	—
115VAC	085A	—	—	—	—	—	—
230VAC	086A	—	—	—	—	—	—
12VDC*	087A	093A	099A	104A	109A	114A	119A
24VDC*	088A	094A	100A	105A	110A	115A	120A

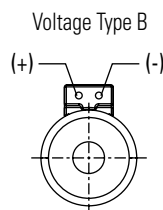
\*With flyback diode. (Voltage Type B)

\*\*DIN 43560 mating connector for "G0" style coil – 02-166796.

For other voltages and connectors contact your Eaton representative.

Std. Voltages	Amperes*
12 DC	1.92
24 DC	0.96
36 DC	0.64
24 AC	1.06
115 AC	0.22
230 AC	0.11

\*Nominal voltage 25°C (77°F).\*



**H Series ToughCoils part numbers - 300AA00**\_\_\_\_ (Complete Part number is 11 Digits)

Voltage	G0** Connector	Q0 Connector	W0 Connector	N0 Connector	Y0 Connector	D0 Connector	J0 Connector
12VDC	121A	129A	135A	141A	146A	151A	156A
24VDC	122A	130A	136A	142A	147A	152A	157A
36VDC	123A	131A	137A	143A	148A	153A	158A
24VAC	124A	132A	138A	—	—	—	—
115VAC	125A	—	—	—	—	—	—
230VAC	126A	—	—	—	—	—	—
12VDC*	127A	133A	139A	144A	149A	154A	159A
24VDC*	128A	134A	140A	145A	150A	155A	160A

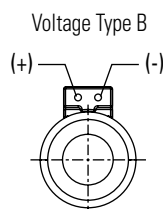
\*With flyback diode. (Voltage Type B)

\*\*DIN 43560 mating connector for "G0" style coil – 02-166796.

For other voltages and connectors contact your Eaton representative.

Std. Voltages	Amperes*
12 DC	2.42
24 DC	1.21
36 DC	0.81
24 AC	1.34
115 AC	0.28
230 AC	0.14

\*Nominal voltage 25°C (77°F).

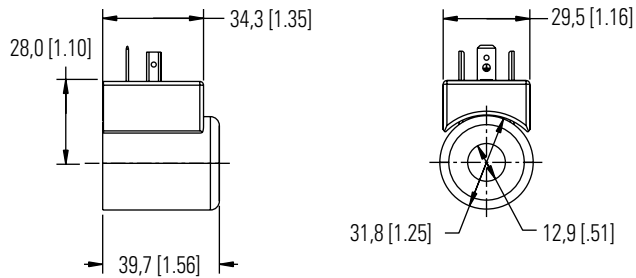


Where measurements are critical request certified drawings. We reserve the right to change specifications without notice.

# S and P Series Coils

J & H Series Coils

## Dimensions

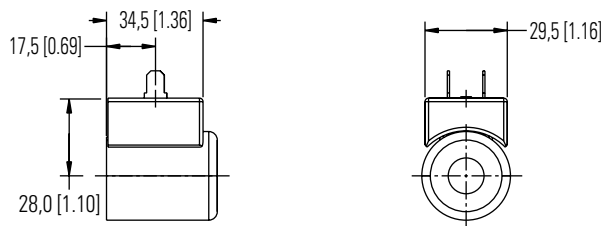


**G0**  
**DIN 43650-A Connector**

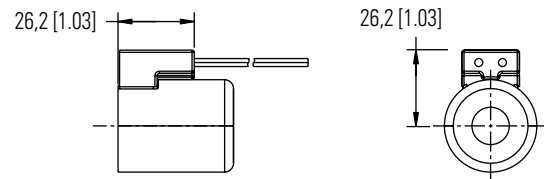


Shown with integrated Deutsch Connector

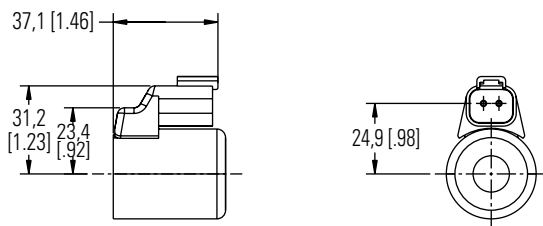
C



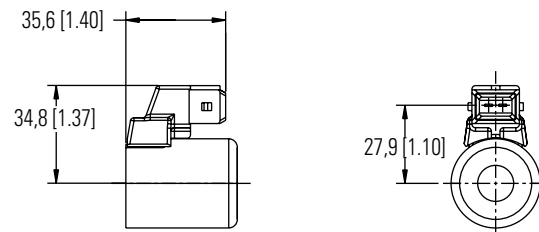
**Q0**  
**Spade Connector**



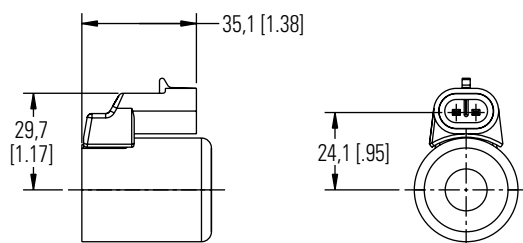
**W0**  
**Leadwire**



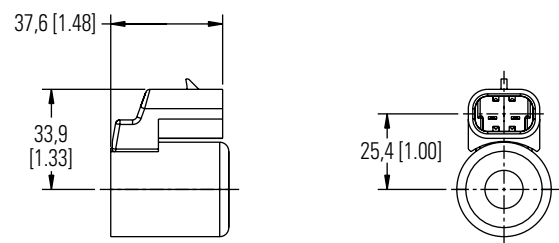
**N0**  
**Deutsch Male DTO4-2P integrated connector**



**Y0**  
**AMP Junior Timer integrated connector**



**D0**  
**Metri-Pack 150 Male, integrated connector**

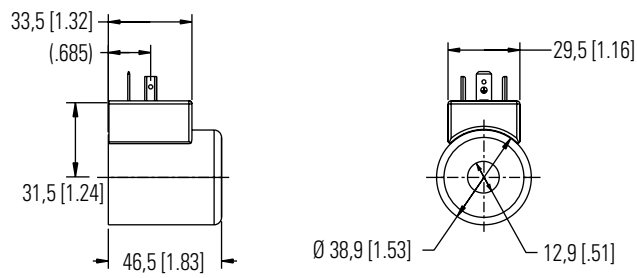


**J0**  
**Metri-Pack 280 Male, integrated connector**

# J Series Coils

## Dimensions

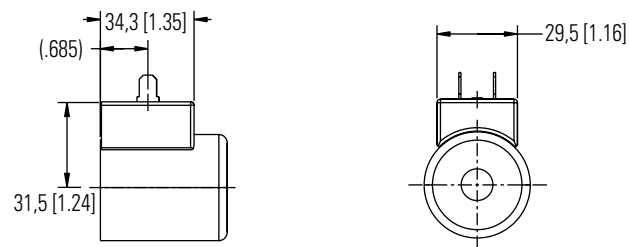
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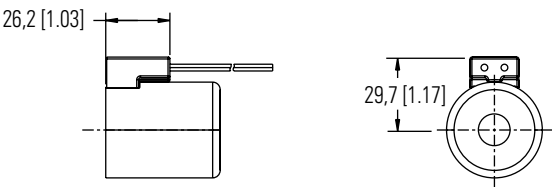
**G0**  
**DIN 43650-A Connector**



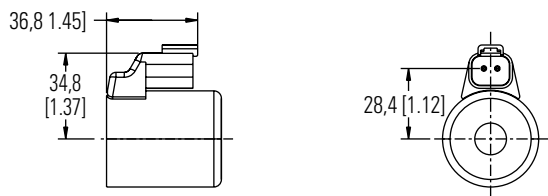
Shown with integrated Metri-Pack 150 Connector



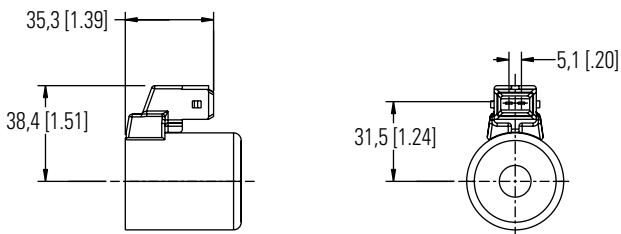
**Q0**  
**Spade Connector**



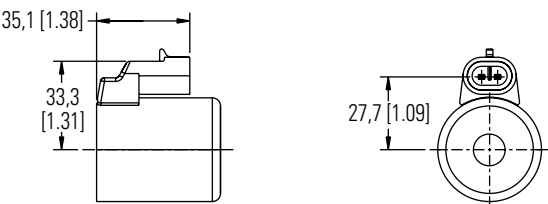
**W0**  
**Leadwire**



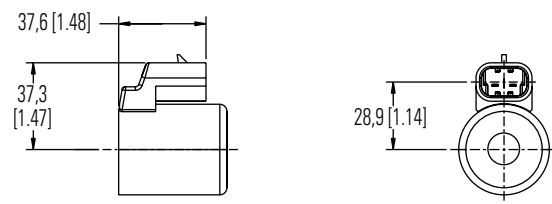
**N0**  
**Deutsch Male DTO4-2P integrated connector**



