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Elactis
Electronics for Actuators and Integrated Systems

SOLENOID VALVE DRIVER[1]

ADRV0003A

Preliminary

[1] This datasheet is a preliminary description. Values and functions may change without notice.

released on: 20/10/2009

Features

- Wide input voltage range
- Power saving
- Limited heating
- Full protection against coil discharge

Description

The ADRV0003A is a small interface electronics integrated into EN 175301-803A type connector that increases the performance of a monostable solenoid valve. It turns on the valve and then reduces the current to the required level for holding, thus saving a lot of power. The ADRV0003A detects automatically the power supply voltage and the solenoid parameters. This allows the solenoid to have the same performances regardless of power supply or temperature. It comes in different finish to accommodate to all customer solutions.

Ordering description

ADRV0003A*CCXXYYZZRR*

CC: Cable length

CC value	**00**	**01**	**05**	**10**	**20**	**50**	**99**
To power supply side	Screw on cable	100mm cable	500mm cable	1m cable	2m cable	5m cable	10m cable

XX: input voltage range

XX value	**01**	**02**
Vcc min [V]	10	4.5
Vcc max [V]	27	12

YY: Holding power

YY value	**05**	**10**	**15**	**23**	**25**	**40**
P hold [mW]	500	1000	1500	2300	2500	4000

ZZ: Pull-in time

ZZ value	**02**	**05**	**10**	**15**
Pull-in time [ms]	20	50	100	150

RR: Coil Range

RR value	**01**	**10**

Other values available upon request

Electrical Specifications, ADRV0003A*CC01YYZZ version*

Parameter			**Minimum**	**Maximum**	**unit**
Power Supply On	XX=01		10	27	V
	XX=02		4.5	12	
Threshold to close the valve	XX=01		6	9	V
	XX=02		3.3	3.8	
Maximum pulse current		YY=05, 10 or 15		1	A
		YY=23, 25 or 40		4	
Max continuous current		YY=05, 10 or 15		0.5	A
		YY=23, 25 or 40		1	
Allowed coil resistance:	XX=01	RR=01	6	30	Ohms
		RR=10	24	300	
	XX=02	RR = 01	3	15	
		RR =10	12	150	
Hold power	YY=05		400	600	mW
	YY=10		900	1100	

	YY=15	1350	1650	
	YY=23	2100	2500	
	YY=25	2300	2700	
	YY=40	3600	4400	
Pull-in time	ZZ = 20	15	25	ms
	ZZ = 05	40	60	
	ZZ = 10	85	115	
	ZZ = 15	130	170	
Operating frequency		DC	50	Hz
Duty cycle, production version		0	100	%
Duty cycle, prototypes		See below		
ESD protection		23 (IEC 61000-4-2 level 4)		kV
Reverse voltage protection			- 30	V
Protection against coil discharge			diode	
Operating temperature range		0	70	°C

* only if the valve is used under abnormal conditions. (the pressure is too high, valve worn out…)

If your application is out of the specifications listed above, do not hesitate to contact Elactis. We can then customize the driver to meet your most demanding needs.

On the prototypes, the maximum duty cycle is dependent on the operating frequency, as shown on the figures below. There is no restriction on the prototypes for:

YY = 05, 10, 15 if the nominal current value of the coil is <= 0.5A
YY = 23, 40 if the nominal current value of the coil is <= 1.5A
For the production version, there is no limit to the duty cycle.

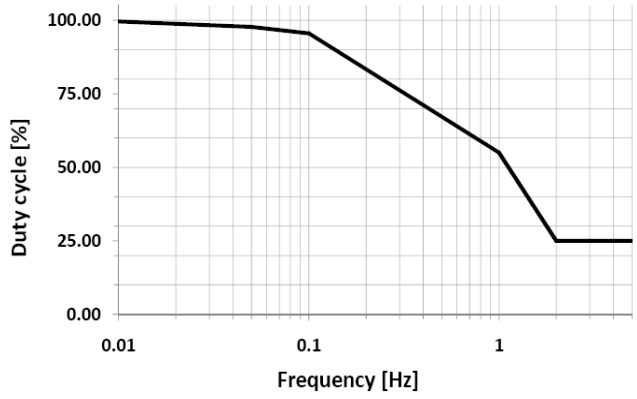


Figure 2: Maximum duty cycle versus frequency for 1A in pull-in and 0.5A hold current (for YY=05, 10 or 15)

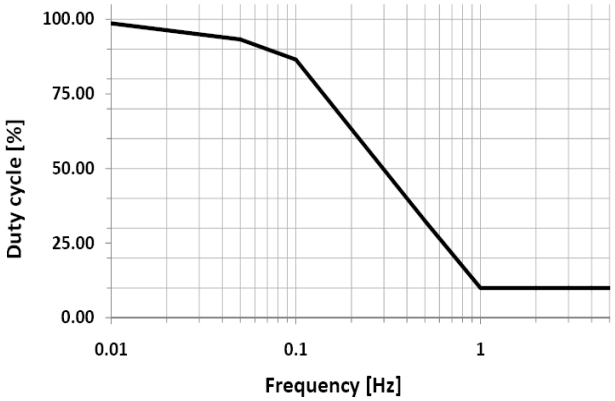


Figure 1: Maximum duty cycle versus frequency for 5A in pull-in and 1A hold current (for YY=40, 25 or 23)

Working principle

The ADRV0003A can be used with any monostable solenoid valve. For best performances it should be used with a coil rated voltage less than the power supply voltage. The ADRV0003A generates a special PWM signal which has the following characteristics:

- The solenoid receives full power during the pull-in time
- It has a high frequency PWM signal that generates a holding current with high power efficiency

Applications

The ADRV0003A can be used for a large variety of applications. The simplest is **heat reduction**. In applications where the coil must be powered for a long time without the ADRV003A, it will heat up with the following disadvantages:

- the coil might reach temperatures beyond 60°C which creates a risk of injury
- high temperature may influence the fluid's properties
- coil will prematurely wear out
- plastic and rubber components may deteriorate
- coil heating limits the useful external temperature range

The ADRV003A is a high efficiency driver which will dissipate very little power in the electronics. The holding power set for the coil is in all standard configurations sufficient to maintain the valve in its active position while the heating is limited to a few °C.

