

Project data																		
Project																		
Handled by																		
Additional info																		
Unit code	Size	qT	qP	Heat recovery section			Coils				Sounds				Electric motor		Spec. input power	
				Heat	etaTs	etaT	v	qLP	qJP	qLTO	LWP	LWI	PN	IN	SFPv	Clean filter		
				recovery	%	%	m/s	l/s	l/s	dB(A)	dB(A)	dB(A)	kW	A	kW/(m³/s)	kW/(m³/s)		
1: PN-1 ok	3C	6305	m3/h	LR	69.9	82.3	2.41	0.28				81	70	2.20	4.70	0.90		
1: PN-1 ok	3C		4740	LR								78	65	1.10	2.50	0.72	1.44	
Total		6305	4740											3.30				

Total electric supply, clean filters 2.52 kW

Common SFP figure of units, clean filters 1.44 kW/(m³/s)

Abbreviations used:		Unit
qT	Supply air flow	m3/h
qP	Exhaust air flow	m3/h
LL	Plate-type exchanger heat recovery	
LG	Water-glycol heat recovery	
LR	Rotor heat recovery	
etaTs	Entering air temperature efficiency with even air flows	%
etaT	Entering air temperature efficiency with designed air flows	%
v	Coil face velocity	m/s
qLP	Water flow of heating coil	l/s

Abbreviations used:		Unit
qJP	Water flow of cooling coil	l/s
qLTO	Fluid flow of heat recovery coil	l/s
LWP	Sound power level at unit's pressure side	dB(A)
LWI	Sound power level at unit's suction side	dB(A)
PN	Fan motor's nominal capacity	kW
IN	Fan motor's nominal current (3~400V)	A
SFPv	Single unit's nominal input power, clean filter	kW/(m³/s)
SFP	Supply-exhaust unit's nominal input power, clean filter	kW/(m³/s)

Unit: PN-1 ok

## Project data

Handled by

**Unit : 1** PN-1 ok

## Summary data

Altitude	0	m
Air pressure	1013	mbar
Air density	1.20	kg/m3

	Supply unit			Exhaust unit		
Unit size	Recair 3C			Recair 3C		
Air flow	6305	m3/h		4740	m3/h	
External static pressure of the unit	200	Pa		200	Pa	
Motor power	1.78	kW		0.99	kW	
Coil face velocity	2.4	m/s				
Face velocity of the unit	2.3	m/s		1.7	m/s	
SFP, specific fan power	1.44	kW/(m³/s)				

Calculation of the SFP figure includes frequency converter's efficiency 97%

Unit equipped with T-handles

The noise performances in accordance with ISO 3741, ISO 5136 and ISO 7235.

Sound power levels in the unit connections

### Supply unit

Octave band Hz	63	125	250	500	1k	2k	4k	8k		Tot.	
Pressure side of the unit	67	73	80	76	77	74	71	68	dB	81	dB(A)
Suction side of the unit	63	67	75	71	62	52	42	34	dB	70	dB(A)
Through the casing	61	62	63	57	59	58	46	38	dB	63	dB(A)

### Exhaust unit

Octave band Hz	63	125	250	500	1k	2k	4k	8k		Tot.	
Pressure side of the unit	62	68	75	72	73	71	69	67	dB	78	dB(A)
Suction side of the unit	57	61	69	65	56	46	36	28	dB	65	dB(A)
Through the casing	55	56	57	51	53	52	40	32	dB	57	dB(A)

Unit: PN-1 ok

Unit code

PN-1 ok

Unit size

3C

Supply air flow

6305

m<sup>3</sup>/h

Exhaust air flow

4740

m<sup>3</sup>/h

Tot. (dry) weight of the unit

784

kg

Additional info

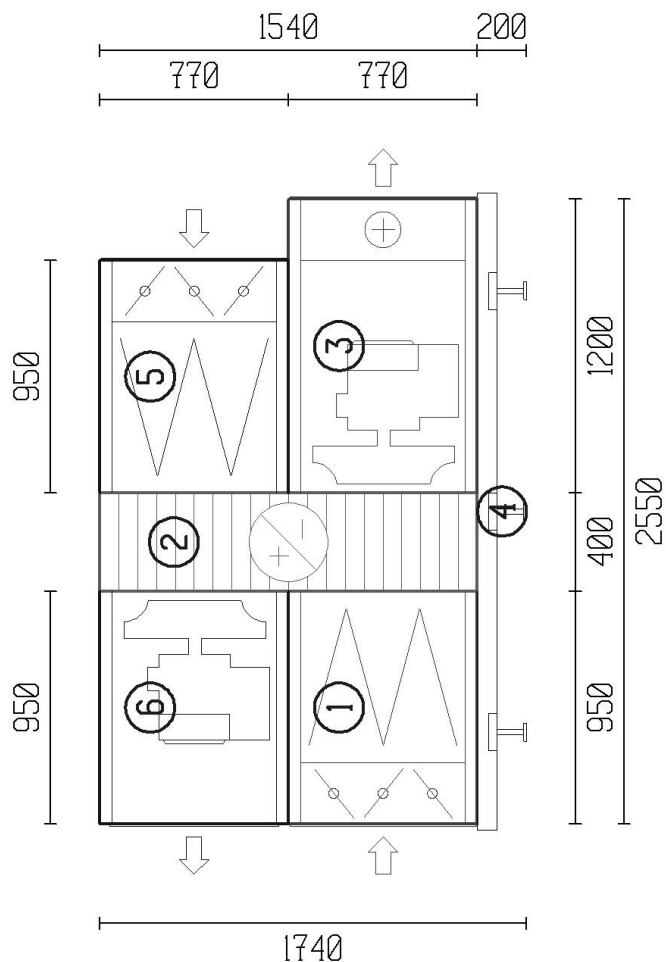
Duct connections supplied with connection flange

Handled by

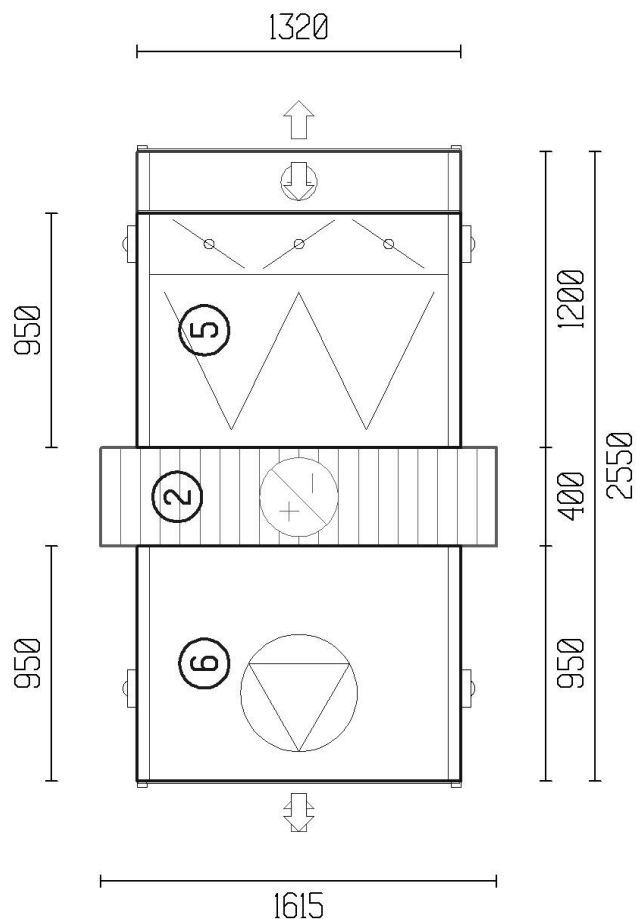
Scale

No scale

### From the service side



### Top view



Unit: PN-1 ok

## Unit sections and technical data

### Supply unit

#### ① CASING 3C L=950

Dimensions (width x height x length)	1320 x 770 x 950	mm
Weight, includes the weight of the casing and parts inside the casing	116	kg

#### DAMPER SECTION 3C L=250

Tightness class	Leakage class 4	
Pressure loss	10	Pa
Torque demand	9	Nm

#### FILTER SECTION 3C L=700

Filter class	F7	
Initial pressure loss	110	Pa
Calculation pressure loss	165	Pa
Final pressure loss	220	Pa
Filter quantity and size	2x[592x592]	
Spare filter set	1	pc

#### ② ROTARY HEAT EXCHANGER SECTION 3C D=1370

Enventus			
Non-hygroscopic rotor wheel material			
Dimensions (width x height x length)	1615 x 1540 x 400	mm	
Weight	200	kg	
Electric supply (max)	230V/1-v/50Hz / 400	W	
External pre fuse	6.3	A	
Control signal	0-10	V	
	Supply	Exhaust	
Air flow	6305 m3/h	4740 m3/h	
Pressure loss	161 Pa	122 Pa	
Heating capacity	82.9 kW		
Supply air temperature efficiency	70 %		
Supply air temperature efficiency / equal airflows	82 %		
Supply air humidity efficiency	62 %		
Supply air humidity efficiency / equal airflows	77 %		
Entering air: temperature / humidity	-21.7 °C / 80 %	22.0 °C / 30 %	
Leaving air: temperature / humidity	8.9 °C / 46 %	-18.5 °C / 84 %	
Air absolute humidity, entering/leaving	0.54 / 3.26 g/kg	5.06 / 0.75 g/kg	
Rotor is supplied with purge sector			
Switch and cable for light			

#### ③ CASING 3C L=1200

Dimensions (width x height x length)	1320 x 770 x 1200	mm
Weight, includes the weight of the casing and parts inside the casing	184	kg

#### FAN SECTION 3C 400 ARRANGEMENT1 DIRECT DRIVE

Performance value tolerance DIN 24166			
Manufacturer	Fläkt Woods		
Blade type/diameter	Backward curved / D400		
Air flow	6305	m3/h	
Connection type	To a chamber		
Fan total pressure	630	Pa	
Fan efficiency	76	%	
Electrical total efficiency	62	%	
Motor speed	2341	1/min	
Maximum speed of revolution	2581	1/min	
Fan shaft power	1.46	kW	
Fan's maximum power	4.72	kW	
Air flow measurement pressure difference / K value	$(q = k \sqrt{\Delta p})$	1491 Pa / 163.3	

#### DIRECT DRIVEN FAN GPEB400

Voltage	400V/3-v/50Hz	
Motor shaft power	1.46	kW

Unit: PN-1 ok

Nominal capacity	2.20	kW
Nominal current	4.70	A
Nominal speed (50 Hz)	1450	1/min
Efficiency	84	%
Motor input power in working point	1.78	kW
Motor frequency in the working point	81	Hz
Motor maximum frequency	89	Hz
Inspection window as standard		

**Light IP 44**
**Switch and cable for light**
**Air flow meter, analog**
**HEATING SECTION, WATER 3C TV1**

Air flow	6305	m3/h
Heating capacity	23.4	kW
Row number / fin spacing	1 / 2.0	mm
Face velocity / Pressure loss	2.4 m/s / 22	Pa
Air temperature, entering / leaving	8.9 / 20.0	°C
Fluid type	Water	
Entering / leaving fluid	70 / 50	°C
Fluid flow / fluid velocity / pressure loss	0.28 l/s / 0.58 m/s / 1.6	kPa
Fluid volume	3	l
Tube connections, threaded	DN25	

**Exhaust unit**
**⑤ CASING 3C L=950**

Dimensions (width x height x length)	1320 x 770 x 950	mm
Weight, includes the weight of the casing and parts inside the casing	116	kg

**DAMPER SECTION 3C L=250**

Tightness class	Leakage class 4	
Pressure loss	6	Pa
Torque demand	9	Nm

**FILTER SECTION 3C L=700**

Filter class	F5	
Initial pressure loss	36	Pa
Calculation pressure loss	54	Pa
Final pressure loss	72	Pa
Filter quantity and size	2x[592x592]	
<b>Spare filter set</b>	1	pc

**② ROTARY HEAT EXCHANGER SECTION 3C D=1370**

The results are shown with the supply air unit

**⑥ CASING 3C L=950**

Dimensions (width x height x length)	1320 x 770 x 950	mm
Weight, includes the weight of the casing and parts inside the casing	142	kg

**FAN SECTION 3C 400 ARRANGEMENT1 DIRECT DRIVE**

Performance value tolerance DIN 24166		
Manufacturer	Fläkt Woods	
Blade type/diameter	Backward curved / D400	
Air flow	4740	m3/h
Connection type	To a chamber	
Fan total pressure	462	Pa
Fan efficiency	78	%
Electrical total efficiency	62	%
Motor speed	1880	1/min
Maximum speed of revolution	2038	1/min
Fan shaft power	0.78	kW
Fan's maximum power	4.72	kW
Air flow measurement pressure difference / K value	$(q = k \sqrt{\Delta p})$ 843 Pa / 163.3	

**DIRECT DRIVEN FAN GPEB400**

Unit: PN-1 ok

Voltage	400V/3-v/50Hz	
Motor shaft power	0.78	kW
Nominal capacity	1.10	kW
Nominal current	2.50	A
Nominal speed (50 Hz)	1435	1/min
Efficiency	81	%
Motor input power in working point	0.99	kW
Motor frequency in the working point	66	Hz
Motor maximum frequency	71	Hz
Inspection window as standard		

**Light IP 44****Switch and cable for light****Air flow meter, analog****④ UNIT BASE 1C-6C L=2600 B=1320 H=200**

Adjustable feet with synthetic rubber pad

Weight 26 kg

Customer information

Project data / object

Handler

dell

Date: 2014/07/29.

**UNIT: RSA-25-HW**  
No control system

VENTILATION UNIT, 1-PIECE  
Rotating heat exchanger (non-hygroscopic)  
Service side: Left  
Zinc coloured outer casing  
Isolation 50 mm mineral wool  
Unit weight (dry / wet) 644 / 646 kg  
SFP value (clean filter) 1.57 kW/(m³/s)

**SUPPLY AIR**

Air flow	3370.00	m³/h
External pressure	200	Pa

**Damper (outdoor air)**

Fixed on unit

Size	190Ø500 mm	
Sealing class (EN 17512)	3	
Insulating	Insulated damper, uninsulated framework	
Total pressure loss	26	Pa

**Outdoor air filter**

F7

Type	RSA 25 Bag filter 560-530-305/8	
Filter area	4.91	m²
Size	2 pcs 560x530x305 mm	
Initial pressure drop (clean)	85	Pa
Final pressure drop (dirty)	149	Pa
Dimensioning pressure loss	117	Pa
Pressure-difference measure plug	1	pcs

**Rotating heat exchanger (non-hygroscopic)**

Standard Recair RSA 25, Ø 1020 mm

Type	Non hygroscopic	
Heat exchanger control	Stepless	
HEX-motor	230 V (1~), 60 W, 0.26 A	
Belt drive	Ø60 2-groove aluminium	
Supply air	Air flow	3370.00 m³/h
	Front area speed	2.4 m/s
	Pressure drop	108 Pa
	Outdoor air	-21 °C / 90 %
	Supply air after heat exchanger	11 °C / 58 %
	Temperature efficiency	74.6 %
	Humidity efficiency	78.6 %
	Effect	49.5 kW
Extract air	Air flow	3340.00 m³/h
	Front area speed	2.3 m/s
	Pressure drop	107 Pa
	Extract air	22 °C / 35 %
	Exhaust air	-10 °C / 100 %
Condensing water connection	DN40 outer thread	

**Additional heater, liquid**

Type	RSA 25, 1007102	
Duct joints	DN 35 / DN 35	
Service side	Left (Unit: Left)	
Volume	1.9	l
Safety margin for temperature	0.0	°C
Air data	Front area speed	2.1 m/s

Customer information

Project data / object

Handler dell

Date: 2014/07/29.

Air before	11	°C
Air after	20	°C
Maximum temperature	22	°C
Pressure drop	17.7	Pa
Liquid side data	Pure water	
Temperature before / after	70 °C / 50	°C
Fluid flow / flow speed	0.11 l/s / 0.2	m/s
Liquid pressure drop	0.2	kPa
Total power	10.25	kW

#### Direct drive, chamber fan

Backward curved blades

Type	GPEV-1-00-031	
Static pressure increase	505	Pa
Efficiency	76	%
Coefficient of the fan (k-factor)	$q_v = \frac{\sqrt{\Delta p}}{k} = [m^3/s]$	36.22
Measured pressure difference	1150	Pa
Fan rotating speed	(max 4400 rpm) 2688	rpm
Fan shaft power	0.68	kW
SFP value (clean filter)	0.82	kW/(m³/s)

#### Motor with integrated frequency converter

Type	APAT-4-00110-30-20	
Power data	400	VAC
1/1 speed.	1410 rpm	2.50 A
Operating Frequency	(max 108 Hz) 95	1.10 kW

#### extract AIR

Air flow	3340.00	m³/h
External pressure	200	Pa

#### Extract air filter

F5

Type	RSA 25 Bag filter 560-530-340/5	
Filter area	3.51	m²
Size	2 pcs 560x530x340 mm	
Initial pressure drop (clean)	39	Pa
Final pressure drop (dirty)	68	Pa
Dimensioning pressure loss	53	Pa
Pressure-difference measure plug	1	pcs

#### Rotating heat exchanger (non-hygroscopic)

Standard Recair RSA 25, Ø 1020 mm

Check supply air side

#### Direct drive, chamber fan

Backward curved blades

Type	GPEV-1-00-031	
Static pressure increase	421	Pa
Efficiency	74	%
Coefficient of the fan (k-factor)	$q_v = \frac{\sqrt{\Delta p}}{k} = [m^3/s]$	36.22
Measured pressure difference	1129	Pa
Fan rotating speed	(max 4400 rpm) 2527	rpm
Fan shaft power	0.60	kW
SFP value (clean filter)	0.75	kW/(m³/s)

#### Motor with integrated frequency converter

Type	APAT-4-00110-30-20	
Power data	400	VAC



Customer information

Project data / object

Handler dell

1/1 speed.	1410	rpm	2.50	A	1.10	kW
Operating Frequency			(max 104 Hz)		90	Hz

**Damper (exhaust air)**

Size	Fixed on unit	190Ø500 mm
Sealing class (EN 17512)		3
Insulating	Insulated damper, uninsulated framework	
Total pressure loss		26 Pa

**CONTROL SYSTEM**

Equipment level	No control system
Fan operation	Continuous regulation, frequency converter
Heat exchanger control	Stepless

**ELECTRIC INFORMATION**
**Supply:**                      **Air handling unit:**      **3 x 10 A, 400 VAC, 50 Hz**

	Effect [W]	Current values by phase		
		L1 [A]	L2 [A]	L3 [A]
SUPPLY FAN AND MOTOR	1100	2.50	2.50	2.50
EXTRACT FAN AND MOTOR	1100	2.50	2.50	2.50
HEAT EXCHANGER MOTOR	60	0.26		
TOTAL	2260	5.26	5.00	5.00

**ACCESSORIES**

Reserve filter kit	1	pcs
heat exchanger spare belt	1	pcs

**NOISE DATA**

SUPPLY AIR	3370	m³/h
extract AIR	3340	m³/h

**UNIT NOISE LEVELS FOR DUCTS AND THROUGH THE CASING**

	dB	dB(A)	63	125	250	500	1k	2k	4k	8k	Hz
SUPPLY AIR	76	75	59	60	69	61	65	67	71	67	dB
OUTDOOR AIR	71	65	54	53	69	64	54	42	29	16	dB
extract AIR	74	68	58	56	72	67	61	55	52	45	dB
EXHAUST AIR	75	74	59	60	69	61	65	66	70	66	dB
ENVIRONMENT	64	49	53	64	49	44	34	30	22	25	dB