**Y0**  
**AMP Junior Timer integrated connector**



**D0**  
**Metri-Pack 150 Male, integrated connector**



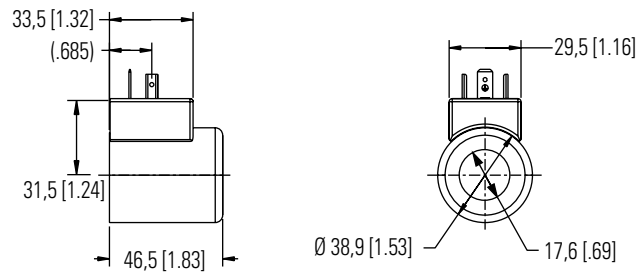
**J0**  
**Metri-Pack 280 Male, integrated connector**

Where measurements are critical request certified drawings. We reserve the right to change specifications without notice.



# H Series Coils

## Dimensions

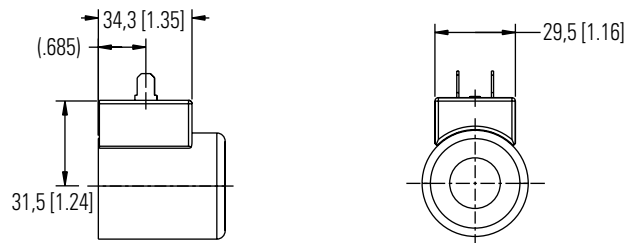


**G0**  
**DIN 43650-A Connector**

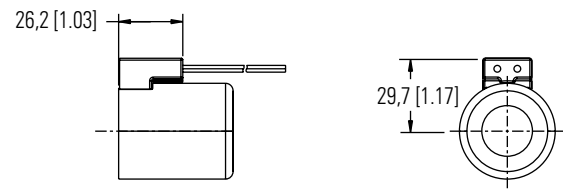


Shown with integrated MetriPack 280 Connector

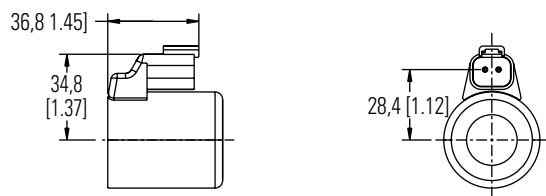
**C**



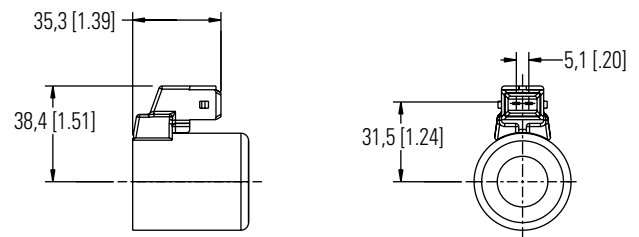
**Q0**  
**Spade Connector**



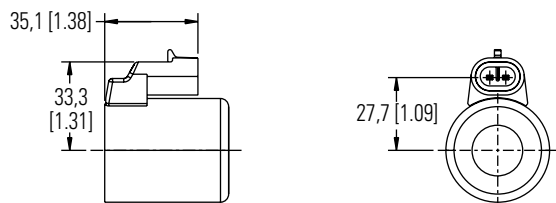
**W0**  
**Leadwire**



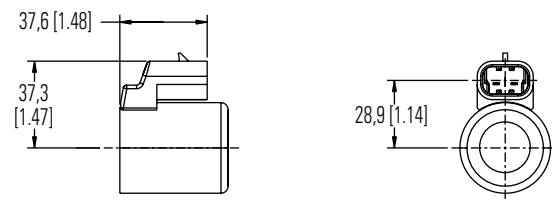
**N0**  
**Deutsch Male DTO4-2P integrated connector**



**Y0**  
**AMP Junior Timer integrated connector**



**D0**  
**Metri-Pack 150 Male, integrated connector**



**J0**  
**Metri-Pack 280 Male, integrated connector**

# R & L Series Coils

For SVx-12-3 and SVx-12-4 Solenoid Valves

## L Series Coils ("EN490" Coils)

DC Coils	Connector	
Voltage	"G" DIN 43650 Connector	"W" Leadwires Only
Full Power Coils:		
12V	02-309454	02-309452
24V	02-309455	02-309453

**Note:** For more information on "L" series coils, please refer to Eaton Technical datasheet 5049/EN/0596/A (Solenoid Operated Directional Valve-DG4V-35, EN490 for Mobile Equipment).

## R Series Coils (Blue Coils)

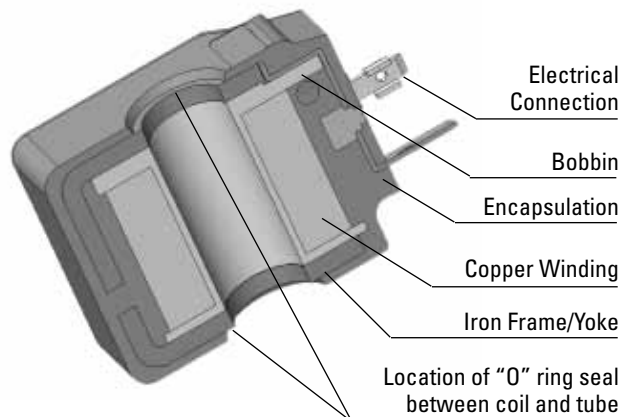
DC Coils	Connector		
Voltage	"G" DIN 43650 Connector	"Q" SpaDe Connector	"W" Leadwires Only
Full Power Coils:			
12V	507847	02-111166	02-140394
24V	507848	02-111168	02-140395

**Note:** For more information on "R" series coils, please refer to Eaton Technical datasheet GB-C-2015 (Solenoid Operated Directional Valve-DG4V-35 and DG4V3 Series).

## R and L Series Coils

Power Consumption	
DC solenoids at rated voltage and 20°C (68°F)	
Full Power Coils:	
12V	30W
24V	30W

# C13 and C16 Series - Coil Information



## Wattage

C13 (for 13 mm tubes) = 14, 22 & 27 Watts  
C16 (for 16 mm tubes) = 19 & 29 Watts

## Voltages

### Standard

12 VDC 110 VRAC  
24 VDC 220 VRAC

### Special/Optional

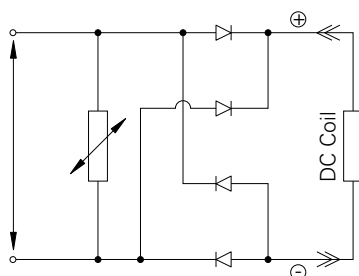
Other Voltages are available on request

## Alternating Current

For AC voltage an ISO4400 rectified connector must be used, as the coils are wound for DC. The correct connector is available from the factory:

110 VAC = AXP9997-115  
220 VAC = AXP9997-230

VDR is fitted for over-voltage protection.  
Diodes are rated at 1.5 amp.



AC Voltage Connector Circuit Diagram

## Duty Rating

The coil is rated for continuous operation at nominal voltage  $\pm 10\%$  and an ambient range of  $-20$  to  $+40$ .

**Note:** Coil performance, force produced and power consumed, is affected by the heat of the coil, performance figures given in this catalogue are measured under simulated continuous duty conditions at the coil stabilized temperature. It is important to verify the actual conditions the valve will experience for any given application it should be tested in situ to confirm valve selection.

## Wire Insulation

The coil winding is copper magnet wire insulation equivalent to class N ( $200^{\circ}\text{C}$ ).

## Encapsulation Material

C13, 14 Watt coils and C16, 19 Watt coils are black in colour and made from PBT (Black Polybutylene Reinforced) equivalent to Class F ( $155^{\circ}\text{C}$ )

C13, 22 & 27 Watt coils and C16, 29 Watt coils are black in colour and made from IXEF (Black Polyarylamide Reinforced) equivalent to Class H ( $180^{\circ}\text{C}$ )

## Ingress Protection (IP) BS EN 60529

The coil/tube joint is sealed by "O" rings preventing fluid ingress and the possibility of tube corrosion.

