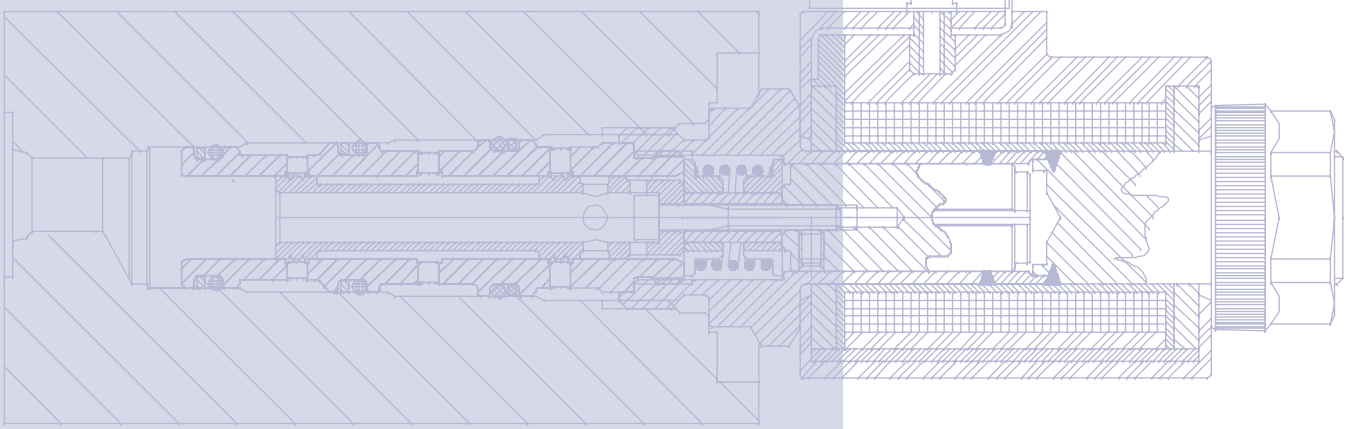
DANFOSS

Solenoid Valves

Product Electrical Installation

Tech Note

E1™ COMPLIANT



Revisions

Version

Revisions

Date	Page	Changed	Rev.
10 Apr, 2007			AA

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Content

References

Refer to *Cartridge Valves Technical Information* **520L0588** for complete product electrical and mechanical specifications.

Refer to *Cartridge Valves Function Block User Manual* **11013500** for compliant function block set-up information.

Technical literature is available at: *www.sauer-danfoss.com*

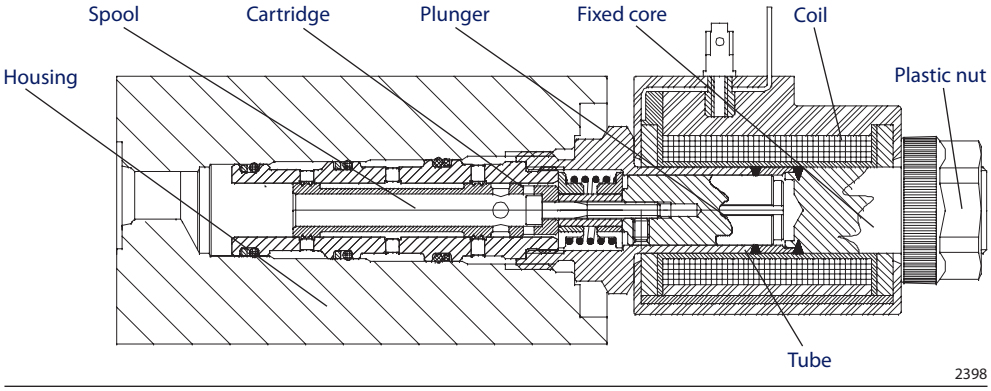
Product Overview

Product Image

Description/ Theory of Operation

A solenoid valve uses an electromagnetic actuator to move a hydraulic control element such as a poppet or a spool. This is accomplished by converting electricity into a magnetic force. This force is applied to the poppet or spool causing it to move. This movement will direct fluid flow through the valve.

