



Project name

TD1971 2RG 1x14000 - Klazienaveen

Quotation number:

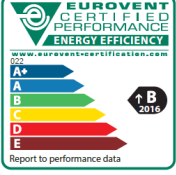

Project created: r.vdwijk@northair.nl - 19.08.2022, 14:34

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List of units in project

Unit_14000

2

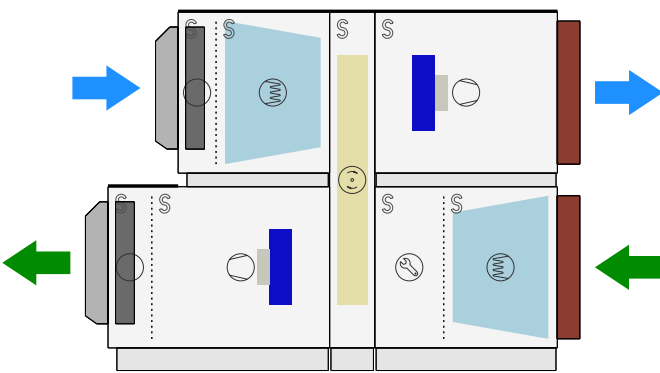
Basic unit parameters	Supply	Extract	
Air flow / External pressure drop	14000 m ³ /hr / 250 Pa	14000 m ³ /hr / 250 Pa	 <p>RHEX 0.37/1.7/3~230V 50Hz AC ³⁾ 1661 W·s/m³ Standard Yes</p> 
Cross section air velocity	2.22 m/s	2.22 m/s	
Filtration class EN779	- F7 -	- F7 -	
Number of fans x Nominal motor power - Nominal motor current	2 x 4.6 kW - 7.4 A ¹⁾	2 x 4.6 kW - 7.4 A ¹⁾	
Fan power supply	3x400V~50Hz	3x400V~50Hz	
Fan motor type	EC - IE5	EC - IE5	
Heat recovery type / Nominal motor power - Nominal motor current / Power supply			
SFPv (AHU)			
Unit specificatio/make			
Ecodesign			

Temperature and humidity parameters	°C/RH%	Brief specification of the accessory supply
Heat recovery - Winter 227.7 kW 74.8 % Thermal efficiency, 61 % Humidity recovery efficiency	-10/63 -> 23.6/38	

Acoustic power level	Inlet duct	Supply duct	Supply - casing radiated	Extract duct	Exhaust - duct	Exhaust- casing radiated
ΣLwA	65 dB(A)	82 dB(A)	56 dB(A)	66 dB(A)	80 dB(A)	56 dB(A)

Brief specification of the control system	
Control unit	Control unit is not delivered
Frequency inverter of the RHEX ³⁾	Danfoss FC051 1F0.37 1×230 V (IP21)

Casing parameters	Supply	Extract
Outer casing surface finish	Powder coating	Powder coating
Inner casing surface finish	Galvanized steel (FeZn)	Galvanized steel (FeZn)
Unit specificatio/make	Outdoor	Outdoor
Parameters accordig EN1886: L1(M), L2(R) @ -400Pa, D1(M), T2(M), TB3(M), <0,5%(F9): Range: REMAK X-series		

Unit dimensions	Weight	
	Weight	1608.64 kg
	Heaviest block	#5 452.13 kg
	Longest block	#5 452.13 kg
	Tallest block	#2 343.69 kg
	Supply unit size	18/09 - 2.22 m/s
	Extract unit size	18/09 - 2.22 m/s
	Mutual branch position	On top of each other
	Legs beneath the base frame	No
Roof	Yes	

Legend

1) In case of stand-by motor or fan installation, these are included in the motors amount. In case of fan frequency inverter beeing part of the unit, the inverter supply voltage can be 1x230V even though the fan supply voltage is 3x230V - see detailed specification.

