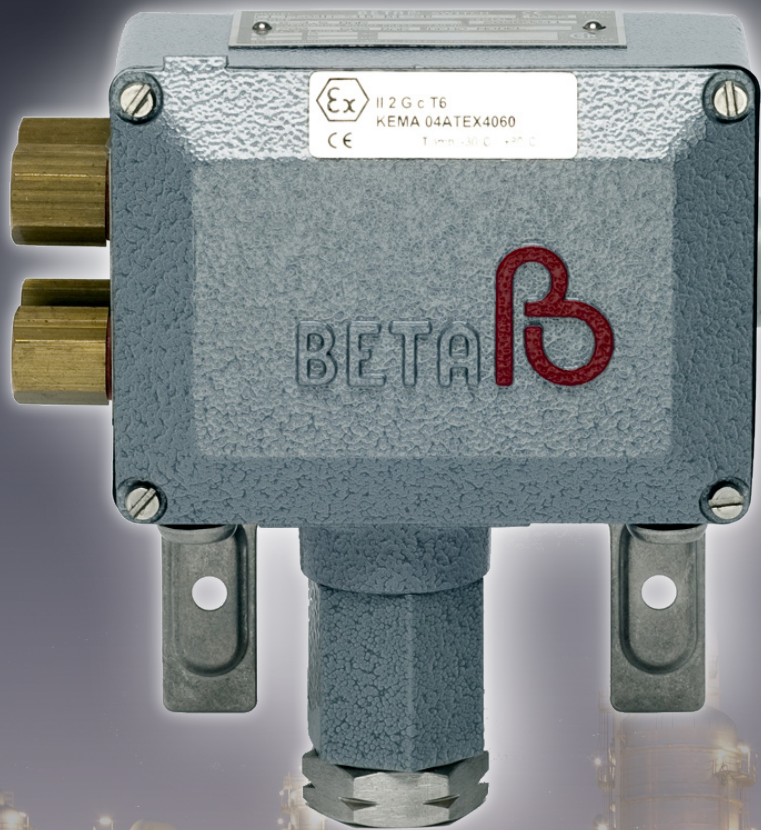




# BETA AIR RELAY

## Pressure & Temperature Switches



## The pressure operated AIR RELAY

Specially designed for:

- Snap acting pneumatic control.
- Control of pneumatic motors / valves.
- Offshore & Onshore.
- Zone 0 applications.



# THE REAL SNAP-ACTING AIR RELAY

# THE “BETA AIR RELAY”: Your special is our standard!

The “user friendly generation” pressure and temperature 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 deadband
- 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)



## The user-friendly generation



# HOW TO SELECT YOUR BETA AIR RELAY SWITCH

BETA uses a simple and logical model code system for easy, accurate product specification, project coordination, efficient document handling and after sales service.

	C1	-	P504H	-	S1N	-	V2	-	SA	-	B	-	X1
1 ENCLOSURES													
2 RANGES													
3 PROCESS CONNECTIONS													
4 DIAPHRAGM / O-RINGS													
5 SWITCH ELEMENTS													
6 OPTIONS													
7 SPECIALS													

## TO SELECT YOUR SWITCH

Follow section 1 through 5

If required: For “Optional” and “Special” accessories  
Follow section 6 or 7 .

Ambient temperature:

Standard: -30 to +80°C

Repeatability:

± 0.5% of Full Range\* (measured at 20°C ambient  
temperature acc. to ANSI/I.S.A.-S51.1-1979).

Tagging/ setting:

BETA will add your tag no. on the nameplate and set the  
pressure switches at desired setpoint if this is clearly indicated.  
on your order.

Temperature switches can also be set at an additional charge.

Warranty:

36 months from EX-Works date of manufacture excl. “wetted parts”  
and use of clean, dry air or inert gas as pilot/ supply only!

**Note:**

Wetted parts are not guaranteed against corrosion or permeation since processes vary from plant and concentration of harmful fluids, gasses or solids vary from time to time in a given process.  
Empirical experience by users should be the final guide and alternate materials based on this are generally available.



# AIR RELAY SWITCHES

## 1 ENCLOSURES

C1 - P504H - S1N - V2 - SA - B - X1

ENCLOSURE CODE	CLASSIFICATION/MATERIAL	AIR RELAY CONNECTION	TYPE OF SENSOR			
			Pressure	Vacuum	Differential	Temperature
C1 <sup>1)</sup>	Weathertight (IP65) Aluminium	4x external 1/4"NPT (F) connection in <b>Brass</b>	√	√	√	√
C8	Weathertight (IP65) SS 316	4x external 1/4"NPT (F) connection in <b>SS 316</b>	√	√	√	√

<sup>1)</sup> Is powder coated acc. SP025, dry film thickness approx. 70 microns finnish hamertone silver/grey high gloss.  
Due to the nature of hammertone finnish some color difference might be visible and cannot be avoided.  
This has no effect on the integrity of the enclosure protection.