Basic Components of a Solenoid and Proportional Valve



Coil is a winding of enamelled copper wire, able to withstand high temperatures and then encapsulated in melted plastic or resin. There could be two wires that exit this plastic covering so that they can be connected externally.

Tube is made up of a **plunger** and a **fixed core**. When electricity passes through the coil it creates a magnetic field that causes them to attract.

Electrical Specifications

Coil Specifications

	D08		D10 - 30 Watt		D14E	
Voltage (V)	12 Vdc	24 Vdc	12 Vdc	24 Vdc	12 Vdc	24 Vdc
Rated Current at 20°C [68°F]	1330 mA	665 mA	2500 mA	1300 mA	2500 mA	1300 mA
Rated Power	16 W	16 W	30 W	30 W	30 W	30 W
Coil Resistance at 20°C [68°F]	9 Ω	36 Ω	4.8 Ω	19 Ω	4.8 Ω	19 Ω
Coil Resistance at 60°C [140°F]	12.4 Ω	49.7 Ω	6.6 Ω	26.2 Ω	6.6 Ω	26.2 Ω
PWM Frequency Range	100-200 Hz	100-200 Hz	100-200 Hz	100-200 Hz	100-200 Hz	100-200 Hz
Recommended PWM Frequency (see not below)	125 Hz	125 Hz	125 Hz	125 Hz	125 Hz	125 Hz

	M13		M16		M19P	
Voltage (V)	12 Vdc	24 Vdc	12 Vdc	24 Vdc	12 Vdc	24 Vdc
Rated Current at 20°C [68°F]	1700 mA	850 mA	2100 mA	1050 mA	2700 mA	1350 mA
Rated Power	20 W	20 W	26 W	26 W	33 W	33 W
Coil Resistance at 20°C [68°F]	7.2 Ω	29 Ω	5.6 Ω	22 Ω	4.4 Ω	17 Ω
Coil Resistance at 40°C [140°F]	8.7 Ω	35.2 Ω	6.8 Ω	26.7 Ω	5.3 Ω	20.7 Ω
PWM Frequency Range	100-200 Hz	100-200 Hz	100-200 Hz	100-200 Hz	100-200 Hz	100-200 Hz
Recommended PWM Frequency (see not below)	125 Hz	125 Hz	125 Hz	125 Hz	125 Hz	125 Hz

	R13		R16	
Voltage (V)	12 Vdc	24 Vdc	12 Vdc	24 Vdc
Rated Current at 20°C [68°F]	1340 mA	670 mA	1740 mA	870 mA
Rated Power	16 W	16 W	20 W	20 W
Coil Resistance at 20°C [68°F]	9 Ω	36 Ω	6.9 Ω	28 Ω
Coil Resistance at 40°C [140°F]	10.9 Ω	43.7 Ω	8.4 Ω	34 Ω
PWM Frequency Range	100-200 Hz	100-200 Hz	100-200 Hz	100-200 Hz
Recommended PWM Frequency (see not below)	125 Hz	125 Hz	125 Hz	125 Hz

Electrical Specifications (continued)

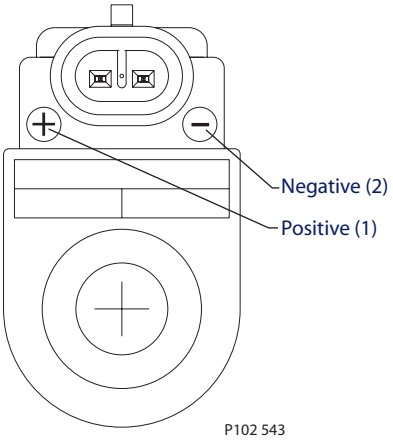
Coil Specifications (continued)

