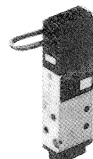
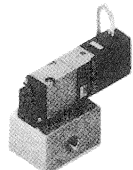
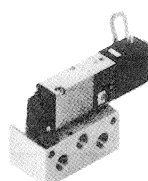
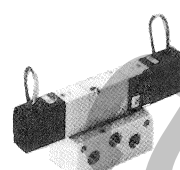
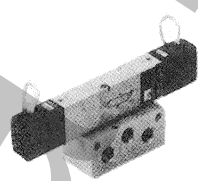
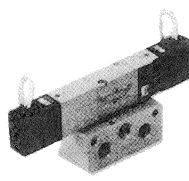


# H110 SERIES BASIC MODELS AND CONFIGURATIONS

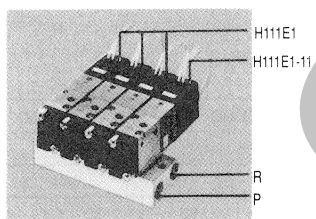
## SINGLE UNIT – IN-LINE AND SUBBASE MOUNTED

| 2-, 3-way                                                                         | 4-way                                                                             |                                                                                   |                                                                                     |                                                                                     |
|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
|                                                                                   | In-line mounted                                                                   |                                                                                   |                                                                                     |                                                                                     |
| Normally closed (N/C) or normally open (N/O)<br>Single solenoid only              | 2 position<br>Single or double solenoid                                           | 3 position                                                                        |                                                                                     |                                                                                     |
|  |  |  |  |  |
| H111E1 series                                                                     | H110-4E1 (-4E2)                                                                   | H113-4E2                                                                          | H113-4E2-13                                                                         | H113-4E2-14                                                                         |
|                                                                                   | Subbase mounted <sup>Note</sup>                                                   |                                                                                   |                                                                                     |                                                                                     |
| Normally closed (N/C)                                                             | 2 position                                                                        | 3 position                                                                        |                                                                                     |                                                                                     |
|  |  |  |   |  |
| HA111E1                                                                           | HA110-4E1                                                                         | HA110-4E2                                                                         | HA113-4E2                                                                           | HA113-4E2-13                                                                        |
|                                                                                   |                                                                                   |                                                                                   |                                                                                     | HA113-4E2-14                                                                        |

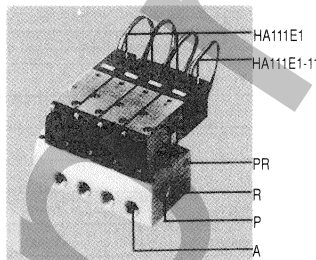
OTE: Valves are mounted to HA111-25 and HA110-25 subbases. Subbases are not available for H110 (3-way) series.

## MULTIPLE UNITS – MANIFOLD MOUNTED

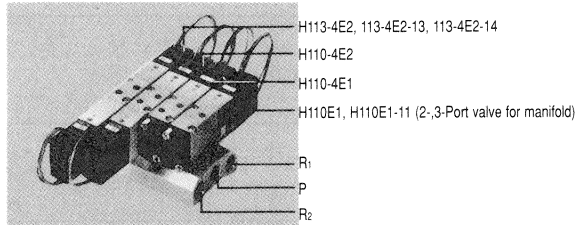
H111M□ F – use with H111 valves



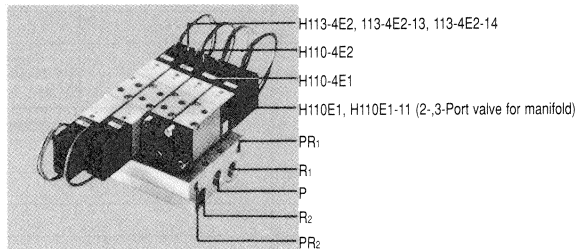
H111M□ A – use with HA111 valves



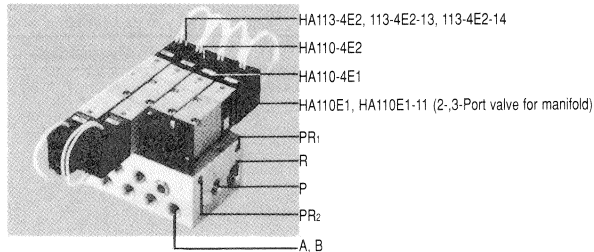
H110M□ F – use with H110, H110-4, H113-4 valves



H110M□ FE – use with H110, H110-4, H113-4 valves



H110M□ A – use with HA110, HA110-4, HA113-4 valves



# LIST OF SPECIFICATIONS

## MODEL AND VALVE FUNCTIONS

| Item                | In-line and manifold type     | Basic model                                                      |                            |                 |
|---------------------|-------------------------------|------------------------------------------------------------------|----------------------------|-----------------|
|                     |                               | H111E1<br>H110E1                                                 | H110-4E1<br>H110-4E2       | H113-4E2        |
|                     | Manifold or subbase type only | HA111E1<br>HA110E1                                               | HA110-4E1<br>HA110-4E2     | HA113-4E2       |
| Number of positions |                               | 2 position                                                       |                            | 3 position      |
| Number of ports     |                               | 2- and 3-way                                                     |                            | 4-way           |
| Valve function      |                               | Normally closed (N/C standard)<br>and normally open (N/O option) | Single and double solenoid | Double solenoid |

NOTE: H110E1 and HA110E1 cannot be used as in-line valves. Use as manifold mount only.