Different electrical connectors offer different levels of protection the minimum being the DIN 43650 connector with a gasket at IP65. Integrated Hydraulics offer a wide range of connector types - details of which are available on request.

## Connectors

H = ISO4400 Standard DIN43650  
2 pin and earth

F = Black Flying Leads  $1.5\text{mm}^2$  wire  
600 mm long, 15 AWG, 2.2 mm diameter, Teflon FEP covered (DC voltage only)

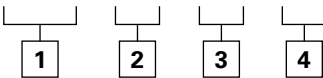
DM = Deutsch Moulded 2 way DT04-2P series  
(DC voltage only).

**Caution** – When handling coils after or during use they may be hot which can cause burning to the skin. Handle with care and use the appropriate equipment.

# C13 and C16 Series - Solenoid Coil

## Model Code

**C13 - H - 24 / 22**



### 1 Coil Series

**C13** - 13 mm tube  
**C16** - 16 mm tube

### 2 Connection

**H** - DIN43650 ISO Standard  
**F** - Flying Leads  
(12 and 24 VDC only)  
**DM** - Deutsch Moulded  
(12 and 24 VDC only)  
(Consult factory for other options)

### 3 Voltage

<b>12</b>	12 VDC
<b>24</b>	24 VDC
<b>110</b>	110 VRAC
<b>220</b>	220 VRAC*

\*220 to 240 VAC

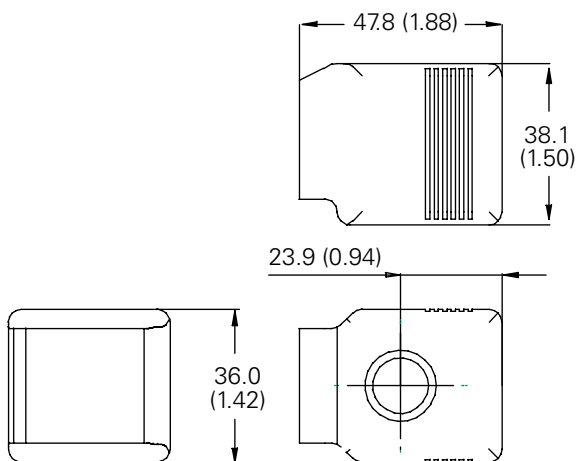
All AC coils must be used with a rectifying connector:  
(AXP9997-115 or AXP9997-230)  
(Other voltages available on request)

### 4 Wattage

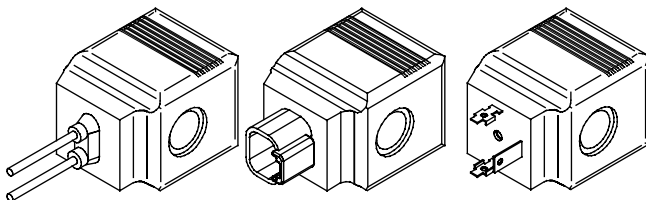
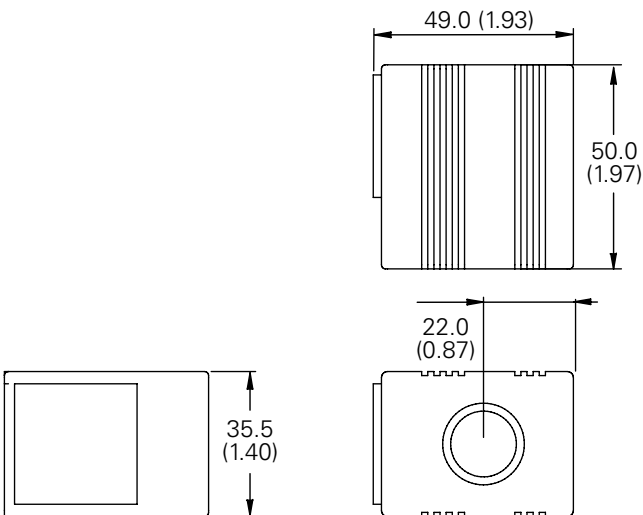
C13	C16
<b>14</b> = 14 Watt	<b>19</b> = 19 Watt
<b>22</b> = 22 Watt	<b>29</b> = 29 Watt
<b>27</b> = 27 Watt	

We reserve the right to change specifications without notice

## C13 Coils



## C16 Coils



Where measurements are critical request certified drawings. We reserve the right to change specifications without notice.

# Explosion Proof Valves

For hazardous environments

Coil Options (SV\*E Series)

## Specifications

Hydraulic Performance Specifications for explosion proof valves are the same as the base valve.  
For details please refer to the base valve page reference.

Coil Temperature Range	-40° to 100°C (-40° to 212°F)
Coil Duty	Continuous from 85% to 110% of nominal voltage
Housing Type	Explosion proof version with 1/2" threaded conduit hub
Coil Type	Epoxy encapsulated lead wire coil
Lead Wire	24" Long, 18 gauge with 1/32" cross linked Polyethylene insulation

## Approvals

UL	File AU2206, Component - Industrial truck accessory, Battery powered
CSA	Both for general purpose and Hazardous locations Class I, Group C & D Class II, Group E, F & G

## Summary

Model Code Reference	Description	Typical Application Pressure	Rated flow psi (bar)	Base Valve l/min (Usgpm)	Section design
SV1E-10-C-XX-XXXXU	2 way, 2 position, normally closed, poppet type	210 (3000)	45 (12)	SV1-10-C	A
SV2E-10-C-XX-XXXXU	2 way, 2 position, normally closed, poppet type	210 (3000)	23 (6)	SV2-10-C	A
SV3E-10-C-XX-XXXXU	2 way, 2 position, normally closed, poppet type	210 (3000)	45 (12)	SV3-10-C	A
SV4E-10-C-XX-XXXXU	2 way, 2 position, normally closed, spool type	210 (3000)	23 (6)	SV4-10-C	A
SV1E-16-C-XX-XXXXU	2 way, 2 position, normally closed, poppet type	210 (3000)	132 (35)	SV1-16-C	A
SV2E-20-C-XX-XXXXU	2 way, 2 position, normally closed, poppet type	210 (3000)	227 (60)	SV2-20-C	A
SV4E-10-0-XX-XXXXU	2 way, 2 position, normally open, spool type	210 (3000)	23 (6)	SV4-10-0	A
SV3E-10-0-XX-XXXXU	2 way, 2 position, normally open, poppet type	210 (3000)	45 (12)	SV3-10-0	A
SV5E-10-0-XX-XXXXU	2 way, 2 position, normally open, poppet type	210 (3000)	45 (12)	SV5-10-0	A
SV3E-16-0-XX-XXXXU	2 way, 2 position, normally open, poppet type	210 (3000)	132 (35)	SV3-16-0	A
SV3E-20-0-XX-XXXXU	2 way, 2 position, normally open, poppet type	210 (3000)	227 (60)	SV3-20-0	A
SV1E-10-3-XX-XXXXU	3 way, 2 position, spool type	210 (3000)	23 (6)	SV1-10-3	A
SV1E-10-4-XX-XXXXU	4 way, 2 position	210 (3000)	23 (6)	SV1-10-4	A
SV2E-10-4-XX-XXXXU	4 way, 2 position, circuit center	210 (3000)	23 (6)	SV2-10-4	A
SV3E-10-4-XX-XXXXU	4 way, 2 position, normally open	210 (3000)	23 (6)	SV3-10-4	A
SV4E-10-4-XX-XXXXU	4 way, 2 position, tandem center	210 (3000)	23 (6)	SV4-10-4	A

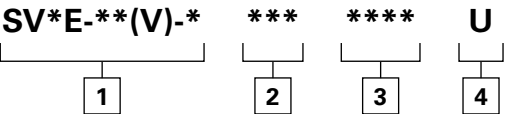
## Replacement Coil Part Numbers

Voltage	Assembly Number	Amperes (A)	Power (W)	Lead Color
12 VDC	888831	1.50	20	Red
24 VDC	888832	0.75	20	Black
36 VDC	888834	0.50	20	Blue
48 VDC	888835	0.38	20	Purple
110 VDC	888836	0.16	20	Brown
24 VAC	888837	0.75	20	Orange
115 VAC	888838	0.16	20	Yellow
230 VAC	888840	0.08	20	Red/White
480 VAC	888841	0.04	20	Black/White

# Explosion Proof Valves

(SV\*E Series) Model Code

## Model Code



### 1 Base Valve

SV1E-10-C	SV1-10-C
SV2E-10-C	SV2-10-C
SV3E-10-C	SV3-10-C
SV4E-10-C	SV4-10-C
SV1E-16-C	SV1-16-C
SV2E-20-C	SV2-20-C
SV4E-10-0	SV4-10-0
SV3E-10-0	SV3-10-0
SV5E-10-0	SV5-10-0
SV3E-16-0	SV3-16-0
SV3E-20-0	SV3-20-0
SV1E-10-3	SV1-10-3
SV1E-10-4	SV1-10-4
SV2E-10-4	SV2-10-4
SV3E-10-4	SV3-10-4
SV4E-10-4	SV4-10-4

For performance specifications refer to base valve data sheet.  
Viton® seal options are available.

