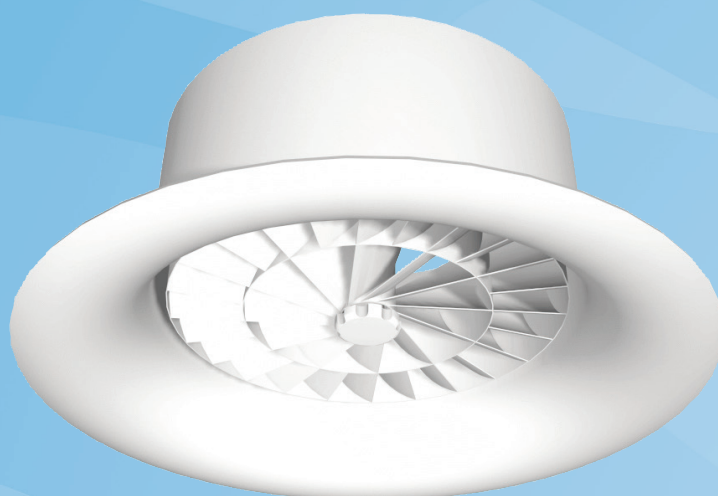


# Halton TSA

## Swirl Diffuser



- Horizontal radial or alternatively vertical compact swirl jet air supply, also suitable for heating applications
- Also well suited to large and high spaces
- Supply air pattern can be adjusted either manually or controlled by actuator
- High induction swirl jet ensures efficient mixing and fast reduction of air velocity
- Installation using plenum or directly to ductwork

### Accessories

- Balancing plenum with adjustment function (PLC) or also with measurement function (TRI)
- Actuator (with 24 VAC power supply and proportional 0...10 VDC control signal or alternatively self-actuating wax-bulb) for the direction of airflow pattern

### MATERIAL AND FINISHING

PART	MATERIAL	NOTE
Casing	Steel	
Deflector ring or cylinder	Steel	
Front vane panel	Steel	
Finishing	Painted White RAL 9010	Special colours available

## QUICK SELECTION

qv	Pa	1200	1440	1800	2160	2640	3240	4200	5400	7200	9000	10800	13200	16800
	l/s	100	120	150	180	220	270	350	450	600	750	900	1100	1400
	m <sup>3</sup> /h	360	432	540	648	792	972	1260	1620	2160	2700	3240	3960	5040
TSA-250(R)	LpA	23	29	37	45	54								
	ΔPst	19	27	42	60	90								
	ΔPtot	21	30	47	68	102								
	Ld	2,2	2,4	2,6	3,0	3,4								
	Lmin	2,6	3,4	4,8	6,2	8,0								
	L0.2	2,3	2,8	3,4	4,2	5,2								
TSA-315(R)	LpA			23	28	35	43	55						
	ΔPst			14	20	30	46	77						
	ΔPtot			16	23	35	53	89						
	Ld			2,4	2,6	3,2	3,4	4,2						
	Lmin			3,4	4,4	6,0	7,8	10,6						
	L0.2			2,8	3,4	4,2	5,2	6,8						
TSA-400(R)	LpA						25	34	43	55				
	ΔPst						16	27	45	79				
	ΔPtot						19	32	52	93				
	Ld						3,0	3,6	4,2	5,0				
	Lmin						5,6	8,0	10,8	15,0				
	L0.2						5,0	6,4	8,2	11,0				
TSA-500(R)	LpA							26	36	45	52			
	ΔPst							17	30	47	68			
	ΔPtot							20	36	56	80			
	Ld							3,2	4,0	4,8	5,4			
	Lmin							8,2	11,6	15,0	18,4			
	L0.2							6,0	8,2	10,2	12,2			
TSA-600(R)	LpA								22	29	35	42	52	
	ΔPst								11	17	25	37	60	
	ΔPtot								13	21	30	45	73	
	Ld								3,0	3,6	4,2	5,0	5,8	
	Lmin								8,8	11,4	14,2	17,8	23,2	
	L0.2								6,4	8,0	9,6	11,8	15,0	

LpA values presented with room attenuation 4 dB (red 10m<sup>2</sup> - sab). When using room attenuation 8 dB (red 25m<sup>2</sup> - sab):  
LpA - 4dB.