## SPECIFICATIONS

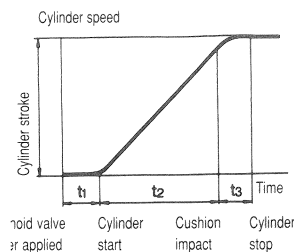
| Item                                              | In-line and manifold type     | Basic model             |                        |             |
|---------------------------------------------------|-------------------------------|-------------------------|------------------------|-------------|
|                                                   |                               | H111E1<br>H110E1        | H110-4E1<br>H110-4E2   | H113-4E2    |
|                                                   | Manifold or subbase type only | HA111E1<br>HA110E1      | HA110-4E1<br>HA110-4E2 | HA113-4E2   |
| Media                                             |                               | Air                     |                        |             |
| Type of operation                                 |                               | Indirect acting         |                        |             |
| Flow – C <sub>v</sub>                             |                               | .23                     |                        | .21         |
| Ports                                             |                               | 10-32 UNF               |                        |             |
| Lubrication                                       |                               | None required           |                        |             |
| Pressure range psig (kgf/cm <sup>2</sup> )        |                               | 20 ~ 100 (1.5 ~ 7)      |                        |             |
| Response time – ms<br>(ON/OFF)                    | 12VDC, 24VDC                  | below 15/20             | below 15/25            | below 15/30 |
|                                                   | 120VAC, 240VAC                | below 15/15             | below 15/15            | below 15/20 |
| Maximum operation frequency – c/s                 |                               | 5                       |                        |             |
| Minimum time to energize (ms)                     |                               | –                       | 50 (E2 only)           | –           |
| Temperature range (atmosphere or media) – °F (°C) |                               | 40 ~ 122 (5 ~ 50)       |                        |             |
| Impact resistance – G                             |                               | 140 (axle direction 30) |                        | 30          |
| Mounting direction                                |                               | Any                     |                        |             |

## SOLENOID SPECIFICATIONS

| Voltage                                       |                                     | 12VDC                            | 24VDC       | 24VAC          |     | 120VAC              |    | 240VAC    |    |
|-----------------------------------------------|-------------------------------------|----------------------------------|-------------|----------------|-----|---------------------|----|-----------|----|
| Model                                         |                                     | Surge protector – flywheel diode |             | Shading system |     |                     |    |           |    |
| Voltage Range                                 |                                     | 10.8 ~ 13.2                      | 21.6 ~ 26.4 | 21.6 ~ 26.4    |     | 90 ~ 132            |    | 180 ~ 264 |    |
| Current value<br>(Rated voltage applied)      | Frequency Hz                        | –                                | –           | 50             | 60  | 50                  | 60 | 50        | 60 |
|                                               | Starting power – mA                 | –                                | –           | 145            | 130 | 44                  | 40 | 22        | 20 |
|                                               | Holding power – mA <sup>NOTE1</sup> | 130 (140)                        | 65 (75)     | 85             | 70  | 32                  | 26 | 16        | 13 |
| Power consumption <sup>NOTE1</sup>            |                                     | 1.6 (1.7)                        | 1.6 (1.8)   | –              | –   | –                   | –  | –         | –  |
| Leak rate (maximum allowed) – mA              |                                     | 8                                | 4           | 8              |     | 4                   |    | 2         |    |
| Temperature rise (at rated voltage) – °F (°C) |                                     | below 77° (25°)                  |             |                |     | Less than 95° (35°) |    |           |    |
| Insulation                                    |                                     | Type B                           |             |                |     |                     |    |           |    |
| Insulation tolerance – MΩ                     |                                     | Over 100                         |             |                |     |                     |    |           |    |
| Lead wire: length                             | Standard                            | Grommet 12" (300mm)              |             |                |     |                     |    |           |    |
|                                               | Options                             | Plug connector                   |             |                |     |                     |    |           |    |
| Lead wire: color                              |                                     | Brown/Black                      | Red/Black   | Black          |     | Yellow              |    | White     |    |
| LED indicator (option) color                  |                                     | Red                              |             | –              |     | Yellow              |    | Green     |    |
| Surge suppression                             |                                     | Flywheel diode                   |             |                | –   |                     |    |           |    |

NOTE 1: Number in ( ) indicates solenoid with LED indicator.

## CYLINDER SPEED



In order to obtain required time for cylinder to make one stroke, add cylinder's delay time t<sub>1</sub> (delay time between activating valve and actual starting time of cylinder) to the time t<sub>2</sub> at the maximum speed. If there is a cushion time, add the cushion time. General cushion time t<sub>3</sub> is around 0.2 seconds.

## H110-4E1, H113-4E2

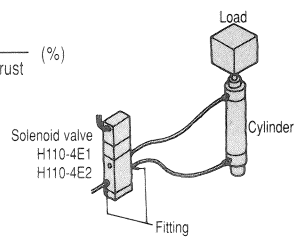
### Measurement requirements

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

1/4" I.D. tubing x 35" long

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

Cylinder stroke: 6 in.



