

**Pneumatic Limiting Relay  
General Instructions**

**APPLICATION**

Pneumatic 1:1 ratio direct acting relay is used to limit minimum or maximum output pressure. The AKR-40605 can also be used as a manual positioner, 1:1 ratio relay and the lowest of two pressures selector. Relay will also increase the capacity of a controller (except when used as maximum output limiter or lowest pressure selector).

**SPECIFICATIONS**

**Action:** 1:1 direct.

**Output:** See Table-1.

**Construction:**

**Housing,** Polysulfone.

**Diaphragm,** Neoprene.

**Adjustments:** See Table-2 for outputs.

**Air Pressure:** Clean, oil free, dry air required (reference EN-123).

**Maximum,** 30 psig (207 kPa).

**Nominal Supply,** 15 to 25 psig (103 to 138 kPa).

**Ambient Limits:**

**Shipping and Storage Temperatures,** -40 to 160°F (-40 to 71°C).

**Operating Temperatures,** 32 to 140°F (0 to 60°C).

**Humidity,** 5 to 95% RH, non-condensing.

**Locations,** NEMA Type 1 indoor only.

**Air Connection Code:** See Table-2.

**Air Connections:** Barbed for 1/4" O.D. plastic tubing.

**Air Consumption for Sizing Air Compressor:** .002 scfm (0.9 ml/s).

**Air Capacity for Sizing Air Mains:** 16 scfm (4.4 ml/s).

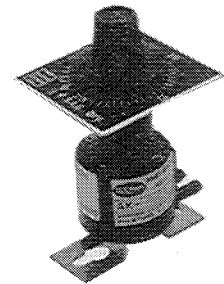
**Mounting:** Panel, wall or in-line; mounting plate and (2) two push-in fasteners for perforated metal subpanel provided.

**Panel Space Required:** 4" high x 2-7/16" wide x 1-3/4" deep (102 mm x 62 mm x 44 mm).

**Maintenance Parts:** None.



**AKR-40605  
Shown with Mounting Plate**



**AKR-40605  
Shown with AK-53098  
Scale Plate and Knob**

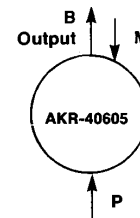


Figure-1 Piping Connections.

Dimensions in inches ( ) mm

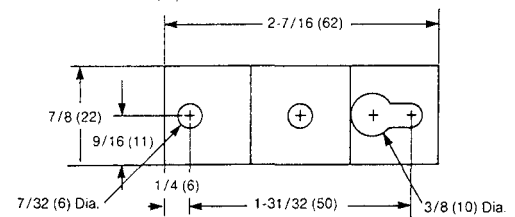


Figure-2 Mounting Bracket Dimensions.

**Table-1 Accessories - Scale Plate and Knob Kit (must be purchased separately).**

Part Number	Description
AK-53098	0 to 20 psig
AK-53198	% Min. O.A.
AK-53298	"Increase" CW
AK-53398	"Increase" CCW
AK-53498	"Close" CW
AK-53598	"Close" CCW
AK-53698	"Warmer" CW
AK-53798	"Warmer" CCW

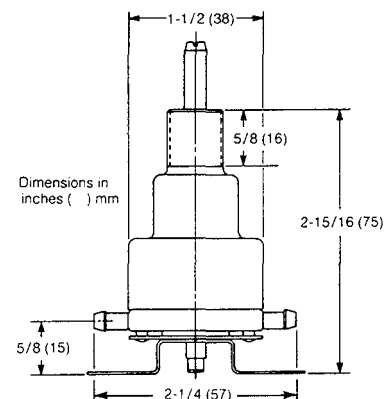


Figure-3 Mounting Dimensions.

