

## Coils and electronic controls

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



**HYDRAULIC CONTROLS** Pty Ltd



# Coils and electronic controls

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### ToughCoils™

HCL/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 HCL/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** - HCL/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 retrofitable -

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.

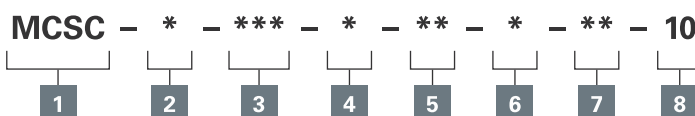
**HCL/IH ToughCoils™, with rated connector, meet or exceed all major OEM environmental protection requirements**



Shown with deutsch connection options

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

## Model code



### 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 forming 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

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

\*Rating dependent on mating connector

### ⚠ Caution

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

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

# 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	Q0 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

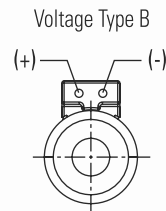
\*With flyback diode. (Voltage Type B)

\*\*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	Q0 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

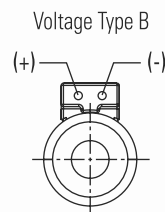
\*With flyback diode. (Voltage Type B)

\*\*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).



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

**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

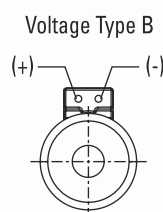
\*With flyback diode. (Voltage Type B)

\*\*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

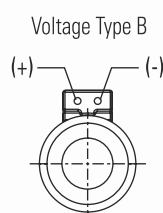
\*With flyback diode. (Voltage Type B)

\*\*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

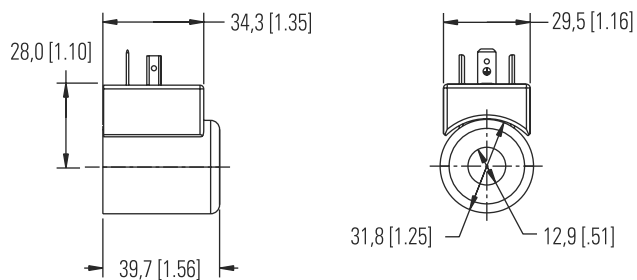
\*Nominal voltage 25°C (77°F).



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

## S and P Series coils

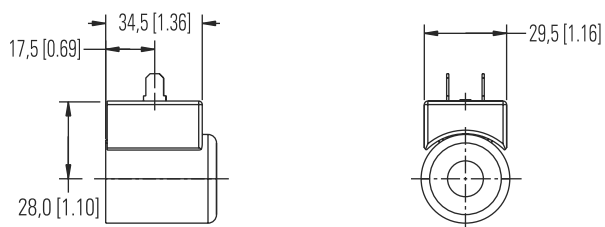
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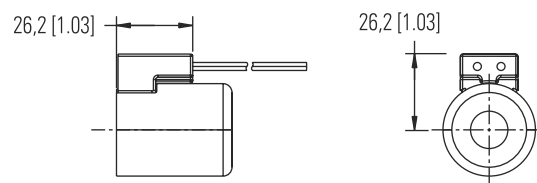
**G0**  
**DIN 43650-A Connector**



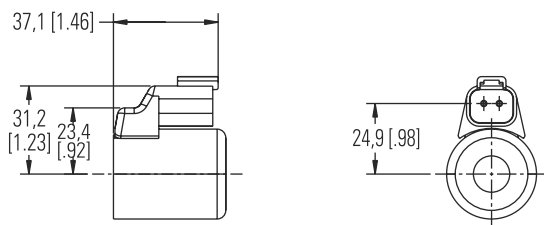
Shown with integrated Deutsch Connector



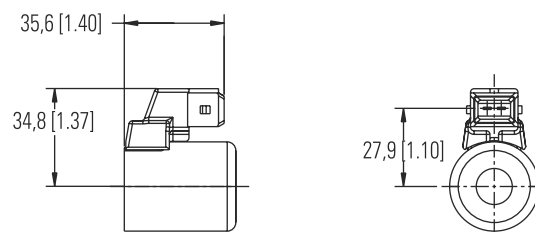
**Q0**  
**Spade connector**



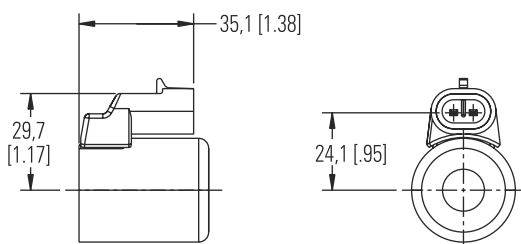
**W0**  
**Leadwire**



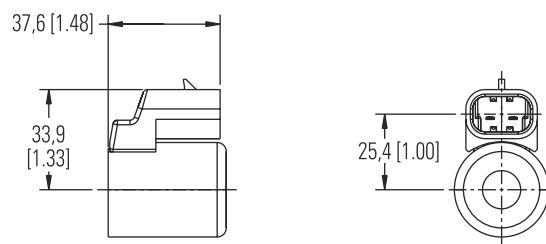
**N0**  
**Deutsch Male DTO4-2P integrated connector**



**Y0**  
**AMP Junior timer integrated connector**



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

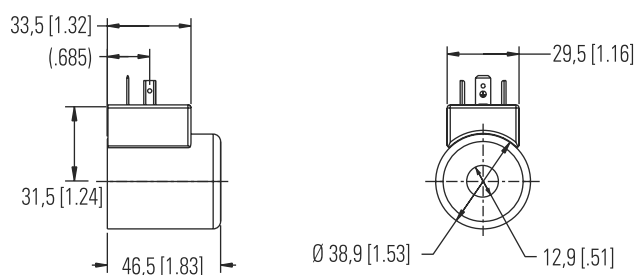


**J0**  
**Metri-Pack 280 Male, integrated connector**

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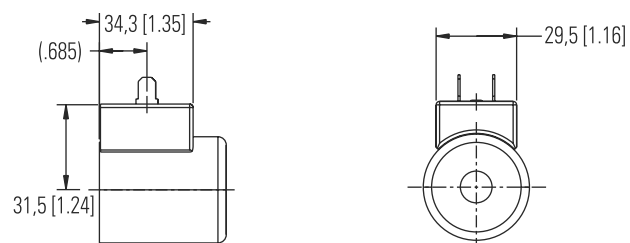
## Dimensions