## HA110-4E1, HA113-4E2

### Measurement requirements

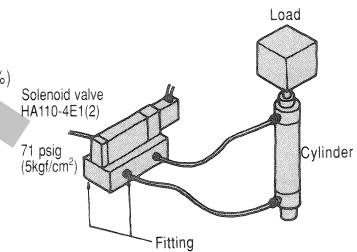
• Mounted to H110-25

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

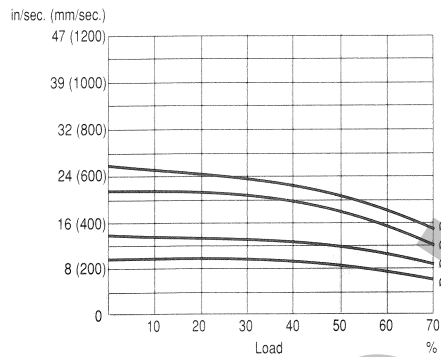
• 1/4" I.D. tubing x 35" long

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

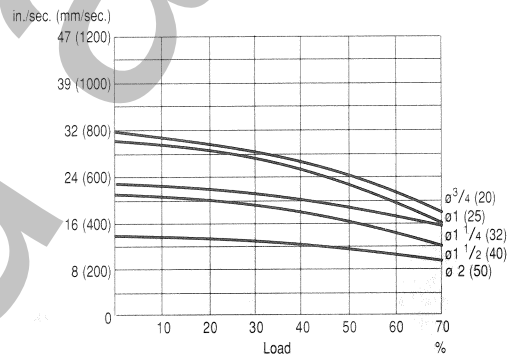
• Cylinder stroke: 6 in.



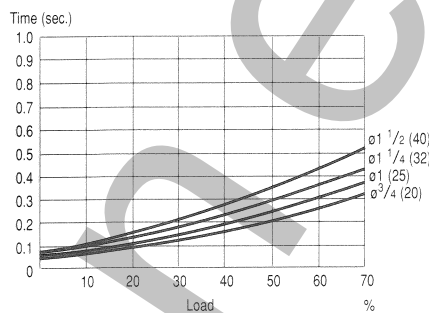
### Maximum operating speed



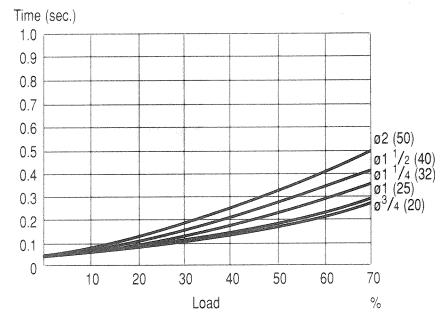
### Maximum operating speed



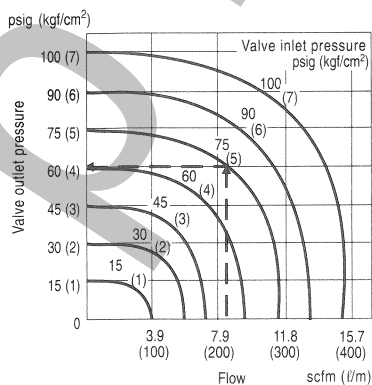
### Delay time



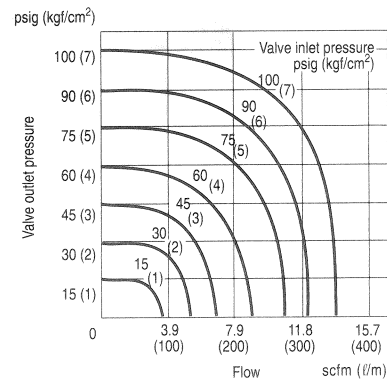
### Delay time



### Flow



### Flow



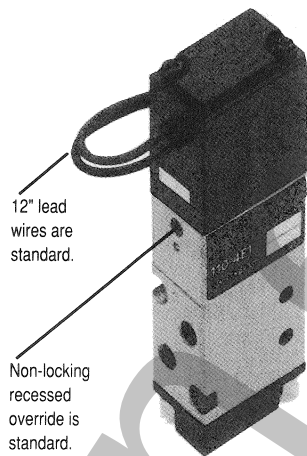


# HOW TO ORDER

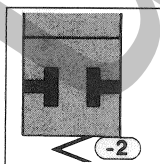
## VALVES

| Description                       |                            | Model     | ORDERING CODE |            |             |                 |            |  | Manual override | Electrical Connection | Voltage |
|-----------------------------------|----------------------------|-----------|---------------|------------|-------------|-----------------|------------|--|-----------------|-----------------------|---------|
|                                   |                            |           | Options       |            |             |                 |            |  |                 |                       |         |
|                                   |                            |           | 2-way         | Norm. Open | Function    |                 | 3 position |  |                 |                       |         |
|                                   |                            |           |               |            | Open center | Pressure center |            |  |                 |                       |         |
| In-line or F-type manifold        | 2 or 3 port                | H111E1    | -2            | -11        |             |                 |            |  |                 |                       |         |
|                                   | 5 port Single solenoid     | H110-4E1  |               |            |             |                 |            |  |                 |                       |         |
|                                   | 5 port Double solenoid     | H110-4E2  |               |            |             |                 |            |  |                 |                       |         |
|                                   | 5 port 3-position          | H113-4E2  |               |            | -13         | -14             |            |  |                 |                       |         |
| Single subbase or A-type manifold | 2 or 3 port                | HA111E1   | -2            | -11        |             |                 |            |  |                 |                       |         |
|                                   | 5 port Single solenoid     | HA110-4E1 |               |            |             |                 |            |  |                 |                       |         |
|                                   | 5 port Double solenoid     | HA110-4E2 |               |            |             |                 |            |  |                 |                       |         |
|                                   | 5 port 3-position          | HA113-4E2 |               |            | -13         | -14             |            |  |                 |                       |         |
| Manifold mount only               | H110M□F, FE<br>2 or 3 port | H110E1    | -2            | -11        |             |                 |            |  |                 |                       |         |
|                                   | H110M□A<br>2 or 3 port     | HA110E1   |               |            |             |                 |            |  |                 |                       |         |

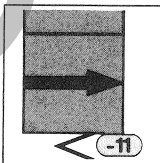
NOTE: 24VAC with lead wires and no LED only.