**Table-2 Specifications.**

Description	Output	Air Connection Code		
		Port P	Port B <sup>a</sup>	Port M
Minimum Output Limiting	Minimum Output Adjustable 0 to 20 psig (0 to 138 kPa)	Pilot	Output	Main
Maximum Output Limiting	Maximum Output Adjustable 0 to 20 psig (0 to 138 kPa)	Open to Atmosphere	Output	Input
Manual Positioner	Manually Selected from 0 to 20 psig (0 to 138 kPa)	Open to Atmosphere	Output	Main
1:1 Ratio Relay	0 to 20 psig (0 to 138 kPa)	Pilot	Output	Main
Lowest Pressure Selector	Lowest of Two Pressures 0 to 20 psig (0 to 138 kPa)	Input	Output	Input

<sup>a</sup> Output pressure will drop to 0 when main air supply is reduced to 0. The reduced air pressure allows controlled device(s) to return to a "failsafe" condition when main air pressure to the AKR-40605 is relieved.

**Table-3 Accessories - Scale Plate and Knob Kit (must be purchased separately).**

Part Number	Description
AK-53098	0 to 20 psig
AK-53198	% Min. O.A.
AK-53298	"Increase" CW
AK-53398	"Increase" CCW
AK-53498	"Close" CW
AK-53598	"Close" CCW
AK-53698	"Warmer" CW
AK-53798	"Warmer" CCW

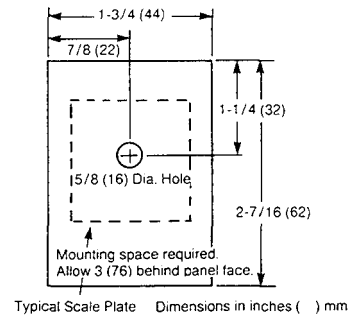


Figure-4 Panel Space and Mounting Hole Size.

**Mounting**

**In-Line**

Pipe with 1/4" plastic tubing (no clamps required).

**Within Control Panel**

Scale and knob kits may be used on AKR-40605 (see Accessories on page 1).

1. Determine mounting location in control panel.
2. Drill mounting holes in subpanel per dimensions shown in Figure 2 or use mounting plate as a template.
3. Secure mounting plate with field supplied screws or use two (2) push-in fasteners provided if metal perforated subpanel is used.
4. Push center post of AKR-40605 into mounting bracket.
5. Pipe with 1/4" plastic tubing.
6. Mount one of the scale and knob kits on the top of the relay (if required by the application).

**Face of Control Panel**

See Figures 4 and 5 for panel space required and mounting hole dimensions.

*Note:* Maximum allowable panel thickness is 7/16" (11 mm).

1. Drill mounting hole in the panel door.
2. Mount the top of the relay to the face of the panel by using one of the scale and knob kits.
3. Pipe with 1/4" plastic tubing.

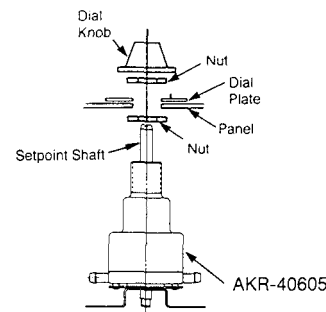


Figure-5 Mounting to Face of Control Panel.

**ADJUSTMENTS AND CHECKOUT**

**Caution:** The setpoint shaft is used for final output adjustment. Do not turn the setpoint shaft all the way into the housing. Turning the setpoint shaft all the way into the housing will damage the relay, voiding the warranty.

**Minimum Output Pressure Application**

See Figures 6 and 7.

**Unit Without a Scale Plate**

1. Disconnect the pilot (P) port connection and leave open to atmosphere.
2. Turn setpoint shaft to obtain the required minimum output.
3. Reconnect the pilot (P) port connection.

## Unit With a Scale Plate

1. Disconnect the pilot (P) port connection and leave open to atmosphere.
2. Turn the setpoint shaft to obtain output pressure which is equal to midscale of the setpoint scale used.
3. Install knob at midscale and secure with 5/64" Allen wrench (TOOL-82).
4. Turn knob to required setpoint.
5. Reconnect the pilot (P) port connection.

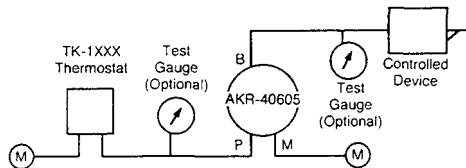


Figure-6 Typical Piping for Minimum Position Application.