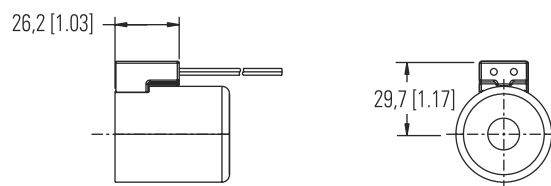
**G0**  
**DIN 43650-A Connector**



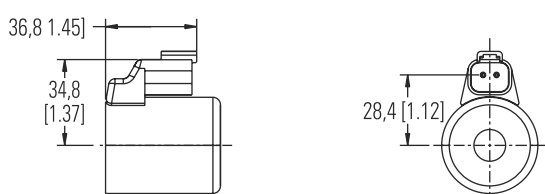
Shown with integrated MetriPack 150 Connector



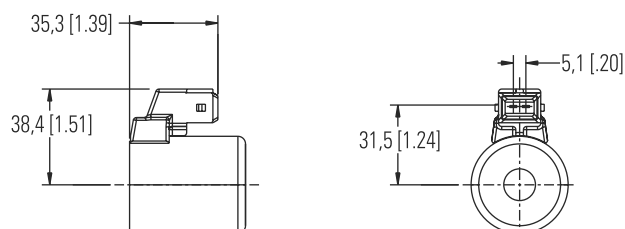
**Q0**  
**Spade connector**



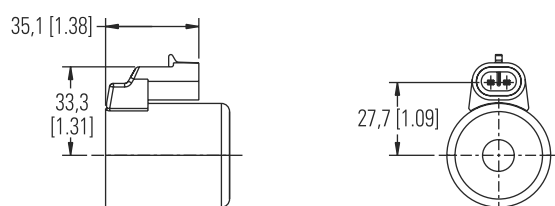
**W0**  
**Leadwire**



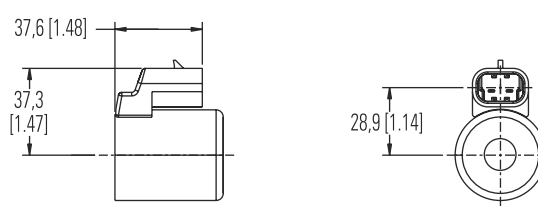
**N0**  
**Deutsch male DTO4-2P integrated connector**



**Y0**  
**AMP Junior timer integrated connector**



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

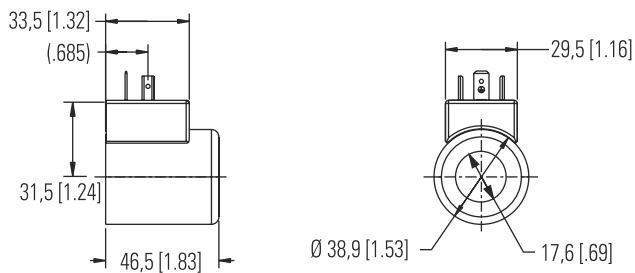


**J0**  
**Metri-Pack 280 Male, integrated connector**

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

# H Series coils

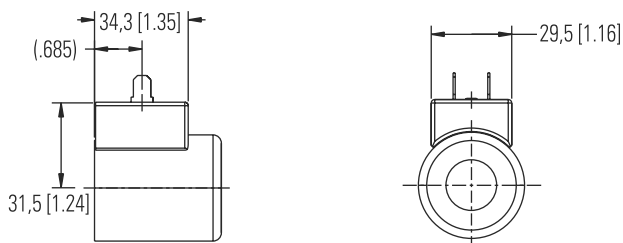
## Dimensions



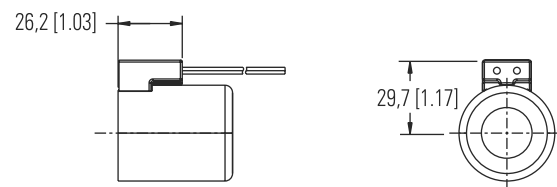
**G0**  
**DIN 43650-A Connector**



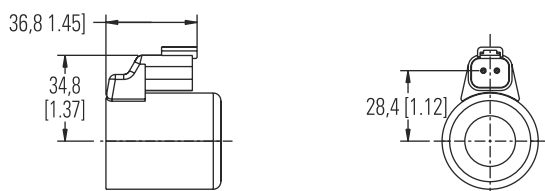
Shown with integrated MetriPack 280 Connector



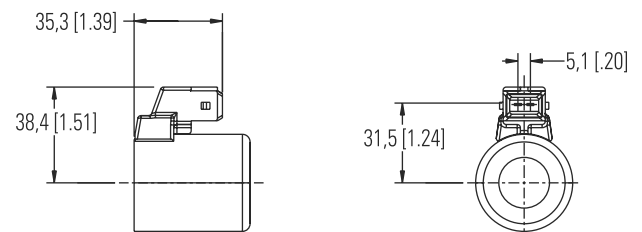
**Q0**  
**Spade connector**



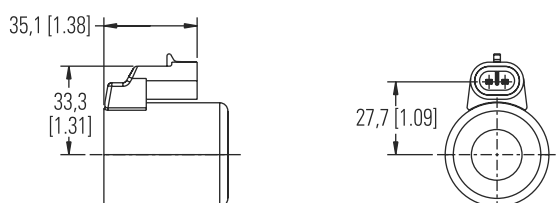
**W0**  
**Leadwire**



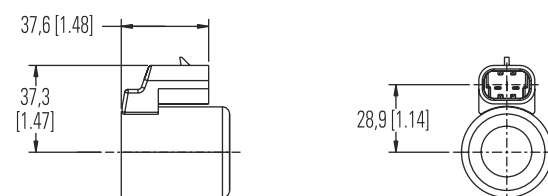
**N0**  
**Deutsch male DTO4-2P integrated connector**



**Y0**  
**AMP Junior timer integrated connector**



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



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

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# Large Tough Coils

Model Code L and R Series Coils

## Model code

<b>LTC</b>	<b>-</b>	<b>2</b>	<b>-</b>	<b>**</b>	<b>-</b>	<b>*</b>	<b>-</b>	<b>***</b>	<b>-</b>	<b>K</b>	<b>-</b>	<b>N0</b>	<b>-</b>	<b>0</b>	<b>-</b>	<b>00</b>	<b>-</b>	<b>10</b>
1		2		3		4		5		6		7		8		9		10