	PD03		PD05	
Voltage (V)	12 Vdc	24 Vdc	12 Vdc	24 Vdc
Rated Current at 20°C [68°F]	2700 mA	1350 mA	2500 mA	1250 mA
Rated Power	40 W	40 W	30 W	30 W
Coil Resistance at 20°C [68°F]	4.4 Ω	18.6 Ω	2.3 Ω	13 Ω
Coil Resistance at 50°C [140°F]	6.8 Ω	28.7 Ω	3 Ω	16.9 Ω
PWM Frequency Range	100-200 Hz	100-200 Hz	100-200 Hz	100-200 Hz
Recommended PWM Frequency (see not below)	125 Hz	125 Hz	125 Hz	125 Hz

Refer to *Cartridge Valves Technical Information* **520L0588** for all the other coil specifications. The valve chosen will determine the coil specifications.

Pinout

Connection Arrangement



All coils are clearly marked to identify the connection arrangement. The figure shows one method of identification. Another method identifies the connection arrangement with the number one as positive and the number two as negative. If the coil uses lead wires they will be color coded red as positive and black as negative. If both wires are black then the connection arrangement does not matter.

Pinout

Pin	Description
1	PWM signal
2	Ground

Pin Compatibility

PLUS+1 Module Pin Type/ Cartridge Valve Pin Compatibility

PLUS+1 Module Pin Type	Acceptable Use: Device Pin Number
PWMOUT/DOUT/PVGOUT	1
DOUT	1
Power ground -	2

Pin Compatibility (continued)

Valve Model and Coil Specifications

This table will assist in determining which function block to be used with the valve selected.

Valve Model versus Coil Matrix

Model Number	Coil	Function Block
SVP08-CDB	M13	ON OFF
EVK 06/C5	M16	ON OFF
EVH 06/A5	M16	ON OFF
SVP08-NC	M13	ON OFF
SVP10-NC	M16	ON OFF
CP501-1	D10	ON OFF
SVP08-NCR	M13	ON OFF
SVP10-NCR	M16	ON OFF
CP501-3	D10	ON OFF
CP502-3	D10	ON OFF
CP503-3	D10	ON OFF
SVP08-NO	M13	ON OFF
SVP10-NO	M16	ON OFF
CP501-2	D10	ON OFF
SVP08-NOR	M13	ON OFF
SVP10-NOR	M16	ON OFF
CP501-4	D10	ON OFF
CP502-4	D10	ON OFF
CP503-4	D10	ON OFF
SV08-22-02	M13	ON OFF
EDH 12/NC	M19	ON OFF
SV10-22-02	M16	ON OFF
SV10-22-01	M16	ON OFF
EDH 12/NA	M19	ON OFF
EVH 06/D5	M16	ON OFF
CP527-2	D08	ON OFF
SV08-23-02	M13	ON OFF
SV10-23-02	M16	ON OFF
SV08-23-01	M13	ON OFF
SV10-23-01	M16	ON OFF
EDH 12/32 04	M19	ON OFF
CP521-21	D14E	ON OFF
SV08-23-03	M13	ON OFF
SV08-23-04	M13	ON OFF
SV10-23-04	M16	ON OFF
EDH 12/32 01	M19	ON OFF
EDH12/33 02	M19	ON OFF ON
EDH12/33/03	M19	ON OFF ON
SV08-24-01	M13	ON OFF