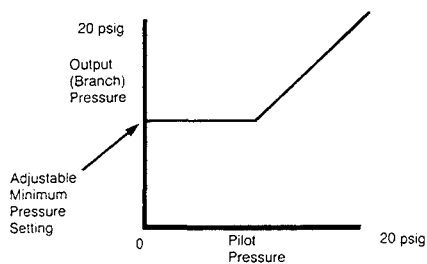


Figure-7 Pilot Pressure vs Output Pressure for Minimum Position Application.

## PRE-INSTALLATION

### Inspection

Visually inspect the carton for damage, if damaged, notify the appropriate carrier immediately. If undamaged, open the carton and visually inspect the device for obvious defects. Return damaged or defective products.

### Required Installation Items

- Piping diagrams
- Tools (not provided):
  - Appropriate screwdriver for mounting screws
  - Appropriate drill and drill bit for mounting screws if unperforated subpanel is used
- Appropriate accessories
- Mounting screws (screws for unperforated subpanel are not provided)

## INSTALLATION

### Caution:

- Installer must be a qualified, experienced technician.
- Make all connections in accordance with the piping diagram.
- Do not exceed ratings of the device.
- Do not locate relay in areas subject to excessive vibration or corrosive atmospheres. NEMA Type 1 housings are intended for indoor use primarily to provide a degree of protection against contact with the enclosed equipment.

### Maximum Output Pressure Application

See Figures 8 and 9.

#### Unit Without a Scale Plate

1. Apply full pressure to the main (M) port.
2. Turn the setpoint shaft to obtain the required maximum output.

#### Unit With a Scale Plate

1. Apply full pressure to the main (M) port.
2. Turn the setpoint shaft to obtain an output pressure which is equal to midscale of the setpoint scale used.
3. Install knob at midscale and secure with 5/64" Allen wrench (TOOL-82).
4. Adjust knob to the required setpoint.

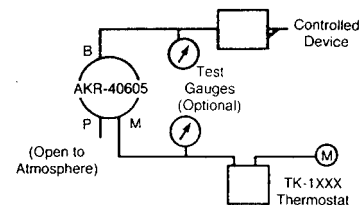


Figure-8 Typical Piping for Maximum Position Application.

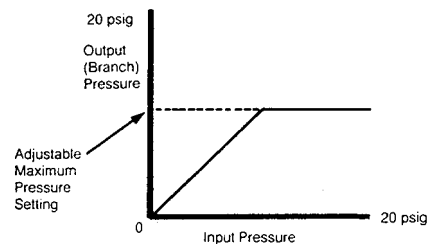


Figure-9 Input Pressure vs Output Pressure for Maximum Position Application.

