

Solenoid Valves for the Fuel Dispensing Industry



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Africa.Americas.Asia.Europe.Oceania



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FUEL DISPENSING AND VAPOUR RECOVERY VALVES

APPLICATIONS FOR FUEL DISPENSING SYSTEMS

To propel a vehicle, a combustible compound is needed. ASCO Numatics is well known as solenoid valve supplier for the dispensers as the combustible compound is:

- Petrol
- Diesel (including vapour recovery)
- Liquefied Petroleum Gas (LPG)
- Compressed Natural Gas (CNG)

With its wide range of solenoid valves, ASCO Numatics is the market leader in fuel dispensing and vapour recovery technology. Working with leading fuel pump manufacturers, ASCO Numatics has assisted in making fuel dispensing the precise operation it is today.

As fuel pump sizes have reduced over the years ASCO Numatics has reduced the size of its valves too.

The development of small encapsulated coils has made the use of large enclosures redundant and reduced costs for pump manufacturers.

Petrol Dispensing Operations

Self Service

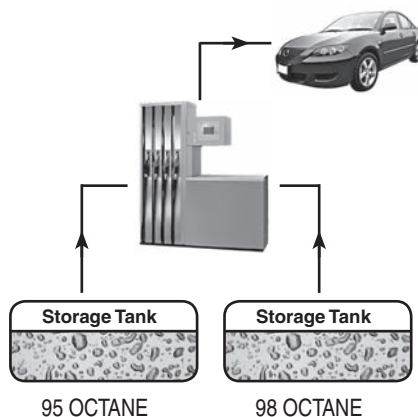
For this form of vending ASCO Numatics manufactures Single Stage Solenoid Valves.

Prepaid & Credit Card

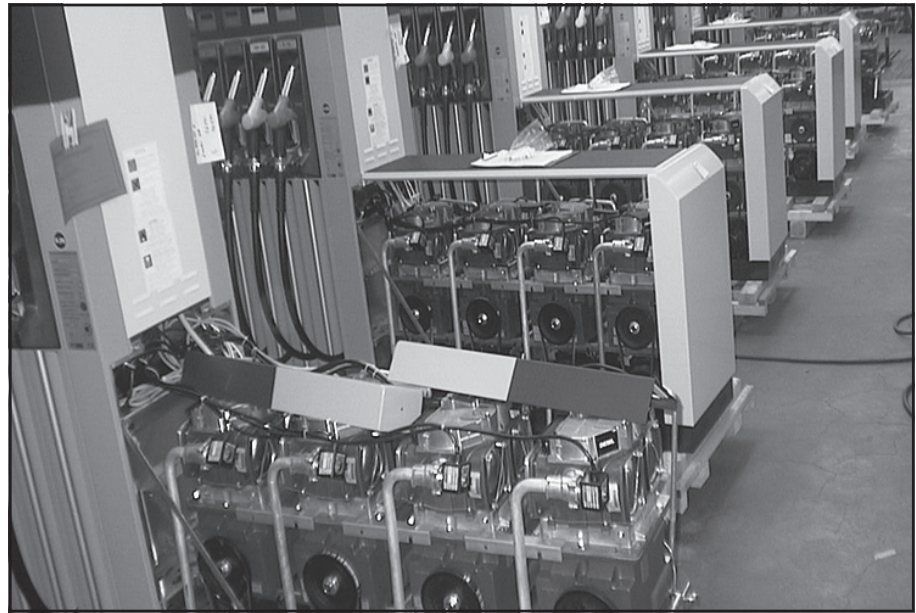
For this form of vending ASCO Numatics manufactures Dual Stage Valves with high and low flows.

Blending

For this form of vending ASCO Numatics manufactures Proportional Valves.



ASCO Numatics has gained considerable experience in petrol vending applications and has applied this knowledge to the dispensing of "clean" fuels such as LPG and CNG.



In both applications the fuels are stored in pressurised tanks and this has led to the development of an innovative three stage delivery system for LNG applications, and the introduction of the new high pressure valve for CNG applications.

Liquefied Petroleum Gas (LPG)

Also called GPL, LP Gas, or auto gas, is a mixture of hydrocarbon gases used as a fuel in heating appliances and vehicles, and increasingly replacing chlorofluorocarbons as an aerosol propellant and a refrigerant to reduce damage to the ozone layer.

When natural gas is cooled to a temperature of approximately -260° Celsius at atmospheric pressure it condenses to a liquid called Liquefied Natural Gas (LNG). One volume of this liquid takes up about 1/600th the volume of natural gas at a stove burner tip. LNG weighs less than one-half that of water.

LNG is odourless, colourless, noncorrosive, and nontoxic. When vaporized it burns only in concentrations of 5% to 15% when mixed with air. Neither LNG, nor its vapor, can explode in an unconfined environment. A storage cylinder is charged with liquid petroleum gas at high pressure. This is then dispensed at a lower pressure into the vehicle.

ASCO Numatics on/off valves are used at several stages during this process.

Compressed Natural Gas (CNG)

Is a fossil fuel substitute for gasoline (petrol), diesel, or propane fuel. Although its combustion does produce greenhouse gases, it is a more environmentally clean alternative to those fuels, and it is much

safer than other fuels in the event of a spill (natural gas is lighter than air, and disperses quickly when released).

Gas from the distribution pipeline is compressed into a cascade storage system. Pressure in the cascade storage is higher than that in the vehicle's storage. Typical cascade storage is: 250 bar and vehicle storage 200 bar. In order to make the utilization of the compressor and storage more efficient, fast fill CNG stations usually operate in a three stage cascade storage system.

ASCO Numatics has introduced a compact high pressure solenoid valve to cope with the rigorous demands of Compressed Natural Gas (CNG) dispensing applications.

Available in 3/8" (8 mm) and 1/2" (12 mm) sizes, the rugged valve can handle pressures up to 350 bar. They can be used to open and close the supply from storage tanks on single and multi-bank dispensers. The new CNG dispensing valves can be provided with numerous explosion proof solenoid operators for use in Zone 1/21 - 2/22 according to ATEX 94/9/EC. Enclosures according to NEMA are also available.



Vapour Recovery

Petrol contains volatile organic compounds (VOCs), which evaporate inside the fuel tank of a vehicle and fill the air space above the liquid fuel. When a vehicle is refuelled, these vapours are forced out from the fuel tank by the incoming fuel and, unless controlled, escape into the atmosphere through the filler neck of the fuel tank. Almost 5% is released into the environment, which may affect the human health.



ASCO Numatics has developed solenoid valves that recover these harmful vapour emissions from the storage tank or from the vending pump while filling the vehicle.

STAGE I SYSTEM

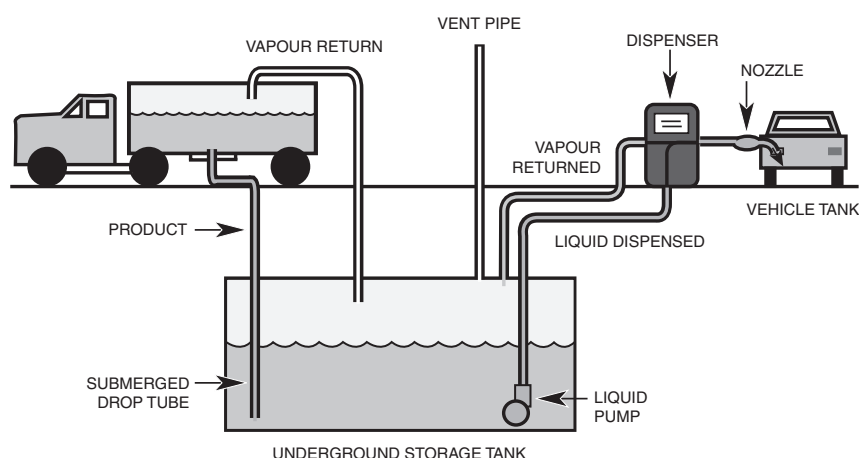


Fig. 1

The 'Stage I' vapour recovery has been in place for a number of years at storage terminals and at filling stations, to recover vapours that would normally escape into the atmosphere during the filling of storage tanks.

The European Parliament has adopted at first reading, on 5th May 2009, the proposal for a Directive on 'Stage II' Petrol Vapour Recovery during refuelling of passenger cars at service stations. The new Directive will require the installation of Stage II petrol vapour recovery systems. See figure 1.

Stage II controls will capture the majority of the emissions emitted from vehicle refuelling at petrol at filling stations

Vapour recovery can be divided into:

- 1. Volumetric Displacement (no valve required)**
(As fuel is pumped into the vehicle, the volumetric displacement draws the vapours from the vehicle into the storage tank)
- 2. Variable Speed Vacuum Pump and a 2 way on/off valve**
(As fuel is pumped into the vehicle, the valve opens and the vacuum pump starts. The vacuum pump and the fuel are kept at the same flow rate to draw vapours from the car into the storage tank - active system)
- 3. Constant Speed Vacuum and a proportional valve**
(As fuel is pumped into the vehicle, the valve opens to allow vapours to be drawn from the vehicle to the tank. The vacuum pump runs at constant speed and the proportional valve opens and closes to match the flow of fuel.)

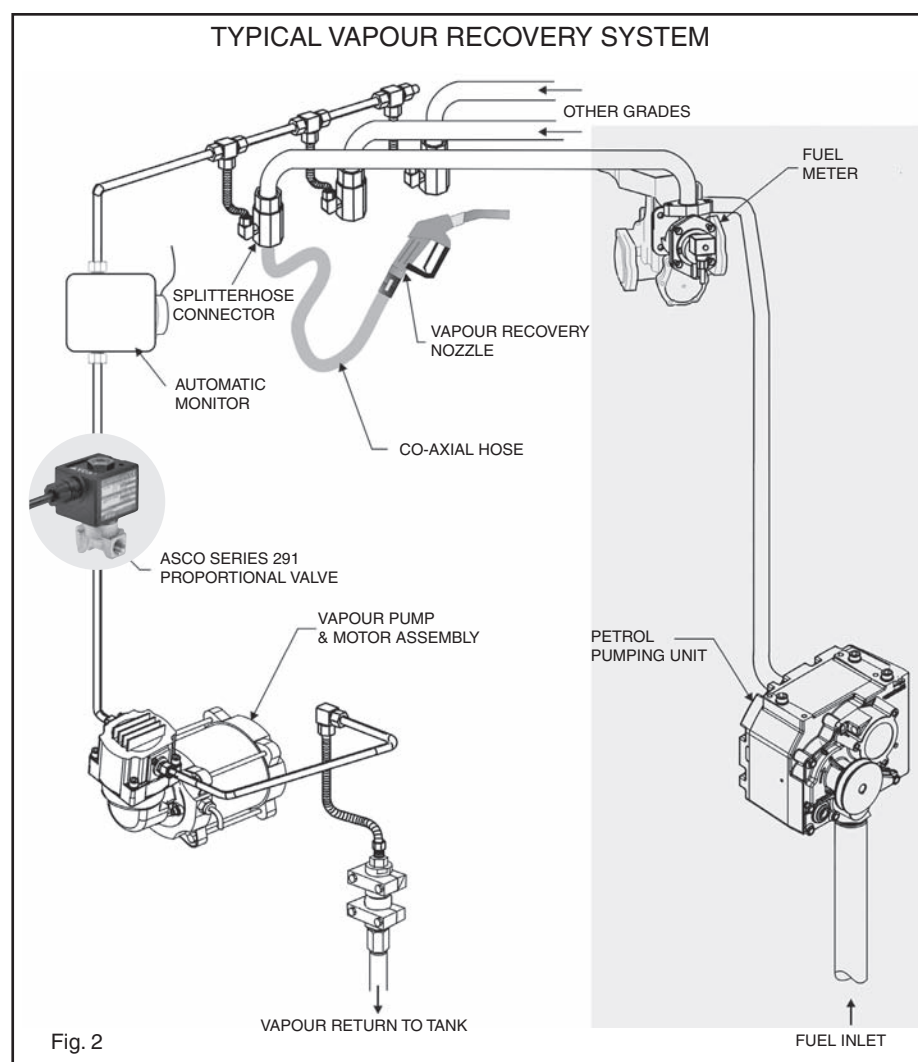


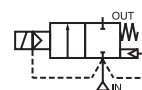
Fig. 2



SOLENOID VALVES

pilot operated, single flow
floating piston for petrol vending
3/4

NC



2/2
Series
291

FEATURES

- The normally closed petrol dispensing valves are especially designed to meet the particular needs for the fuel dispensers
- The high quality polyphenylene sulfide piston guarantees a long operating life and a wide temperature range. Hydrocarbon resistant FPM seal material for tight shut off
- Choice of explosion proof operators, intended for use in potentially explosive atmospheres, according to Directive ATEX 94/9/EC
- Solenoid ingress protection degree $\geq$ IP65
- ASCO Numatics components satisfy all relevant EC directives

GENERAL

Differential pressure 0,3 - 3,5 bar [1 bar = 100kPa]

Ambient temperature range -40 to +70°C

fluids (*)	temperature range (TS)	seal materials (*)
Petrol & Liquid fuels	-40 to +70°C	FPM (fluoroelastomer) / VMQ (silicone)

MATERIALS IN CONTACT WITH FLUID

(*) Ensure that the compatibility of the fluids in contact with the materials is verified

Body	Brass
Bonnet	Brass
Core tube	Stainless steel
Core and plugnut	Stainless steel
Core disc	FPM
Core guide	POM
Rider ring	PTFE
Springs	Stainless steel
Sealing	FPM / VMQ
Piston	PPS
Piston disc	FPM
Lip seal	PTFE
Piston support	Brass

ELECTRICAL CHARACTERISTICS

Coil insulation class F

Electrical safety IEC 335

Standard voltages DC (=) 24V - 48V

prefix option	power ratings		operator ambient temperature range (TS) (C°)	safety code	electrical enclosure protection (EN 60529)	replacement coil		type ⁽¹⁾
	holding ~	hot/cold =				~	=	
	(W)	(W)				230V/50/60 Hz	24V/DC	
PV	-	9,0 / 11,2	-40 to +65	II 2 G Ex mb II T4	moulded IP67	-	⁽²⁾	01
ZN	-	9,0 / 11,2	-20 to +50	II 3 G EEx nA II T3	moulded IP65	-	⁽²⁾	02
EF	-	9,0 / 11,2	-40 to +55	NEMA type 7 and 9	Nema 4X	-	238714-006D	03
SC	-	9,0 / 11,2	-40 to +55	EN 60730	moulded IP65	-	400425-142	04

⁽¹⁾ Refer to the dimensional drawings on page 6

⁽²⁾ Multiple coils kits available under ATEX, contact us

- Not available

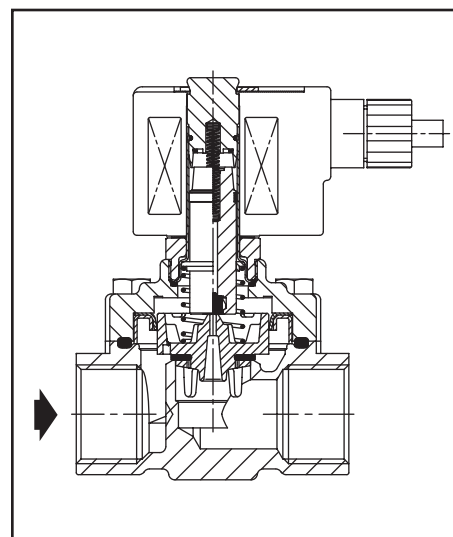
SPECIFICATIONS

pipe size	orifice size	flow coefficient Kv		operating pressure differential (bar)		prefix optional solenoids *						basic catalogue number
						NEMA 7&9	ATEX / IECEx				IP65	
				min	max. PS	Ex d	Ex e mb	Ex mb	EEx nA	SC		
G	(mm)	(m³/h)	(l/min)		=	EF ⁽¹⁾	NF	EM	PV	ZN		
NC - Normally closed												
3/4	20	3.9	65	0.3	3.5	●	-	-	●	●	●	G291A110

● Available feature - Not available

* For description of solenoids see page 31-40

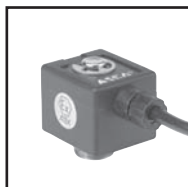
⁽¹⁾ Prefix EF should always be used in conjunction with change letter G in the basic number



INSTALLATION

- The valves can be mounted in any position without affecting operation
- Pipe connection identifier is: G = pipe thread according to ISO 228/1
- Installation/maintenance instructions are included with each valve
- PV solenoids have a standard cable length of 2 meters. Other lengths in full meters are available on request
- SC/ZN solenoids are supplied with ISO 4400 spade plug connectors (cable Ø 6-10 mm)

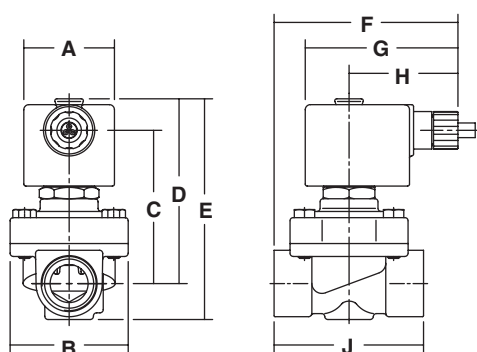
DIMENSIONS (mm), WEIGHT (kg)



TYPE 01

Prefix "PV" Solenoid
Epoxy encapsulated
EN-IEC 60079-0, 60079-18, 61241-0, 61241-18
II 2 G/D Ex mb II / Ex mD
IP67

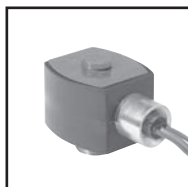
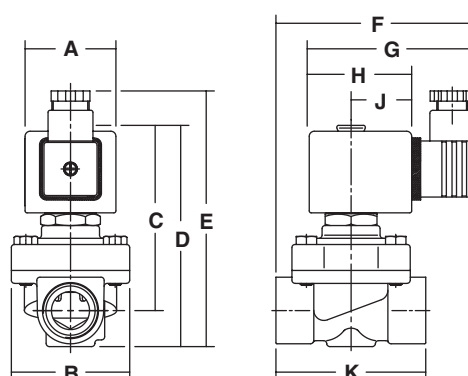
G291A110