3) Rotary heat and humidity exchanger

Ecodesign - Evaluation of the ErP (2018) compliance

INFORMATION ABOUT THE AHU ACCORDING COMMISSION REGULATION (EU) No. 1253/2014, of 7. July 2014, implementing Directive 2009/125/EC of the European Parliament and of the Council with regard to ecodesign requirements for ventilation units

AHU is ErP2018 compliant: Yes

* **	Required information	ErP2018 requirement	Value	ErP 2018 compliant
	Unit name - Unit_14000			
x x	a) Manufacturer	Information	REMAK	
x x	b) Product series	Information	X	
x x	c) Declared unit type	Information	NRVU / BVU 1)	
x x	d) Drive type	Type/compliance	Variable rotation speed 2)	Yes
x x	e) Heat recovery system type	Type/compliance	RHEX 3)	Yes
x	f) Heat recovery efficiency	$\eta_{t_nrvu, \min} = 73 \%$	$\eta_{t_nrvu} = 74.8 \%$	Yes
x x	g) Unit nominal air flow	Information	$q_{nom} = 3.89 \text{ m}^3/\text{s}$	
x	h) Effective power input	Information	$P = 7221.98 \text{ W}$	
x	i) Specific fan power of ventilation component	$SFP_{int_limit} = 854 \text{ W}\cdot\text{s}/\text{m}^3$	$SFP_{int} = 845.83 \text{ W}\cdot\text{s}/\text{m}^3$	Yes
x	Supply fan	No requirement	$SFP_{int, SUP, F} = 423.06 \text{ W}\cdot\text{s}/\text{m}^3$	
x	Extract fan	No requirement	$SFP_{int, EHA, F} = 422.76 \text{ W}\cdot\text{s}/\text{m}^3$	
x x	j) Face velocity in m/s at design flow rate	Information	$v = 2.22 \text{ m/s}$	
x x	k) Nominal external pressure			
x x	Supply branch	Information	$\Delta p_{s, ext, SUP} = 250 \text{ Pa}$	
x x	Extract branch	Information	$\Delta p_{s, ext, EHA} = 250 \text{ Pa}$	
x	l) Internal pressure drop of ventilation component			
x	Supply branch	Information	$\Delta p_{s, int, SUP} = 291.16 \text{ Pa}$	
x	Extract branch	Information	$\Delta p_{s, int, EHA} = 290.95 \text{ Pa}$	
x	m) Internal pressure drop of non-ventilation components			
x	Supply branch	Information	$\Delta p_{s, add, SUP} = 95.56 \text{ Pa}$	
x	Extract branch	Information	$\Delta p_{s, add, EHA} = 98.1 \text{ Pa}$	
x	n) Fan static efficiency			
x	Supply branch	$\eta_{fan, \min} = 0 \%$	$\eta_{fan, SUP} = 70.49 \%$	Yes
x	Extract branch	$\eta_{fan, \min} = 0 \%$	$\eta_{fan, EHA} = 70.47 \%$	Yes
x x	o) Declared max. casing leakage			
x x	Casing air leakage (negative and positive pressure)	Information	0.41 / 0.31 %	
x x	Carry-over leakage	Information	5 %	
x x	p) Energy performance of filters	Information	-	
x x	q) Filter replace visual alert	Information	4)	
x	r) Casing acoustic power level			
x	Supply branch	Information	$L_{WA, SUP} = 56 \text{ dB(A)}$	
x	Extract branch	Information	$L_{WA, EHA} = 56 \text{ dB(A)}$	

* Real unit

** Reference unit

1) NRVU - non residential ventilation unit

UVU - unilateral ventilation unit; Bidirectional ventilation unit BVU

2) P.EcodSpeedControlInfo

3) RAC - Run Around Coils Heat Recovery System

PHE - plate heat exchanger

RHE - rotary heat exchanger

4) Clogged filters increase the AHU's electricity consumption. This is the reason why the filters have to be changed at the latest when the final pressure drop according to EN 13053 was reached (value is specified in the detailed technical documentation). The Control system has to be equipped with a differential pressure sensor with visual or acoustic signaling of the final pressure drop for each filter.

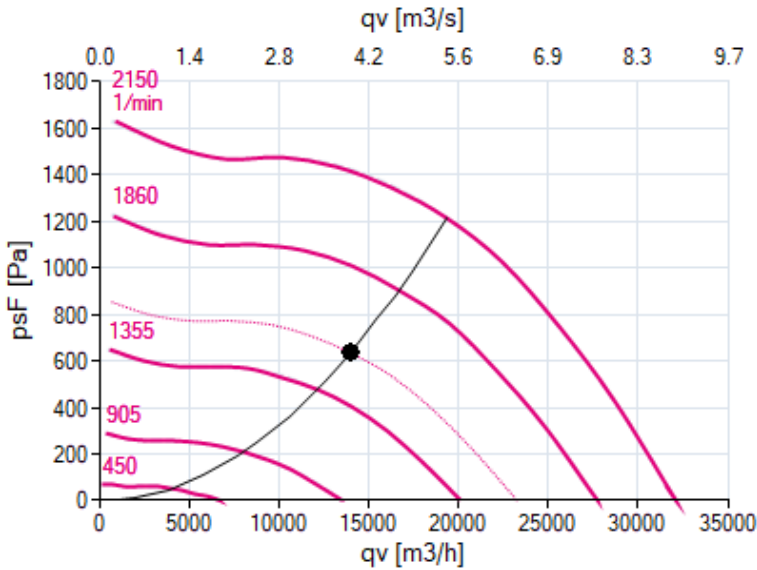
6) Reference unit is considered with the fine filter in supply and medium filter in the exhausts

