

# HUMPHREY SELECTION GUIDE

Organized by Port Size

## SOLENOID

### 2-, 3-way

M3	C <sub>v</sub>	10-32	C <sub>v</sub>	1/8"	C <sub>v</sub>	1/4"	C <sub>v</sub>	3/8"	C <sub>v</sub>	1/2"	C <sub>v</sub>	3/4"	C <sub>v</sub>
H010E1	0.01	3E1	0.01	31E1	0.09	(V)062E1	0.12			(VA/VV)500(A)E1	2.16	(VA)590(A)E1	2.56
H041E1	0.08	M3E1	0.01	M31E1	0.06	T062E1	0.11			500E2	2.16	(VA)590(A)E2	2.56
H040 E1	0.08	M3E1-81-MTL	0.01	310	0.12	125E1	0.19			501E1	2.20		
		3E1-PCM	0.01	S310	0.15	T125E1	0.17			501E2	2.20		
		3E1-39-BOU	0.01	M310	0.12	(VA/VV)250(A)E	0.63						
		3E1-TSD	0.01	(VA)125(A)E1L	0.24	250E2	0.63						
		H(V)030E1	0.03	M125E1LW	0.17	320	1.00						
		H110E1	0.23	H181E1	0.57								
		H111E1	0.23										

### 4-way

M3	C <sub>v</sub>	10-32	C <sub>v</sub>	1/8"	C <sub>v</sub>	1/4"	C <sub>v</sub>	3/8"	C <sub>v</sub>	1/2"	C <sub>v</sub>	3/4"	C <sub>v</sub>
H040 4E1	0.08	401	0.05	41E1	0.03	42E1	0.43			501-4E1	1.80		
H040 4E2	0.08	M401	0.05	M41E1	0.03	M42E1	0.39			501-4E2	1.80		
		402	0.04	MC41E1	0.03	42E2	0.43						
		M402	0.04	410	0.14	062-4E1	0.07						
		H030-4E1	0.03	410-70	0.14	125-4E1	0.11						
		H110-4E1	0.23	S410	0.13	T062-4E1	0.07						
		H110-4E2	0.23	S410-70	0.13	T125-4E1	0.11						
		H113-4E2	0.21	M410	0.13	M42E2	0.39						
				M410-70	0.13	250-4E1	0.58						
				H180-4E1	0.57	250-4E2	0.88						
				H180-4E2	0.57	H240-4E1	0.88						
				H183-4E2	0.50	H243-4E2	0.83						
						S420	1.00						
						M420	1.00						

## AIR PILOTED

### 2-, 3-way

M3	C <sub>v</sub>	10-32	C <sub>v</sub>	1/8"	C <sub>v</sub>	1/4"	C <sub>v</sub>	3/8"	C <sub>v</sub>	1/2"	C <sub>v</sub>	3/4"	C <sub>v</sub>
		2P	0.09	31P	0.29	(VA/VV)250A	0.63			(VA)500A	2.20	(VA)590A	3.73
		3P	0.09	(VA)125A	0.22	250AA	0.85			500AB	2.20	590AB	3.73
				125AA	0.23	250AL	0.65			500AG	2.20	590AG	3.73
				125LA	0.15	250AH	0.50			501A	2.41		
				125AH	0.17					501AA	2.49		

### 4-way

M3	C <sub>v</sub>	10-32	C <sub>v</sub>	1/8"	C <sub>v</sub>	1/4"	C <sub>v</sub>	3/8"	C <sub>v</sub>	1/2"	C <sub>v</sub>	3/4"	C <sub>v</sub>
		4P	0.11	41P	0.29	42A	0.38			501-4A	1.89		
		4PP	0.11	41PP	0.28	42A2	0.35			501-4AA	1.89		
		110-4A	0.23	H180-4A	0.50	M42A2	0.32						
		110-4A2	0.23	H180-4A2	0.50	250-4A	0.49						
						250-4AA	0.75						

## MANUAL/MECHANICAL

### 2-, 3-way

M3	C <sub>v</sub>	10-32	C <sub>v</sub>	1/8"	C <sub>v</sub>	1/4"	C <sub>v</sub>	3/8"	C <sub>v</sub>	1/2"	C <sub>v</sub>	3/4"	C <sub>v</sub>
		2P	0.09	31P	0.29	250PL	0.83			501V	2.20	590C	3.85
		2V	0.09	31V	0.29	250P	0.84			(V)500C	2.20		
		3P	0.09	125PLG	0.22	250HO	0.83						
		3V	0.09	125P	0.22	250F	0.83						
				125HO	0.22	(V)250C	0.83						
				125B	0.23	250T	0.83						
				125MP	0.22	(V)250V	0.83						
				125MC	0.22								
				125MOC	0.22								
				125C	0.22								
				125T	0.22								
				(V)125V	0.22								

### 4-way

M3	C <sub>v</sub>	10-32	C <sub>v</sub>	1/8"	C <sub>v</sub>	1/4"	C <sub>v</sub>	3/8"	C <sub>v</sub>	1/2"	C <sub>v</sub>	3/4"	C <sub>v</sub>
		4P	0.11	41P	0.29	42P	0.39						
		4PP	0.11	41PP	0.29	42PP	0.39						
		4PPX	0.29	41PPX	0.29	M42P	0.32						
		4PP/PPX	0.29	41PP/PPX	0.29	M42PP	0.29						
		4V	0.11	41V	0.29	M42PA	0.29						
				41T	0.09	250-4F	0.75						
				41R	0.09	250-4H	0.75						

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# Humphrey General Guidelines

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## Don't take chances

Compressed air is an extremely powerful medium. Always take maximum precautions when handling any component of a compressed air system.

**Never** attempt to construct, replace, operate or service any component of a compressed air system unless you have been specifically and properly trained to do so.

**Always** disconnect the supply air and exhaust the air system before attempting to remove or service a component of that system.

Failure to heed these warnings could result in **SERIOUS, EVEN FATAL, PERSONAL INJURY.**

## Use the right valve

Humphrey valves are general purpose air valves designed for use in general industrial applications in accordance with the limitations described in this catalog for each valve. The specifications of individual products are subject to change without notice. Consult factory for specific information concerning valve/application compatibility

Each Humphrey valve is tested before it leaves our factory to assure the valve's conformance to catalog specifications.

Any use or application which deviates from the valve's specifications will void the warranty unless Humphrey has provided specific and written authorization beforehand.

## Use the right lubrication

Except where model specifications state "No lubrication required," all Humphrey valves require appropriate lubrication. Humphrey recommends a non-detergent, 20w or 30w, mineral-based petroleum oil for most of its valves.

Some lubricants may cause swelling or deterioration of the valve's seals, therefore lubricant/seal compatibility must be confirmed. Read specifications carefully. If there is any doubt, consult factory.

## Use the right air supply

The valved medium, including the lubricants and other substances it may contain, must be compatible with the materials of which the valve is constructed. Read the specifications carefully; if there is any doubt, consult factory.

Some valve models are vulnerable to contaminated or moisture-laden compressed air. To promote proper functioning and long life in such instances, appropriate air

treatment equipment should be installed. Consult your supplier of air filters, regulators, and lubricators.

## Use proper service procedures

Never attempt to service a Humphrey valve or any system component unless you have been properly trained to do so. A properly trained person will never attempt to remove or service a component of a compressed air system unless the compressed air has been disconnected and the system thoroughly exhausted.

Some Humphrey valves can be repaired in the field. Humphrey makes available factory seal repair kits (SRKs) and individual valve components for this purpose. All repaired valves should be tested for conformance to specifications before they are returned to service. Field repairing of Humphrey valves voids their warranty.

## Design a proper system

Always strive to design systems which are safe as well as efficient. Either eliminate potential hazards completely or install safety features which neutralize them.

Give special consideration to any potential for accidental actuation of a valve. Either select a model that resists accidental actuation or mount the valve to prevent unintended actuation.

Consider the adverse consequences of individual component failure and design to prevent or minimize these consequences. Design a system that will fail safe under conditions of pressure variation, pressure loss, or other system failures.

Read the component literature carefully. If a model is not completely understood, do not apply it without first consulting the factory.

Size valves properly. A model having a capacity insufficient to the system may cause the entire system to be inefficient. Always note the size of the valve orifice — this is often more important than the pipe connection.

The circuit drawings in this catalog are intended *only* as examples of circuits in which certain components might typically be used. They are not to be considered recommendations of specific applications. The proper, safe functioning of any system must be insured by the system's designer or user.

The following are registered trademarks of the companies indicated: Delrin, Zytel, E.I., duPont; Rylton, Phillips Petroleum.

Specifications subject to change without notice.

All port connections are available in metric sizes. Specify metric port threads by using letter E as a model number prefix. The bottom number in all drawing dimensions is shown in millimeters.

**HUMPHREY PRODUCTS** **MH6681 (N)**  
**KILGORE AND SPRINKLE ROADS P O BOX 2008,** **CSA LR41336**  
**KALAMAZOO MI 49003**

The following models are UL RECOGNIZED for component use.

Models 3E1, M3E1 valves; Models DMZ1, MZ1 manifolds.

Models 31E1, 41E1, M31E1, M41E1, MC41E1 valves; Models MM-2 through -7, MMC-2 through -7 manifolds.

Models 062-4E1, 062-4E2, 062E1, 062E2, VO62E1 valves, may be prefixed by T. Models TM-1R through -12R manifolds.

Models 125-4E1, 125E1, V125E1 valves, may be prefixed by T. Models TM-1R through -12R manifolds.

Model 310 may be prefixed by E, EM, ES, ESMP, EV, EVM, EVS, EVSMP, M, S, SMP, V, VM, VS, VSMP, may be suffixed by 2, 21, 39, 50, 81, 87, LL, MOV, RC, or SA, suffixed by UR.

Model 410 may be prefixed by E, EM, ES, ESMP, M, S, SMP, may be suffixed by 21, 39, 50, 70, 81, 87, LL, MOV, RC, or SA, suffixed by UR.

Models 250E1, 250E2.

The following models are UL LISTED for General use.

Model 062-4E1 with or without suffix 21, followed by 36, with or without suffixes 61 and/or 70.

Models 062E1, VO62E1 followed by 2 or 3, followed by 10 or 11, with or without suffix 20 or 21, followed by 36, with or without suffix 61.

Model 125-4E1 may be prefixed by T, with or without suffix 21, followed by 36, with or without suffix 60 or 70,

Model 125E1 may be prefixed by T, suffixed by 2 or 3, followed by 10 or 11, with or without suffix 20 or 21, followed by 36, may be followed by 60.

Model V125E1 followed by 2 or 3, followed by 10 or 11, with or without suffix 20 or 21, followed by 36, may be followed by 60.

Model V125E1 followed by 2 or 3, followed by 10 or 11, with or without suffix 20 or 21, followed by 36.

Models 250-4E1, 250-4E2 with or without suffix 21.

Model 250E1 followed by 2 or 3, followed by 10 or 11, followed by 20 or 21, followed by 36, with or without suffix 61.

Models TM-1L thru -12L manifolds.

# BASIC MODELS AND CONFIGURATIONS – H010, H040

## VALVES

### DIRECT ACTING, IN-LINE

H010 Series – 2- and 3-way

Normally Closed (N/C)



H010E1

### INDIRECT ACTING

H040 Series – 2- and 3-way

(N/C)

(N/O)



H041E1



H041E1-11

(N/C)

(N/O)



HA041E1



HA041E1-11

H040 Series – 4-way

2 position



H040-4E1



H040-4E2

Double solenoid

2 position



HA040-4E1



Double solenoid

HA040-4E2

### SUB-BASE TYPE

### MANIFOLDS

#### 2- AND 3-WAY MINIATURE MANIFOLD

H010 Series

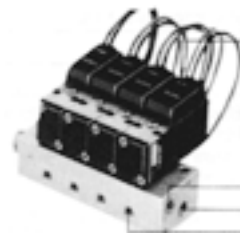
H010M□F – F type manifolds have common inlet and common exhaust ports.