TYPE 02

Prefix "ZN" Solenoid
Epoxy moulded
EN 50021
II 3 G/D EEx nA II
IP65

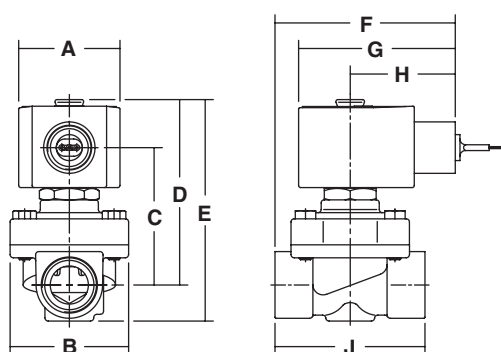
G291A110



TYPE 03

Prefix "EF" Solenoid
Epoxy encapsulated
ICS-6 ANSI / NEMA
Type 7 and 9 (applicable to solenoid only)

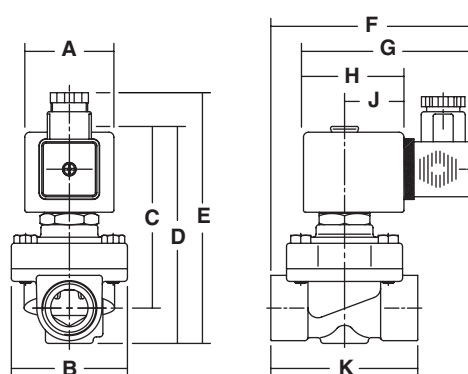
G291G110



TYPE 04

Prefix "SC" Solenoid
Epoxy moulded
IEC 335 / ISO 4400
IP65

G291A110



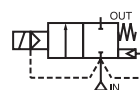
type	AC/DC	prefix option	catalogue number	spare parts kits	A	B	C	D	E	F	G	H	J	K	weight
01	=	PV	G291A110	PVC117690	45	58	75	91	108	90	75	54	73	-	1,2 kg
02	=	ZN	G291A110	ZNC117690	45	58	91	108	125	98	82	50	30	73	1,1 kg
03	=	EF	G291G110	EFC117690	50	58	67	91	108	88	77	51	73	-	1,3 Kg
04	=	SC	G291A110	C117690	45	58	91	108	125	102	85	50	30	73	1,1 Kg



SOLENOID VALVES

pilot operated, single flow
floating diaphragm, for petrol vending
3/4 and 1

NC

2/2
Series
293

FEATURES

- Compact aluminium flanged bodied single flow valves for petrol vending applications
- Minimum operating differential pressure 0,35 bar
- Explosion proof operators, intended for use in potential explosive areas, according to Directive ATEX 94/9/EC
- Easy electrical installation by means of the moulded-in supply cable, standard length 2 meter
- ASCO Numatics components satisfy all relevant EC directives

GENERAL

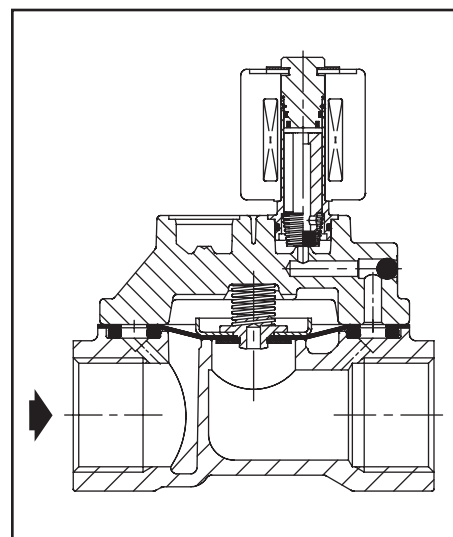
Differential pressure 0,35 - 3,5 bar [1 bar = 100kPa]
Ambient temperature range AC: -40 to +65°C
DC: -40 to +40°C

fluids (*)	temperature range (TS)	seal materials (*)
Petrol & Liquid fuels	-20 to +40°C	FPM (fluoroelastomer) / VMQ (silicone)

MATERIALS IN CONTACT WITH FLUID

(*) Ensure that the compatibility of the fluids in contact with the materials is verified

Body	Aluminium
Core tube	Stainless steel
Core and plugnut	Stainless steel
Springs	Stainless steel
Seat	Aluminium
Sealing	FPM / VMQ
Disc & O-Rings	FPM
Diaphragm Support	POM
Shading Ring (AC only)	Copper



ELECTRICAL CHARACTERISTICS

Coil insulation class F
Electrical safety IEC 335
Standard voltages DC (=) 24V - 48V;
AC (~) 24V - 48V - 115V - 230V / 50 Hz

prefix option	power ratings		operator ambient temperature range (TS) (C°)	safety code	electrical enclosure protection (EN 60529)	replacement coil		type ⁽¹⁾
	holding ~	hot/cold =				~	=	
	(W)	(W)				230V/50/60 Hz	24V/DC	
PV	4,0	5,0 / 6,9	-40 to +40/60	II 2 G Ex mb II T3 / T4	moulded IP67	-	⁽²⁾	01 & 02

⁽¹⁾ Refer to the dimensional drawings on page 8

⁽²⁾ Multiple coils kits available under ATEX, contact us

- Not available

SPECIFICATIONS

pipe size	orifice size	flow coefficient Kv		operating pressure differential (bar)			prefix optional solenoids *						basic catalogue number	
							NEMA 7&9	ATEX / IECEx				IP65		
								Ex d	Ex e mb	Ex mb	EEx nA			
G	(mm)	(m³/h)	(l/min)	min	~	=	EF	NF	EM	PV	ZN	SC		
NC - Normally closed														
3/4	19,5	7,3	122	0,35	3,5	3,5	-	-	-	●	-	-	G293A001	
3/4	25	9,5	158	0,35	3,5	3,5	-	-	-	●	-	-	G293B002	
1	25	11,5	192	0,35	3,5	3,5	-	-	-	●	-	-	G293B003	

● Available feature

- Not available

* For description of solenoids see pages 31-40

INSTALLATION

- The valves can be mounted in any position without affecting operation
- Pipe connection identifiers: G = pipe thread according to ISO 228/1
- Installation/maintenance instructions are included with each valve
- PV solenoids have a standard cable length of 2 meters. Other lengths in full meters are available on request

DIMENSIONS (mm), WEIGHT (kg)



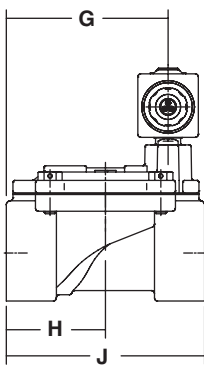
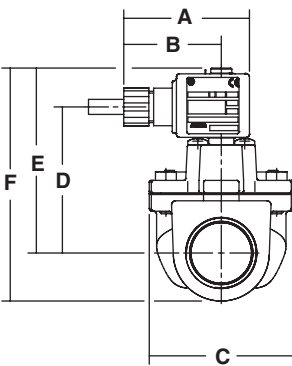
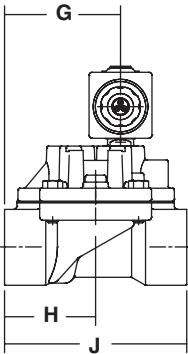
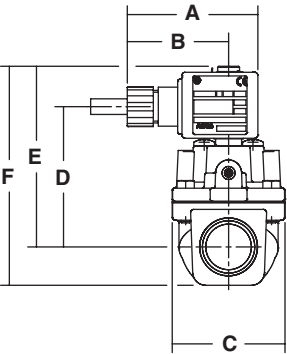
TYPE 01
Prefix "PV" Solenoid
Epoxy encapsulated
EN-IEC 60079-0, 60079-18, 61241-0, 61241-18
II 2 G/D Ex mb II / Ex mD
IP67

G293A001



TYPE 02
Prefix "PV" Solenoid
Epoxy encapsulated
EN-IEC 60079-0, 60079-18, 61241-0, 61241-18
II 2 G/D Ex mb II / Ex mD
IP67

G293B002 / B003



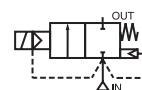
type	AC/DC	prefix option	catalogue number	spare parts kits	A	B	C	D	E	F	G	H	J	weight
01	~ / =	PV	G293A001	320191	60	47	52	65	83	101	53	42	84	0,9 Kg
02	~ / =		G293B002	320197 / 320198	60	47	69	70	89	112	73	48	95	0,9 Kg
	~ / =		G293B003	320197 / 320198	60	47	69	70	89	112	73	48	95	0,9 Kg



SOLENOID VALVES

pilot operated, dual flow
floating diaphragm, for petrol vending
3/4

NC



2/2
Series
T292

FEATURES

- Compact aluminium flanged bodied dual flow valves for petrol vending applications
- Valve offers three flow positions, i.e. full flow, low flow, and shut off
- Minimum operating differential pressure 0,35 bar
- Explosion proof operator, intended for use in potential explosive areas, according to Directive ATEX 94/9/EC
- Easy electrical installation by means of the moulded-in supply cable, standard length 2 meter
- ASCO Numatics components satisfy all relevant EC directives

GENERAL

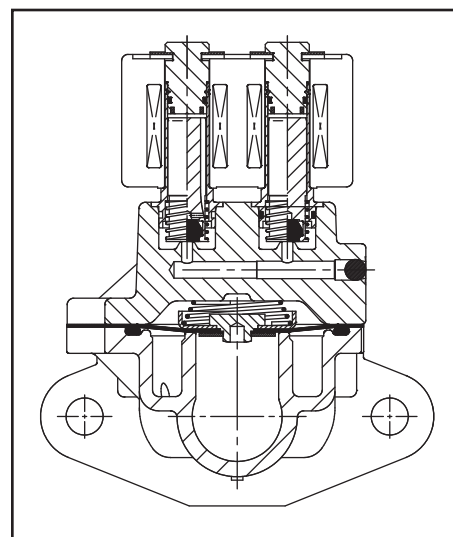
Differential pressure 0,35 - 2,7 bar [1 bar = 100kPa]
Ambient temperature range AC: -20 to +40°C
DC: -20 to +40°C

fluids (*)	temperature range (TS)	seal materials (*)
Petrol & Liquid fuels	-40 to +40°C	FPM (fluoroelastomer) / VMQ (silicone)

MATERIALS IN CONTACT WITH FLUID

(*) Ensure that the compatibility of the fluids in contact with the materials is verified

Body	Brass
Core tube	Stainless steel
Core and plugnut	Stainless steel
Springs	Stainless steel
Seat	Brass
Sealing	FPM / VMQ
Disc & O-Rings	FPM
Diaphragm Support	POM
Shading Ring (AC only)	Copper



ELECTRICAL CHARACTERISTICS

Coil insulation class F
Electrical safety IEC 335
Standard voltages DC (=) 24V - 48V;
AC (~) 24V - 48V - 115V - 230V / 50 Hz

prefix option	power ratings		operator ambient temperature range (TS) (C°)	safety code	electrical enclosure protection (EN 60529)	replacement coil		type ⁽¹⁾
	holding ~ (W)	hot/cold = (W)				~ 230V/50/60 Hz	= 24V/DC	
						-	⁽²⁾	
PV	4,0	5,0 / 6,9	-40 to +65	II 2 G Ex mb II T3	moulded IP67	-	⁽²⁾	01

⁽¹⁾ Refer to the dimensional drawings on page 10

⁽²⁾ Multiple coils kits available under ATEX, contact us
- Not available

SPECIFICATIONS

pipe size	orifice size		flow coefficient Kv				operating pressure differential (bar)			prefix optional solenoids *						basic catalogue number
	Low	High	Low		High		min	max. PS		NEMA 7&9	ATEX / IECEx				IP65	
			(m³/h)	(l/min)	(m³/h)	(l/min)		~	=		Ex d	Ex e mb	Ex mb	EEx nA		
T	(mm)	(mm)	(m³/h)	(l/min)	(m³/h)	(l/min)		~	=	EF	NF	EM	PV	ZN	SC	
NC - Normally closed																
3/4	2,5	19	0,10	1,7	7,3	122	0,35	2,7	2,7	-	-	-	●	-	-	T292B027

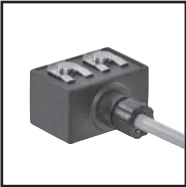
● Available feature
- Not available

* For description of solenoids see pages 31-40

INSTALLATION

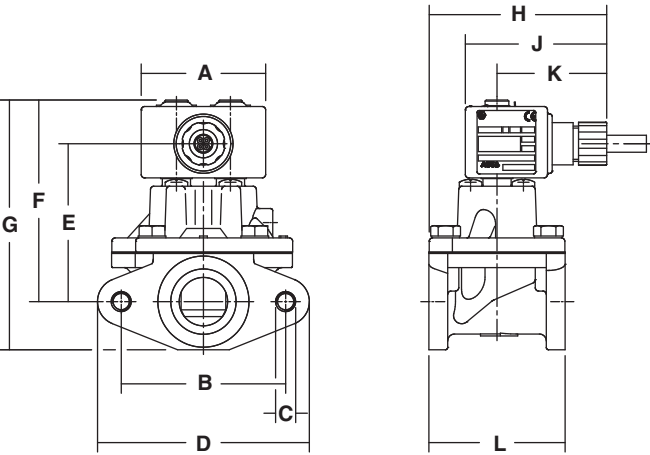
- The valves can be mounted in any position without affecting operation
- Pipe connection identifiers: T = flanged body
- Installation/maintenance instructions are included with each valve
- PV solenoids have a standard cable length of 2 meters. Other lengths in full meters are available on request

DIMENSIONS (mm), WEIGHT (kg)



TYPE 01
Prefix "PV" Solenoid
Epoxy encapsulated
EN-IEC 60079-0, 60079-18, 61241-0, 61241-18
II 2 G/D Ex mb II / Ex mD
IP67

T292B027



type	AC/DC	prefix option	catalogue number	spare parts kits	A	B	C	D	E	F	G	H	J	K	L	weight
01	~/=	PV	T292B027	320056 / 323369	53	70	M8	90	67	86	106	76	60	47	58	1,4 Kg

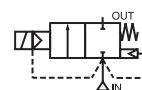


SOLENOID VALVES

pilot operated, dual flow
floating diaphragm, for petrol vending

1

NC



2/2
Series
T292

FEATURES

- Compact aluminium flanged bodied dual flow valves for petrol vending applications
- Valve offers three flow positions, i.e. full flow, low flow, and shut off
- Minimum operating differential pressure 0,35 bar
- Explosion proof operators, intended for use in potential explosive areas, according to Directive ATEX 94/9/EC
- Easy electrical installation by means of the moulded-in supply cable, standard length 2 meter
- ASCO Numatics components satisfy all relevant EC directives

GENERAL

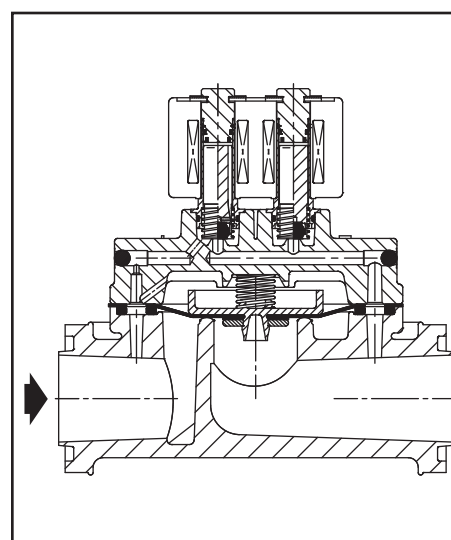
Differential pressure 0,35 - 3,5 bar [1 bar = 100kPa]
Ambient temperature range AC: -40 to +65°C
DC: -40 to +40°C

fluids (*)	temperature range (TS)	seal materials (*)
Petrol & Liquid fuels	-40 to +40°C	FPM (fluoroelastomer) / VMQ (silicone)

MATERIALS IN CONTACT WITH FLUID

(*) Ensure that the compatibility of the fluids in contact with the materials is verified

Body	Aluminium
Core tube	Stainless steel
Core and plugnut	Stainless steel
Springs	Stainless steel
Seat	Aluminium
Sealing	FPM / VMQ
Disc & O-Rings	FPM
Diaphragm Support	POM
Shading Ring (AC only)	Copper



ELECTRICAL CHARACTERISTICS

Coil insulation class F
Electrical safety IEC 335
Standard voltages DC (=) 24V - 48V;
AC (~) 24V - 48V - 115V - 230V / 50 Hz

prefix option	power ratings		operator ambient temperature range (TS) (C°)	safety code	electrical enclosure protection (EN 60529)	replacement coil		type ⁽¹⁾
	holding ~	hot/cold =				~	=	
	(W)	(W)				230V/50/60 Hz	24V/DC	
PV	4,0	5,0 / 6,9	-40 to +65	II 2 G Ex mb II T3	moulded IP67	-	⁽²⁾	01

⁽¹⁾ Refer to the dimensional drawings on page 12

⁽²⁾ Multiple coils kits available under ATEX, contact us
- Not available

SPECIFICATIONS

pipe size	orifice size	flow coefficient Kv				operating pressure differential (bar)			prefix optional solenoids *						basic catalogue number
		Low		High		min	max. PS		NEMA 7&9	ATEX / IECEx				IP65	
										Ex d	Ex e mb	Ex mb	EEEx nA		
T	(mm)	(m³/h)	(l/min)	(m³/h)	(l/min)		~	=	EF	NF	EM	PV	ZN	SC	
NC - Normally closed															
1	25	0,12	2,0	11,5	192	0,35	3,5	3,5	-	-	-	●	-	-	T292B025

● Available feature

- Not available

* For description of solenoids see pages 31-40

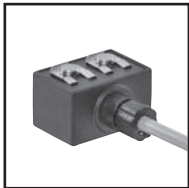
X020GB-2009/R0 - X020-02-040
Availability, design and specifications are subject to change without notice. All rights reserved.