## 2 RANGES for AIR RELAY Presure Switches

C1 - **P504H** - S1N - V2 - SA - B - X1

RANGE CODE	ADJUSTABLE RANGE		MAX. DEADBAND		MAX. OVRERRANGE PRESSURE	PROOF PRESSURE
		bar [mbar]		bar [mbar]	bar	bar
P 301 L <sup>1)</sup> P 302 L <sup>1)</sup>	Not possible with AIR RELAY					
P 304 L P 306 L P 308 L	[45 - 240] [45 - 560] [50 - 1300]	[mbar] [mbar] [mbar]	[13 - 17.5] [13 - 22] [14.5 - 26]	[mbar] [mbar] [mbar]	30	35
P 402 M	Not possible with AIR RELAY					
P 404 M P 406 M P 408 M	[200 - 950] [220 - 2300] [240 - 5400]	[mbar] [mbar] [mbar]	[40 - 60] [40 - 90] [40 - 150]	[mbar] [mbar] [mbar]	125	140
P 502 H		Not possible with AIR RELAY				
P 504 H P 506 H P 508 H P 708 H P 808 H P 908 H P 909 H	0.8 - 3.5 0.9 - 9.0 1.0 - 21.5 4 - 76 6 - 170 10 - 30 14 - 300	bar bar bar bar bar bar bar	0.15 - 0.30 0.15 - 0.55 0.15 - 1.3 0.70 - 5.85 1.8 - 14.5 4.3 - 30 4.3 - 31.5	[mbar] [mbar] [mbar] bar bar bar bar	200    300 400	600

Ranges given here are valid for setpoints at increasing pressure in (m)bar and at 2 bar Pilot supply pressure.

Deadband 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.

Ranges and deadband values may vary at higher Pilot pressures (up to max. 7 bar) and/ or in case of metal diaphragm. Consult your BETA switch Representative.

## RANGES for AIR RELAY Vacuum Switches

RANGE CODE	ADJUSTABLE RANGE <sup>1)</sup> (INCR. VAC. TO PRESS.)		MAX. DEADBAND (VAC. / PRESS.)		MAX. VACUUM	MAX. OVERRANGE PRESSURE		PROOF PRESSURE	
		bar [mbar]		mbar	bar [mbar]		bar		bar
V 304 L	[-40/0/+150]	[mbar]	4/4/6.5	mbar	[-500]	[mbar]	+30	bar	+35 bar
V 406 M	-0.6/0/+1	bar	30/30/40	mbar	-1	bar	+125	bar	+140 bar
V 506 H	-0.7/0/+6	bar	80/80/25	mbar	-1	bar	+200	bar	+600 bar

<sup>1)</sup> For setpoint around zero bar gauge, consult factory.

# AIR RELAY SWITCHES

## RANGES for Differential switches

RANGE CODE	ADJUSTABLE RANGE DIFF. RANGE		TYPICAL DEADBAND		MAX. STATIC PRESSURE		MAX. OVERRANGE PRESSURE		PROOF PRESSURE	
	[mbar]	bar	[mbar]	bar	bar		bar		bar	
D 304 L	[22 - 180]	[mbar]	[8]	[mbar]	30	bar	30 <sup>3)</sup>	bar	35	bar
D 306 L	[25 - 450]	[mbar]	[11]	[mbar]						
D 309 L	[35 - 1250]	[mbar]	[15]	[mbar]						
D 352 H	[ 80 - 160]	[mbar]	[25]	[mbar]	200	bar	200 <sup>4)</sup>	bar	200	bar
D 354 H	[100 - 500]	[mbar]	[35]	[mbar]						
D 356 H	[120 - 1450]	[mbar]	[50]	[mbar]						
D 359 H	[150 - 3450]	[mbar]	[75]	[mbar]						

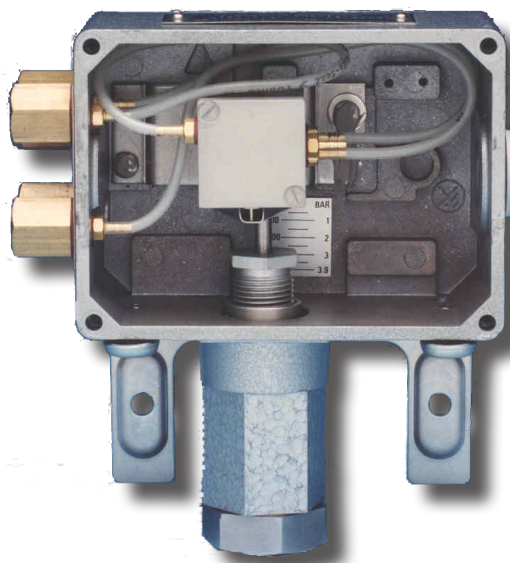
IN THE FOLLOWING TABLE THE ESTIMATED INFLUENCE FOR INCREASING STATIC PRESSURE IS GIVEN.  
(Provided pilot / supply pressure is the same.)