Pa Supply air cooling capacity, W  
LpA A-weighted sound pressure level, reduced by total equivalent absorption surface of 10m<sup>2</sup>, dB(A) red 10m<sup>2</sup> - sab  
ΔPst Static pressure drop, Pa

ΔPtot Total pressure drop, Pa  
Ld Distance from the supply unit, at which air jet detaches from ceiling, m  
Lmin Minimum distance between central lines of two supply units, m (V3 = 0,25m/s at 1.8m height)  
L0.2 Isothermal throw length, m when residual velocity of supply air jet 0,2 m/s  
Room temperature (Tr) = 24 °C  
Supply air temperature (Ta) = 14 °C  
Room height = 2,8 m

## QUICK SELECTION

qv	Pa	1440	1800	2160	2640	3120	3600	4200	4800	5400	6000	7200	9000	10800	13200	15600	
	l/s	120	150	180	220	260	300	350	400	450	500	600	750	900	1100	1300	
	m <sup>3</sup> /h	432	540	648	792	936	1080	1260	1440	1620	1800	2160	2700	3240	3960	4680	
TSA-250(C)	LpA	22	30	37	46	53											
	ΔPst	22	35	50	75	104											
	ΔPtot	26	40	58	87	121											
	L0.2	2,8	3,6	4,4	5,6	6,8											
TSA-315(C)	LpA		17	22	28	34	39	44	49	53							
	ΔPst		12	17	26	36	48	65	85	108							
	ΔPtot		14	20	30	43	57	77	101	128							
	L0.2		2,4	3,0	4,0	4,8	5,6	6,8	8,0	9,0							
TSA-400(C)	LpA					19	23	28	33	37	42	49					
	ΔPst					12	16	22	28	36	44	64					
	ΔPtot					15	19	26	34	44	54	78					
	L0.2					3,0	3,6	4,2	5,0	5,8	6,6	8,2					
TSA-500(C)	LpA							21	24	28	33	41	48				
	ΔPst							10	13	16	23	35	51				
	ΔPtot							12	16	20	28	44	63				
	L0.2							2,8	3,2	3,8	4,6	6,2	7,6				
TSA-600(C)	LpA												22	29	34	41	47
	ΔPst												9	14	20	30	42
	ΔPtot												11	17	25	37	52
	L0.2												2,6	3,4	4,2	5,2	6,4

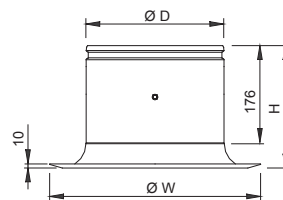
LpA values presented with room attenuation 4 dB (red 10m<sup>2</sup> - sab). When using room attenuation 8 dB (red 25m<sup>2</sup> - sab): LpA - 4dB.

Pa Supply air cooling capacity, W  
 LpA A-weighted sound pressure level, reduced by total equivalent absorption surface of 10m<sup>2</sup>, dB(A) red 10m<sup>2</sup> - sab  
 ΔPst Static pressure drop, Pa

ΔPtot Total pressure drop, Pa  
 Ld Distance from the supply unit, at which air jet detaches from ceiling, m  
 L0,2 Isothermal throw length, m when residual velocity of supply air jet 0,2 m/s  
 Room temperature (Tr) = 24 °C  
 Supply air temperature (Ta) = 14 °C  
 Room height = 2,8 m

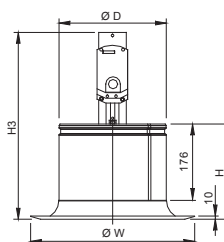
## DIMENSIONS

NS	ØD	ØW	H
250	249	382	221
315	314	475	233
400	399	593	246
500	499	735	264
630	629	917	286



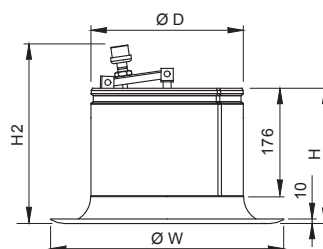
### TSA with electrical actuator

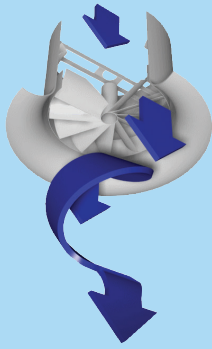
NS	ØD	ØW	H	H3
250	249	382	221	430
315	314	475	233	459
400	399	593	246	486
500	499	735	264	499
630	629	917	286	524