X020-11

INSTALLATION

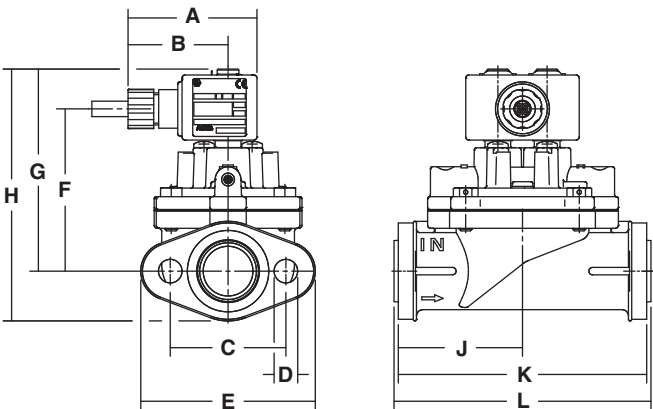
- The valves can be mounted in any position without affecting operation
- Pipe connection identifiers: T = flanged body
- Installation/maintenance instructions are included with each valve
- PV solenoids have a standard cable length of 2 meters. Other lengths in full meters are available on request

DIMENSIONS (mm), WEIGHT (kg)



TYPE 01
Prefix "PV" Solenoid
Epoxy encapsulated
EN-IEC 60079-0, 60079-18, 61241-0, 61241-18
II 2 G/D Ex mb II / Ex mD
IP67

T292B025



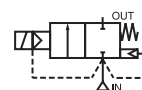
type	AC/DC	prefix option	catalogue number	spare parts kits	A	B	C	D	E	F	G	H	J	K	L	weight
01	~ / =	PV	T292B025	320180 / 320196	60	47	54	Ø11	82	76	94	118	58	116	120	1,0 Kg



SOLENOID VALVES

pilot operated, dual flow
floating diaphragm, for petrol vending
3/4 to 1

NC



2/2
Series
292

FEATURES

- Compact aluminium flanged bodied dual flow valves for petrol vending applications
- Minimum operating differential pressure 0,35 bar
- Explosion proof operators, intended for use in potential explosive areas, according to Directive ATEX 94/9/EC
- Easy electrical installation by means of the moulded-in supply cable, standard length 2 meter
- ASCO Numatics components satisfy all relevant EC directives

GENERAL

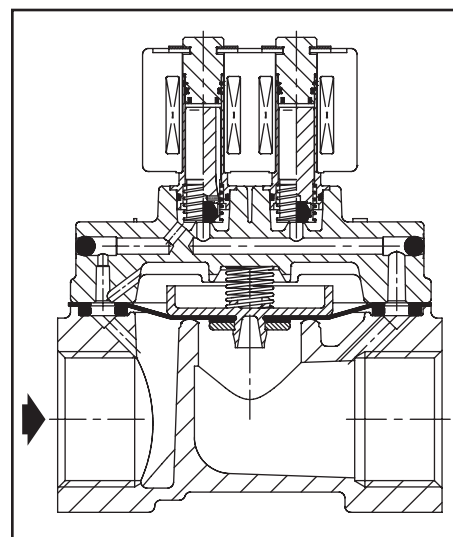
Differential pressure 0,35 - 3,5 bar [1 bar = 100kPa]
Ambient temperature range AC: -40 to +65°C
DC: -40 to +40°C

fluids (*)	temperature range (TS)	seal materials (*)
Petrol & Liquid fuels	-20 to +40°C	FPM (fluoroelastomer) / VMQ (silicone)

MATERIALS IN CONTACT WITH FLUID

(*) Ensure that the compatibility of the fluids in contact with the materials is verified

Body	Aluminium
Core tube	Stainless steel
Core and plugnut	Stainless steel
Springs	Stainless steel
Seat	Aluminium
Sealing	FPM / VMQ
Disc & O-Rings	FPM
Diaphragm Support	POM
Shading Ring (AC only)	Copper



ELECTRICAL CHARACTERISTICS

Coil insulation class F
Electrical safety IEC 335
Standard voltages DC (=) 24V - 48V;
AC (~) 24V - 48V - 115V - 230V / 50 Hz

prefix option	power ratings		operator ambient temperature range (TS) (C°)	safety code	electrical enclosure protection (EN 60529)	replacement coil		type ⁽¹⁾
	holding ~	hot/cold =				~	=	
	(W)	(W)				230V/50/60 Hz	24V/DC	
PV	4,0	5,0 / 6,9	-40 to +40/65	II 2 G Ex mb II T3	moulded IP67	-	⁽²⁾	01 & 02

⁽¹⁾ Refer to the dimensional drawings on page 14

⁽²⁾ Multiple coils kits available under ATEX, contact us
- Not available

SPECIFICATIONS

pipe size	orifice size		flow coefficient Kv				operating pressure differential (bar)			prefix optional solenoids *						basic catalogue number
	Low	High	Low		High		min	max. PS		NEMA 7&9	ATEX / IECEx				IP65	
			(m³/h)	(l/min)	(m³/h)	(l/min)		~	=		Ex d	Ex e mb	Ex mb	EEx nA		
Rp	(mm)	(mm)	(m³/h)	(l/min)	(m³/h)	(l/min)				EF	NF	EM	PV	ZN	SC	
NC - Normally closed																
3/4	2,5	19	0,10	1,7	7,3	122	0,35	3,5	3,5	-	-	-	●	-	-	E292A021
3/4	2,5	25	0,12	2,0	9,5	158	0,35	3,5	3,5	-	-	-	●	-	-	E292B022
1	2,5	25	0,12	2,0	11,5	192	0,35	3,5	3,5	-	-	-	●	-	-	E292B023

● Available feature

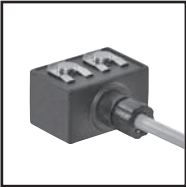
- Not available

* For description of solenoids see pages 31-40

INSTALLATION

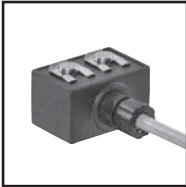
- The valves can be mounted in any position without affecting operation
- Pipe connection identifiers: E = pipe thread according to ISO 7/1
- Installation/maintenance instructions are included with each valve
- PV solenoids have a standard cable length of 2 meters. Other lengths in full meters are available on request

DIMENSIONS (mm), WEIGHT (kg)



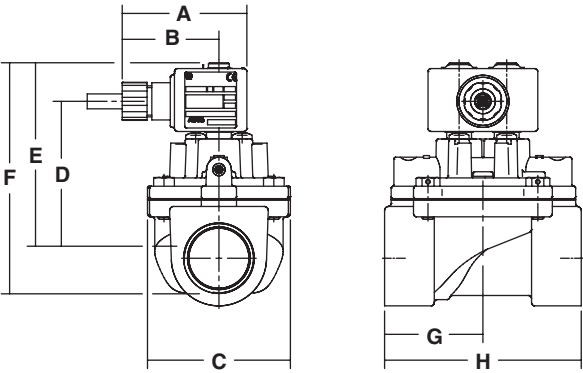
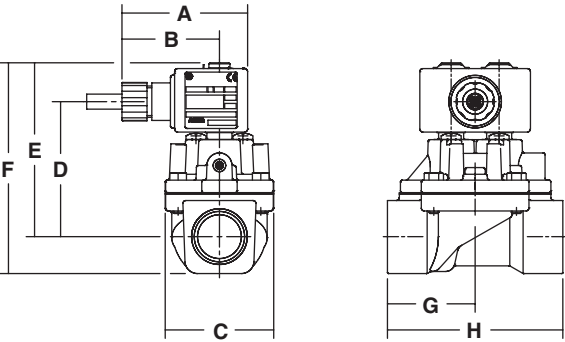
TYPE 01
Prefix "PV" Solenoid
Epoxy encapsulated
EN-IEC 60079-0, 60079-18, 61241-0, 61241-18
II 2 G/D Ex mb II / Ex mD
IP67

E293A021



TYPE 02
Prefix "PV" Solenoid
Epoxy encapsulated
EN-IEC 60079-0, 60079-18, 61241-0, 61241-18
II 2 G/D Ex mb II / Ex mD
IP67

E293B022 / B023



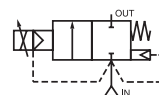
type	AC/DC	prefix option	catalogue number	spare parts kits	A	B	C	D	E	F	G	H	weight
01	~ / =	PV	E292A021	320179	60	47	52	65	83	101	42	84	1,0 Kg
02	~ / =		E292B022	320180 / 320196	60	47	69	70	89	112	48	95	1,0 Kg
	~ / =		E292B023	320180 / 320196	60	47	69	70	89	112	48	95	1,0 Kg



SOLENOID VALVES

proportional pilot operated
for petrol vending regulating applications
3/4

NC

**2/2**
Series
291

FEATURES

- The proportional petrol dispensing valves can handle a variable flow of petrol, proportional to the control signal. Frequently used for blending applications.
- The high quality polyphenylene sulfide piston guarantees a long operating life and a wide temperature range. Hydrocarbon resistant FPM seal for tight shut off
- Explosion proof operator, intended for use in potentially explosive areas, according to Directive ATEX 94/9/EC
- Easy electrical installation by means of the moulded-in supply cable, standard length of 2 meter
- ASCO Numatics components satisfy all relevant EC directives

GENERAL

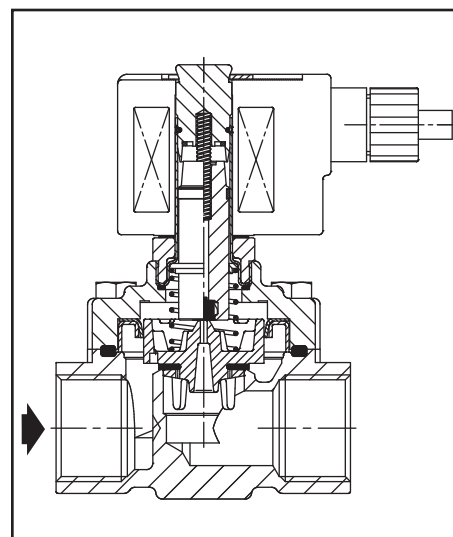
Differential pressure 0,3 - 3,5 bar [1 bar = 100kPa]**Ambient temperature range** -40 to +70°C

fluids (*)	temperature range (TS)	seal materials (*)
Petrol & Liquid fuels	-40 to +70°C	FPM (fluoroelastomer)

MATERIALS IN CONTACT WITH FLUID

(*) Ensure that the compatibility of the fluids in contact with the materials is verified

Body	Brass
Bonnet	Brass
Core tube	Stainless steel
Core and plugnut	Stainless steel
Core disc	FPM
Core guide	POM
Rider ring	PFTE
Springs	Stainless steel
Piston	PPS
Piston disc	FPM
Lip seal	PFTE
Piston support	Brass



ELECTRICAL CHARACTERISTICS

Coil insulation class F**Electrical safety** IEC 335**Standard voltages** DC (=) 24V - 48V

prefix option	power ratings		operator ambient temperature range (TS)	safety code	electrical enclosure protection (EN 60529)	replacement coil		type ⁽¹⁾
	holding ~	hot/cold =				~	=	
	(W)	(W)				230V/50/60 Hz	24V/DC	
PV	-	9,0 / 11,2	-40 to +60	II 2 G Ex mb II T4	moulded IP67	-	⁽²⁾	01
SC	-	9,0 / 11,2	-40 to +55	EN 60730	moulded IP65	-	400425-142	02

⁽¹⁾ Refer to the dimensional drawings on page 16⁽²⁾ Multiple coils kits available under ATEX, contact us

- Not available

SPECIFICATIONS

pipe size	orifice size	flow coefficient Kv		operating pressure differential (bar)		prefix optional solenoids *						basic catalogue number
						NEMA 7&9	ATEX / IECEx				IP65	
				min	max. PS	Ex d	Ex e mb	Ex mb	EEx nA			
G	(mm)	(m³/h)	(l/min)		=	EF	NF	EM	PV	ZN	SC	
NC - Normally closed												
3/4	20	3.9	65	0.3	3.5	-	-	-	●	-	●	G291A111

● Available feature

- Not available

* For description of solenoids see pages 31-40

ADDITIONAL OPTIONS

- Other explosionproof enclosures for use in zone 1/21-2/22, categories 2-3 to ATEX Directive 94/9/EC
- Explosionproof and watertight solenoids according to “NEMA” standards

INSTALLATION

- The valves can be mounted in any position without affecting operation
- Pipe connection identifiers: G = pipe thread according to ISO 228/1
- Installation/maintenance instructions are included with each valve
- PV solenoids have a standard cable length of 2 meters. Other lengths in full meters are available on request

DIMENSIONS (mm), WEIGHT (kg)



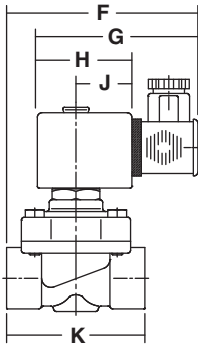
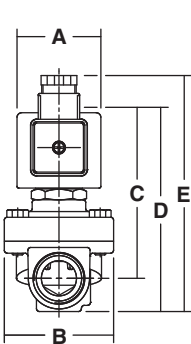
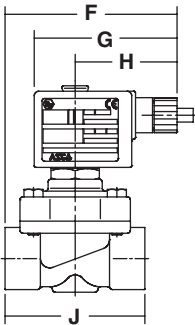
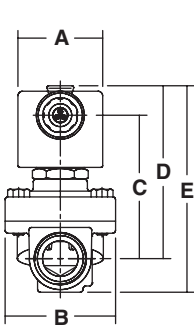
TYPE 01
Prefix "PV" Solenoid
Epoxy encapsulated
EN-IEC 60079-0, 60079-18, 61241-0, 61241-18
II 2 G/D Ex mb II / Ex mD
IP67

G291A111



TYPE 02
Prefix "SC" Solenoid
Epoxy moulded
IEC 335 / ISO 4400
IP65

G291A111



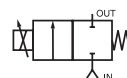
type	AC/DC	prefix option	catalogue number	spare parts kits	A	B	C	D	E	F	G	H	J	K	weight
01	=	PV	G291A111	PVC117691	45	58	75	91	108	90	75	54	73	-	1,2 Kg
02	=	SC	G291A111	C117691	45	58	91	108	125	102	85	50	30	73	1,1 Kg



SOLENOID VALVES

proportional direct operated
for vapour recovery regulating applications
1/4

NC

**2/2**
Series
291

FEATURES

- The proportional solenoid valves can handle a variable flow of fuel vapour, proportional to the control signal
- The high quality FPM disc core construction guarantees a long operating life and a wide temperature range
- Explosion proof operator, intended for use in potentially explosive areas, according to Directive ATEX 94/9/EC
- Easy electrical installation by means of the moulded-in supply cable, standard length of 2 meter
- ASCO Numatics components satisfy all relevant EC directives

GENERAL

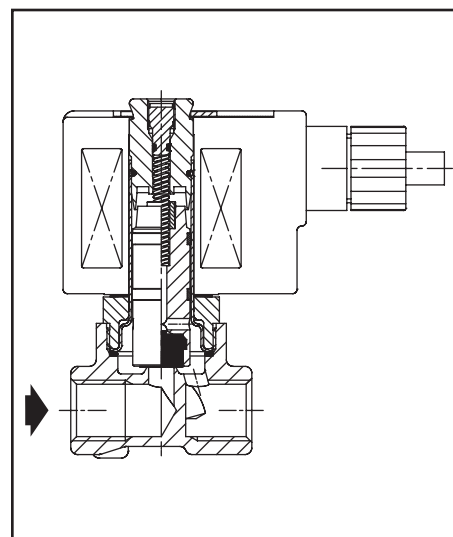
Differential pressure 0 - 1 bar [1 bar = 100kPa]**Ambient temperature range** -40 to +65°C

fluids (*)	temperature range (TS)	seal materials (*)
Fuel vapour	-40 to +65°C	FPM (fluoroelastomer)

MATERIALS IN CONTACT WITH FLUID

(*) Ensure that the compatibility of the fluids in contact with the materials is verified

Body	Brass
Core tube	Stainless steel
Core and plugnut	Stainless steel
Core disc seal	FPM
Rider ring	PFTE
Springs	Stainless steel
Lip seal	PFTE
Seat	Brass
Breaker piece	Stainless steel



ELECTRICAL CHARACTERISTICS

Coil insulation class F**Electrical safety** IEC 335**Standard voltages** DC (=) 24V - 48V

prefix option	power ratings		operator ambient temperature range (TS) (C°)	safety code	electrical enclosure protection (EN 60529)	replacement coil		type ⁽¹⁾
	holding ~	hot/cold =				~	=	
	(W)	(W)				230V/50/60 Hz	24V/DC	
PV	-	9,0 / 11,2	-40 to +65	II 2 G Ex mb II T4	moulded IP67	-	⁽²⁾	01
SC	-	9,0 / 11,2	-40 to +55	EN 60730	moulded IP65	-	400425-142	02

⁽¹⁾ Refer to the dimensional drawings on page 18⁽²⁾ Multiple coils kits available under ATEX, contact us

- Not available

SPECIFICATIONS

pipe size	orifice size	flow coefficient Kv		operating pressure differential (bar)		prefix optional solenoids *						basic catalogue number	
						NEMA 7&9	ATEX / IECEx				IP65		
				min	max. PS		Ex d	Ex e mb	Ex mb	EEx nA			
G	(mm)	(m³/h)	(l/min)			=	EF	NF	EM	PV	ZN	SC	
NC - Normally closed													
1/4	5,6	0,73	12,2	0	1	-	-	-	●	-	●	G291A210	

● Available feature

- Not available

* For description of solenoids see pages 31-40

ADDITIONAL OPTIONS

- Other explosionproof enclosures for use in zone 1/21-2/22, categories 2-3 to ATEX Directive 94/9/EC
- Explosionproof and watertight solenoids according to “NEMA” standards

INSTALLATION

- The valves can be mounted in any position without affecting operation.
- Pipe connection identifiers: G = pipe thread according to ISO 228/1
- Installation/maintenance instructions are included with each valve.
- PV solenoids have a standard cable length of 2 meters. Other lengths in full meters are available on request

DIMENSIONS (mm), WEIGHT (kg)



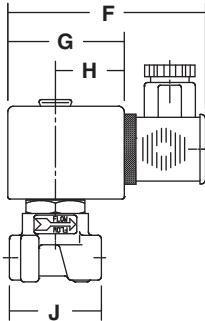
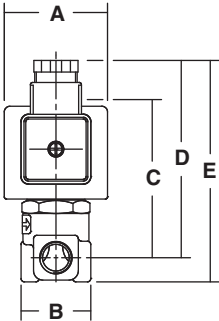
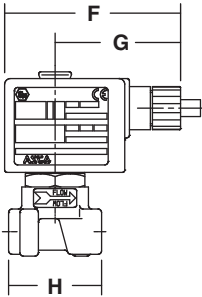
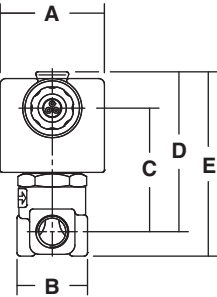
TYPE 01
Prefix "PV" Solenoid
Epoxy encapsulated
EN-IEC 60079-0, 60079-18, 61241-0, 61241-18
II 2 G/D Ex mb II / Ex mD
IP67

