



Hydraulics

Electronic Proportional (EP) Control for Medium Duty 72400 Piston Pumps

Data Sheet

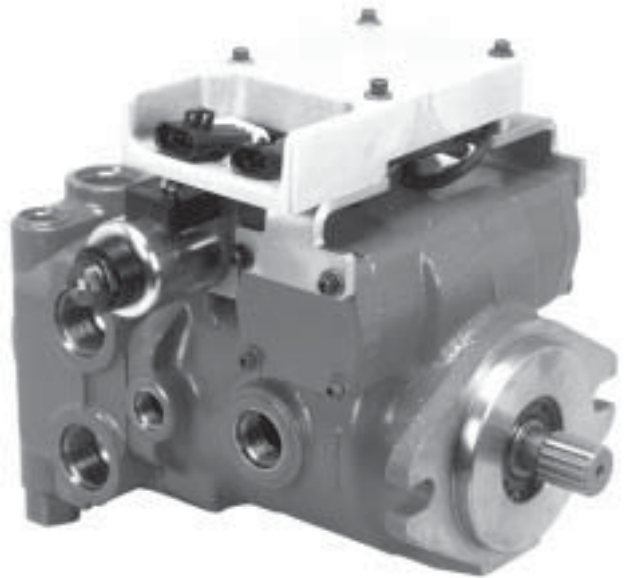
The Electronic Proportional (EP) Control is ideal for a wide range of mobile and industrial applications where electrical control of pump displacement is desired. Danfoss's robust design incorporates an electronic module, proportional solenoids and a valve assembly.

Pump displacement is controlled by an input command signal which is converted into proportional current output by the electronic module. The proportional solenoid-actuated valve assembly then converts the current output into proportional pump displacement.

Designed to meet the rigorous duty cycle requirements of off-highway equipment, the EP Control utilizes an electronic module encapsulated in an aluminum enclosure and environmentally-sealed Metri-Pack® connectors to assure maximum protection from the elements. The EP Control is designed to resist Electromagnetic Interference (EMI) which could affect proper operation.

The EP Control offers maximum design and application flexibility with two different types of command input options and compatibility with both 12 and 24 Vdc power supplies. Typical input devices include joysticks (1-6 Vdc) and PLCs (± 4 -20 mA).

For precise, repeatable operation, closed-loop current control is used to compensate for resistance and voltage changes of the proportional solenoids due to temperature variation. In the event of a power loss or loss of signal, the EP Control automatically returns the pump to neutral. Mechanical feedback of the swashplate position provides closed-loop control to maintain the selected displacement setting over a wide range of operating conditions. Solenoids have integral manual override actuators.



EP Control Features

- Robust, flexible electronic pump control
- Electronic module encapsulated for environmental protection
- Automotive style environmentally sealed Metri-Pack® connectors
- Closed-loop current control compensates for resistance change of the proportional solenoids due to temperature variations
- Return to neutral for loss of power or loss of command input signal
- Mechanical feedback of swashplate position for closed-loop control
- Two choices for command input signal
- Operates from 12 or 24 Vdc power supply
- Ease of installation
- Operating temperature range -40° to +85° C
- On-pump mounting for many installations
- External neutral adjustment
- Manual override capability
- Drive module qualification per SAE J1455, SAE J1113, CISPR 25
- External fuse (customer supplied): 3A

Electronic Module Qualification

(Contact Danfoss for Specific Levels)