Unit detailed acoustic parameters

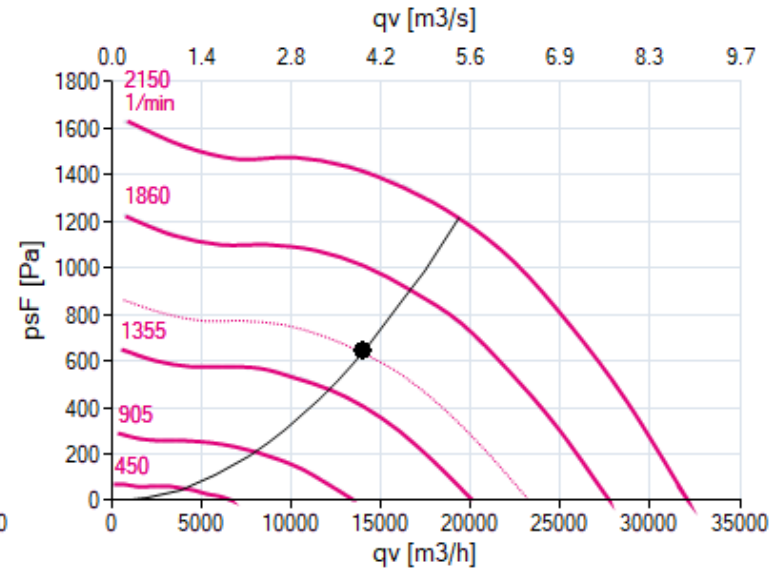
Octave band	LwAokt [dB(A)]								ΣLwA [dB(A)]
	63Hz	125Hz	250Hz	500Hz	1000Hz	2000Hz	4000Hz	8000Hz	
Inlet duct	40	60	60	58	53	47	40	40	65
Supply duct	48	70	72	77	77	75	72	65	82
Supply - casing radiated	40	52	50	48	40	40	40	40	56
Extract duct	40	60	61	60	57	51	44	40	66
Exhaust - duct	48	70	71	75	73	72	67	60	80
Exhaust- casing radiated	40	52	50	48	40	40	40	40	56

Fans curves

Supply



Extract



Detailed technical specification

Multipurpose section 1

Block number: Block 1
 Service side: Right

Placement: Supply

Damper (left)

Pressure drop: 1.65 Pa
 Damper placement: Inside the unit
 Leakage class EN1751: 2
 Damper torque: 5.16 N·m
 Number of required actuators: 1
 Flange width (side): 35 mm
 Flange width (top, bottom): 25 mm
 Shaft coupling dimension: 12x12
 Base material: Aluminium (Al)
 Surface treatment: None
 Packaged: Installed

Damper actuator

Type: NFA
 Manufacturer: BELIMO
 Quantity: 1
 Packaged: Installed

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Filter section 1

Placement: Supply

Block number	Block 1	Filter insert F1	
Service side	Right	Size	592 x 592 x 635
Filter type	Bag filter	Count of pockets	8
Design pressure drop (supply)	134 Pa	Quantity	3
Filter class EN779	F7	Frame material	Plastic
Filter class ISO 16890	ePM2.5 65%	Energy efficiency class	C
Initial pressure drop	67 Pa	Packaged	Installed
Final pressure drop EN13053	200 Pa	Filter insert F3	
Final pressure drop Eurovent	167 Pa	Size	592 x 287 x 635
Maximal construction pressure drop	450 Pa	Count of pockets	8
Filter replacement	Pulling out to the service side	Quantity	3
Hose nipples - filter pressure	Yes	Frame material	Plastic
		Energy efficiency class	D
		Packaged	Installed
		Filter module mounting	
		Filter insert 1	Frame dimensions: 592 x 592 Frame width: 25 Pocket length: 635 Quantity: 3
		Filter insert 3	Frame dimensions: 592 x 287 Frame width: 25 Pocket length: 635 Quantity: 3
		Base material	Galvanized steel (FeZn)
		Surface treatment	None
		Packaged	Installed
		Pressure difference sensor	
		Type	P33N 30-500 Pa
		Quantity	1
		Packaged	Installed

