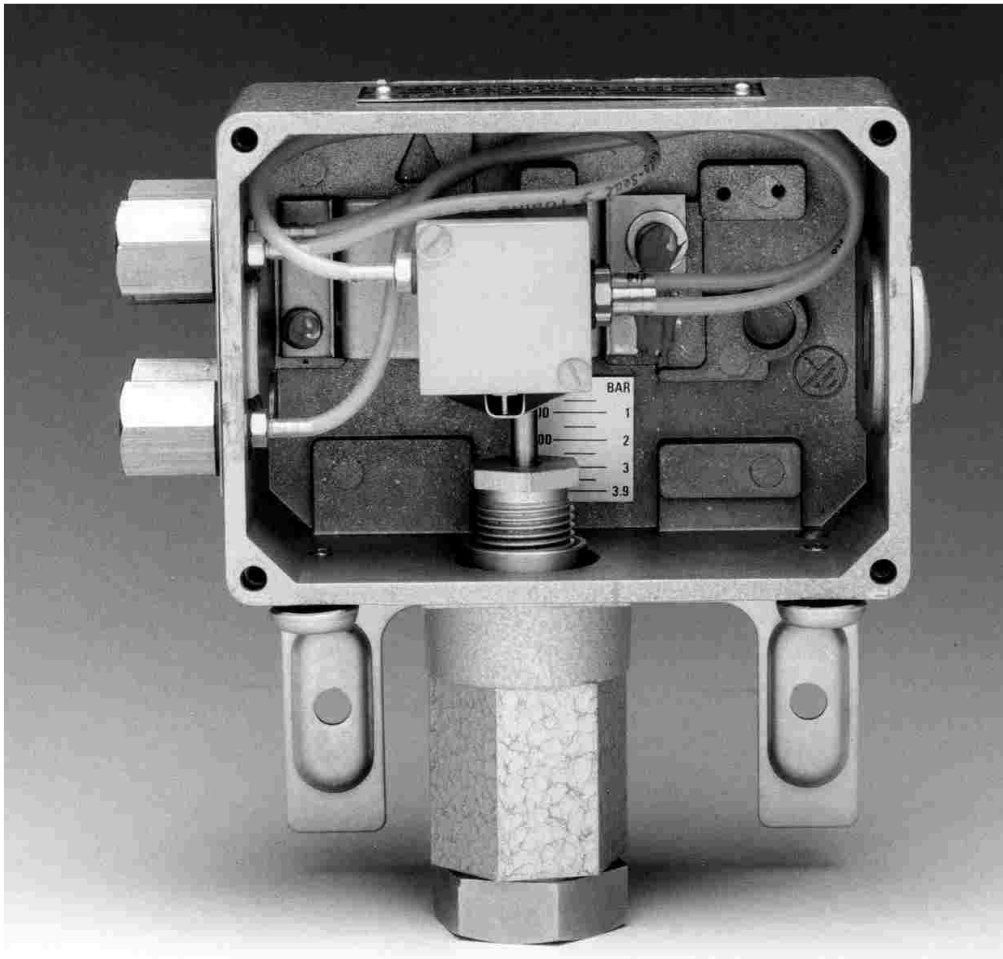


The "BETA AIR RELAY"



The pressure operated AIR RELAY

- Specially designed for:
- Valve Control
 - Offshore & Onshore
 - Zone 0 applications

Products and specifications are liable to be changed without prior notice as a result of technical development or to meet legal requirements. No part of this publication may be reproduced without written permission of BETA.
© Copyright 1995 BETA B.V.

THE REAL SNAP-ACTING AIR RELAY

The "user friendly generation" pressure switches from BETA can also be supplied with a pneumatic switching element (Air Relay).

This pilot operated snap acting pneumatic switching element has very attractive features, such as:

- Snap acting (no throttling band)
- High accuracy
- Low dead band
- Very low range (45 mbar >)

Typical applications for the Air Relay are:

- Valve control
- Bleed-off-shut-down systems
- Alarm systems
- In hazardous area's; even in zone 0 (no spark)

HOW TO SELECT YOUR AIR RELAY ?