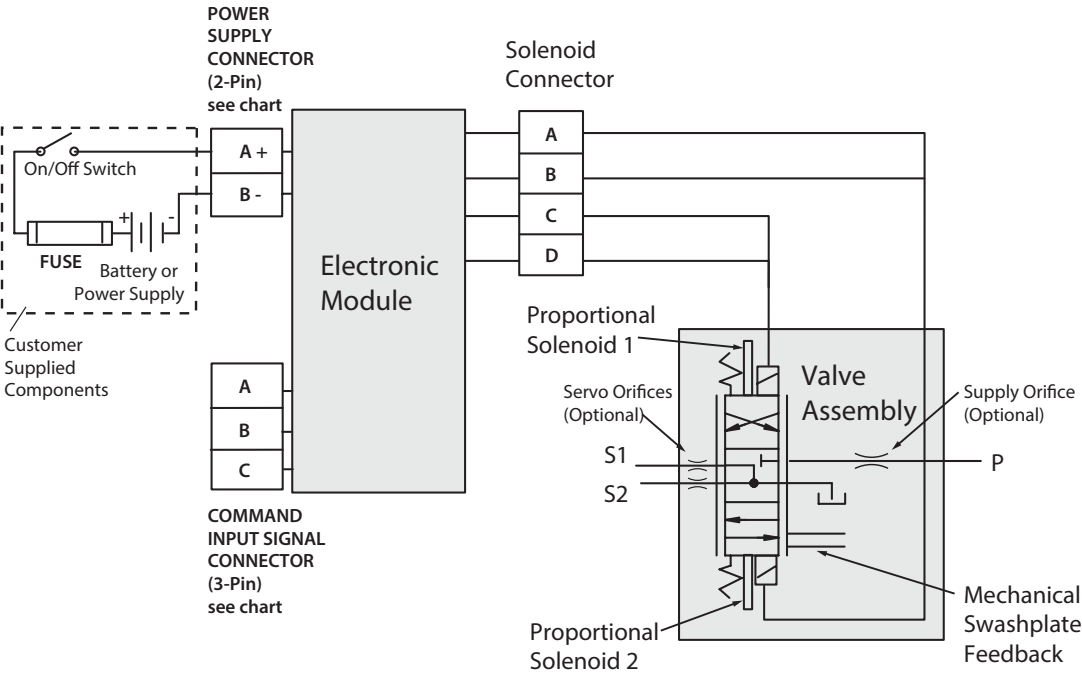
- SAE J1455 - Recommended Environmental Practices for Electronic Equipment Design
 - Humidity/Temperature Extreme Cycling
 - Salt Spray
 - Splash & Immersion
 - Steam Cleaning/High Pressure Wash
 - Vibration
 - Mechanical Shock
 - Temperature Cycling
 - Load Dump Transients
 - Inductive Load Switching Transients
- SAE J1113 - Electromagnetic Susceptibility Measurement Procedures for Vehicle Components
 - EMI/EMC - Conducted & Radiated Immunity
- CISPR 25 - International Electrotechnical Commission "Limits and Methods of Measurement of Radio Disturbance Characteristics for the Protection of Receivers used on Board Vehicles"
 - EMI/EMC - Conducted & Radiated Emissions

Electronic Proportional (EP) Control For Medium Duty 72400 Piston Pumps

Model Code
Position 16,17

MODEL CODE	MODEL CODE DESCRIPTION COMMAND INPUT SIGNAL	TYPICAL INPUT DEVICES	NOMINAL COMMAND INPUT IMPEDANCE OF ELECTRONIC MODULE
EE	1 to 6 Vdc Potentiometric	Joysticks or potentiometers with a resistance between 160 ohms and 50K ohms	500K Ohms
EG	±4-20 mA Current Loop	Programmable Logic Controllers (PLC)	250 Ohms
EC	12 Volts	Requires customer supplied electronics	
ED	24 Volts	Requires customer supplied electronics	

Interconnect
Schematic



Command Input Signal Connector

C COMMAND INPUT SIGNAL	PINS	WIRE COLOR	SIGNAL
1 to 6 Vdc Potentiometric	A	Black	Ref Low - 1 Vdc
	B	Green	Command (wiper)
	C	Red	Ref Hi - 6 Vdc
±4-20 mA Current Loop	A	Orange	Loop Return
	B	White	Loop In
	C	No Connection Required*	