Model Number	Coil	Function Block
SV10-24-01	M16	ON OFF
EDH 12/42 05	M19	ON OFF
CP531-21	D14E	ON OFF
SV08-24-02	M13	ON OFF
EDH 12/42 06	M19	ON OFF
SV10-24-07	M16	ON OFF
EDH 12/42 14	M19	ON OFF
SV10-24-05	M16	ON OFF
EDH 12/42 12	M19	ON OFF
SV08-24-04	M13	ON OFF
SV10-24-12	M16	ON OFF
EDH 12/42 08	M19	ON OFF
SV08-24-03	M13	ON OFF
EDH 12/42 07	M19	ON OFF
SV10-24-13	M16	ON OFF
SV08-24-06	M13	ON OFF
SV10-24-06	M16	ON OFF
SV08-34-04	M13	ON OFF ON
SV10-34-04	M16	ON OFF ON
EDH 12/43 08	M19	ON OFF ON
SV08-34-03	M13	ON OFF ON
SV10-34-03	M16	ON OFF ON
EDH 12/43 07	M19	ON OFF ON
SV08-34-02	M13	ON OFF ON
SV10-34-02	M16	ON OFF ON
EDH 12/43 06	M19	ON OFF ON
SV08-34-05	M13	ON OFF ON
SV10-34-05	M16	ON OFF ON
EDH 12/43 09	M19	ON OFF ON
SV10-34-09	M16	ON OFF ON
SV10-34-06	M16	ON OFF ON
SV10-34-06	M16	ON OFF ON
SV10-34-10	M16	ON OFF ON
SV10-34-11	M16	ON OFF ON
SV10-34-08	M16	ON OFF ON
SV10-34-07	M16	ON OFF ON
EDH12/43 10	M19	ON OFF ON
DCV03	PD03	ON OFF ON
DCV05	PD05	ON OFF ON

All coils are not polarity sensitive unless they have an internal diode. When connecting a coil without a diode there are two connections to make, a positive and negative. When utilizing a diode the positive leg must be connected to pin 1. Pin 1 is identified by a 1 or + molded in the coil. If you are using lead wires they are generally red and black.

Mating Connector

Coil Termination Specifications

Code	Termination	Specifications
A	DOM 43650	DIN 43650A/ISO 4400 standard electrical connector
AJ	AMP® Junior	Integral to coil
AMJ	AMP Junior	Integral to coil
AMS	AMP Super Seal 1.5 (also conforms to Delphi® Metri-Pack™ 150 Type 1)	Integral to coil; mating connector is Delphi/Packard Part Number 12052641
AS	AMP Super Seal 1.5 (also conforms to Delphi Metri-Pack 150 Type 1)	Integral to coil; mating connector is Delphi/Packard Part Number 12052641
C	Conduit	Two 18 AWG wires, 457 mm [18 in] long with 1/2-14 NPT internal thread for conduit
DE	Deutsch®	Integral to coil; mating connector is Deutsch IPD (Industrial Products Division) Part Number DT06-2S
DED	Deutsch with diode	Integral to coil; mating connector is Deutsch IPD (Industrial Products Division) Part Number DT06-2S
DN	DIN 43650	DIN 43650A / ISO 4400 standard electrical connector
DP	Dual Post	Two No. 8-32UNC screw terminals 9.5 mm [0.375 in] long
DT04	Deutsch	Integral to coil; mating connector is Deutsch IPD (Industrial Products Division) Part Number DT06-2S
E1	DIN 43650	DIN 43650A / ISO 4400 standard electrical connector
E2	DIN 43650 with diode	DIN 43650A / ISO 4400 standard electrical connector
E3	AMP Junior	Integral to coil
E4	AMP Junior with diode	Integral to coil
E5	DIN 43650 with rectifier	DIN 43650A / ISO 4400 standard electrical connector
E8	Lead wires	Two 18 AWG wires, 457 mm [18 in] long
E9	Lead wires with diode	Two 18 AWG wires, 457 mm [18 in] long
E10	Deutsch (on leads)	On two 18 AWG lead wires, 203 mm [8 in] long with protective braid; mating connector is Deutsch IPD (Industrial Products Division) Part Number DT06-2S
E11	Deutsch (on leads) with diode	On two 18 AWG lead wires, 203 mm [8 in] long with protective braid; mating connector is Deutsch IPD (Industrial Products Division) Part Number DT06-2S
E12	Deutsch	Integral to coil; mating connector is Deutsch IPD (Industrial Products Division) Part Number DT06-2S
E13	Deutsch with diode	Integral to coil; mating connector is Deutsch IPD (Industrial Products Division) Part Number DT06-2S
FL & FL600	Flying leads	Two 18 AWG wires, 600 mm [24 in] long
FLD	Flying leads with diode	Two 18 AWG wires, 600 mm [24 in] long
H	DIN 43650	DIN 43650A / ISO 4400 standard electrical connector
L	Lead Wires	Two 18 AWG wires, 457 mm [18 in] long
M2	Delphi Metri-Pack 150 Type 1 (also conforms to AMP Super Seal 1.5)	Integral to coil; mating connector is Delphi/Packard Part Number 12052641
M3	Delphi Metri-Pack 150 Type 2	Integral to coil; mating connector is Delphi/Packard Part Number 12040753
S	Dual Spade	Two 6.35 mm [0.25 in] wide Type 1B spade terminals per SAE J858A
S1	Single Spade	One 6.35 mm [0.25 in] wide Type 1B spade terminal per SAE J858A with internal ground
SP	Dual Spade (M13 & M16 coils)	Two 6.35 mm [0.25 in] wide Type 1B spade terminals per SAE J858A
	Single Post (D08 & D10 coils)	One No. 8-32UNC Screw Terminals 9.5 mm [0.375 in] long with internal ground
WPF	Delphi® Weather-Pack™ Female	On 150 mm [6 in] lead wires; mating connector is Delphi/Packard Part Number 12010973
WPM	Delphi Weather-Pack Male	On 150 mm [6 in] lead wires; mating connector is Delphi/Packard Part Number 12015792
WPMD	Delphi Weather-Pack Male with diode	On 150 mm [6 in] lead wires; mating connector is Delphi/Packard Part Number 12015792