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Rotary heat exchanger 1

Placement: Supply, Extract

Block number	Block 2
Service side	Right
Design pressure drop (supply)	244 Pa
Design pressure drop (extract)	249 Pa
Air flow, winter	14000 m ³ /hr
Outdoor air temperature, winter	-10 °C
Outdoor air humidity, winter	63 %
Outdoor air density, winter	1.34 kg/m ³
Supply air temperature, winter	23.6 °C
Supply air humidity, winter	38 %
Supply air density, winter	1.18 kg/m ³
Heat recovery efficiency, winter	74.8 %
Humidity efficiency, winter	61 %
Capacity, winter	227.7 kW
Condensing water qty, winter	97.58 kg/hr
Air flow, winter	14000 m ³ /hr
Extract air temperature, winter	35 °C
Extract air humidity, winter	30 %
Extract air density, winter	1.14 kg/m ³
Exhaust air temperature, winter	1.4 °C
Exhaust air humidity, winter	99 %
Exhaust air density, winter	1.28 kg/m ³

Rotary heat exchanger

Heat recovery efficiency (ErP), η _{t_nrvu}	74.8 %
Supply pressure drop, winter	212 Pa
Supply pressure drop, summer	244 Pa
Extract pressure drop, winter	249 Pa
Extract pressure drop, summer	244 Pa
Eurovent pressure drop - ODA	236 Pa
Eurovent pressure drop - ETA	236 Pa
Wheel type	Enthalpy/sorption
Foil material	Sorption hybrid rotor
Wheel depth	200 mm
Wave height	1.65 mm
Painted frame	No
Corrosion protection air inlet	No
Speed sensor	No
Item code	SH1-SL-WV-1700-SM-V0-B1-5,W1830,H2100,P75
Efficiency class	H1
Voltage	3~230V 50Hz AC
Nominal motor power	0.37
Nominal motor current	1.7
Weight	246 kg
Packaged	Installed

Rotary heat exchanger module mounting

Surface treatment	None
Packaged	Installed

Frequency inverter

Quantity	1
Type	FC051 1F0.37
Weight	1.6 kg
Packaged	Separately

Notes

Rotary heat exchanger 1

To achieve the maximal efficiency the regenerator motor is required to run at 75 Hz

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Unit name: Unit_14000



Fan section 1 **Placement: Supply**

Block number	Block 3	Fan	
Service side	Right	Quantity	2
Air flow	14000 m ³ /hr	Type	GR50I-ZID.GL.CR
Static pressure	637 Pa	Article number	116905/A01
Total pressure	653 Pa	Power input at duty point	1802 W
External pressure drop	250 Pa	Nominal motor current	7.4 A
Power input total at duty point	3604 W	Current at duty point	2.74 A
Specific power total	1854 W·s/m ³	Fan speed at duty point	1546 1/min
Rated fan speed	72 %	Maximal fan speed	2150 1/min
Duty point frequency	50 Hz	Motor voltage	3x400V~50Hz
Motor type	EC	Nominal motor power	4.6 kW
Motor protection	EC controller	IP rating	IP55
Hose nipples - fan pressure	Yes	Transmission	Direct
		Air density for calculation	1.2 kg/m ³
		Diffuser pressure difference	625 Pa
		K-factor	280
		Packaged	Installed
		Fan module mounting	
		Base material	Galvanized steel (FeZn)
		Surface treatment	None
		Packaged	Installed
		Flexible connector (right)	
		Base material	Galvanized steel (FeZn)
		Surface treatment	None
		Packaged	Installed

Notes

Fan section 1 The fan system effect is taken into account in the fan performances
The fan has been designed for wet condition of coils
Absorbed electrical power includes the power losses in a motor speed controller