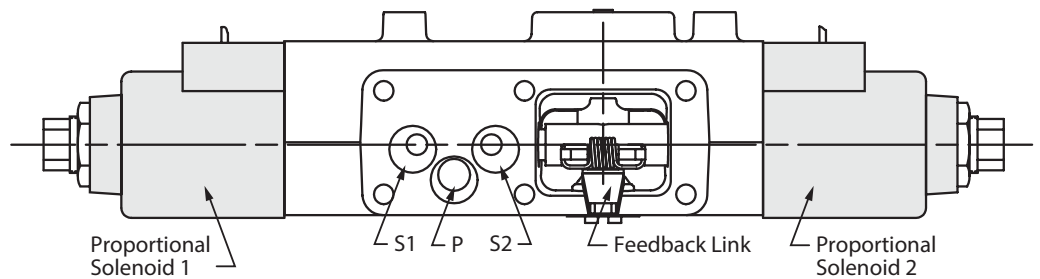
*EP Control Electronic Module Mating Connector Kit 990762-000 contains plug used to seal mating end connector.

Power Supply Connector

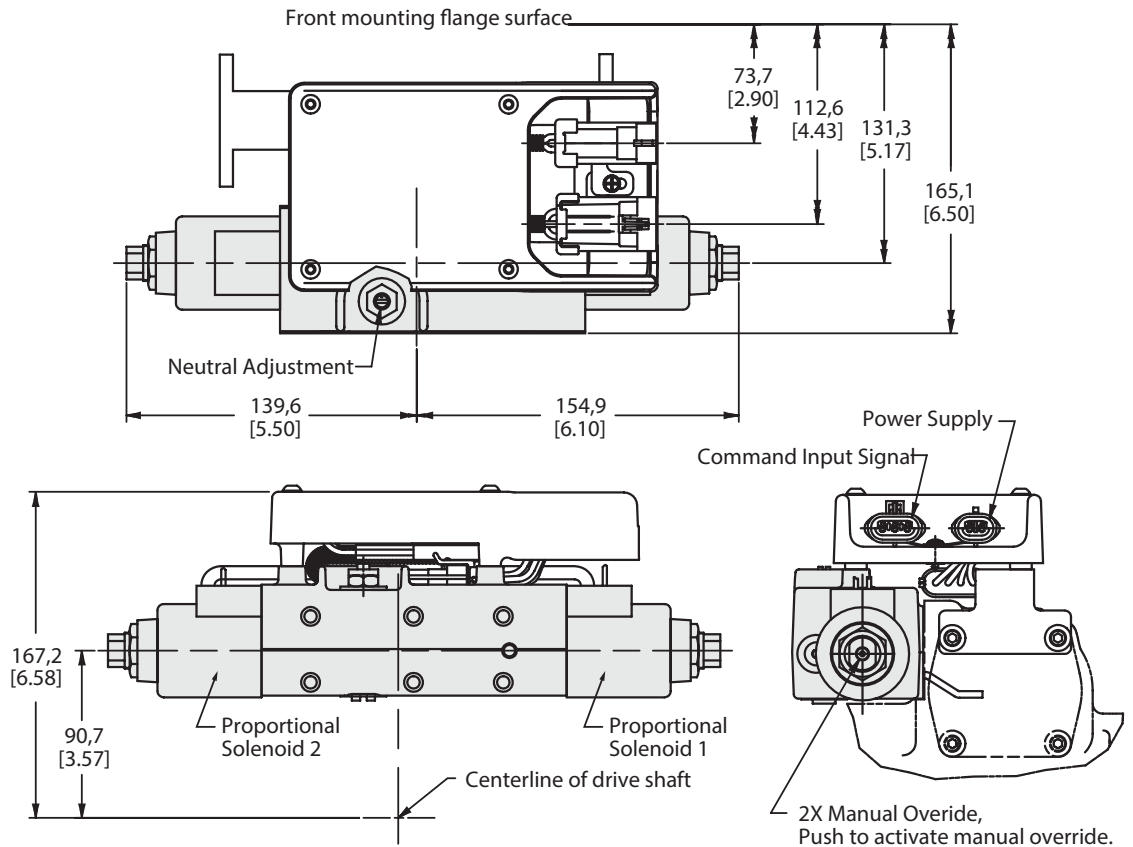
PINS	WIRE COLOR	SIGNAL
A	Red	+ Supply Voltage
B	Black	Supply Return