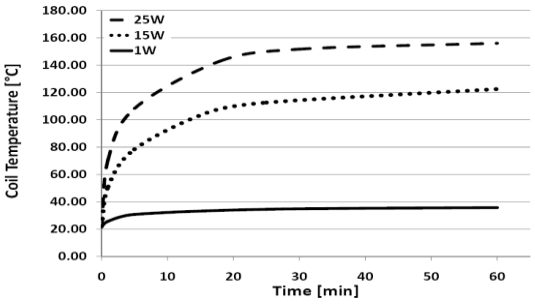


Figure 3: Temperature rise in a coil of a 32 mm solenoid valve for different power consumptions. The full line indicates that obtained with the ADRV003A

The ADRV0003A has an **integrated protection feature**. The client does not need to worry about induced reverse voltages or residual voltages on the cable. The driver closes automatically at voltages below the minimum operating voltage and eliminates the coil discharge voltage.

The ADRV0003A is useful for **battery applications**, by maintaining the valve in a low power mode. It also adjusts to the variations of the battery voltage.

The ADRV0003A is ideal for your **dosing** applications: whether you need to dose for a few milliseconds or for several hours the driver will make your dosing more accurate. Indeed, the lower increase of temperature stabilizes the coil resistance, thus ensuring a constant opening time.

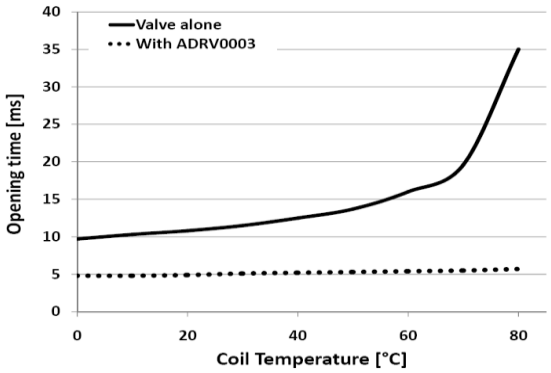


Figure 4: Response time stabilized using the ADRV0003A

Application examples

Transportation : door locking systems. Use it to compensate for the wide operating temperature and the fluctuating power supply.
Food industry: milking system. The driver allows battery operated units work for longer period.
Inkjet industry: inlet valve for ink tank. The reduced heating prevents the ink to dry on the valve seat. It also adds extra force to open the valve against the ink's viscosity.
Beverage dispense: coffee machine. It enables the precise dosing of the ingredients such as sugar. The ADRV0003A can also be used to increase the working pressure range in the machine.
Irrigation systems: battery powered valves. Enhances battery lifetime.
Hydraulic systems: The ADRV0003A adds additional power to your valve and limits the heating of the oil. The fast current discharge accelerates the closing of the valve compared to systems protected by a diode.
Machine miniaturization: Due to reduced heating the valve needs less ventilation therefore it can be put into a smaller closed box.

Mechanical drawing

EN 175301-803 type A connector (ex - DIN43650 A). Connector aspect and material can be subject to changes.

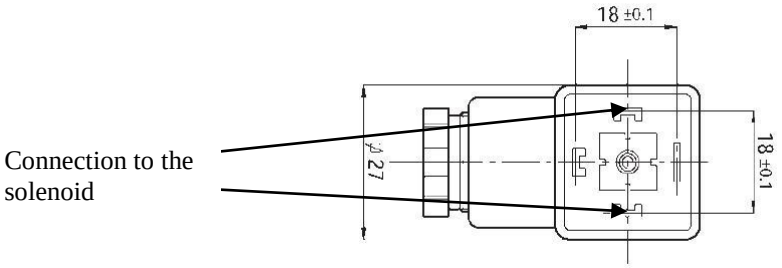
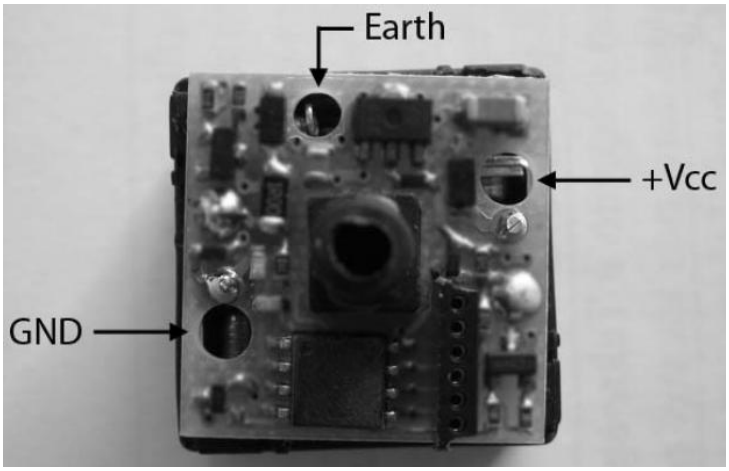


Figure 5: Drawing of the connector

Connection schematic



History records

Rev.	Change	Date
01	Creation	15.02.08
02	Added the 2.3W version; added the pull-in time options	27.02.08
03	Added the coil range specification	19.05.08
04	Update of the applications	08.12.08
05	Added new parameter values	20.10.09