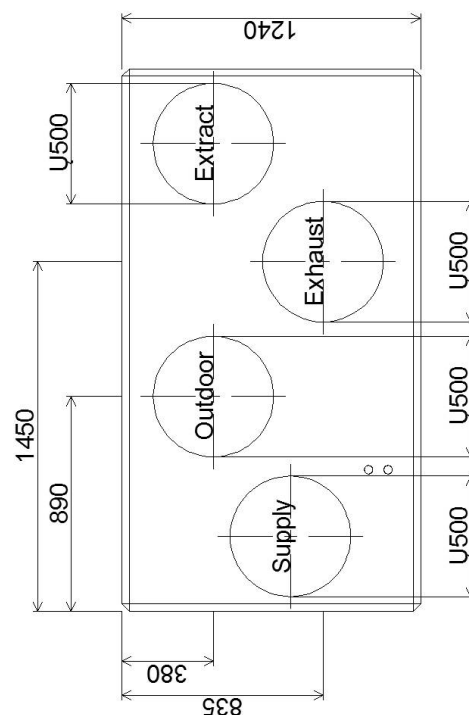
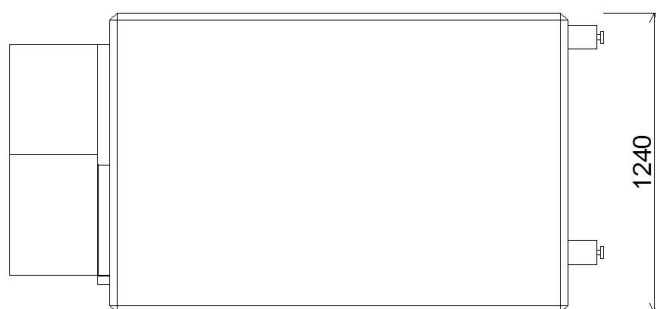
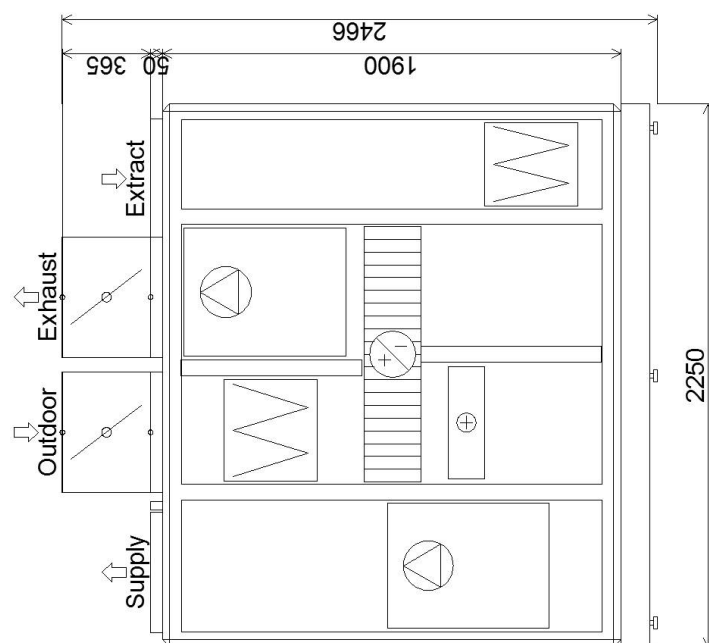
Customer information

Project data / object

Handler

dell

**UNIT: RSA-25-HW**  
No control system



Project data																	
Project																	
Handled by																	
Additional info																	
Unit code	Size	qT	qP	Heat recovery section			Coils			Sounds				Electric motor		Spec. input power	
				Heat	etaTs	etaT	v	qLP	qJP	qLTO	LWP	LWI	PN	IN	Clean filter	SFPv	
				recovery	%	%	m/s	l/s	l/s	dB(A)	dB(A)	dB(A)	kW	A	kW/(m³/s)		
2: PN-3 ok	2C	5795	m3/h	LR	65.9	77.5	2.77	0.30				86	86	74	3.00	5.90	1.39
2: PN-3 ok	2C		4260	LR								83	83	67	1.50	3.17	1.03
Total		5795	4260												4.50		

Total electric supply, clean filters 3.46 kW

Common SFP figure of units, clean filters 2.15 kW/(m³/s)

Abbreviations used:		Unit
qT	Supply air flow	m3/h
qP	Exhaust air flow	m3/h
LL	Plate-type exchanger heat recovery	
LG	Water-glycol heat recovery	
LR	Rotor heat recovery	
etaTs	Entering air temperature efficiency with even air flows	%
etaT	Entering air temperature efficiency with designed air flows	%
v	Coil face velocity	m/s
qLP	Water flow of heating coil	I/s

Abbreviations used:		Unit
qJP	Water flow of cooling coil	I/s
qLTO	Fluid flow of heat recovery coil	I/s
LWP	Sound power level at unit's pressure side	dB(A)
LWI	Sound power level at unit's suction side	dB(A)
PN	Fan motor's nominal capacity	kW
IN	Fan motor's nominal current (3~400V)	A
SFPv	Single unit's nominal input power, clean filter	kW/(m³/s)
SFP	Supply-exhaust unit's nominal input power, clean filter	kW/(m³/s)

Unit: PN-3 ok

## Project data

Handled by

**Unit : 1** PN-3 ok

## Summary data

Altitude	0	m
Air pressure	1013	mbar
Air density	1.20	kg/m3

	Supply unit			Exhaust unit		
Unit size	Recair 2C			Recair 2C		
Air flow	5795	m3/h		4260	m3/h	
External static pressure of the unit	200	Pa		200	Pa	
Motor power	2.57	kW		1.27	kW	
Coil face velocity	2.8	m/s				
Face velocity of the unit	2.7	m/s		2.0	m/s	
SFP, specific fan power	2.15	kW/(m³/s)				

Calculation of the SFP figure includes frequency converter's efficiency 97%

Unit equipped with T-handles

The noise performances in accordance with ISO 3741, ISO 5136 and ISO 7235.

Sound power levels in the unit connections

### Supply unit

Octave band Hz	63	125	250	500	1k	2k	4k	8k		Tot.	
Pressure side of the unit	73	73	73	80	83	79	79	75	dB	86	dB(A)
Suction side of the unit	73	70	69	76	68	55	45	37	dB	74	dB(A)
Through the casing	67	62	56	61	65	63	54	45	dB	68	dB(A)

### Exhaust unit

Octave band Hz	63	125	250	500	1k	2k	4k	8k		Tot.	
Pressure side of the unit	67	67	68	75	78	75	76	73	dB	83	dB(A)
Suction side of the unit	66	63	63	69	61	48	38	30	dB	67	dB(A)
Through the casing	60	55	50	54	58	56	47	38	dB	61	dB(A)

Unit: PN-3 ok

Unit code PN-3 ok

Unit size 2C

Supply air flow 5795 m<sup>3</sup>/h

Exhaust air flow 4260 m<sup>3</sup>/h

Tot. (dry) weight of the unit 640 kg

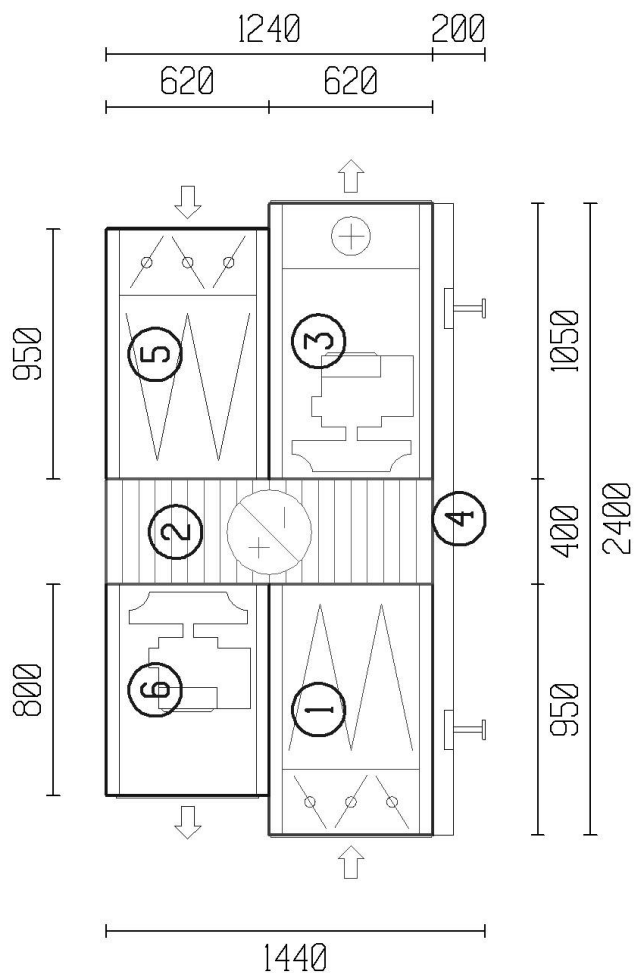
Additional info

Duct connections supplied with connection flange

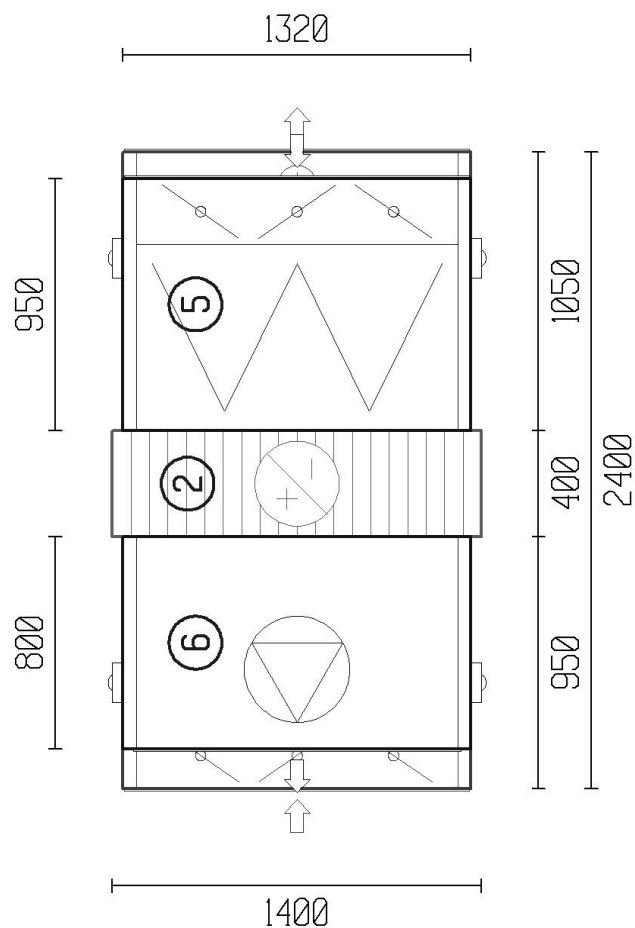
Handled by  
Scale

No scale

### From the service side



### Top view



Unit: PN-3 ok

## Unit sections and technical data

### Supply unit

#### ① CASING 2C L=950

Dimensions (width x height x length)	1320 x 620 x 950	mm
Weight, includes the weight of the casing and parts inside the casing	101	kg

#### DAMPER SECTION 2C L=250

Tightness class	Leakage class 4	
Pressure loss	20	Pa
Torque demand	8	Nm

#### FILTER SECTION 2C L=700

Filter class	F7	
Initial pressure loss	156	Pa
Calculation pressure loss	234	Pa
Final pressure loss	312	Pa
Filter quantity and size	2x[592x442]	
Spare filter set	1	pc

#### ② ROTARY HEAT EXCHANGER SECTION 2C D=1070

Enventus			
Non-hygroscopic rotor wheel material			
Dimensions (width x height x length)	1400 x 1240 x 400	mm	
Weight	150	kg	
Electric supply (max)	230V/1-v/50Hz / 400	W	
External pre fuse	6.3	A	
Control signal	0-10	V	
	Supply	Exhaust	
Air flow	5795 m3/h	4260 m3/h	
Pressure loss	244 Pa	178 Pa	
Heating capacity	72.4 kW		
Supply air temperature efficiency	66 %		
Supply air temperature efficiency / equal airflows	77 %		
Supply air humidity efficiency	59 %		
Supply air humidity efficiency / equal airflows	73 %		
Entering air: temperature / humidity	-21.7 °C / 80 %	22.0 °C / 30 %	
Leaving air: temperature / humidity	7.1 °C / 49 %	-17.3 °C / 86 %	
Air absolute humidity, entering/leaving	0.54 / 3.12 g/kg	5.06 / 0.85 g/kg	
Rotor is supplied with purge sector			
Switch and cable for light			

#### ③ CASING 2C L=1050

Dimensions (width x height x length)	1320 x 620 x 1050	mm
Weight, includes the weight of the casing and parts inside the casing	155	kg

#### FAN SECTION 2C 315 ARRANGEMENT1 DIRECT DRIVE

Performance value tolerance DIN 24166			
Manufacturer	Fläkt Woods		
Blade type/diameter	Backward curved / D315		
Air flow	5795	m3/h	
Connection type	To a chamber		
Fan total pressure	897	Pa	
Fan efficiency	69	%	
Electrical total efficiency	56	%	
Motor speed	4061	1/min	
Maximum speed of revolution	4270	1/min	
Fan shaft power	2.11	kW	
Fan's maximum power	3.34	kW	
Air flow measurement pressure difference / K value	$(q = k \sqrt{\Delta p})$	3399 Pa / 99.4	

#### DIRECT DRIVEN FAN GPEB310

Voltage	400V/3-v/50Hz	
Motor shaft power	2.11	kW

Unit: PN-3 ok

Nominal capacity	3.00	kW
Nominal current	5.90	A
Nominal speed (50 Hz)	2925	1/min
Efficiency	85	%
Motor input power in working point	2.57	kW
Motor frequency in the working point	69	Hz
Motor maximum frequency	73	Hz
Inspection window as standard		

#### Light IP 44

Switch and cable for light

Air flow meter, analog

#### HEATING SECTION, WATER 2C TV3

Air flow	5795	m3/h
Heating capacity	24.9	kW
Row number / fin spacing	2 / 2.0	mm
Face velocity / Pressure loss	2.8 m/s / 42	Pa
Air temperature, entering / leaving	7.1 / 20.0	°C
Fluid type	Water	
Entering / leaving fluid	70 / 50	°C
Fluid flow / fluid velocity / pressure loss	0.30 l/s / 0.61 m/s / 3.0	kPa
Fluid volume	4	l
Tube connections, threaded	DN25	

### Exhaust unit

#### ⑤ CASING 2C L=950

Dimensions (width x height x length)	1320 x 620 x 950	mm
Weight, includes the weight of the casing and parts inside the casing	101	kg

#### DAMPER SECTION 2C L=250

Tightness class	Leakage class 4	
Pressure loss	11	Pa
Torque demand	8	Nm

#### FILTER SECTION 2C L=700

Filter class	F5	
Initial pressure loss	47	Pa
Calculation pressure loss	71	Pa
Final pressure loss	94	Pa
Filter quantity and size	2x[592x442]	
Spare filter set	1	pc

#### ② ROTARY HEAT EXCHANGER SECTION 2C D=1070

The results are shown with the supply air unit

#### ⑥ CASING 2C L=800

Dimensions (width x height x length)	1320 x 620 x 800	mm
Weight, includes the weight of the casing and parts inside the casing	111	kg

#### FAN SECTION 2C 315 ARRANGEMENT1 DIRECT DRIVE

Performance value tolerance DIN 24166		
Manufacturer	Fläkt Woods	
Blade type/diameter	Backward curved / D315	
Air flow	4260	m3/h
Connection type	To a chamber	
Fan total pressure	611	Pa
Fan efficiency	72	%
Electrical total efficiency	57	%
Motor speed	3124	1/min
Maximum speed of revolution	3364	1/min
Fan shaft power	1.00	kW
Fan's maximum power	3.34	kW
Air flow measurement pressure difference / K value	$(q = k \sqrt{\Delta p})$ 1837 Pa / 99.4	

#### DIRECT DRIVEN FAN GPEB310

Unit: PN-3 ok

Voltage	400V/3-v/50Hz	
Motor shaft power	1.00	kW
Nominal capacity	1.50	kW
Nominal current	3.17	A
Nominal speed (50 Hz)	2900	1/min
Efficiency	81	%
Motor input power in working point	1.27	kW
Motor frequency in the working point	54	Hz
Motor maximum frequency	58	Hz
Inspection window as standard		

**Light IP 44****Switch and cable for light****Air flow meter, analog****④ UNIT BASE 1C-6C L=2400 B=1320 H=200**

Adjustable feet with synthetic rubber pad

Weight 21 kg

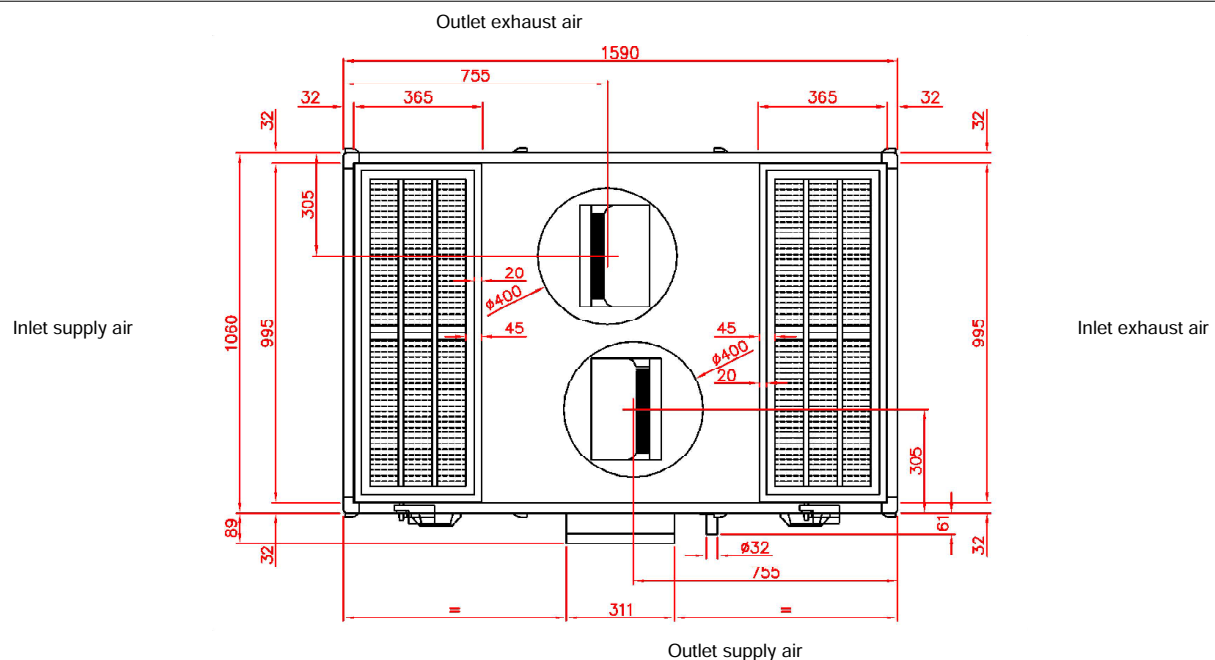
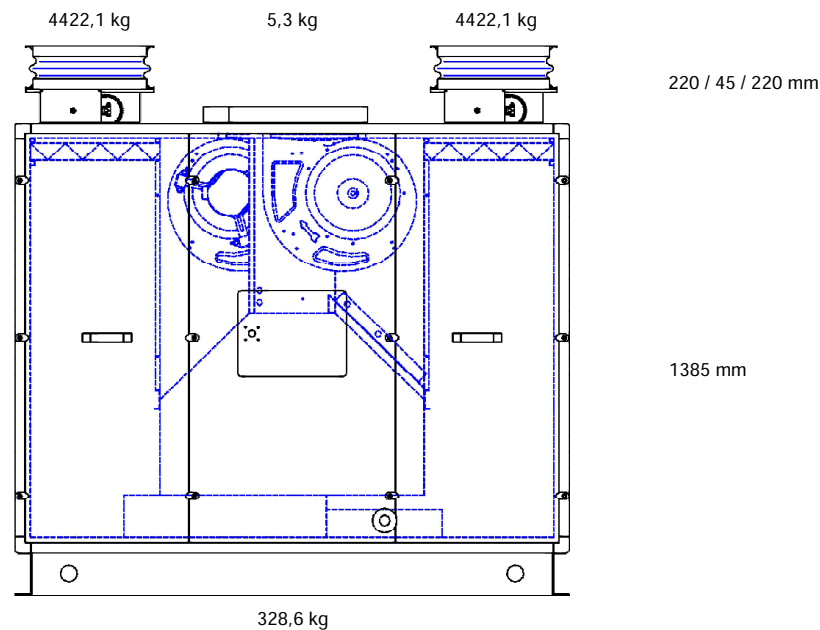