H010E1

R (EXH)  
P (IN)

H010M□A – A type manifolds have all ports contained in the manifold.



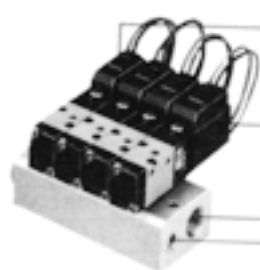
HA010E1

R (EXH)  
P (IN)  
A (OUT)

#### 2- AND 3-WAY SMALL MANIFOLD

H041 Series

H041M□F – F type manifolds have common inlet and common exhaust ports.

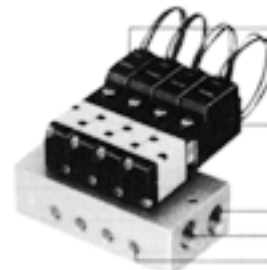


H041E1

H041E1-11

R (EXH)  
P (IN)

H041M□A – A type manifolds have inlet, exhaust, and cylinder ports in manifold.



HA041E1

HA041E1-11

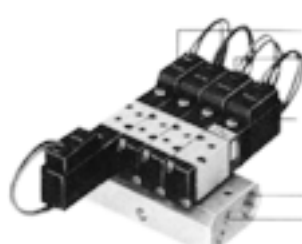
R (EXH)  
P (IN)  
A (OUT)

H041M manifolds accommodate 2- and 3-way valves.

#### 2-, 3-, AND 4-WAY SMALL MANIFOLD

H040 Series

H040M□F – F type manifolds have common inlet and common exhaust ports.



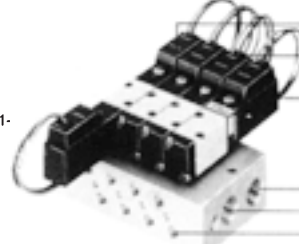
H040-4E2

H040-4E1

H040E1, H040E1-

R (EXH)  
P (IN)

H040M□A – A type manifolds have inlet, exhaust, and cylinder ports in manifold.



HA040-4E2

HA040-4E1

HA040E1, HA040E1-11

R (EXH)  
P (IN)  
A (OUT), B (OUT)

H040M series manifolds accommodate 2-, 3- and 4-way valves in any combination.

# BASIC MODEL AND VALVE FUNCTIONS

Item	Model		
	In-line and F type manifold	H010E1	HV010E1
	A type manifold	HA010E1 <sup>NOTE</sup>	HAV010E1
Number of positions	2 position		2 position
Style	2- or 3-way		2- or 3-way
Valve functions	Normally closed only		Normally open or Vacuum normally closed

NOTE: HA010E1 is for A type manifold only.

# SPECIFICATIONS

Item	Model	
	In-line and F type manifold	H010E1
	A type manifold	HA010E1
Media	Air (HV010E1 - Vacuum)	
Type of operation	Direct acting	
Effective area - in. <sup>2</sup> (cm <sup>2</sup> ) [Cv] <sup>NOTE 1</sup>	P → A 3.1 x 10 <sup>-4</sup> in. <sup>2</sup> (0.2mm <sup>2</sup> ) [0.01] In to cyl A → R 4.7 x 10 <sup>-4</sup> in. <sup>2</sup> (0.3mm <sup>2</sup> ) [0.02] Cyl to exh	
Port threads <sup>NOTE 2</sup>	M3x0.5	
Lubrication	Not required	
Pressure range psi (kgf/cm <sup>2</sup> )	0 ~ 100 psi (0 ~ 7) <sup>NOTE 4</sup>	
Proof pressure psi (kgf/cm <sup>2</sup> )	150 (10.5)	
Response time <sup>NOTE 3</sup>	DC5V, DC12V	Below 4/8
ON/OFF ms	DC6V, DC24V	Below 4/8
Maximum cycles/second	5	
Ambient range of operating temperature °F (°C)	40 ~ 120 (5 ~ 50)	
Shock resistance G	140 (60 in direction of stem)	
Mounting direction	Unrestricted	

NOTE 1: Please refer to Effective Area chart on page 9 for details.

NOTE 2: Please refer to Port Dimensions chart on page 9.

NOTE 3: Value with air pressure at 70 psi (5 kgf/cm<sup>2</sup>).

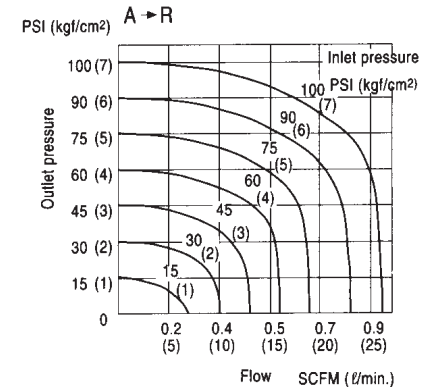
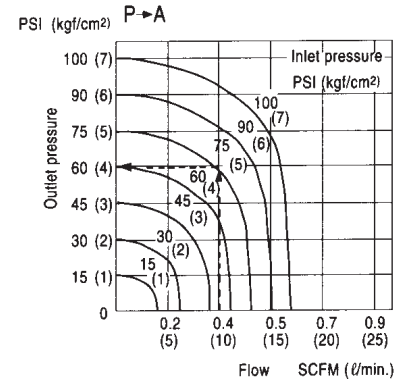
NOTE 4: H(A)V010E1 Max. vacuum is 28" HG.

# ELECTRICAL SPECIFICATIONS CHART

Item	Voltage			
	5 VDC	6 VDC	12 VDC	24 VDC
Method	Flywheel diode incorporated for transient suppression			
Voltage range (% of rated voltage)	4.5 ~ 5.5 (± 10%)	5.4 ~ 6.6 (± 10%)	10.8 ~ 13.2 (± 10%)	21.6 ~ 26.4 (± 10%)
Current mA	Standard	325 (1.6W)	270 (1.6W)	130 (1.6W)
	With LED	335 (1.7W)	280 (1.7W)	140 (1.7W)
Maximum allowable current leakage mA	30	25	15	5
Heat rise °F (°C)	95° (35°) {Add 10% to rated voltage at ambient temperatures of 122° (50°)}			
Insulation resistance MΩ	Over 100			
Connector and lead wire length	Standard	Grommet type 12 in. (300mm)		
	Option	Plug connector type 12 in. (300mm)		
Lead wire colors	Green (+) Black (-)	Blue (+) Black (-)	Brown (+) Black (-)	Red (+) Black (-)
LED indicator	Red			
Surge suppression	Flywheel diode			

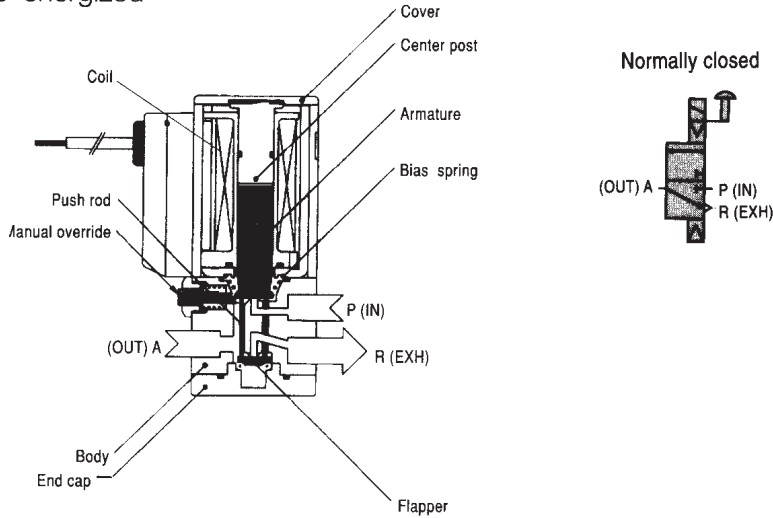
# HOW TO READ THE GRAPH

If input pressure is 70 psi and flow is 0.4 cfm, value output pressure is 57 psi.



# H010E1

De-energized



## EFFECTIVE AREA [Cv] in.<sup>2</sup> (mm<sup>2</sup>)

Model	Standard valve	Notes
H(V)010E1	P → A $3.1 \times 10^{-4}$ in. <sup>2</sup> (0.2 cm <sup>2</sup> ) [0.01] A → R $4.7 \times 10^{-4}$ in. <sup>2</sup> (0.3 cm <sup>2</sup> ) [0.01]	Use F type manifold
H(V)A010E1	P → A $3.1 \times 10^{-4}$ in. <sup>2</sup> (0.2 cm <sup>2</sup> ) [0.01] A → R $4.7 \times 10^{-4}$ in. <sup>2</sup> (0.3 cm <sup>2</sup> ) [0.01]	Use A type manifold

## VALVE WEIGHTS oz. (gf)

Model	Weight per unit
H(V)010E1	0.63 (18)
H(V)A010E1	0.63 (18)

## MANIFOLD WEIGHTS oz. (gf)

Type	Weight calculation of each station (n = station)	Block off plate
H010M□F	{2.33 (6.6) x n} + 3.17 (9)	0.07 (2)
H010M□A	{2.33 (6.6) x n} + 3.17 (9)	0.07 (2)

## MATERIALS OF MAIN PARTS

	Part	Material
Valve	Body	Aluminum
	Flapper	Buna
	Armature	Electro magnetic stainless steel
	Center post	
	Mounting base	Steel (zinc plated)
Manifold	Manifold	Aluminum
	Block off plate	Steel (nickel plated)
	Gasket	Buna

## PORT DIMENSIONS

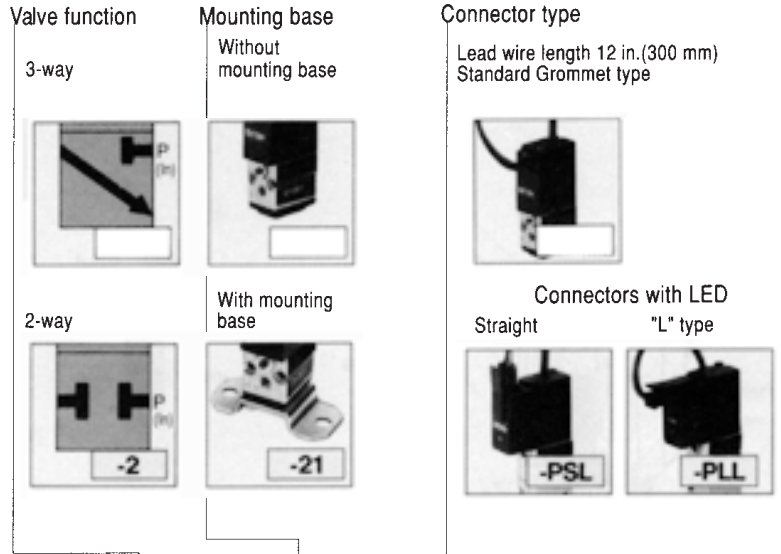
Model	Ports	Type	Port dimension
H(V)010E1	P, A, R	Female	M3x0.5

No sub-base plumbing.