SENSOR	SETPOINT	DEADBAND
D...L	1 mbar/bar	= -10 mbar/bar
D...H	-2 mbar/bar	= -5 mbar/bar

Example: D...H-type Diff. setpoint: 1 bar (1000 mbar).

If static pressure increases 10 bar Diff.setpoint will be  $(10 \times -2 \text{ mbar}) = -20 \text{ mbar}$  less = 980 mbar.

**NOTE:** For differential application outside above ranges consult your BETA Switch Representative.



Differential Pressure Switches can use the same Diaphragm/O-ring combinations as Pressure Switches but we have to consider following:

TYPE	STANDARD	FOLLOWING COMBINATIONS ARE POSSIBLE
D...H	P1	Metal + TCP

**Note:** Pilot pressure > 2 bar will influence deadband also the same as for pressure switch.  
Consult your Beta representative.

# AIR RELAY SWITCHES

3

PROCESS CONNECTIONS

C1

-

P504H

-

S1N

-

V2

-

SA

-

B

-

X1

PROCESS CONNECT SIZE / CODE	AVAILABLE ON SENSOR <sup>2)</sup>	ALUMINIUM		SS 316		MONEL	
		NPT	BSP	NPT	BSP	NPT	BSP
1/4"F	L	A1N	A1B	S1N	S1B	M1N	M1B
	H						
1/2"F	L	A2N	A2B	S2N	S2B	M2N	M2B
	H						
1"F	L			S4N	S4B		
2"F	L			S6N	S6B		
1/2"M	L & M			S7N	S7B		
	H						
1"M	L			S8N	S8B		
	H						

NOTES:

\*\* Process connection according to NACE standards are available, consult your BETA Switch Representative.

\*\* NPT connections are tapered; BSP are parallel threaded.





# AIR RELAY SWITCHES

## 4 DIAPHRAGM / O-RINGS

C1 - P504H - S1N - **V2** - SA - B - X1

DIAPHRAGM/ O-RING CODE	DIAPHRAGM <sup>5)</sup>		O-RING	USE <sup>1)</sup>	DEADBAND MULTIPLIER
B1	Buna-N		Buna-N	Standard water / oil (-30°C to +80°C).	1.0
E6	EPDM		EPDM	Some hydraulic fluids.	1.0
K5	Kalrez		Kalrez	Highly corrosive fluids.	1.5
M1	Monel		Buna-N	Seawater.	2.0
M2			Viton-A <sup>4)</sup>	High temperature NOT below -10°C. <sup>6)</sup>	
M4			PTFE <sup>3)</sup>	Corrosive acids.	
M5			Kalrez	Highly corrosive and permeative acids.	
N3	Neoprene		Neoprene	When required.	1.0
P1	PTFE (Polyimide coated with PTFE)		Buna-N	Oil / air / water.	1.5
P2			Viton-A <sup>4)</sup>	High temperature NOT below -10°C. <sup>6)</sup>	
P4			PTFE <sup>3)</sup>	Corrosive acids.	
P5			Kalrez	Corrosive acids.	
S1	SS 316		Buna-N	Permeative gases.	2.0
S2			Viton-A <sup>4)</sup>	High temperature NOT below -10°C <sup>6)</sup>	
S3			Neoprene	Permeative refrigerant gases.	
S4			PTFE <sup>3)</sup>	Corrosive acids.	
S5			Kalrez	Highly corrosive and permeative acids.	
S6			EPDM	Steam.	
T1	Tantalum		Viton-A <sup>4)</sup>	Highly corrosive and permeativr gases and non-acid liquids. Select O-ring as required.	2.0
T2			Buna-N		
T3			Neoprene		
T4			PTFE <sup>3)</sup>		
T5			Kalrez		
V2	Viton-A		Viton-A <sup>4)</sup>	High temperature NOT below -10°C. <sup>6)</sup>	1.5
S0	SS 316	Welded diaphragm	None <sup>2)</sup>	Highly permeative gases.	3.0
M0	Monel				

<sup>1)</sup> Wetted parts are suggested for use on the service indicated. However they do not constitute a guarantee against corrosive or permeation since processes vary from plant to plant.

Empirical experience by users should be the final guide. The diaphragm / O-Ring combinations are for process temperatures of -30°C to +80°C, unless otherwise indicated.

For process temperatures beyond these limits please contact your BETA Switch Representative.

<sup>2)</sup> Only for 1/4" & 1/2" process connections. Not available on vacuum switches. For other sizes and materials, consult your BETA Switch Representative.