G291A210



TYPE 02
Prefix "SC" Solenoid
Epoxy moulded
IEC 335 / ISO 4400
IP65

G291A210



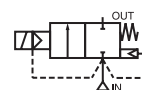
type	AC/DC	prefix option	catalogue number	spare parts kits	A	B	C	D	E	F	G	H	J	weight
01	=	PV	G291A210	PVC117692	45	30	53	68	79	75	54	40	-	0,45 Kg
02	=	SC	G291A210	C117692	45	30	68	85	95	85	50	30	40	0,35 Kg



SOLENOID VALVES

high pressure, single flow
pilot operated for LPG applications
1/2 to 3/4

NC



2/2
Series
291

FEATURES

- The normally closed LPG valves are especially designed to meet the particular heavy duty requirements of LPG applications
- Single flow execution for self service systems
- Explosion proof operator, intended for use in potentially explosive areas, according to Directive ATEX 94/9/EC
- Easy electrical installation by means of the moulded-in supply cable, standard length of 2 meter
- ASCO Numatics components satisfy all relevant EC directives

GENERAL

Differential pressure 0 - 25 bar [1 bar = 100kPa]
Ambient temperature range -20 to +65°C (FPM execution)
-40 to +65°C (PTFE execution)

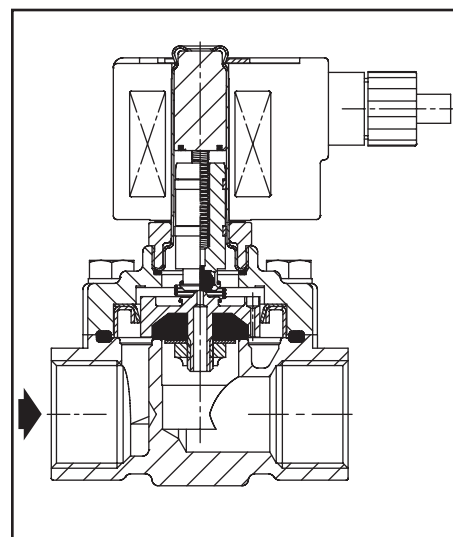
fluids (*)	temperature range (TS)	seal materials (*)
LPG / Liquid	-20 to +65°C	FPM (fluoroelastomer) / VMQ (silicone)
LPG / Liquid	-40 to +65°C	PTFE (**)

MATERIALS IN CONTACT WITH FLUID

(*) Ensure that the compatibility of the fluids in contact with the materials is verified

(**) Specify suffix T behind catalogue number for the PTFE execution

Body & Bonnet	Brass
Core tube	Stainless steel
Core and plugnut	Stainless steel
Piston	Stainless steel
Core & Piston disc	FPM or PTFE
Rider ring	PTFE
Springs	Stainless steel



ELECTRICAL CHARACTERISTICS

Coil insulation class F
Electrical safety IEC 335
Standard voltages DC (=) 24V - 48V;
AC (~) 24V - 48V - 115V - 230V / 50 Hz

prefix option	power ratings		operator ambient temperature range (TS)	safety code	electrical enclosure protection (EN 60529)	replacement coil		type ⁽¹⁾
	holding ~	hot/cold =				~	=	
	(W)	(W)				230V/50/60 Hz	24V/DC	
PV	10,5	-	-40 to +65	II 2 G Ex mb II T3	moulded IP67	(2)	-	01
(WS)EM	-	12,0 / 16,8	-40 to +40	II 2 G Ex e mb II T3	SS / moulded IP65	-	(2)	02
SC	10,5	12,0 / 16,8	-40 to +65	EN 60730	moulded IP65	400425-117	400625-142	03 & 04

(1) Refer to the dimensional drawings on page 20

(2) Multiple coils kits available under ATEX, contact us

- Not available

SPECIFICATIONS

pipe size	orifice size		flow coefficient Kv				operating pressure differential (bar)			prefix optional solenoids *						basic catalogue number
										NEMA 7&9	ATEX / IECEx				IP65	
	Low	High	Low		High		min	max. PS			Ex d	Ex e mb	Ex mb	EEx nA		
G	(mm)	(mm)	(m³/h)	(l/min)	(m³/h)	(l/min)		~	=	EF	NF	EM	PV	ZN	SC	
NC - Normally closed																
1/2	2,4	19	0,15	2,5	4,0	66,7	0	25	17	-	-	○	□	-	●	G291A310
3/4	2,4	19	0,15	2,5	4,0	66,7	0	25	17	-	-	○	□	-	●	G291A320

● Available feature ○ Available feature in DC only □ Available feature in AC only

- Not available

* For description of solenoids see pages 31-40

ADDITIONAL OPTIONS

- Other explosionproof enclosures for use in zone 1/21-2/22, categories 2-3 to ATEX Directive 94/9/EC
- Explosionproof and watertight solenoids according to "NEMA" standards

INSTALLATION

- The valves can be mounted in any position without affecting operation
- Pipe connection identifiers: G = pipe thread according to ISO 228/1
- Installation/maintenance instructions are included with each valve
- PV solenoids have a standard cable length of 2 meters. Other lengths in full meters are available on request

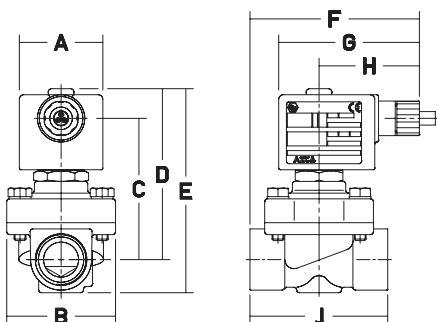
DIMENSIONS (mm), WEIGHT (kg)



TYPE 01

Prefix "PV" Solenoid
Epoxy encapsulated
EN-IEC 60079-0, 60079-18, 61241-0, 61241-18
II 2 G/D Ex mb II / Ex mD
IP67

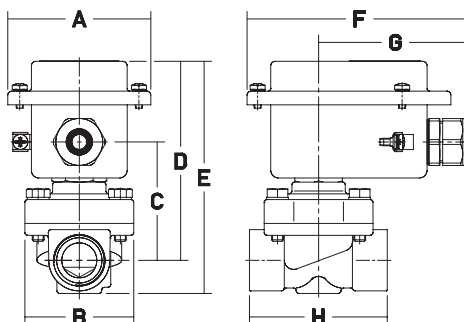
G291A321 / A320



TYPE 02

Prefix "EM" and "WSEM" Solenoid
Zinc plated steel, epoxy coated (EM)
Stainless steel, AISI 316 (WSEM)
EN-IEC 60079-0, 60079-7, 60079-18, 61241-0, 61241-1
II 2 G/D Ex e mb II / Ex tD
IP67

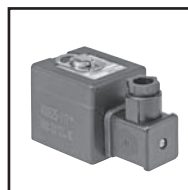
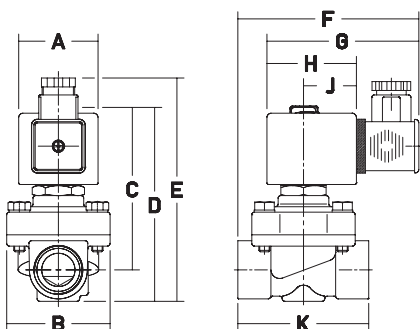
G291A310 / A320



TYPE 03

Prefix "SC" Solenoid
Epoxy moulded
IEC 335 / ISO 4400
IP65

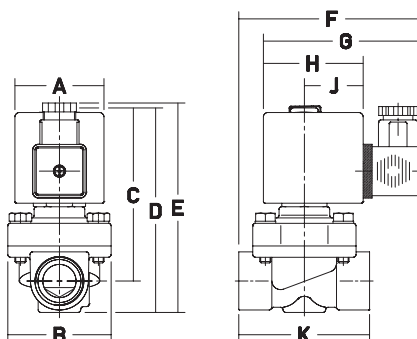
G291A310 / A320



TYPE 04

Prefix "SC" Solenoid
Epoxy moulded
IEC 335 / ISO 4400
IP65

G291A310 / A320



type	AC/DC	prefix option	catalogue number	spare parts kits	A	B	C	D	E	F	G	H	J	K	weight
01	~	PV	G291A310	PVC144067	45	58	71	87	101	88	75	54	70	-	1,1 Kg
			G291A320	PVC144064	45	58	75	91	109	90	75	54	73	-	1,2 Kg
02	=	(WS)EM	G291A310	EMC144072	76	58	59	102	116	120	82	70	-	-	1,3 Kg
			G291A320	EMC144069	76	58	63	106	124	120	82	73	-	-	1,4 Kg
03	~	SC	G291A310	C144067	45	58	87	101	118	100	85	50	30	70	1,0 Kg
			G291A320	C144064	45	58	91	109	125	102	85	50	30	73	1,1 Kg
04	=	SC	G291A310	C144072	50	58	93	107	110	103	91	56	33	70	1,2 Kg
			G291A320	C144069	50	58	97	115	118	105	91	56	33	73	1,3 Kg

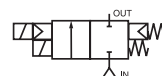
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SOLENOID VALVES

high pressure, dual flow
pilot operated for LPG applications
3/4

NC



2/2
Series
291

FEATURES

- The normally closed LPG valves are especially designed to meet the particular heavy duty requirements of LPG applications
- Dual flow execution, for use in prepaid systems
- Explosion proof operator, intended for use in potentially explosive areas, according to Directive ATEX 94/9/EC
- Easy electrical installation by means of the moulded-in supply cables, standard length of 2 meter
- ASCO Numatics components satisfy all relevant EC directives

GENERAL

Differential pressure 0 - 25 bar [1 bar = 100kPa]
Ambient temperature range -20 to +65°C (FPM execution)
-40 to +65°C (PTFE execution)

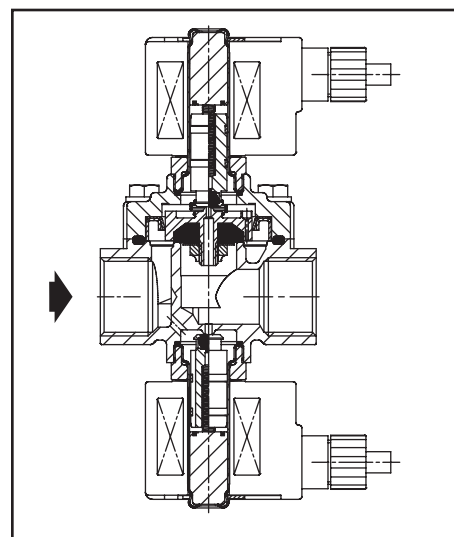
fluids (*)	temperature range (TS)	seal materials (*)
LPG / Liquid	-20 to +65°C	FPM (fluoroelastomer)
LPG / Liquid	-40 to +65°C	PTFE (**)

MATERIALS IN CONTACT WITH FLUID

(*) Ensure that the compatibility of the fluids in contact with the materials is verified

(**) Specify suffix T behind catalogue number for the PTFE execution

Body	Brass
Core tube	Stainless steel
Core and plugnut	Stainless steel
Core disc	FPM or PTFE
Rider ring	PTFE
Springs	Stainless steel



ELECTRICAL CHARACTERISTICS

Coil insulation class F
Electrical safety IEC 335
Standard voltages DC (=) 24V - 48V;
AC (~): 24V - 48V - 115V - 230V / 50 Hz

prefix option	power ratings		operator ambient temperature range (TS)	safety code	electrical enclosure protection (EN 60529)	replacement coil		type ⁽¹⁾
	holding ~	hot/cold =				~	=	
	(W)	(W)				230V/50/60 Hz	24V/DC	
PV	10,5	-	-40 to +65	II 2 G Ex mb II T3	moulded IP67	(2)	(2)	01
(WS)EM	-	12,0 / 16,8	-40 to +40	II 2 G Ex e mb II T3	SS / moulded IP65	(2)	(2)	02
SC	10,5	12,0 / 16,8	-40 to +65	EN 60730	moulded IP65	400425-117	400625-142	03 & 04

⁽¹⁾ Refer to the dimensional drawings on page 22

⁽²⁾ Multiple coils kits available under ATEX, contact us
- Not available

SPECIFICATIONS

pipe size	orifice size		flow coefficient Kv				operating pressure differential (bar)			prefix optional solenoids *						basic catalogue number
	Low	High	Low	High	min	max. PS		NEMA 7&9	ATEX / IECEx				IP65			
						~	=		Ex d	Ex e mb	Ex mb	EEEx nA				
G	(mm)	(mm)	(m³/h)	(l/min)	(m³/h)	(l/min)			EF	NF	EM	PV	ZN	SC		
NC - Normally closed																
3/4	2,4	19	0,15	2,5	4,0	66,7	0	25	17	-	-	○	□	-	●	G291A321

● Available feature ○ Available feature in DC only □ Available feature in AC only

- Not available

* For description of solenoids see pages 31-40

ADDITIONAL OPTIONS

- Other explosionproof enclosures for use in zone 1/21-2/22, categories 2-3 to ATEX Directive 94/9/EC
- Explosionproof and watertight solenoids according to "NEMA" standards

INSTALLATION

- The valves can be mounted in any position without affecting operation
- Pipe connection identifiers: G = pipe thread according to ISO 228/1
- Installation/maintenance instructions are included with each valve
- PV solenoids have a standard cable length of 2 meters. Other lengths in full meters are available on request

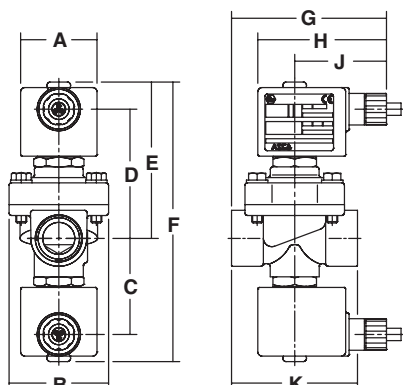
DIMENSIONS (mm), WEIGHT (kg)



TYPE 01

Prefix "PV" Solenoid
Epoxy encapsulated
EN-IEC 60079-0, 60079-18, 61241-0, 61241-18
II 2 G/D Ex mb II / Ex mD
IP67

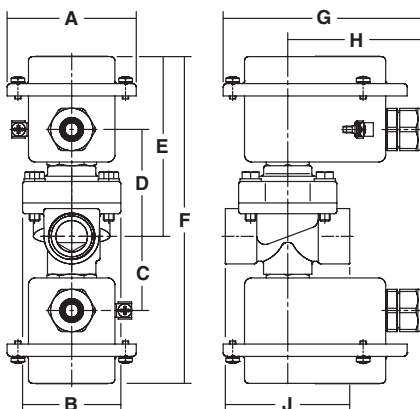
G291A321



TYPE 02

Prefix "EM" and "WSEM" Solenoid
Zinc plated steel, epoxy coated (EM)
Stainless steel, AISI 316 (WSEM)
EN-IEC 60079-0, 60079-7, 60079-18, 61241-0, 61241-1
II 2 G/D Ex e mb II / Ex tD
IP67

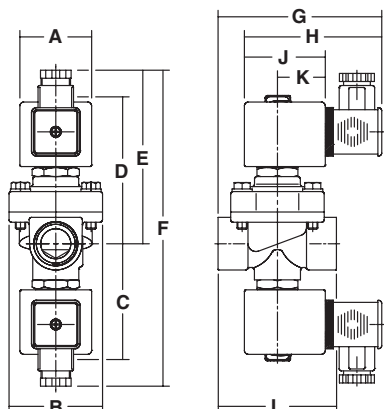
G291A321



TYPE 03

Prefix "SC" Solenoid
Epoxy moulded
IEC 335 / ISO 4400
IP65

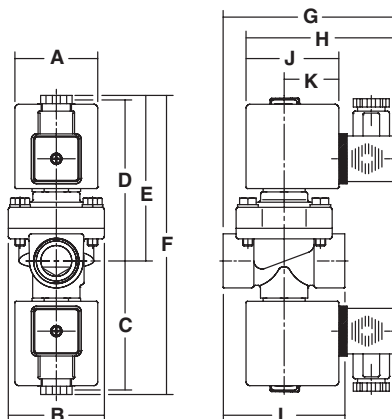
G291A321



TYPE 04

Prefix "SC" Solenoid
Epoxy moulded
IEC 335 / ISO 4400
IP65

G291A321



type	AC/DC	prefix option	catalogue number	spare parts kits	A	B	C	D	E	F	G	H	J	K	L	weight
01	~	PV	G291A321	PVC139678	45	58	56	75	91	163	90	75	54	73	-	1,7 Kg
02	=	(WS)EM	G291A321	EMC139679	76	58	44	63	106	193	120	82	73	-	-	2,1 Kg
03	~	SC	G291A321	C139678	45	58	72	91	108	196	102	85	50	30	73	1,5 Kg
04	=	SC	G291A321	C139679	50	58	78	97	100	181	105	91	56	33	73	1,9 Kg

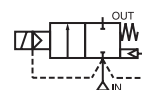
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SOLENOID VALVES

high pressure, pilot operated
for CNG applications
3/8 and 1/2

NC



2/2
Series
291

FEATURES

- The normally closed high pressure valves are especially designed to meet the particular heavy duty requirements of compressed natural gas
- Stainless steel body material to achieve a compact and reliable design
- The high quality PEEK piston guarantees a long operating life and a large temperature range
- Valves can withstand a burst pressure beyond 1400 bar
- Explosion proof operator, intended for use in potentially explosive areas, according to Directive ATEX 94/9/EC
- Easy electrical installation by means of the moulded-in supply cable, standard length 2 meter
- ASCO Numatics components satisfy all relevant EC directives

GENERAL

Differential pressure 10 - 350 bar [1 bar = 100kPa]

Ambient temperature range -40 to +70°C

fluids (*)	temperature range (TS)	seal materials (*)
CNG	-40 to +70°C	FPM (fluoroelastomer) / VMQ (silicone) High-grade PTFE / 302 Stainless steel

MATERIALS IN CONTACT WITH FLUID

(*) Ensure that the compatibility of the fluids in contact with the materials is verified