## MANIFOLD CONNECTION PORT DIMENSIONS

Manifold model	Port	Component	Dimensions
H010M□F	P	Manifold	10-32 UNF
	A	Valve	M3x0.5
	R	Manifold	10-32 UNF
H010M□A	P	Manifold	10-32 UNF
	A		M3x0.5
	R		10-32 UNF

# H010 NOMENCLATURE



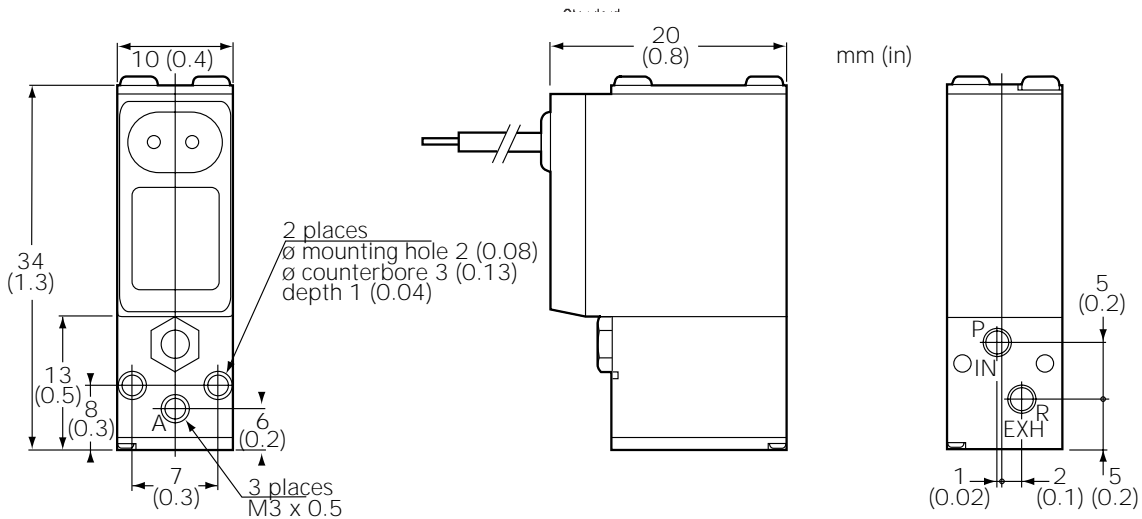
# SOLENOID

	Model				Voltage
Use with "F" type manifold, 2- and 3-way	<b>H(V)010E1</b>	<b>-2</b>	<b>-21</b>	<b>-PSL</b> <b>-PLL</b>	<b>5 VDC 12 VDC</b> <b>6 VDC 24 VDC</b>
Use with "A" type manifold, 2- and 3-way	<b>HA(V)010E1</b> NOTE 1	<b>-2</b>			

NOTE 1: Not to be used as stand-alone valve.

# VALVE DIMENSIONS

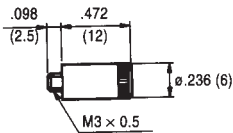
H(V)010E1



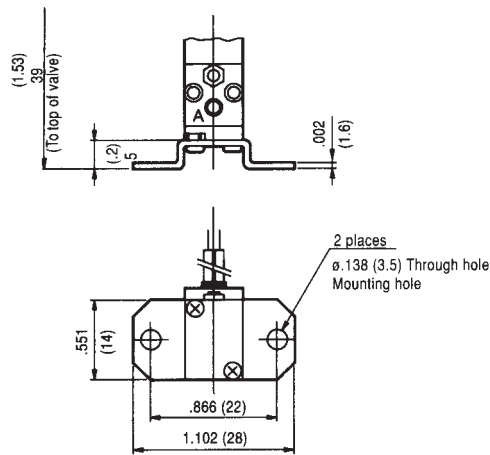
Dimensions in inches (millimeters)

## OPTIONS

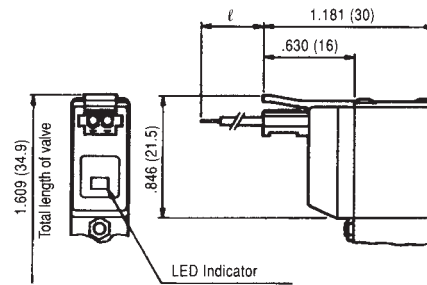
Model HKM-03 muffler sold separately.



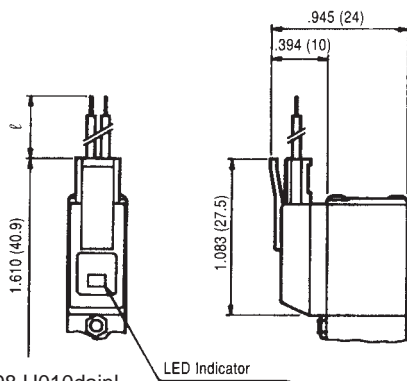
Mounting base



With "L" type connector – PLL



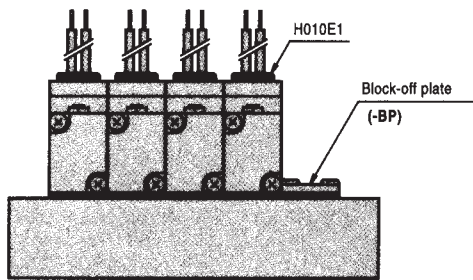
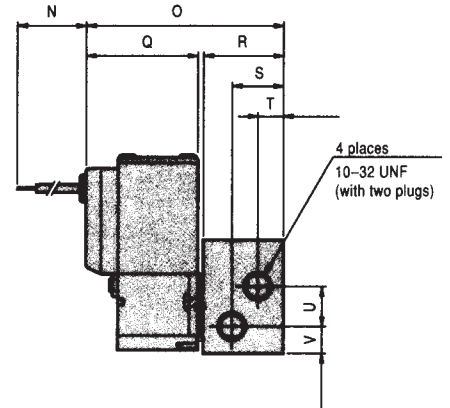
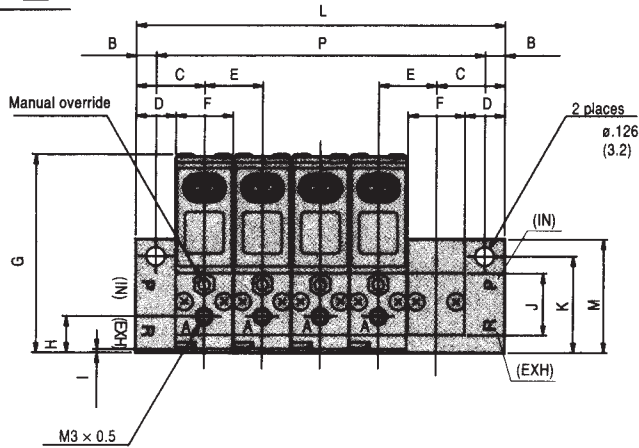
With straight connector – PSL



Type	Code	Lead wire length in. (mm)
- PSL, PLL (std.)		12 (300)
Made to order	ℓ1	36 (1000)
	ℓ2	72 (2000)
	ℓ3	108 (3000)

# MANIFOLD DIMENSIONS

H010M□F



## "F" TYPE MANIFOLD DIMENSIONS BY UNIT in. (mm)

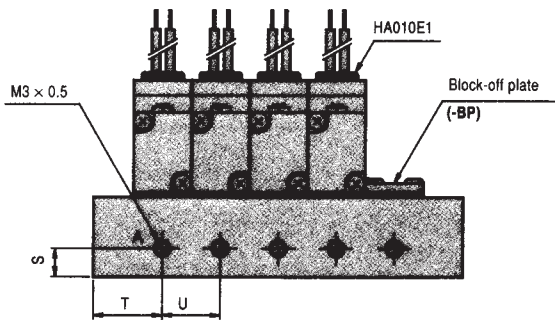
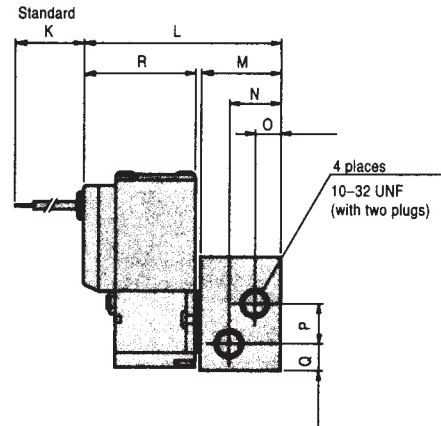
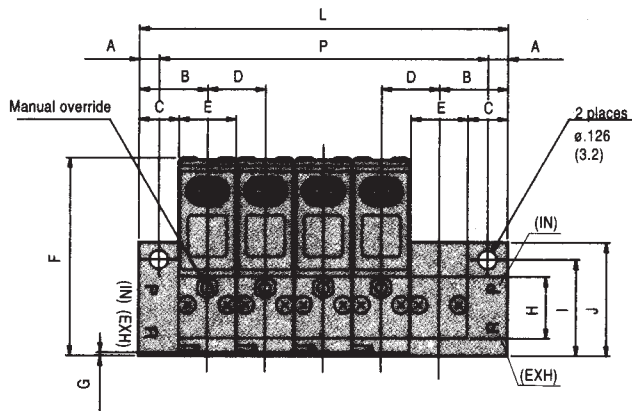
Model	L	P	Model	L	P
H010M2F	1.346 (34.2)	1.071 (27.2)	H010M12F	5.362 (136.2)	5.087 (129.2)
H010M3F	1.748 (44.4)	1.472 (37.4)	H010M13F	5.764 (146.4)	5.488 (139.4)
H010M4F	2.150 (54.6)	1.874 (47.6)	H010M14F	6.165 (156.6)	5.890 (149.6)
H010M5F	2.709 (68.8)	2.276 (57.8)	H010M15F	6.567 (166.8)	6.291 (159.8)
H010M6F	2.953 (75)	2.677 (68)	H010M16F	6.968 (177)	6.693 (170)
H010M7F	3.354 (85.2)	3.079 (78.2)	H010M17F	7.370 (187.2)	7.094 (180.2)
H010M8F	3.756 (95.4)	3.480 (88.4)	H010M18F	7.764 (197.2)	7.496 (190.4)
H010M9F	4.157 (105.6)	3.882 (98.6)	H010M19F	8.173 (207.6)	7.898 (200.6)
H010M10F	4.559 (115.8)	4.283 (108.8)	H010M20F	8.575 (217.8)	8.299 (210.8)
H010M11F	4.961 (126)	4.685 (119)	-	-	-

## DRAWING DIMENSIONS in. (mm)

B	C	D	E	F	G	H	I	J	K	M	N	O	Q
0.138 (3.5)	0.472 (12)	0.276 (7)	0.402 (10.2)	0.394 (10)	1.374 (34.9)	0.252 (6.4)	0.024 (0.6)	0.433 (11)	0.669 (17)	0.787 (20)	12 (300)	1.362 (34.6)	0.772 (19.6)

R	S	T	U	V
0.551 (14)	0.354 (9)	0.177 (4.5)	0.280 (7.1)	0.185 (4.7)

# H010M□A



## “A” TYPE MANIFOLD DIMENSIONS BY UNIT in. (mm)

Model	L	P	Model	L	P
H010M2A	1.346 (34.2)	1.071 (27.2)	H010M12A	5.362 (136.2)	5.087 (129.2)
H010M3A	1.748 (44.4)	1.472 (37.4)	H010M13A	5.764 (146.4)	5.488 (139.4)
H010M4A	2.150 (54.6)	1.874 (47.6)	H010M14A	6.165 (156.6)	5.890 (149.6)
H010M5A	2.709 (68.8)	2.276 (57.8)	H010M15A	6.567 (166.8)	6.291 (159.8)
H010M6A	2.953 (75)	2.677 (68)	H010M16A	6.968 (177)	6.693 (170)
H010M7A	3.354 (85.2)	3.079 (78.2)	H010M17A	7.370 (187.2)	7.094 (180.2)
H010M8A	3.756 (95.4)	3.480 (88.4)	H010M18A	7.764 (197.2)	7.496 (190.4)
H010M9A	4.157 (105.6)	3.882 (98.6)	H010M19A	8.173 (207.6)	7.898 (200.6)
H010M10A	4.559 (115.8)	4.283 (108.8)	H010M20A	8.575 (217.8)	8.299 (210.8)
H010M11A	4.961 (126)	4.685 (119)	-	-	-

## DRAWING DIMENSIONS in. (mm)

A	B	C	D	E	F	G	H	I	J	K	L	M	N
0.138 (3.5)	0.472 (12)	0.276 (7)	0.402 (10.2)	0.394 (10)	1.374 (34.9)	0.024 (0.6)	0.433 (11)	0.669 (17)	0.787 (20)	12 (300)	1.362 (34.6)	0.551 (14)	0.354 (9)

O	P	Q	R	S	T	U
0.177 (4.5)	0.280 (7.1)	0.185 (4.7)	0.772 (19.6)	0.197 (5)	0.472 (12)	0.402 (10.2)

# LIST OF SPECIFICATIONS MICRO SOLENOID VALVES SERIES H040

## BASIC MODELS AND VALVE FUNCTIONS

Item	Model			
	In-line and F type manifold	H041E1 H040E1	H040-4E1	H040-4E2
	Sub-base and A type manifold	HA041E1 HA040E1 <sup>NOTE</sup>	HA040-4E1	HA040-4E2
Number of positions	2 positions			
Number of ports	2- and 3-way		4-way	
Valve functions	N/C standard N/O optional		Single solenoid	Double solenoid

NOTE: See pages 11 and 12 for option specifications and order code. H040E1 and HA040E1 are the 2- and 3-way valves to be mounted on the 2, 3 and 5 port combination manifolds only. They cannot be used in-line. If the 2- and 3-way valve is used, use H041E1 and HA041E1 with sub-base.