### 1 Function

**LTC** - Solenoid coil

### 2 Control type

**2** - Voltage Control (on/off)

### 3 Power rating

**AA** - 30W (standard for R series)

**AG** - 28W (standard for L series)

### 4 Series

**L** - 10 size for ESV9 and SV9A valves (17.6mm inner diameter)

**R** - 10 and 12 size used on SV\*M solenoid valves (23.6mm inner diameter)

### 5 Voltage rating

**012** - 12 volt

**024** - 24 volt

### 6 Voltage type protection

**K** - DC with no protection

**G** - AC w/ full bridge rectifier

**M** - DC w/ bi-directional Diode

### 7 Connector type

**N0** - Deutsch male, DT04-2P, integrated

**W0** - Flying lead

**Y0** - Amp Jr (DC Only) Mating Connector: AMP 963040-3 or equivalent

### 8 Lead length

**0** - None

**C** - 152mm [6.0 in] (Standard length with connector)

**J** - 622mm [24.5 in] (Standard length without connector)

### 9 Special features

**00** - None

### 10 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
Power Rating	L Series: 28W R Series: 30W
Encapsulant	Glass filled nylon
Magnet Wire	U.L. class N, 200°C (392°F) NEMA pub. No. MW 1000, section MW 35 – C (single)

## Environmental protection

Connector	IP65	IP67	IP69K	Thermal shock dunk
Y0: Amp Jr.	X	X*		
W0: Wire Leads	X	X		X
N0: Deutsch	X	X	X	X

\*Rating dependent on mating connector

### ⚠ Caution

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

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

# Large Tough Coils

## L & R Series Coils

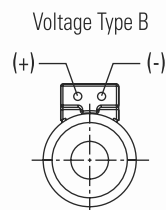
**L Series ToughCoils part numbers - 309AA00\_\_\_\_\_** (Complete part number is 11 Digits)

Voltage	Q0 Connector	W0 Connector	N0 Connector	Y0 Connector	D0 Connector	J0 Connector
12VDC	—	—	041A	—	—	—
24VDC	—	—	042A	—	—	—

For other voltages and connectors contact your HCL representative.

Std. voltages	Amperes*
12 DC	2.35
24 DC	1.17

\*Nominal voltage 25°C (77°F).



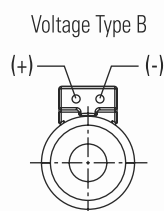
**R Series ToughCoils part numbers - 309AA00\_\_\_\_\_** (Complete part number is 11 Digits)

Voltage	Q0 Connector	W0 Connector	N0 Connector	Y0 Connector	D0 Connector	J0 Connector
12VDC	—	—	001A	006A	—	—
24VDC	—	—	017A	021A	—	—

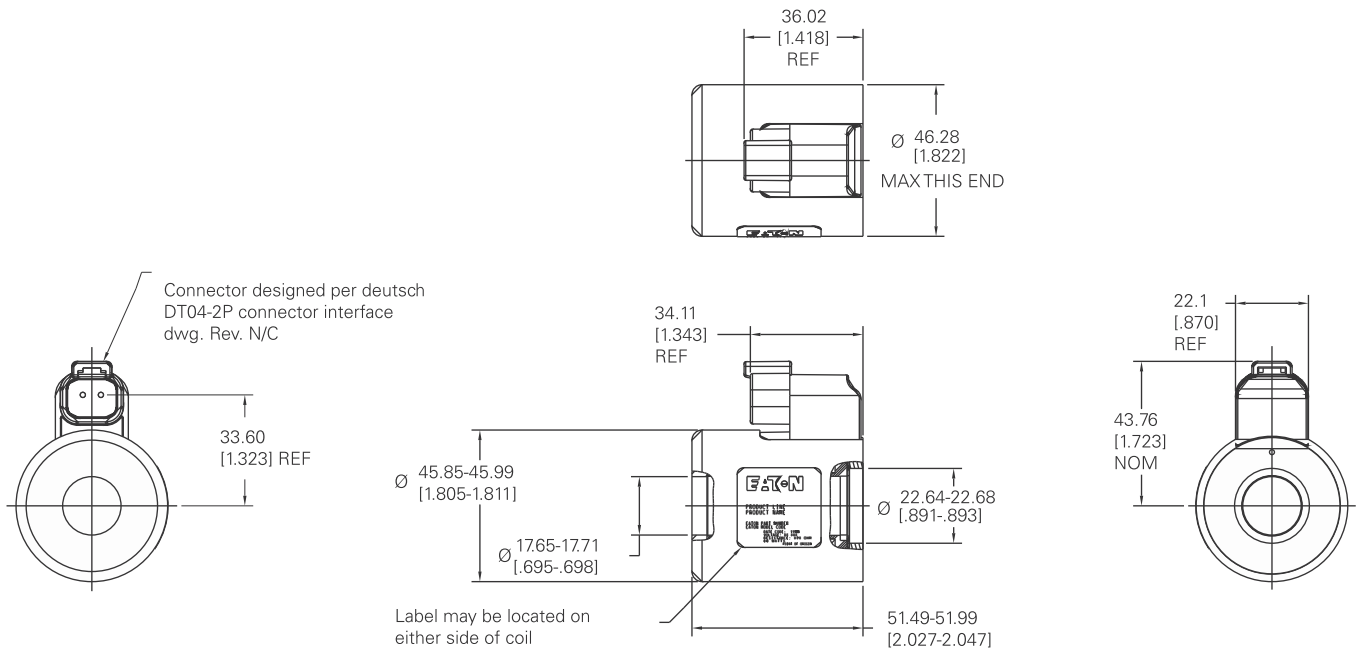
For other voltages and connectors contact your HCL representative.

Std. voltages	Amperes*
12 DC	2.50
24 DC	1.25

\*Nominal voltage 25°C (77°F).