3-port options:

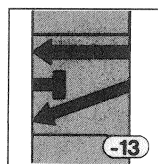


2-way (3-way std.)

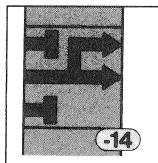


Normally open (Normally closed-std.)

3-position options:  
Block center std.  
Order code: Blank

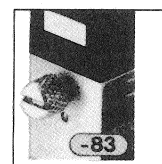


Exhaust center



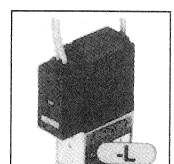
Pressure center

Override  
Non-locking recessed std.



Locking

Electrical:  
Grommet with 12" lead wires std.  
Order code: Blank



Grommet with LED and surge protection



Plug-in with LED and surge protection NOTE

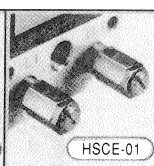
## ACCESSORIES

3 port valves are 3-way, normally closed standard.

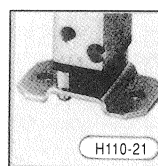
3 position 4-way valves have all ports blocked in the center position as standard.



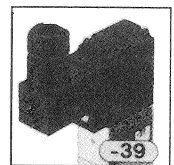
10-32 UNF exhaust flow control.



1/8" NPT exhaust flow control.



Mtg. base: single solenoid only.



DIN-style plug-in (LED not available)

NOTE: Standard wire length is 12" (300mm). Specify -PSL-L3 for 108" (3000mm) lead wires.

# HOW TO ORDER

## MANIFOLDS AND SINGLE STATION SUBBASES

2- and 3-way valve manifolds

| Model number | Description                                             |
|--------------|---------------------------------------------------------|
| H111M□ F     | Select 2 – 20 stations (□), accepts H111 series valves  |
| H111M□ A     | Select 2 – 20 stations (□), accepts HA111 series valves |

2-, 3- and 4-way valve manifolds

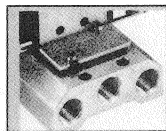
| Model number              | Description                                             |
|---------------------------|---------------------------------------------------------|
| H110M□ F                  | Select 2 – 20 stations (□), accepts H110 series valves  |
| H110M□ FE <sup>NOTE</sup> | Select 2 – 20 stations (□), accepts H110 series valves  |
| H110M□ A                  | Select 2 – 20 stations (□), accepts HA110 series valves |

Single station subbases

| Model number | Description                                    |
|--------------|------------------------------------------------|
| HA111-25     | Subbase accepts HA111E1 3-way valves           |
| HA110-25     | Accepts HA110-4E1 (2) & HA113-4E2 4-way valves |

OTE: FE has captured pilot exhaust.

## ACCESSORIES



Block-off plates:

H111MF-BP: for H111M□ F

H111MA-BP: for H111M□ A

H110MF-BP: for H110M□ F

H110MA-BP: for H110M□ FE & H110M□ A

## PORT INFORMATION

### SINGLE VALVE PORT INFORMATION

| Model                                  | Port     | Specifications | Port diameter |
|----------------------------------------|----------|----------------|---------------|
| H111E1, (H110E1 <sup>NOTE 1</sup> )    | Standard | Female thread  | 10-32 UNF     |
| H110-4E1, H110-4E2, H113-4E2           | Standard | Female thread  | 10-32 UNF     |
| HA110-25 <sup>NOTE 2</sup><br>HA111-25 | P        | Female thread  | 1/8 NPT       |
|                                        | A, B     |                |               |
|                                        | R        |                |               |
|                                        | PR       | Female thread  | 10-32 UNF     |

OTE 1: H110E1 is for manifold installation only. Cannot be used as stand alone valve.

OTE 2: Single station subbase for manifold mounted valves.

### MANIFOLD PIPING OUTLET DIAMETER

| Manifold model       | Port | Location | Port dimensions |
|----------------------|------|----------|-----------------|
| H111M□ F<br>H110M□ F | P    | Manifold | 1/8 NPT         |
|                      | A, B | Valve    | 10-32           |
|                      | R    | Manifold | 1/8 NPT         |
| H110M□ FE            | P    | Manifold | 1/8 NPT         |
|                      | A, B | Valve    | 10-32           |
|                      | R    | Manifold | 1/8 NPT         |
|                      | PR   |          | 10-32 UNF       |
| H111M□ A<br>H110M□ A | P    | Manifold | 1/8 NPT         |
|                      | A, B |          | 1/8 NPT         |
|                      | R    |          | 1/4 NPT         |
|                      | PR   |          | 10-32 UNF       |

## WEIGHT

### SOLENOID VALVE WEIGHT oz. (gf)

| Basic model | Weight    |
|-------------|-----------|
| H111E1      | 2.6 (75)  |
| H110E1      | 2.8 (80)  |
| H110-4E1    | 2.8 (80)  |
| H110-4E2    | 4.6 (130) |
| H113-4E2    | 5.1 (145) |
| HA111E1     | 2.8 (80)  |
| HA110E1     | 3.0 (85)  |
| HA110-4E1   | 3.0 (85)  |
| HA110-4E2   | 4.8 (135) |
| HA113-4E2   | 5.3 (150) |
| HA111-25    | 3.0 (85)  |
| HA110-25    | 3.4 (95)  |