## SPECIFICATIONS

Item	Model			
	In-line and F type manifold	H041E1 (H040E1)	H040-4E1	H040-4E2
	Sub-base and A type manifold	HA041E1 (HA040E1)	HA040-4E1	HA040-4E2
Media	Air			
Type of operation	Indirect acting			
Effective area in. <sup>2</sup> (mm <sup>2</sup> ) [Cv] <sup>NOTE 1</sup>	.002 (1.5) [0.08]			
Port threads <sup>NOTE 2</sup>	M3x0.5			
Lubrication	Not required			
Pressure range psi (kgf/cm <sup>2</sup> )	28.5 ~ 100 psi (2 ~ 7)			
Proof pressure psi (kgf/cm <sup>2</sup> )	150 (10.5)			
Response time <sup>NOTE 3</sup> ON/OFF ms	DC5V, DC12V DC6V, DC24V	Below 12/15		12
Maximum cycles/second	5			
Ambient range of operating temperature °F (°C)	41 ~ 122 (5 ~ 50)			
Shock resistance G	140 (60 in direction of stem)			
Mounting direction	Unrestricted			

NOTE 1: Please refer to Effective Area chart on page 15 for details.

NOTE 2: Please refer to Port Dimensions chart on page 15.

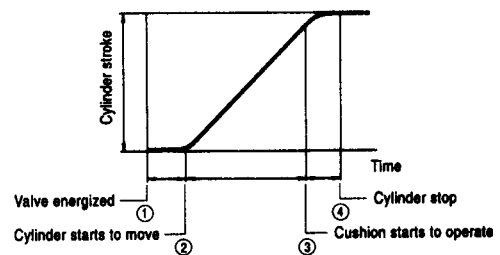
NOTE 3: Value with air pressure at 70 psi (5 kgf/cm<sup>2</sup>). Value of H040-4E2 is with pressure opposite the coil energized.

## ELECTRICAL SPECIFICATIONS CHART

Item	Voltage			
	5 VDC	6 VDC	12 VDC	24 VDC
Type	Flywheel diode incorporated for surge suppression			
Voltage range VDC	4.5 ~ 5.5 (5 ± 10%)	5.4 ~ 6.6 (6 ± 10%)	10.8 ~ 13.2 (12 ± 10%)	21.6 ~ 26.4 (24 ± 10%)
Current mA	Standard 120 (0.6W)	105 (0.6W)	55 (0.7W)	28 (0.7W)
	With LED 130 (0.65W)	115 (0.7W)	65 (0.8W)	40 (1.0W)
Maximum allowable current leakage mA	10	7	5	2
Heat rise °F (°C)	68° (20°)			
Insulation resistance MΩ	Over 100			
Connector and lead wire length	Standard	Grommet type 12 in. (300mm)		
	Option	Plug connector type 12 in. (300mm) <sup>NOTE 4</sup>		
Lead wire colors	Green (+) Black (-)	Blue (+) Black (-)	Brown (+) Black (-)	Red (+) Black (-)
LED indicator	Red			
Surge suppression	Flywheel diode			

NOTE 4: Please refer to page 12 for made-to-order information.

## HOW TO FIGURE STROKE TIME (CYLINDER SPEED)



- To obtain stroke speed, add t1 to t2. t1 is the lag time of coil energizing point 1 to when the cylinder begins to move point 2. t2 is the maximum speed zone of cylinder moving to its fullest position at point 3.
- If a cushion is incorporated, add t3 to the sum of t1 and t2. Point 3 now becomes the point where the cushion begins to take effect. Point 4 is the end of stroke when cushion is incorporated.

## MEASUREMENT CONDITIONS

### H040-4E1

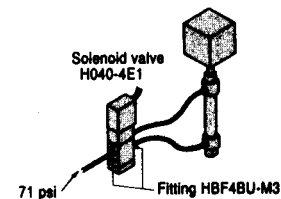
Air pressure: 71 psi (5 kgf/cm<sup>2</sup>)

Tubing I.D. and length: ø .098 in. (2.5mm) x 39.370 in. (1000mm)

Fitting: HB4BU-M3

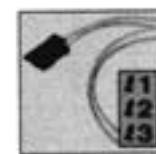
$$\text{Load ratio} = \frac{\text{Load}}{\text{Cylinder theoretical thrust}} (\%)$$

Examples for ø 3/8 in. nominal (ø 10mm actual) bore, ø 5/8 in. nominal (ø 16mm actual) bore, the stroke is 2.362 in. (60mm).  
For ø 3/4 in. nominal (ø 20mm actual), ø 1 1/4 in. nominal (ø 32mm actual) bore, the stroke is 3.397 in. (100mm).



## MADE TO ORDER

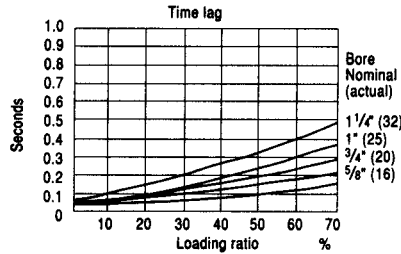
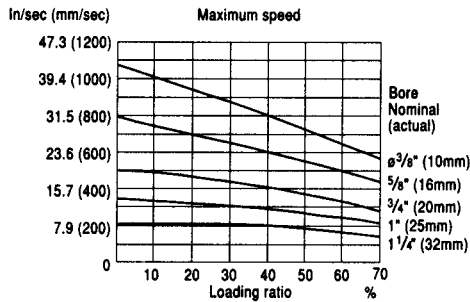
Plug model number



For plug connector only.  
Length in. (mm) t1=36 (1000)  
t2=72 (2000)  
t3=108 (3000)

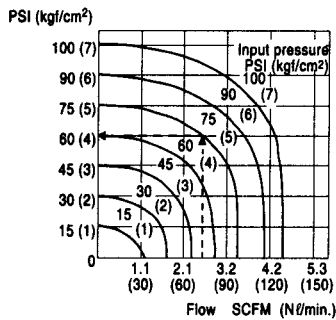
## CYLINDER SPEED

### H040 Series



## AIR FLOW

### H041 - H040 Series



## EFFECTIVE AREA [Cv] in.<sup>2</sup> (mm<sup>2</sup>)

Model	Standard	Notes
H041E1 (H040E1) H040-4E1 H040-4E2	.002 (1.5) [.08]	When HT53-M3M fittings are used in P, A and B ports, valves become .001 (.75) [.001 (.04)]. When HT53-M3M fittings are used in the A and B ports of "F" type manifold, valves become .001 (.80), [.001 (.05)].
HA041E1 (HA040E1) HA040-4E1 HA040-4E2	.002 (1.5) [.08]	When HT54-M5M fittings are in the P, A, and B ports of "A" type manifold, valves become .002 (1.30), [.001 (.07)].

## VALVE PORT DIMENSIONS

Model	Port	Type	Dimensions
H041E1 (H040E1) <small>NOTE</small>	P, A, R	Female thread	M3x0.5
H040-4E1 H040-4E2	P, A, B, R	Female thread	M3x0.5
HA041E1-25 HA040-4E1-25 HA040-4E2-25	P	Female thread	10-32 UNF
	A, B		
	R		
	PR		

NOTE: H040-4E1 is to be used on manifolds only. Use H041E1 for in-line service.

## MANIFOLD CONNECTION PORT DIMENSIONS

Manifold model	Port	Component	Dimensions
H041M□F H040M□F	P	Manifold	10-32 UNF
	A, B	Valve	M3x0.5
	R	Manifold	1/8 NPT
H041M□A H040M□A	P	Manifold	1/8 NPT
	A, B		
	R		
	PR		

## VALVE WEIGHTS oz. (gf)

Model	Weight per unit
H041E1	0.81 (23)
H040E1	0.88 (25)
H040-4E1	0.88 (25)
H040-4E2	1.48 (42)
HA041E1	0.85 (24)*
HA040E1	0.88 (25)
HA040-4E1	0.88 (25)**
HA040-4E2	1.48 (42)**

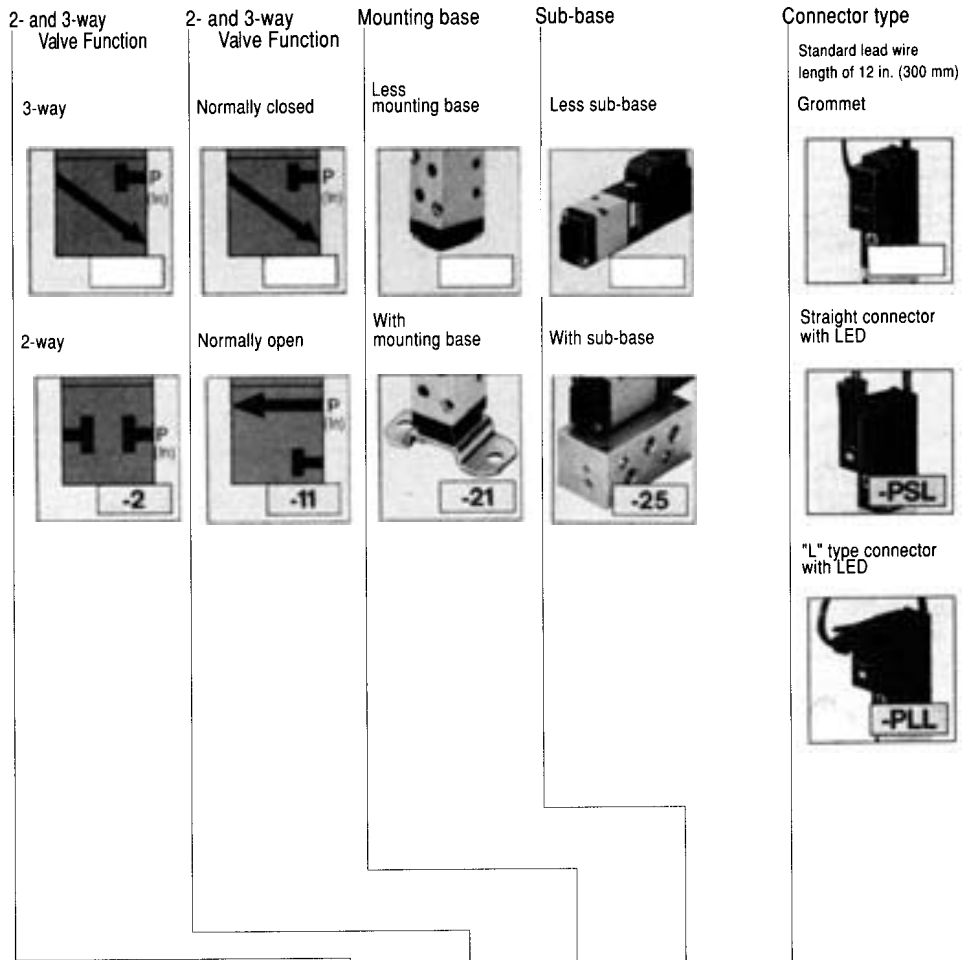
\* Add .60 oz. (13 gf) for sub-base weight, code 25.

\*\* Add .81 oz. (23 gf) for sub-base weight, code 25.