Example:

<u>ENCLOSURE</u>	<u>RANGE</u>	<u>PROCESS CONN.</u>	<u>DIAPHR. /O-RING</u>	<u>SWITCH ELEMENT</u>	<u>OPTION</u>	<u>SPECIAL</u>
<u>C1</u>	- <u>P504H</u>	- <u>S1N</u>	- <u>V2</u>	- <u>SA</u>	- <u>..</u>	- <u>..</u>
1	2	3	4	5	6	7

1. ENCLOSURE

Enclosure code	Classification / Material	Air relay ²⁾ connections	Type of		Sensor	
			press.	vac.	diff.	temp.
C1	Weathertight Aluminium¹⁾	4x external 1/4"NPT (F) conn. in brass	√	CF	CF	CF
C8	Weathertight 316 SS	4x external 1/4"NPT (F) conn. in 316 SS	√	CF	CF	CF

1) Silumin (alloy 231) according to DIN 1725

2) Air Relay connection see page 9.

CF = Consult Factory.

2. RANGES for Pressure Switches

Ranges given here are valid for set points at increasing pressure in (m)bar and at 1,5 bar Pilot pressure.

Dead band values are the max. possible values for the pressure switch with Air Relay switching element and elastomer diaphragm/O-ring combination and varies nearly linear with set point between limits of range.

For ranges and dead band values at higher Pilot pressures (up to max. 7 bar) and/or in case of metal diaphragm: Consult your BETA switch Representative.

RANGE CODE	ADJUSTABLE RANGE MAX. DEADBANDS		MAX. OVERRANGE PRESSURE	PROOF PRESS.
P301L P302L	<i>NOT APPLICABLE WITH AIR RELAY</i>			
P304L P306L P308L	45 - 240 mbar 45 - 560 mbar 50 - 1300 mbar	13---- 17,5 mbar 13---- 22,0 mbar 14,5---26,0 mbar	30 bar	35 bar
P402M	<i>NOT APPLICABLE WITH AIR RELAY</i>			
P404M P406M P408M	200 - 950 mbar 220 - 2300 mbar 240 - 5400 mbar	40---- 60 mbar 40---- 90 mbar 40----150 mbar	125 bar	125 bar
P502H	<i>NOT APPLICABLE WITH AIR RELAY</i>			
P504H P506H P508H	0,8 - 3,5 bar 0,9 - 9,0 bar 1,0 - 21,5 bar	0,15---0,30 bar 0,15---0,55 bar 0,15---1,30 bar	200 bar	600 bar
P708H	4,0 - 76 bar	0,70---5,85 bar	400 bar	
P808H P908H	6,0 - 170 bar 14 - 300 bar	1,8----14,5 bar 4,3----30,0 bar		

For Vacuum, Differential and/or Temperature switches with Air Relay please consult factory.

3. PROCESS CONNECTION

PROCESS CONN. SIZE	AVAILABLE ON SENSOR	316 SS		MONEL		ALUMINIUM	
		NPT	BSP	NPT	BSP	NPT	BSP
1/4 "F	L & M	S1N	S1B	M1N	M1B	A1N	A1B
	H						
1/2 "F	L & M	S2N	S2B	M2N	M2B	A2N	A2B
	H						
1"F	L	S4N	S4B	M4N	M4B	A4N	A4B
2"F	L	S6N	S6B	M6N	M6B	A6N	A6B
1/2"M	L & M	S7N	S7B	M7N	M7B		
	H						
1"M	M	S8N	S8B	M8N	M8B	A8N	A8B
	H						

For more complete summary of process connections, see also our General Bulletin "BETA Pressure & Temperature Switches", SP 210.

4. DIAPHRAGM / O-RING

DIAPHRAGM / O-RING CODE	DIAPHRAGM	O-RING	DEAD BAND MULTIPLIER
B1	Buna-N	Buna-N	1.0
E6	EPR	EPR	1.0
K5	Kalrez	Kalrez	1.5
N3	Neoprene	Neoprene	1.0
P1	Teflon	Buna-N	1.5
P2	(polyimide	Viton-A	
P4	coated	Teflon ¹⁾	
P5	with teflon)	Kalrez	
S1	SS316	Buna-N	2.0
S2		Viton-A	
S3		Neoprene	
S4		Teflon ¹⁾	
S5		Kalrez	
S6		EPR	
T1	Tantalum	Buna-N	2.0
T2		Viton-A	
T3		Neoprene	
T4		Teflon ¹⁾	
T5		Kalrez	
V2	Viton-A	Viton-A	1.5
S0	SS316, welded	None ²⁾	3.0
M0	Monel, welded	None ²⁾	3.0

1) Teflon O-ring not suitable for vacuum switches or conditions.

