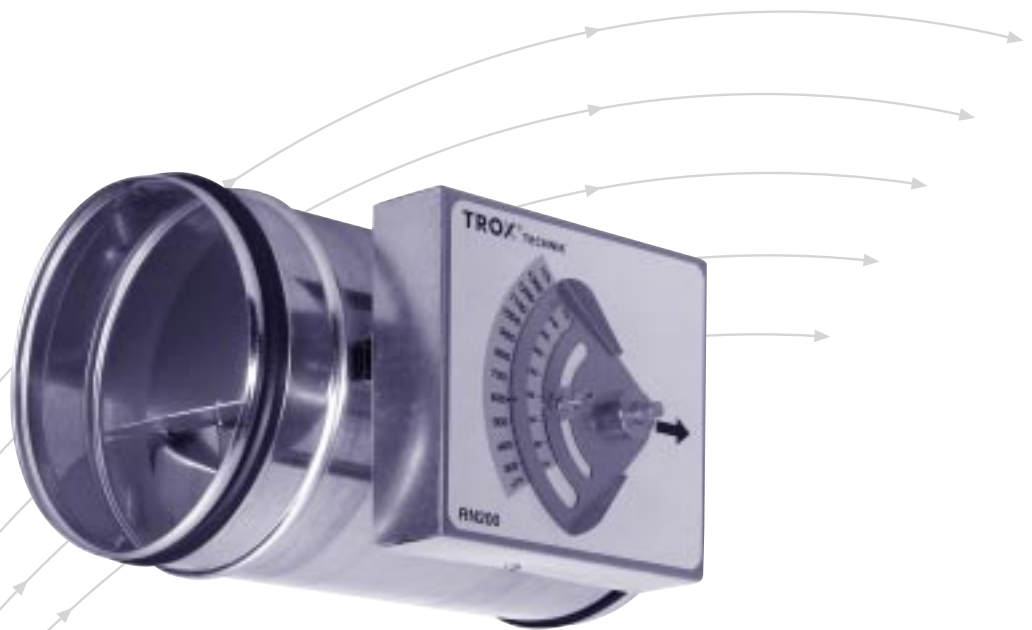


# CONSTANTFLOW Volume Flow Controllers

for constant volume systems  
Type RN



**TROX®** **TECHNIK**

The art of handling air

# Contents · Description

Description _____	2	Nomenclature · Air-regenerated noise _____	8
Application _____	3	Air-regenerated noise _____	9
Construction · Dimensions _____	4	Case-radiated noise _____	10
Aerodynamic and acoustic quick selection _____	6	Order details _____	11

**Type RNS volume flow controller**  
Nominal size 80...125



**Type RN volume flow controller**  
Nominal size 80...400



TROX Type RNS and RN volume flow controllers are mechanical system-powered controllers and were developed for the control of flow rates in constant volume systems. The controllers are suited for both supply air and extract air.

RNS: Compact installation height controllers for nominal sizes 80 to 125

RN: Controllers for nominal sizes 80 to 400

RND: Controllers for nominal sizes 80 to 400, with additional acoustic cladding

Each controller is set up to a reference flow rate and has been subjected to an aerodynamic function test.

The required flow rate can be easily set without tools using an external scale. To simplify installation, the controllers can be ordered and fitted by nominal size. The required flow rate can then be easily and accurately set during commissioning.

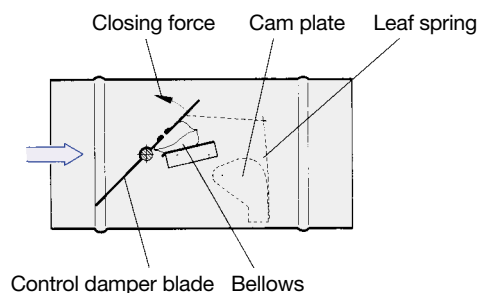
The RN controllers are also available with additional acoustic cladding to reduce case-radiated noise (RND). For more stringent noise requirements the CS and CF circular silencers can be used.

The controller operates without an external power supply. A control damper blade, shaft mounted supported on bearings, is adjusted by the aerodynamic forces such that the preset flow rate is held constant over the entire differential pressure range.

Aerodynamic forces from air flow create a closing force on the damper blade. A self inflating bellows amplifies this force, acting simultaneously as an oscillation damper. This closing force is counteracted by a leaf spring that unrolls over a cam plate. The cam plate is designed such that as the pressure differential changes, the damper blade adjusts to keep a constant flow rate within close tolerances.

Further, current information on application and selection can be found in the "Technical Documentation" download area of our website.

Also available on the Internet is the "Air terminal units" on-line programme for the design and selection of our units.



## Inexpensive commissioning

By a simple step and without need for preliminary measurements, the required flow rate value can be set using the pointer against the externally mounted scale of the Type RN or RNS. The advantage over conventional balancing dampers is that there is no need for repeated measurement and readjustment by a qualified commissioning engineer.