Body	303 Stainless steel
Core	Aluminium bronze
Piston	PEEK
Core and plugnut	Stainless steel
Core spring	Stainless steel
Sealing (U-cup)	FPM
	High-grade PTFE / 302 Stainless steel
O-ring	FPM

ELECTRICAL CHARACTERISTICS

Coil insulation class	F
Electrical safety	IEC 335
Standard voltages	DC (=) 24V - 48V; AC (~): 24V - 48V - 115V - 230V / 50 Hz

prefix option	power ratings		operator ambient temperature range (TS)	safety code	electrical enclosure protection (EN 60529)	replacement coil		type ⁽¹⁾
	holding ~	hot/cold =				~	=	
	(W)	(W)				230V/50/60 Hz	24V/DC	
PV	-	9,0 / 11,2	-40 to +40/65	II 2 G Ex mb II T3 / T4	moulded IP67	-	(2)	01
(WS)EM	10,0	9,0 / 11,2	-40 to +40/65	II 2 G Ex e mb II T3 / T4	SS / moulded IP65	(2)	(2)	02
SC	-	9,0 / 11,2	-40 to +55	EN 60730	moulded IP65	-	400425-142	03

⁽¹⁾ Refer to the dimensional drawings on page 24

⁽²⁾ Multiple coils kits available under ATEX, contact us
- Not available

SPECIFICATIONS

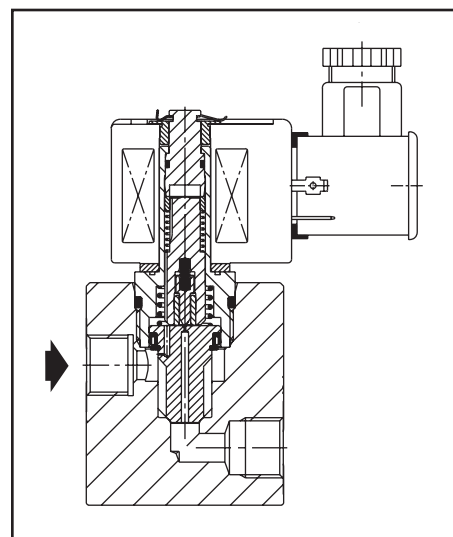
pipe size	orifice size	flow coefficient Kv		operating pressure differential (bar)		prefix optional solenoids *						basic catalogue number
						NEMA 7&9	ATEX / IECEx				IP65	
				min	max. PS		Ex d	Ex e mb	Ex mb	EEx nA		
❖	(mm)	(m³/h)	(l/min)	min	~/=	EF	NF	EM	PV	ZN	SC	
NC - Normally closed												
3/8	8	0,96	16	10	350	-	-	●	○	-	●	❖291A410
1/2	12	2,30	38	10	350	-	-	●	○	-	●	❖291A420

● Available feature ○ Available feature in DC only

- Not available

* For description of solenoids see pages 31-40

❖: Select 'G' for ISO 228/1 or 'C' for SAE



OPTIONS

- Other explosionproof enclosures for use in zone 1/21-2/22, categories 2-3 to ATEX Directive 94/9/EC
- Explosionproof and watertight solenoids according to "NEMA" standards

INSTALLATION

- The valves can be mounted in any position without affecting operation
- Pipe connection identifiers: G = pipe thread according to ISO 228/1, C = SAE
- Installation/maintenance instructions are included with each valve
- PV solenoids have a standard cable length of 2 meters. Other lengths in full meters are available on request

DIMENSIONS (mm), WEIGHT (kg)



TYPE 01

Prefix "PV" Solenoid
Epoxy encapsulated
EN-IEC 60079-0, 60079-18, 61241-0, 61241-18
II 2 G/D Ex mb II / Ex mD
IP67

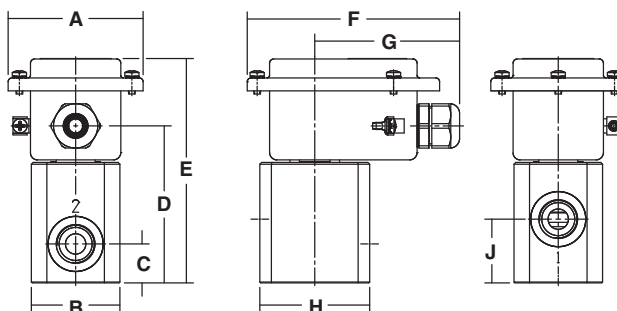
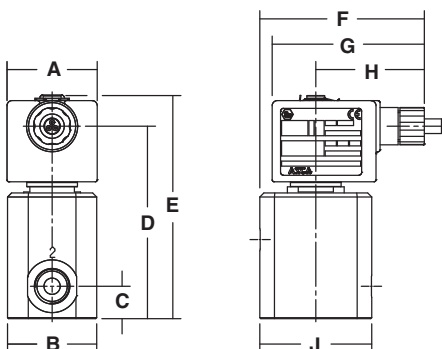
G291A410 / A420, C291A410 / A420



TYPE 02

Prefix "EM" and "WSEM" Solenoid
Zinc plated steel, epoxy coated (EM)
Stainless steel, AISI 316 (WSEM)
EN-IEC 60079-0, 60079-7, 60079-18, 61241-0, 61241-1
II 2 G/D Ex e mb II / Ex tD
IP67

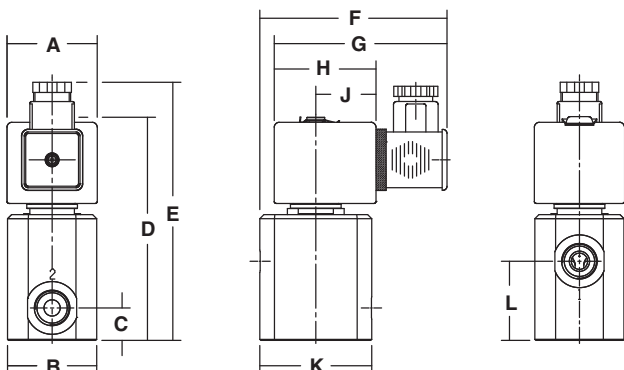
G291A410 / A420, C291A410 / A420



TYPE 03

Prefix "SC" Solenoid
Epoxy moulded
IEC 335 / ISO 4400
IP65

G291A410 / A420, C291A410 / A420



type	AC/DC	prefix option	catalogue number	spare parts kits	A	B	C	D	E	F	G	H	J	K	L	weight
01	=	PV	✧291A410	PVC144695	45	44	16	95	110	81	75	54	55	39	-	1,4 Kg
			✧291A420	PVC144696	45	50	22	101	116	85	75	54	62	36	-	1,8 Kg
02	~	(WS)EM	✧291A410	EMC144695	76	44	16	83	120	120	82	55	39	-	-	1,5 Kg
			✧291A420	EMC144696	76	50	22	89	126	120	82	62	36	-	-	1,9 Kg
03	~	SC	✧291A410	C144695	45	44	16	110	127	92	85	50	30	55	39	1,3 Kg
			✧291A420	C144696	45	50	22	116	133	96	85	50	30	62	36	1,7 Kg

✧: Select 'G' for ISO 228/1 or 'C' for SAE

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GENERAL

The accidental ignition of an atmosphere containing a large quantity of gas, vapour, mists and/or dust may cause an explosion. Specific **measures** have been taken on an **international level** in order to avoid any material damage or the loss of human lives.

These measures mainly apply to chemical and petrochemical industries where such hazardous atmospheres may be developed during the production, transformation, transport and storage of flammable products. They also cover installations where combustible dust is produced in the processing of pulverised and grain products (grinding and sieving).

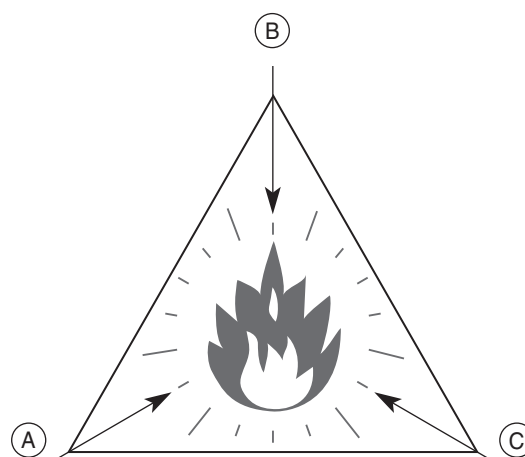
SOME DEFINITIONS

What is a potentially explosive atmosphere?

3 elements must be combined to trigger an explosion:

- (A) **The oxygen in the surrounding air = always present**
- (B) **A flammable substance** (gas, vapours, mists or dusts)
- (C) **A source of ignition:** Electrical equipment / installation or any source of heat

A **spark** or a **flame** are not the only sources of ignition. An **increase of the surface temperature** of an electrical equipment may cause an explosion if it exceeds the ignition temperature of the surrounding gas or mixture of substances.



What is an explosive atmosphere?

This is an atmosphere which could become explosive (the danger is potentially present) due to the local or operational condition in an installation such as: leaks, rupture of pipeline, temperature variations, etc.

What is a gaseous or dusty explosive atmosphere?

This is a mixture with air, under atmospheric conditions, of flammable substances in the form of gases, vapours, mists or dusts in which, after ignition has occurred, combustion spreads to the entire unburned mixture (definition according to Directive 1999/92/EC).

What is the fundamental difference between a gaseous and a dusty atmosphere?

It's the density. The density of gases and vapours is approximately 1,000 times less than that of dusts. Gases are dispersed in the air due to convection and diffusion, thereby creating a homogeneous atmosphere. Since dusts are much heavier than air, they have the tendency to settle to the bottom more or less quickly.

What are the characteristic features of an explosive atmosphere caused by dust?

For a dusty atmosphere to become explosive, the following four conditions must be present:

- The dust must be flammable (particle size < 0.3 mm in general).
- The atmosphere must contain an oxidiser (generally oxygen, even in a very small quantity).
- The dusts must be in suspension. (The explosion will be caused by the extremely rapid rate of combustion of the dust in the oxygen in the air.)
- The dust concentration must be in the explosive range. (As a rule, the lower limit of explosion is around 50 g/m³.)

OBJECTIVES OF THE ATEX DIRECTIVE 94/9/EC ("ATmosphères EXplosibles")

To ensure free circulation of the products to which it is applicable throughout the territory of the European Union.

To remove barriers to trade via the New Approach by requiring a definition of **essential requirements regarding safety and health** by which a high level of protection will be ensured (Annex II of Directive 94/9/EC).

To cover by a single directive both mining and surface equipment.

To increase the scope as compared to national regulations by providing for the first time essential safety and health requirements for:

- **Non-electrical equipment** intended for use in potentially explosive atmospheres [EN 13463-1 (2001)];
- Equipment intended for use in **dusty environments** as well as protective systems;
- Devices intended **for use outside explosive atmospheres** which are required for or contribute to the **safe functioning** of equipment or protective systems.

WHAT OBLIGATIONS DOES THE MANUFACTURER HAVE UNDER THIS DIRECTIVE?

The manufacturer has sole and ultimate responsibility for the conformity of his product to the applicable directives. He bears responsibility for:

- Ensuring the conformity of his products to the Directive (providing for certificates of conformity);
- Designing and constructing his products in accordance with the essential safety and health requirements;
- Following the procedures for the assessment of the conformity of the product.

EFFECTIVE DATE

Since 1 July 2003, all products placed on the market in the European Union have to conform to Directive 94/9/EC. Already installed equipment need, however, not be replaced by equipment conforming to the ATEX directive.

WHAT ABOUT THE PRODUCTS AFTER 30 JUNE 2003?

After 30 June 2003, conformity to the ATEX directive is obligatory in order to enable free movement of products throughout the European Union. Only the New Approach remains valid. It takes into account:

- Hazardous areas;
- CE Marking;
- Dust atmospheres;
- The CENELEC standards EN 60079-0 (EN 50014) for electrical equipment for explosive gas atmosphere;
- Standard EN 13463 for non-electrical equipment for potentially explosive atmospheres.

WHAT ABOUT THE PRODUCTS AFTER 1 JULY 2006?

After 1 July 2006, standards EN 50014..28 are progressively replaced by the EN 60079 series of standards in the list of harmonised standards. The same applies for EN 50281-1-1 (electrical apparatus for the use in the presence of combustible dust) which is replaced by the EN 61241 series of standards.

If the equipment is not affected by substantial modifications of the new standards, the manufacturer does not need to apply for an addition to the EC type-examination certificate.

Status of the harmonisation of these standards at the end of 2006:

EN 50014		Replaced by EN 60079-0.
EN 50018	«d»	Replaced by EN 60079-1.
EN 50019	«e»	Replaced by EN 60079-7.
EN 50020	«i»	To be harmonised by 1 October 2009, then replaced by EN 60079-11.
EN 50021	«n»	Replaced by EN 60079-15.
EN 50028	«m»	Replaced by EN 60079-18.
EN 50281-1-1		Replaced by EN 61241-0 and EN 61241-1.

WHAT IS THE IECEx CERTIFICATION?

The IECEx International Certification Scheme is a voluntary certification system. It offers a certification of conformity with the IEC series of standards 60079, 61241 and 61779. This certification facilitates the international trade of electrical equipment intended for use in explosive atmospheres and contributes to avoiding the multiplicity of national certifications while guaranteeing an adapted level of safety. The certification is issued by an organisation recognised by IECEx, an ExCB (Ex Certification Body).

- It provides direct access to the markets in Australia, New Zealand etc.
- It simplifies access to local certifications in Russia, China, USA etc.
- It reduces the time and costs for certification due to its international recognition.
- All certificates issued are available for download worldwide under «Online Certificates» at IECEx.com.

WHAT ARE EQUIPMENT PROTECTION LEVELS (EPLs)?

The degree of hazard is currently defined according to the probability of the occurrence of explosive atmospheres. Equipment Protection Levels (EPLs) are introduced to enable an alternative approach to selecting Ex equipment by taking into account the potential consequences of an explosion and other factors such as the toxicity of materials.

A risk assessment approach for the acceptance of explosion protected equipment has been introduced to clearly indicate the inherent ignition risk of the equipment, no matter what type of protection is used.

IEC / CENELEC COOPERATION

The main CENELEC EN 50014 standard (General Requirements) pertaining to electrical apparatus for potentially explosive atmospheres was originally published in 1977. It is derived from the IEC Publications 79.

From that date, these 2 organisations have constantly intensified their cooperation. The new series of standards 6 (60079-0, etc.) which gradually replace the old standards are an example for the approximation between European and international standards.

WHAT ARE THESE 2 ORGANISATIONS?

IEC

The "International Electrotechnical Commission" (IEC), founded in 1906, has its head office in Geneva. The commission is currently composed of 55 national committees and 19 associate members. Its purpose is "fostering international cooperation in all issues relative to standardisation and in related subjects such as certification in the fields of electricity and electronics, and thus favouring international exchanges".

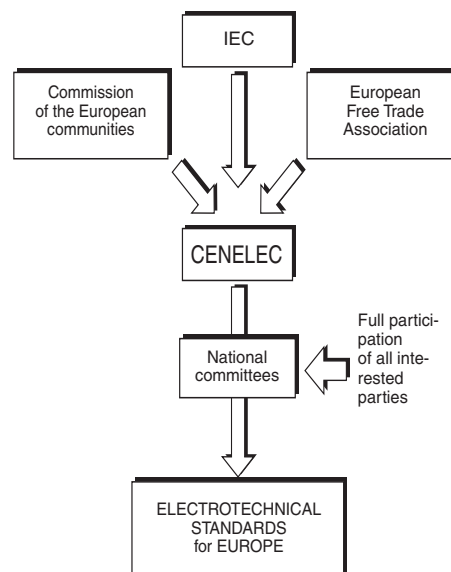
Since 1976, the IEC has been cooperating with the International Standard Organisation (ISO), among others.

CENELEC

The "European Committee for Electrotechnical Standardisation" (CENELEC) is a technical organisation located in Brussels. It is composed of the National Electrotechnical Committees from 31 European countries and 11 affiliated countries. The committee's major role is to harmonise national standards to produce a single European Standard ("EN").

In 1958, the standardisation process started, and in 1973, the name CENELEC was adopted with the expansion of the Common Market.

Within the CENELEC, the Technical Committee 31 is in charge of elaborating the standards for electrical apparatus intended for use in explosive atmospheres.



WHAT IS CEN?

CEN (European Committee for Standardisation) works in close partnership with CENELEC. CEN is a "European forum" for standardisation, with the exception of electro-technology, which fosters and organises relations between governments, governmental bodies, producers, users, consumers, trade unions etc. This is, in particular achieved by:

- harmonising published national standards and promoting ISO standards;
 - elaborating new EN standards, developing procedures for the mutual recognition of test results etc.
- (Example: Standards EN 13463-1 to 8 for non-electrical apparatus).

LATEST DEVELOPMENTS IN THE STANDARDISATION OF EXPLOSIVE ATMOSPHERES

CENELEC and **CEN** have been entrusted with developing new directives as a support to harmonise the legislation of the Member States of the European Union.

Key dates to bear in mind:

- 23 March 1994: Creation of Directive **94/9/EC** (also called **ATEX** or **ATEX 100A**) in replacement of Directives 76/117/EEC, 79/196/EEC, 82/130/EEC. **The directive is to form the basis of the current regulations relating to electrical and non-electrical equipment for explosive atmospheres.**
- From 1996, transposition of the directive in the Member States of the European Union. Start of the **transitory period** allowing for a progressive adaptation of the manufacture of products to the requirements of the directive.
- **30 June 2003**, end of the transitory period: All products placed on the market throughout the European Union from **1 July 2003** must fulfil the safety and health requirements of Directive 94/9/EC.
- **2006-2009**: Gradual application of the new harmonised series of standards "6" (EN 60079-0, EN 60214-0, etc.). The series of standards "5" (EN 50014, EN 50281-1-1 etc.) will cease to apply due to the substantial modifications required by some of the series of standards "6".
- **2007**: The significant changes in the 5th edition of IEC 60079-0 are:
 - Requirements for explosive dust atmospheres transferred from IEC 61241-0
 - The marking Group II alone has been replaced by IIA, IIB or IIC
 - Dusts groups defined as Group IIIA, IIIB and IIIC
 - Limits for ultrasonic and electromagnetic radiation introduced
 - Remainder of "electrostatic" requirements transferred from IEC 60079-26
 - Equipment protection levels (EPLs) introduced

What are the types of protection derived from standard EN 60079-0 (EN 50014) for ASCO Numatics?