### MANIFOLD WEIGHT oz. (gf)

| Manifold model | Weight calculation for each unit mounting (n = number) | Block-off plate |
|----------------|--------------------------------------------------------|-----------------|
| H111M□ F       | {0.5 (15) x n + 1.1 (30)}                              | 0.18 (5)        |
| H111M□ A       | {1.6 (45) x n + 1.6 (45)}                              | 0.35 (10)       |
| H110M□ F       | {0.7 (20) x n + 1.1 (30)}                              | 0.21 (6)        |
| H110M□ FE      | {1.4 (40) x n + 1.8 (50)}                              | 0.39 (11)       |
| H110M□ A       | {2.1 (60) x n + 2.1 (60)}                              |                 |

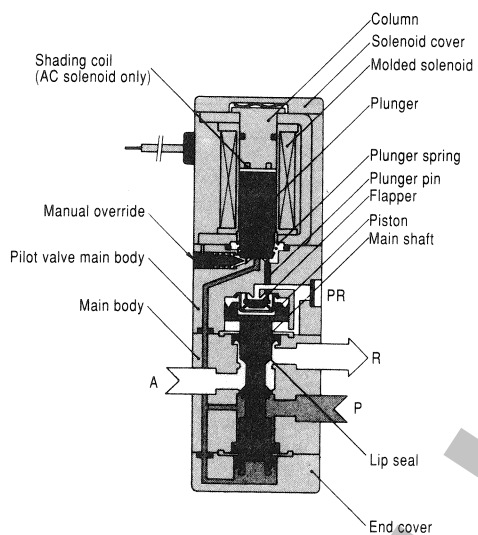
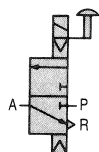
# OPERATING PRINCIPLE

## 3-WAY

H111E1

Unactuated

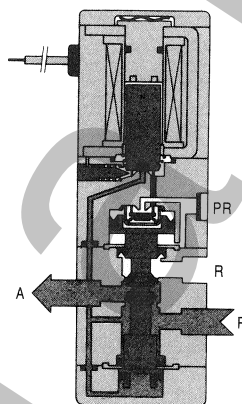
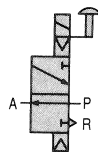
Normally closed (N/C)



H111E1-11

Unactuated

Normally open (N/O)

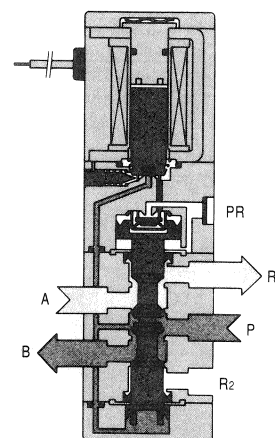
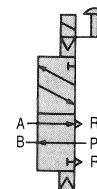


## 4-WAY, 2-POSITION

H110-4E1

Unactuated

Single solenoid

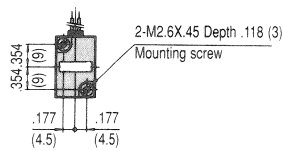
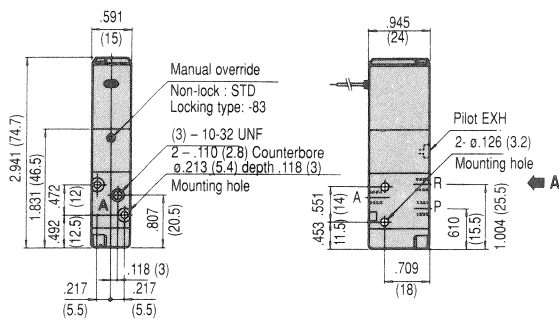


## MATERIALS OF MAIN PARTS

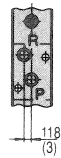
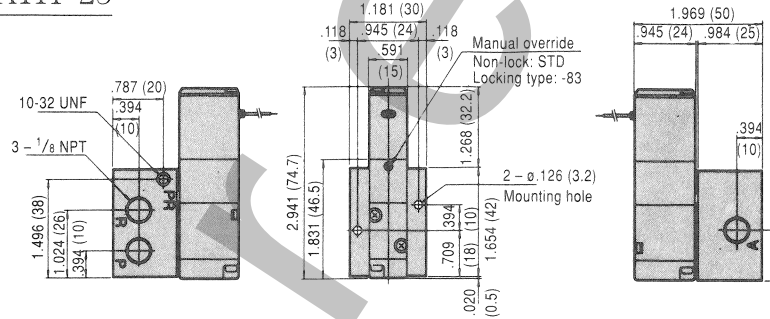
| Item     | Parts           | Materials                 |
|----------|-----------------|---------------------------|
| Valve    | Body            | Aluminum (anodized)       |
|          | Stem            |                           |
|          | Lip seal        | Buna                      |
|          | Flapper         |                           |
|          | Mounting base   | Soft steel (zinc plated)  |
|          | Subbase         | Aluminum (anodized)       |
|          | Plunger         | Electromagnetic stainless |
| Manifold | Column          |                           |
|          | Body            | Aluminum (anodized)       |
|          | Block-off plate | Steel (nickel plated)     |
|          | Seal            | Buna                      |