### 2 Port Size Housing Number

Refer to table in Model Code for Base valves  
4.8 liters/min

### 3 Voltage\*

Code	Voltage	Replacement Coil Part Number
12D	12 VDC	888831
24D	24 DVC	888832
36D	36 VDC	888834
48D	48 VDC	888835
110D	110 VDC	888836
24A	24 VAC	888837
115A	115 VAC	888838
230A	230 VAC	888840
460A	460 VAC	888841

\*Arc suppression diode is not available

### 4 Type (C.S.A. Approved)

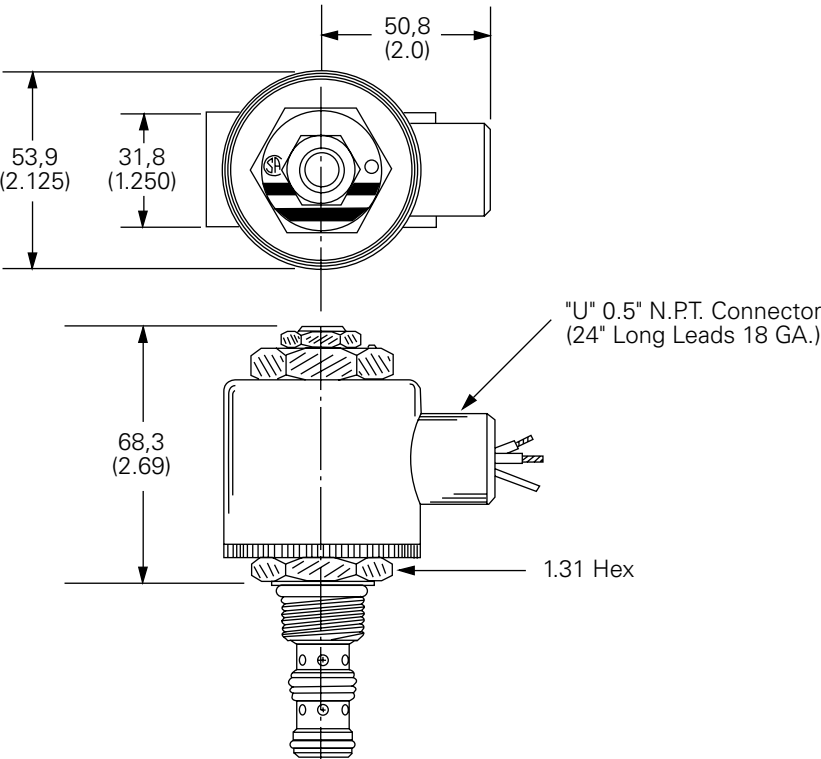
U - 1/2" NPT Connector  
Class I, Group C & D  
Class II, Group E, F & G

## Dimensions

mm (inch)

**Note:** Cartridge only or coil housing are not available as service parts. It is not possible to convert standard valves to explosion proof variants. SV1E-10-3 shown. Dimensions of coil housing are the same for all Vickers explosion proof SiCV valves, for other dimensions please refer to base valve datasheet.

## Description Type



# EPV Series Proportional Valve Coils

## EPV Coils

C

### Control and specifications

Rheostat	12 VDC operation 10-12 $\Omega$ , 20-25 watts 24 VDC operation 25-30 $\Omega$ , 20-25 watts
Power plug options	EHH-AMP-702, EPAD-SA-1A6-10 (Require 24 VDC power supply to power plug and 12 VDC coil)
Amplifier card	EEA-PAM-523 (Requires 24 VDC power supply and either 12VDC or 24 VDC coil)
Joystick suppliers	OEM Controls, Inc, Shelton, CT P-Q Controls, Inc, Bristol, CT

Std. Voltages	Amperes*	Lead Color	Power Rating
12 DC	1.32	red	16 W
24 DC	.66	black	16 W

\*Nominal voltage @ 25°C (77°F).

### Coil part numbers

Voltage	F Connector	Q Connector	U* Connector	W Connector	Y Connector
12VDC	02-308810	02-317154	02-154070	02-154072	02-308808
24VDC	02-308811	02-317155	02-154071	02-154073	02-308809

\*DIN 43650 mating connector for "U" style coil – 02-166796.

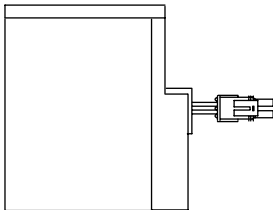
### Coil Configurations



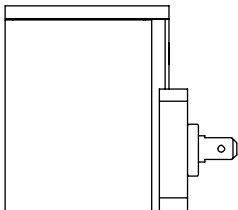
#### CAUTION

Coils may be hot to touch if used in continuous duty applications.

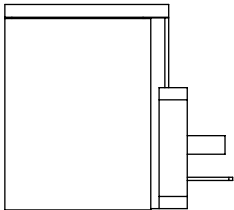
"F"- Weather-Pack male on leads



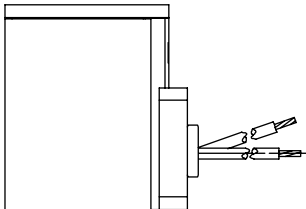
"Q" - Spade terminal



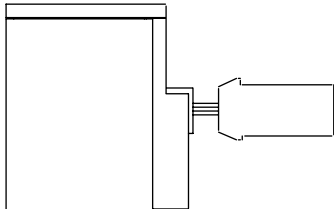
"U"- DIN 43650



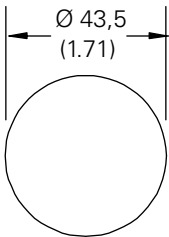
"W" 610 mm (24 inch) lead wire



"Y"- Metri-Pack 150 male on leads



Note: Width – all configurations



# EFV Series Proportional Valve Coils

## EFV

E Series Coils

C



### CAUTION

Coils may be hot to touch if used in continuous duty applications.

### Control and Specifications

Power plug options	EHH-AMP-702, EPAD-SA-1A6-10 (Require 24 VDC power supply to power plug and 12 VDC coil)
Amplifier card	EEA-PAM-523 (Requires 24 VDC power supply and either 12VDC or 24 VDC coil)
Joystick suppliers	OEM Controls, Inc., Shelton, CT P-Q Controls, Inc., Bristol, CT

### Specifications

Standard Voltage	Resistance	Power
12 VDC	4.7 $\Omega$	30 W
24 VDC	19.0 $\Omega$	30 W

### Coil Model Code

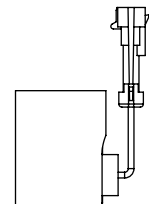
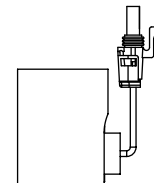
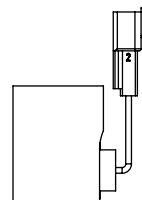
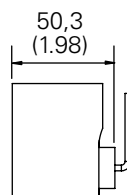
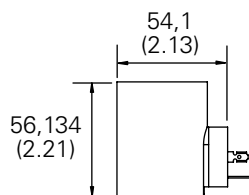
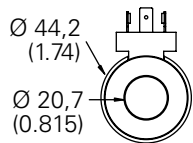
SC	***	*	*	E	**
1	2	3	4	5	6

Model code positions 2, 3, 4, 5 and 6 are integrated into EFV model code when ordered with valve.

<b>1 Solenoid Coil</b> <b>2 Voltage</b> <b>012</b> - 12VDC <b>024</b> - 24VDC	<b>3 Protection</b> <b>D</b> - Standard DC coil <b>B</b> - DC coil with flyback diode	<b>4 Connection</b> <b>G</b> - DIN 43650* <b>W</b> - Leadwire - 24" <b>E</b> - Weather-Pack female on wire leads - 6" <b>C</b> - Deutsch DT0402P wire leads - 6" <b>H</b> - Metri-Pack 150 wire leads - 6" <small>*DIN 43560 mating connector for "G" style coil – 02-166796.</small>	<b>5 Series</b> <b>E</b> - EFV series coil <b>6 Special Features</b> <b>00</b> - None
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### Coil Kits

Standard Coil	Part Numbers
Model Code	Assembly Number
SC-012BGE00	4995052-230
SC-012BWE00	4995052-231
SC-012DGE00	4995052-001
SC-012DWE00	4995052-002
SC-024BGE00	4995052-232
SC-024BWE00	4995052-233
SC-024DGE00	4995052-003



**Note:** Width all configurations

"G" - DIN 43650

"W" - 610 mm (24 inch) lead wire

"C" - Deutsch DT0402P on leads

"E" - Weather-Pack female on leads

"H" - Metri-Pack 150 male on leads

Where measurements are critical request certified drawings. We reserve the right to change specifications without notice.