Filter section 2 **Placement: Extract**

Block number	Block 4	Filter insert F1	
Service side	Left	Size	592 x 592 x 635
Filter type	Bag filter	Count of pockets	8
Design pressure drop (extract)	134 Pa	Quantity	3
Filter class EN779	F7	Frame material	Plastic
Filter class ISO 16890	ePM2.5 65%	Energy efficiency class	C
Initial pressure drop	67 Pa	Packaged	Installed
Final pressure drop EN13053	200 Pa	Filter insert F3	
Final pressure drop Eurovent	167 Pa	Size	592 x 287 x 635
Maximal construction pressure drop	450 Pa	Count of pockets	8
Filter replacement	Pulling out to the service side	Quantity	3
Hose nipples - filter pressure	Yes	Frame material	Plastic
		Energy efficiency class	D
		Packaged	Installed
		Filter module mounting	
		Filter insert 1	Frame dimensions: 592 x 592 Frame width: 25 Pocket length: 635 Quantity: 3
		Filter insert 3	Frame dimensions: 592 x 287 Frame width: 25 Pocket length: 635 Quantity: 3
		Base material	Galvanized steel (FeZn)
		Surface treatment	None
		Packaged	Installed
		Flexible connector (right)	
		Base material	Galvanized steel (FeZn)
		Surface treatment	None
		Packaged	Installed
		Pressure difference sensor	
		Type	P33N 30-500 Pa
		Quantity	1
		Packaged	Installed

Service section 1 **Placement: Extract**

Block number	Block 4
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Fan section 2		Placement: Extract	
Block number	Block 5	Fan	
Service side	Left	Quantity	2
Air flow	14000 m ³ /hr	Type	GR50I-ZID.GL.CR
Static pressure	639 Pa	Article number	116905/A01
Total pressure	656 Pa	Power input at duty point	1809 W
External pressure drop	250 Pa	Nominal motor current	7.4 A
Power input total at duty point	3618 W	Current at duty point	2.75 A
Specific power total	1860 W·s/m ³	Fan speed at duty point	1548 1/min
Rated fan speed	72 %	Maximal fan speed	2150 1/min
Duty point frequency	50 Hz	Motor voltage	3x400V~50Hz
Motor type	EC	Nominal motor power	4.6 kW
Motor protection	EC controller	IP rating	IP55
Hose nipples - fan pressure	Yes	Transmission	Direct
		Air density for calculation	1.2 kg/m ³
		Diffuser pressure difference	625 Pa
		K-factor	280
		Packaged	Installed
		Fan module mounting	
		Base material	Galvanized steel (FeZn)
		Surface treatment	None
		Packaged	Installed

Notes

Fan section 2
 The fan system effect is taken into account in the fan performances
 The fan has been designed for wet condition of coils
 Absorbed electrical power includes the power losses in a motor speed controller

Multipurpose section 2		Placement: Extract	
Block number	Block 5	Damper (left)	
Service side	Left	Pressure drop	1.65 Pa
		Damper placement	Inside the unit
		Leakage class EN1751	2
		Damper torque	5.16 N·m
		Number of required actuators	1
		Flange width (side)	35 mm
		Flange width (top, bottom)	25 mm
		Shaft coupling dimension	12x12
		Base material	Aluminium (Al)
		Surface treatment	None
		Packaged	Installed
		Damper actuator	
		Type	NFA
		Manufacturer	BELIMO
		Quantity	1
		Packaged	Installed

Detailed blocks specification

Block	Block weight	Height	Width	Length	Base frame height	Frame feet height	Type of legs	Roof
Block 1	245.09 kg	1160 mm	1940 mm	1006 mm	90 mm			Yes
Block 2	343.69 kg	2380 mm	1940 mm	300 mm	150 mm			Yes
Block 3	347.72 kg	1160 mm	1940 mm	1212.5 mm	90 mm			Yes
Block 4	220.01 kg	1220 mm	1940 mm	1212 mm	150 mm			No
Block 5	452.13 kg	1220 mm	1940 mm	1471.5 mm	150 mm			Yes