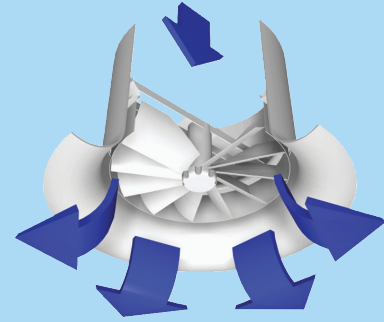
### TSA with wax-bulb actuator

NS	ØD	ØW	H	H2
250	249	382	221	273
315	314	475	233	302
400	399	593	246	329
500	499	735	264	342
630	629	917	286	367





Compact jet



Radial Jet

## Function

- The TSA is a high induction swirl diffuser with an adjustable flow pattern. The horizontal radial swirl jet is used mainly in cooling applications that use cool supply air or for ventilation with isothermal supply air.
- The vertical compact swirl jet with warm supply air is used in heating applications.
- Adjustment of the supply air pattern is effected by moving the internal adjustment element (cylinder).
- It is also possible to change from cooling mode to heating mode by adjusting the flow pattern using an electric or wax bulb actuator.
- The recommended maximum temperature differences between room and supply air temperatures are +15 °C for heating and -15 °C for cooling applications.

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## Product models

### TSA with electric actuator

- Siemens GDB161.2E/HA actuator with 24 VAC power supply and proportional 0...10 VDC control signal

### TSA with wax-bulb actuator

- TSA can be equipped with a wax-bulb actuator, which work without any power supply. The cylinder position changes according to the temperature of supply air.
- The temperature range of the wax-bulb actuator is about 20 °C to 27 °C.
- The time taken to change from radial to compact jet (or the other way around) is 10 - 20 minutes.
- When warm air is supplied the piston of the wax bulb actuator keeps moving until the TSA supply air pattern is vertical. When cold air is supplied, the TSA supply air pattern is changed back to horizontal by means of a spring.

## Installation

The diffuser is connected either directly to the duct by screwing or riveting or alternatively to TRI or PLC balancing plenum.

The front vane panel can be reattached  
Remove the screws through the front vane panel (sizes 250 and 315) or between the cylinder and casing (sizes 400, 500 and 630), turn and hold the front vane panel to remove.

Take care during installation to ensure that the cylinder can move freely and that the actuator has adequate installation space. There should be at least 50 mm clearance space above the top of the device when the cylinder is in the lowest position. The connection and fixing rivets or screws may not be located more than 50 mm below the upper edge of the diffuser.

A minimum safety distance upstream of the diffuser of  $3xD$  is recommended.

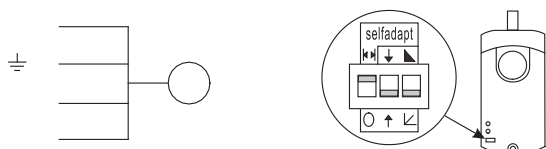
Ensure that the actuator has adequate installation space when installed in TRI plenum. It is recommended to install the collar outwards.

The technical performance for the combination of supply air diffuser and TRI plenum is presented separately for the two different installations. See HIT Design software.

## Wiring and DIL switches

### DIL switches:

1. Automatic adaptation of limited movement length to 0-10 VDC control signal
2. Direction of shaft movement based on 0-10 VDC control signal
3. Feedback signal