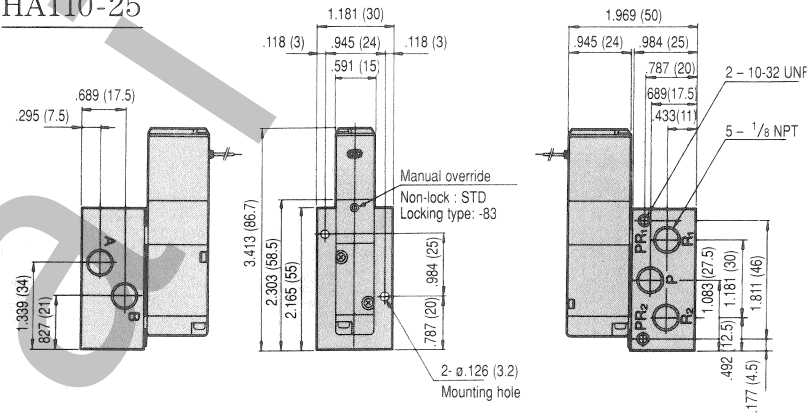
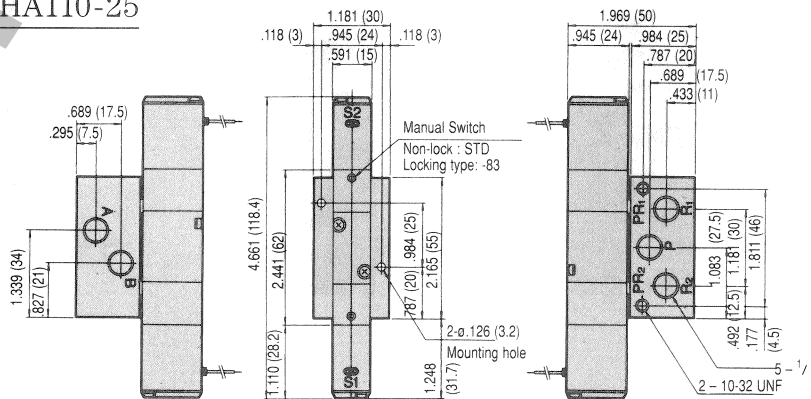
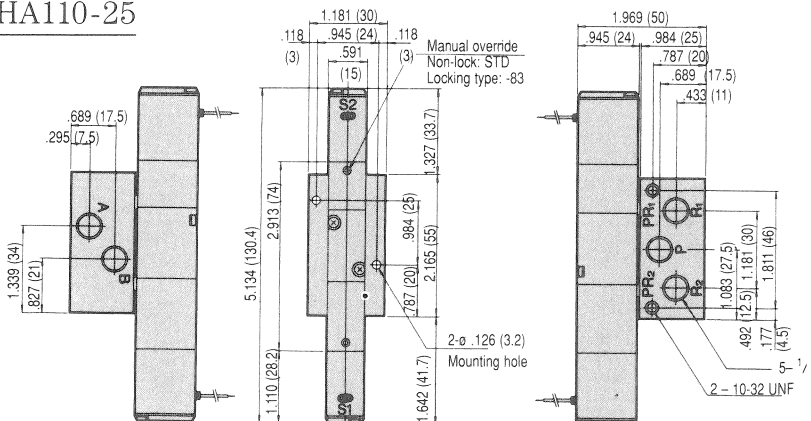
## H111E1



View from A

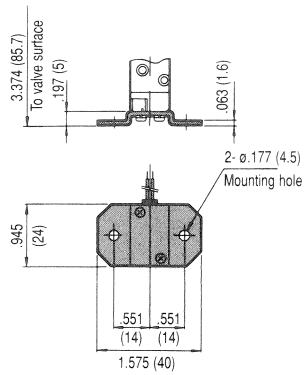
HA111E1 &  
HA111-25

HA110-4E1 &  
HA110-25

HA110-4E2 &  
HA110-25HA113-4E2 &  
HA110-25

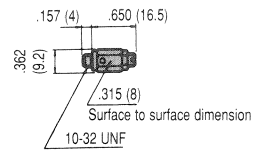
## ADDITIONAL PARTS (sold separately)

Mounting base: H110-21

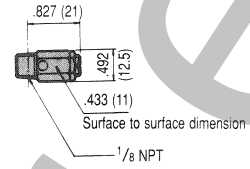


Flow control

In-line: HSCE-M5

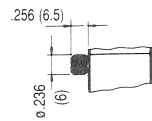


Subbase: HSCE-01

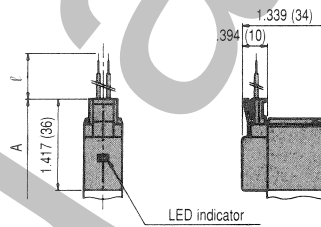


## CONNECTOR OPTIONS

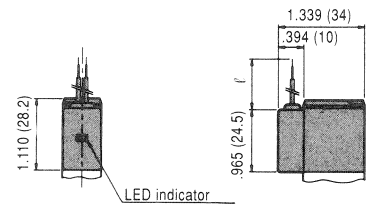
Locking manual override: (-83)



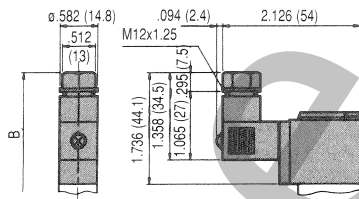
Straight connector solenoid: (-PSL)



Grommet with LED: (-L)