# Electronic Controls

Proportional Valve  
Control Power Plugs

## EHH-AMP-702-D/J/K-2\* Series

For use with valve types:

EPV\*\*-12D-1\*

EFV1\*\*-012DE\*

ERV1/2\*\*-12D-1\*

EPRV1\*\*-12D-1\*

## Application

Primary applications are in the control of non-feedback proportional valves where the cost of more sophisticated electronic controls can be avoided.

Type J is typically used in closed-loop applications.

## General Description

Three types of plugs, conforming to ISO 4400/DIN 43650 interface, with integral amplifiers and necessary adjustment potentiometers, are designed for use with non-feed back hydraulic valves.

This plug/valve combination offers very low cost solutions to many hydraulic control problems requiring proportional control.

Type D is controlled with a 0-10V command signal, and has adjustable gain, ramp, deadband compensation and dither.

Type J, designed for closed-loop applications, is controlled with a 0-10V command signal, and has no ramp function.

Type K is controlled with a 4-20 mA command signal, and has an adjustable ramp time of 50 ms to 5s.

## Features and Benefits

- Integral amplifier provides essential functions for control of proportional valves
- Adjustable ramp time (types D and K), gain, deadband compensation and dither
- Ease of installation, with reduced cost
- Fully short-circuit and reverse-polarity protected
- Differential voltage command signal (types D and J)
- Adjustable dither
- EMC to latest European standards
- Protection to IP67

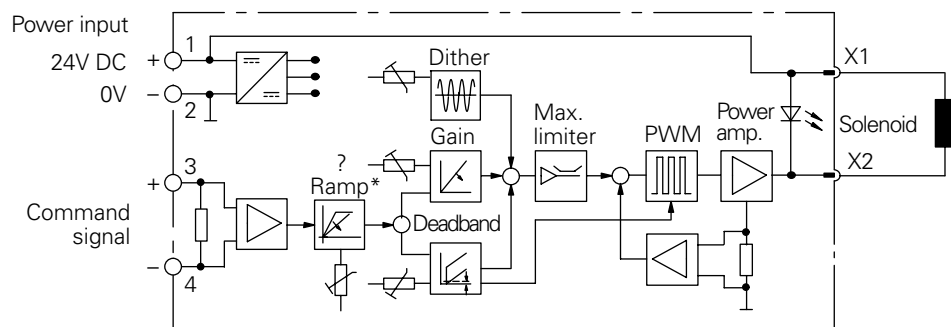
C

## Electrical Block Diagram

EHH-AMP-702-D/J/K-2\*



**Note:** This product has been designed and tested to meet specific standards outlined in the European Electro-magnetic Compatibility Directive (EMC) 89/336/EEC, amended by 91/26/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 a warning symbol and Electromagnetic Compatibility (EMC).



\* Type J does not have the ramp function.

# Model Code/ Operating Data

## Model Code

**EHH – AMP – 702 – \* 2\***

## 1 Adjustment Range

**D** - Proportional plug:  
0-10 VDC with ramp  
**J** - Proportional plug: 0-10  
VDC without ramp function  
**K** - Proportional plug:  
4-20 mA with ramp

## 2 Design Number 20 Series

Subject to change. Installation  
dimensions unaltered for  
design numbers 20 to 29  
inclusives.

## Operating Data

### Electrical

	Types D and J	Type K
Connections		
1	24V DC	
2	0V (power and signal)	
3	Positive command signal	
4	Negative command signal	
Power (input) supply	20-30V DC including $\pm 10\%$ maximum ripple (peak-to-peak) 24V DC nominal	
Absolute maximum voltage	40V	
Max. power consumption including solenoid	35W	
Reverse polarity protected	Yes	
Short circuit protected	Yes	
Maximum output current	1,6A	
Maximum output voltage typical (1,6A output current)	Typically 1,5V below supply voltage	
Command signal	0-10V (10 kohms)	4-20 mA (250 ohms)
Deadband triggering	200 mV	4 mA
For output (LED on)	200 mV to 10V	4-20 mA
For no output (LED off)	0 mV to 100 mV	0-4 mA
Deadband adjustment range	100 to 1000 mA	
Gain adjustment range	0.02A/V to 0.16A/V	0.01 A/mA to 0.08 A/mA
Dither adjustment range	0 to 500 mA	
Ramp time (types D and K only)	50 ms to 5s	
PWM frequency	1200 Hz $\pm 10\%$	
Dither frequency	120 Hz $\pm 10\%$	
Protection	IEC 529: IP67 (when correctly installed with interface seal in place) Fully short-circuit and reverse-polarity protected	
Isolation to VDE 0110	Group "B"	
Electromagnetic compatibility (EMC):		
Emission	EN 50081-2	
Immunity	EN 50082-2	

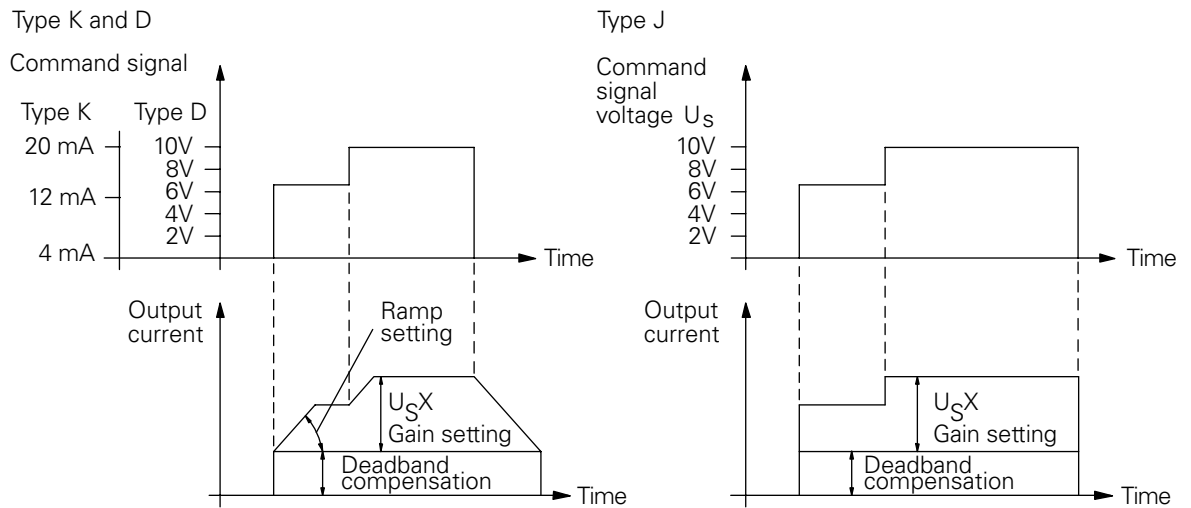
### Mechanical

Housing	PA6 glass-reinforced plastic (conforming to UL-94HB). Color: gray
Mounting interface	ISO 4400 (DIN 43650)
Cable clamp	Pg9 screw type
Cable diameter	Ø 5 to 10 mm (0.197 to 0.394" dia.)
Wire section	0,5 to 1,0 mm <sup>2</sup> (20-17 AWG)
Temperature, ambient range	-20° to +70°C (-4° to +158°F)
Mass	0,07 kg (0.154 lb)

Where measurements are critical request certified drawings. We reserve the right to change specifications without notice.