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

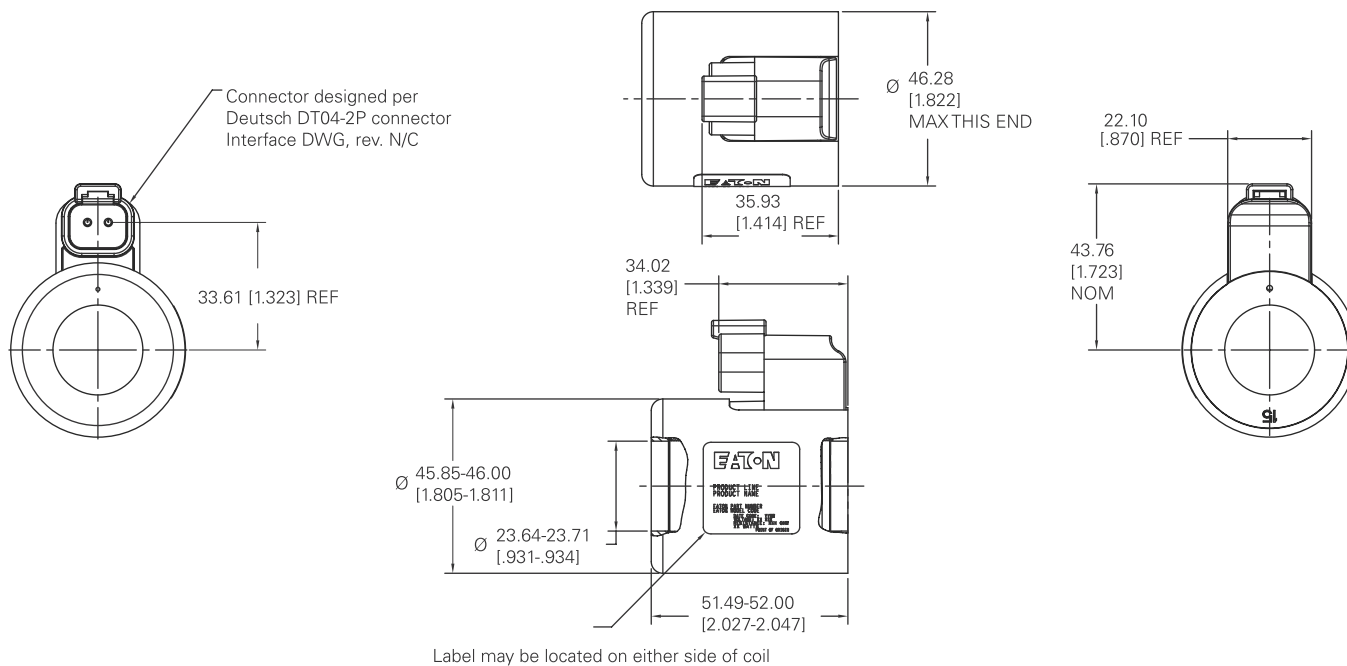


**N0**  
**Deutsch Male DTO4-2P integrated connector**

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

# R Series Large Toughcoils

## Dimensions



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

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

## Legacy 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 HCL 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

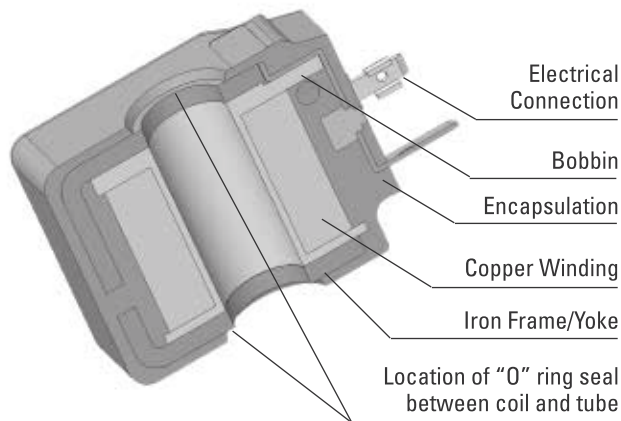
**Note:** For more information on 'R' series coils, please refer to HCL Technical Datasheet V=VLDL-MC011-E (Solenoid Operated Directional Valve-DG4V-35 and DG4V3 Series).

### R and L series coils

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

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

## 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

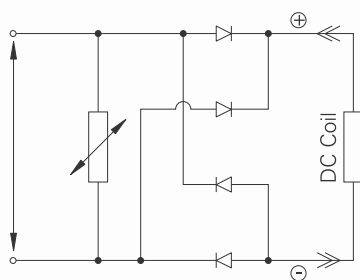
Other Voltages are available on request

### 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 +/- 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°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°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°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 1.5mm<sup>2</sup> 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).

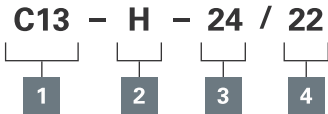
### Caution

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



### 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*

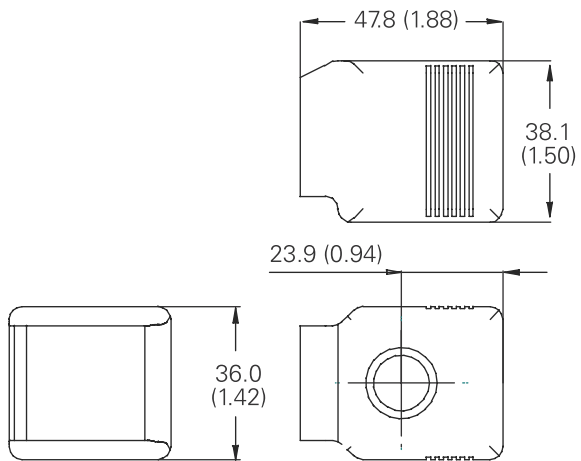
\*220 to 240 VAC  
All AC coils must be used with a rectifying connector:  
(AXP9997- 115 or AXP9997-230)  
(Other voltages available on request)

### 4 Wattage

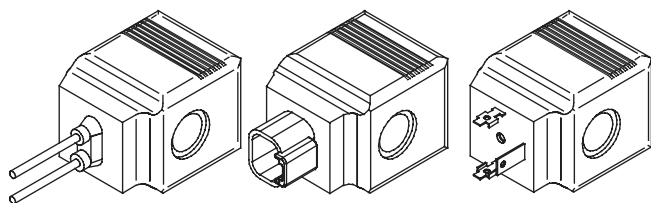
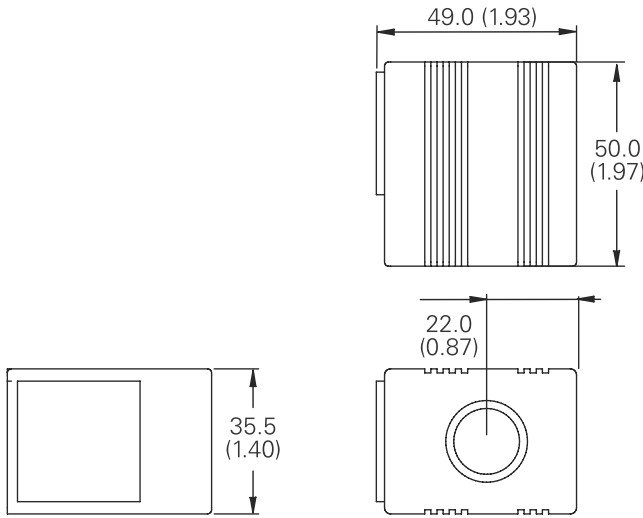
<b>C13</b>	<b>C16</b>
<b>14</b> = 14 Watt	<b>19</b> = 19 Watt
<b>22</b> = 22 Watt	<b>29</b> = 29 Watt
<b>27</b> = 27 Watt	

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.