2) In combination with x1N/x1B or x2N/x2B only. For other sizes and materials, consult your BETA representative.

5. SWITCHING ELEMENT "AIR RELAY"

For the BETA Pressure (Vacuum or Temperature) switches the Air Relay is available in two configurations:

Type "SA" for Normally Closed (N.C.) operations

This Air Relay opens a pneumatic circuit when the process pressure (or temperature) exceeds the set point (Actuated). It shuts-off the pneumatic circuit at decreasing pressure (or temperature). (De-actuated)

(Fig. 1)

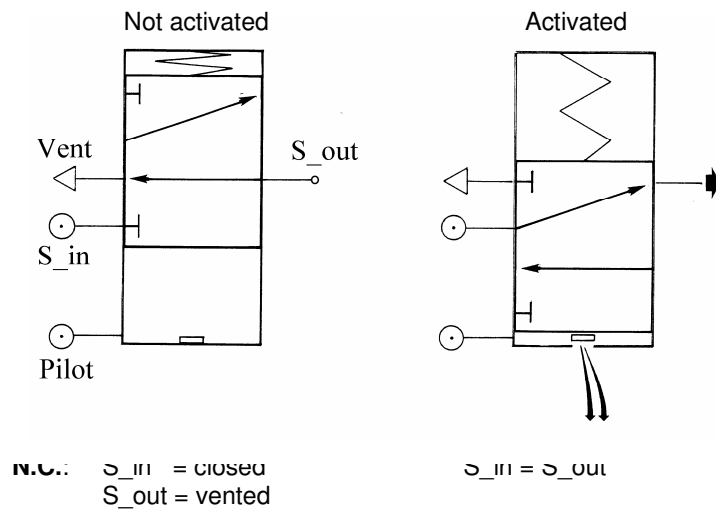


Fig. 1: Air Relay SA, Schematic N.C.

Type "SB" for Normally Open (N.O.) operations

This Air Relay shuts-off a pneumatic circuit when the process pressure (or temperature) exceeds the set point. It opens the pneumatic circuit at decreasing pressure (or temperature).

(Fig. 2)

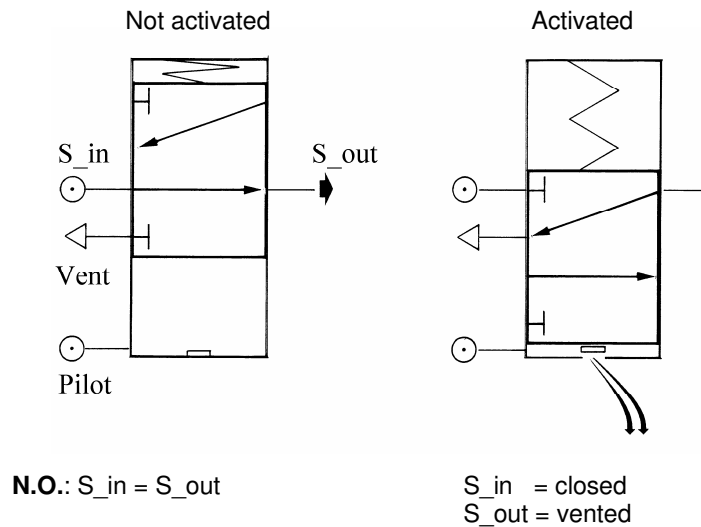


Fig. 2: Air Relay SB, Schematic N.O.