Fuse Rating

3 Amp SLO-BLO (Time Delay) fuse for 12-24 Vdc system - customer supplied



Installation



EP Control Connector Kits

Electronic Module Mating Connector Kit

KIT NO.	PART (QTY)	DELPHI PACKARD P/N
990762-000	Command Input Signal Connector (1)	1211 0293
	Terminal (3)	1204 8074
	Cable Seal (3)	1204 8086
	Cavity Plug (1)	1205 9168
	Secondary Lock (1)	1205 2845
Power Supply	Connector (1)	1205 2641
	Terminal (2)	1204 8074
	Cable Seal (2)	1204 8086
	Secondary Lock (1)	1205 2634

Recommended wire size: 16 - 18 AWG

Recommended cable diameter: 2.03 - 2.80 mm

Alternate reference source: Pioneer Standard Electronics 1-800-257-6613
www.pios.com

Solenoid Coil Mating Connector Kit

(not needed when using a Danfoss Electronic Module)

KIT NO.	PART (QTY)	DELPHI PACKARD P/N
9900023-000	Connector (1)	1218 6568
	Terminal (4)	1204 8074
	Cable Seal (4)	1204 8086
	Secondary Lock (1)	1204 7948

Recommended wire size: 16 - 18 AWG

Recommended cable diameter: 2.03 - 2.80 mm

Alternate reference source: Pioneer Standard Electronics 1-800-257-6613
www.pios.com

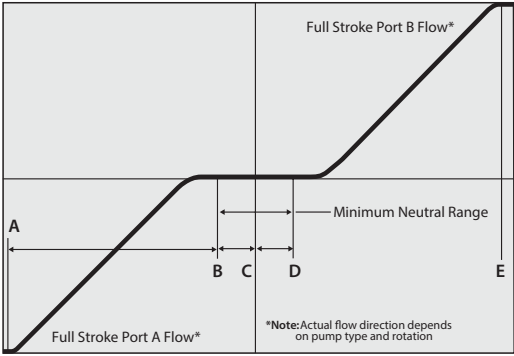
Solenoid Connector Update Kit

Note: This kit was created to update electrical connectors, on field units, to the current design. It is to be used when replacing solenoid coils, with the previous-design connectors, with new coils with new-style connectors.

The kit contains necessary parts and a tool to update the connector that mates the new solenoid coil connector.

KIT NO.	PART (QTY)	DELPHI PACKARD P/N
9900045-000	Tool (1)	1209 4429
	4-Pin Housing Connector (Female) (1)	1218 6568
	4-Pin Housing Connector (Male) (1)	1218 6271

Pump Displacement
vs. Input Signal



Typical Control Characteristics

A (MAX)	B (MIN)	C	D (MIN)	E (MAX)
Command Input Signal				
1-6 Vdc	1.5 Vdc	3.3 Vdc	3.5 Vdc	3.7 Vdc
±4-20 mA	-20 mA	-4.5 mA	0 mA	+4.5 mA
Shaft Rotation				
CCW	Solenoid #2	Neither	Solenoid #1	
	Flow OUT port "B"	No flow	Flow OUT port "A"	
CW	Solenoid #2	Neither	Solenoid #1	
	Flow OUT port "A"	No Flow	Flow OUT port "B"	

Note: The +20 mA command input signal configuration operates the pump in one direction. The customer has to change the polarity on the -20 mA signal to operate the pump in the opposite direction.