# EPV Series proportional valve coils

## EPV coils

C

Control and specifications	
Rheostat	12 VDC operation 10-12 V, 20-25 watts 24 VDC operation 25-30 V, 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

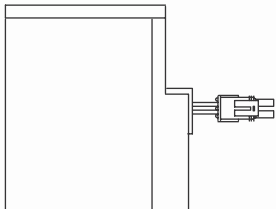
Voltage	F Connector	Q Connector	U* Connector	W Connector	Y Connector
12VDC	02-308810	02-317154	02-154070	02-154072	02-308808
24VDC	02-308811	02-317155	02-154071	02-154073	02-308809

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

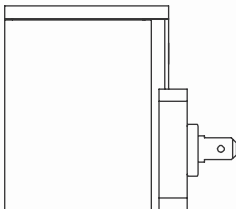
### Coil configurations

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

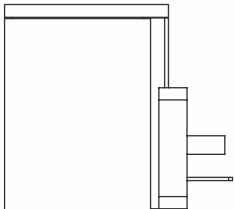
"F" - Weather-Pack male on leads



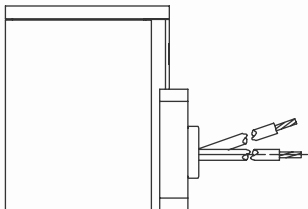
"Q" - Spade terminal



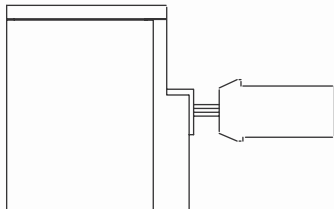
"U" - DIN 43650



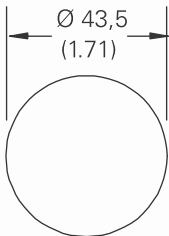
"W" 610 mm (24 inch) lead wire



"Y" - Metri-Pack 150 male on leads



Note: Width – all configurations



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

# EFV Series proportional valve coils EFV

M series coils

## Control and specifications

	EHH-AMP-702 (Requires 24 VDC power supply to power plug and 12 VDC coil)
Power plug options	EHH-AMP-712 (Requires 12 VDC power supply to power plug and 12 VDC coil)
DIN Rail Module	EHH-PAM-600 (Requires 24 VDC power supply and 12VDC)

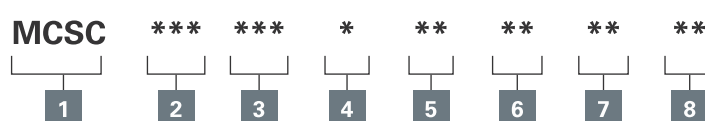
## ⚠ Caution

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

## Specifications

Standard Voltage	Resistance	Power
12 VDC	4.7 Ω	30 W
24 VDC	19.0 Ω	30 W

## Coil model code



### 1 Function

**MCSC** - Solenoid Coil

### 2 Series

**M** - Size 10 (210 Bar)

### 3 Voltage rating

**012** - 12 volt

**024** - 24 volt

### 4 Voltage type

**D** - DC

### 5 Connector

**G0** - ISO 4400 DIN 43650

**W0** - Flying lead

**C0** - Deutsch Male, DT04-2P,  
On wire leads

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

DIN 43560 mating connector for "G" style coil – 02-166796.

### 6 Lead length

**0** - None

**A** - 152mm [6.0 in] (standard length with connector)

**B** - 610mm [24.0 in] (standard length without connector)

**K** - 127mm [5.0 in]

## Coil kits

### Standard coil

#### Model code

MCSC012DGE00

MCSC024DGE00

MCSC012DWE00

MCSC012DCE06

### Part numbers

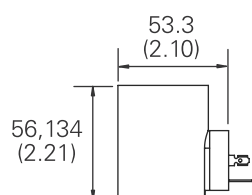
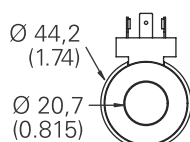
#### Assembly number

6034440-001

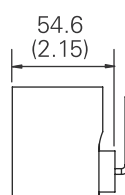
6034440-002

6034441-001

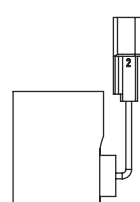
6034442-002



"G" - DIN 43650



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



"C" - Deutsch  
DT0402P on  
leads

**Note:** Width all configurations

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/K-\* Series

##### For use with valve types:

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

EFV1\*\*-012DE\*

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

EPRV1/3\*\*-12D-1\*

ESV1\*\*-12D-1\*

IRV\*\*-012D-1\*

PFR21\*

PFR24\*

PDR21A\*

PPD22\*\*-012D-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.

For closed-loop and no ramp applications adjust the ramp port to minimum setting.

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

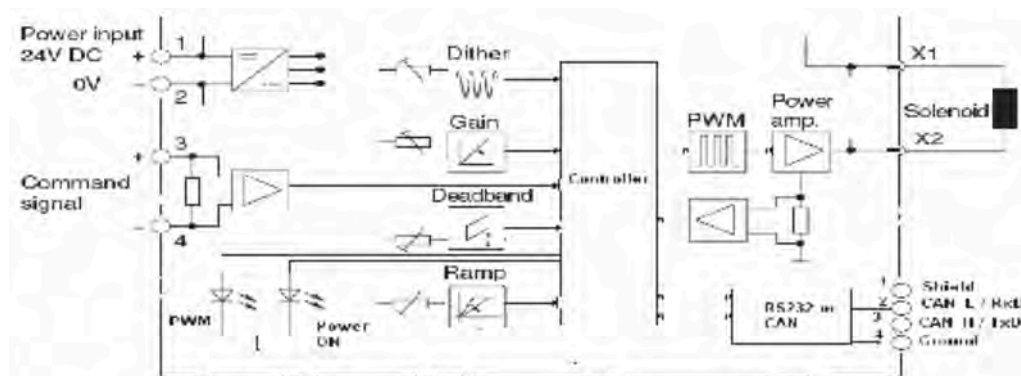
- Integral amplifier provides essential functions for control of proportional valves
- Adjustable ramp time (types D and K), gain, deadband compensation and dither
- Ease of installation, with reduced cost
- Fully short-circuit and reverse-polarity protected
- Differential voltage command signal (type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