SPECIFICATIONS

Pilot supply pressure	: 1.5 to 7.0 bar
Pilot air consumption	: less then 1 l/ min. at 1.5 bar supply
Signal in pressure	: up to 7.0 bar
Media for Pilot supply and Signal in supply	: clean, dry air or inert gas
Signal flow capacity	: max. 20 l/min. at 1.2 bar

IMPORTANT

The signal pressure should **NOT EXCEED** the pilot supply pressure.
Changing the signal or pilot pressure will result in a change in the adjustable range and the dead band. Consult your BETA Representative.

AIR RELAY CONNECTION (Fig. 3)

The Air Relay connections are situated and clearly marked at one side of the switch enclosure. Standard connections include 1/4" NPTF threaded brass or 316 SS connections.

The external connections are connected to the Air Relay through plastic tubes.

The switch has been provided with a venting port to avoid overpressure in the enclosure.

The "Signal In" pressure connection and the "Pilot Supply" connection may be connected to each other inside the switch enclosure as an option (provided that "Signal In" pressure is > 1.5 bar).

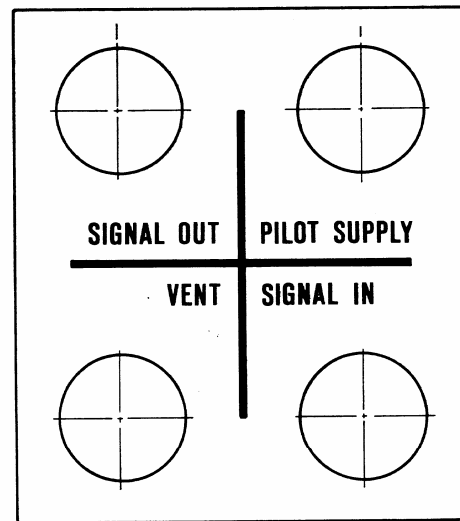


Fig. 3: Indication plate Air Relay connection

6. OPTION

OPTION CODE	OPTION DESCRIPTION
B	Industrial cleaning for oxygen services
M	Vacuum protector plate (not on vacuum switch)
R	Oversized nameplate. Extra: electr. Rating and 2 lines (14 char.) for tag no.
S	Stainless Steel Tag* - wired to enclosure
T	Stainless Steel Tag* - permanently attached
V	Fungicidal varnish coating (internal)
Y	Epoxy coating of switch (external)

* Stainless steel tag has 3 lines, 18 characters or spaces per line.
Standard nameplate has 1 line for tag no. with 18 characters or spaces.

Note: On request we add your tag no. on standard nameplate, free of charge, if information is given on your order.

7. SPECIALS

We can incorporate numerous specials to meet your requirements. These special requirements are indicated by the letter X at the end of the model number, followed by a figure showing the number of specials.

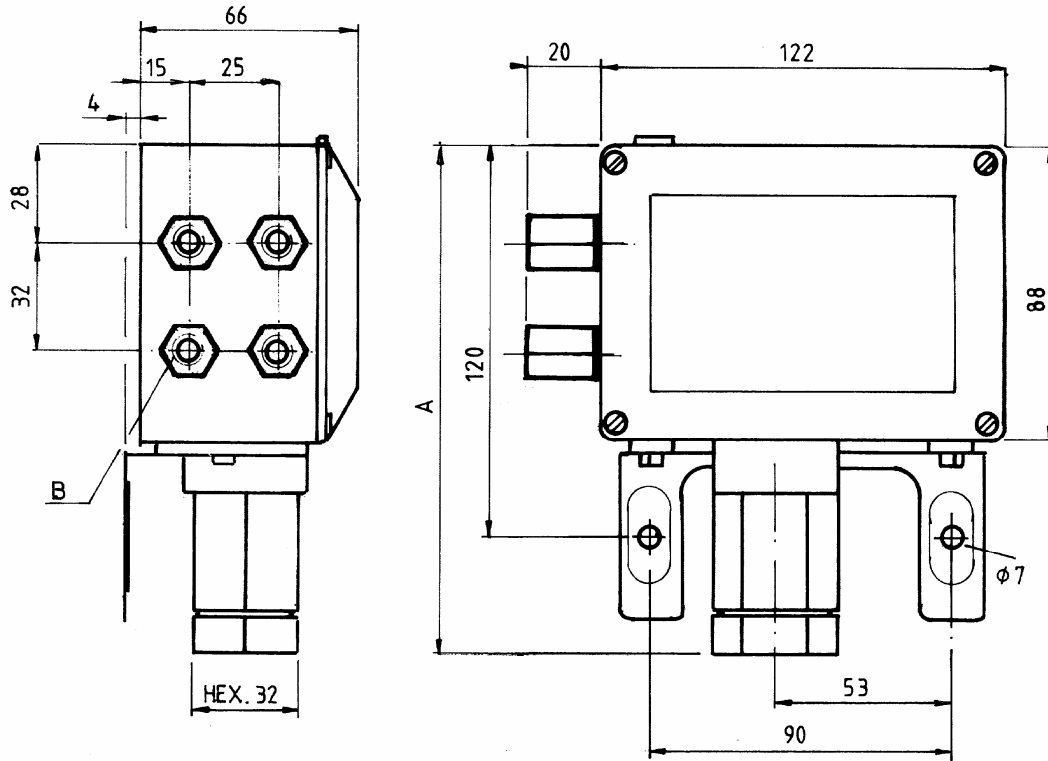
Example:

"X1" at the end of the model reference means **one** special.

"X2" at the end of model reference means **two** specials have been incorporated.

Details of each special must always be specified in full on enquiries and orders.

DIMENSIONAL DRAWING
 (figures are in mm)



TYPE	P...L	P...M	P...H	P...F
1/4" F	152	152	152	160
1/2" F	152	152	156	166
1" F	159	-	-	-
2" F	165	-	-	-
1/2" M	165	165	172	-
1" M	173	173	177	-

Size A in mm ($\pm 1,5$ mm)
 Pneumatic conn.: 1/4" F

“BETA AIR RELAY”

SUPPLEMENT TO AIR RELAY BROCHURE (Internal Technical Information)

GENERAL

1. The Air Relay ("SA"/"SB") will, due to the high operating force, effect the lower end of the **ADJUSTABLE RANGE** and the **MAX. DEADBAND** of the pressure switch.
2. On top of this, the **PILOT PRESSURE** to the Air Relay makes additional calculations necessary.

MINIMUM ADJUSTABLE RANGE AS A FUNCTION ON THE PILOT PRESSURE

The MIN. ADJUSTABLE RANGE has been given in TABEL A. for a Pilot Pressure of 1,5 bar.

The table includes the correction key to be added to the minimum Adjustable Range for Pilot Pressures > 1,5 bar.

The max. Adjustable Range will not be influenced!

MAXIMUM DEADBAND

In TABLE B. is the max. deadband given for a Pilot Pressure of 1,5 bar for different types of diaphragm materials.

The deadband (same as for standard switch) must be completed with an additional value when using a Pilot Pressure > 1,5 bar.



Example: C1-P506H-C1N-B1-SA

Pilot pressure : 6 bar
Setpoint : 6 bar (incr.)

1. Range 0,9 - 9,0 bar (at 1,5 bar Pilot pressure).

With Pilot pressure 6 bar Range: 1,22 - 9,0 bar
(0,32 add. to minimum Range).

2. Max. Deadband 0,15 - 0,4 bar (at 1,5 bar Pilot pressure).

Setpoint : 6 bar (incr.) max. deadband =

$$\frac{0,4 - 0,15}{9,0 - 0,9} \times (6 - 0,9) + 0,15 = 0,30 \text{ bar}$$

$$\begin{aligned} \text{Correction with add. value at Pilot pressure 6 bar} &= \underline{0,35 \text{ bar}} + \\ \text{Max. deadband} &= \underline{0,65 \text{ bar}} \end{aligned}$$

IMPORTANT

For best pressure switch performance, choose always the lowest possible maximum range. Especially in combination with high Pilot Pressures (> 3 bar).

For Vacuum- and/or Temperature switches with Air Relay, please consult factory.

In case you have questions, don't hesitate to call us.