Description	Characteristics
FLAMEPROOF ENCLOSURE The most currently used type of protection. Standard equipment is contained in a sturdy casing specifically designed for use in explosive atmospheres. Features - keeps an internal inflammation within a dimensionally stable enclosure; - prevents inflammation from penetrating the ambient atmosphere; - keeps the outside temperature of the enclosure below the ignition temperature of the ambient gas, vapours or dusts.	CONSTRUCTION Standard EN IEC 60079-1 includes elements of standard EN 50018 and specifies the 2 following main characteristics for the construction of a "d" type enclosure to prevent an internal inflammation from igniting the ambient atmosphere: - the length "L" (in mm) of the flameproof seal; - the maximum experimental safe gap (MESG) "i" (in mm). The dimensions given depend on the seal and volume of the enclosure and gas groups. Example: with a seal length $L = 12.5$ mm and an enclosure volume ≤ 100 cm³, the MESG "i" will be: I : 0,5 mm seals included ① / ② IIB : 0,2 mm seals included ① / ② IIA : 0,3 mm seals included ① / ② IIC : 0,15 mm seals included ③ EN 60079-1: All non-threaded flamepaths have to be at 1.5 times the maximum gap (if the maximum gap stated for a flange joint is 0.1 mm, the product will be tested at 0.15 mm). OPERATING VOLTAGE, TEMPERATURE EN 60079-1: - All equipment needs to be tested within the range of ± 10 % of its operating voltage; - If the ambient temperature is below -20°C, a test to determine the reference pressure is required unless a statement that the enclosure is unaffected by lower temperatures (i.e. it does not become more brittle) is furnished. WIRING (by cable gland certified to ATEX) Standard EN 60079-1 specifies that the thread sizes (3/4 NPT, 1/2 NPT or M20) must be marked on the product or label or indicated in the installation and maintenance instructions. The cable glands must be certified in accordance with this new standard and must be appropriate for use within the ambient temperature range for which the product is certified.
ENCAPSULATION Easy to install, the enclosure with this type of protection can be adapted to many models of electrical equipment. Features - encloses in a compound the electrical parts which are likely to ignite the ambient explosive atmosphere; - prevents ignition of the ambient explosive atmosphere.	CONSTRUCTION Standard EN 60079-18 (EN 50028) defines that this type of protection must be used even in case of overvoltage or excessive current as a result of: - an internal short-circuit; - the valve with blocked core in an open circuit. A fuse is required with alternating current. The maximum surface temperature may not exceed the certified temperature class. The coil and electrical components must be enclosed in a compound (example: epoxy resin). EN 60079-18: ma for zone 0 and mb for zone 1. WIRING By cable with 3 flying leads embedded in a compound. This airtight sealing prevents the ambient explosive atmosphere from penetrating the enclosure.

	Description	Characteristics
"i"	INTRINSIC SAFETY This type of protection takes into account the minimum energy necessary to ignite an explosive atmosphere. The whole circuit is designed in such a way that this energy must never be available, neither in normal operation nor in specific faulty operating conditions. How? - By limiting peak current and no-load voltage; - By limiting thermal and electric energy storage. Unlike the other types of protection which apply to single electrical components, this one applies to the <i>whole</i> circuit. Example of an intrinsically safe circuit: What about the zones? Some components may present defects (reliability). Intrinsically safe components are classified into "ia" and "ib" groups depending on the number of defects and their location in hazardous area: "ia" (zones 0, 1 & 2): 2 defects = intrinsically safe "ib" (zones 1 & 2): 1 defect = intrinsically safe	WHAT IS EN 50020 BASED ON? (Future EN 60079-11) Explosion groups: identical to the type of protection "d", IIA-IIB-IIC. Energy storage: During circuit opening / closing, inductance or capacitance may partially release its energy in addition to the ignition power already available. A safety factor must then be applied. What about the electrical components? A distinction is made between apparatus rated intrinsically safe and their "associated components" in which the circuits may themselves be either intrinsically safe or not. DEVICES FOR ELECTRICAL SUPPLY Safety barrier It limits the available power in a circuit to specific values. The voltage is limited by Zener diodes, current by resistances (standard barriers) or by electronic systems (special barriers). It isolates the intrinsically safe circuit <i>without galvanic barriers</i>. To operate correctly, it must be connected to a reference potential = 0 (equipotential earth). This solution is preferable to interfaces (see below) which require a common earth. Galvanic barrier (interface) Other intrinsically safe apparatus <i>with galvanic barriers</i> are used for various applications: - Current-transmitters for 2-lead converters; - Transmitters; - Converters: temperature converters, electropneumatic I/P or P/I; - Amplifier relays; - Power packs with galvanic barriers. The voltage U_2 at the entrance of an interface must be lower than the barrier voltage U_1 ($U_2 < U_1$).
"e"	INCREASED SAFETY <i>Prevents</i> the occurrence of any accidental ignition source: arcs or sparks. Sparking components are excluded from this method of protection. How? - Use of high quality insulation materials; - Min. IP54 ingress protection to reduce the probability of contamination by dirt and moisture ingress; - Special enclosure with connections which cannot become loose; - Taking account of specified temperature classes; - Conformity of cable entries and labelling.	WHAT IS EN 60079-7 (EN 50019) BASED ON? Explosion group: I or II; Group II includes subdivisions IIA-IIB-IIC. Temperature class: The temperature which must be taken into account is that of the <i>hottest point of the equipment as a whole</i> and not that of the external temperature as is the case with flameproof enclosures. The temperature classification is identical to that of protection type "d". CONNECTION Securely fastened certified cable gland always supplied mounted on the product.

OBJECTIVES OF DIRECTIVE 97/23/CE

The European Union Pressure Equipment Directive is intended to protect the environment and users of industrial equipment and be applied alongside the Machinery Directive (98/37/CE), the Low Voltage Directive (73/23/EEC) and the Electromagnetic Compatibility Directive (89/336/EEC). It does not cover the operational function of the equipment.

The Directive covers equipment such as pressurised storage containers, industrial piping, safety devices and pressure accessories. It applies to the design, manufacture and conformity assessment of pressure equipment and assemblies of pressure equipment with a maximum allowable pressure greater than 0.5 bar.

Article 3 (3) covers pressure equipment and assemblies of pressure equipment below or equal to the specified pressure and/or volume or nominal size (DN) thresholds.

Classification under categories 1 and higher covers pressure equipment and assemblies of pressure equipment above the specified pressure and/or volume or nominal size (DN) thresholds. They must:

- be safe;
- meet essential requirements covering design, manufacture, inspection and testing;
- satisfy appropriate conformity assessment procedures; and
- carry the CE marking and other information.

EFFECTIVE DATE

The application of and compliance with the Directive is mandatory from **29 May 2002**.

EQUIPMENT COVERED

Any equipment or assembly intended to contain gaseous or liquid fluids at a pressure greater than 0.5 bar is covered by the Directive.

Pressure is not a significant design factor for cylinders and control valves and, consequently, they are excluded. These components are built to withstand external mechanical stress (exclusion referred to in Article 1 section 3.10 of the Directive).

CLASSIFICATION

(see glossary of terms on the following page)

For equipment above the pressure, DN and internal volume thresholds and for fluids specified in the Directive, ASCO has drawn up technical files covering the following categories.

Article 3 (3) PED

Equipment below the specified thresholds is covered by Article 3 (3) of the Directive.

It must:

- be designed and manufactured in accordance with the sound engineering practice of a Member State in order to ensure safe use;
- bear specified markings (but not the CE marking).
Solenoid and pressure-operated valves with a nominal diameter equal to or less than DN25 (1" dia.) as well as air service equipment (volume) are covered by Article 3 (3).

Categories 1 to 4

(according to ascending level of hazard for products within the scope of the Directive)

Category 1 equipment is subject to in-house conformity assessment procedures.

Category 2 to 4 equipment is subject to a conformity assessment performed by a notified body.

In order to determine which category an item of the equipment falls into, the manufacturer needs to identify:

- the type of equipment - **vessel / steam generator / piping** etc.
- the state of the intended fluid contents - **gaseous or liquid**
- the fluid group of the intended contents - **Group I or Group II**

Group I comprises those fluids classified according to the EC Directive on the classification of dangerous substances as:

- explosive
- extremely flammable
- highly flammable
- flammable (where the maximum allowable temperature is above flashpoint)
- very toxic
- toxic
- oxidising

Group II comprises all other fluids including air, neutral gases, oil, water and steam.

COMPLIANCE

None of our products need to undergo technical modifications. The conformity concerns marking aspects and documents relating to putting the equipment into service.

Conformity assessment activities

For products under Article 3 (3) PED:

- Marking of the manufacturer's name.
- Equipment designed and manufactured taking account of state-of-the-art and current practice at the time of design and manufacture.
- No CE marking is required. **Nevertheless, all solenoid valves will bear the CE marking in accordance with other directives (LVD, EMC, ATEX 94/9/EC etc.).**
- The General Instructions in 12 languages relating to putting the equipment into service takes account of the essential safety requirements of the Directive.



OPERATORS

for potentially explosive atmospheres
encapsulated enclosure with integrated cable
II 2 G/D Ex mb II T5.. T3 / Ex mD 21

Series

PV
(EM5)

FEATURES

- Explosionproof operator, intended for use in potentially explosive atmospheres according to Directive ATEX 94/9 EC
- EC type examination certificate (BAS 98 ATEX 2168 X) and IECEx certificate (IECEx SIR 06.109X) are in compliance with the International and European Standards EN-IEC 60079-0, EN-IEC 60079-18, EN-IEC 61241-0 and EN-IEC 61241-18
- Easy electrical installation by means of the moulded-in supply cable, standard length 2 meters
- A thermal fuse is fitted in the coil winding and any excessive heating due to prolonged over-voltage or a locked core will cause the thermal fuse to operate
- Ingress protection degree (IP67)
- A wide range of valves can be supplied with the operator

CONSTRUCTION

Solenoid enclosure

Core, tube, springs & plugnut

Shading coil

Nameplate

Connection

Epoxy encapsulated

Stainless Steel

Copper or Silver

Polyester

Integral 3 core tube

ELECTRICAL CHARACTERISTICS

Standard voltages:

DC (=): 24V - 48V

AC (~): 24V - 48V - 115V - 230V / 50 Hz

(Other voltages and 60 Hz on request)

SAFETY CODE

II 2 G Ex mb II T5 to T3 (gas)

II 2 D Ex mD 21 IP67 100°C to 200°C (dust)

TEMPERATURE CLASSIFICATION TABLES

The minimum allowable ambient temperature is -40°C for the operator.

Select the requested "T" classification from the temperature classification tables

(AC or DC), respecting the maximum ambient temperature and cold (20°C)

electrical holding power values.

AC (~) Solenoids

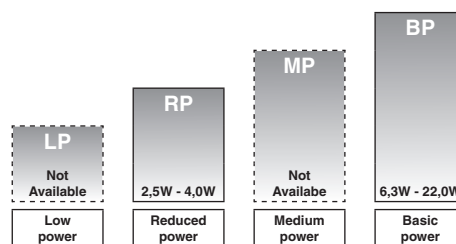
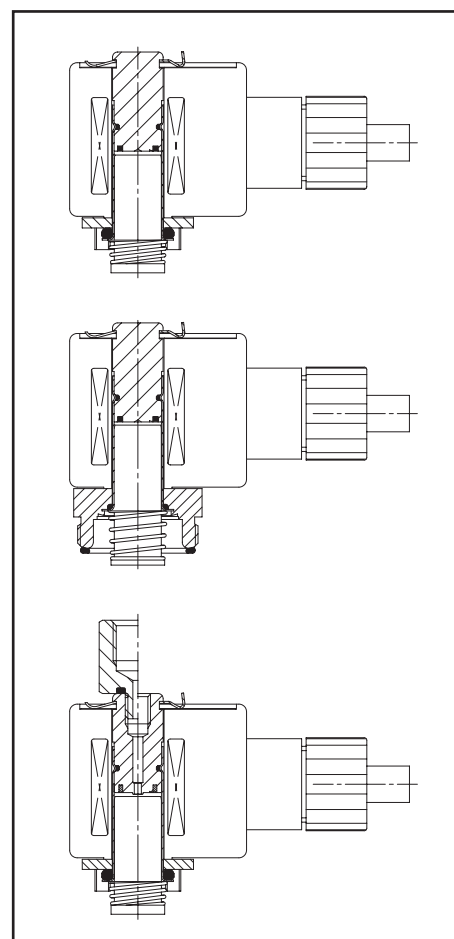
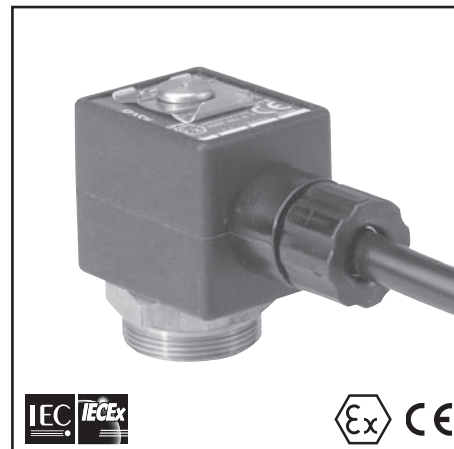
power level (watt)	insulation class	maximum ambient ⁽¹⁾ temp. "T" classification			
		T6 (G) 85°C (D)	T5 (G) 100°C (D)	T4 (G) 135°C (D)	T3 (G) 200°C (D)
Reduced power (RP)					
2,5	F	-	-	60°C	65°C
4,0	F	-	-	60°C	65°C
Basic power (BP)					
6,3	F	-	-	-	65°C
10,0	F	-	-	-	65°C

DC (=) Solenoids

power level (watt)	insulation class	maximum ambient ⁽¹⁾ temp. "T" classification			
		T6 (G) 85°C (D)	T5 (G) 100°C (D)	T4 (G) 135°C (D)	T3 (G) 200°C (D)
Reduced power (RP)					
3,0	F	-	40°C	60°C	60°C
Basic power (BP)					
6,9	F	-	-	-	40°C
15,0*	F	-	-	-	40°C
22,0*	F	-	-	-	40°C

* Only to be used if E.D. is 10% or less (Energized Duty)

⁽¹⁾ Make sure that the selected ambient temperature does not exceed the allowable valve temperature characteristics as specified on the appropriate valve catalogue sheets



POWER LEVELS - cold electrical holding values (watt)

PREFIX TABLE

prefix							description		power level			
1	2	3	4	5	6	7			LP	RP	MP	BP
P	V						Encapsulated epoxy moulded ATEX+IECEX (EN/IEC 60079 / 61241)*		-	●	-	●
						X	Other special constructions		-	●	-	●

- Available feature
- Not available
- * ATEX / IECEX solenoids are also approved according to EN 13463-1 (non electrical valves)

ORDERING EXAMPLES VALVES:

	PV	G	293A001	230V / 50 Hz
prefix				
pipe thread				
basic number				
				voltage

PRODUCT SELECTION GUIDE

(The selection can only be made in conjunction with the appropriate valve catalogue sheet)

STEP 1

Select basic valve catalogue number, including pipe thread identification letter from one of the specification tables on the separate catalogue pages.

Example: G293A001

STEP 2

Select voltage. Refer to standard voltages on page 31.

Example: 230V / 50Hz

STEP 3

Select solenoid prefix (combination). Refer to the prefix table on this page and respect the indicated power level, cold electrical holding values and "T" classification mentioned on page 31.

NOTE: Make sure that the ambient temperature does not exceed the allowable valve temperature characteristics.

Example: PV

65°C ambient

Basic Power (BP) 6,3W

II 2 G Ex mb II T3

II 2 D Ex mD 21 T200°C

STEP 4

Final catalogue / ordering number.

Example:

PV G293A001 230V / 50 Hz

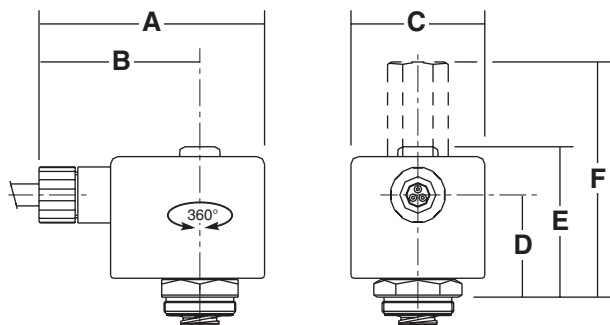
ADDITIONAL OPTIONS

- Various lead lengths from 1 meter up to 10 meters

INSTALLATION

- Multi language installation/maintenance instructions are included with each valve
- The solenoid operators can be mounted in any position without affecting operation (with the exception of manual reset versions)
- The operator can be rotated 360° to select the most favourable position for cable entry
- The solenoid shall be protected by a fuse capable of interrupting the prospective short circuit current

DIMENSIONS (mm), WEIGHT (kg)



type	A	B	C	D	E	F	weight
PV-EM5	60	45	29	21	38,5	66	0,113



OPERATORS

for potentially explosive atmospheres
encapsulated enclosure with integrated cable
II 2 G/D Ex mb II T6.. T3 / Ex mD 21

Series
PV
(EMXX)

FEATURES

- Explosionproof operator, intended for use in potentially explosive atmospheres according to Directive ATEX 94/9/EC
- EC type examination certificate (BAS 98 ATEX 2168 X) and IECEx certificate (IECEx SIR 06.109X) are in compliance with the International and European Standards EN-IEC 60079-0, EN-IEC 60079-18, EN-IEC 61241-0 and EN-IEC 61241-18
- Easy electrical installation by means of the moulded-in supply cable, standard length 2 meters
- A thermal fuse is fitted in the coil winding and any excessive heating due to prolonged over-voltage or a locked core will cause the thermal fuse to operate
- Ingress protection degree (IP67)
- A wide range of valves can be supplied with the operator

CONSTRUCTION

Solenoid enclosure

Core, tube, springs & plugnut

Shading coil

Nameplate

Connection

Epoxy encapsulated

Stainless Steel

Copper or Silver

Polyester

Integral 3 core tube

ELECTRICAL CHARACTERISTICS

Standard voltages:

DC (=): 24V - 48V

AC (~): 24V - 48V - 115V - 230V / 50 Hz

(Other voltages and 60 Hz on request)

SAFETY CODE

II 2G Ex mb II T6 to T3 (gas)

II 2D Ex mD 21 85°C to 200°C (dust)

TEMPERATURE CLASSIFICATION TABLES

The minimum allowable ambient temperature is -40°C for the operator.
Select the requested "T" classification from the temperature classification tables (AC or DC), respecting the maximum ambient temperature and cold (20°C) electrical holding power values.