<sup>3)</sup> PTFE O-Ring not suitable for vacuum switches or vacuum conditions.  
(Wetted internal spring of Co-Cr-Ni alloy, comparable with Elgiloy).

<sup>4)</sup> For process temperature > 100 °C, consult your BETA Switch Representative.

<sup>5)</sup> Other diaphragm materials like Hastelloy available, consult your BETA Switch Representative.

<sup>6)</sup> High temperature refers to max. 140 °C at process connection.

### Note:

Wetted parts are not guaranteed against corrosion or permeation since processes vary from plant and concentration of harmful fluids, gasses or solids vary from time to time in a given process.

Empirical experience by users should be the final guide and alternate materials based on this are generally available.

# AIR RELAY SWITCHES

## 5 SWITCHING ELEMENTS

C1 - P504H - S1N - V2 - **SA** - B - X1

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)

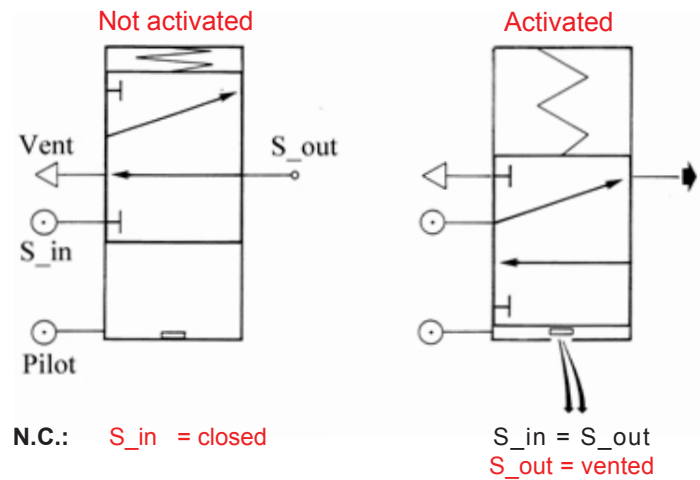


Fig. 1: Air Relay SA, Schematic N.C.

### 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)

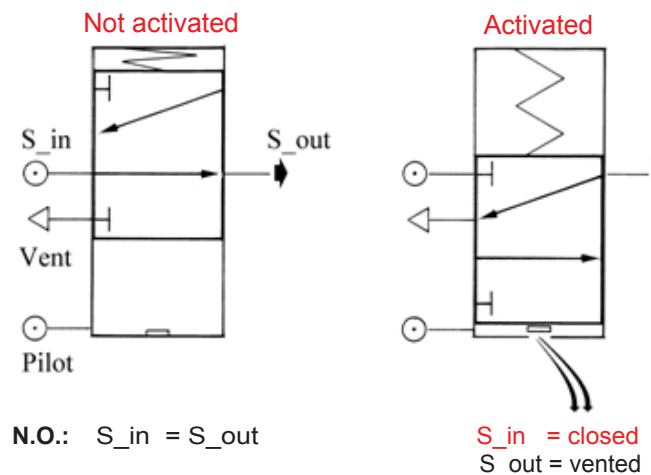


Fig. 2: Air Relay SB, Schematic N.O.

## GENERAL SPECIFICATIONS: AIR RELAY / SA / SB

- Pilot supply pressure : 2 to 7.0 bar
- Pilot air consumption : less than 1 l/ min. at 2 bar supply
- Signal in pressure : up to 7.0 bar **maximum**.
- Media for Pilot supply and Signal in supply : clean, dry air or inert gas
- Signal flow capacity : max. 20 l/min. at 2 bar

### IMPORTANT:

The signal pressure should NOT be lower than 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 SWITCHES

## AIR RELAY CONNECTION (Fig. 3)

The Air Relay connections are situated and clearly marked at one side of the switch enclosure.

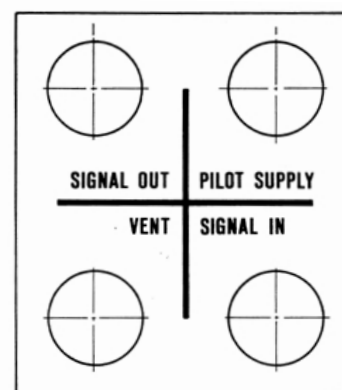
Standard connections include 1/4" NPTF threaded brass (standard **C1** Enclosure) or 316 SS connections.

(standard **C8** Enclosure, option for C1 Enclosure.)

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 > 2 bar).

Fig. 3: Indication plate Air Relay connection

## 6 OPTIONS

C1 - P504H - S1N - V2 - SA - **B** - X1

OPTION CODE	DESCRIPTION
<b>B</b>	Industrial cleaning of "wetted" parts for oxygen services.
<b>M</b>	Vacuum protection plate (Standard SS 316).
<b>S</b>	Stainless steel Tag key ringed to enclosure. Tag has 2 lines (16 characters per line).
<b>Y</b>	Epoxy coating of switch (External)

Tag no. space on nameplates \_\_ added free of charge

Standard nameplate C - Series : 2 lines with 16 characters or spaces  
+ 1 line with 14 characters or spaces

## 7 SPECIALS

C1 - P504H - S1N - V2 - SA - B - **X1**

We can incorporate numerous specials to meet your requirements.