Mating Connector (continued)

Coil Mating Connector Parts List

Amp Junior		
Code	AJ AMJ E3 E4	
Description	**Quantity**	**Tyco Electronics® Part Number**
Housing	1	282190-1
Terminal	2	929940-3
Seal	2	828904-1

Amp SuperSeal		
Code	AMS AS	
Description	**Quantity**	**Packard Part Number**
TPA (Housing)	1	12052634
Connector	2	12162000
Terminal	2	12045773
Seal	2	12048074

Deutsch		
Code	DE DED DT04 E10 E11 E12 E13	
Description	**Quantity**	**Packard Part Number**
Contact	2	0462-201-16141
Locking Wedge	1	W2S
Plug	1	DT06-2S

ISO 4400 (DIN 43650)*		
Code	A DN H E1 E2 E5	
Description	**Quantity**	**Sauer-Danfoss Part Number**
Type A Connector	1	088010080
Type C Connector	1	088010060
Type E Connector	1	088010410

* Refer to section 10.18 of *Cartridge Valves Technical Information* **520L0588**

Lead Wires	
Code	C E8 E9 FL FL600 FLD L
	All lead wires are 18 AWG

MetriPak 150 Type 1		
Code	M2	
Description	**Quantity**	**Packard Part Number**
TPA	1	12052634
Connector	2	12162000
Terminal	2	12045773
Seal	2	12048074

MetriPak 150, Type 2		
Code	M3	
Description	**Quantity**	**Packard Part Number**
TPA	1	12052634
Connector	2	12052644
Terminal	2	12048074
Seal	2	12048806

Spade	
Code	SP S S1
	6.35 mm [.25 in] wide

Weatherpack (female)		
Code	WPF	
Description	**Quantity**	**Packard Part Number**
Terminal (male)	1	12089040
Seal	2	12015323
Connector (male)	2	12010973

Weatherpack (male)		
Code	WPM WPMD	
Description	**Quantity**	**Packard Part Number**
Terminal (female)	1	12015792
Seal	2	12015323
Connector (female)	2	12089188

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