AC (~) Solenoids

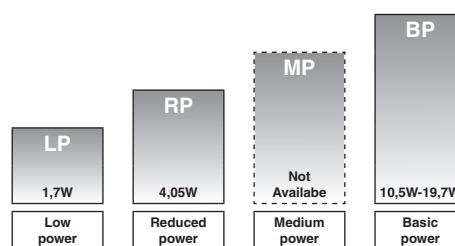
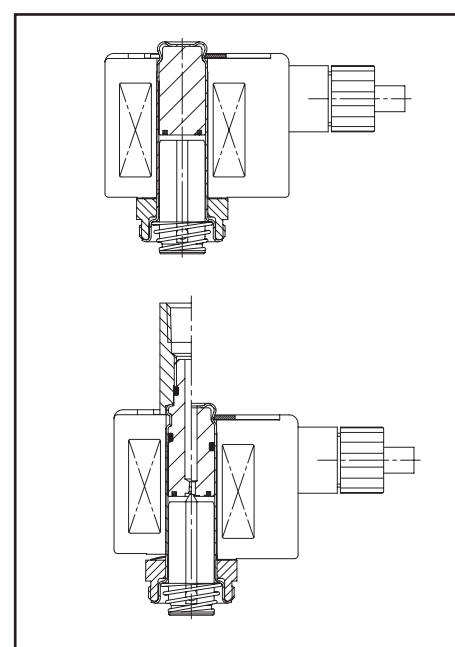
power level (watt)	insulation class	maximum ambient ⁽¹⁾ temp. "T" classification			
		T6 (G) 85°C (D)	T5 (G) 100°C (D)	T4 (G) 135°C (D)	T3 (G) 200°C (D)
Reduced power (RP)					
4,05	F	-	-	-	65°C
Basic power (BP)					
10,50	F	-	-	-	65°C

DC (=) Solenoids

power level (watt)	insulation class	maximum ambient ⁽¹⁾ temp. "T" classification			
		T6 (G) 85°C (D)	T5 (G) 100°C (D)	T4 (G) 135°C (D)	T3 (G) 200°C (D)
Low power (LP)					
1,7	F	65°C	-	-	-
Basic power (BP)					
11,2	F	-	-	65°C	70°C
19,7	F	-	-	40°C	70°C

⁽¹⁾ Make sure that the selected ambient temperature does not exceed the allowable valve temperature characteristics as specified on the appropriate valve catalogue sheets

* Only to be used if E.D. is 10% or less (Energized Duty)



POWER LEVELS - cold electrical holding values (watt)

PREFIX TABLE

prefix							description		power level			
1	2	3	4	5	6	7			LP	RP	MP	BP
P	V						Encapsulated epoxy moulded ATEX+IECEX (EN/IEC 60079 / 61241)*		●	●	-	●
						X	Other special constructions		●	●	-	●

● Available feature

- Not available

* ATEX / IECEX solenoids are also approved according to and EN 13463-1 (non electrical valves)

ORDERING EXAMPLES VALVES:

	PV	G	293A310	230V / 50 Hz
prefix				
pipe thread				
basic number				
				voltage

PRODUCT SELECTION GUIDE

(The selection can only be made in conjunction with the appropriate valve catalogue sheet)

STEP 1

Select basic valve catalogue number, including pipe thread identification letter from one of the specification tables on the separate catalogue pages.

Example: G291A310

STEP 2

Select voltage. Refer to standard voltages on page 33.

Example: 230V / 50Hz

STEP 3

Select solenoid prefix (combination). Refer to the prefix table on this page and respect the indicated power level, cold electrical holding values and "T" classification mentioned on page 33.

NOTE: Make sure that the ambient temperature does not exceed the allowable valve temperature characteristics.

Example: PV

65°C ambient

Basic Power (BP) 10,5W

II 2 G Ex mb II T3

II 2 D Ex mD 21 T200°C

STEP 4

Final catalogue / ordering number.

Example:

PV G291A310 230V / 50 Hz

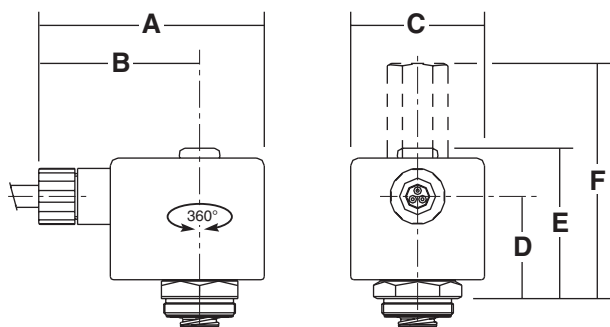
ADDITIONAL OPTIONS

- Various lead lengths from 1 meter up to 10 meters

INSTALLATION

- Multi language installation/maintenance instructions are included with each valve
- The solenoid operators can be mounted in any position without affecting operation (with the exception of manual reset versions)
- The operator can be rotated 360° to select the most favourable position for cable entry
- The solenoid shall be protected by a fuse capable of interrupting the prospective short circuit current

DIMENSIONS (mm), WEIGHT (kg)



type	A	B	C	D	E	F	weight
PV-MXX	75	53,5	44,5	33,6	49,4	77,3	0,348



OPERATORS

for potentially explosive atmospheres
increased safety/encapsulation
II 2 G/D Ex e mb II T6..T3 / Ex tD A21 IP67
steel or stainless steel enclosure

Series
EM
WSEM

FEATURES

- Explosion proof operator, intended for use in potentially explosive atmospheres, according to Directive ATEX 94/9/EC
- EC type examination certificate (KEMA 98ATEX2542 X) and IECEx certificate (KEM) is in compliance with the European Standards EN-IEC 60079, EN-IEC 60079-7, EN-IEC 60079-18, EN-IEC 61241-0 and EN-IEC 61241-1
- Easy electrical installation by means of a screw terminal coil
- Peak voltage suppression standard for DC executions
- Enclosure provided with integral strain relief for cables with an o.d. from 7 to 12 mm
- Ingress protection degree IP67
- A wide range of valves can be supplied with the operator

CONSTRUCTION

Solenoid enclosure

Zinc plated epoxy coated steel (Prefix EM) or
AISI 316 SS (Prefix WSEM)

Cable gland

PA (polyamide) , M20x1,5

Cable gland sealing

NBR (nitrile)

Core, core tube and plugnut

Stainless steel

Shading coil

Copper or silver

Nameplate

Polyester

Coil connection

Embedded screw terminals

ELECTRICAL CHARACTERISTICS SAFETY CODE

Standard voltages:

DC (=): 24V - 48V

II 2 G Ex e mb II T6..T3 (gas)

AC (~): 24V - 48V - 115V - 230V / 50 Hz

II 2 D Ex tD A21 85°C to 200°C (dust)

(Other voltages and 60 Hz on request)

TEMPERATURE CLASSIFICATION TABLES

The minimum allowable ambient temperature is -40°C for the operator.

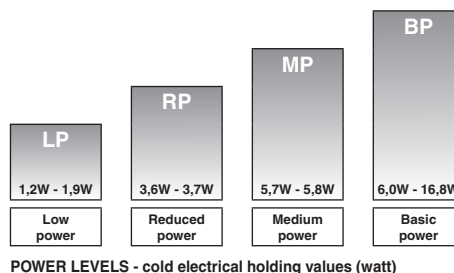
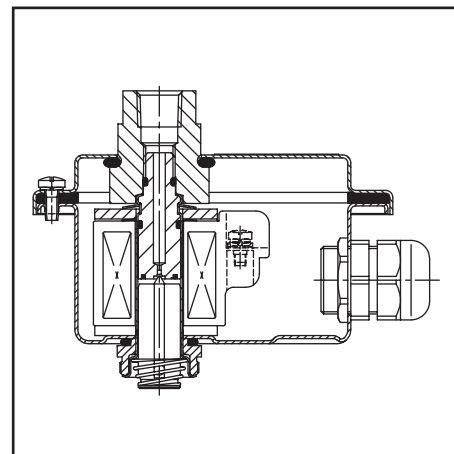
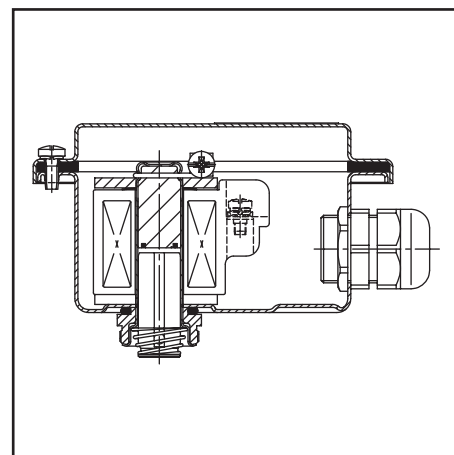
Select the requested "T" classification from the temperature classification tables (AC or DC), respecting the maximum ambient temperature and cold (20°C) electrical holding power values.

AC (~) Solenoids

power level (watt)	insulation class	maximum ambient ⁽¹⁾ temp. "T" classification			
		T6 (G) 85°C (D)	T5 (G) 100°C (D)	T4 (G) 135°C (D)	T3 (G) 200°C (D)
Low power (LP)					
1,2 ⁽²⁾	F	60°C	75°C	-	-
1,5 ⁽²⁾	F	40°C	55°C	-	-
1,9 ⁽²⁾	F	40°C	55°C	-	-
Reduced power (RP)					
3,7 ⁽²⁾	F	40°C	55°C	90°C	-
Medium power (MP)					
5,8 ⁽²⁾	F	-	40°C	75°C	90°C
Basic power (BP)					
6,0	F	-	-	-	40°C
9,0	F	-	-	-	40°C
10,0 ⁽²⁾	F	-	-	-	40°C
10,0 ⁽²⁾	F	-	-	40°C	65°C
10,5	F	-	-	-	40°C
13,0	F	-	-	-	40°C
13,6 ⁽²⁾	F	-	-	-	40°C
14,1 ⁽²⁾	F	-	-	-	40°C
16,5	F	-	-	-	40°C

DC (=) Solenoids

power level (watt)	insulation class	maximum ambient ⁽¹⁾ temp. "T" classification			
		T6 (G) 85°C (D)	T5 (G) 100°C (D)	T4 (G) 135°C (D)	T3 (G) 200°C (D)
Low power (LP)					
1,3	F	60°C	75°C	-	-
1,7	F	40°C	55°C	-	-
1,8	F	40°C	55°C	-	-
Reduced power (RP)					
3,6	F	40°C	75°C	90°C	-
Medium power (MP)					
5,7	F	-	40°C	75°C	90°C
Basic power (BP)					
9,7	F	-	-	-	40°C
10,0	F	-	-	40°C	65°C
11,2	F	-	-	-	40°C
14,0	F	-	-	-	40°C
15,3	F	-	-	-	40°C
16,8	F	-	-	-	40°C
19,7	F	-	-	-	40°C
23,0	F	-	-	-	50°C



⁽¹⁾ Make sure that the selected ambient temperature does not exceed the allowable valve temperature characteristics as specified on the appropriate valve catalogue sheets

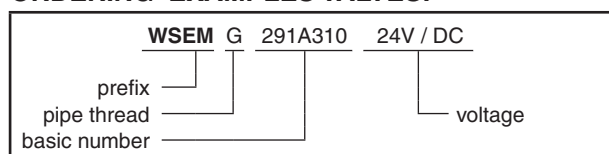
⁽²⁾ AC (~) rectified coil construction

PREFIX TABLE

prefix							description	power level			
1	2	3	4	5	6	7		LP	RP	MP	BP
E	M						Encapsulated ATEX + IECEx (EN/IEC 60079 / 61241)*	●	●	●	●
		E	T				Threaded conduit/hole (M20 x 1.5)	●	●	●	●
W	S						Waterproof IP67 - 316 SS enclosure	●	●	●	●
W	S	E	M				316 SS "EM" encl. ATEX + IECEx (EN/IEC 60079 / 61241)*	●	●	●	●
		T					Threaded conduit (1/2" NPT)	●	●	●	●
						X	Other special constructions	●	●	●	●

- Available feature
- Not available
* ATEX solenoids are also approved according to EN 13463-1 (non electrical valves)

ORDERING EXAMPLES VALVES:



PRODUCT SELECTION GUIDE

(The selection can only be made in conjunction with the appropriate valve catalogue sheet)

STEP 1

Select basic valve catalogue number, including pipe thread identification letter from one of the specification tables on the separate catalogue pages.

Example: G291A310

STEP 2

Select voltage. Refer to standard voltages on page 35.

Example: 24V / DC

STEP 3

Select solenoid prefix (combination).
Refer to the prefix table on this page
and respect the indicated power level,
cold electrical holding values and
"T" classification mentioned on page 35.

NOTE: Make sure that the ambient temperature does not exceed the allowable valve temperature characteristics.

Example: WSEM

60°C ambient

Basic Power (BP) 10,0W

Il 2 G Ex e mb II T3

II 2 D Ex tD A21 IP67 T200°C

STEP 4

Final catalogue / ordering number.

Example:

WSEM G291A310 24V / DC

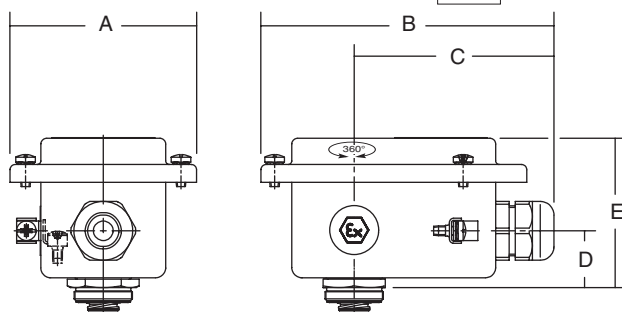
ADDITIONAL OPTIONS

- Special moulded-in solid state components for peak voltage suppression and/or AC (~) rectification
- Cable gland (cable o.d. 10 to 14 mm), TPL 16497
- Brass nickel plated cable gland
- 1/2" NPT (prefix "T") and M20x1.5 (prefix "ET") conduits (aluminium or 316 SS) available

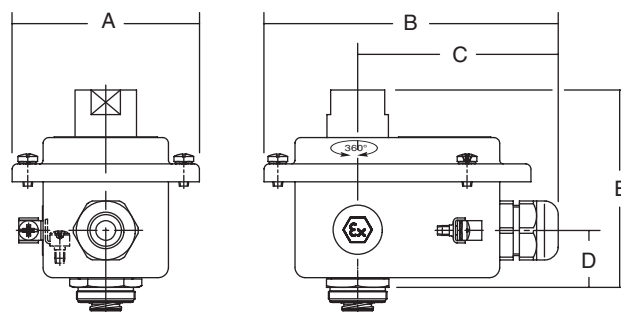
INSTALLATION

- Multi language installation/maintenance instructions are included with each valve
- The solenoid operators can be mounted in any position without affecting operation
- Refer to the nameplate for identification of the maximum cable temperature
- Internal and external earthing connection
- The operator can be rotated 360° to select the most favourable position for cable entry
- The solenoid shall be protected by a fuse capable of interrupting the prospective short circuit current

DIMENSIONS (mm), WEIGHT (kg)



series	A	B	C	D	E	weight
EM/WSEM-(M6)	77	120	82	26	64	0,48
EM/WSEM-(MXX)	77	120	82	23	62	0,55
EM/WSEM-(M12)	77	120	82	21	65	0,67



series	A	B	C	D	E	weight
EM/WSEM-(MXX)	77	120	82	23	80	0,68



OPERATORS

for potentially explosive atmospheres
non sparking protection
II 3 G/D EEx nA II T4..T3 / IP65
moulded enclosure with connector

Series

ZN

FEATURES

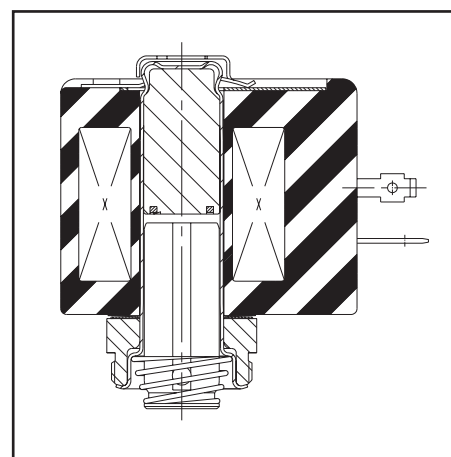
- Explosionproof operator, intended for use in potentially explosive atmospheres according to Directive ATEX 94/9/EC
- Fully compliant with the European Standard EN 50021 and EN 50281-1-1
- Easy electrical installation by means of the size 30 plug in connector with PG 9P cable gland
- A thermal fuse is fitted in the coil winding and any excessive heating due to prolonged over-voltage or a locked core will cause the thermal fuse to operate
- Ingress protection degree (IP65)
- A wide range of valves can be supplied with the operator

CONSTRUCTION

Solenoid Enclosure	Epoxy encapsulated
Core, tube, springs & plugnut	Stainless Steel
Shading coil	Copper & Silver
Nameplate	Polyester
Spade connector	ISO 4400 (cable Ø 6-8mm)

ELECTRICAL CHARACTERISTICS SAFETY CODE

Standard voltages:	II 3 G EEx nA II T4 to T3 (gas)
DC (=): 24V - 48V	II 3 D EEx nA II 135°C to 200°C (dust)
AC (~): 24V - 48V - 115V - 230V / 50 Hz	
(Other voltages and 60 Hz on request)	



TEMPERATURE CLASSIFICATION TABLES

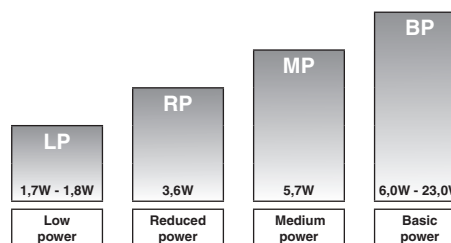
The minimum allowable ambient temperature is -20°C for the operator.
Select the requested "T" classification from the temperature classification tables (AC or DC), respecting the maximum ambient temperature and cold (20°C) electrical holding power values.