These special requirements are indicated by the letter "X" in the model code or at the end of the model number, followed by a figure showing the number of specials.

**Example:**

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

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

Details of each special must always be specified completely on inquiries and orders.

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

# AIR RELAY SWITCHES

## RECAPTURE: SELECT YOUR BETA AIR RELAY SWITCH

### 1 ENCLOSURES

C1	-	P504H	-	S1N	-	V2	-	SA	-	B	-	X2
----	---	-------	---	-----	---	----	---	----	---	---	---	----

See section 1. **Enclosure** on page 4.

### 2 RANGES

C1	-	P504H	-	S1N	-	V2	-	SA	-	B	-	X2
----	---	-------	---	-----	---	----	---	----	---	---	---	----

See section 2. **Range** on page 4, and 5.

### 3 PROCESS CONNECTIONS (Material / Size / Thread)

C1	-	P504H	-	S1N	-	V2	-	SA	-	B	-	X2
----	---	-------	---	-----	---	----	---	----	---	---	---	----

See section 3. **Process connections** on page 6.

### 4 DIAPHRAGM/ O-RINGS

C1	-	P504H	-	S1N	-	V2	-	SA	-	B	-	X2
----	---	-------	---	-----	---	----	---	----	---	---	---	----

See section 4. **Diaphragm / O-ring** on page 7.

### 5 SWITCHING ELEMENTS

C1	-	P504H	-	S1N	-	V2	-	SA	-	B	-	X2
----	---	-------	---	-----	---	----	---	----	---	---	---	----

See section 5. **Switching Elements** on page 8.

Selection of your switch is now completed.

If required: For “Optional” and “Special” accessories

**Options** : See section 6. **Options**” on page 9/ 12.

**Specials**: See section 7. **Specials**” on page 9/ 12.

# AIR RELAY SWITCHES

## TEMPERATURE SWITCHES

### 1 ENCLOSURES

C1 - T548H - D00 - S0 - SA - Y - X2

### 2 RANGES

C1 - T548H - D00 - S0 - SA - Y - X2

RANGE CODE	ADJUSTABLE RANGE		MAX. DEADBAND <sup>3)</sup>		MAX. TEMPERATURE		PROOF TEMPERATURE		MAX. PROCESS PRESSURE	
T 528 H	-35 / +40	°C	15	°C	+125	°C	+200	°C	175	bar
T 548 H	0 / +95	°C			+200	°C	+250	°C		
T 568 H <sup>1)</sup>	+60 / +180	°C			+300	°C	+350	°C		
T 588 H <sup>2)</sup>	+160 / +300	°C	15.5	°C	+400	°C	+450	°C		

<sup>1)</sup> In case process temperature > 140 °C, Direct mount sensing bulb is not recommended.

<sup>2)</sup> Not in combination with Direct mount sensing bulb.

### 3 SENSOR BULBS

C1 - T548H - D00 - S0 - SA - Y - X2

PROCESS CONNECTION	SENSOR CODE	TYPE OF TEMPERATURE SENSING BULB			
1/2" NPT (M)	D00	Direct mount. <sup>1)</sup>	128 mm length		
	D02		225 mm length		
	C02	Capillary mount.	2 m. capillary length		
	C03		3 m. capillary length		
	C05		5 m. capillary length		
	C10		10 m. capillary length		
	CXX		Special capillary length <sup>2)</sup>		

**Note:** All SS 316 stainless steel sensor, capillary (SS 304 armored) and compression fitting.

<sup>1)</sup> Not in combination with range T588H (+160/+300 °C), not recommended with T568H in case of process temperature >140 °C.

<sup>2)</sup> Length of capillary should be specified, consult your BETA Switch Representative. (Max 15 m.)

\*\* Thermowells available, see page 12.

### 4 DIAPHRAGM / O-RINGS

C1 - T548H - D00 - S0 - SA - Y - X2

All temperature switches have "S0" welded diaphragm.

### 5 SWITCHING ELEMENTS

C1 - T548H - D00 - S0 - SA - Y - X2



# AIR RELAY SWITCHES

## TEMPERATURE SWITCHES

### 6 OPTIONS

C1 - T548H - D00 - S0 - SA - Y - X2

OPTION CODE	DESCRIPTION
S	Stainless steel Tag key ringed to enclosure. Tag has 2 lines (16 characters per line).
V	Fungicidal varnish coating (internal).
Y	Epoxy coating of enclosure and sensorbody (external).