**Table-4 Competitive Cross Reference.**

Relay Being Replaced	Function Being Replaced	Manufacturer	Port Codes for AKR-40605 Versus Ports for Relay Being Replaced			Plug the Tubing (Main) Attached to the Port Shown Below on the Relay Being Replaced
			Port "P"	Port "B"	Port "M"	
2372-351	1:1 Ratio D.A.	Robertshaw	S	B	M	
2372-351	2 Input Low Signal Selection	Robertshaw	S	B	M	
2372-501 <sup>a</sup>	2 Input Low Signal Selection	Robertshaw	S1	B	M	
2390-501 <sup>b</sup>	Manual Positioner	Robertshaw	Vent <sup>c</sup>	B	M	
2390-505 <sup>b</sup>	1:1 Ratio D.A. Adj. Minimum Limit	Robertshaw	S1	B	M	
2390-510 <sup>b</sup>	1:1 Ratio D.A. Adj. Minimum Limit	Robertshaw	S1	B	M	
2390-515	Manual Positioner	Robertshaw	Vent <sup>c</sup>	B	M	
AK-40605	Limiting Relay	TAC	P	B	M	
AK-50603	1:1 Ratio D.A.	TAC	2	1 or 4	3	
AK-50604 <sup>d</sup>	1:1 Ratio D.A. Adj. Maximum Limit	TAC		1 or 4	2	3
AK-50605	1:1 Ratio D.A. Adj. Minimum Limit	TAC	2	1 or 4	3	
AK-51642	2 Input Low Signal Selection	TAC	Input	Branch	Input	Main
AL-225	Manual Positioner	TAC	Vent <sup>c</sup>	4	3	
AL-241	1:1 Ratio D.A.	TAC	Input	Output	Supply	
AL-291 <sup>d</sup>	1:1 Ratio D.A. Adj. Maximum Limit	TAC	Vent <sup>c</sup>	Output	Input	Supply
AL-292	1:1 Ratio D.A. Adj. Minimum Limit	TAC	Input	Output	Supply	
C-5230-1 <sup>e</sup>	1:1 Ratio D.A. Adj. Minimum Limit	Johnson	2	O	S	
C-5230-1 <sup>ed</sup>	1:1 Ratio D.A. Adj. Maximum Limit	Johnson	Vent <sup>c</sup>	O	2	S
C-5230-2	1:1 Ratio D.A. Adj. Minimum Limit	Johnson	2	O	S	
C-5230-2 <sup>d</sup>	1:1 Ratio D.A. Adj. Maximum Limit	Johnson	Vent <sup>c</sup>	O	2	S
C-5230-3 <sup>e</sup>	1:1 Ratio D.A. Adj. Minimum Limit	Johnson	2	O	S	
C-5230-3 <sup>ed</sup>	1:1 Ratio D.A. Adj. Maximum Limit	Johnson	Vent <sup>c</sup>	O	2	S
R-2080-1	1:1 Ratio D.A.	Johnson	P	O	S	
R432-11	2 Input Low Signal Selection	Robertshaw	S1	B	M	
R432-11	1: Ratio D.A.	Robertshaw	S1	B	M	
R532-L	2 Input Low Signal Selection	Robertshaw	S1	B	M	
RL 243L	2 Input Low Signal Selection	MCC Powers	S	B	M	
RL 243L	1:1 Ratio D.A.	MCC Powers	S	B	M	
RL 243MP <sup>a</sup>	2 Input Low Signal Selection	MCC Powers	TD	R <sup>f</sup>	S <sup>f</sup>	
RL 243MP <sup>a</sup>	1:1 Ratio D.A. Adj. Minimum Limit	MCC Powers	TD (TR)	R	S	
RL 243MP <sup>a</sup>	1:1 Ratio D.A.	MCC Powers	TD	R	S	
RO95A	1:1 Ratio D.A.	Honeywell	1	3	2	
RP2372-351	1:1 Ratio D.A.	Robertshaw	S1	B	M	
RP2372-351	2 Input Low Signal Selection	Robertshaw	S1	B	M	
RP904A	2 Input Low Signal Selection	Honeywell	P2	B	M	
RP904A	1:1 Ratio D.A.	Honeywell	P2	B	M	
RP95A	1:1 Ratio D.A.	Honeywell	1	3	2	
RP970A1008	2 Input Low Signal Selection	Honeywell	3	2	1	
RP970A1008	2 Input Low Signal Selection	Honeywell	3	2	1	
S-224-2 <sup>b</sup>	Manual Positioner	Johnson	Vent <sup>c</sup>	C	S	
S10-11	Manual Positioner	Robertshaw	Vent <sup>c</sup>	3	1	
S510 <sup>b</sup>	Manual Positioner	Robertshaw	Vent <sup>c</sup>	B	M	
S511-10 <sup>b</sup>	1:1 Ratio D.A. Adj. Minimum Limit	Robertshaw	S1	B	M	
S511-5 <sup>b</sup>	1:1 Ratio D.A. Adj. Minimum Limit	Robertshaw	S1	B	M	
S515	Manual Positioner	Robertshaw	Vent <sup>c</sup>	B	M	
SP2390-101	Manual Positioner	Robertshaw	Vent <sup>c</sup>	3	1	
SP93A, B <sup>b</sup>	1:1 Ratio D.A. Adj. Minimum Limit	Honeywell	P	B	M	
SP93A, B <sup>b</sup>	Manual Positioner	Honeywell	Vent <sup>c</sup>	B	M	
SP970A, B	1:1 Ratio D.A. Adj. Minimum Limit	Honeywell	3	2	1	
SP970A, B <sup>b</sup>	Manual Positioner	Honeywell	Vent <sup>c</sup>	2	1	
SW 151-142 <sup>b</sup>	Manual Positioner	MCC Powers	Vent <sup>c</sup>	R	S	

<sup>a</sup> NOTE: AKR-40605 does not perform all the same functions; it replaces only the functions shown.