Should the system pressure change, e.g. by opening or closing of duct sections, the flow rates in the entire system will alter if balancing dampers are used; however, this is not the case if the Type RNS and RN volume flow controllers are used.

The controller reacts immediately and adjusts the damper blade position directly, so that the flow rate set is kept constant over the entire differential pressure range.

The Type RN controllers can be fitted with an electric actuator for setpoint value readjustment.

## Simplified installation

The TROX lip seal is available as an option for nominal sizes 80 to 400. Low leakage can be achieved at the joint without additional sealing materials giving low installation costs. The cut edges adjacent circular ductwork must be deburred and cleaned prior to the installation of the controller. Pretreating the lip seal with a lubricant makes it easier to push the seal up to the bead on the spigot connection.

It is recommended that the circular duct is fixed to the spigot by means of self tapping screws or air tight blind rivets evenly spaced around the circumference.

## Acoustic requirements

Depending on requirements, a CS or CF circular silencer with 50 mm packing thickness may be supplied in nominal sizes 80 to 400 to reduce the air-regenerated noise.

### Type RN volume flow controller with actuator



### Type RND volume flow controller



# Construction · Dimensions

## Characteristics

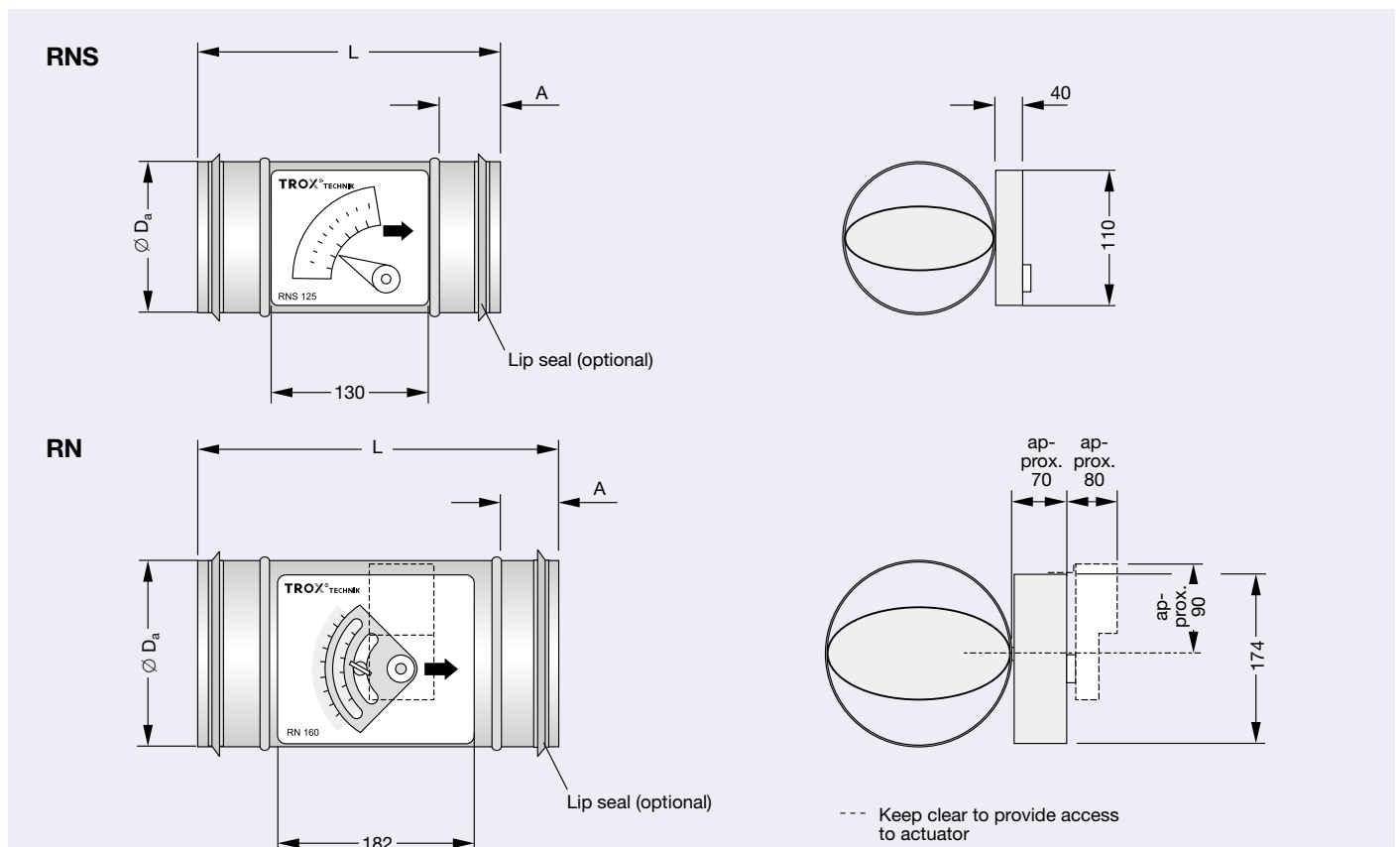
- Mechanical system-powered, without external power supply
- Suitable for supply or extract air
- Correct operation, even under unfavourable upstream and downstream conditions (straight length required upstream 1.5 D)
- Close tolerances on flow rate
- Flow rate setting using pointer on external scale, scale accuracy approximately  $\pm 4\%$
- Flow rate range 4 : 1
- Damper blade shaft supported in bearings
- Bellows also acts as an oscillation damper
- Differential pressure range 50 to 1000 Pa
- Independent of orientation
- Damper blade mechanisms maintenance-free
- Operating temperatures 10 to 50 °C