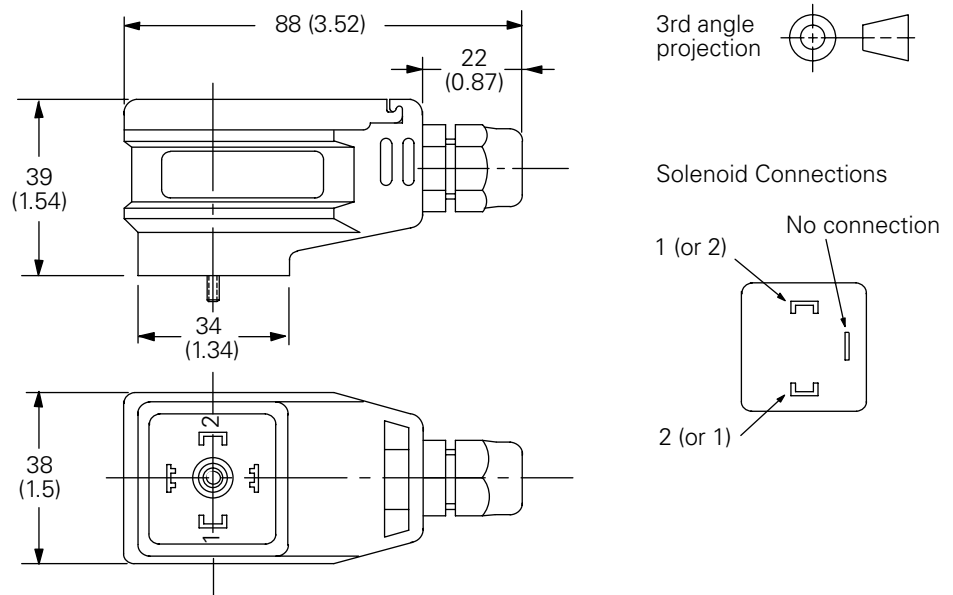
# Installation Data

## Input/Output Characteristics



## Installation Dimensions

mm (inch)



# Installation Data

## Adjustments

**Ramp time:** Turn clockwise to increase ramp time (Only types D/K).

**Gain:** Turn clockwise to increase gain.

**Deadband compensation:** Turn clockwise to increase deadband compensation current.

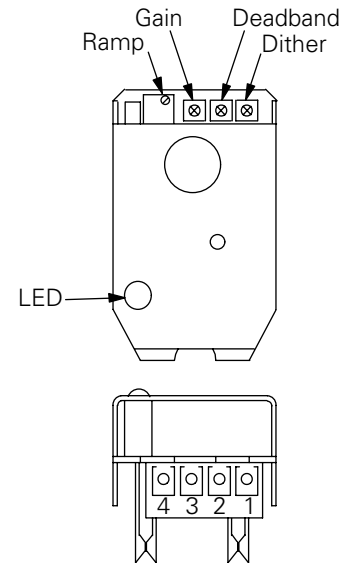
**Dither:** Turn clockwise to increase the dither current.

**Terminal 1:** Power Supply 20V-30V DC, positive.

**Terminal 2:** Power Supply 0V.

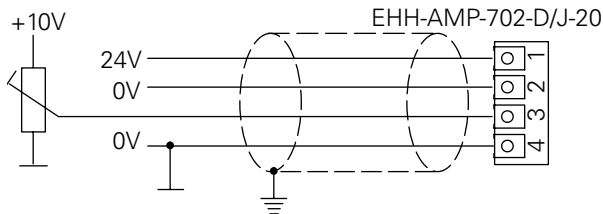
**Terminal 3:** Command signal positive (see "Operating Data").

**Terminal 4:** Command signal negative (see "Operating Data").

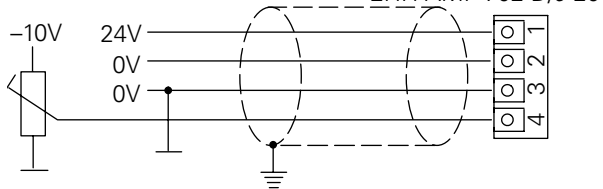


## Installation Wiring Options

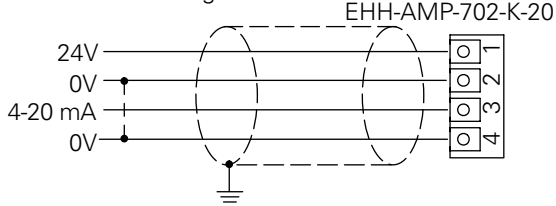
### Positive Command Voltage



### Negative Command Voltage

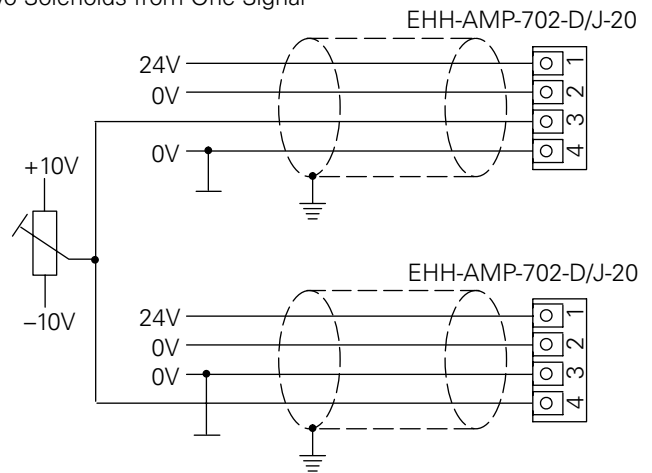


### 4-20 mA Command Signal

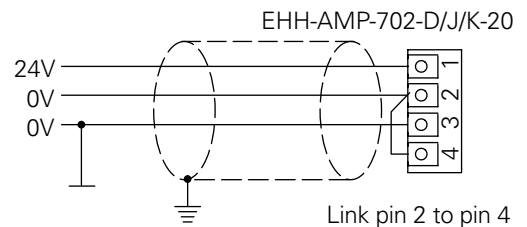


⏏ Protective ground connection.

### Bi-polar Command Voltage for Operating Two Solenoids from One Signal



Connections when replacing -10 design power plug with -20 design and only 3 wires exist



## WARNING


Electromagnetic Compatibility (EMC) - Screened cables should be used and particular attention paid to the grounding of the screens as shown in the above diagrams.

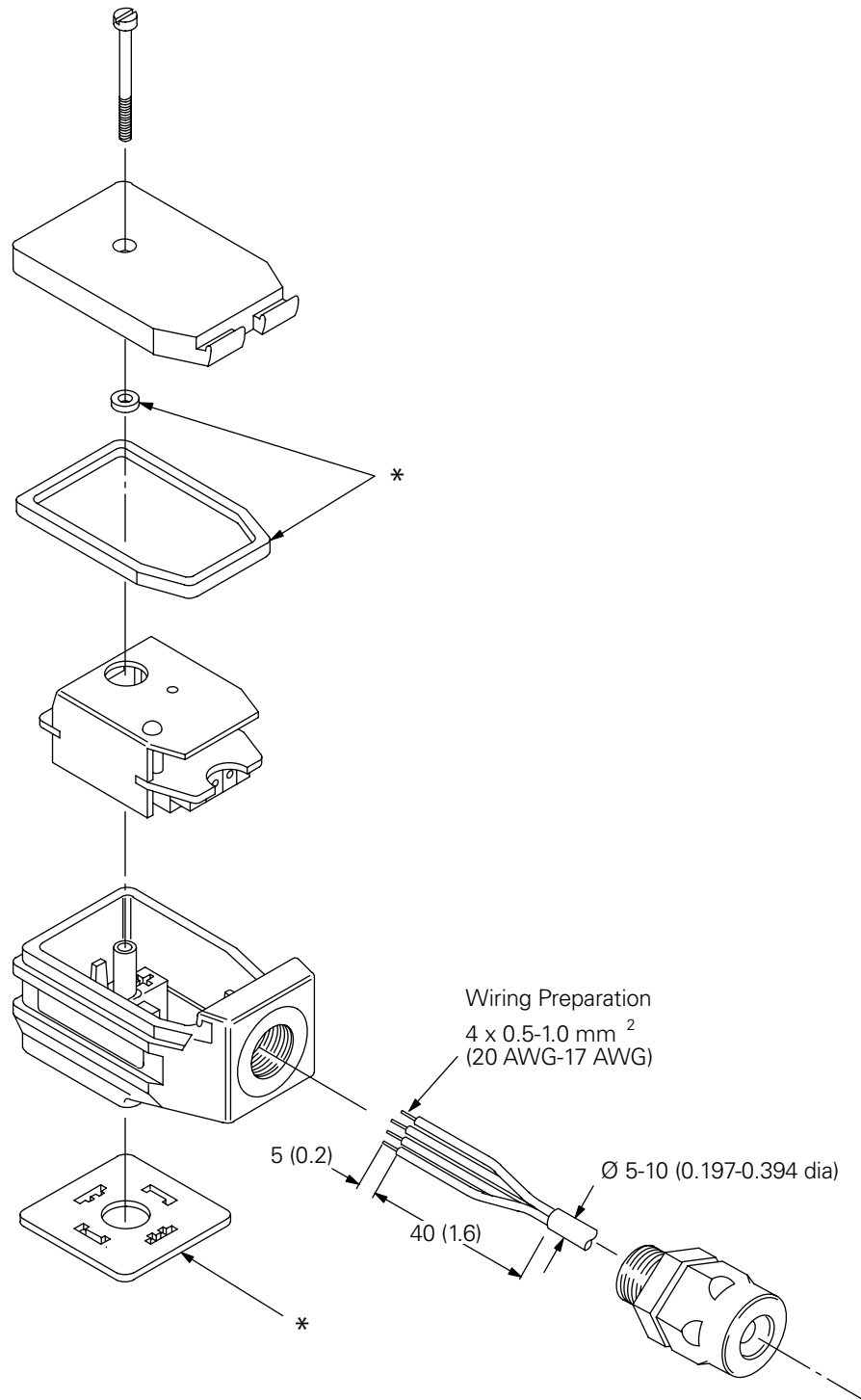
## Installation Data

## Assembly Showing Wiring Connection Points



## WARNING

 Ensure cable clamp nut is adequately tightened to secure cable. Do not connect, or disconnect, the plug while power is on. Do not mount, or dismount, the plug while power is on.