EP Control
Kits

KIT NO.	MODEL CODE REF.	KIT DESCRIPTION	INPUT SIGNAL	VALVE ASSEMBLY	ELECTRONIC MODULE	VOLTAGE
9900015-000	EE	EP Ctrl Kit MD 72400: 1-6 V input, w/o brackets	1-6 V	4993057-012	111520-016	12/24 V
9900016-000	EC	EP Ctrl Kit MD 72400: 12 V coils w/o electronics	—	4993057-012	—	12 V
9900017-000	ED	EP Ctrl Kit MD 72400: 24 V coils w/o electronics	—	4993057-024	—	24 V
9900019-000	EG	EP Ctrl Kit MD 72400: ±4-20 mA input, w/o brackets	±4-20 mA	4993057-012	111520-020	12/24 V
9900021-000	EG	EP Ctrl Kit MD 72400: ±4-20 mA input	±4-20 mA	4993057-012	111520-020	12/24 V
9900022-000	EE	EP Ctrl Kit MD 72400: 1-6 V input	1-6 V	4993057-012	111520-016	12/24 V
990830-000		EP Ctrl Electronic Module 1-6 V	1-6 V	—	111520-016	—
990832-000		EP Ctrl Electronic Module ±4-20 mA	±4-20 mA	—	111520-020	—
72400-942		Brackets and Screws				

Note: All kits using Danfoss Electronic Modules use 12 V coils.

CAUTION

In order to assure the most reliable installation and operation of any electronic control, proper component selection and installation procedures must be followed with respect to interconnection wiring harnesses, input command signal devices, fusing, and input power switching.

Appropriate industry practices must be followed to prevent damage of and shorting of all electrical and electronic components caused by environmental hazards and application specific hazards. Typical hazards that damage the wiring harnesses or other components are abrasion, moving objects, and heat from the engine or exhaust system. Moisture can damage poorly sealed connectors and/or components, causing short circuits and other problems like corrosion.

A switch must be installed in line with (+ battery) power to the electronic module, so that power may quickly be disconnected in case of emergency (component failure or inadvertent commands). A fuse rated at the maximum module operating current (3 Amp) must be installed in the + battery line to the electronic module.

All the electrical connections to the EP Control electronic module must be disconnected prior to performing any electrical welding on the vehicle or machine. The electronic module and/or the hydraulic pump are not to be used as a connection point for electrical welding equipment.

During initial start-up and/or checkout of the machine after service, the machine must be placed on jack stands to prevent inadvertent movement.

The reliable operation and suitability of this product is dependent upon how it is applied and the other components used in the system. The system integrator must review all aspects of the application and all of the components used to assure proper operation and reliability.

Information contained in this publication is accurate as of the publication date and is subject to change without notice. Performance values are typical values. Customers are responsible for selecting products for their applications using normal engineering methods.

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- Orbital motors
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- PLUS+1® software
- PLUS+1® software services, support and training
- Position controls and sensors
- PVG proportional valves
- Steering components and systems
- Telematics

Danfoss Power Solutions is a global manufacturer and supplier of high-quality hydraulic and electric components. We specialize in providing state-of-the-art technology and solutions that excel in the harsh operating conditions of the mobile off-highway market as well as the marine sector. Building on our extensive applications expertise, we work closely with you to ensure exceptional performance for a broad range of applications. We help you and other customers around the world speed up system development, reduce costs and bring vehicles and vessels to market faster.

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Hydro-Gear

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Daikin-Sauer-Danfoss

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**Danfoss
Power Solutions (US) Company**
2800 East 13th Street
Ames, IA 50010, USA
Phone: +1 515 239 6000

**Danfoss
Power Solutions GmbH & Co. OHG**
Krokamp 35
D-24539 Neumünster, Germany
Phone: +49 4321 871 0

**Danfoss
Power Solutions ApS**
Nordborgvej 81
DK-6430 Nordborg, Denmark
Phone: +45 7488 2222

**Danfoss
Power Solutions Trading
(Shanghai) Co., Ltd.**
Building #22, No. 1000 Jin Hai Rd
Jin Qiao, Pudong New District
Shanghai, China 201206
Phone: +86 21 2080 6201