#### Electrical block diagram

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



**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).



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

## Model code

**EHH - AMP - 702 - \* - R - P - \* - 30**

1

2

## 1 Adjustment range

**D** - Proportional plug:  
0-10 VDC with ramp

**K** - Proportional plug:  
4-20 mA with ramp

## 2 Cable gland

**1** - PG9

**2** - M16

## Operating data

### Electrical

	Types D	Type K
Connections		
1	24V DC	
2	Supply GND	
3	Positive command signal	
4	Negative command signal	
Power (input) supply	18-36V 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	$\varnothing 5$ 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)

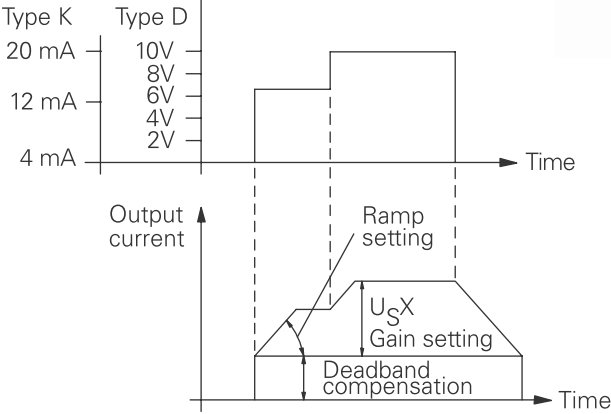
Where measurements are critical request certified drawings. We reserve the right to change specifications without notice.

# Installation data

## Input/output characteristics

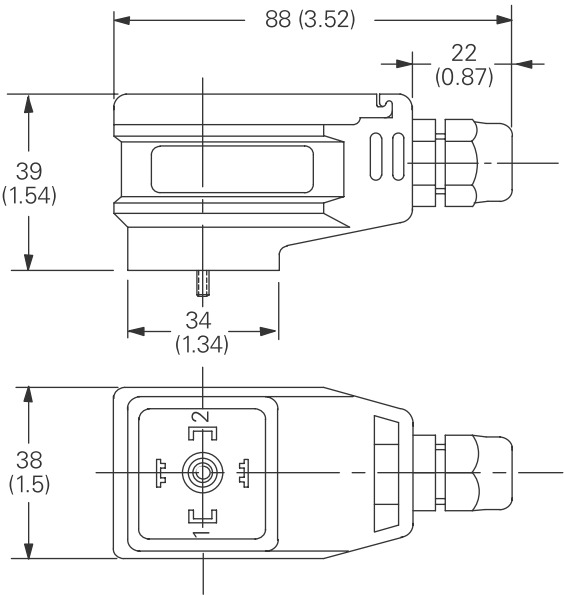
Type K and D

Command signal



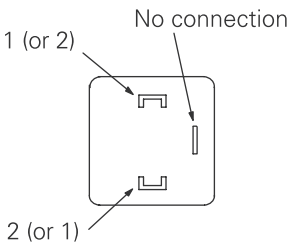
## Installation dimensions

mm (inch)



3rd angle projection

Solenoid Connections



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

## 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.

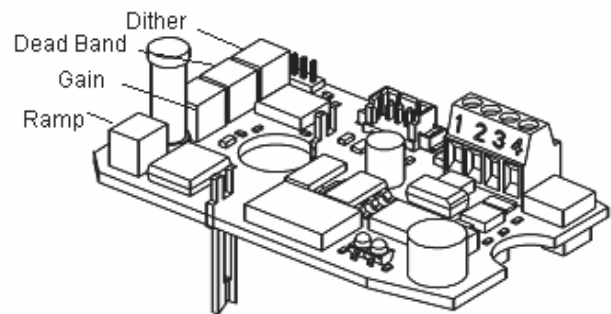
**Dither:** Turn clockwise to increase the dither current.

**Terminal 1:** Power Supply 18-36V DC, positive.

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

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

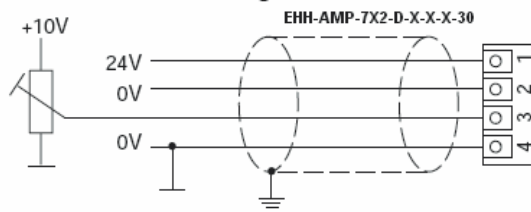
**Terminal 4:** Command signal negative (see "Operating Data").