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Model : **HRup 2000 / NVr / CTm / MSa / CTm / MSa / SR / SR**

The HRup series is a range of mechanical home ventilation units (up to 2000 m<sup>3</sup>/h) with high efficiency (90 % and more) heat recovery, consisting of aluminium counterflow heat exchangers, a stainless steel drain pan, G4 and F7 class filters and of TAC technology centrifugal fans with high efficiency electronic motors. It will be delivered ready to use, entirely pre-cabled (the options as well) and with a remote control which will allow to control the unit without opening it. All that'll need to be done is to connect the power (outside the unit), to connect the remote control and to set the parameters and that's it ! The device will be delivered as standard with a 100% by-pass, and its pre-cabled control. The new control is designed to receive and monitor the different options available according to your needs. The structure of the unit is in extruded anodized aluminium profile, articulated around strengthened polypropylene modules. Panels are 30 mm double skin. The outside is made of polyester pre-painted steel, and the inside is made of galvanized steel. The heat and sound insulation is made of 28mm fireproofed rockwool panels, in conformity with the European standards for the environment. The HRup series is mounted on base frame, and is made in one piece (mono block). All the access doors to the filters are equipped with handles. Airtightness of the group allows to classify the device in class 1 for the internal leaks and class 2 for the external leaks according to standard EN 13141-7.



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Model : **HRup 2000 / NVr / CTm / MSa / CTm / MSa / SR / SR**

### Supply : Fans + Regulation

Voltage : 1 x 230 V  
Intensity : 14,3 A max.  
Electrical protection : D16A - 10kA - AC3

### Fans - TAC

Units are equipped with high efficiency TAC technology fans. They are driven by electronically commutated motors and allow accurate control of the fan's actual working point. The efficiency of the motor remains between 85% and 60%, whatever the working point. The motor is a permanent magnet DC driven motor but AC power supplied.

	<u>Supply</u>	<u>Exhaust</u>		Fan name :	DD 11-9 TAC 3/4 HRu2000
Airflow :	2070	1910	m³/h	Number of fans :	1 + 1
Internal pressure drop :	274	255	Pa	Sound power spectrum (fan only)-(dB re.10E-12 W/m²)	
External pressure drop :	150	140	Pa		
Extra available pressure drop :	246	301	Pa		
Rotation speed :	1202	1159	rpm		
Voltage :	230	230	V		
Intensity :	3,61	3,17	A		
Power :	602	523	W		
SFP W/(m³/h) [W/(l/s)] :	0.29 [1.05]	0.27 [0.99]			

	63	125	250	500	1000	2000	4000	8000	Hz
S	88,5	83,5	78,5	71,5	73,5	66,5	61,5	56,5	dBL
E	87,5	82,5	77,5	70,5	72,5	65,5	60,5	55,5	dBL

Radiated A weighted Sound pressure level for ducted unit  
in free field (d=3m)

45,4 dBA

(RF=600000000/DF=1/ZF=20,40)-(dB re. 20 µPa)

## Regulation

The units are delivered fully pre-wired as standard ('plug & play') with general switch and complete regulation of the unit. The latter includes all the necessary components and is fully wired to T° probes, fans, general switch, by-pass , as well as all options such as pre and post heating (except HRup 450). Connect the power supply and configure the parameters and the unit is ready to run.

The regulation monitors each component:

- Setting and piloting of TAC fans in selected mode: CA (constant flow), CP (constant pressure measured by an optional external sensor) or LS (link with signal 0 - 10V, for example a CO2 air quality sensor).
- Automatic freecooling control with bypass
- Antifrost system of the air/air heat exchanger (airflow modulation or electrical coil)
- Control of internal post-heating coil (water or electrical)
- Control of external post-heating coil (water or electrical) or cooling coil (water), or reversible coil (heating or cooling water coil)
- Open/Close motorized dampers
- Time slot management (scheduling)
- Alarms management (fire, pressure, maintenance, component failure,...)
- Display and management of all system parameters via RC, GRC, BMS or web page (option)
- MODBUS communication (RTU, TCP/IP and GPRS) (option)

## Heat Recovery unit - CF

The heat exchanger is an air/air high efficiency counterflow heat exchanger, executed in sea water resistant aluminium, at a temperature of up to 80°C. The airtightness tests according to DIN1946 show a leakage rate of 0.017 % at 400 Pa difference between the 2 air streams. The heat exchanger is compliant to standard EN 308.

Air pressure :	1013 mbar					
	<u>Supply</u>	<u>Exhaust</u>			<u>Supply</u>	<u>Exhaust</u>
Airflow :	2070	1910	m³/h	Air outlet temperature :	16,7	-9,0 °C
	0,58	0,53	m³/s	Relative humidity out :	2,5	100,0 %
Airspeed through HRU :	1,93	2,10	m/s	Humidity out :	0,3	1,8 g/kg
Air inlet temperature :	-21,0	22,0	°C	Total capacity (W.B.) :	26,2	kW
Relative humidity in :	50,0	35,0	%	HRU efficiency (W.B.) :	87,7	%
Humidity in :	0,3	5,7	g/kg	Pressure drop in REC :	180	222 Pa

### Post-heating (Warm water) - NVr

It's a warm water coil of post-heater to allow an accurate control of the supply air temperature. It is delivered ready to be connected to the hot water circuit, with a motorized 3-ways valve and a complete pre-wired regulation. Just key in the assignment temperature, the regulation will modulate the capacity of the heating coil to reach the assignment, according to the resulting temperature after the heat exchanger.

Coil name :	HRu 2000-1	Air inlet T° :	10,0 °C	Fluid type :	Water
Number of rows :	1	Outlet air T° :	20,0 °C	Glycol %age :	0 %
Number of circuits :	1	Airflow :	2070 m³/h	Fluid T° in/out :	70,0 / 36,2 °C
Total capacity :	7,21 kW	Air speed :	2,57 m/s	Fluid flow :	186 l/h
		Air pressure drop :	19 Pa	Fluid pressure drop :	2.15 kPa

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Model :	<b>HRup 2000 / NVr / CTm / MSa / CTm / MSa / SR / SR</b>
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<b>Filter - G/F</b>					
The heat recovery ventilation unit is equipped with G4 zig-zag filters at the inlet of the polluted air and filters F7 class filters at inlet of the fresh air, to protect the heat exchanger and guarantee an air quality inside the building. They are easily accessible for maintenance by the access doors equipped with handles.					
				<u>Supply</u>	<u>Exhaust</u>
Filter class :	F7 (Compact)	Dimensions :	503 x 370 x 50 mm	Air speed :	1,54 m/s
		Quantity :	2	Filter pressure drop :	68 Pa
Filter class :	G4 (Plane Z)	Dimensions :	503 x 370 x 50 mm	Air speed :	1,43 m/s
		Quantity :	2	Filter pressure drop :	27 Pa

<b>Damper(s) - CTm</b>					
It 's a damper delivered motorized and pre-wired, to cut the draft during the powering off of the device. It comes with a pre-wired servo motor and is controlled by the regulation. The frame and the aerofoil blades are in galvanised steel, the bearings are in nylon. The external gears, in plastic material, allow a transmission without looseness or deformation.					
				<u>Supply</u>	<u>Exhaust</u>
External dimensions :	365 x 995 mm	Air speed :	2,20	2,03	m/s
Internal dimensions :	285 x 915 mm	Damper pressure drop :	7	6	Pa

<b>Circular outlet - SR ø 400 mm</b>
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<b>Base frame - BA</b>
------------------------

<b>Flexible connection (air in) - MS</b>
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Model : **HRflat 600 (Weight: 137,8 kg)**

The HRflat heat recovery unit is compact unit with self-contained casing from galvanized metal sheet. Bottom part of the casing has lacquered finish advantage in case of shown installation. Casing's insulation thickness is 30 mm. The unit is equipped with radial fans with TAC motors low on consumption. On both inlet and outlet the unit is fitted with desk filters G4. Furthermore the unit is equipped with counterflow heat exchangers with efficiency up to 90%, condensation tub, by-pass 100% and automatic condensation pumping. Total height of the unit enables easy mounting into ceiling. Condensed water does not drop into siphon but is drained away with pump. The unit is delivered with an prewired regulation. More details on [www.lemmens.com](http://www.lemmens.com).

**Supply : Fans + Regulation**

Voltage : 1 x 230 V - 50 Hz  
Intensity : 3,0 A mac.  
Electrical protection : D8A - 10kA - AC3

**Fans - TAC**

Units are equipped with high efficiency TAC technology fans. They are driven by electronically commutated motors and allow accurate control of the fan's actual working point. The efficiency of the motor remains between 85% and 60%, whatever the working point. The motor is a permanent magnet DC driven motor but AC power supplied.

	<u>Supply</u>	<u>Exhaust</u>	
Airflow :	550	280	m³/h
Internal pressure drop :	125	62	Pa
External pressure drop :	200	200	Pa
Extra available pressure drop :	48	147	Pa
Rotation speed :	2451	2175	rpm
Voltage :	230	230	V
Intensity :	1,07	0,49	A
Power :	156	65	W
SFP W/(m³/h) [W/(l/s)] :	0,28 [1,02]	0,23 [0,84]	

Fan name : DD 146-210 TAC 180w HRf60  
Number of fans : 1 + 1

Sound power spectrum (fan only)-(dB re.10E-12 W/m<sup>2</sup>)

	63	125	250	500	1000	2000	4000	8000	Hz
S	80,4	75,4	70,4	63,4	63,4	60,4	53,4	48,4	dBL
E	75,6	70,6	65,6	58,6	58,6	55,6	48,6	43,6	dBL

Radiated A weighted Sound pressure level for ducted unit  
in free field (d=3m) 36,2 dBA

(RF=600000000/DF=1/ZF=20.40)-(dB re. 20  $\mu$ Pa)

## Regulation

The units are delivered fully pre-wired as standard ('plug & play') with general switch and complete regulation of the unit. The latter includes all the necessary components and is fully wired to T° probes, fans, general switch, by-pass. Connect the power supply and configure the parameters and the unit is ready to run.

The regulation monitors each component:

- Setting and piloting of TAC fans in selected mode: CA (constant flow), CP (constant pressure measured by an optional external sensor) or LS (link with signal 0 - 10V, for example a CO2 air quality sensor).
- Automatic freecooling control with bypass
- Antifrost system of the air/air heat exchanger (airflow modulation or electrical coil). Device mounted outside the unit
- Control of external post-heating coil (water or electrical) or cooling coil (water), or reversible coil (heating or cooling water coil)
- Open/Close motorized dampers
- Time slot management (scheduling)
- Alarms management (fire, pressure, maintenance, component failure,...)
- Display and management of all system parameters via RC, GRC, BMS or web page (option)
- MODBUS communication (RTU, TCP/IP and GPRS) (option)

## Heat Recovery unit - CF

The heat exchanger is an air/air high efficiency counterflow heat exchanger, executed in sea water resistant aluminium, at a temperature of up to 80°C. The airtightness tests according to DIN1946 show a leakage rate of 0.017 % at 400 Pa difference between the 2 air streams. The heat exchanger is compliant to standard EN 308.

Air pressure :	1013 mbar					
	<u>Supply</u>	<u>Exhaust</u>			<u>Supply</u>	<u>Exhaust</u>
Airflow :	550	280	m³/h	Air outlet temperature :	5,3	-17,4 °C
	0,15	0,08	m³/s	Relative humidity out :	6,4	100,0 %
Airspeed through HRU :	1,74	1,04	m/s	Humidity out :	0,3	0,8 g/kg
Air inlet temperature :	-21,0	22,0	°C	Total capacity (W.B.) :	4,8	kW
Relative humidity in :	60,0	35,0	%	HRU efficiency (W.B.) :	61,1	%
Humidity in :	0,3	5,7	g/kg	Pressure drop in REC :	95	51 Pa

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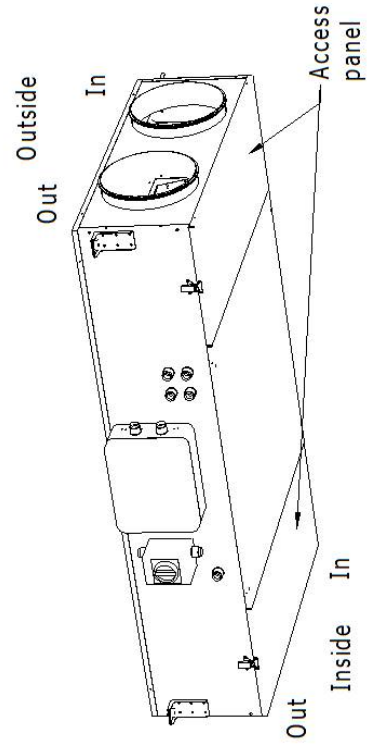
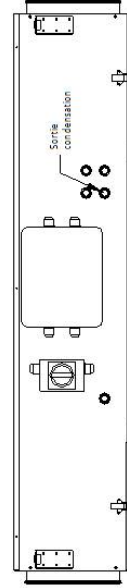
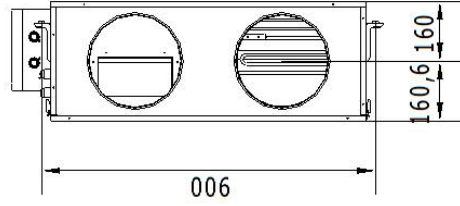
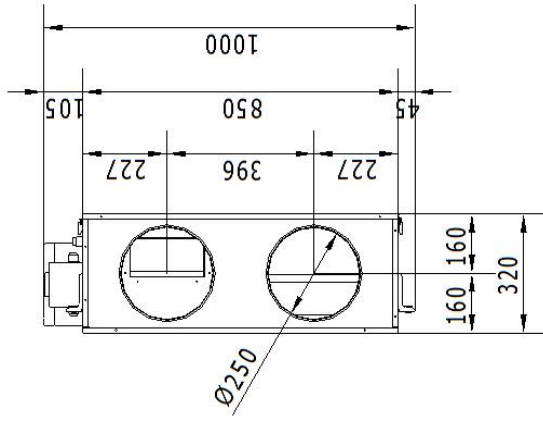
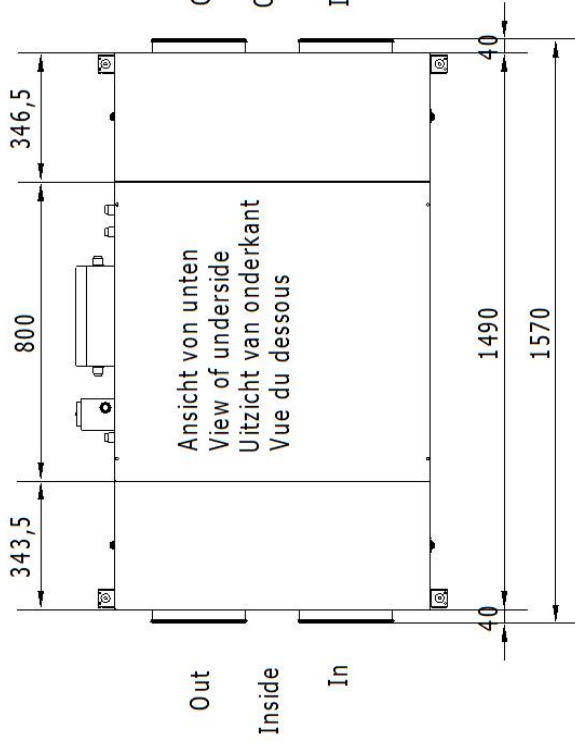
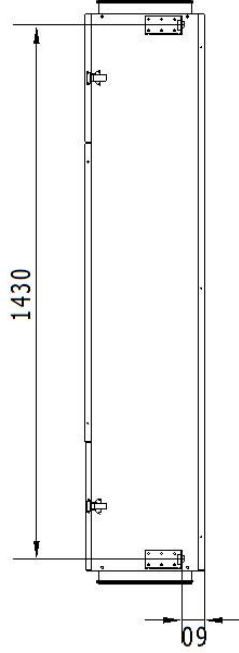
Model :	<b>HRflat 600 (Weight: 137,8 kg)</b>
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**Filter - G/F**

The heat recovery ventilation unit is equipped with G4 zig-zag filters at the inlet of the polluted air and at inlet of the fresh air, to protect the heat exchanger and guarantee an air quality inside the building. They are easily accessible for maintenance by the access doors equipped with handles.

					<u>Supply</u>	<u>Exhaust</u>	
Filter class :	G4 (Plane Z)	Dimensions :	390 x 255 x 50 mm	Air speed :	1,54		m/s
		Quantity :	1	Filter pressure drop :	30		Pa
Filter class :	G4 (Plane Z)	Dimensions :	390 x 255 x 50 mm	Air speed :		0,78	m/s
		Quantity :	1	Filter pressure drop :		11	Pa

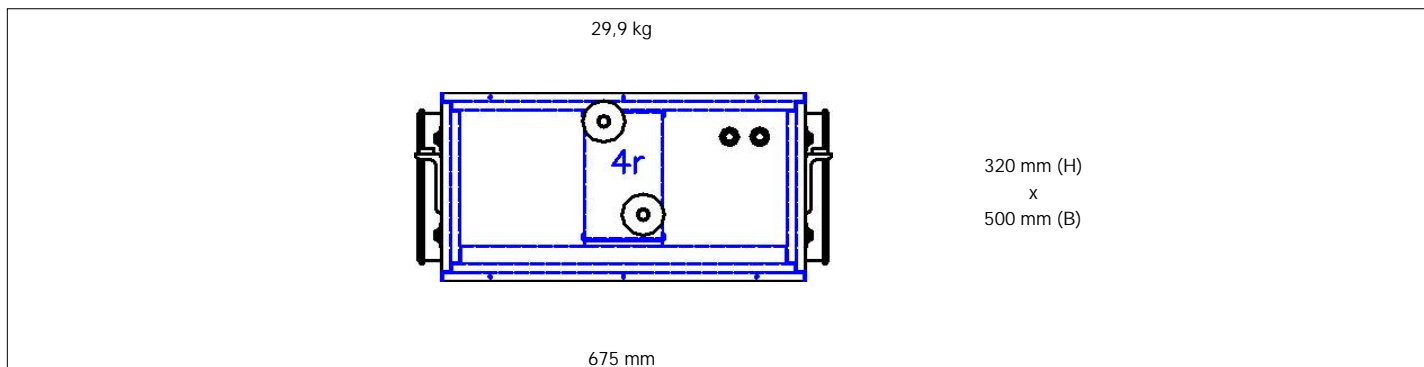
<b>Circular inlet - ER ø 250 mm</b>	<b>Circular outlet - SR ø 250 mm</b>
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Index	Date	Modification	Per	Contrôle
			By	Controlled
Toutes les cotes sont des cotes extérieures / All dimensions are outside dimensions				
Titre : HRflat 600 TAC4 (PLC)				
Titre :				
Client/Client :				
Code client/Client code :				
Date :	17/10/2011	Numéro de plan : 886202		
Unité :	mm	Drawing number :		
Drawn by :	M.H.			