## MANIFOLD WEIGHT oz. (gf)

Type	Weight calculation of each station (n = number of stations)	Block-off plate
H041M□F	{0.36 (10.1) x n} + 0.53 (14.9)	0.07 (2)
H041M□A	{0.43 (12.3) x n} + 0.67 (19)	0.11 (3)
H040M□F	{0.31 (8.8) x n} + 0.52 (14.8)	0.11 (3)
H040M□A	{0.63 (17.8) x n} + 1.35 (38.2)	0.14 (4)

# H040 SERIES ORDERING NOMENCLATURE



		Model				Voltage	
In-line Valve	2- and 3-way	H041E1	-2	-11	-21	-PSL -PLL	5 VDC 6 VDC 12 VDC 24 VDC
	4-way Single solenoid	H040-4E1					
	4-way Double solenoid	H040-4E2					
		HA040-E1					
Sub-base Mounted	2- and 3-way	HA041E1	-2	-11	-25	-PSL -PLL	5 VDC 6 VDC 12 VDC 24 VDC
	4-way Single solenoid	HA040-4E1					
	4-way Double solenoid	HA040-4E2	-2	-11			
* 2-, 3-, and 4-way manifolds for using 3- and 4-way valves		H040M□ F 2- and 3-way				-PSL -PLL	5 VDC, 6 VDC, 12 VDC, 24 VDC
		H040M□ A 2- and 3-way					

\* NOTE: This series cannot be used without manifold.

## OPTIONAL PARTS (AVAILABLE SEPARATELY)

Mufflers

Block-off plates



For in-line valves.

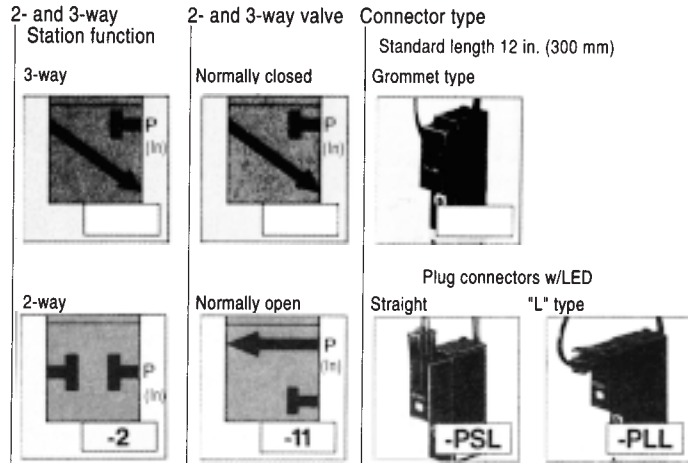
For sub-base.



H040 M □ F -BP

F- For "F" type manifold.  
A- For "A" type manifold.

# H040 SERIES MANIFOLD NOMENCLATURE



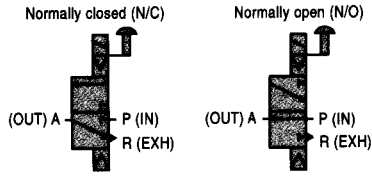
	Manifold model	Station	Valve					Voltage		
Manifold 2- and 3-way only	H041M	2 20	F	stn. <input type="checkbox"/>	-H041E1	-2	-11	-PSL -PLL	5 VDC 6 VDC 12 VDC 24 VDC	
			A	stn. <input type="checkbox"/>	-HA041E1	-2	-11			
		H040M	2 20	F	stn. <input type="checkbox"/>	-H040E1	-2	-11		-PSL -PLL
				A	stn. <input type="checkbox"/>	-HA040E1	-2	-11		
Manifold For 2-, 3- and 5-way valves	H040M	2 20	F	stn. <input type="checkbox"/>	-H040E1	-2	-11	-PSL -PLL		
				stn. <input type="checkbox"/>	-H040-4E1					
				stn. <input type="checkbox"/>	-H040-4E2					
		A	stn. <input type="checkbox"/>	-HA040E1	-2	-11	-PSL -PLL			
			stn. <input type="checkbox"/>	-HA040-4E1						
			stn. <input type="checkbox"/>	-HA040-4E2						

Valve mounted from left to right with cylinder ports front.

Specify valve model on each station.  
Use "BP" for stations without valves to be mounted.

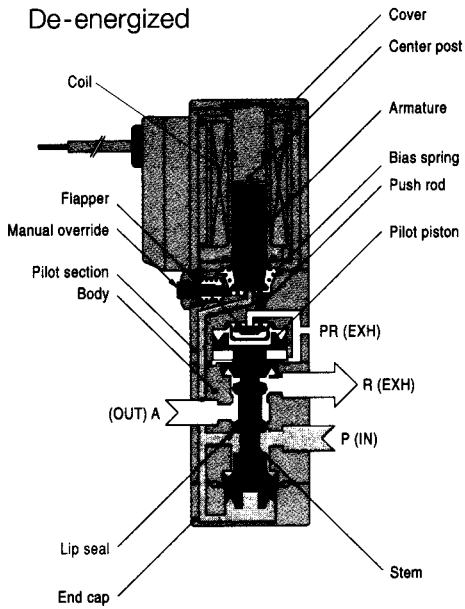
### 3 WAYS

#### H041E1



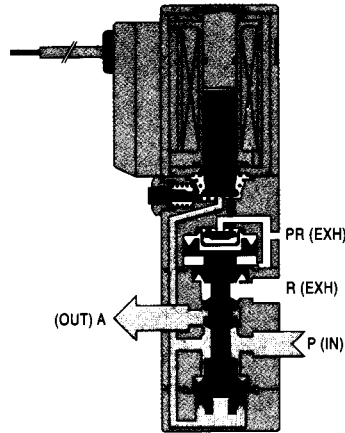
#### H041E1

De-energized



#### H041E1-11

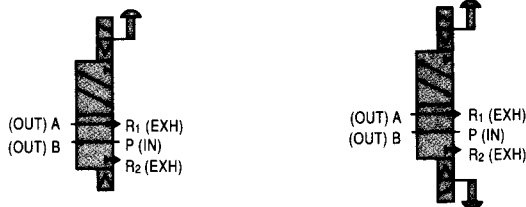
De-energized



### MATERIALS OF MAIN PARTS

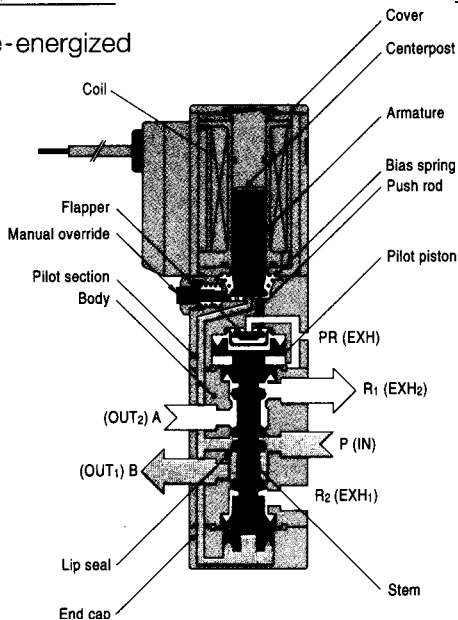
Part		Material
Valve	Body	Aluminum
	Stem	
	Lip seal	Buna N
	Flapper	
	Mounting base	
	Sub-base	Zinc plated steel
	Armature	Electro magnetic Stainless steel
Center post		
Manifold	Body	Aluminum
	Block-off plate	Nickel plated steel
	Seal	Buna N

### 4 WAYS

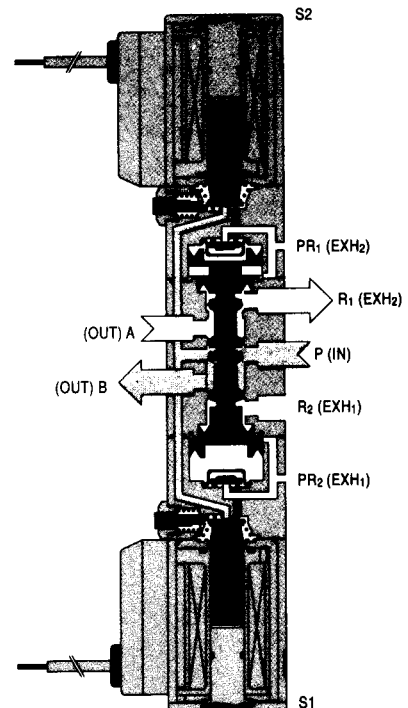


#### H040-4E1

De-energized

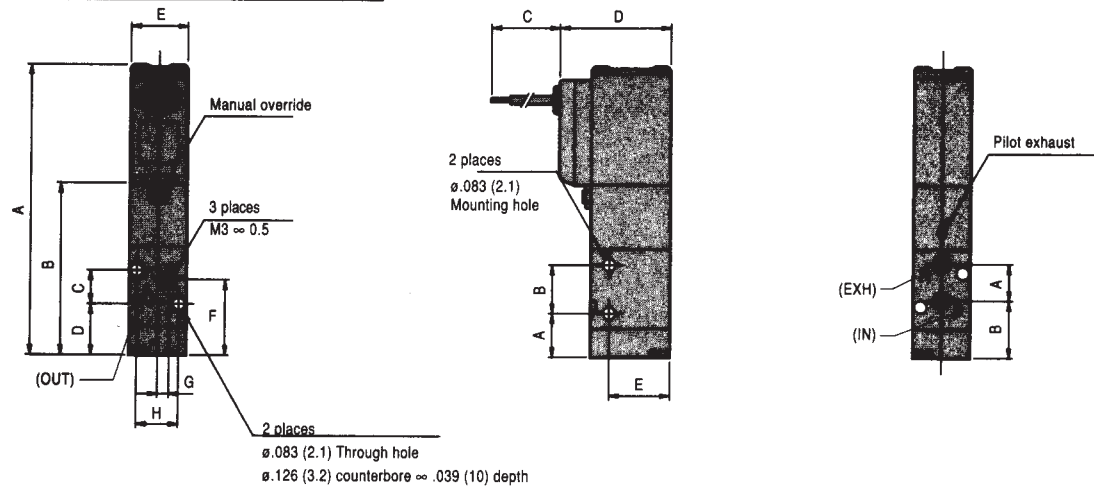


#### H040-4E2



2- AND 3-WAY VALVE SERIES – in. (mm)

H041E1



DIMENSIONS – in. (mm)

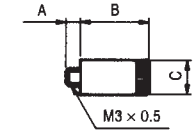
A	B	C	D	E	F
2.012 (51.1)	1.189 (30.2)	0.232 (5.9)	0.354 (9)	0.394 (10)	0.534 (13.3)

A	B	C	D	E
0.303 (7.7)	0.335 (8.5)	12 (300)	0.772 (19.6)	0.423 (10.75)

A	B
0.251 (6.4)	0.398 (10.1)

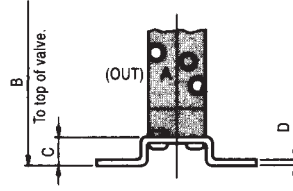
# OPTIONS

Muffler: Sold separately.  
Order number HKM-03.



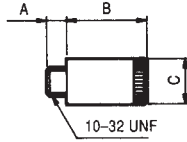
A	B	C
0.098 (2.5)	0.472 (12)	0.236 (6)

Mounting base: Code 21

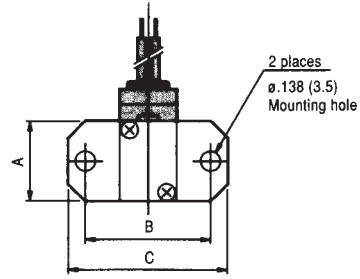


B	C	D
2.197 (55.8)	0.197 (5)	0.063 (1.6)

For sub-base use. Sold separately.  
Order number HKM-05.