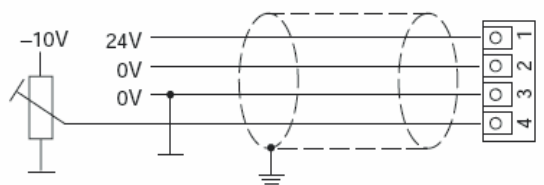
## Installation wiring options

### Installation Wiring Options

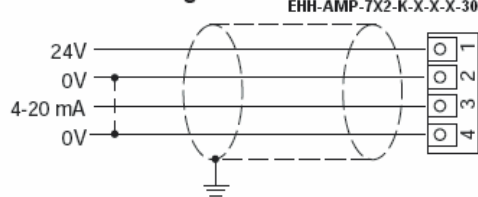
#### Positive Command Voltage



#### Negative Command Voltage

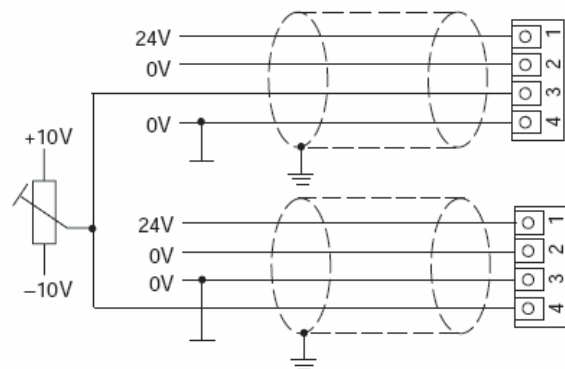


#### 4-20 mA Command Signal



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

EHH-AMP-7X2-D-X-X-X-30



### ⚠ 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.

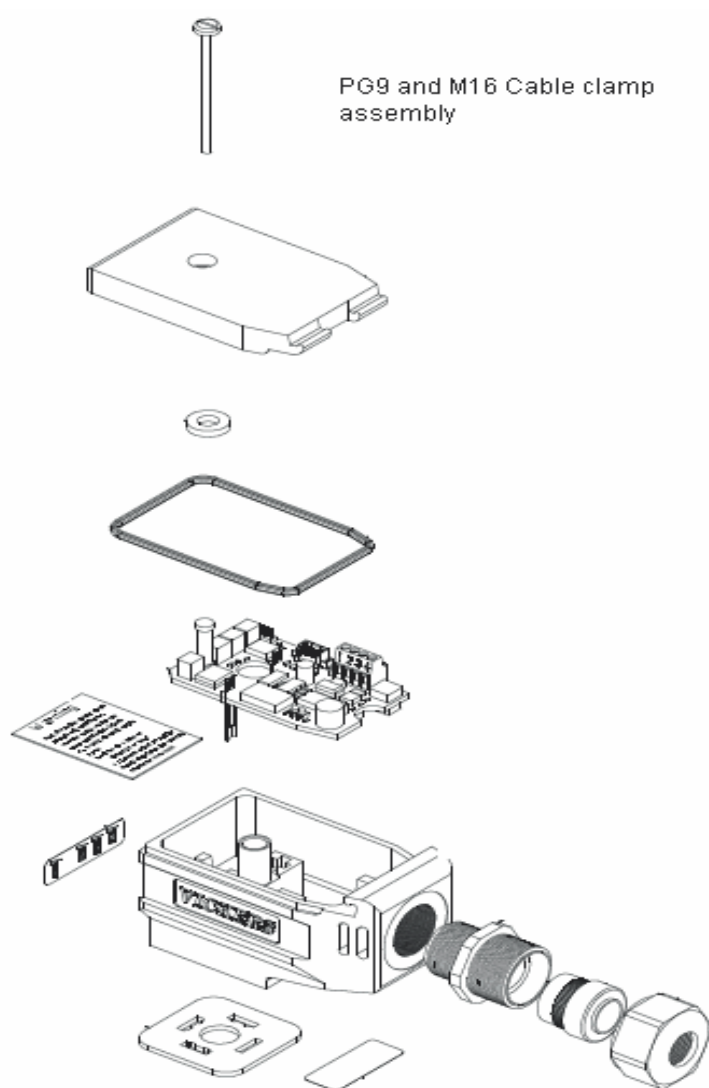
Where measurements are critical request certified drawings. We reserve the right to change specifications without notice.

## 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).

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



### Start-Up procedure

- With the plug correctly wired but not mounted to the load provide with a DC power supply (See table).
  - Apply the command signal (ON) and check the Power ON LED (RED) illuminates. Reduce the signal to the Command signal (OFF) level and check the LED (RED) goes out.
  - If there is malfunction to the LED replace the plug.
  - Switch off the power supply and command signal and connect the plug to the load. Ensure that the interface seal is correctly fitted and clamped between the mounting faces (essential for IP65 protection). Tighten the retaining screw.
  - Ensure that no damage or injury will occur on the machine when the valve is operated.
- Switch on the power supply. Apply the command signal.
    - (a) Observe Power On LED (RED) is ON.
    - (b) Observe PWM LED (Orange) is ON.If LED is not operated then there is short circuit in the load. Replace the load/ load coil.
  - Successful completion of these steps means that the plug and load are ready for normal 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-\* 10 Series

##### For use with valve types:

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

EFV1\*\*-012DE\*

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

EPRV1/3\*\*-12D-1\*

ESV1\*\*-12D-1\*

IRV\*\*-012D-1\*

PFR21\*

PFR24\*

PDR21A\*

PPD22\*\*-012D-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

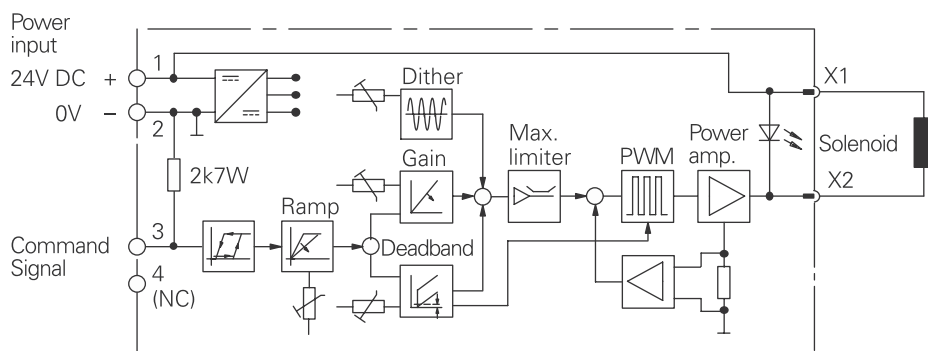
- Integral amplifier provides control from on/off logic command signal
- Adjustable ramp time
- Deadband compensation
- Adjustable output level
- Adjustable dither
- EMC to latest European standards
- Improved switching time repeatability
- Fully short-circuit and reverse-polarity protected
- Protection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

#### Electrical block diagram

##### EHH-AMP-702-C-\* 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

**EHH - AMP - 702 - C - \***

## Operating data

### Electrical

Connections	
1	24V DC
2	0V (power and signal)
3	Positive command signal
4	Negative command signal
Power (input) supply	18 - 36V 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)	11 to 24V
For no output (LED off)	0V to 5V
Input impedance	10 KOhm 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 Immunity	EN 50081-2 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)

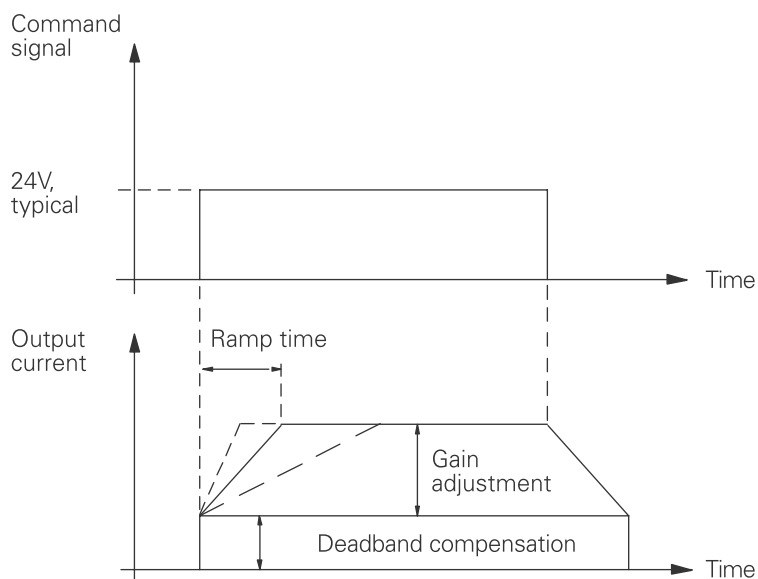
Where measurements are critical request certified drawings. We reserve the right to change specifications without notice.