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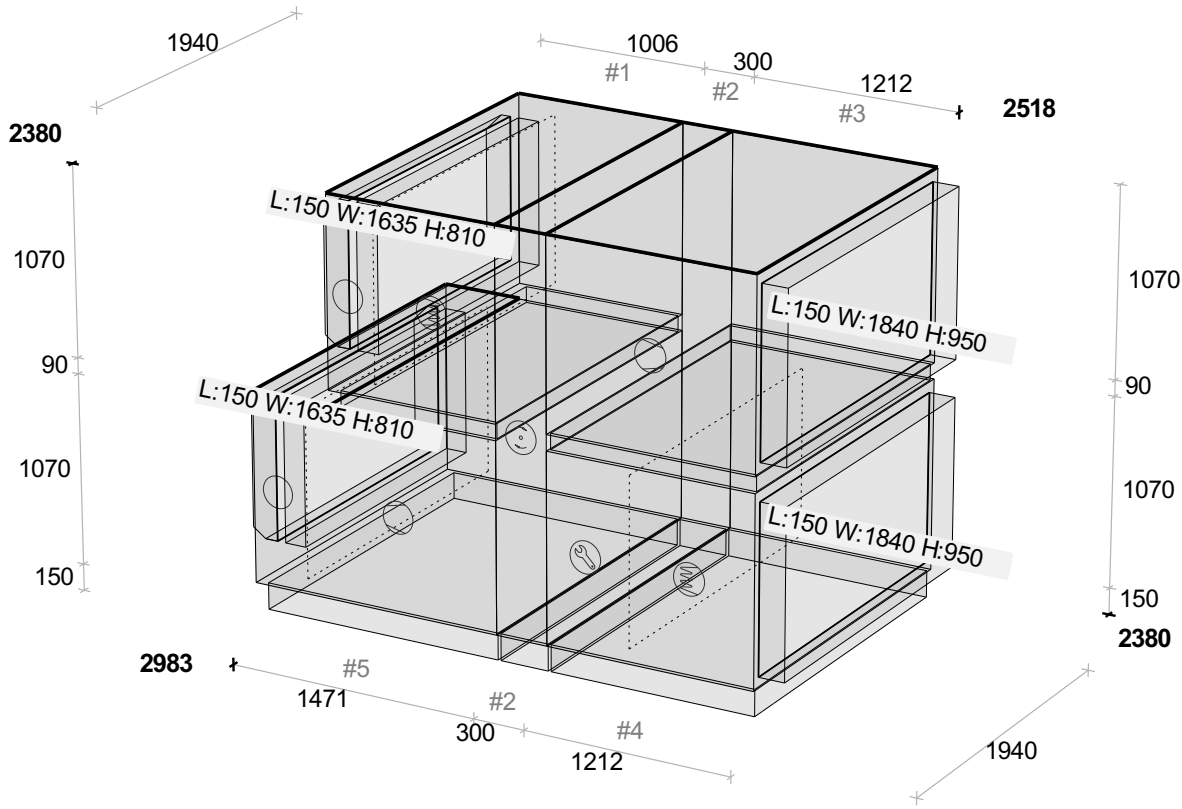


Block	Casing parameters - Inside			Casing parameters - Outside		
	Material	Surface finish	Colour	Material	Surface finish	Colour
Block 1	Galvanized steel (FeZn)	None	None	Galvanized steel (FeZn)	Powder coating	9002
Block 2	Galvanized steel (FeZn)	None	None	Galvanized steel (FeZn)	Powder coating	9002
Block 3	Galvanized steel (FeZn)	None	None	Galvanized steel (FeZn)	Powder coating	9002
Block 4	Galvanized steel (FeZn)	None	None	Galvanized steel (FeZn)	Powder coating	9002
Block 5	Galvanized steel (FeZn)	None	None	Galvanized steel (FeZn)	Powder coating	9002