<sup>b</sup> May require AK-53XXX scale plate and knob kit.

<sup>c</sup> Vent this port to atmosphere.

<sup>d</sup> If a high volume output is required, use a second AKR-40605 as a 1:1 ratio relay.

<sup>e</sup> If C5230-1 or C5230-3 are being used as both low and high limit, then two AKR-40605 piped in series are required.

<sup>f</sup> Remove the check release between ports "R" and "S".

## Manual Positioner Application

See Figures 10 and 11.

1. Apply full pressure to the main (M) port.
2. Turn the setpoint shaft to obtain an output pressure which is equal to midscale of the setpoint scale used.
3. Install knob at midscale and secure with 5/64" Allen wrench (TOOL-82).
4. Adjust knob to the required setpoint.

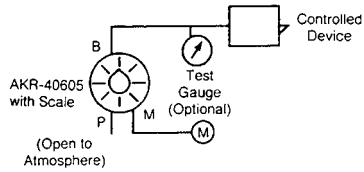


Figure-10 Typical Piping for Manual Position Application.

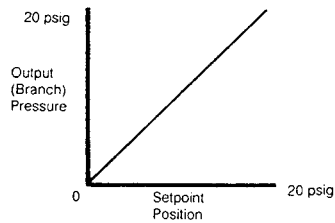


Figure-11 Pilot Pressure vs Output Pressure for Manual Position Application.

## 1:1 Ratio Relay Application (See Figures 12 & 13)

1. Apply full pressure to the main (M) port.
2. The setpoint shaft should be backed out or removed completely from the AKR-40605.

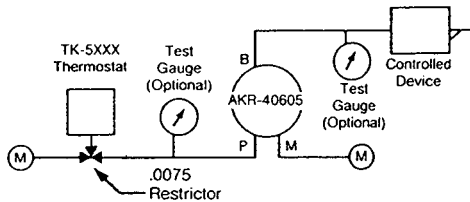


Figure-12 Typical Piping for 1:1 Ratio Application.

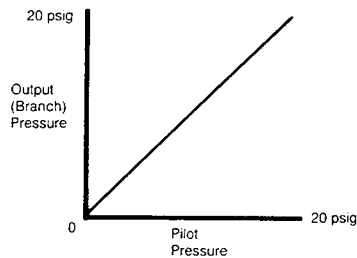


Figure-13 Pilot Pressure vs Output Pressure for 1:1 Ratio Application.

## Lowest Pressure Selector (See Figure 14)

1. The input with the greatest volume capacity is connected to the (M) port and the other input is connected to the (P) port.
2. The setpoint shaft should be backed out or removed completely from the AKR-40605.
3. Adjust one of the inputs to maximum value and the other input to less than the maximum input value. The branch (output) pressure should be the same as the lowest input pressure.
4. Readjust the input controller setpoints to their required values.

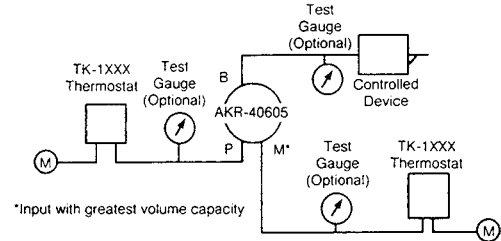


Figure-14 Typical Piping for Lowest of Two Pressures Selector Application.

## FIELD CALIBRATION

None required.

## MAINTENANCE

Regular maintenance of the total system is recommended for sustained optimum performance.

## FIELD REPAIR

Do not field repair. Replace with a functional relay.





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F-22968-4

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