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Model :	<b>HR flat 600 / BA W</b>
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<b>Manufacturing info</b>
882445 / BA W

The BA option is an add-on section to the HRflat unit, equipped with a water or a direct expansion (dx) coil and a drain pan with a condensate pump (230 Vac). The water coil can be supplied with hot or cold water in order to control the supply air temperature to the room. The kit is delivered with the regulation and the temperature sensors used to control the motorized 3-way valve. The latter is controlled by a 0-10V output signal. The 3-way valve is included in the kit. The dx coil is provided without regulation.

<b>Heating coil - NVr</b>				Connection diam. :	3/4"
Coil name :	HRf 450-4	Inlet air T° :	5,3 °C	Fluid type :	Water
Number of rows :	4	Outlet air T° :	20,0 °C	Glycol %age :	%
Number of circuits :	4	Airflow :	550 m³/h	Fluid T° in/out :	70,0 / 18,3 °C
Total capacity :	2,86 kW	Air speed :	2,26 m/s	Fluid flow :	48 l/h
		Air pressure drop :	54 Pa	Fluid pressure drop :	0,06 kPa

Circular inlet - ER Ø 250 mm	Circular inlet - ER Ø 250 mm
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Project data																	
Project																	
Handled by																	
Additional info																	
Unit code	Size	qT m3/h	qP m3/h	Heat recovery section			Coils			Sounds				Electric motor		Spec. input power	
				Heat recovery	etaTs %	etaT %	v m/s	qLP l/s	qJP l/s	qLTO l/s	LWP dB(A)	LWI dB(A)	PN kW	IN A	SFPv kW/(m³/s)	Clean filter	
3: PN-6 ok	2C	4850	m3/h	LG	61.0		2.32	0.23				0.58	83	72	2.20	4.54	1.03
3: PN-6 ok	2C		4910	LG			2.35					0.58	86	71	2.20	4.54	1.12
Total		4850	4910												4.40		

Total electric supply, clean filters 2.92 kW

Common SFP figure of units, clean filters 2.14 kW/(m³/s)

Abbreviations used:		Unit
qT	Supply air flow	m3/h
qP	Exhaust air flow	m3/h
LL	Plate-type exchanger heat recovery	
LG	Water-glycol heat recovery	
LR	Rotor heat recovery	
etaTs	Entering air temperature efficiency with even air flows	%
etaT	Entering air temperature efficiency with designed air flows	%
v	Coil face velocity	m/s
qLP	Water flow of heating coil	l/s

Abbreviations used:		Unit
qJP	Water flow of cooling coil	l/s
qLTO	Fluid flow of heat recovery coil	l/s
LWP	Sound power level at unit's pressure side	dB(A)
LWI	Sound power level at unit's suction side	dB(A)
PN	Fan motor's nominal capacity	kW
IN	Fan motor's nominal current (3~400V)	A
SFPv	Single unit's nominal input power, clean filter	kW/(m³/s)
SFP	Supply-exhaust unit's nominal input power, clean filter	kW/(m³/s)



Unit: PN-6 ok

## Project data

Handled by

**Unit : 1** PN-6 ok

## Summary data

Altitude	0	m
Air pressure	1013	mbar
Air density	1.20	kg/m3

	Supply unit			Exhaust unit		
Unit size	Recair 2C			Recair 2C		
Air flow	4850	m3/h		4910	m3/h	
External static pressure of the unit	200	Pa		200	Pa	
Motor power	1.60	kW		1.60	kW	
Coil face velocity	2.3	m/s		2.3	m/s	
Face velocity of the unit	2.3	m/s		2.3	m/s	
Temp. efficiency of the heat recovery	61.00	%				
SFP, specific fan power	2.14	kW/(m³/s)				

Calculation of the SFP figure includes frequency converter's efficiency 97%

Unit equipped with T-handles

The noise performances in accordance with ISO 3741, ISO 5136 and ISO 7235.

Sound power levels in the unit connections

### Supply unit

Octave band Hz	63	125	250	500	1k	2k	4k	8k		Tot.	
Pressure side of the unit	69	69	69	76	79	75	75	71	dB	83	dB(A)
Suction side of the unit	71	68	68	74	67	53	40	31	dB	72	dB(A)
Through the casing	63	58	52	57	61	59	50	41	dB	64	dB(A)

### Exhaust unit

Octave band Hz	63	125	250	500	1k	2k	4k	8k		Tot.	
Pressure side of the unit	70	70	70	78	81	78	79	76	dB	86	dB(A)
Suction side of the unit	70	67	67	72	64	49	37	28	dB	71	dB(A)
Through the casing	63	58	52	57	61	59	50	41	dB	64	dB(A)

Unit: PN-6 ok

Unit code PN-6 ok

Unit size 2C

Supply air flow 4850 m<sup>3</sup>/h

Exhaust air flow 4910 m<sup>3</sup>/h

Tot. (dry) weight of the unit 384 kg

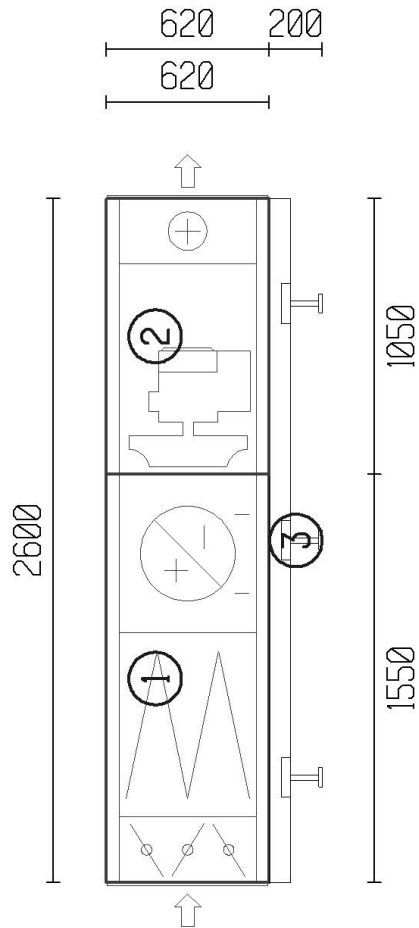
Additional info

Duct connections supplied with connection flange

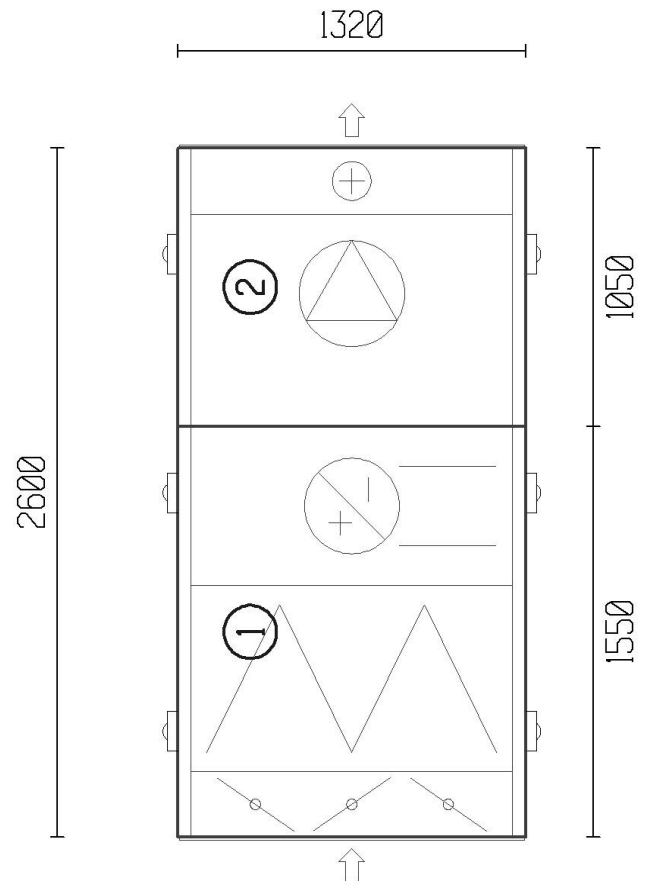
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Scale

No scale

### From the service side



### Top view



Unit: PN-6 ok

Unit code PN-6 ok

Unit size 2C

Supply air flow 4850 m<sup>3</sup>/h

Exhaust air flow 4910 m<sup>3</sup>/h

Tot. (dry) weight of the unit 385 kg

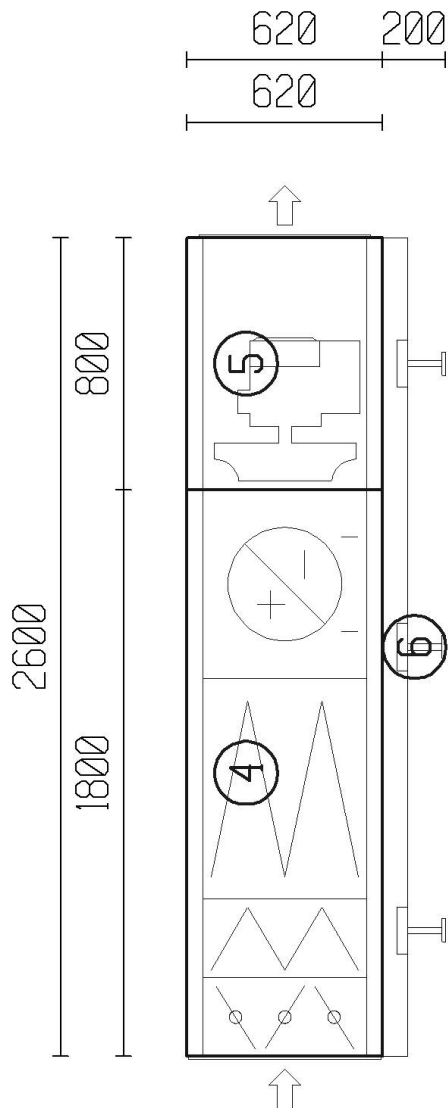
Additional info

Duct connections supplied with connection flange

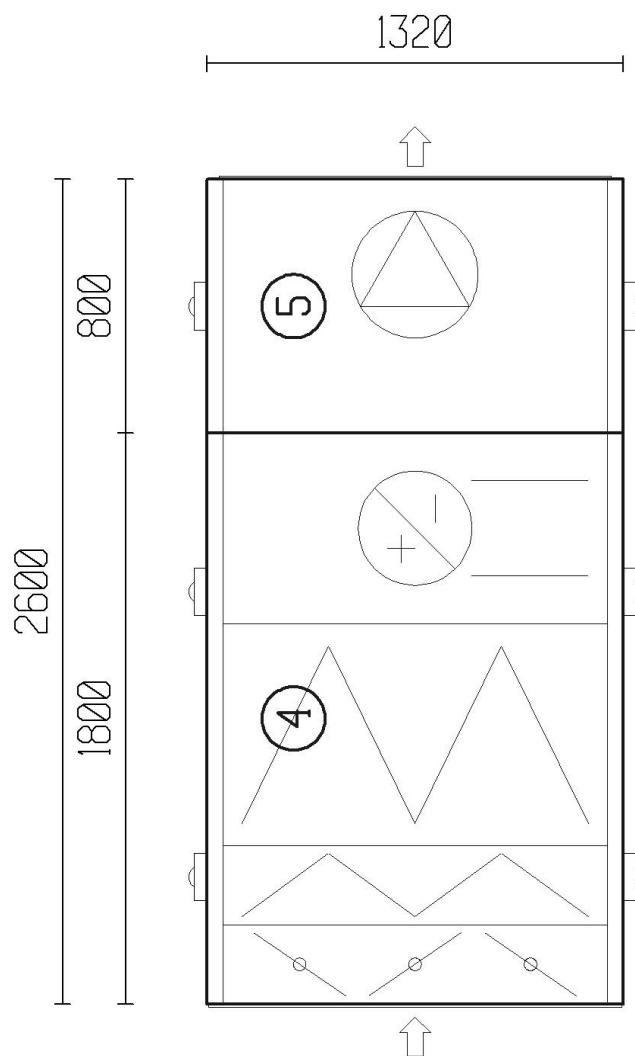
Handled by  
Scale

No scale

### From the service side



### Top view



Unit: PN-6 ok

## Unit sections and technical data

### Supply unit

#### ① CASING 2C L=1550

Dimensions (width x height x length)	1320 x 620 x 1550	mm
Weight, includes the weight of the casing and parts inside the casing	217	kg

#### DAMPER SECTION 2C L=250

Tightness class	Leakage class 4	
Pressure loss	14	Pa
Torque demand	8	Nm

#### FILTER SECTION 2C L=700

Filter class	F7	
Initial pressure loss	119	Pa
Calculation pressure loss	179	Pa
Final pressure loss	238	Pa
Filter quantity and size	2x[592x442]	
Spare filter set	1	pc

#### HEAT RECOVERY SECTION 2C Z=14 SUPPLY

Air flow	4850	m <sup>3</sup> /h
Heating capacity	45.1	kW
Row number / fin spacing	14 / 2.0	mm
Face velocity / Pressure loss	2.3 m/s / 144	Pa
Entering air: temperature / humidity / enthalpy	-21.7 °C / 80 % / -20.5	kJ/kg
Leaving air: temperature / humidity / enthalpy	6.2 °C / 0 % / 0.0	kJ/kg
Fluid type	Ethylene glycol 30	%
Entering / leaving fluid	13 / -7	°C
Fluid flow / fluid velocity / pressure loss	0.58 l/s / 0.70 m/s / 28.6	kPa
Fluid volume	24	l
Tube connections, flange	DN25	

#### ② CASING 2C L=1050

Dimensions (width x height x length)	1320 x 620 x 1050	mm
Weight, includes the weight of the casing and parts inside the casing	141	kg

#### FAN SECTION 2C 315 ARRANGEMENT1 DIRECT DRIVE

Performance value tolerance DIN 24166		
Manufacturer	Fläkt Woods	
Blade type/diameter	Backward curved / D315	
Air flow	4850	m <sup>3</sup> /h
Connection type	To a chamber	
Fan total pressure	668	Pa
Fan efficiency	70	%
Electrical total efficiency	56	%
Motor speed	3444	1/min
Maximum speed of revolution	3802	1/min
Fan shaft power	1.29	kW
Fan's maximum power	3.34	kW
Air flow measurement pressure difference / K value	$\left( q = k \sqrt{\Delta p} \right)$ 2381 Pa / 99.4	

#### DIRECT DRIVEN FAN GPEB310

Voltage	400V/3-v/50Hz	
Motor shaft power	1.29	kW
Nominal capacity	2.20	kW
Nominal current	4.54	A
Nominal speed (50 Hz)	2880	1/min
Efficiency	83	%
Motor input power in working point	1.60	kW
Motor frequency in the working point	60	Hz
Motor maximum frequency	66	Hz
Inspection window as standard		
Light IP 44		

Unit: PN-6 ok

**Switch and cable for light**  
**Air flow meter, analog**
**HEATING SECTION, WATER 2C TV1**

Air flow	4850	m <sup>3</sup> /h
Heating capacity	19.1	kW
Row number / fin spacing	1 / 2.0	mm
Face velocity / Pressure loss	2.3 m/s / 20	Pa
Air temperature, entering / leaving	6.2 / 18.0	°C
Fluid type	Water	
Entering / leaving fluid	70 / 50	°C
Fluid flow / fluid velocity / pressure loss	0.23 l/s / 1.41 m/s / 19.5	kPa
Fluid volume	2	l
Tube connections, threaded	DN10	

**③ UNIT BASE 1C-6C L=2600 B=1320 H=200**

Adjustable feet with synthetic rubber pad

Weight 26 kg

**Exhaust unit**
**④ CASING 2C L=1800**

Dimensions (width x height x length)	1320 x 620 x 1800	mm
Weight, includes the weight of the casing and parts inside the casing	246	kg

**DAMPER SECTION 2C L=250**

Tightness class	Leakage class 4	
Pressure loss	14	Pa
Torque demand	8	Nm

**FILTER SECTION 2C L=250**

Filter class	G4 short	
Initial pressure loss	56	Pa
Calculation pressure loss	83	Pa
Final pressure loss	111	Pa
Filter quantity and size	2x[592x442]	
<b>Spare filter set</b>	1	pc

**FILTER SECTION 2C L=700**

Filter class	F5	
Initial pressure loss	57	Pa
Calculation pressure loss	85	Pa
Final pressure loss	113	Pa
Filter quantity and size	2x[592x442]	
<b>Spare filter set</b>	1	pc

**HEAT RECOVERY SECTION 2C Z=14 EXHAUST**

Air flow	4910	m <sup>3</sup> /h
Cooling capacity	45.1	kW
Row number / fin spacing	14 / 2.0	mm
Face velocity / Pressure loss	2.3 m/s / 157	Pa
Entering air: temperature / humidity / enthalpy	24.0 °C / 30 % / 38.7	kJ/kg
Leaving air: temperature / humidity / enthalpy	1.0 °C / 96 % / 10.7	kJ/kg
Fluid type	Ethylene glycol 30	%
Entering / leaving fluid	-7 / 13	°C
Fluid flow / fluid velocity / pressure loss	0.58 l/s / 0.70 m/s / 28.6	kPa
Fluid volume	24	l
Tube connections, flange	DN25	

**⑤ CASING 2C L=800**

Dimensions (width x height x length)	1320 x 620 x 800	mm
Weight, includes the weight of the casing and parts inside the casing	113	kg

**FAN SECTION 2C 315 ARRANGEMENT1 DIRECT DRIVE**

Performance value tolerance DIN 24166

Unit: PN-6 ok

Manufacturer	Fläkt Woods
Blade type/diameter	Backward curved / D315
Air flow	4910 m <sup>3</sup> /h
Connection type	To a chamber
Fan total pressure	652 Pa
Fan efficiency	69 %
Electrical total efficiency	56 %
Motor speed	3460 1/min
Maximum speed of revolution	3802 1/min
Fan shaft power	1.29 kW
Fan's maximum power	3.34 kW
Air flow measurement pressure difference / K value	$\left( q = k \sqrt{\Delta p} \right)$ 2440 Pa / 99.4

#### DIRECT DRIVEN FAN GPEB310

Voltage	400V/3-v/50Hz
Motor shaft power	1.29 kW
Nominal capacity	2.20 kW
Nominal current	4.54 A
Nominal speed (50 Hz)	2880 1/min
Efficiency	83 %
Motor input power in working point	1.60 kW
Motor frequency in the working point	60 Hz
Motor maximum frequency	66 Hz
Inspection window as standard	

**Light IP 44**

**Switch and cable for light**

**Air flow meter, analog**

#### ⑥ UNIT BASE 1C-6C L=2600 B=1320 H=200

Adjustable feets with synthetic rubber pad	
Weight	26 kg

# TFSK 200 ROOF FAN BLACK

Item no. 1349

Version: 50 Hz

Document type: **Product card**  
Document date: **2014-09-02**  
Generated by: **Systemair Online Catalogue**

## Description

- Swing-out
- Speed-controllable
- Easy to install
- Reliable

The TFSK range consists of roof fans with a square base frame and are fitted with a single-inlet centrifugal fan with backward-curved blades and external rotor motors. The motors can be tilted outwards to facilitate inspection and service. They have integral on/off switch and are supplied with 1 m cable and are easy connected to our standard roof curbs TG, FDS and SSD.