## Constructional features

- Spigot connections on both ends suitable for circular connecting ducts to DIN EN 1506 or DIN EN 13180 with groove for lip seal (if lip seals are required, these will be factory fitted)
- Optionally available with flanges complying with DIN EN 12220 on either end (not for RNS)
- Casing air leakage complies with DIN EN 1751, class A

## Casing

- Casing and damper blade made of galvanised sheet steel
- Stainless steel leaf spring
- Polyurethane bellows
- Plain bearings with PTFE coating



Dimensions in mm														Weight in kg					
Nom. size	D <sub>a</sub>	RNS				RN								RNS	RN	RND	additional weight		
		L	A	D <sub>a1</sub>	D <sub>2</sub>	RN	L			L <sub>1</sub>	A	t	b				n <sup>3)</sup>	Flange	Actuator
80	79	250 <sup>1)</sup>	30 <sup>1)</sup>	181	-	310 <sup>2)</sup>	-	-	-	232	50 <sup>2)</sup>	-	-	-	1.4	1.4	2.2	-	1.0
100	99	250	50	200	132	310	290	350	232	50	3	25	4	1.8	1.8	3.6	0.6	1.0	
125	124	250	50	220	157	310	290	350	232	50	3	25	4	2.0	2.0	4.0	0.7	1.0	
160	159	-	-	262	192	310	290	350	232	50	4	25	6	-	2.5	5.0	1.0	1.0	
200	199	-	-	300	233	310	290	350	232	50	4	25	6	-	3.0	6.0	1.4	1.0	
250	249	-	-	356	283	400	380	440	317	50	4	25	6	-	3.5	7.3	1.8	1.0	
315	314	-	-	418	352	400	380	440	317	50	4	30	8	-	4.8	9.8	2.5	1.0	
400	399	-	-	500	438	400	380	440	317	50	4	30	8	-	5.7	11.8	3.9	1.0	

1) Nominal size 80 with lip seal (D2): L = 332 mm, A = 40 mm

2) Nominal size 80 with surface powder-coated (P1): L = 332 mm, A = 40 mm

3) Number of holes in flange

# Construction · Dimensions

## RND Acoustic cladding

- Outer cover in galvanised sheet steel
- Sound-absorbent lining
- Structure-borne noise isolation
- Cannot be retrofitted

## Actuators (not RNS)

- For setpoint readjustment
- 24 VAC or 230 VAC power
- Factory-fitted
- Small footprint thanks to compact construction

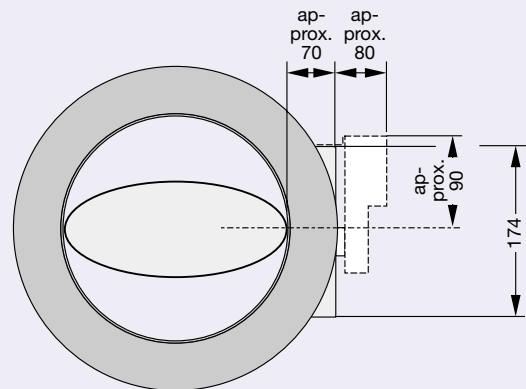
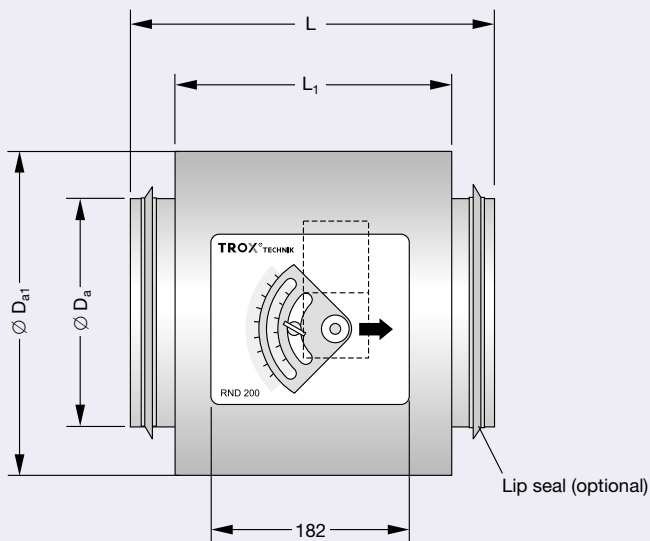
## Secondary silencer