\*All seals must be fitted correctly at plug installation to provide protection to IP67 (IEC 529).

# Installation Data

C

## Start-Up Procedure

- Correctly wire the plug and, before mounting it on the valve solenoid, apply 24V DC (20 to 30V limits) to the "power input" terminals.
- Check for correct plug function by illumination/non-illumination of the LED. The LED should illuminate when the demand applied to the "signal input" terminal is between 200 mV and 10V (or 4 mA and 20 mA) and should not be illuminated when the applied demand is less than 100 mV (4 mA). If there is a malfunction a new plug must be fitted.
- Switch off power supply and command/input signal and then install plug on solenoid. Ensure that all seals are fitted correctly and clamped as the retaining screw is tightened: this is essential in providing IP67 protection.
- Ensure that the hydraulic system will not cause any erratic movement of actuators, then:
  - Switch on power supply again.
  - Repeat LED/function check as in 2.An LED malfunction now indicates a short circuit at the load.
- Successful completion of these checks means that the plug and load are ready for use.

## Spare Parts

The only spare part available is the interface seal, part number 732100.

## Ordering Procedure

Order plug by full model code, and spare interface seals by part number 732100.

# Electronic Controls

"Soft Switch" Power Plugs

## EHH-AMP-702-C-2\* 10 Series

### For use with valve types:

EPV\*\*-12D-1\*

EFV1\*\*-012DE\*

ERV1/2\*\*-12D-1\*

EPRV1\*\*-12D-1\*

### Application

Focus applications for this plug are in the control of hydraulic solenoid operated directional and pressure control valves where control of valve response time can significantly reduce shocks in the hydraulic system.

Best results in reducing hydraulic shocks will only be obtained by using valves with the right "low shock", or "proportional" features.

### General Description

These plugs, conforming to ISO 4400/DIN 43650 interface, offer adjustable, ramped on/off switching times through the use of an integral amplifier.

The switching time range is 50 ms to 5 seconds.

The soft switch plug is rated for 24V DC nominal and controlled by a 24V logic signal. Applying an "on" signal causes the output current to ramp up to, and stay at, an adjustable maximum while the "on" signal is maintained. At "switch-off" the output current is ramped down to zero and will remain at zero until the next "on" signal.

Ramp times (switching times) can be adjusted by an in-built potentiometer.

An adjustment also allows for compensation of any deadband in the valve.

### Features and Benefits

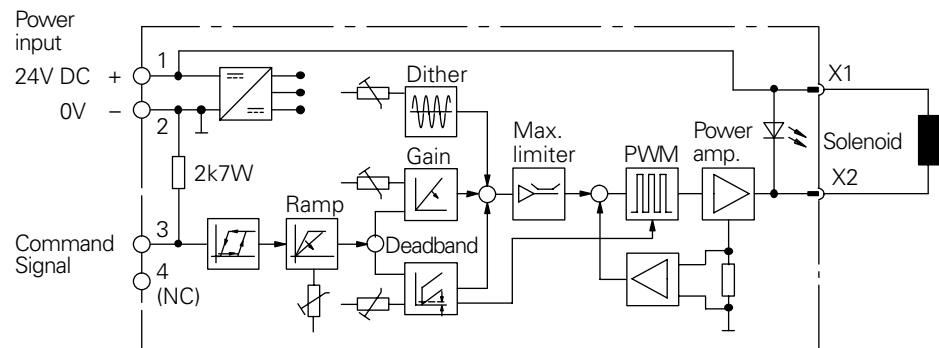
- Integral amplifier provides control from on/off logic command signal
- Adjustable ramp time
- Deadband compensation
- Adjustable output level
- Adjustable dither
- EMC to latest European standards
- Improved switching time repeatability
- Fully short-circuit and reverse-polarity protected
- Protection to IP67

### Electrical Block Diagram

#### EHH-AMP-702-C-2\* 10 Series



**Note:** This product has been designed and tested to meet specific standards outlined in the European Electro-magnetic Compatibility Directive (EMC) 89/336/EEC, amended by 91/26/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 a warning symbol and Electromagnetic Compatibility (EMC).



# Model Code/ Operating Data

## Model Code

EHH – AMP – 702 – C – 2\*

1

1 Design Number  
20 Series

Subject to change. Installation dimensions unaltered for design numbers 20 to 29 inclusives.

C

## Operating Data

### Electrical

Connections	
1	24V DC
2	0V (power and signal)
3	Positive command signal
4	Negative command signal
Power (input) supply	20-30V DC including $\pm 10\%$ maximum ripple ripple (peak-to-peak) 24V DC nominal
Absolute maximum voltage	40V
Max. power consumption including solenoid	35W
Reverse polarity protected	Yes
Short circuit protected	Yes
Maximum output current	1,6A
Maximum output voltage typical (1,6A output current)	Typically 1,5V below supply voltage
Command signal	
For output (LED on)	15V to 24V
For no output (LED off)	0V to 5V
Input impedance	2700 ohms
Deadband adjustment range	<100 - 1000 mA
Gain adjustment range	0.02A to 1,6A (maximum)
Dither adjustment range	0 to 500 mA
Ramp time	50 ms to 5s
PWM frequency	1200 Hz $\pm 10\%$
Dither frequency	120 Hz $\pm 10\%$
Protection	IEC 529: IP67 (when correctly installed with interface seal in place) Fully short-circuit and reverse-polarity protected
Isolation to VDE 0110	Group "B"
Electromagnetic compatibility (EMC):	
Emission	EN 50081-2
Immunity	EN 50082-2

### Mechanical

Housing	PA6 glass-reinforced plastic (conforming to UL-94HB). Color: gray
Mounting interface	ISO 4400 (DIN 43650)
Cable clamp	Pg9 screw type
Cable diameter	$\varnothing$ 5 to 10 mm (0.197 to 0.394" dia.)
Wire section	0,5 to 1,0 mm <sup>2</sup> (20-17 AWG)
Temperature, ambient range	-20° to +70°C (-4° to +158°F)
Mass	0,07 kg (0.154 lb)

Where measurements are critical request certified drawings. We reserve the right to change specifications without notice.

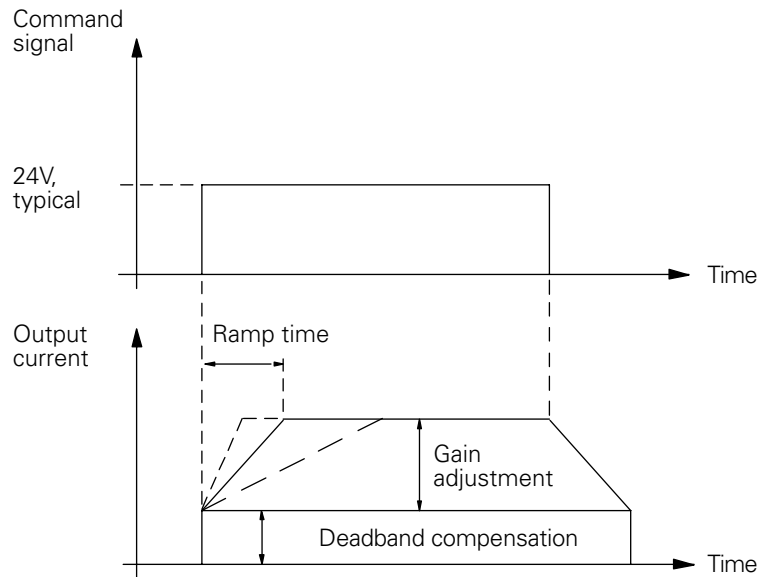


# Installation Data

## Input/Output Characteristics

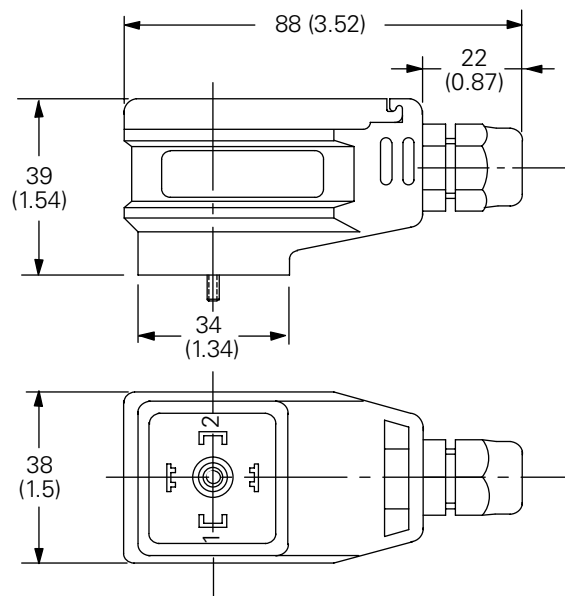
### Functions

Switch-on/off: after switching on with a 15V signal the amplifier will remain in the "on" condition with a command signal above 6V. The command signal must be reduced to below 5V to achieve switch-off of the amplifier.