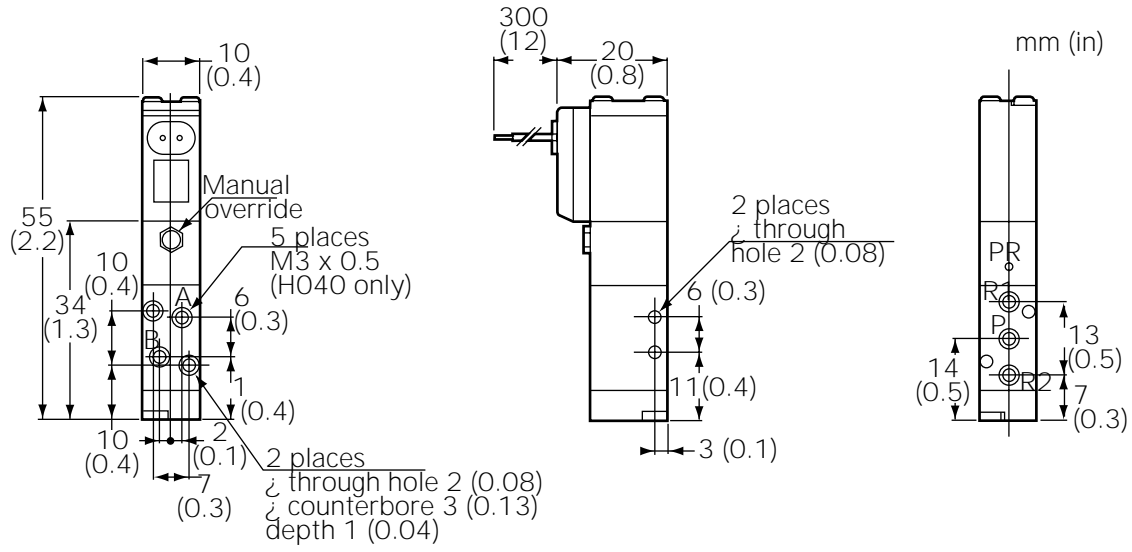


A	B	C
0.138 (3.5)	0.551 (14)	0.315 (8)



A	B	C
0.551 (14)	0.866 (22)	1.102 (28)

# H040-4E1



C	D	E	F	G
0.398 (10)	2.157 (54.8)	1.330 (33.9)	0.354 (9)	0.378 (9.6)

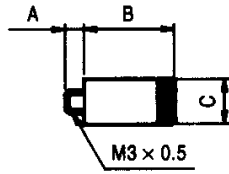
A	B	C	D	E
12 (300)	0.772 (19.6)	0.251 (6.4)	0.417 (10.6)	0.114 (2.9)

A	B	C
0.504 (12.8)	0.291 (7.4)	0.543 (13.8)

H	I	J	K	L
0.251 (6.4)	0.417 (10.6)	0.079 (2)	0.291 (7.4)	0.079 (2)

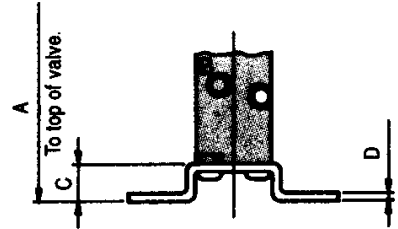
# OPTIONS

Muffler: Code 75. For use with in-line valve, use HKM-03.



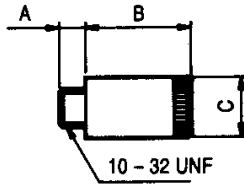
A	B	C
0.098 (2.5)	0.472 (12)	0.236 (6)

Mounting base: Code 21

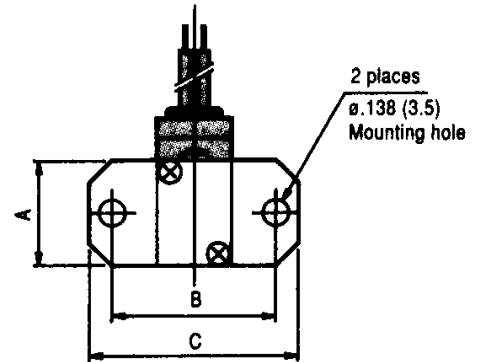


A	C	D
2.343 (59.5)	0.197 (5)	0.063 (1.6)

For sub-base mounted valves, use HKM-05.

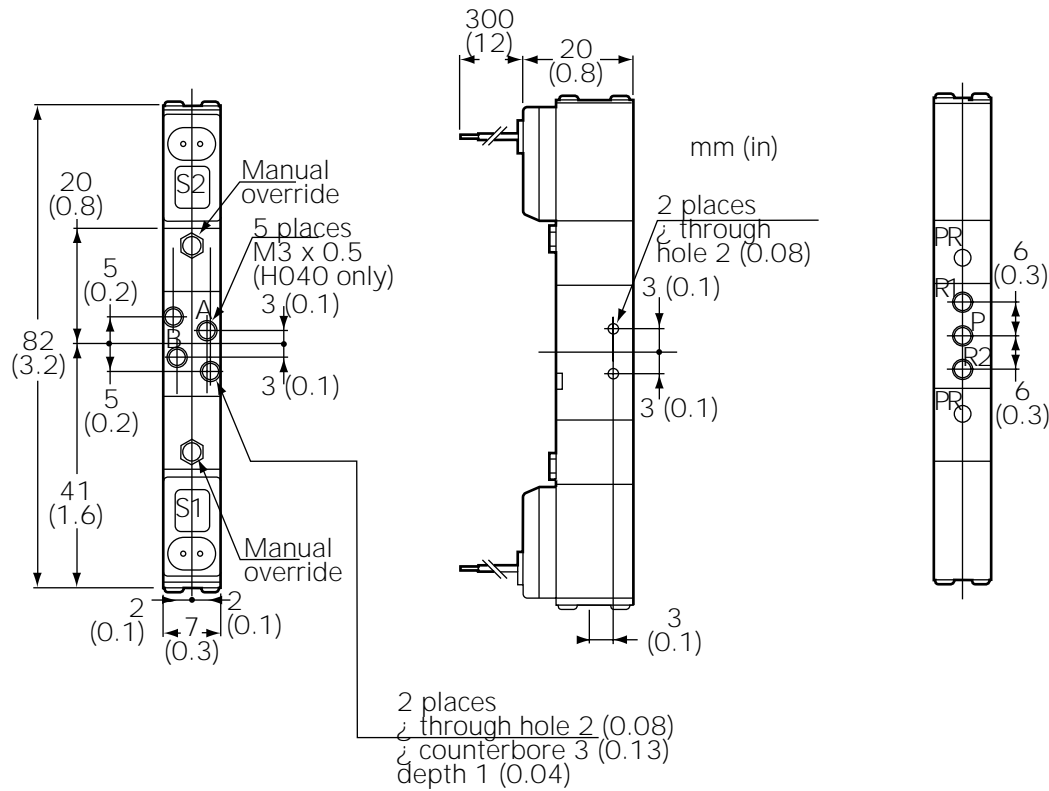


A	B	C
0.138 (3.5)	0.551 (14)	0.315 (8)



A	B	C
0.551 (14)	0.866 (22)	1.102 (28)

# H040-4E2



C	D	E	F	G
3.228 (82.0)	1.614 (41.0)	0.791 (20.1)	0.189 (4.8)	0.398 (10)

A	B	C	D
12 (300)	0.772 (19.6)	0.114 (2.9)	0.126 (3.2)

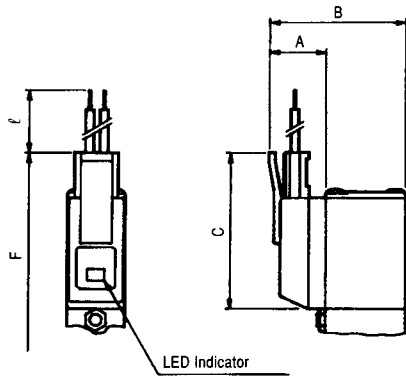
A	B
0.252 (6.4)	0.252 (6.4)

H	I	J	K
0.126 (3.2)	0.079 (2)	0.079 (2)	0.291 (7.4)

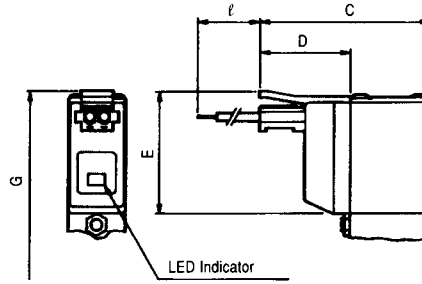
## OPTIONS

Solenoid with straight connector – PSL

Solenoid with “L” connector – PLL



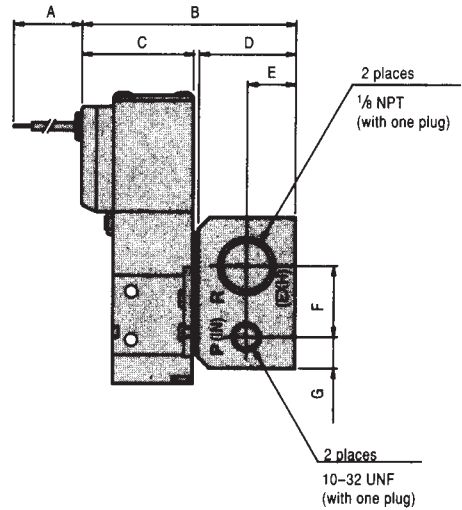
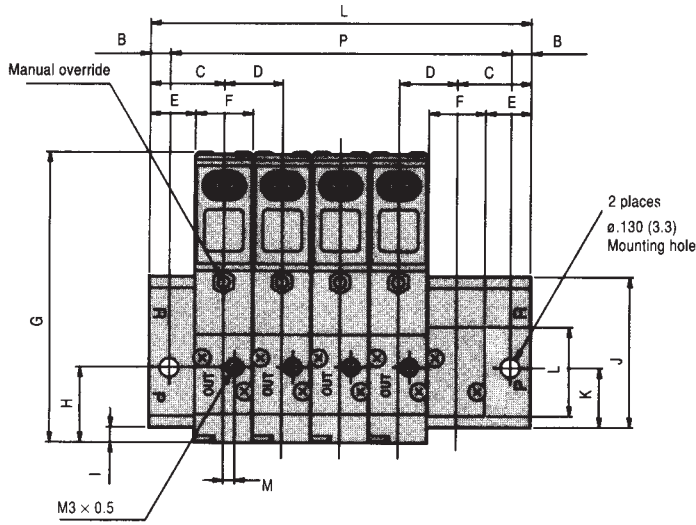
A	B	C
0.394 (10)	1.024 (26)	1.083 (27.5)



C	D	E
1.181 (30)	0.630 (16)	0.846 (21.5)

## DIMENSIONS

Valve	F	G	ℓ (Lead wire length)	Notes
H041E1, HA041E1-25	2.271 (57.7)	2.035 (51.7)	-PSL, -PLL: 12 (300) Made to order: ℓ1 – 36 (1000) ℓ2 – 72 (2000) ℓ3 – 108 (3000)	Whole lengths to valve end or sub-base end
H040-4E1	2.417 (61.4)	2.181 (55.4)		
HA040-4E1-25	2.562 (65.1)	2.326 (59.1)		
H040-4E2, HA040-4E2-25	3.747 (95.2)	3.275 (83.2)		Whole length from the solenoid end to opposite end of valve

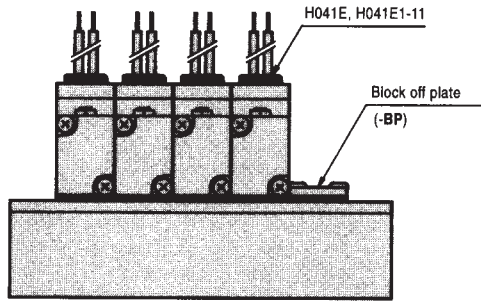


B	C	D	E	F	G
0.138 (3.5)	0.512 (13)	0.402 (10.2)	0.315 (8)	0.394 (10)	2.012 (51.1)