Tag no. space on nameplates    added free of charge

Standard nameplate C - Series : 2 lines with 16 characters or spaces  
+ 1 line with 14 characters or spaces

### 7 SPECIALS

C1 - T548H - D00 - S0 - SA - Y - X2

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

Example:

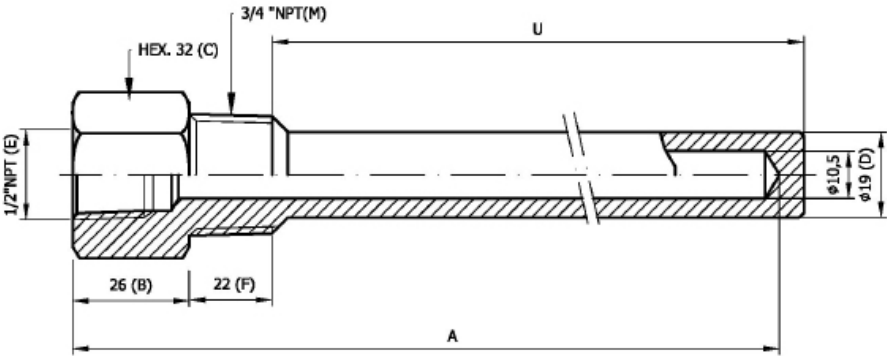
“X1” at the end of model reference means one special.

“X2” at the end of model reference means two specials have been incorporated.

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

## ACCESSORIES

### Thermowell (SS 316)



Standard BETA Thermowell

CODE	INSERTION LENGTH U (MM)	INSERTION ELEMENT LENGHT A (MM)	FIT TO BETA TEMP. SENSING BULB
TW 11	115	155	D00, C02, C03
TW 15	155	195	C02, C03, C05
TW 19	190	228	D02, C02, C03, C05

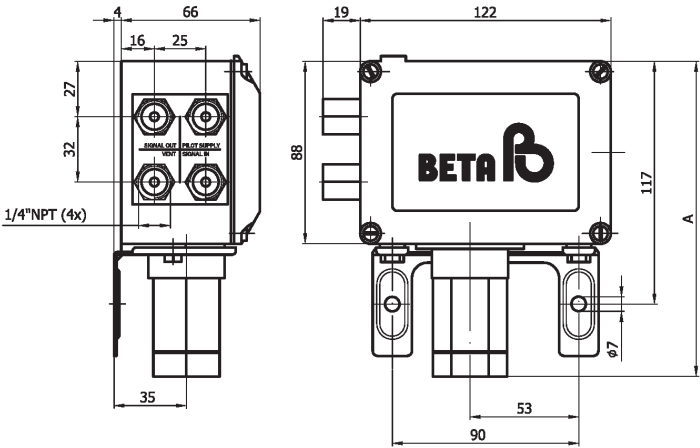
NOTES:

- BETA Thermowells to be ordered as separate item. Do not include Thermowell code into the switch code.
- Special Thermowell possible. Consult your BETA Switch Representative.

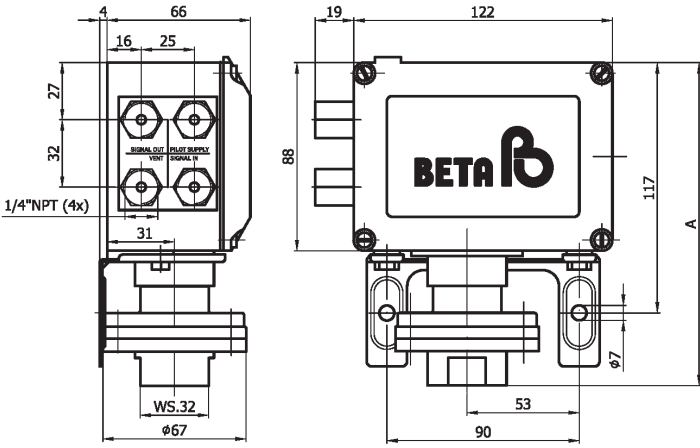
# AIR RELAY SWITCHES

## DIMENSIONS

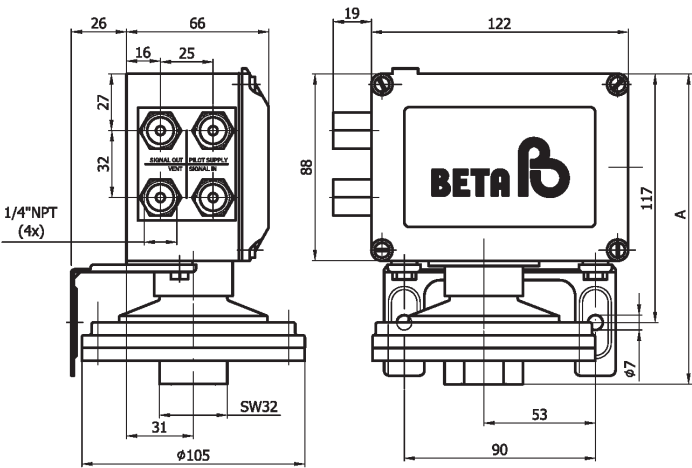
“C”- Series: Pressure & Vacuum “P...H/ F”