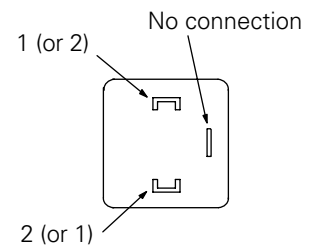


## Installation Dimensions

mm (inch)



### Solenoid Connections



# Installation Data

## Adjustments

**Ramp time:** Turn clockwise to increase ramp time.

**Gain:** Turn clockwise to increase gain.

**Deadband compensation:** Turn clockwise to increase deadband compensation current.

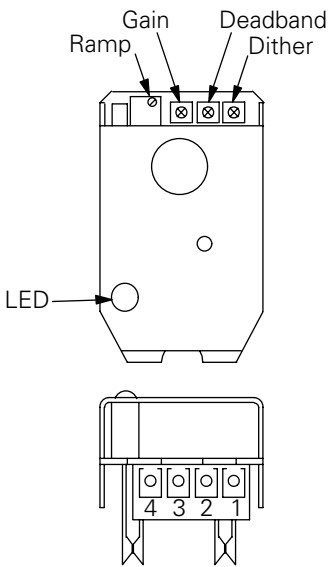
**Dither:** Turn clockwise to increase the dither current.

**Terminal 1:** Power Supply 20V-30V DC, positive.

**Terminal 2:** Power Supply 0V.

**Terminal 3:** Switch command signal positive.

**Terminal 4:** Not connected



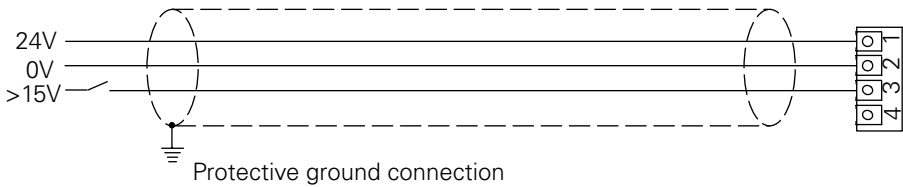
## Installation Wiring



### WARNING

Electromagnetic Compatibility (EMC)  
- Screened cables

should be used and particular attention paid to the grounding of the screens as shown in the above diagram.



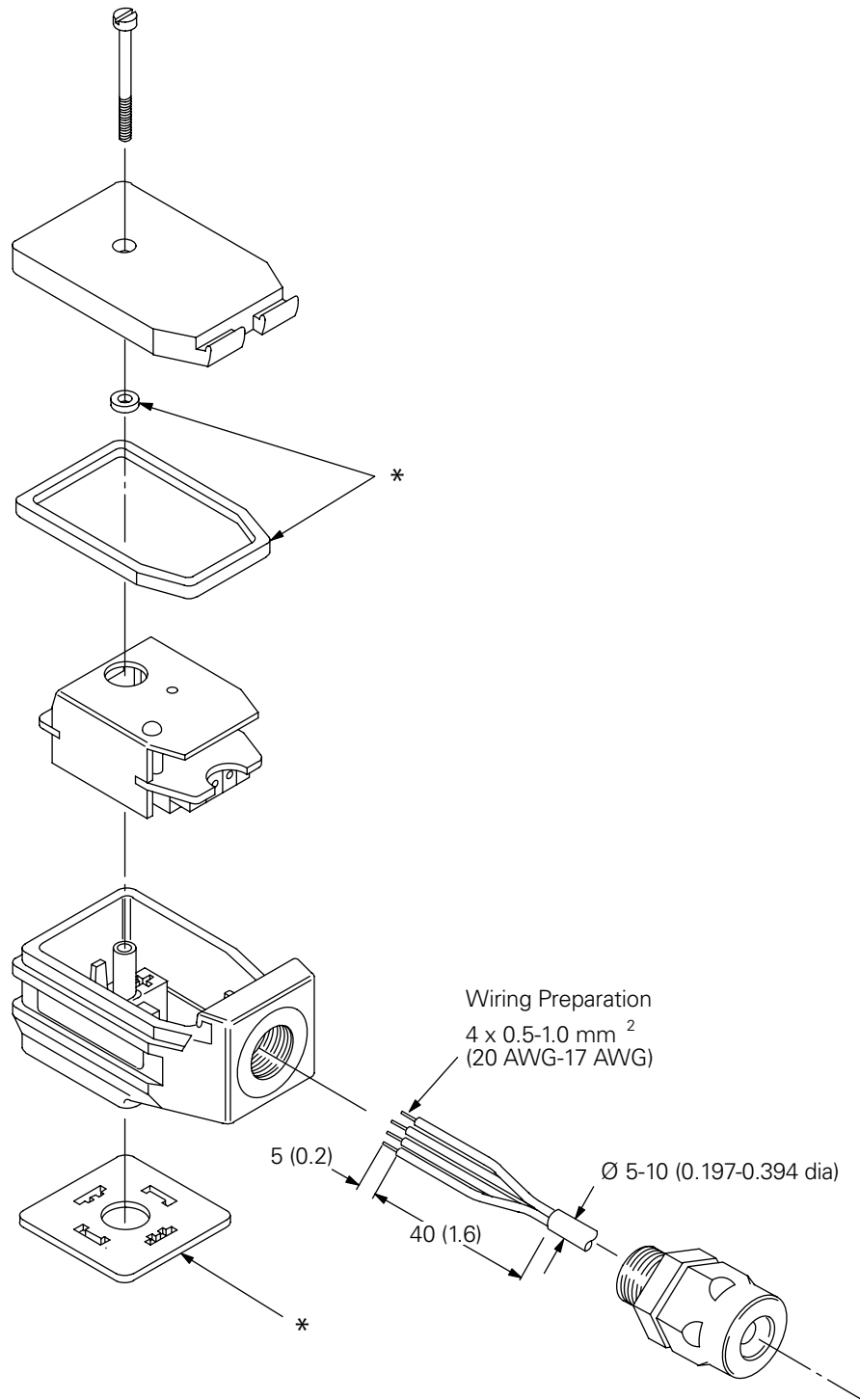
# Installation Data

## Assembly Showing Wiring Connection Points



### WARNING

Ensure cable clamp nut is adequately tightened to secure cable. Do not connect, or disconnect, the plug while power is on. Do not mount, or dismount, the plug while power is on.



\*All seals must be fitted correctly at plug installation to provide protection to IP67 (IEC 529).

# Installation Data

## Start-Up Procedure

- Correctly wire the plug and, before mounting it on the valve solenoid, apply 24V DC (20 to 30V limits) to the "power input" terminals.
- Check for correct plug function by illumination/non-illumination of the LED:
  - a. Apply less than 2 to 3 volts to the input terminal: LED should not be illuminated.
  - b. Increase voltage: the LED should illuminate when the voltage reaches 15V.  
**Do not exceed 30V command signal.**
  - c. Decrease voltage: the LED should go off when the voltage is less than 5V.

- Switch off power supply and command/input signal and then install plug on solenoid. Ensure that all seals are fitted correctly and clamped as the retaining screw is tightened: this is essential in providing IP67 protection.
- Ensure that the hydraulic system will not cause any erratic movement of actuators, then:
  - Switch on power supply again.
  - Repeat LED/function check as in 2.An LED malfunction now indicates a short circuit at the load.
- Successful completion of these checks means that the plug and load are ready for use.

## Spare Parts

The only spare part available is the interface seal, part number 732100.

## Ordering Procedure

Order plug by full model code, and spare interface seals by part number 732100.

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