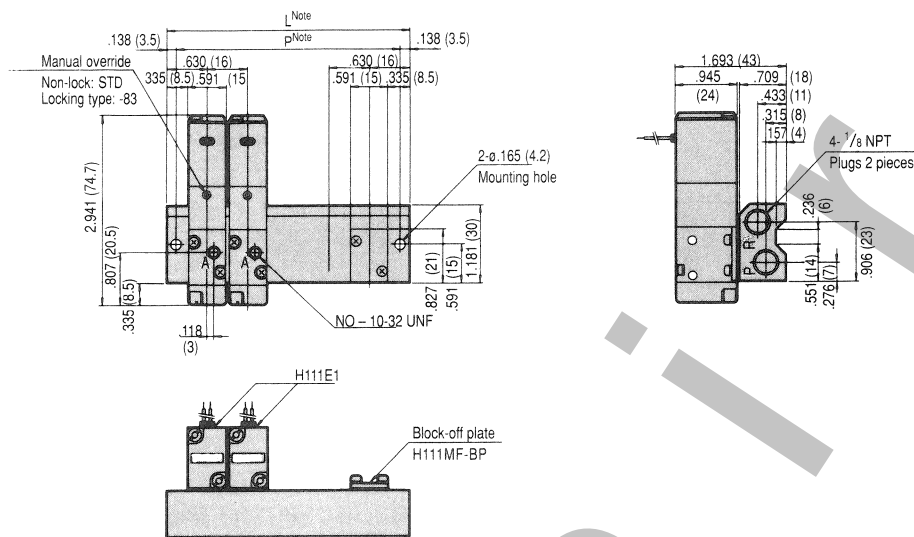
DIN connector solenoid: (-39)



| Type                             | Body length with connector – in. (mm) |               | Measurement                     |
|----------------------------------|---------------------------------------|---------------|---------------------------------|
|                                  | A                                     | B             |                                 |
| H111E1, HA111E1, w/HA111-25      | 3.248 (82.5)                          | 3.567 (90.6)  | Length to valve end             |
| H110-4E1                         | 3.484 (88.5)                          | 3.803 (96.6)  |                                 |
| HA110-4E1, w/HA110-25            | 3.720 (94.5)                          | 4.039 (102.6) |                                 |
| HA110-4E2, HA110-4E2, w/HA110-25 | 5.276 (134)                           | 5.913 (150.2) | Length to opposite solenoid end |
| H113-4E2, HA113-4E2, w/HA110-25  | 5.748 (146)                           | 6.386 (162.2) |                                 |

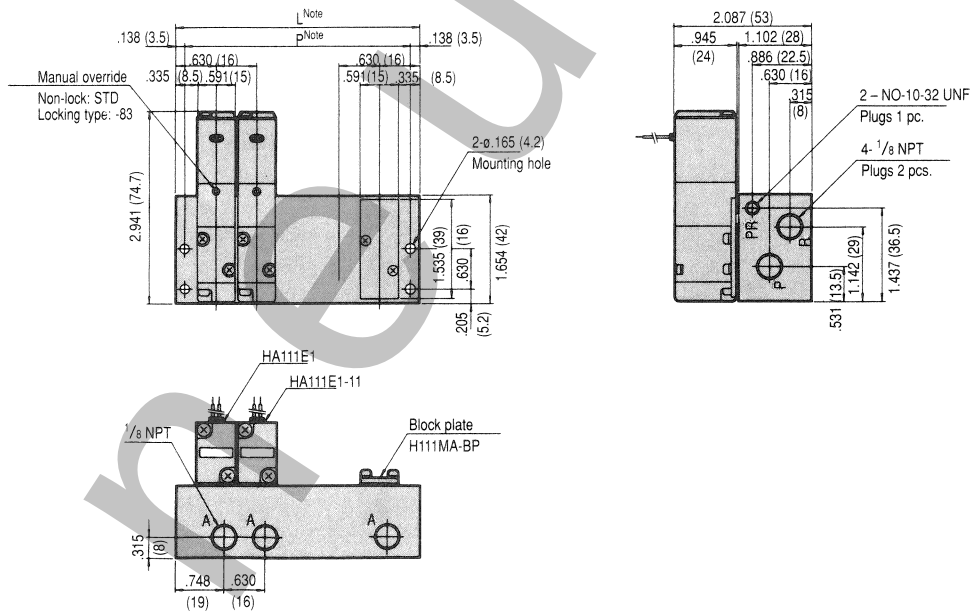


I111M□ F



NOTE: L = 1.890 (48) and P = 1.614 (41) for a 2 station manifold. Add 0.630 (16) for each station over 2  
Example: for a 6 station manifold, add 2.520 (64), or L = 4.410 (112) and P = 4.134 (105)].

I111M□ A



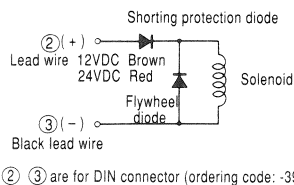
NOTE: L = 1.890 (48) and P = 1.614 (41) for a 2 station manifold. Add 0.630 (16) for each station over 2  
Example: for a 6 station manifold, add 2.520 (64), or L = 4.410 (112) and P = 4.134 (105)].