- Suitable for RN and RNS
- Rigid circular silencer Type CS
- Flexible circular silencer Type CF
- See leaflet 6/5/EN/... for dimensions and more technical data

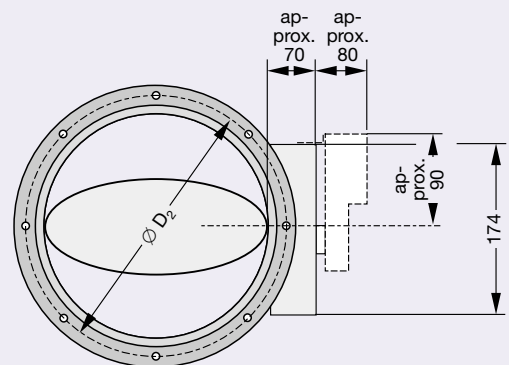
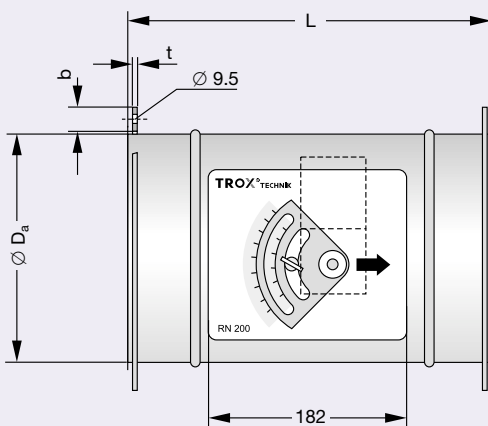
## Air heater

- Suitable for RN and RNS
- See leaflet 5/20/EN/... for dimensions and technical data

### RND



### Flange construction



--- Keep clear to provide access to actuator

# Aerodynamic and Acoustic Quick Selection

System attenuation in dB/Oct. acc. to VDI 2081 (values incorporated into the quick selection table)								
$f_m$ in Hz	63	125	250	500	1000	2000	4000	8000
Duct bend attenuation	0	0	1	2	3	3	3	3
Room attenuation	5	5	5	5	5	5	5	5
End reflection	10	5	2	0	0	0	0	0

Correction for distribution into the duct system (values incorporated into the quick selection table)									
$\dot{V}$	l/s	140	280	415	555	695	835	1110	1390
	m <sup>3</sup> /h	504	1008	1494	1998	2502	3006	3996	5004
dB per octave		0	3	5	6	7	8	9	10

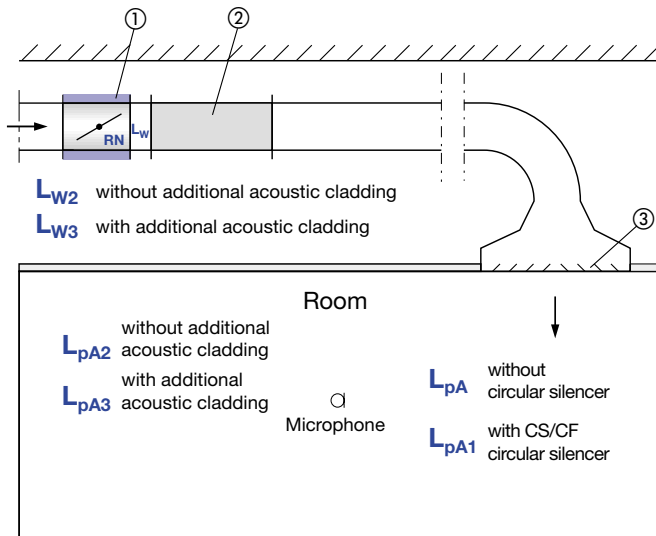
Correction for other pressure differentials (averaged values)						
$\Delta p_g$ in Pa	100	200	400	600	800	1000
dB	-4	0	5	8	11	13