These fans are suitable for exhaust-air ventilation systems, e.g. single and multiple dwellings, offices and day nurseries. To protect the motors from overheating, all motors have an integral thermal contact with electrical reset. The casings are manufactured from galvanized steel, with powder-coating in black colour.

For cold climates we recommend that the fan runs continuously to avoid problems with ice.

In case of installing FSD-L flat roof socket, a TDA adapter is needed.

- Swing-out
- Speed-controllable
- Easy to install
- Reliable

The TFSK range consists of roof fans with a square base frame and are fitted with a single-inlet centrifugal fan with backward-curved blades and external rotor motors. The motors can be tilted outwards to facilitate inspection and service. They have integral on/off switch and are supplied with 1 m cable and are easy connected to our standard roof curbs TG, FDS and SSD.

These fans are suitable for exhaust-air ventilation systems, e.g. single and multiple dwellings, offices and day nurseries. To protect the motors from overheating, all motors have an integral thermal contact with automatic reset. The casings are manufactured from galvanized steel, with powder-coating in black colour.

For cold climates we recommend that the fan runs continuously to avoid problems with ice.

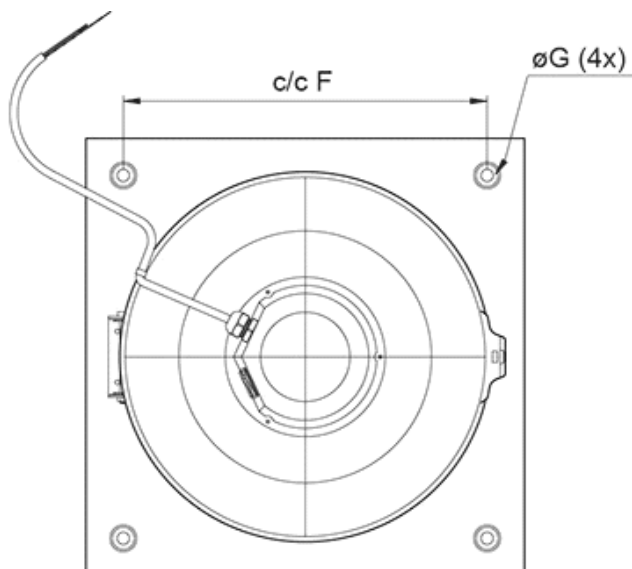
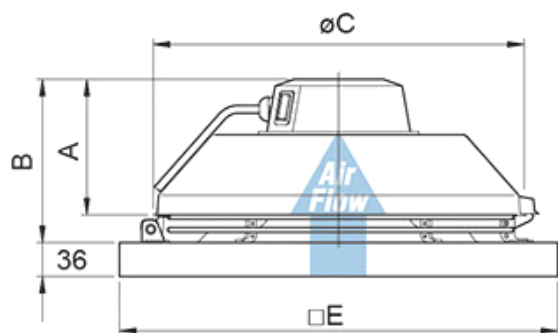
In case of installing FSD-L flat roof socket, a TDA adapter is needed.



## Technical parameters

Voltage	230	V
Frequency	50	Hz
Phase	1	~
Power	108	W
Current	0.466	A
Max. airflow	749	m³/h
Fan impeller speed	2537	r.p.m.
Max. temperature of transported air	62	°C
Max. temperature of transported air when voltage-controlled	62	°C
Sound pressure level at 10 m (free field)	40.2	dB(A)
Weight	4.2	kg
Insulation class, motor	B	
Enclosure class, motor	44	IP
Capacitor	3	µF
Colour	Black	

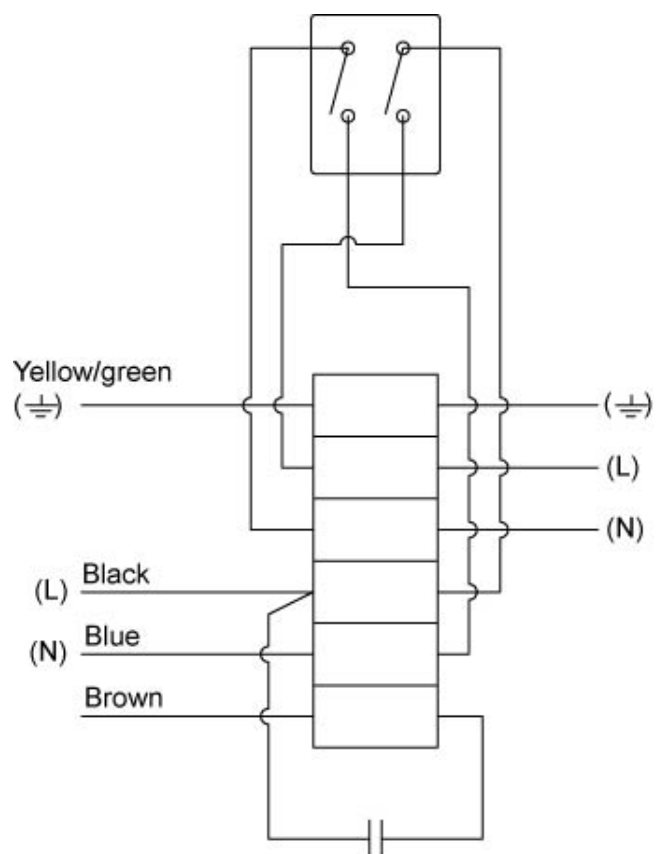
## Dimensions



TFSK	A	B	øC	□E	c/c F	øG
200	123	160	364	421	330	9

## Wiring

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# TFSK 315 L ROOF FAN BLACK

Item no. 1352

Version: 50 Hz

Document type: **Product card**  
 Document date: **2014-09-02**  
 Generated by: **Systemair Online Catalogue**

## Description

- Swing-out
- Speed-controllable
- Easy to install
- Reliable

The TFSK range consists of roof fans with a square base frame and are fitted with a single-inlet centrifugal fan with backward-curved blades and external rotor motors. The motors can be tilted outwards to facilitate inspection and service. They have integral on/off switch and are supplied with 1 m cable and are easy connected to our standard roof curbs TG, FDS and SSD.

These fans are suitable for exhaust-air ventilation systems, e.g. single and multiple dwellings, offices and day nurseries. To protect the motors from overheating, all motors have an integral thermal contact with automatic reset. The casings are manufactured from galvanized steel, with powder-coating in black colour.

For cold climates we recommend that the fan runs continuously to avoid problems with ice.

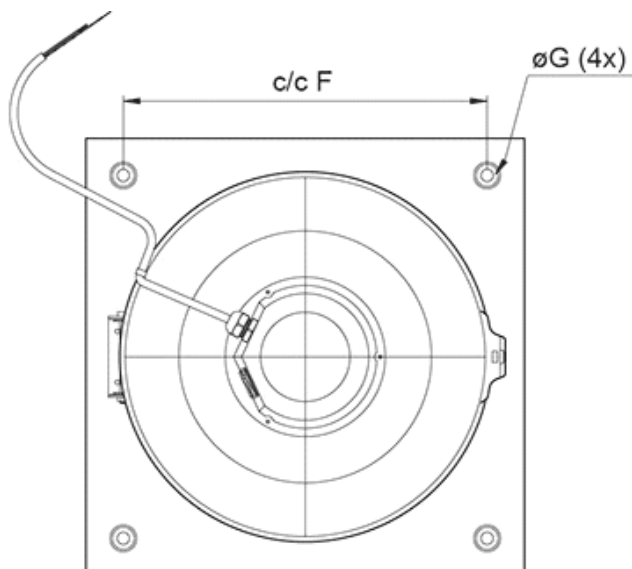
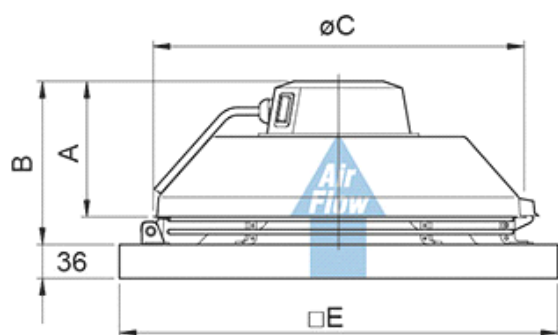
In case of installing FSD-L flat roof socket, a TDA adapter is needed.



## Technical parameters

Voltage	230	V
Frequency	50	Hz
Phase	1	~
Power	329	W
Current	1.43	A
Max. airflow	1598	m³/h
Fan impeller speed	2401	r.p.m.
Min. static back pressure	0	Pa
Max. temperature of transported air	42.2	°C
Max. temperature of transported air when voltage-controlled	38	°C
Sound pressure level at 10 m (free field)	53	dB(A)
Weight	10.7	kg
Insulation class, motor	F	
Enclosure class, motor	44	IP
Capacitor	8	µF
Colour	Black	

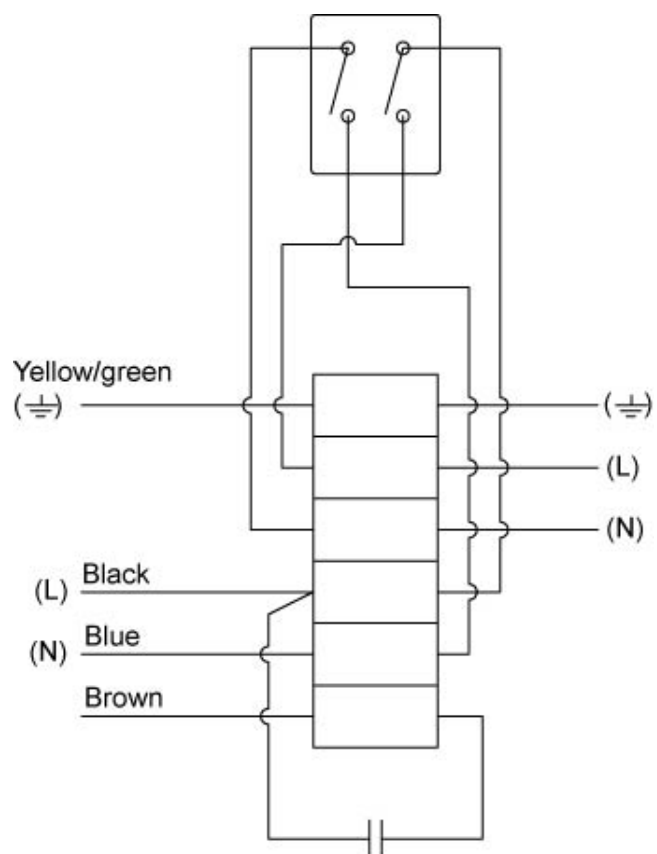
## Dimensions



TFSK	A	B	øC	□E	c/c F	øG
315M/L	160	206	404	521	450	11

## Wiring

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# TFSK 160 ROOF FAN BLACK

Item no. 1348

Version: 50 Hz

Document type: **Product card**  
Document date: **2014-09-02**  
Generated by: **Systemair Online Catalogue**

## Description

- Swing-out
- Speed-controllable
- Easy to install
- Reliable

The TFSK range consists of roof fans with a square base frame and are fitted with a single-inlet centrifugal fan with backward-curved blades and external rotor motors. The motors can be tilted outwards to facilitate inspection and service. They have integral on/off switch and are supplied with 1 m cable and are easy connected to our standard roof curbs TG, FDS and SSD.

These fans are suitable for exhaust-air ventilation systems, e.g. single and multiple dwellings, offices and day nurseries. To protect the motors from overheating, all motors have an integral thermal contact with electrical reset. The casings are manufactured from galvanized steel, with powder-coating in black colour.

For cold climates we recommend that the fan runs continuously to avoid problems with ice.

In case of installing FSD-L flat roof socket, a TDA adapter is needed.

- Swing-out
- Speed-controllable
- Easy to install
- Reliable

The TFSK range consists of roof fans with a square base frame and are fitted with a single-inlet centrifugal fan with backward-curved blades and external rotor motors. The motors can be tilted outwards to facilitate inspection and service. They have integral on/off switch and are supplied with 1 m cable and are easy connected to our standard roof curbs TG, FDS and SSD.

These fans are suitable for exhaust-air ventilation systems, e.g. single and multiple dwellings, offices and day nurseries. To protect the motors from overheating, all motors have an integral thermal contact with automatic reset. The casings are manufactured from galvanized steel, with powder-coating in black colour.

For cold climates we recommend that the fan runs continuously to avoid problems with ice.

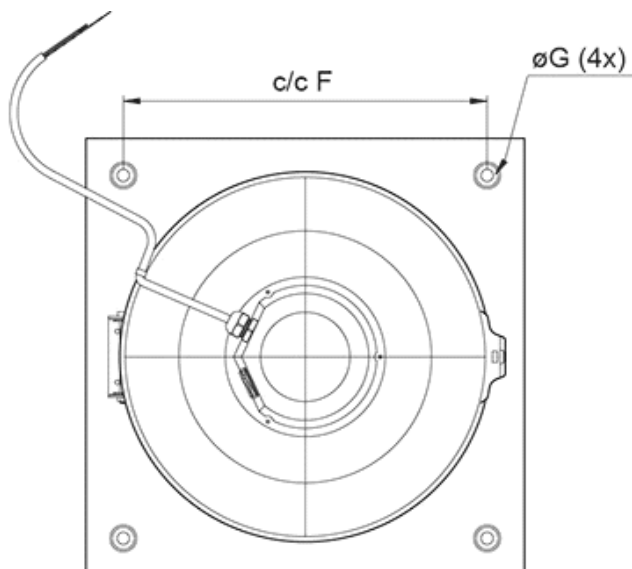
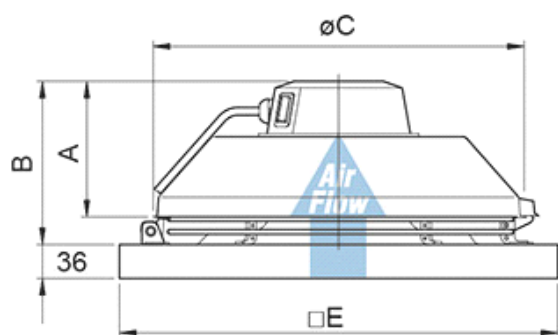
In case of installing FSD-L flat roof socket, a TDA adapter is needed.



## Technical parameters

Voltage	230	V
Frequency	50	Hz
Phase	1	~
Power	58.3	W
Current	0.256	A
Max. airflow	436	m³/h
Fan impeller speed	2461	r.p.m.
Max. temperature of transported air	70	°C
Max. temperature of transported air when voltage-controlled	70	°C
Sound pressure level at 10 m (free field)	35.6	dB(A)
Weight	3.3	kg
Insulation class, motor	B	
Enclosure class, motor	44	IP
Capacitor	2	µF
Colour	Black	

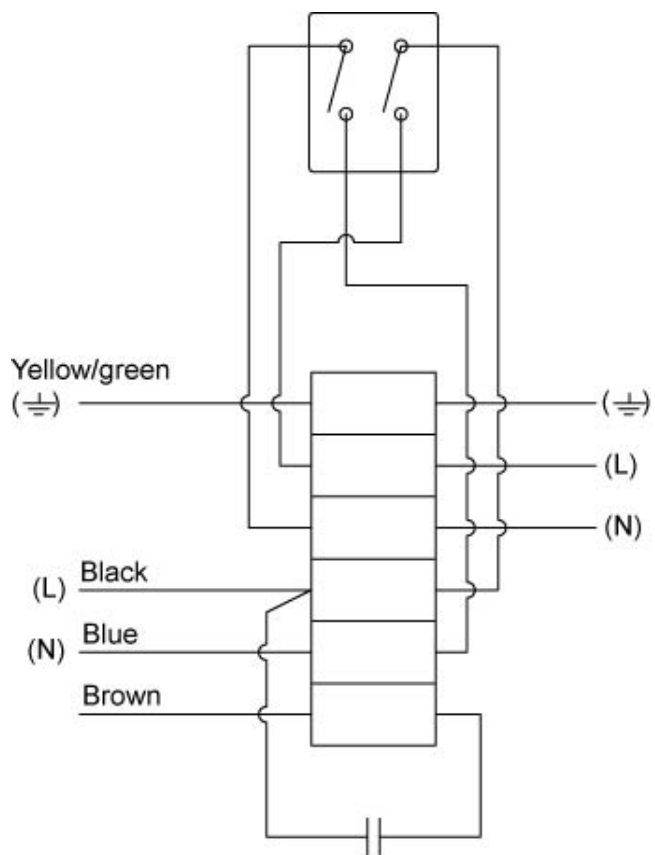
## Dimensions



TFSK	A	B	øC	□E	c/c F	øG
160	120	145	334	421	330	9

## Wiring

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# TFSK 125 M ROOF FAN BLACK

Item no. 1344

Version: 50 Hz

Document type: **Product card**  
 Document date: **2014-09-02**  
 Generated by: **Systemair Online Catalogue**

## Description

- Swing-out
- Speed-controllable
- Easy to install
- Reliable

The TFSK range consists of roof fans with a square base frame and are fitted with a single-inlet centrifugal fan with backward-curved blades and external rotor motors. The motors can be tilted outwards to facilitate inspection and service. They have integral on/off switch and are supplied with 1 m cable and are easy connected to our standard roof curbs TG, FDS and SSD.

These fans are suitable for exhaust-air ventilation systems, e.g. single and multiple dwellings, offices and day nurseries. To protect the motors from overheating, all motors have an integral thermal contact with automatic reset. The casings are manufactured from galvanized steel, with powder-coating in black colour.

For cold climates we recommend that the fan runs continuously to avoid problems with ice.