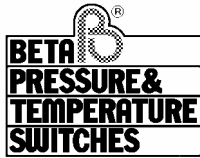
RANGES AIR RELAY

(Internal specification Ranges // Pilot pressure)

TABLE A

range code	adjustable range (Pilot pressure at 1,5 bar)	add to minimum adjustable range for pilot pressure (in bar) of:					
		2	3	4	5	6	7
P301L P302L	NOT APPLICABLE WITH AIR RELAY						
P304L P306L P308L	45 - 240 mbar 45 - 560 mbar 50 - 1300 mbar	2 mbar	5 mbar	10 mbar	15 mbar	20 mbar	25 mbar
P402M	NOT APPLICABLE WITH AIR RELAY						
P404M P406M P408M	200 - 950 mbar 220 - 2300 mbar 240 - 5400 mbar	10 mbar	25 mbar	45 mbar	60 mbar	80 mbar	100 mbar
P502H	NOT APPLICABLE WITH AIR RELAY						
P504H P506H P508H	0,8 - 3,5 bar 0,9 - 9,0 bar 1,0 - 21, 5 bar	0,04 bar	0,10 bar	0,18 bar	0,25 bar	0,32 bar	0,40 bar
P708H	4,0 - 76 bar	0,1 bar	0,4 bar	0,6 bar	0,9 bar	1,1 bar	1,4 bar
P808H	6,0 - 170 bar	0,3 bar	1,0 bar	1,6 bar	2,2 bar	2,8 bar	3,5 bar
P908H	14 - 300 bar	0,5 bar	1,5 bar	2,5 bar	3,5 bar	4,5 bar	5,5 bar

For vacuum, differential and/or temperature switches with Air Relay, please consult factory.



DEADBAND CALCULATION AIR RELAY

TABLE B

RANGE CODE	Maximum Deadband * at 1,5 bar pilot pressure with diaphragm material				Add to maximum deadband for pilot pressure (in bar) of:						maximum overrange pressure (process)	Proof pressure (process)
	Buna-N EPR Neoprene	Teflon Kalrez Viton	Tantalum Hastelloy 316 SS	Welded Metal Diaphragms	2	3	4	5	6	7		
P301L P302L	NOT APPLICABLE WITH AIR RELAY										30 bar	35 bar
P304L	10-13 mbar	13-17,5 mbar	16-22 mbar	22-30 mbar	2	7	12	17	22	27		
P306L	10-15 mbar	13-22,0 mbar	16-28 mbar	22-40 mbar	mbar	mbar	mbar	mbar	mbar	mbar		
P308L	10-20 mbar	14,5 - 26,0 mbar	18-34 mbar	25-50 mbar								
P402M	NOT APPLICABLE WITH AIR RELAY										125 bar	140 bar
P404M	30-45 mbar	40-60 mbar	45-75 mbar	60-105 mbar	10	30	50	70	90	110		
P406M P408M	30-65 mbar 30-105 mbar	40-90 mbar 40-150 mbar	50-115 mbar 50-200 mbar	65-165 mbar 65-285 mbar	mbar	mbar	mbar	mbar	mbar	mbar		
P502H	NOT APPLICABLE WITH AIR RELAY										200 bar	600 bar
P504H	0,15-0,25 bar	0,15-0,30 bar	0,20-0,40 bar	0,25-0,55 bar	0,05	0,12	0,20	0,27	0,35	0,45		
P506H	0,15-0,40 bar	0,15-0,55 bar	0,20-0,75 bar	0,25-1,05 bar	bar	bar	bar	bar	bar	bar		
P508H	0,15-0,90 bar	0,15-1,30 bar	0,20-1,70 bar	0,25-2,50 bar	bar	bar	bar	bar	bar	bar		
P708H	0,50-4,00 bar	0,70-5,85 bar	0,85-7,75 bar	1,15-11,50 bar	0,15 bar	0,40 bar	0,70 bar	1,0 bar	1,25 bar	1,55 bar		
P808H	1,2- 9,7 bar	1,8-14,5 bar	2,4-18,9 bar	3,3-28,7 bar	0,35 bar	1,05 bar	1,75 bar	2,45 bar	3,15 bar	3,90 bar		
P908H	3,2-20,4 bar	4,3-30,0 bar	5,4-40,0 bar	7,6-59,5 bar	0,55 bar	1,65 bar	2,80 bar	3,90 bar	5,00 bar	6,10 bar		
											400 bar	

The maximum deadband varies nearly linear the setpoints between the indicated limits of adjustable range.