## Installation with plenum

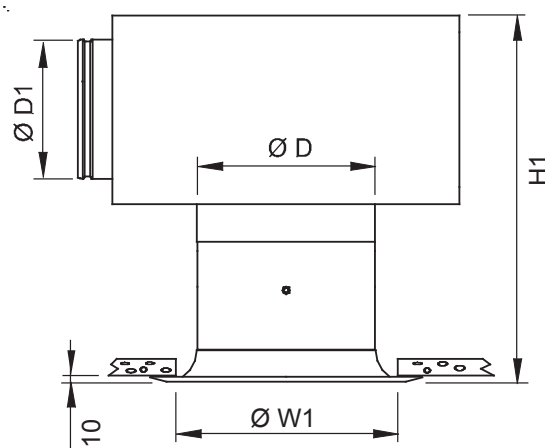
### TSA with TRI plenum

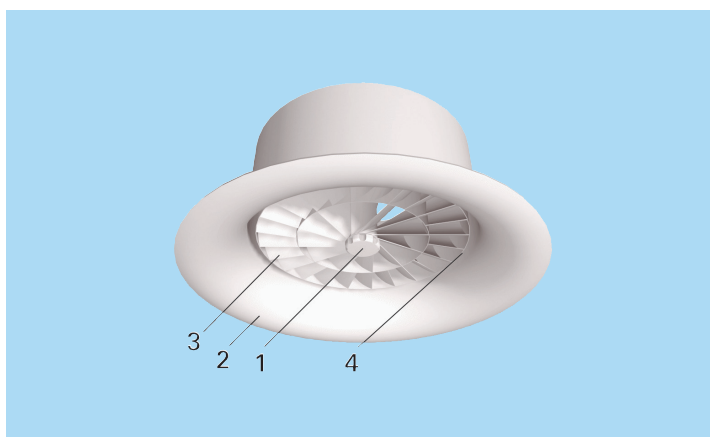
TSA	ØD1	TRI	H1	ØW1
250	200	TRI-200-250	390-535	310
315	250	TRI-250-315	465-610	400
400	315	TRI-315-400	525-670	500

### TSA with PLC plenum

TSA	ØD1	PLC	H1	ØW1
500	500	PLC 500	810-950	620
630	630	PLC 630	850-990	785

It is recommended that the distance between the PLC plenum and TSA sizes 500 and 630 is at least  $1xD$  to ensure proper diffuser operation.





## Adjustment

### CODE DESCRIPTION

1	Control knob
2	Casing
3	Front vane panel
4	Cylinder

### Throw pattern adjustment

The supply air jet is adjusted by changing the position of the cylinder.

When you turn the knob clockwise the throw pattern is changes from radial to compact.

### Airflow adjustment

It is not possible to adjust the airflow in TSA itself. In order to enable airflow adjustment and measurement of airflow rate it is recommended that you connect the diffuser TSA 250, 315 and 400 to the TRI balancing plenum. The supply flow rate is determined by using the measurement and adjustment module MSM.

Pass the tubes and control spindle through the front vane panel.

Measure the differential pressure using a manometer. The flow rate is calculated using the formula below.

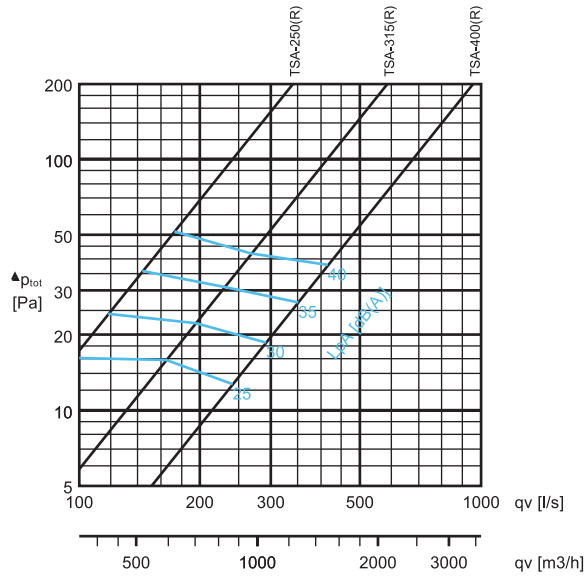
$$q_v = k * \sqrt{\Delta p_m}$$

Adjust the airflow rate by rotating the control spindle until the desired setting is achieved. Replace the tubes and spindle in the plenum.

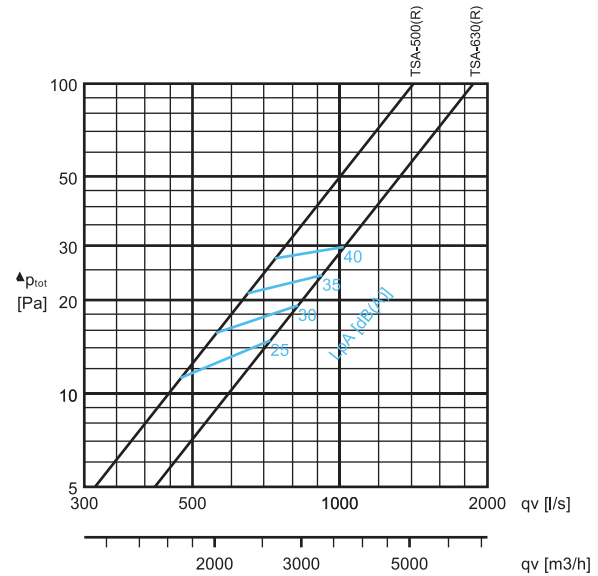
Pressure drop, throw pattern and sound data