Quick selection of sound pressure level in dB(A) at $\Delta p_g = 200$ Pa										
Nominal size	$\dot{V}$		$\Delta p_{g \min}$	$\Delta \dot{V}$	Air-regenerated noise				Case-radiated noise <sup>1)</sup>	
					$L_{pA}$	$L_{pA1}$			$L_{pA2}$	$L_{pA3}$
	l/s	m <sup>3</sup> /h	Pa	± %	without silencer	with circular silencer Type CS050/CF050 Length in mm			without additional acoustic cladding	with additional acoustic cladding
					500	1000	1500			
80	11	40	100	20	38	24	16	<	22	<
	20	72	100	15	41	28	18	17	24	<
	40	144	100	10	49	36	25	23	31	<
	45	162	100	8	50	37	27	25	32	<
100	22	80	50	10	37	26	20	18	18	<
	40	144	50	8	43	31	23	21	23	<
	70	252	50	6	50	38	30	28	31	<
	90	324	50	5	52	40	32	30	34	<
125	35	126	50	10	40	29	23	20	16	<
	60	216	50	8	45	36	29	26	21	<
	115	414	50	6	52	44	38	35	29	<
	140	504	50	5	55	47	41	39	31	<
160	60	216	50	10	43	34	28	25	31	<
	105	378	50	8	48	40	34	32	35	<
	190	684	50	6	52	44	38	36	40	18
	240	864	50	5	52	43	38	36	42	18

< indicates values below 15

1) 4 dB/octave ceiling reduction and 5 dB/octave room attenuation have been allowed for in the calculation of case-radiated noise.

# Aerodynamic and Acoustic Quick Selection



Nomenclature, see page 8

Quick selection of sound pressure level in dB(A) at  $\Delta p_g = 200 \text{ Pa}$

Nominal size	$\dot{V}$		Air-regenerated noise						Case-radiated noise <sup>1)</sup>	
			$\Delta p_{g \text{ min}}$	$\Delta \dot{V}$	$L_{pA}$	$L_{pA1}$			$L_{pA2}$	$L_{pA3}$
						without silencer	with circular silencer Type CS050/CF050 Length in mm			
l/s	m <sup>3</sup> /h	Pa	± %		500	1000	1500	without additional acoustic cladding	with additional acoustic cladding	
200	90	324	50	10	43	34	26	25	30	<
	160	576	50	8	46	38	30	29	34	<
	300	1080	50	6	50	42	36	34	40	21
	360	1296	50	5	51	43	37	35	43	23
250	145	522	50	10	44	36	28	26	32	<
	255	918	50	8	45	37	31	29	35	<
	470	1692	50	6	47	41	35	34	40	23
	580	2088	50	5	50	43	37	36	44	25
315	230	828	50	10	42	36	28	26	32	<
	400	1440	50	8	44	38	31	29	36	15
	750	2700	50	6	47	41	35	33	42	22
	920	3312	50	5	48	43	37	35	44	26
400	350	1260	50	10	48	42	36	32	46	15
	610	2196	50	8	50	44	38	34	50	20
	1130	4068	50	6	51	45	40	37	54	26
	1400	5040	50	5	53	47	42	39	57	29

< indicates values below 15

<sup>1)</sup> 4 dB/octave ceiling reduction and 5 dB/octave room attenuation have been allowed for in the calculation of case-radiated noise.

# Nomenclature · Air-regenerated Noise

## Nomenclature

- $f_m$  in Hz: Octave band centre frequency
- $L_W$  in dB: Sound power level of air-regenerated noise in the room (low pressure) side ducting
- $L_{W2}$  in dB: Sound power level of case-radiated noise
- $L_{W3}$  in dB: Sound power level of case-radiated noise with additional acoustic cladding
- $L_{pA}$  in dB: A-weighted sound pressure level of air-regenerated noise in the room, system attenuation taken into account
- $L_{pA1}$  in dB: A-weighted sound pressure level of air-regenerated noise in the room with CS/CF circular silencer, system attenuation taken into account
- $L_{pA2}$  in dB: A-weighted sound pressure level of case-radiated noise in the room, system attenuation taken into account
- $L_{pA3}$  in dB: A-weighted sound pressure level of case-radiated noise in the room with additional acoustic cladding, system attenuation taken into account

- $\Delta L_W$  in dB: Correction value for case-radiated noise without additional acoustic cladding
- $\Delta L_{W1}$  in dB: Correction value for case-radiated noise with additional acoustic cladding
- $\dot{V}$  in m<sup>3</sup>/h or l/s: Flow rate
- $\Delta \dot{V}$  in  $\pm$  %: Flow rate tolerance from setpoint value
- $\Delta p_g$  in Pa: Total pressure differential
- $\Delta p_{g \min}$  in Pa: Minimum total pressure differential

All sound power levels are based on 1 pW, all sound pressure levels on 20  $\mu$ Pa.

All noise levels measured in a reverberation chamber. The sound power data was determined and corrected according to DIN EN ISO 5135, February 1999.