H	I	J	K	L	M
0.524 (13.3)	0.106 (2.7)	1.043 (26.5)	0.413 (10.5)	0.618 (15.7)	0.079 (2.0)

A	B	C	D
12 (300)	1.481 (37.6)	0.772 (19.6)	0.669 (17)

E	F	G
0.335 (8.5)	0.492 (12.5)	0.217 (5.5)

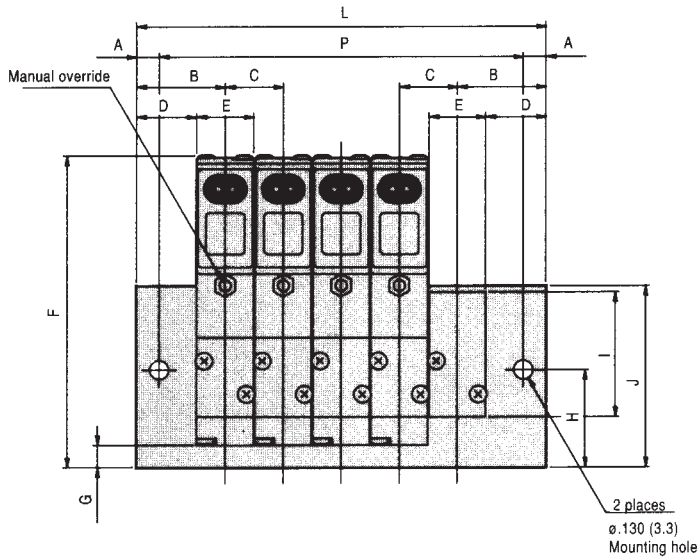


“F” TYPE MANIFOLD  
DIMENSIONS BY UNIT in. (mm)

Model	L	P	Model	L	P
HA041M2F	1.425 (36.2)	1.150 (29.2)	HA041M12F	5.441 (138.2)	5.165 (131.2)
HA041M3F	1.827 (46.4)	1.551 (39.4)	HA041M13F	5.843 (148.4)	5.567 (141.4)
HA041M4F	2.228 (56.6)	1.953 (49.6)	HA041M14F	6.244 (158.6)	5.968 (151.6)
HA041M5F	2.630 (66.8)	2.354 (59.8)	HA041M15F	6.646 (168.8)	6.370 (161.8)
HA041M6F	3.031 (77)	2.756 (70)	HA041M16F	7.047 (179)	6.772 (172)
HA041M7F	3.433 (87.2)	3.157 (80.2)	HA041M17F	7.449 (189.2)	7.173 (182.2)
HA041M8F	3.835 (97.4)	3.559 (90.4)	HA041M18F	7.850 (199.4)	7.575 (192.4)
HA041M9F	4.236 (107.6)	3.961 (100.6)	HA041M19F	8.252 (209.6)	7.976 (202.6)
HA041M10F	4.638 (117.8)	4.362 (110.8)	HA041M20F	8.654 (219.8)	7.984 (212.8)
HA041M11F	5.040 (128)	4.764 (121)	-	-	-

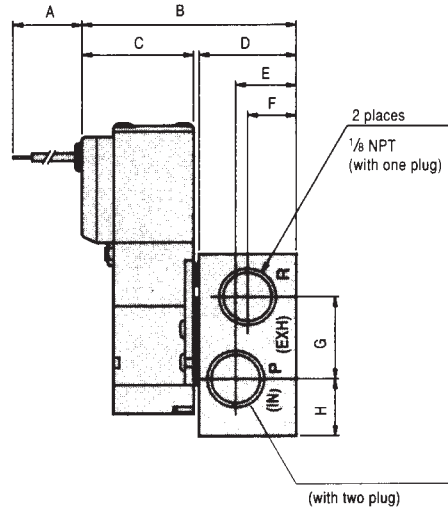
Valve mounting screws to manifolds and subbases: M2xL16

# H041M□A



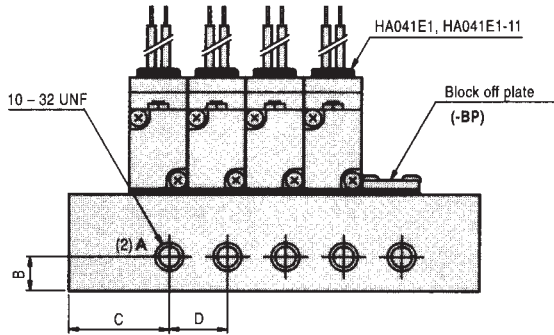
A	B	C	D	E
0.157 (4.0)	0.614 (15.6)	0.402 (10.2)	0.417 (10.6)	0.394 (10)

F	G	H	I	J
2.165 (55.0)	0.154 (3.9)	0.677 (17.2)	0.866 (22)	1.259 (32)



A	B	C	D
12 (300)	1.481 (37.6)	0.772 (19.6)	0.669 (17)

E	F	G	H
0.417 (10.6)	0.335 (8.5)	0.571 (14.5)	0.394 (10)



B	C	D
0.236 (6)	0.693 (17.6)	0.402 (10.2)

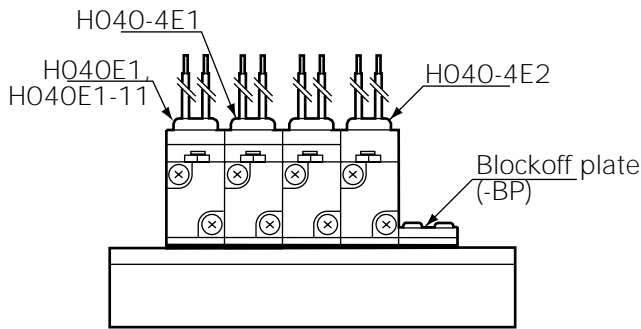
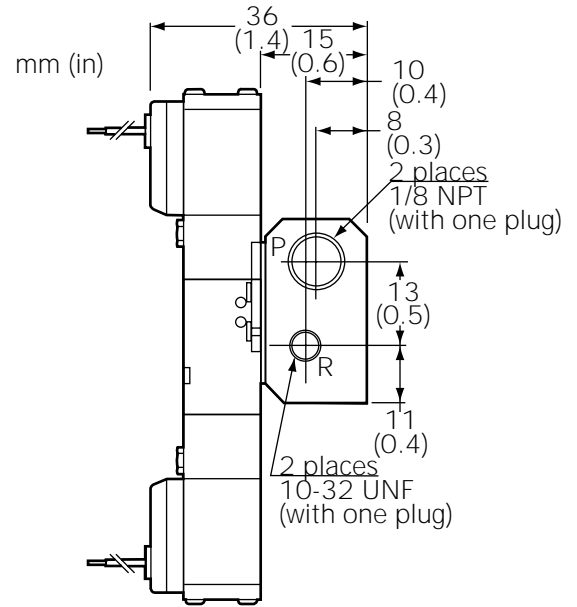
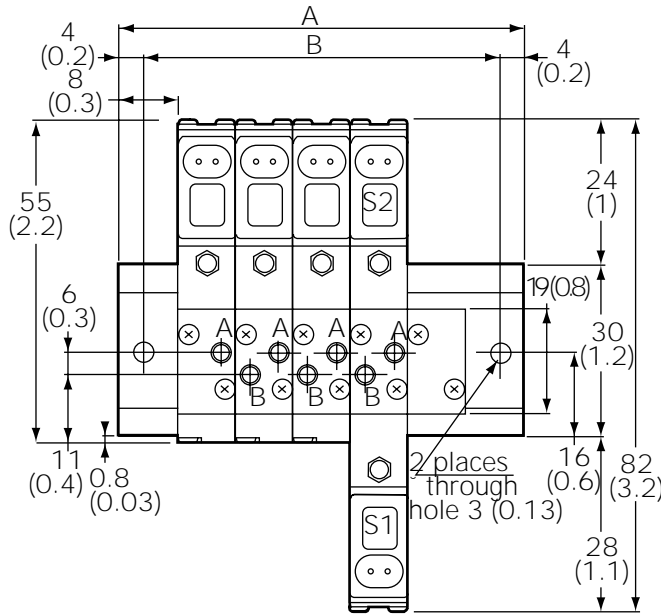
## “A” TYPE MANIFOLD DIMENSIONS BY UNIT in. (mm)

Model	L	P	Model	L	P
HA041M2A	1.630 (41.4)	1.315 (33.4)	HA041M12A	5.644 (143.4)	5.330 (135.4)
HA041M3A	2.031 (51.6)	1.716 (43.6)	HA041M13A	6.046 (153.6)	5.731 (145.6)
HA041M4A	2.433 (61.8)	2.118 (53.8)	HA041M14A	6.447 (163.8)	6.133 (155.8)
HA041M5A	2.834 (72)	2.519 (64)	HA041M15A	6.849 (174)	6.534 (166)
HA041M6A	3.236 (82.2)	2.921 (74.2)	HA041M16A	7.250 (184.2)	6.940 (176.2)
HA041M7A	3.637 (92.4)	3.322 (84.4)	HA041M17A	7.652 (194.4)	7.337 (186.4)
HA041M8A	4.039 (102.6)	3.734 (94.6)	HA041M18A	8.053 (204.6)	7.739 (196.6)
HA041M9A	4.440 (112.8)	4.125 (104.8)	HA041M19A	8.455 (214.8)	8.140 (206.8)
HA041M10A	4.841 (123)	4.527 (115)	HA041M20A	8.856 (225)	8.541 (217)
HA041M11A	5.243 (133.2)	4.928 (125.2)	-	-	-

Valve mounting screws to manifolds and subbases: M2xL16

# MANIFOLD DIMENSIONS FOR 2, 3-, AND 4-WAY VALVE COMBINATIONS

## H040M□F



C	D	E	F	G	H	I	J
0.402 (10.2)	0.516 (13.1)	0.157 (4)	0.318 (8.1)	0.394 (10)	2.157 (54.8)	0.252 (6.4)	0.417 (10.6)

A	B	C	D	E	F	G	H
12 (300)	1.402 (35.6)	0.772 (19.6)	0.590 (15)	0.382 (9.7)	0.315 (8)	0.492 (12.5)	0.433 (11)

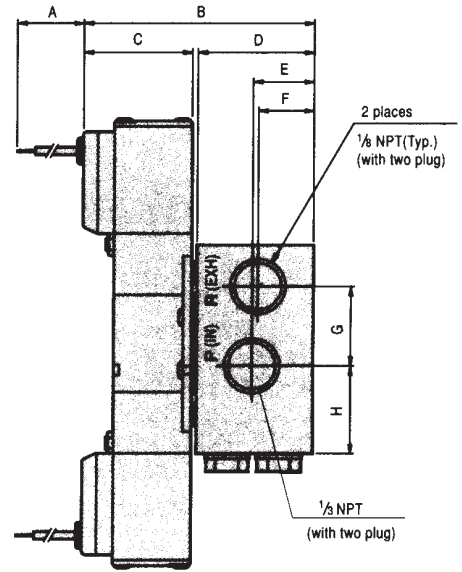
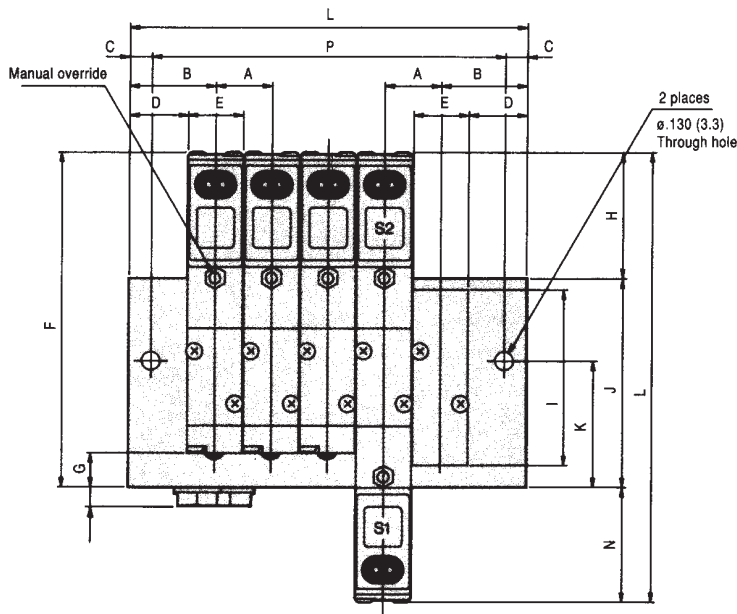
K	L	M	N	O	P	Q	R	S
0.031 (0.8)	0.945 (24.0)	0.748 (19)	0.630 (16)	1.181 (30)	3.228 (82)	1.102 (28.0)	0.079 (2)	0.945 (24)