AC (~) Solenoids

power level (watt)	insulation class	maximum ambient ⁽¹⁾ temp. "T" classification			
		T6 (G) 85°C (D)	T5 (G) 100°C (D)	T4 (G) 135°C (D)	T3 (G) 200°C (D)
Low power (LP)					
-	-	-	-	-	-
Basic power (BP)					
6,0	F	-	-	-	50°C
9,0	F	-	-	-	50°C
10,5	F	-	-	-	50°C
15,4	F	-	-	-	50°C
16,7	F	-	-	-	50°C
20,0	F	-	-	-	50°C

DC (=) Solenoids

power level (watt)	insulation class	maximum ambient ⁽¹⁾ temp. "T" classification			
		T6 (G) 85°C (D)	T5 (G) 100°C (D)	T4 (G) 135°C (D)	T3 (G) 200°C (D)
Low power (LP)					
1,7	F	-	-	-	50°C
1,8	F	-	-	-	50°C
Reduced power (RP)					
3,6	F	-	-	-	50°C
Medium power (MP)					
5,7	F	-	-	-	50°C
Basic power (BP)					
9,7	F	-	-	50°C	-
10,0	F	-	-	-	50°C
11,2	F	-	-	-	50°C
14,0	F	-	-	-	50°C
15,3	F	-	-	-	50°C
16,8	F	-	-	-	50°C
19,7	F	-	-	-	50°C
23,0	F	-	-	-	50°C



POWER LEVELS - cold electrical holding values (watt)

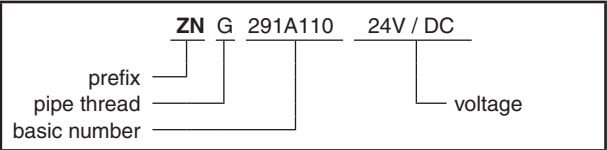
⁽¹⁾ Make sure that the selected ambient temperature does not exceed the allowable valve temperature characteristics as specified on the appropriate valve catalogue sheets

PREFIX TABLE

prefix							description	power level			
1	2	3	4	5	6	7		LP	RP	MP	BP
Z	N						Moulded enclosure ATEX (EN 50021 & 50281-1-1) *	●	●	●	●
						X	Other special constructions	●	●	●	●

- Available feature
- Not available
- * ATEX solenoids are also approved according to EN 13463-1 (non electrical valves)

ORDERING EXAMPLES VALVES:



PRODUCT SELECTION GUIDE

(The selection can only be made in conjunction with the appropriate valve catalogue sheet)

STEP 1
Select basic valve catalogue number, including pipe thread identification letter from one of the specification tables on the separate catalogue pages.
Example: G291A110

STEP 2
Select voltage. Refer to standard voltages on page 37.
Example: 24V / DC

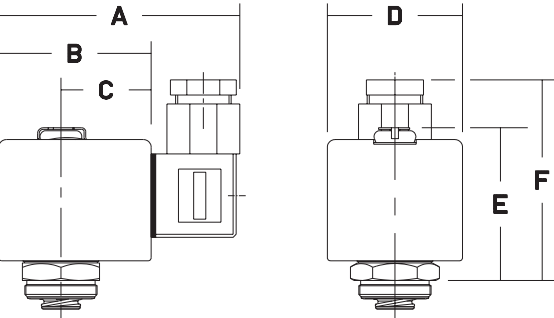
STEP 3
Select solenoid prefix (combination). Refer to the prefix table on this page and respect the indicated power level, cold electrical holding values and "T" classification mentioned on page 37.
NOTE: Make sure that the ambient temperature does not exceed the allowable valve temperature characteristics.
Example: ZN
50°C ambient
Basic Power (BP) 11,2W
II 3 G EEx nA II T3
II 3 D EEx IP65 T200°C

STEP 4
Final catalogue / ordering number.
Example:
ZN G291A110 24V / DC

INSTALLATION

- Multi language installation/maintenance instructions are included with each valve
- The solenoid operators can be mounted in any position without affecting operation
- The operator can be rotated 360° to select the most favourable position for cable entry

DIMENSIONS (mm), WEIGHT (kg)



type	prefix option	A	B	C	D	E	F	weight
NM6	ZN	75	45	27	39	45	63	0,2 kg
NMXX	ZN	80	50	30	45	49	67	0,3 kg
NM12	ZN	86	56	33	50	57	57	0,4 kg



OPERATORS

for explosive atmospheres
2 and 3 way
encapsulated moulded coils with leads

Series
EF
EV

FEATURES

- The solenoid is conforming to **ICS-6 ANSI / NEMA** standard and **UL** standards **429, 508 and 1002**
- A one-piece moulded epoxy coated solenoid with an integral 1/2" NPT conduit hub and built-in strain relief for leads
- The epoxy encapsulation serves as the enclosure and the magnetic frame is moulded into the coil
- The operator is available as both pull or push type solenoid and can be installed on normally open and normally closed valves
- The solenoid has 35 cm long leaded wires
- The solenoids include an internal non-resetable thermal fuse to limit solenoid temperature in the event that extraordinary conditions occur, which could cause excessive temperatures

CONSTRUCTION

Encapsulant	Thermosetting epoxy-resin
Core tube	Stainless steel
Core and plugnut	Stainless steel
Core spring	Stainless steel
Sealings & discs	NBR
Top disc (3 way)	PA
Disc holder	CA
Cartridge	Welded, packless AISI 430
Cartridge seat	Brass
Seat insert	CA
Shading coil	Copper
Ridering (Low Power)	PTFE
Nameplate	Stainless steel
Conduit hub	1/2" NPT zinc plated carbon steel (EF prefix) or 1/2" NPT stainless steel (EV prefix)

ELECTRICAL CHARACTERISTICS

Standard voltages:

DC (=) : 24V - 48V

AC (~) : 24V - 48V - 120V - 240V / 60 Hz

(Other voltages and 50 Hz on request)

SAFETY CODE

NEMA, types 7 and 9

TEMPERATURE CLASSIFICATION TABLES

The minimum allowable ambient temperature is -40°C for the operator.

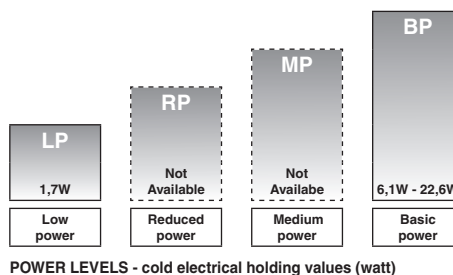
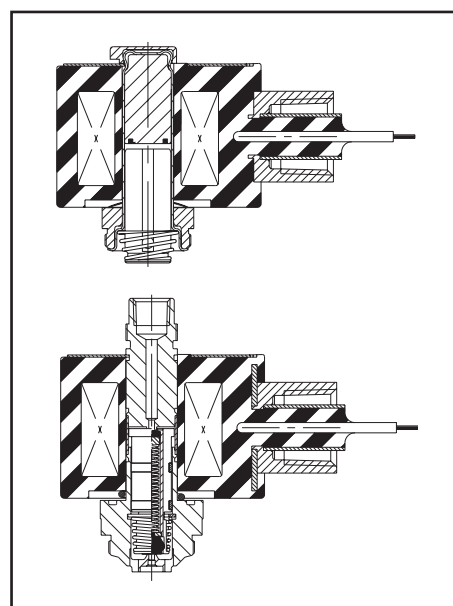
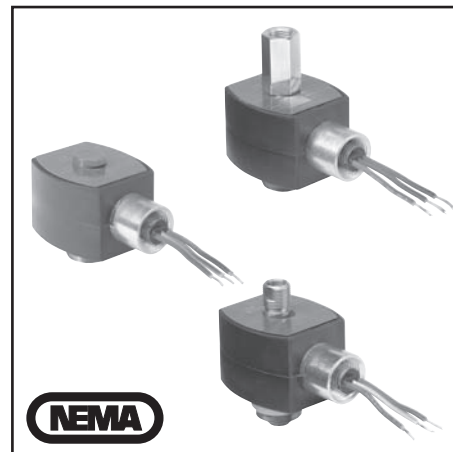
Select the requested "T" classification from the temperature classification tables (AC or DC), respecting the maximum ambient temperature and cold (20°C) electrical holding power values.

AC (~) Solenoids

power level (watt)	insulation class	maximum ambient ⁽¹⁾ temp. "T" classification			
		T6 (G) 85°C (D)	T5 (G) 100°C (D)	T4 (G) 135°C (D)	T3 (G) 200°C (D)
Low power (LP)					
-	-	-	-	-	-
Basic power (BP)					
6,1	F	-	-	-	52°C
9,1	F	-	-	-	52°C
10,1	F	-	-	-	52°C
15,1	F	-	-	-	52°C
17,1	F	-	-	-	52°C

DC (=) Solenoids

power level (watt)	insulation class	maximum ambient ⁽¹⁾ temp. "T" classification			
		T6 (G) 85°C (D)	T5 (G) 100°C (D)	T4 (G) 135°C (D)	T3 (G) 200°C (D)
Low power (LP)					
1,7	F	-	-	-	40°C
Basic power (BP)					
10,6	F	-	-	-	40°C
11,6	F	-	-	-	40°C
22,6	F	-	-	-	40°C



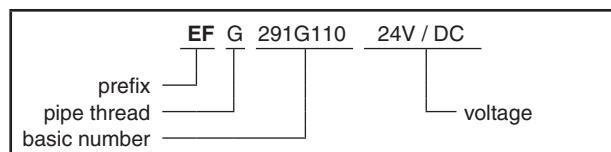
POWER LEVELS - cold electrical holding values (watt)

PREFIX TABLE

prefix							description	power level			
1	2	3	4	5	6	7		LP	RP	MP	BP
E	F						Explosionproof - NEMA 3, 4, 6, 7, 9 - Alu conduit	○	-	-	●
E	V						Explosionproof - NEMA 3, 4, 6, 7, 9 - 316 SS conduit	○	-	-	●
						X	Other special constructions	-	-	-	-

- Available feature
- Available feature in DC only
- Not available

ORDERING EXAMPLES VALVES:



PRODUCT SELECTION GUIDE

(The selection can only be made in conjunction with the appropriate valve catalogue sheet)

STEP 1

Select basic valve catalogue number, including pipe thread identification letter from one of the specification tables on the separate catalogue pages.

Example: G291G110

STEP 2

Select voltage. Refer to standard voltages on page 39.

Example: 24V / DC

STEP 3

Select solenoid prefix (combination). Refer to the prefix table on this page and respect the indicated power level, cold electrical holding values and "T" classification mentioned on page 39.

NOTE: Make sure that the ambient temperature does not exceed the allowable valve temperature characteristics.

Example: EF

40°C ambient

Basic Power (BP) 11,6W

NEMA Type 7 and 9, T3

STEP 4

Final catalogue / ordering number.

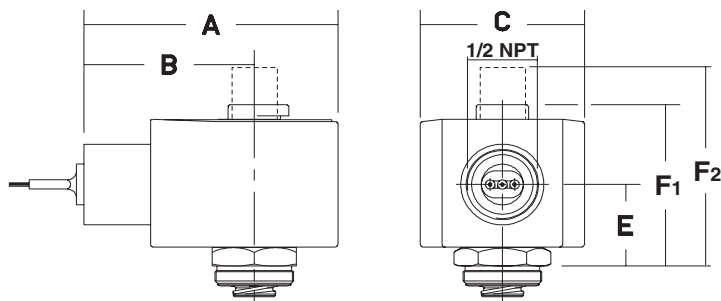
Example:

EF G291G110 24V / DC

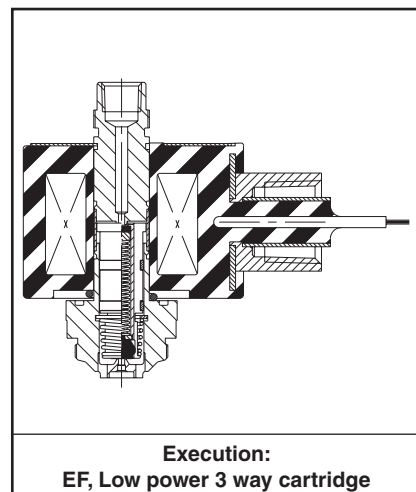
INSTALLATION

- The solenoid valves can be mounted in any position without affecting operation
- The solenoid can be rotated 360° to select the most favourable position for cable entry

DIMENSIONS (mm), WEIGHT (kg)



SECTIONAL DRAWING



type	prefix option	power level	A	B	C	E	F1 (1)	F2	weight
M6	EF / EV (M6)	basic power	70	48	43	24	46	-	0,25 kg
MXX	EF / EV (MXX)	basic power	77	52	50	26	51	-	0,35 kg
MXX	EF / EV	low power	77	52	50	26	49	66	0,35 kg

● RUBBERS:

FPM (fluoroelastomer)

Suitable for temperatures somewhat above the NBR range. Excellent resistance to many petroleum oils, gasoline, dry-cleaning fluids and jet fuels. Not good for ketones, halogenated hydrocarbons and freons.

FPM is a fluorocarbon elastomer which was primarily developed for handling hydrocarbons such as jet fuels, gasolines, solvent, etc., which normally caused detrimental swelling to NBR. FPM has a high temperature range similar to ethylene-propylene but has the advantage of being somewhat more resistant to "dry heat". FPM has a rather wide range of chemical compatibility. It has a useful temperature range of -40°C to +190°C. Viton® is an example for FPM, it is part of the family of elastomers.

(Viton® is a registered trademark of Dupont Performance Elastomers)

NBR (nitrile)

Standard compound for service in petroleum oils, air, water, mild acids, acetylene, kerosene, lime solutions, liquified petroleum gases and turpentines. Not recommended for highly aromatic gasolines or acids. NBR is commonly referred to as a nitrile rubber and is standard synthetic elastomer for accomplishing resilient-type seating or sealing. It has excellent compatibility for most air, water and light oil applications. It has a useful temperature range of -20°C to +90°C. Buna® is an example of NBR, it is part of the family of elastomers.

(Buna® is a registered trademark of DuPont de Nemours and Company or its affiliates)

Note:

Temperature limitations for elastomers are somewhat dependent on their specific functional usage in a valve. Obviously, a diaphragm which stiffens at low temperature is objectionable while an "O" ring gasket of similar material which stiffens at low temperature may still be performing its sealing function. Generally, temperatures down to -20°C can be considered tolerable and special elastomers such as silicone and low temperature NBR must be selected for use below this temperature. These elastomers can extend the lower limit to approximately minus 40°C (-40°C) depending on specific usage. The upper limit for elastomers is generally around +100°C, except FPM, EPDM and VMQ which can, on specific applications, be utilized up to +190°C. PTFE (see following page) is a commonly used gasket or disc material not considered an elastomer. This unique chemical-resistant material can be used from -270°C to +250°C with proper design limitations.

● PLASTICS:

PEEK (polyetheretherketone)

High performance thermoplastic with exceptional resistance to a wide range of chemical environments including high temperatures.

POM (polyacetal or polyoxymethylene)

Acetal resin type thermoplastics are extremely rigid but not brittle. They provide good toughness, tensile strength, stiffness and long life. They are odourless, tasteless, non-toxic and resistant to most solvents. Delrin® is an example of polyacetal, it is part of the family of plastics.

(Delrin® is a registered trademark of DuPont de Nemours and Company or its affiliates)

PTFE (polytetrafluoroethylene)

A fluorocarbon resin known to be suitable for disc material where all other synthetic materials have failed. Teflon® is not easily fabricated and is known to have objectionable "cold flow" characteristics. Teflon® is an example of PTFE, it is part of the family of plastics.

(Teflon® is a registered trademark of DuPont de Nemours and Company or its affiliates)

PTFE Reinforced

PTFE reinforced is a form of PTFE having fillers which have been added for improved mechanical properties. PTFE and TPFE with fillers are considered more of a plastic than a resilient-type material. They are virtually unattacked by any fluid. Their temperature usage ranges from discs for cryogenic valves to discs for steam valves. The "cold flow" characteristics may contribute to leakage particularly on gases. They have a useful temperature range of -270°C to +250°C. Rulon® is an example of reinforced PTFE, it is part of the family of plastics.

(Rulon® is a registered trademark of Saint Gobain Performance Plastics Corporation)

PPS (polyphenylene sulfide)

This resin has outstanding chemical resistance and no known solvents below 200°C. It has low friction, good wear resistance and high tensile strength. Rytan® is an example of PPS, it is part of the family of plastics.

(Rytan® is a registered trademark of Chevron Phillips Chemical Company)

VMQ (silicone)

Known as the only elastomer which, under certain conditions, can be utilized for both high and low temperature, which is its principal use. Also handles hydrogen peroxide and some acids. Not good for steam; poor disc life. Fluorosilicone compounds are noted to have better fuel resistance.

● METALS:

Ag (silver)

Shading coil material for stainless steel valves.

Al (aluminum)

Shading coil material for special fluids or for making washers, etc. Die cast aluminum is generally used for bodies for low pressure gas valves and can only be used with "water free" systems. It can be noted that die cast aluminum is successfully used in oil and gasoline applications.

Cu (copper)

Primarily used for shading coil.

Cu Sn (bronze)

Casting bronze is used for body forging. Good sealing and casting properties, resistant to abrasion.

Cu Zn Pb (brass)

Forging brass is used in our body forgings. Forging brass has a composition of 59% copper, 2% lead and 39% zinc.

Fe Cr Ni (stainless steel AISI 303 or 304)

One of the most widely used steels containing 18% chromium and 8% nickel. Used for valve bodies, springs and internal parts. Known as stainless steel type 303 or 304.

Fe Cr Ni Mo (stainless steel AISI 316)

Alloy containing approx 17 % chromium, 12% nickel and 2 % molybdenum. Highly corrosion resistant.

Fe Cr Ni Mo (stainless steel AISI 316L)

Alloy containing 16 to 18% chromium, 11 to 14% nickel and 2,5 to 3% molybdenum. Valve bodies made from this material provide excellent resistance to particularly aggressive fluids.

Ni Fe (nickel iron)

Core material for low temperature fluids (below -100°C) particularly for "long stroke" solenoids.

Pb (lead)

Gaskets - sometimes - lead-clad copper gaskets.

Zamak

Zinc alloy containing approx. 4% aluminium, 0,04% magnesium and 1% copper. Used, for example, for the bodies of air treatment equipment.