Air-regenerated noise																										
Nominal size	$\dot{V}$		$\Delta p_g = 100 \text{ Pa}$								$\Delta p_g = 200 \text{ Pa}$								$\Delta p_g = 500 \text{ Pa}$							
			$L_W$ in dB								$L_W$ in dB								$L_W$ in dB							
	l/s    m <sup>3</sup> /h		$f_m$ in Hz								$f_m$ in Hz								$f_m$ in Hz							
			63	125	250	500	1000	2000	4000	8000	63	125	250	500	1000	2000	4000	8000	63	125	250	500	1000	2000	4000	8000
80	11	40	66	51	42	40	39	36	30	25	60	52	45	43	41	41	38	35	57	54	49	47	45	46	47	44
	20	72	67	55	47	39	35	38	35	30	60	56	51	47	42	43	41	38	64	60	53	51	47	47	47	46
	40	144	58	60	57	47	43	45	42	38	61	64	62	55	49	48	48	46	62	66	62	59	53	51	52	51
	45	162	55	61	56	49	44	46	43	39	63	66	64	57	50	49	49	48	65	68	64	62	55	53	54	54
100	22	80	68	50	42	38	31	24	16	<	65	52	48	45	42	39	33	26	67	57	54	51	47	46	47	43
	40	144	61	55	48	44	38	32	25	18	66	58	55	51	46	42	37	33	70	62	59	56	51	47	47	45
	70	252	60	60	53	50	45	41	33	27	68	67	63	58	54	50	43	39	73	69	67	63	59	55	50	49
	90	324	53	62	56	53	50	47	41	36	68	68	65	60	56	53	45	43	75	71	70	66	62	58	52	51
125	35	126	55	50	43	40	35	26	18	16	62	56	51	48	45	42	36	30	62	61	56	53	48	49	50	45
	60	216	60	58	50	46	40	33	27	22	61	62	58	54	49	44	40	37	65	66	62	59	54	51	50	48
	115	414	64	65	57	53	49	44	40	36	67	72	65	60	56	51	47	45	70	75	71	67	62	58	54	53
	140	504	65	69	59	55	52	46	43	40	68	76	67	62	58	54	50	48	71	77	73	69	64	61	57	56
160	60	216	59	54	46	43	40	38	28	26	63	59	52	50	47	48	40	32	63	61	56	54	51	53	51	45
	105	378	61	59	52	47	42	42	33	26	69	66	60	56	51	53	45	37	71	69	65	61	57	60	54	49
	190	684	64	63	56	51	50	48	43	35	73	72	65	62	56	57	51	45	74	73	71	68	63	65	58	53
	240	864	62	66	58	54	53	51	47	41	72	72	64	61	57	58	52	46	77	75	73	70	64	66	59	54

< indicates values below 15

Acoustic data for differential pressure up to 1000 Pa, see on-line design programme "Air terminal units".

# Air-regenerated Noise

## Example

Given:  $\dot{V}_{\max} = 60 \text{ l/s}$  or  $216 \text{ m}^3/\text{h}$   
 $\Delta p_g = 100 \text{ Pa}$   
 Required sound pressure level in the room  $45 \text{ dB(A)}$   
 For further assumptions, see calculation procedure

## Calculation procedure

Quick selection:  
 RN/125  
 Air-regenerated noise  
 $L_{pA} = 45 - 4 = 41 \text{ dB(A)}$   
 Case-radiated noise  
 $L_{pA2} = 21 - 4 = 17 \text{ dB(A)}$

## Air-regenerated noise calculation procedure

$f_m$	63	125	250	500	1000	2000	4000	8000
$L_W$ (page 8)	60	58	50	46	40	33	27	22
Duct bend	0	0	0	0	1	2	3	4
End reflection	20	14	9	4	1	0	0	0
Sound power level to room	40	44	41	42	38	31	24	18
Room attenuation	6	6	5	5	4	4	4	4
A-weighting	-26	-16	-9	-3	0	1	1	-1
Corrected level	<b>8</b>	<b>22</b>	<b>27</b>	<b>34</b>	<b>34</b>	<b>28</b>	<b>21</b>	<b>13</b>

Result:  $L_{pA}$  approx. **38 dB(A)**, the requirement is met.