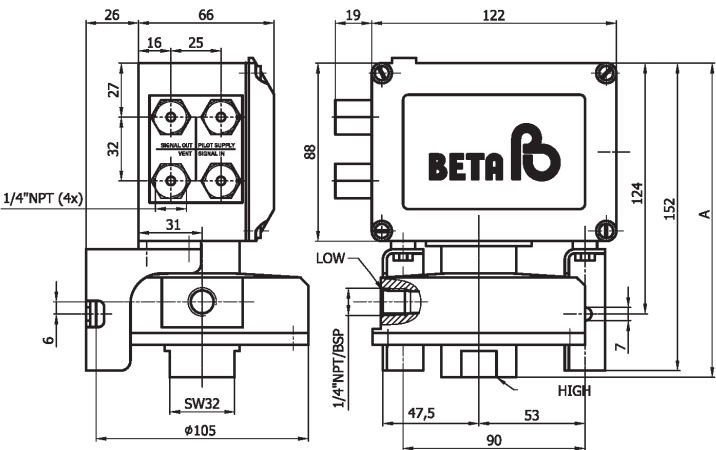
“C”- Series: Pressure & Vacuum “P...M”



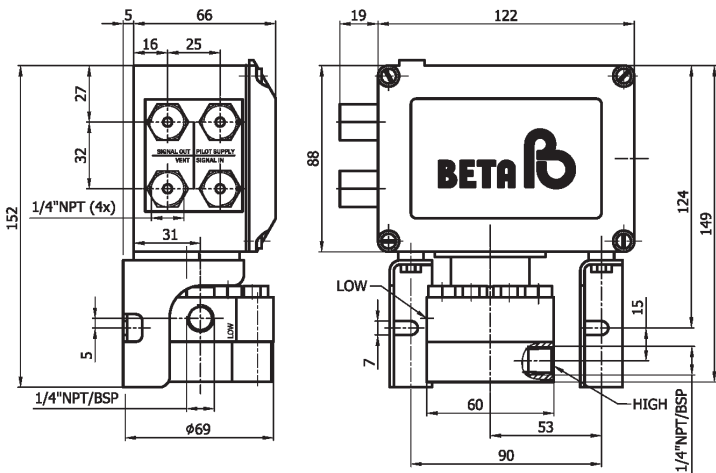
“C”- Series: Pressure & Vacuum “P...L”



“C”- Series: Differential “D...L”



“C”- Series: Differential “D...H”

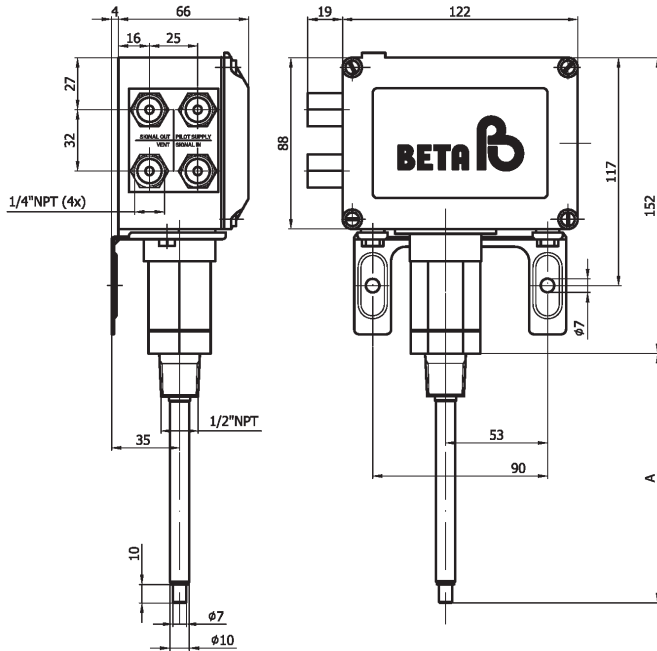


Dimensions given here are for 1/4" and 1/2" (F) process connections: For "H"-sensor with 1/2" (F) add 4 mm on "A" dimension.  
Sizes in mm, tolerances  $\pm 1,5$  mm.