## “F” TYPE MANIFOLD DIMENSIONS BY UNIT in. (mm)

Model	L	P	Model	L	P
H040M2F	1.433 (36.4)	1.118 (28.4)	H040M12F	5.449 (138.4)	5.134 (130.4)
H040M3F	1.835 (46.6)	1.520 (38.6)	H040M13F	5.850 (148.6)	5.535 (140.6)
H040M4F	2.236 (56.8)	1.921 (48.8)	H040M14F	6.252 (158.8)	5.937 (150.8)
H040M5F	2.638 (67)	2.323 (59)	H040M15F	6.654 (169)	6.339 (161)
H040M6F	3.039 (77.2)	2.724 (69.2)	H040M16F	7.055 (179.2)	6.764 (171.8)
H040M7F	3.441 (87.4)	3.126 (79.4)	H040M17F	7.457 (189.4)	7.142 (181.4)
H040M8F	3.843 (97.6)	3.528 (89.6)	H040M18F	7.858 (199.6)	7.543 (191.6)
H040M9F	4.244 (107.8)	3.929 (99.8)	H040M19F	8.230 (209.8)	7.945 (201.8)
H040M10F	4.646 (118)	4.331 (110)	H040M20F	8.661 (220)	8.346 (212)
H040M11F	5.047 (128.2)	4.732 (120.2)	-	-	-

Valve mounting screws to manifolds and subbases: M2xL16

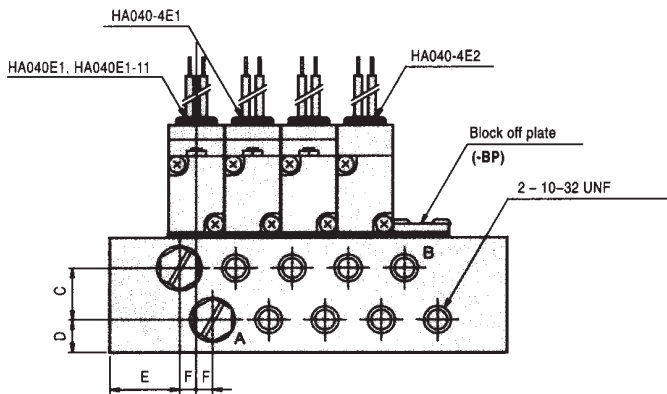
# H040M□A



A	B	C	D	E	F	G
0.402 (10.2)	0.614 (15.6)	0.157 (4)	0.417 (10.6)	0.394 (10)	2.402 (61.0)	0.244 (6.2)

H	I	J	K	L	M	N
0.906 (23.0)	1.230 (32)	1.496 (38)	0.905 (23)	3.228 (82)	0.197 (5)	0.827 (21.0)

A	B	C	D	E	F	G	H
12 (300)	1.637 (41.6)	0.771 (19.6)	0.827 (21)	0.433 (11)	0.394 (10)	0.571 (14.5)	0.630 (16)



C	D	E	F
0.374 (9.5)	0.236 (6)	0.496 (12.6)	0.118 (3)

## "A" TYPE MANIFOLD DIMENSIONS BY UNIT in. (mm)

Model	L	P	Model	L	P
H040M2A	1.630 (41.4)	1.315 (33.4)	H040M12A	5.646 (143.4)	5.331 (135.4)
H040M3A	2.031 (51.6)	1.717 (43.6)	H040M13A	6.047 (153.6)	5.732 (145.6)
H040M4A	2.433 (61.8)	2.118 (53.8)	H040M14A	6.449 (163.8)	6.134 (155.8)
H040M5A	2.835 (72)	2.520 (64)	H040M15A	6.850 (174)	6.535 (166)
H040M6A	3.236 (82.2)	2.921 (74.2)	H040M16A	7.252 (184.2)	6.937 (176.2)
H040M7A	3.638 (92.4)	3.323 (84.4)	H040M17A	7.654 (194.4)	7.339 (186.4)
H040M8A	4.039 (102.6)	3.724 (94.6)	H040M18A	8.055 (204.6)	7.740 (196.6)
H040M9A	4.441 (112.8)	4.126 (104.8)	H040M19A	8.457 (214.8)	8.142 (206.8)
H040M10A	4.843 (123)	4.528 (115)	H040M20A	8.858 (225)	8.543 (217)
H040M11A	5.244 (133.2)	4.929 (125.2)	-	-	-

Valve mounting screws to manifolds and subbases: M2xL16

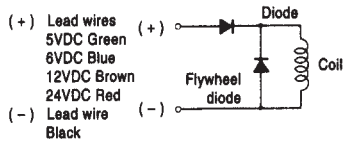
# PROPER HANDLING AND PRECAUTIONS

## SOLENOID

### INTERNAL CIRCUIT

#### STANDARD SOLENOID

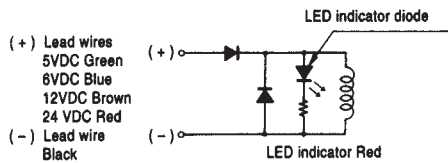
(Transient suppression incorporated)



#### SOLENOID WITH LED INDICATOR

(Transient suppression)

Order No. -PSL, -PLL

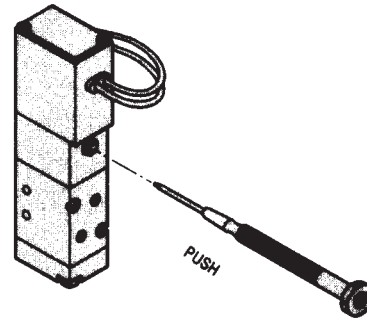


### CAUTIONS

1. Do not apply megger across lead wires.
2. Valve is polarity protected.
3. If current leakage within the circuit exceeds the recommended allowable quantity, the solenoid may not drop out. This malfunction is demonstrated by the valve not returning to the "home" position when de-energized (single solenoid).
4. Do not energize double solenoids simultaneously. The valve may midshift.

## MANUAL OVERRIDE OPERATION

Push the button all the way down, using a fine-tipped instrument. While pushing the button, the single solenoid valve will enter into the energized position. It will return to the "home" position when released. For the double solenoid, when the push button at the S<sub>1</sub> (S<sub>2</sub>) side is pushed, it will switch to the same condition as with the S<sub>1</sub> (S<sub>2</sub>) energized position. The valve will remain in that position even after the button is released. To return, operate the push button at the opposite end of the valve S<sub>2</sub> (S<sub>1</sub>).



### CAUTIONS

1. The H040 series is indirect acting type. Therefore, the body of the valve will not operate when pushing the manual override button unless minimum air pressure is supplied to the P-port.
2. Do not use a sharp tipped instrument to operate the manual override button. It may damage the button.

## MANIFOLD

### PIPING

Ports P and R are located at both ends of the manifold. Piping direction can be determined according to the mounting location. Ports at one end of the manifold are temporarily plugged during shipping. Remove plugs and reseal with sealing agent.

### BLOCK OFF PLATE

Use Block Off Plate to close stations when they are not in use. See charts on page 16 for proper model.

### CAUTIONS

1. For P port piping, make sure to select fitting sizes to fit the manifold connecting pipe dimensions. Actuators may not operate properly if there is insufficient flow and/or pressure due to improper piping.
2. When installing fittings or mufflers to R port, make sure that exhaust remains unrestricted. Restriction of exhaust may cause actuators to operate erratically. Consider using R ports at both ends of manifold to enhance exhaust.
3. When several manifold valves are to be operated simultaneously, connect supply air to both ends of manifold. Also exhaust through both ends of manifold. This ensures adequate supply and exhaust capacity.

## POINTS TO BE CONSIDERED

### INSTALLATION

1. Mount valves in any direction. However, mount valves perpendicular to significant shock or vibration.
2. Location near water, oil, or in excessively dusty conditions requires adequate solenoid housing protection to prevent solenoid actuator contamination. Also consider the installation of breather/muffler in exhaust ports to prevent foreign objects from entering valves.
3. Before installing fittings and tubing, blow all foreign material from them. If using a sealant, take extra care that sealant does not enter valve causing potential malfunction and/or leaks.
4. When valves are installed in tight enclosures, consider the possibility of heat build up. Ensure adequate ventilation.
5. Valves with A or B ports open to atmosphere will not operate properly.

### AIR SOURCE

1. Use compressed air or inert gas in accordance with the pressure rating in the specifications.
2. Compressed air should be clean and uncontaminated. When in doubt, install an air filter with filtering capacity of 40 microns. Periodically remove and clean or replace filter element.
3. For optimum performance, use largest possible tubing size and minimum tubing length.

### LUBRICATION

No externally applied lubrication is required. However, when dry air is used (air that does not contain water or oil), use of a turbine SAE 20 oil (ISO VG32) or equivalent is recommended. Thin or low viscosity oils (spindle oil, machine oil, etc.) do not provide a good residual film of lubrication, thus should not be used.

### AIR QUALITY

These valves cannot be used when media or ambient conditions contain organic solvents, phosphoric acid, ester type machine oil, sulfuric acid gas, or other acids.

## MANIFOLD

### PIPING

Ports P and R are located at both ends of the manifold. Piping direction can be determined according to the mounting location. Ports at one end of the manifold are temporarily plugged during shipping. Remove plugs and reseal with sealing agent.

### BLOCK OFF PLATE

Use Block Off Plate to close stations when they are not in use. See charts on page 16 for proper model.

### CAUTIONS

1. For P port piping, make sure to select fitting sizes to fit the manifold connecting pipe dimensions. Actuators may not operate properly if there is insufficient flow and/or pressure due to improper piping.
2. When installing fittings or mufflers to R port, make sure that exhaust remains unrestricted. Restriction of exhaust may cause actuators to operate erratically. Consider using R ports at both ends of manifold to enhance exhaust.
3. When several manifold valves are to be operated simultaneously, connect supply air to both ends of manifold. Also exhaust through both ends of manifold. This ensures adequate supply and exhaust capacity.

## POINTS TO BE CONSIDERED

### INSTALLATION

1. Mount valves in any direction. However, mount valves perpendicular to significant shock or vibration.
2. Location near water, oil, or in excessively dusty conditions requires adequate solenoid housing protection to prevent solenoid actuator contamination. Also consider the installation of breather/muffler in exhaust ports to prevent foreign objects from entering valves.
3. Before installing fittings and tubing, blow all foreign material from them. If using a sealant, take extra care that sealant does not enter valve causing potential malfunction and/or leaks.
4. When valves are installed in tight enclosures, consider the possibility of heat build up. Ensure adequate ventilation.
5. Valves with A or B ports open to atmosphere will not operate properly.

### AIR SOURCE

1. Use compressed air or inert gas in accordance with the pressure rating in the specifications.
2. Compressed air should be clean and uncontaminated. When in doubt, install an air filter with filtering capacity of 40 microns. Periodically remove and clean or replace filter element.
3. For optimum performance, use largest possible tubing size and minimum tubing length.

### LUBRICATION

No externally applied lubrication is required. However, when dry air is used (air that does not contain water or oil), use of a turbine SAE 20 oil (ISO VG32) or equivalent is recommended. Thin or low viscosity oils (spindle oil, machine oil, etc.) do not provide a good residual film of lubrication, thus should not be used.

### AIR QUALITY

These valves cannot be used when media or ambient conditions contain organic solvents, phosphoric acid, ester type machine oil, sulfuric acid gas, or other acids.