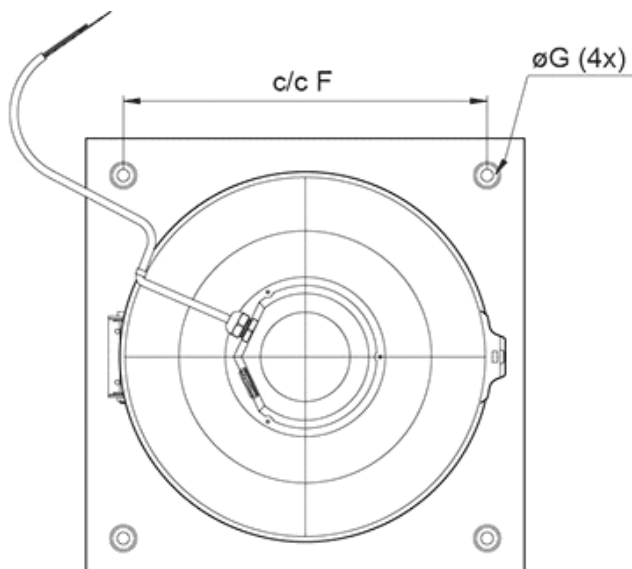
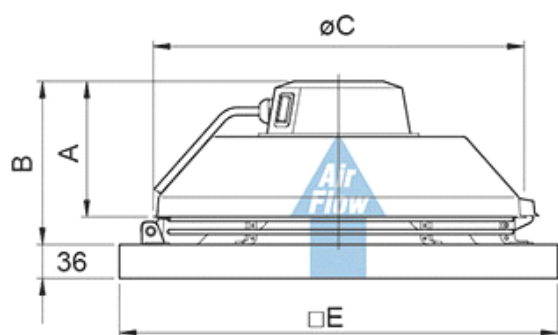
In case of installing FSD-L flat roof socket, a TDA adapter is needed.



## Technical parameters

Voltage	230	V
Frequency	50	Hz
Phase	1	~
Power	24.8	W
Current	0.13	A
Max. airflow	310	m³/h
Fan impeller speed	1965	r.p.m.
Max. temperature of transported air	70	°C
Max. temperature of transported air when voltage-controlled	70	°C
Sound pressure level at 10 m (free field)	23.3	dB(A)
Weight	2.5	kg
Insulation class, motor	B	
Enclosure class, motor	44	IP
Capacitor	1.5	µF
Colour	Black	

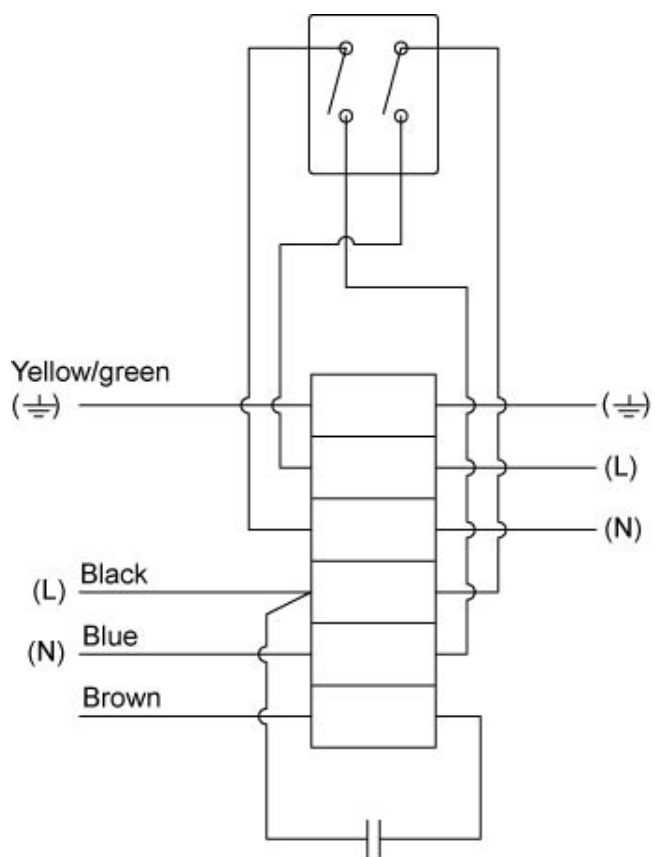
## Dimensions



TFSK	A	B	øC	□E	c/c F	øG
125M/XL	119	144	284	321	245	9

## Wiring

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# KVO 100 CIRCULAR DUCT FAN

Item no. **2075**

Version: 50 Hz

Document type: **Product card**  
 Document date: **2014-09-02**  
 Generated by: **Systemair Online Catalogue**

## Description

- Speed-controllable
- Integral thermal contacts
- Low noise level
- Compact construction - Low profile

KVO 100-160 models have a single-inlet centrifugal fan with forward-curved blades and a maintenance-free external rotor motor.

KVO 200-315 models have a single-inlet centrifugal fan with backward-curved blades and a maintenance-free external rotor motor.

In all KVO models, the motor and impeller are mounted on the cover for easy cleaning and maintenance.

To protect the motor from overheating, the KVO 100-315 have integral thermal contacts with manual reset. The fans can be installed in any position, and are easy to connect to spiral ducts using FK mounting clamps.

The lid is insulated with 40 mm rockwool. The casing is manufactured from galvanised sheet steel.

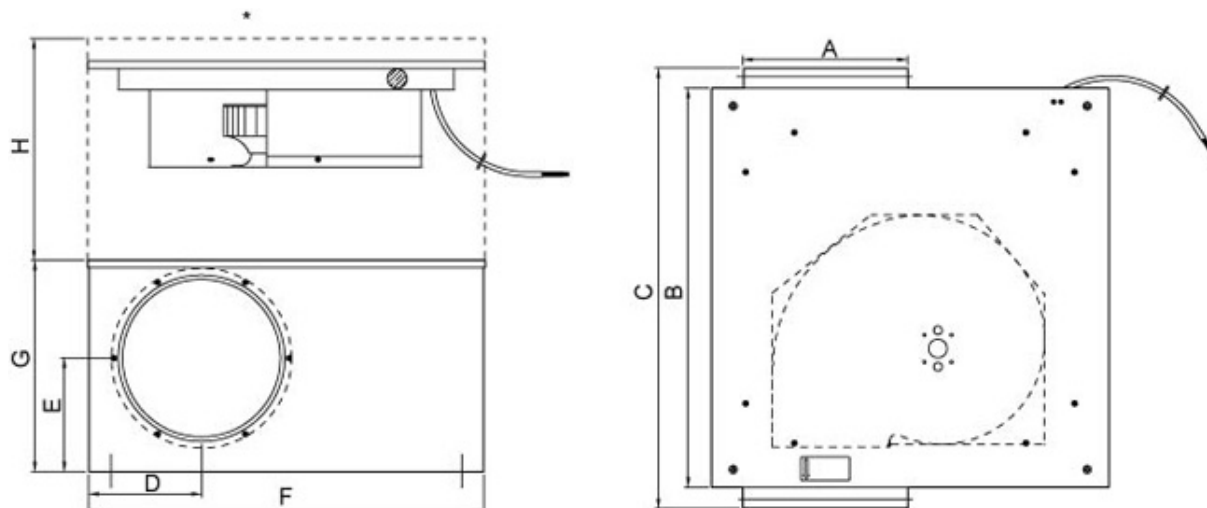


## Technical parameters

Voltage	230	V
Frequency	50	Hz
Phase	1	~
Power	77.9	W
Current	0.346	A
Max. airflow	280	m³/h
Fan impeller speed	2438	r.p.m.
Max. temperature of transported air	60	°C
Max. temperature of transported air when voltage-controlled	60	°C
Sound pressure level at 3 m (20m² Sabine)	39.6	dB(A)
Weight	5.6	kg
Insulation class, motor	B	
Enclosure class, motor	44	IP
Capacitor	2	µF

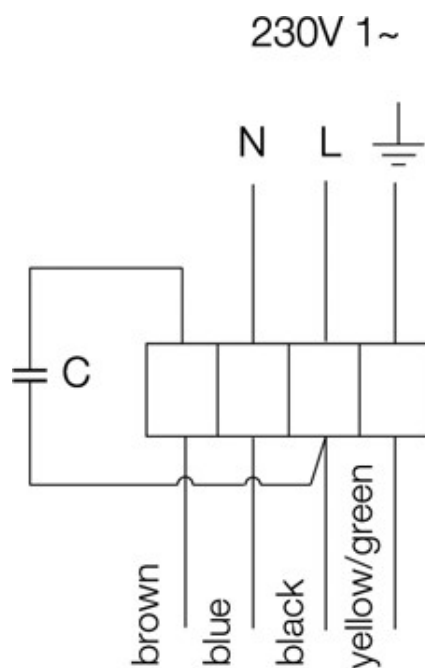
## Dimensions

\* Free area



	A	B	C	D	E	F	G	H
100	100	329	367	69	76	300	150	150
125	125	329	367	84	72	300	150	150
150	150	329	367	94	95	300	185	185
160	160	329	367	99	90	300	185	185
200	200	419	466	123	109	435	220	220
250	250	528	612	151	133	558	270	270
315	315	614	700	183	164	615	344	260
355	355	572	661	209	231	640	425	600
400	400	572	653	221	209	640	425	600

## Wiring





## FUNCTIONING

The functioning of a fire resistant transfer grill is based on the dilatation properties of the intumescent materials in the profiles. When the room temperature reaches 100°C, the material dilates to attain several times its original thickness. The slats then melt together to constitute a non-combustible mass that procures a fire resistance similar to that of the construction penetrated. This way, it impedes the passage of the flames, heat, and gases.

The following images show how the intumescent grills behave to fire.



The intumescent grill is made of horizontal profiles filled with intumescent material



The fire breaks out and the temperature reaches 100°C



Due to heat activity, the intumescent material inflates to attain several times its original thickness and thus prevent passage of the smoke and flames

## FIRE RESISTANCE

The fire resistance of a product is measured in time units (60 = 60 minutes). Some basic criteria are applied in the European fire test and classification systems in order to measure performance in terms of the transfer grills fire resistance:

**E – integrity:** the period of time during which no flames pass through to the non-exposed side of the wall. During this lapse of time, no openings (such as cracks, splits, joint openings...) in the construction elements are produced through which flames are able to propagate.

**W – radiation:** limitation of heat radiation through the construction element, measured at one metre distance from the element (maximum 15 kW/m²).

**I – insulation:** this criterion defines the capacity of a construction element to resist fire exposure on one side, without significant heat transmission to the side that is not exposed to the fire. For this criterion, heat transmission is measured on the element itself.

**Indication (i – o), (o – i) or (i – o):** this complementary indication specifies if the element tested fulfils the criterion from the interior (i = inside) towards the exterior (o = outside), the opposite or both, in which case the direction of the fire is irrelevant.

**ve or ho:** refers to the direction in which the element is positioned, either vertically or horizontally in the wall, that is to say respectively in a wall or in a massive ceiling.

The specifications table allows you to determine which product corresponds best to your specific needs, for example, in terms of fire resistance, transfer rate, and aesthetic.

## RANGE SPECIFICATIONS

The range of RF-Technologies fire resistant transfer grills consists of two product families named Cz and Ge.

The **Ge60 grill** is an aesthetically finished non-vision model approved for mounting into any type of wall, including fire resistant wooden door panels. In order to satisfy architectural preferences, the grill is available in the three standard RAL colours. A fixed or variable frame finishing ensures a perfect result for the opening effected in the wall. This grill offers a harmonious architectural solution for the natural ventilation of hospitals or office buildings.

The **Ge grill** is available in various degrees of fire-resistance (60 or 90 minutes). The Ge60-XL model also disposes of a reinforced frame in HDF, which ensures its rigidity, even for the largest dimensions. This complete family of products is ideal for ventilating technical premises, for example.

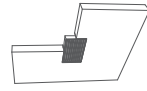
	Ge60	Ge60	Ge60 XL	Ge60-XL
Product				
Definition	Aesthetically finished non-vision grill for wooden door panels and all types of walls	Technical vision grill in small dimensions	Technical vision grill in large dimensions	Technical vision grill with fire resistance of 90 minutes
Dimensions See table	•	•	•	•
Thickness	55mm	50mm	Frame 100mm Grill 50mm	50mm
"Vision" grill				
Classification	EN 13501-2			
Fire tests	EN 1364-1	EN 1364-1		
	EN 1364-2			
	EN 1915-2			
	EN 1364-1			
Classification	EL 60 (Ve i – o)	EL 60 (Ve i – o)		
	EW 60 (Ve i – o)	EW 60 (Ve i – o)		
	EW 90 (Ve i – o)	EW 90 (Ve i – o)		
	EW 90 (Ve i – o)			
Massive wall				
Massive floor				
Light wall				
Wooden door				
Free air passage %	48.53 – 59.48	42.3 – 57.55	41.07 – 55.22	42.3 – 57.55
Transfer rate m²/h Δp = 10Pa	19.9 – 1257.1	62.3 – 2409	600.5 – 7210.4	62.3 – 2409
Colour	3 RAL colours : 9022, 7024, 9016	RAL 7035	RAL 7035	RAL 7035
Options	Finishing frame			
Grill frame	PS	PVC	Treated High-Density Fibreboard	PVC
Fixing	Depending on its application	Silicone mastic BCM	Mortar	Silicone mastic BCM

(\*) only in massive walls

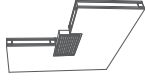
## AVAILABLE DIMENSIONS

H/L [mm]	100	150	200	250	300	350	400	500	600	700	800
100	•	•	•	•	•	•	•	•	•	•	•
150	•	•	•	•	•	•	•	•	•	•	•
200	•	•	•	•	•	•	•	•	•	•	•
250	•	•	•	•	•	•	•	•	•	•	•
300	•	•	•	•	•	•	•	•	•	•	•
350	•	•	•	•	•	•	•	•	•	•	•
400	•	•	•	•	•	•	•	•	•	•	•
500	•	•	•	•	•	•	•	•	•	•	•
600	•	•	•	•	•	•	•	•	•	•	•
700	•	•	•	•	•	•	•	•	•	•	•
800	•	•	•	•	•	•	•	•	•	•	•

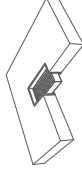
• Ge60-XL  
• Ge60, Ge90, Gz60



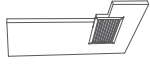
Massive wall



Light wall



Massive floor



Wooden door panel



# TVC

## Transfer Grille

20/TVC/3500/0606/EN



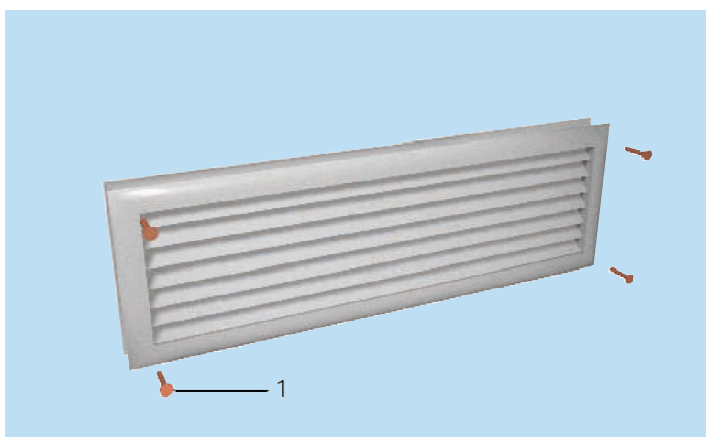
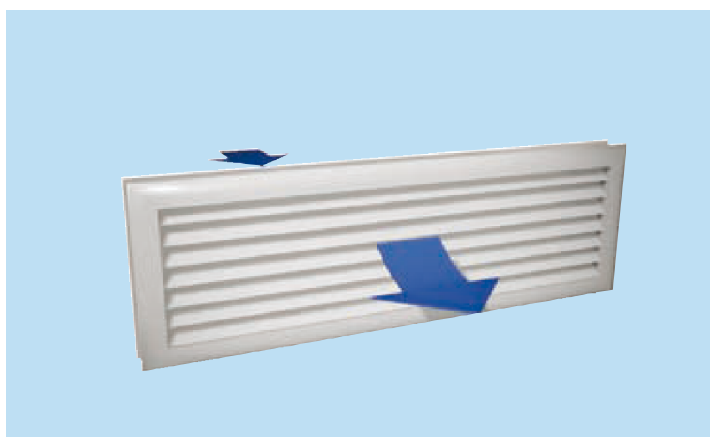
- Transfer grille for partition wall and door installations
- Adjustable casing depth adapts to the thickness of the wall/door
- Large free area, minimal pressure drop
- No visibility through the transfer grille

### Accessories

- Opposite grille for installation depths 25...50 mm

### MATERIAL AND FINISHING

PART	MATERIAL	FINISHING	NOTE
Frame	Aluminium	Anodised Polyester-painted / White RAL 9010, 50% gloss Mill finished	Special colours available
Vanes	Aluminium	Anodised Polyester-painted / White RAL 9010, 50% gloss Mill finished	Special colours available
Opposite grille	Aluminium		Accessory



## Function

Air moves to adjoining rooms through the transfer grille due to pressure difference.

The transfer unit does not permit vision from room to room.

## ACCESSORIES

ACCESSORY	CODE	DESCRIPTION
Opposite grille	OF	Used in installation depths 25...50 mm

## Installation

TVC transfer grilles are screwed (1) either to the wall or door, on both sides (2 x TVC, if required).

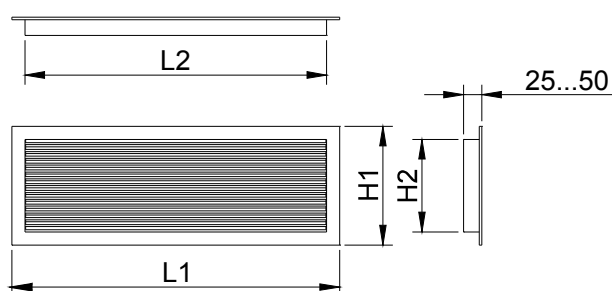
If necessary, a rectangular duct can be installed between the grilles.

The TVC transfer grille can also be used together with an OF opposite grille accessory as a complete transfer unit for 25 to 50 mm thick doors or partition walls.

Both the TVC grille and OF opposite grille are screwed to the wall or door.

For the size of the installation hole, see Dimensions (L1xH1).

## DIMENSIONS



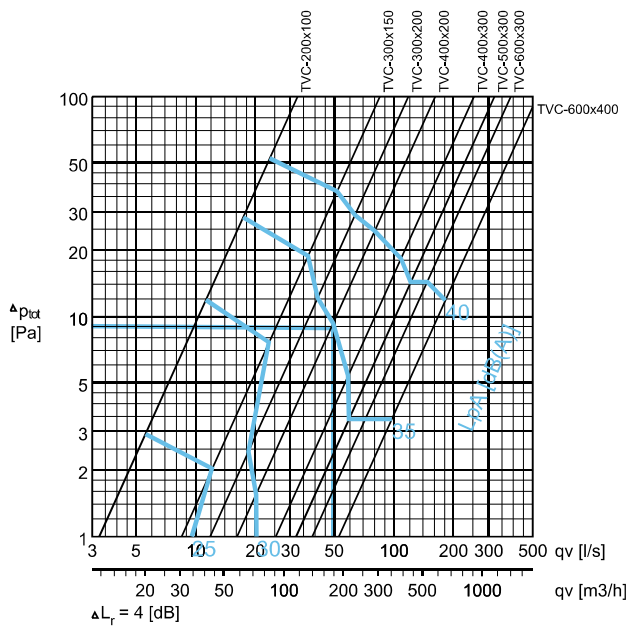
LxH	L1	L2	H1	H2
200x100	226	176	126	76
300x100	326	276	126	76
300x150	326	276	176	126
300x200	326	276	226	176
400x200	426	376	226	176
400x300	426	376	326	276
500x200	526	476	226	176
500x300	526	476	326	276
600x200	626	576	226	176
600x300	626	576	326	276
600x400	626	576	426	376

In addition to these standard sizes, other dimensions can be specially ordered.