Supply, radial jet, ceiling installation flush to the ceiling

TSA-250, TSA-315, TSA-400



TSA-500, TSA-630



Selection example :

Requirements : qv = 350 l/s      Selection : TSA-400  
 LpA ≤ 35 dB(A)      LpA = 34 dB(A)  
 L0,2 ≤ 8,0      L0,2 = 8,0  
 Horizontal jet      ΔPtot = 27 Pa

Note :

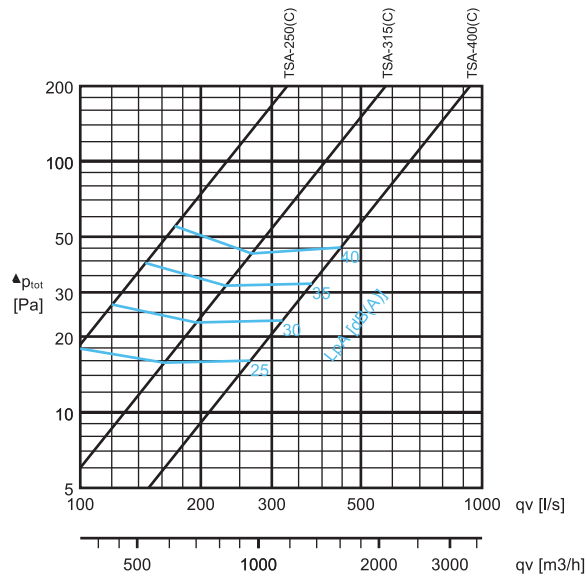
For exposed installation horizontal the throw pattern can be reduced by approximately 30 %, of the value given in the diagram. With isothermal air, the throw pattern can be calculated for other terminal velocity by using correction factor :  
 $L_{0.3} = L_{0.2} \times 0.67$   
 $L_{0.4} = L_{0.2} \times 0.5$   
 With non-isothermal air, the throw pattern changes due to air density. Please refer to next page or to the Halton HIT. CD-ROM calculation program.

SOUND LEVEL DATA

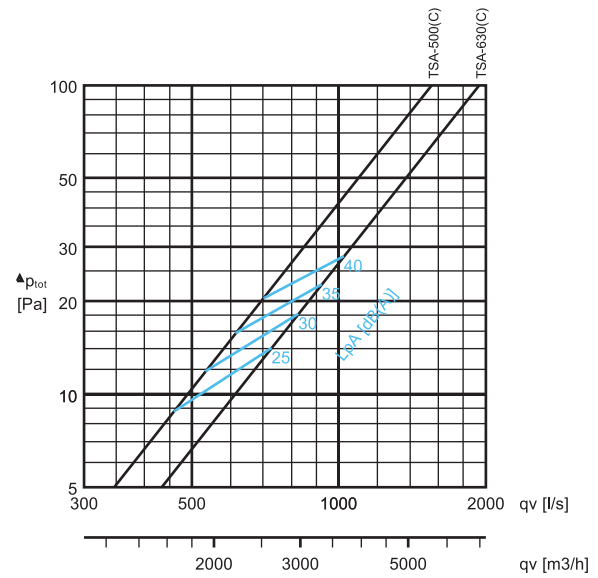
Radial Jet	qv (l/s)	qv (m³/h)	ΔPst (Pa)	ΔPtot (Pa)	F (Hz)						LpA [dB(A)]	NR	NC	
					125	250	500	1000	2000	4000				8000
TSA-250(R)	108	389	21	24	29	26	26	26	19	15	15	25	22	20
	124	446	28	32	32	29	29	31	26	20	18	30	27	25
	141	508	37	42	36	32	32	36	33	25	21	35	32	31
	160	576	47	54	39	35	35	41	39	30	23	40	38	36
TSA-315(R)	163	587	17	19	29	27	28	25	17	13	14	25	21	19
	189	680	22	26	32	30	31	31	24	17	17	30	27	25
	217	781	30	34	36	33	34	36	31	22	21	35	32	31
	248	893	39	45	39	35	36	41	38	26	24	40	37	36
TSA-400(R)	271	976	16	19	28	26	29	24	15	14	15	25	21	19
	316	1138	22	26	33	30	32	31	22	19	18	30	27	25
	364	1310	29	34	37	33	36	37	28	24	22	35	33	31
	414	1490	38	44	41	36	39	42	34	28	25	40	38	37
TSA-500(R)	433	1559	16	18	29	26	28	25	17	13	14	25	21	19
	505	1818	21	25	33	29	31	31	24	19	18	30	27	25
	583	2099	28	33	37	32	34	36	31	24	21	35	32	31
	664	2390	37	44	40	35	37	41	38	29	24	40	37	36
TSA-630(R)	660	2376	13	16	29	26	28	25	16	12	14	25	21	19
	776	2794	19	22	34	30	31	31	24	18	18	30	27	25
	896	3226	25	30	37	33	34	36	31	23	21	35	32	31
	1029	3704	33	39	41	36	37	41	37	28	24	40	37	36