# HANDLING CAUTIONS AND GENERAL ITEMS

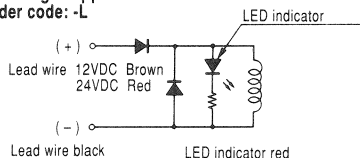
## SOLENOIDS

### INTERNAL CIRCUIT – DC

#### STD. Solenoid (Surge protection)

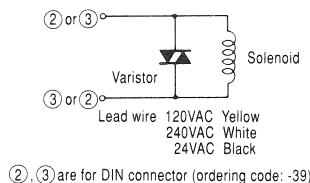


#### Solenoid with LED indicator with surge suppression Order code: -L

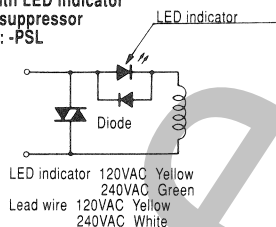


### INTERNAL CIRCUIT – AC

#### STD. Solenoid (Surge protection)



#### Solenoid with LED indicator with surge suppressor Order code: -PSL

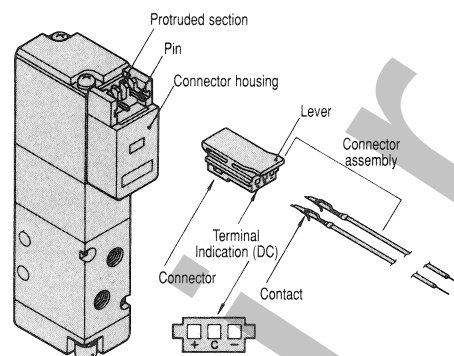


## CAUTIONS

1. Shorting will not occur to the 24VDC solenoid even if the wrong polarity is applied. However, the solenoid valve with surge suppression will not operate. Also the indicator on the valve with the LED indicator will not light.
2. If there is a current leakage in the circuit, improper operation, such as the valve not returning to the proper position, will occur. Make sure to operate the valve well within the limit of current leakage. If a leakage larger than the limit occurs, please consult factory.
3. Double solenoid: Do not apply power to both solenoids simultaneously. The valves may be put into a neutral state.
4. The AC solenoids contain diodes. Therefore, when a number of solenoid valves are connected together, make sure to connect the same color lead wires.

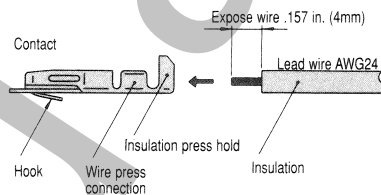
## PLUG CONNECTOR

To plug in, push connector until the lever clips into place. To take plug out, press lever and pull out.



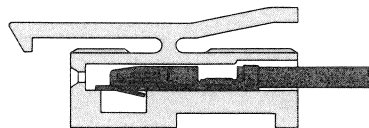
## LEAD WIRE AND CONTACT ASSEMBLY

Remove insulation from the lead wire and expose for 0.157" (4). Insert wire into contact and bend down press holds.



## CONTACT INSERTION AND DISASSEMBLY

Insert contact into square hole of connector until the hook engages. Pull lightly to assure the assembly. Push hook up with small screwdriver from side of connector to disassemble.



## CAUTIONS

1. Do not pull lead wire too hard.
2. Make sure pins on the connector housing are straight before inserting the connector.
3. Use appropriate tool to attach contact on lead wires.

## DIN CONNECTOR

High performance in contamination and environmental protection. Lead wire self stripping system.



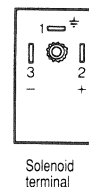
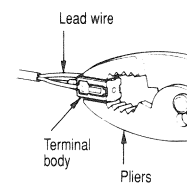
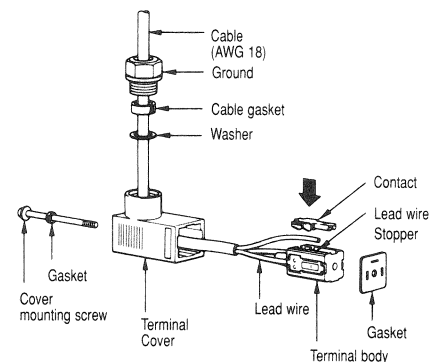
Indicate -39 option in valve order code.

Surge suppressors are equipped as standard feature.

LED indicator cannot be used.

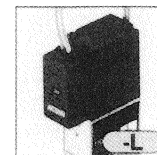
Solenoid w/DIN connector:

No need to strip lead wire. Insert lead wire into terminal body until seated with stopper and press down with pliers to ensure positive connection with the contact.



## LED INDICATOR

Confirm presence of current at coil of grommet type (12" lead wires) with LED.



Indicate -L in plug connector option.

Surge suppressors are equipped as standard feature.

## MANUAL OVERRIDE

### NON-LOCKING

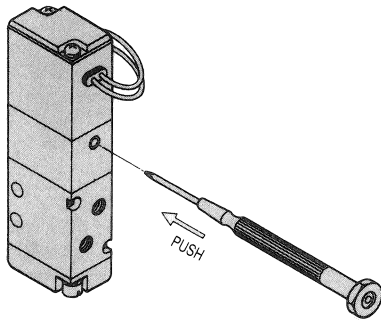
Actuate valve by fully depressing manual override with small tool. Valve remains actuated until manual override is released. Upon release, valve spring returns valve to normal position.

### LOCKING

Use a small tool to push in and turn manual override more than 45° to actuate. Override remains in either direction.

Spring force will return override to normal position when override is turned past the locking position.

If override is not turned to actuate, it may be operated like a non-locking override merely by depressing.



Cautions:

- Since these valves are indirect acting, manual override will not actuate unless air is applied to IN port.
- Do not use a sharp instrument to operate the override as it may damage the button.
- Take care to release locking override before resuming normal operation.

## MANIFOLD

### PIPING

Ports P and R are located at both ends of the manifold. Piping direction can be determined according to 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. Order code is H111M□ -BP or H110M□ -BP).

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 in 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 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.

## CAUTION

Compressed air is powerful and may be dangerous. Before attempting to remove a component from an air line or system, *always* disconnect the supply air and thoroughly exhaust the line or system. *Never* attempt to construct, operate or service anything using compressed air unless you have been properly trained to do so. Failure to heed the warning could result in **SERIOUS, EVEN FATAL, PERSONAL INJURY.**