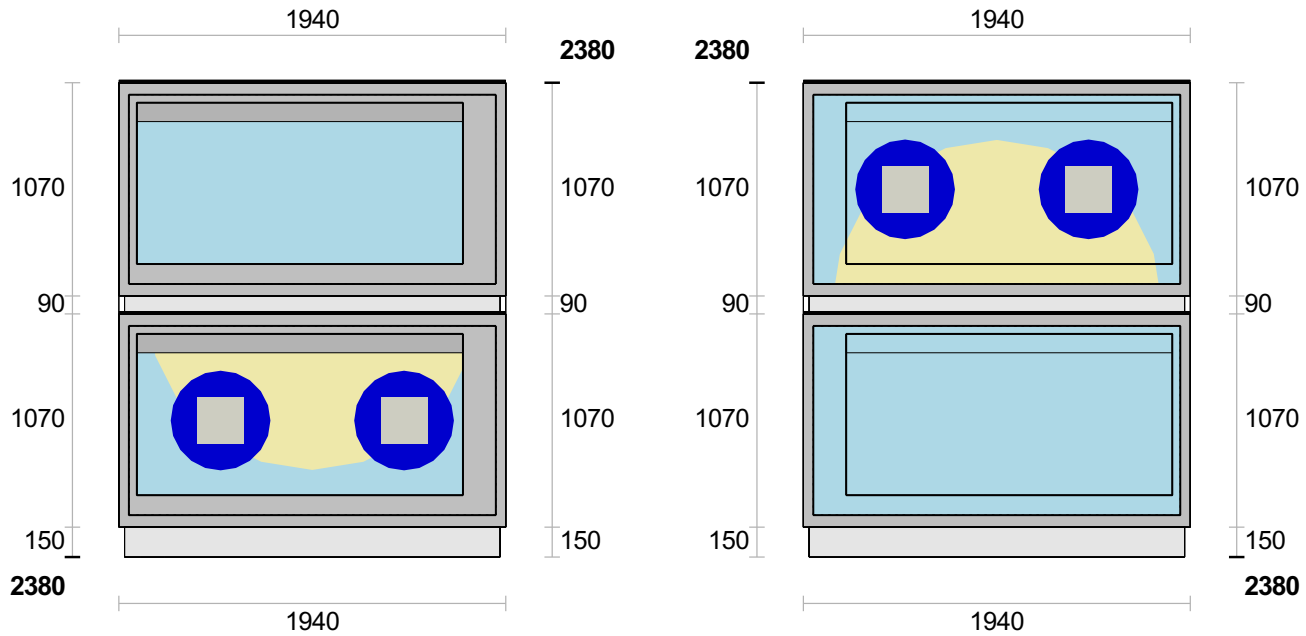
Notes

Graphics views