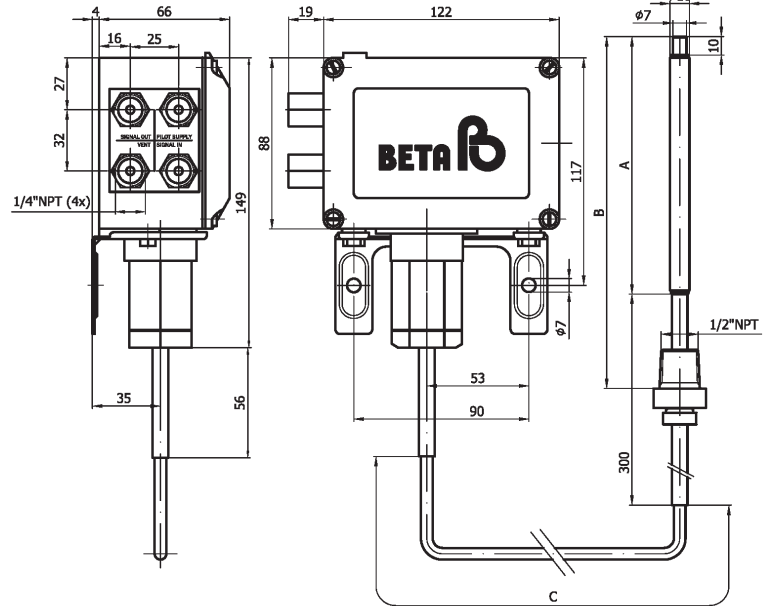
# AIR RELAY SWITCHES

## DIMENSIONS

“C”- Series: Temperature “T..H / D”



“C”- Series: Temperature “T..H-C”



## BETA AIR RELAY SWITCHES FOR HAZARDOUS AREA

The “BETA Switch”, well known as a safety instrument, adds an extra dimension to industrial safety by having area approval by ATEX.

- Worldwide agency approvals.
- “User Friendly” Modifications – Standard features incorporated for your safety.
- Very wide rangeability with 100% accuracy over the full range – Fewer switches required to meet customers specifications / requirements / needs.
- Only 3 process wetted parts.
- Very high overrange pressures – No setpoint shift or damage to sensor.
- No maintenance.
- Wetted parts to NACE standard available.





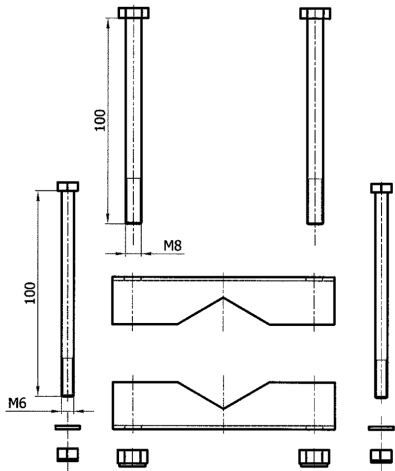
# AIR RELAY SWITCHES

## 2" Pipe mount bracket (SS 304)

**Contents :**  
2 x bolts M6 x 100 mm + washer + nut  
Size +/- 1,5 mm / Material SS 304

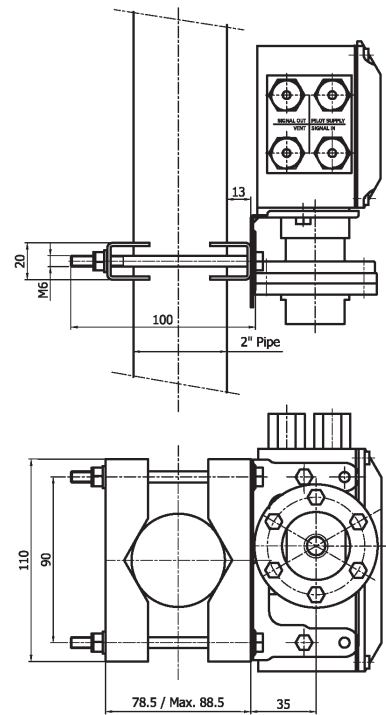
**Disclaimer :**  
This pipe mount bracket is solely intended for use in combination with BETA Pressure & Temperature Switches.

Foundation vibrations, as well as process vibrations, can disturb the proper functioning of the mounted instrument, the use of this bracket does not prevent or diminishes such occurrence.



## 2" Pipemount Set (SS 304) Configuration Examples

"C." Series Enclosure on 2" Pipe



Dimensions given here are for 1/4" and 1/2" (F) process connections: For "H"-sensor with 1/2" (F) add 4 mm on "A" dimension.  
Sizes in mm, tolerances ± 1,5 mm.

# BETA AIR RELAY

## Pressure & Temperature Switches

Contact:

**BETA** Pressure & Temperature switches  
are designed & manufactured in The Netherlands



**Office:**  
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2288 EL Rijswijk. The Netherlands

Phone: +31 (0)70 3199 700  
Fax: +31 (0)70 3199 790

E-mail: [2sales@beta-b.nl](mailto:2sales@beta-b.nl)  
Internet: [www.beta-b.nl](http://www.beta-b.nl)

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