## Installation data

### Input/Output characteristics

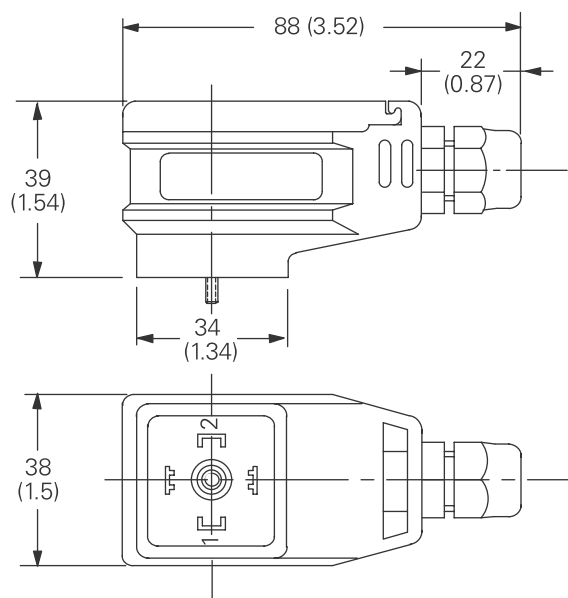
#### Functions

Switch-on/off: after switching on with a 11V 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.

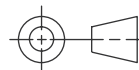


### Installation dimensions

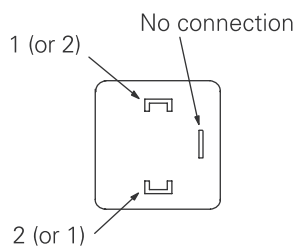
mm (inch)



3rd angle projection



Solenoid Connections



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

## Adjustments

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

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

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

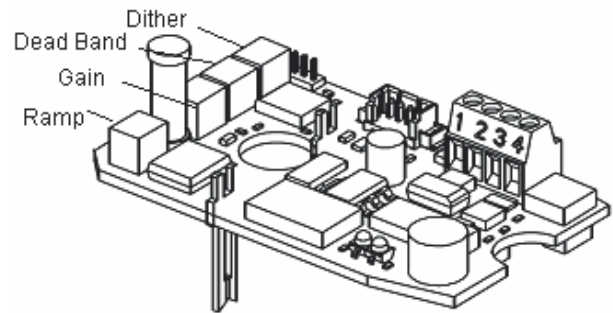
**Dither:** Turn clockwise to increase the dither current.

**Terminal 1:** Power Supply 18 - 36V DC, positive.

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

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

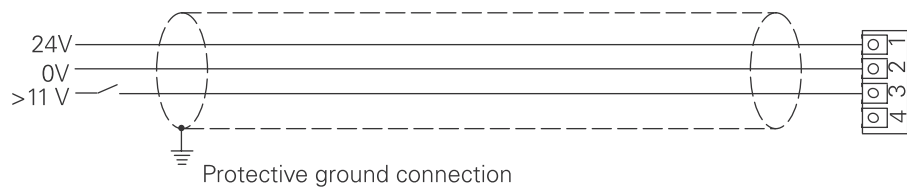
**Terminal 4:** Not connected



## 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.



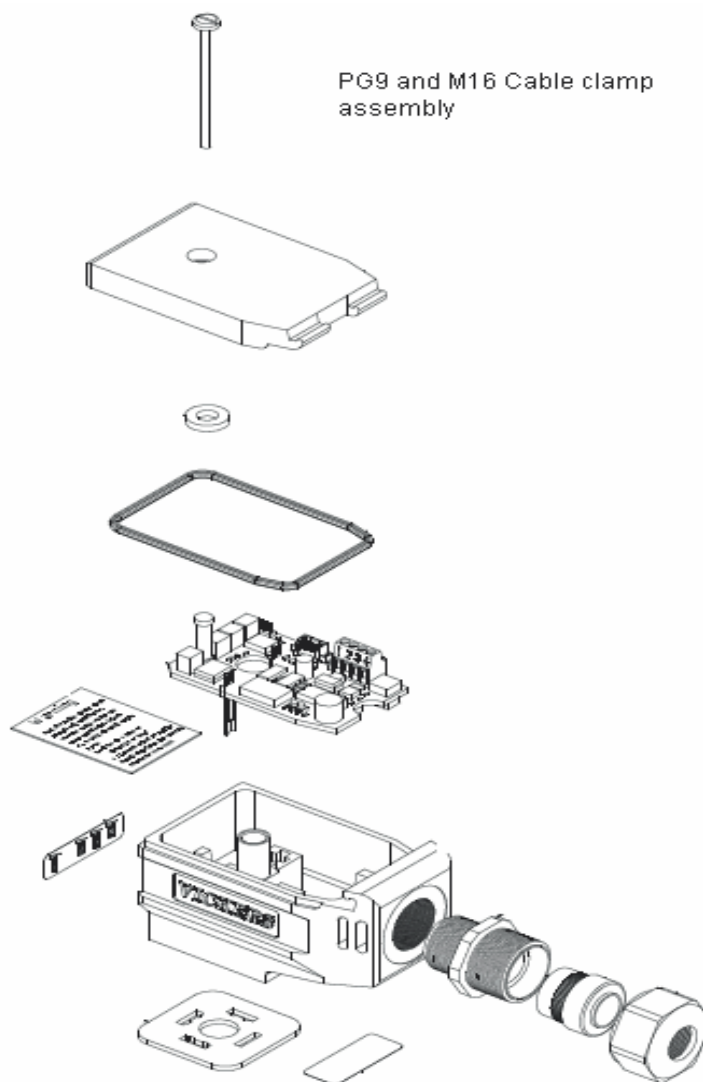
Where measurements are critical request certified drawings. We reserve the right to change specifications without notice.

## 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).

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

### Start-Up procedure

- Correctly wire the plug and, before mounting it on the valve solenoid, apply 24V DC (18 to 36V 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 11V.  
**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.

For enquiries please contact our  
Technical Sales Team directly;  
**Tim Daniels: 0400 665 388**

Alternatively contact us via  
the office on **02 9938 5400**



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