Air-regenerated noise																										
Nominal size	$\dot{V}$		$\Delta p_g = 100 \text{ Pa}$								$\Delta p_g = 200 \text{ Pa}$								$\Delta p_g = 500 \text{ Pa}$							
			$L_W$ in dB								$L_W$ in dB								$L_W$ in dB							
			$f_m$ in Hz								$f_m$ in Hz								$f_m$ in Hz							
			63	125	250	500	1000	2000	4000	8000	63	125	250	500	1000	2000	4000	8000	63	125	250	500	1000	2000	4000	8000
200	90	324	57	50	41	40	39	37	34	27	64	55	47	48	48	49	47	40	63	56	51	52	54	55	54	49
	160	576	62	54	47	44	43	43	39	36	65	61	54	51	50	50	45	69	64	60	56	57	57	57	52	
	300	1080	69	61	53	50	50	53	48	43	77	70	60	57	55	56	51	79	74	65	62	60	60	60	56	
	360	1296	70	64	55	52	52	55	50	46	75	72	61	58	57	59	52	79	76	67	63	61	62	62	58	
250	145	522	47	41	41	42	39	39	34	26	53	55	51	50	50	47	42	66	58	55	55	57	59	56	52	
	255	918	61	52	47	45	42	44	39	32	63	61	55	52	51	53	45	68	65	62	57	57	59	57	53	
	470	1692	69	61	53	52	49	53	48	42	73	70	59	57	53	56	49	76	75	65	62	59	62	60	57	
	580	2088	72	64	56	55	52	55	51	46	75	72	62	60	56	60	54	78	78	68	64	61	64	63	60	
315	230	828	53	48	42	42	41	40	35	26	56	53	49	48	49	46	39	63	58	54	54	55	57	57	51	
	400	1440	55	54	49	47	45	46	41	33	64	60	55	52	51	54	46	68	65	61	57	57	59	58	55	
	750	2700	66	61	54	53	51	51	48	43	73	67	61	58	56	58	52	78	73	67	63	61	64	63	60	
	920	3312	70	65	58	56	53	54	52	46	76	70	64	60	58	60	54	80	77	69	65	63	65	64	62	
400	350	1260	50	51	45	48	51	50	42	35	58	57	52	53	58	59	45	60	60	59	59	63	66	61	55	
	610	2196	60	56	52	52	55	56	48	42	66	62	58	56	60	62	50	70	66	63	62	66	68	64	58	
	1130	4068	68	63	57	55	58	61	54	48	74	68	63	62	64	66	55	78	72	67	66	68	71	68	63	
	1400	5040	74	66	60	58	59	63	58	52	79	71	65	65	65	69	58	81	76	70	68	70	73	70	65	

Acoustic data for differential pressure up to 1000 Pa, see on-line design programme "Air terminal units".

# Case-radiated Noise

## Example

Given:  $\dot{V}_{\max} = 190 \text{ l/s}$  or  $684 \text{ m}^3/\text{h}$   
 $\Delta p_g = 500 \text{ Pa}$   
 Required sound pressure level in the room  $45 \text{ dB(A)}$   
 For further assumptions, see calculation method

## Calculation procedure

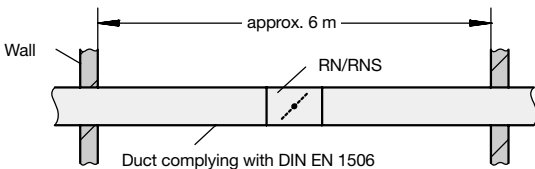
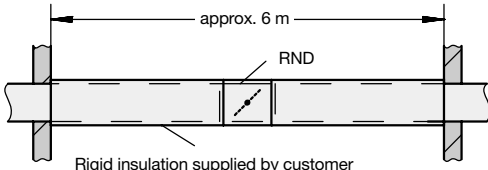
Quick selection:  
 RND/160 + CF050/160 x 1500  
 Air-regenerated noise  
 $L_{pA1} = 36 + 6 = 42 \text{ dB(A)}$   
 Case-radiated noise  
 $L_{pA3} = 18 + 6 = 24 \text{ dB(A)}$

## Case-radiated noise calculation procedure

$f_m$	63	125	250	500	1000	2000	4000	8000
$L_W$ (page 8)	74	73	71	68	63	65	58	53
$\Delta L_{W1}$	32	28	34	43	41	50	55	40
$L_{W3}$	42	45	37	25	22	15	3	13
Ceiling reduction	4	4	4	4	4	4	4	4
Room attenuation	6	6	5	5	4	4	4	4
A-weighting	-26	-16	-9	-3	0	1	1	-1
Corrected level	<b>6</b>	<b>19</b>	<b>19</b>	<b>13</b>	<b>14</b>	<b>8</b>	<b>-4</b>	<b>4</b>

Result:  $L_{pA3}$  approx. **23 dB(A)**, the requirement is met.

## Correction values for case-radiated noise in dB

Installation location	$\Delta L_W / \Delta L_{W1}$	Nominal size	$\Delta L_W / \Delta L_{W1}$ in dB, related to $f_m$ in Hz							
			63	125	250	500	1000	2000	4000	8000
<b>RN/RNS</b> $L_{W2} = L_W - \Delta L_W$ 	$\Delta L_W$	80	37	34	33	22	18	12	12	10
		100	35	32	31	21	17	12	12	10
		125	26	30	30	24	22	20	16	12
		160	25	23	20	18	10	9	9	4
		200	21	17	15	15	14	11	9	9
		250	19	15	14	14	13	11	9	9
		315	17	14	13	14	13	11	9	9
		400	17	16	9	7	6	4	6	15
<b>RND (with acoustic cladding)</b> $L_{W3} = L_W - \Delta L_{W1}$ 	$\Delta L_{W1}$	80	44	39	47	47	49	53	58	46
		100	42	37	45	46	48	53	58	46
		125	33	35	44	49	53	61	62	48
		160	32	28	34	43	41	50	55	40
		200	28	22	29	40	45	52	55	45
		250	26	20	28	39	44	52	55	45
		315	24	19	27	39	44	52	55	45
		400	23	17	26	37	41	49	52	41

Correction values for the estimation of radiated noise from a system with integral Type RN controllers are dependent on a number of variables. These are, for example, supply air or extract air, duct type (linear seamed or spiral seamed ducts), duct shape (circular or square), length of duct radiating noise, noise insulation and ceiling systems. The values stated have been averaged over all nominal sizes and are valid for a maximum room length of 6 m. The tolerances may be up to  $\pm 4 \text{ dB}$ .