The maximum dimensions are 1000x600 mm.

Dimensions for installation holes are L1xH1.

## Pressure drop and sound data



Selection example :

Requirements :  $qv = 50 \text{ l/s}$   
 $LpA \leq 35 \text{ dB(A)}$

Selection : TVC-400x200  
 $LpA < 31 \text{ dB(A)}$   
 $\Delta p_{tot} = 10 \text{ Pa}$

20/TVC/3500/0606/EN

## Servicing

Detach the grille for cleaning.

Wipe the grille with a damp cloth instead of immersing in water.

## Suggested Specifications

The transfer grille shall consist of a frame with V-shaped vanes and opposite side closure.

The transfer unit shall be manufactured from profiled aluminium with a white (RAL 9010) colour. The depth of the casing shall be adjustable (25 to 50mm) according to the thickness of the door or partition wall.

## Product Code

TVC-W-H

W = Width  
 200,+50,...,800

H = Height  
 100,+50,...,400

Specifics and accessories

FI = Finishing  
 AN Anodised  
 PN Painted  
 MF Mill finished

CO = Colour  
 W White  
 X Special colour  
 N No painting

AC = Accessories  
 OF Opposite frame

Code example

TVC-200-100, FI=AN,CO=N

## SINUS-C-200 NOZZLE DIFF 30G

Item no. 19757

Document type: **Product card**  
Document date: **2014-09-02**  
Generated by: **Systemair Online Catalogue**

### Description

The Systemair visible ceiling diffuser.

The Sinus-C ceiling diffuser is suitable for visible installation, and can be connected directly to the duct using the connection sleeve fitted with a rubber seal tested for airtightness. The Sinus-C consists of a front plate with a number of nozzles combined with a sound-insulated plenum box and damper. The design of the nozzles enables the diffuser to achieve very high induction of room air. The Sinus-C can be used for both cooled and heated air. Max. temperature difference:  $\Delta T$  12 K. The side gap of this ceiling diffuser can be set to any width between 0 and 20 mm so as to increase the air supply. The nozzles can be individually set at any angle within 360°. This means that an unlimited number of distribution patterns can be set without affecting noise levels, air volume or pressure drop. The nozzles' rounded edges prevent dust from settling and facilitate cleaning.

The Sinus-C ceiling diffuser consists of a supply-air element (the front plate) and plenum box with connection sleeve (ø100-250) manufactured from sheet metal. The entire unit has a white powder-coated finish (RAL 9010-30). The nozzles are made from recyclable ABS with a diameter of 57 mm, and are finished in standard white (30% gloss) which matches RAL 9010-30.



### Performance data

The diagram shows

Air volume (l/s and m<sup>3</sup>/h), total pressure (Pa), throw (l<sub>0,2</sub>) and sound pressure level [dB(A)].

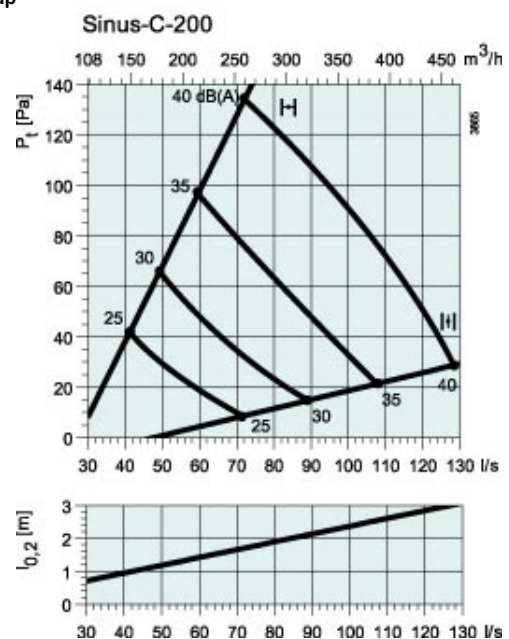
Sound attenuation  $\Delta L$

The air terminal device's self-damping (dB), including its aperture damping, can be read off from the tables below.

#### Sound attenuation, $\Delta L$ (dB)

Open gap	Mid-frequency band, Hz							
	63	125	250	500	1k	2k	4k	8k
Sinus-C-100	22	17	12	11	6	5	6	8
Sinus-C-125	22	16	9	9	7	5	6	7
Sinus-C-160	16	13	7	9	6	4	5	7
Sinus-C-200	21	11	7	8	7	5	6	7
Sinus-C-250	15	9	7	9	6	5	6	7
Sinus-C-315	16	8	11	9	5	6	6	9
<b>Closed gap</b>								
Sinus-C-100	23	16	12	13	7	6	7	9
Sinus-C-125	21	16	9	10	8	7	6	8
Sinus-C-160	18	14	9	12	8	6	6	8
Sinus-C-200	16	10	9	9	7	6	6	8
Sinus-C-250	16	10	9	10	7	6	7	9
Sinus-C-315	17	9	11	10	6	7	6	10

closed gap



20 mm open gap

#### Sound power level, Lw

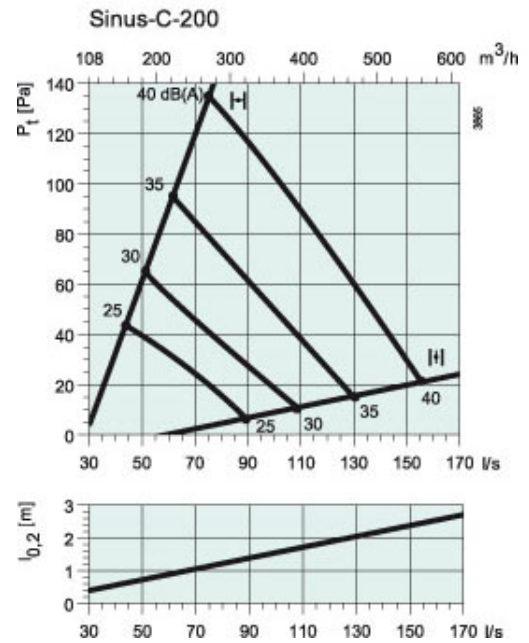
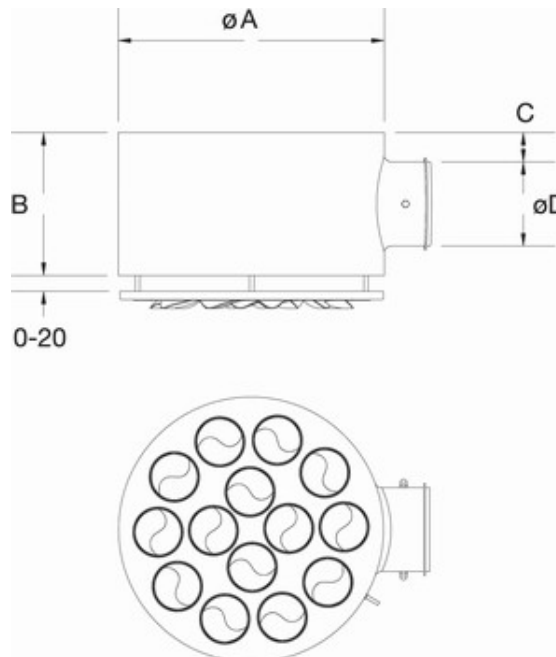
Open gap	Mid-frequency band, Hz							
	63	125	250	500	1k	2k	4k	8k
Sinus-C-100	9	2	9	2	-5	-12	-18	-21
Sinus-C-125	11	4	10	0	-8	-13	-18	-22
Sinus-C-160	12	6	10	-2	-7	-12	-16	-21
Sinus-C-200	14	9	8	2	-6	-15	-19	-20
Sinus-C-250	12	11	9	1	-6	-14	-19	-21
Sinus-C-315	10	15	6	1	-9	-16	-19	-13
<b>Closed gap</b>								
Sinus-C-100	7	2	9	2	-6	-13	-19	-22
Sinus-C-125	10	4	10	0	-9	-15	-19	-21
Sinus-C-160	12	6	10	-1	-7	-14	-19	-23
Sinus-C-200	13	10	8	2	-6	-15	-20	-19
Sinus-C-250	14	11	8	1	-5	-15	-18	-22
Sinus-C-315	8	14	6	2	-7	-17	-20	-13
Tolerance	±6	±2	±2	±2	±3	±5	±6	±6

$L_w(\text{dB}) = L_pA + K_{ok}$  ( $L_pA$  = diagram  $K_{ok}$  = table)

correction factor  $K_{ok}$

#### Dimensions

	øA	B	C	øD
Sinus-C-100	314	170	35	99
Sinus-C-125	399	200	37	124
Sinus-C-160	399	250	45	159
Sinus-C-200	599	285	42	199
Sinus-C-250	599	330	40	249
Sinus-C-315	799	420	53	314



# SINUS-C-250 NOZZLE DIFF 30G

Item no. 19758

Document type: **Product card**  
Document date: **2014-09-02**  
Generated by: **Systemair Online Catalogue**

## Description

The Systemair visible ceiling diffuser.

The Sinus-C ceiling diffuser is suitable for visible installation, and can be connected directly to the duct using the connection sleeve fitted with a rubber seal tested for airtightness. The Sinus-C consists of a front plate with a number of nozzles combined with a sound-insulated plenum box and damper. The design of the nozzles enables the diffuser to achieve very high induction of room air. The Sinus-C can be used for both cooled and heated air. Max. temperature difference:  $\Delta T$  12 K. The side gap of this ceiling diffuser can be set to any width between 0 and 20 mm so as to increase the air supply. The nozzles can be individually set at any angle within 360°. This means that an unlimited number of distribution patterns can be set without affecting noise levels, air volume or pressure drop. The nozzles' rounded edges prevent dust from settling and facilitate cleaning.

The Sinus-C ceiling diffuser consists of a supply-air element (the front plate) and plenum box with connection sleeve (ø100-250) manufactured from sheet metal. The entire unit has a white powder-coated finish (RAL 9010-30). The nozzles are made from recyclable ABS with a diameter of 57 mm, and are finished in standard white (30% gloss) which matches RAL 9010-30.



## Performance data

The diagram shows

Air volume (l/s and m<sup>3</sup>/h), total pressure (Pa), throw (l<sub>0,2</sub>) and sound pressure level [dB(A)].

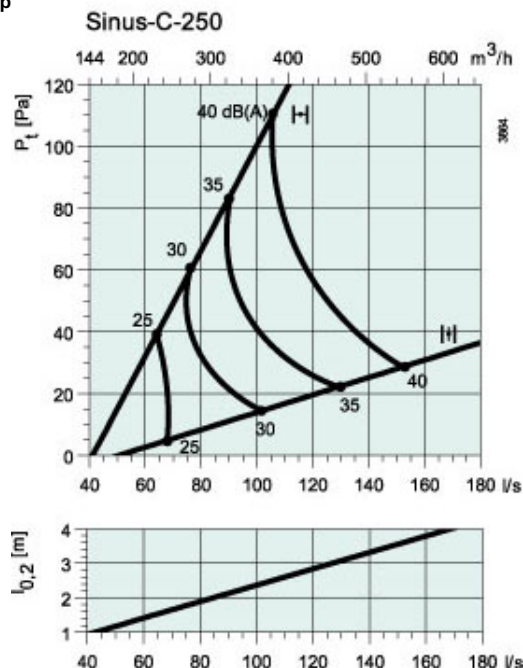
Sound attenuation  $\Delta L$

The air terminal device's self-damping (dB), including its aperture damping, can be read off from the tables below.

### Sound attenuation, $\Delta L$ (dB)

	Mid-frequency band, Hz							
Open gap	63	125	250	500	1k	2k	4k	8k
Sinus-C-100	22	17	12	11	6	5	6	8
Sinus-C-125	22	16	9	9	7	5	6	7
Sinus-C-160	16	13	7	9	6	4	5	7
Sinus-C-200	21	11	7	8	7	5	6	7
Sinus-C-250	15	9	7	9	6	5	6	7
Sinus-C-315	16	8	11	9	5	6	6	9
Closed gap								
Sinus-C-100	23	16	12	13	7	6	7	9
Sinus-C-125	21	16	9	10	8	7	6	8
Sinus-C-160	18	14	9	12	8	6	6	8
Sinus-C-200	16	10	9	9	7	6	6	8
Sinus-C-250	16	10	9	10	7	6	7	9
Sinus-C-315	17	9	11	10	6	7	6	10

closed gap





20 mm open gap

#### Sound power level, L<sub>w</sub>

Open gap	Mid-frequency band, Hz							
	63	125	250	500	1k	2k	4k	8k
Sinus-C-100	9	2	9	2	-5	-12	-18	-21
Sinus-C-125	11	4	10	0	-8	-13	-18	-22
Sinus-C-160	12	6	10	-2	-7	-12	-16	-21
Sinus-C-200	14	9	8	2	-6	-15	-19	-20
Sinus-C-250	12	11	9	1	-6	-14	-19	-21
Sinus-C-315	10	15	6	1	-9	-16	-19	-13
<b>Closed gap</b>								
Sinus-C-100	7	2	9	2	-6	-13	-19	-22
Sinus-C-125	10	4	10	0	-9	-15	-19	-21
Sinus-C-160	12	6	10	-1	-7	-14	-19	-23
Sinus-C-200	13	10	8	2	-6	-15	-20	-19
Sinus-C-250	14	11	8	1	-5	-15	-18	-22
Sinus-C-315	8	14	6	2	-7	-17	-20	-13
Tolerance	±6	±2	±2	±2	±3	±5	±6	±6

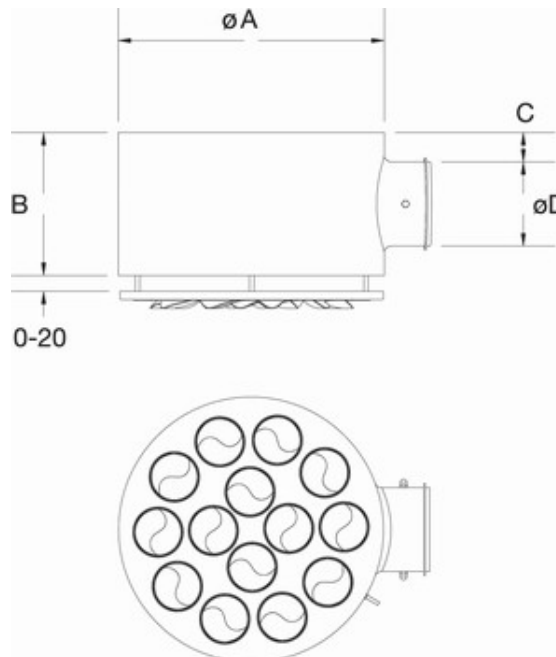
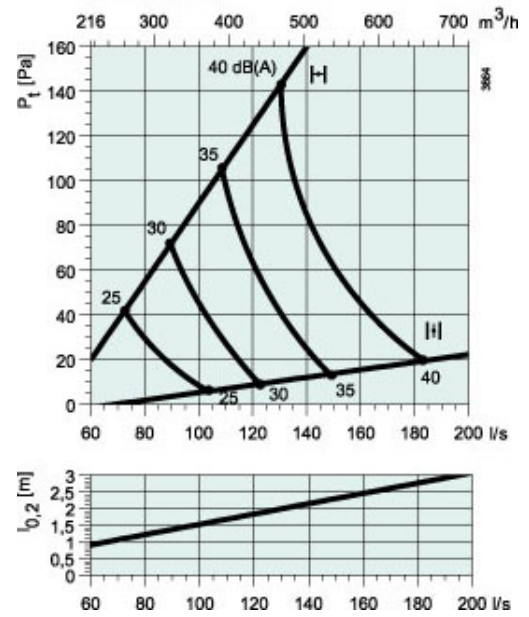
L<sub>w</sub>(dB) = L<sub>pA</sub> + K<sub>ok</sub> (L<sub>pA</sub> = diagram Kok = table)

correction factor K<sub>ok</sub>

#### Dimensions

	øA	B	C	øD
Sinus-C-100	314	170	35	99
Sinus-C-125	399	200	37	124
Sinus-C-160	399	250	45	159
Sinus-C-200	599	285	42	199
Sinus-C-250	599	330	40	249
Sinus-C-315	799	420	53	314

#### Sinus-C-250





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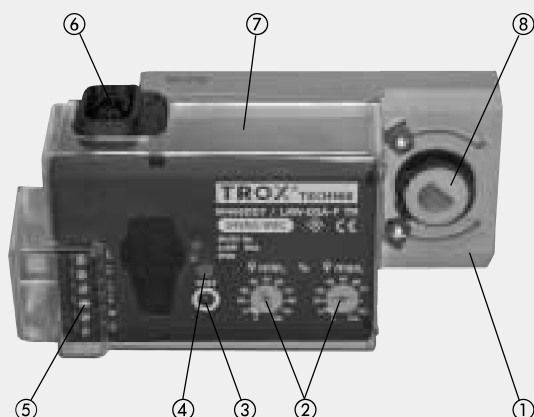
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### TROX Compact-controller



- |                           |                                   |
|---------------------------|-----------------------------------|
| ① TROX Compact-controller | ⑥ Tube connections for transducer |
| ② Potentiometers          | ⑦ Protection cover                |
| ③ Indicator light         | ⑧ Shaft clamp                     |
| ④ Service button          |                                   |
| ⑤ Connection terminals    |                                   |

### Area of application

The TROX Compact-controller is a complete control device designed for VAV air terminal units. The dynamic differential pressure transducer, damper actuator and electronic controls are combined in one housing.

The control signal input is wired based on the required operating mode. For variable flow rate control, a suitable room temperature controller (alternatively, an air quality controller or similar) or a DDC outstation must be used. The control signal is 0 to 10 VDC voltage.

Switches or relays are used for constant flow rate control with 2 set values.

The actual value of the flow rate is output as a standard linear, electrical signal. The voltage range is 0 to 10 VDC.

- Factory settings are  $\dot{V}_{\min} = 40\%$  and  $\dot{V}_{\max} = 80\%$ .
- Changes of setpoints on site by means of potentiometers.
- Several controllers can be connected to a common room temperature controller for parallel operation.
- Supply air – extract air tracking control can be provided.

Standard filtration in air-conditioning systems allows the use of the flow rate controller in the supply air without dust protection filters. Since a small volume flow is passed through the transducer in order to measure the flow rate, the following must be noted:

- With heavy dust load in the room, suitable extract air filters must be provided.
- If the air is contaminated with fluff or sticky particles or contains aggressive media, the TROX Compact-controller should not be used.

### Proper application

The VAV terminal units are suitable for use in ventilation and air conditioning systems. Particular conditions can restrict the functioning capacity and must be taken into account during the design stage:

- Installation and wiring should only be carried out by specialists. During installation, wiring and commissioning, the normal rules of site working, in particular the health and safety regulations must be complied with.
- Safety transformers must be used.
- For aggressive air, only air terminal units made of plastic materials should be used after extensive tests for suitability.
- Galvanised sheet steel units must not be installed in contaminated environments (e.g. acetic acid).
- For hazardous areas, only use units with explosion proof electrical components.
- For protected exterior areas, only use units with membrane pressure transducers.
- Use in aircraft is not allowed.
- If there is a risk of fire due to flammable solids, the electric equipment must be rated IP 4X (see VdS 2033 fire safety guidelines or appropriate regulations).

TROX Compact-controllers are used in the air terminal units of the Easy type as follows.  
Technical and acoustic data see relevant leaflet:



#### TVR-Easy

Leaflet 5/3.5/EN/..