LpA values presented with room attenuation 4 dB (red 10m² - sab). When using room attenuation 8 dB (red 25m² - sab): LpA - 4dB. NR/NC noise criteria

TSA-250, TSA-315, TSA-400



TSA-500, TSA-630



Selection example :

Requirements : qv = 350 l/s      Selection : TSA-400  
 LpA ≤ 35 dB(A)      LpA = 33 dB(A)  
 L0,2 ≤ 16,0      L0,2 = 15,0  
                                  ΔPtot = 28 Pa

Note :

With non-isothermal air, the throw pattern changes due to air density. Please refer to next page or to the Halton HIT software.

SOUND LEVEL DATA

Compact Jet	qv		ΔPst (Pa)	ΔPtot (Pa)	F (Hz)							LpA [dB(A)]	NR	NC
	(l/s)	(m³/h)			125	250	500	1000	2000	4000	8000			
TSA-250(C)	130	468	26	30	29	26	26	23	22	18	17	25	21	19
	149	536	34	40	32	29	29	29	28	22	18	30	28	25
	170	612	45	52	35	32	33	34	34	26	20	35	34	31
	192	691	57	66	37	35	36	39	40	30	22	40	39	37
TSA-315(C)	199	716	21	25	30	27	27	23	21	16	14	25	21	18
	232	835	29	34	31	31	32	29	27	19	15	30	27	24
	270	972	39	46	33	34	36	34	33	22	16	35	33	30
	311	1120	51	61	35	37	40	39	39	25	17	40	38	36
TSA-400(C)	319	1148	18	22	29	26	29	22	20	17	17	25	20	19
	370	1332	24	30	32	30	32	29	26	21	20	30	25	23
	425	1530	32	39	34	33	35	35	32	25	22	35	31	30
	481	1732	41	50	37	36	38	41	37	29	25	40	37	36
TSA-500(C)	458	1649	13	16	30	26	28	23	20	16	16	25	20	18
	539	1940	18	23	33	29	31	30	26	21	19	30	26	24
	628	2261	25	31	35	32	35	36	31	25	22	35	32	30
	726	2614	33	41	38	35	38	41	37	29	25	40	37	36
TSA-630(C)	663	2387	11	14	30	26	28	23	20	15	16	25	20	18
	783	2819	15	19	33	29	32	30	26	20	19	30	26	24
	918	3305	21	26	36	32	35	36	31	25	22	35	32	30
	1065	3834	28	35	38	36	38	41	37	29	25	40	37	36

LpA values presented with room attenuation 4 dB (red 10m² - sab). When using room attenuation 8 dB (red 25m² - sab): LpA - 4dB. NR/NC noise criteria



## Servicing

Remove the front vane panel and clean the diffuser by wiping it with a damp cloth, instead of immersing it in water.

### Option with balancing plenum

Remove the measurement and adjustment module by pulling gently the shaft; (not the control spindle or measurement tubes!).

Wipe the parts with a damp cloth, instead of immersing them in water.

Remount the measurement and adjustment module by pushing the shaft until the module meets the stopper.

### Suggested specifications

The diffuser shall consist of a frame with fixed internal profiled vane rings and a movable cylinder for throw pattern selection.

The front vane panel, the movable cylinder and the frame shall be made of powder painted steel, with a white (RAL 9010) as standard colour.

The airflow pattern shall be adjustable automatically using an electrical or wax-bulb actuator, (in applications where both heating and cooling are required.)

## Product code

TSA-D

D = Connection size  
250, 315, 400, 500, 630

### Specifics and accessories

CO = Colour  
W White  
X Special colour

MO = Actuator type  
NA No actuator  
M2 24 VAC actuator, 0...10 VDC control signal  
M3 Wax-bulb actuator

### Code example

TSA-250, CO=W,MO=NA

### Sub products

PLC Plenum (Ceiling diffusers)  
TRI Plenum (Diffusers)