## Specification text \*

Circular volume flow controllers for constant volume systems, mechanical system-powered (external power supply not required), for supply and extract air, in 8 nominal sizes. Consists of a casing with a control damper blade shaft mounted, supported on bearings with a bellows and an external cam plate with leaf spring.

Special features:

- Mechanical system-powered, without external power supply
- Low-friction bellows, also operates as an oscillation damper
- The flow rate can be set with an external scale
- Close tolerances on flow rate
- Independent of orientation and maintenance-free

The standard construction of controller is supplied with a set reference flow rate. The required flow rate should be set on site by the customer.

Spigots suitable for ducts complying with DIN EN 1506 or DIN EN 13180, with groove for lip seal. Differential pressure range 50 to 1000 Pa (size 80, 100 to 1000 Pa), flow rate range 4 : 1.

Materials:

Casing and control damper blade made from galvanised sheet steel, plain bearings made of plastic. Polyurethane bellows.

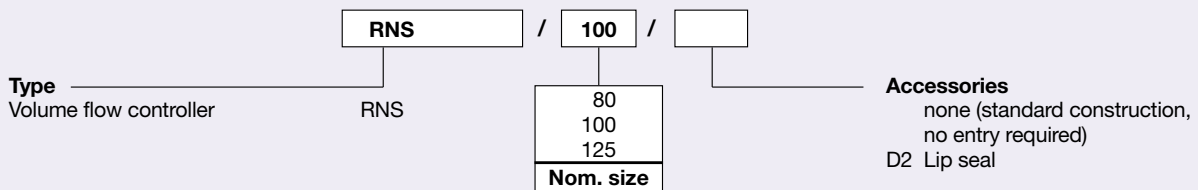
Options:

**Actuator**, 24 VAC or 230 VAC for setpoint value readjustment.

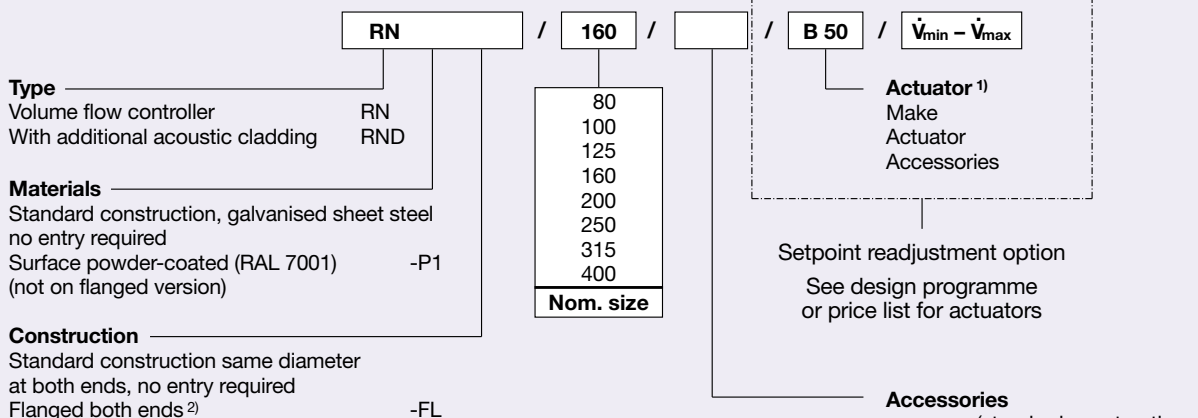
**Additional acoustic cladding** to reduce case-radiated noise. Consists of 40 mm mineral wool and outer cover of galvanised sheet steel. This gives a reduction of case-radiated noise of minimum 7 dB providing the upstream and downstream ducting has a rigid external insulation. Cannot be retrofitted.

\* Text for standard construction; for the actuators, see the design programme or price list

## Order codes RNS



## Order codes RN



1) no actuator, no entry required  
The minimum and maximum setpoint flow rates are set on the construction with an actuator.  
2) not nominal size 80

For order details regarding the Type CS/CF circular silencer see leaflet 6/5/EN/...

## Order example RNS

Make: TROX  
Type: RNS / 100

## Order example RN

Make: TROX  
Type: RN / 160