#### TVJ-/TVT-Easy

Leaflet 5/4.1/EN/..



#### TVZ-/TVA-Easy

Leaflet 5/1.2/EN/..

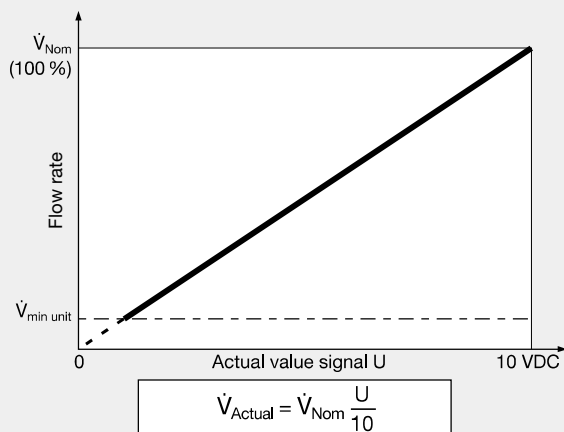
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### Characteristic of actual value signal



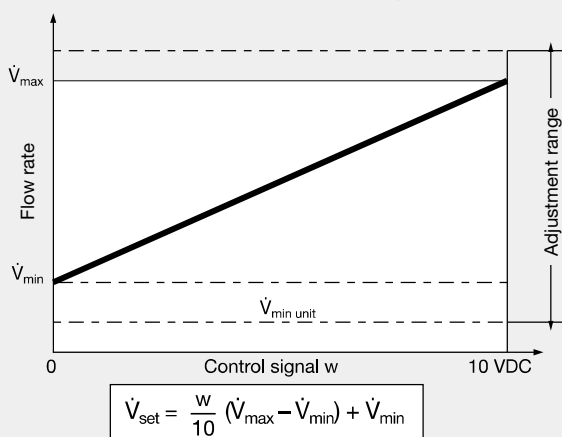
### Description of function

The flow rate is measured using the dynamic differential pressure principle. The effective pressure ( $\Delta p_w$ ) from the differential pressure sensor is based on a partial volume flow passing through the transducer. The characteristic of effective pressure is calibrated in the controller to provide a linear actual value signal.

The actual flow rate can be monitored as the voltage signal U. The measurement range is factory set to match the unit size so that the 10 VDC always corresponds to the unit nominal flow rate ( $\dot{V}_{\text{Nom}}$ ).

The required flow rate is set by the room temperature controller or by switch contacts. The controller determines the set flow rate in accordance with the characteristic shown opposite and compares this with the actual value. The integral damper actuator is controlled based on the deviation. The factory pre-settings of  $\dot{V}_{\text{min}} = 40\%$  and  $\dot{V}_{\text{max}} = 80\%$  can be easily readjusted on site.

### Characteristics of the control signal



$$\dot{V}_{\text{max-set value}} = \frac{\dot{V}_{\text{max}}}{\dot{V}_{\text{Nom}}} \cdot 100\%$$

$$\dot{V}_{\text{min-set value}} = \frac{\dot{V}_{\text{min}}}{\dot{V}_{\text{Nom}}} \cdot 100\%$$

### Control signal range limiting

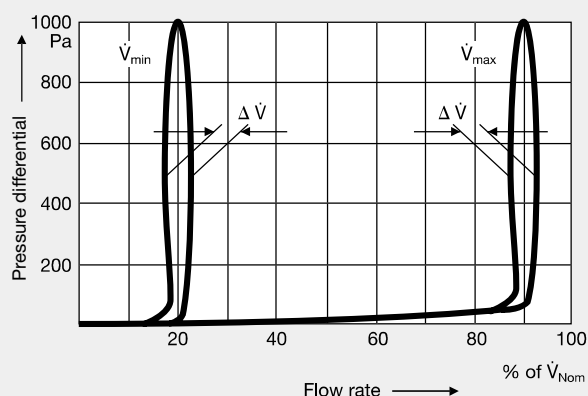
For settings between  $\dot{V}_{\text{min}} = 0\%$  and  $\dot{V}_{\text{max}} = 100\%$ , the control signal must be limited in the DDC outstation. In this case, the full published flow rate range can be used for future adjustment via the BMS.

### Flow rate control

The flow rate controller works independently of the duct pressure, i.e. the system pressure variations do not result in flow rate changes. To prevent the flow rate control becoming unstable, a dead band (hysteresis) must be built in within which the damper blade does not move.

This dead band, coupled with the measuring tolerances, produces a flow rate deviation as shown opposite. If the conditions stated in the sales leaflet (e.g. minimum pressure differential, inlet flow conditions) are not observed, greater deviations must be expected.

### Pressure independent control characteristics



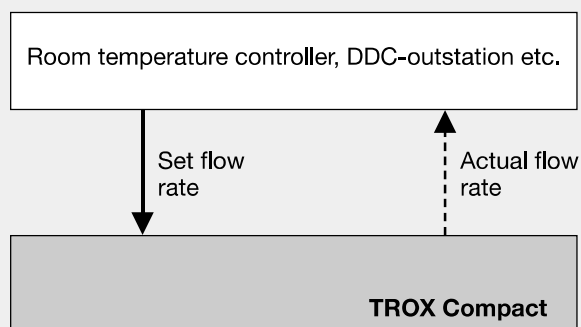
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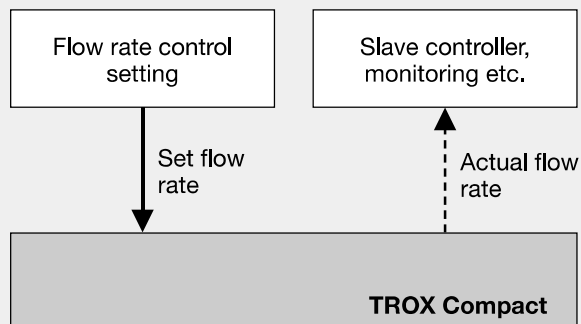
### Variable flow rate control



### Variable volume flow

The TROX Compact-controller controls the set flow rate, between  $\dot{V}_{\min}$  and  $\dot{V}_{\max}$ , from the control signal. Override to CLOSED or OPEN is available.

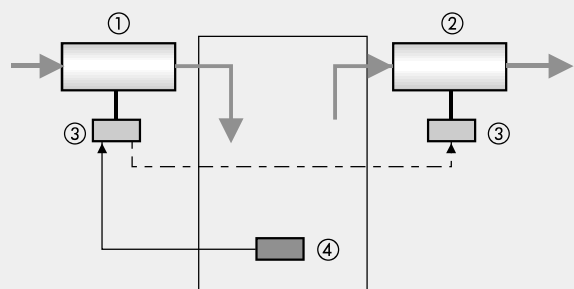
### Constant flow rate control



### Constant volume flow

By wiring the control signal input terminal w via switch contacts, constant flow rates  $\dot{V}_{\min}$  and  $\dot{V}_{\max}$ , and various override controls can be achieved.

### Supply – extract tracking control



- ① Supply terminal unit
- ② Extract terminal unit
- ③ TROX Compact-controller
- ④ Room temperature controller

### Supply – extract tracking control

With parallel control of the systems, an unacceptable difference between supply and extract air can occur if the pressure in one duct is too low.

It is therefore preferable to use the actual value signal, usually that of the supply air, as a control signal for the slave flow rate controller. If the extract air is not controlled by the temperature controller (DDC), slave control is also implemented.

Only ratio control can be implemented with the TROX Compact-controller, i.e. supply and extract air are always in the same ratio to each other under all operating conditions.

The flow rate ratio is set as follows at the  $\dot{V}_{\max}$ -potentiometer of the slave controller.

$$\dot{V}_{\max}\text{-set value} = \frac{\dot{V}_{\max \text{ supp.}}}{\dot{V}_{\max \text{ extr.}}} \cdot \frac{\dot{V}_{\text{Nom supp.}}}{\dot{V}_{\text{Nom extr.}}} \cdot 100 \%$$

With the same unit sizes and flow rates, 100 % is set.

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### Potentiometers

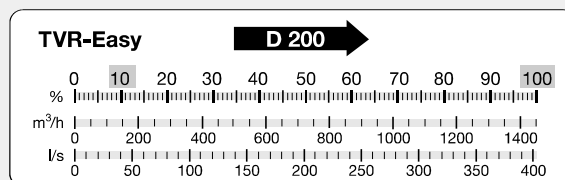


### Flow rate adjustment on site

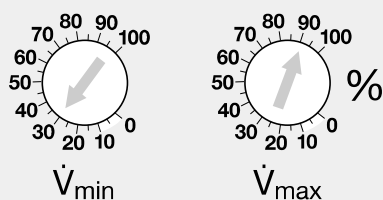
There are potentiometers for the adjustment of the flow rate limits. The values can be calculated using the formula on page 2 or determined from the flow rate scale which is on each unit.

### Flow rate scale

(example for TVR-Easy 200)

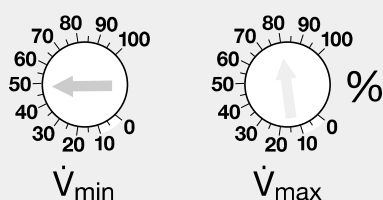


### Variable flow rate control



The required flow rates must be adjusted by the customer. If  $\dot{V}_{min}$  is set higher than  $\dot{V}_{max}$ , then  $\dot{V}_{min}$  is provided as a constant flow rate, even if a control signal is transmitted. If  $\dot{V}_{min}$  is set on 0 %, then control is between shut-off and  $\dot{V}_{max}$ . If the control signal falls below 0.1 VDC, the control damper closes (leakage flow only).

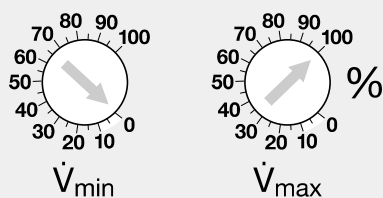
### Constant flow rate control



The constant flow rate can be set with the  $\dot{V}_{min}$ -potentiometer.

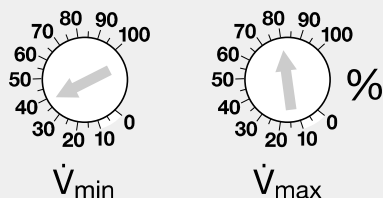
The setting of the  $\dot{V}_{max}$ -potentiometer is unimportant.

### BMS operation



If the flow rate is set by the BMS, the  $\dot{V}_{min}$ -potentiometer must be set at 0 % and the  $\dot{V}_{max}$ -potentiometer must be set at 100 %. If the control signal falls below 0.1 VDC, the control damper closes (leakage flow only).

### Factory setting



For delivery, settings are,  $\dot{V}_{min} = 40 \%$  and  $\dot{V}_{max} = 80 \%$ .

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### Terminal allocation

○	○	○	○	○	○
1	2	1	2	3	4
⊥	~	⊥	~	w	U
-	+	-	+		
TROX Compact					

1, ⊥, - : Ground, neutral  
2, ~, + : 24 V supply voltage  
w : Control signal input 0 to 10 VDC  
U : Actual value signal output 0 to 10 VDC

### Wiring

The 24 V supply voltage must be wired by the customer. Safety transformers must be used (EN 60742). If several flow rate controllers are connected to one 24 V network, it is important to ensure that a common neutral or ground wire is used and that this is not connected to other wires. Wiring must be carried out in compliance with local legal regulations!

### Electrical safety

#### 1. Contact safety of the connection terminals

In addition to the pertinent EMC standards for compliance with the Electromagnetic Compatibility (EMC) Directive, actuators and compact controllers must comply with the following standards:

- DIN EN 60335: Safety of electric devices for household use and similar purposes (part 1: general requirements).
- DIN EN 60730: Automatic electric regulators and controllers for household use and similar applications (part 1: general requirements; parts 2-14: special requirements for electric actuators).

According to these standards, a touchable component (screw-type terminals, for example) is considered inactive if there is a safety extra low voltage (SELV). SELV must have a peak value of 42.4 V or less for alternating current and 42.5 V or less for direct current.

The TROX Compact-controller is compliant with the above standards according to protection class III with a protection rating of IP20.

The circumstances mentioned below result in protection level IP23 (see photograph):

- Damper blade shaft vertically, TROX Compact-controller on top.
- Transparent protection cover in place.



#### 2. Operation in areas subjected to moisture or vapour

Installation locations must meet ambient conditions of 0-50 °C at 5-95 % relative humidity without condensation.

IP20 does not protect against dripping water, but IP54 also offers no protection against vapour condensation inside the actuator (not moisture tight). The printed circuit boards do have a lacquer coating, which insulates the circuit paths. The solder joints are also insulated because of the fluxing agent used.

#### 3. Strain relief on connecting cables

The connection terminals are designed according to DIN VDE 0631-1 section 10 and exhibit the corresponding retention forces for the wire gauges indicated therein. For a tightening torque of up to 0.4 Nm (see standard and manufacturer specifications), this results in a retention force of 20 N for a flexible cable with a cross section of 0.75 mm<sup>2</sup>.

A wire clamping bracket is fixed to the casing of all air terminal units of the Easy type.

### Summary

The TROX Compact-controller meets the standards for compliance with the Low Voltage Directive. The controller is also compliant with the Electromagnetic Compatibility (EMC) Directive. The manufacturer's statement has been justified and the product may be marketed with a CE mark.

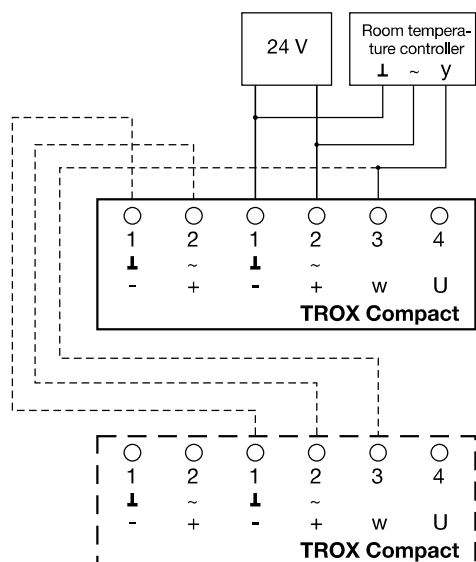
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### Room temperature control



### Room temperature control

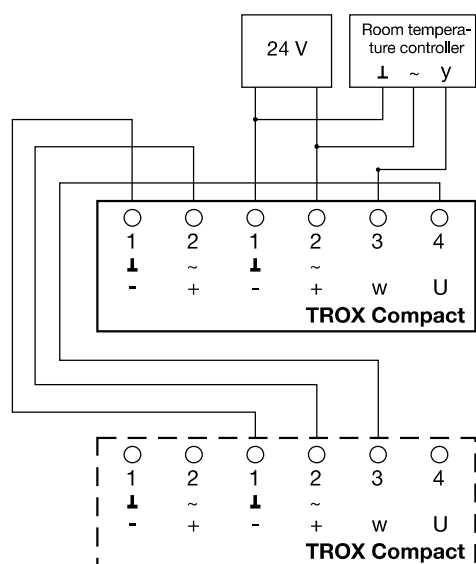
A dedicated room temperature controller or a DDC outstation with 0 to 10 VDC output is connected as shown opposite. If the controllers is on the same mains make sure that terminal 1 of the TROX Compact is identical to the ground of the control signal.

### Parallel control

Several flow rate controllers (supply or extract air) are run in parallel by one controller. If the air terminal units are of the same size and the  $\dot{V}_{\min}$ - and  $\dot{V}_{\max}$ -values are set the same, all units will control to the same flow rate.

If there are different settings, then the controls will maintain a constant percentage between the flow rates.

### Tracking control

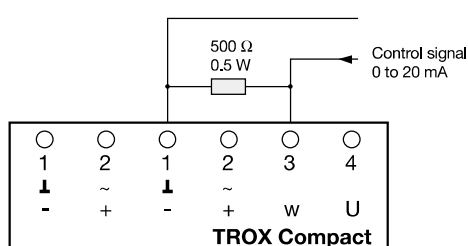


### Supply – extract tracking control

If the units are controlled in parallel and if the pressure in one duct area is too low there may be an undesirable difference in flow rate between supply and extract air.

It is therefore more beneficial to use the actual value signal, usually that of the supply air, as the control signal for the slave flow rate (extract) controller.

### Control using 0 to 20 mA



### Control using 0 to 20 mA

It is possible to control using 0 to 20 mA by wiring a 500 Ω resistor to ground and input w in parallel.

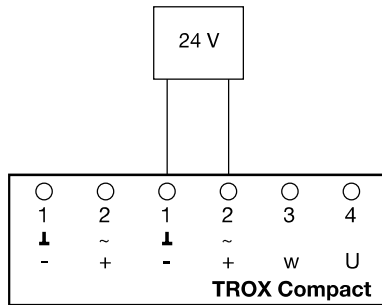
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## VARYCONTROL<sup>®</sup> Air terminal units TROX Compact-controller Instruction manual

**EASY**

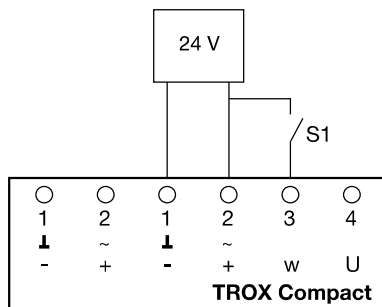
### Constant flow rate control



### Constant flow rate control

As soon as the 24 V supply voltage is applied, the controller runs the set  $\dot{V}_{\min}$ -value as a constant flow rate.

### $\dot{V}_{\min} / \dot{V}_{\max}$ changeover

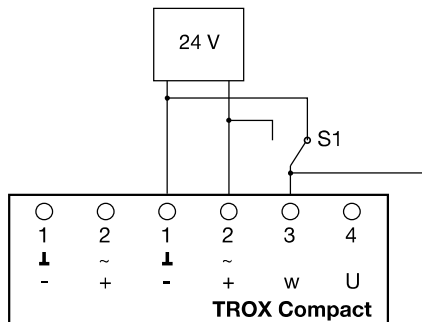


### $\dot{V}_{\min} / \dot{V}_{\max}$ changeover

The switch S1 enables a changeover between the two constant flow rates of  $\dot{V}_{\min}$  and  $\dot{V}_{\max}$ .

Switch S1 open:  $\dot{V}_{\min}$   
Switch S1 closed:  $\dot{V}_{\max}$

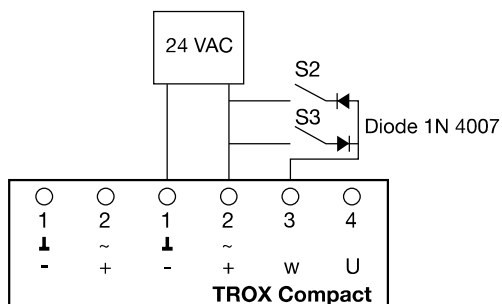
### Changeover of multiple controllers



### Changeover of multiple controllers

When there is parallel connection of multiple TVR-Easy controllers, the switch S1 must be used as changeover switch and the contact for the  $\dot{V}_{\min}$  operation must be connected to the ground (terminal 1).

### Override controls OPEN / CLOSED



### Override controls OPEN / CLOSED

The override control to provide OPEN and CLOSED can be achieved using external switches (potential-free contacts), only for a.c. voltage.

Switch S2 closed: Damper blade CLOSED  
Switch S3 closed: Damper blade OPEN

All override controls can be combined among themselves and with the different circuit options.