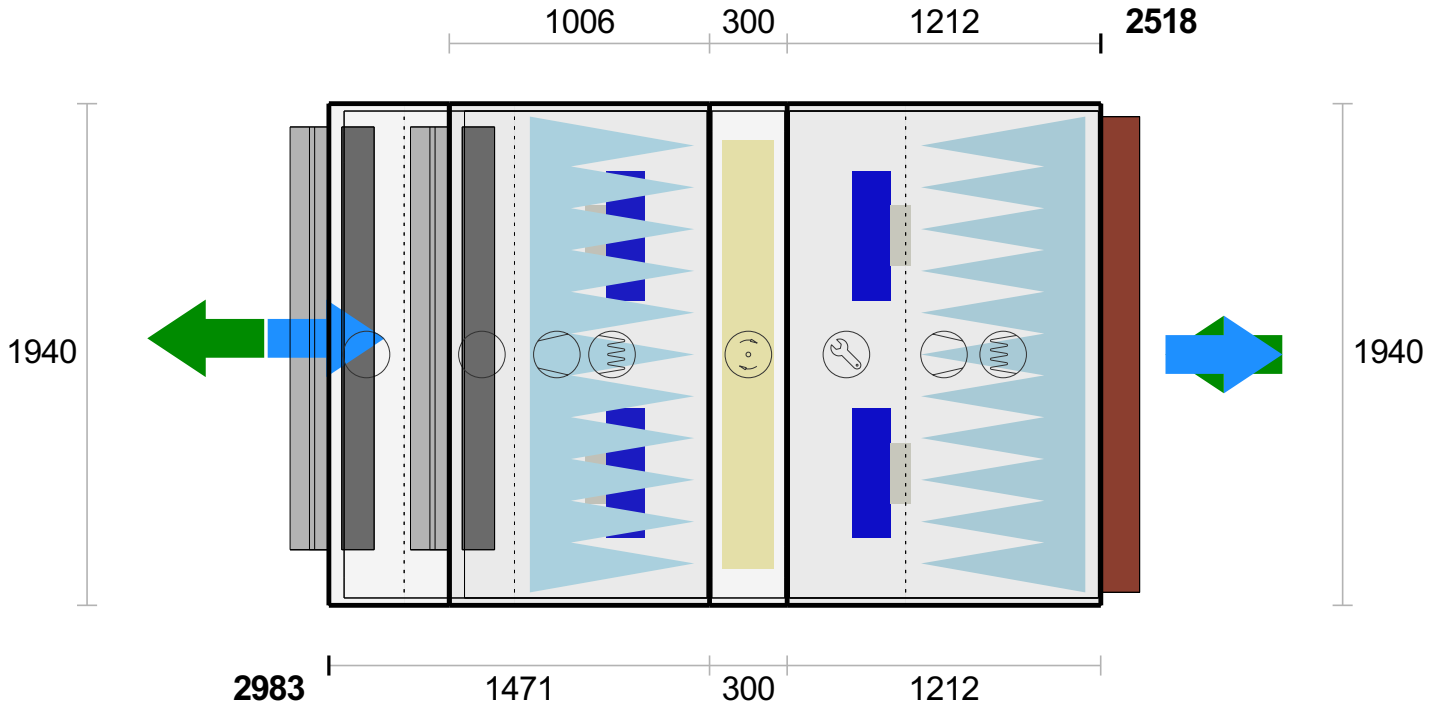
3D



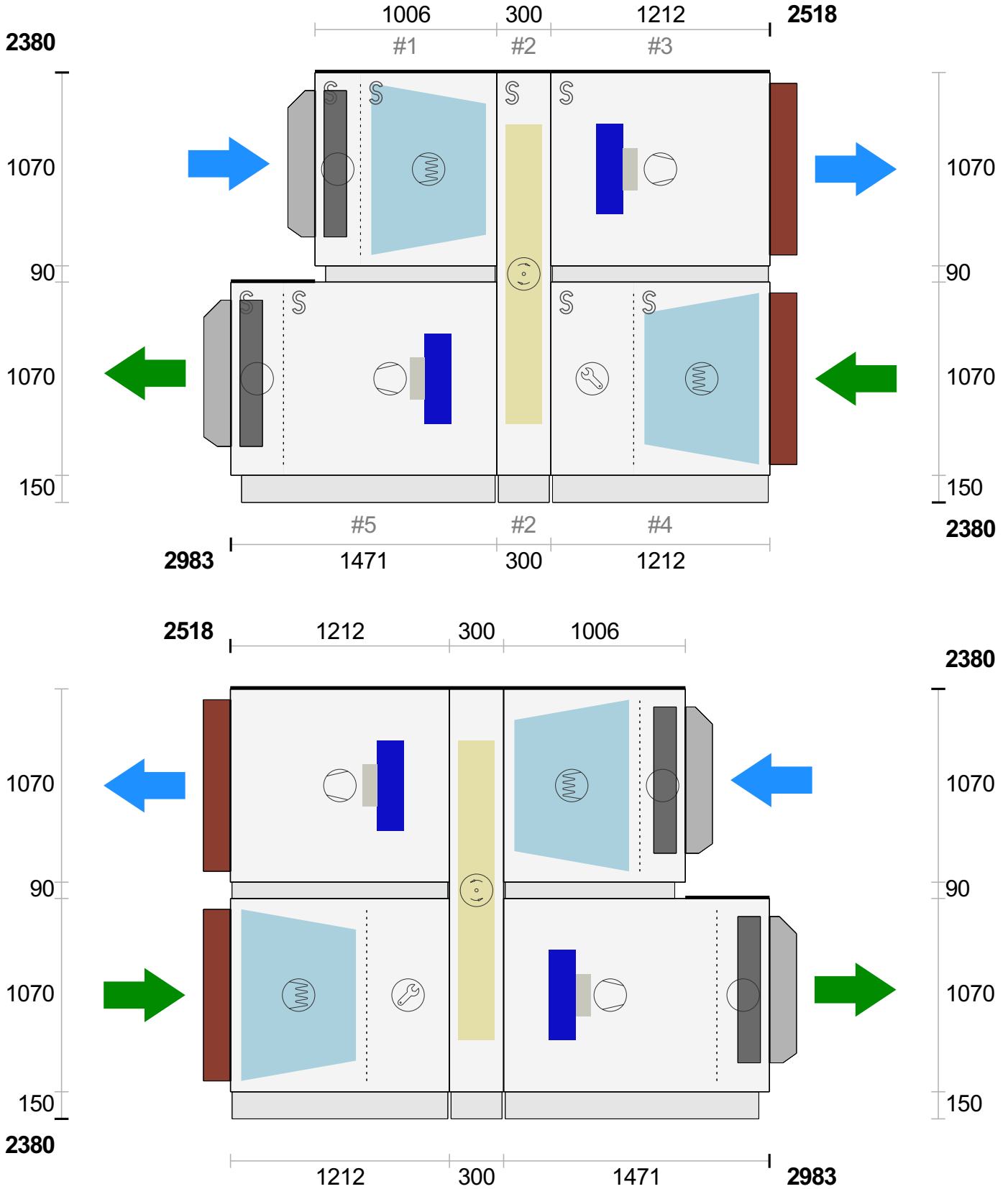
Left, Right



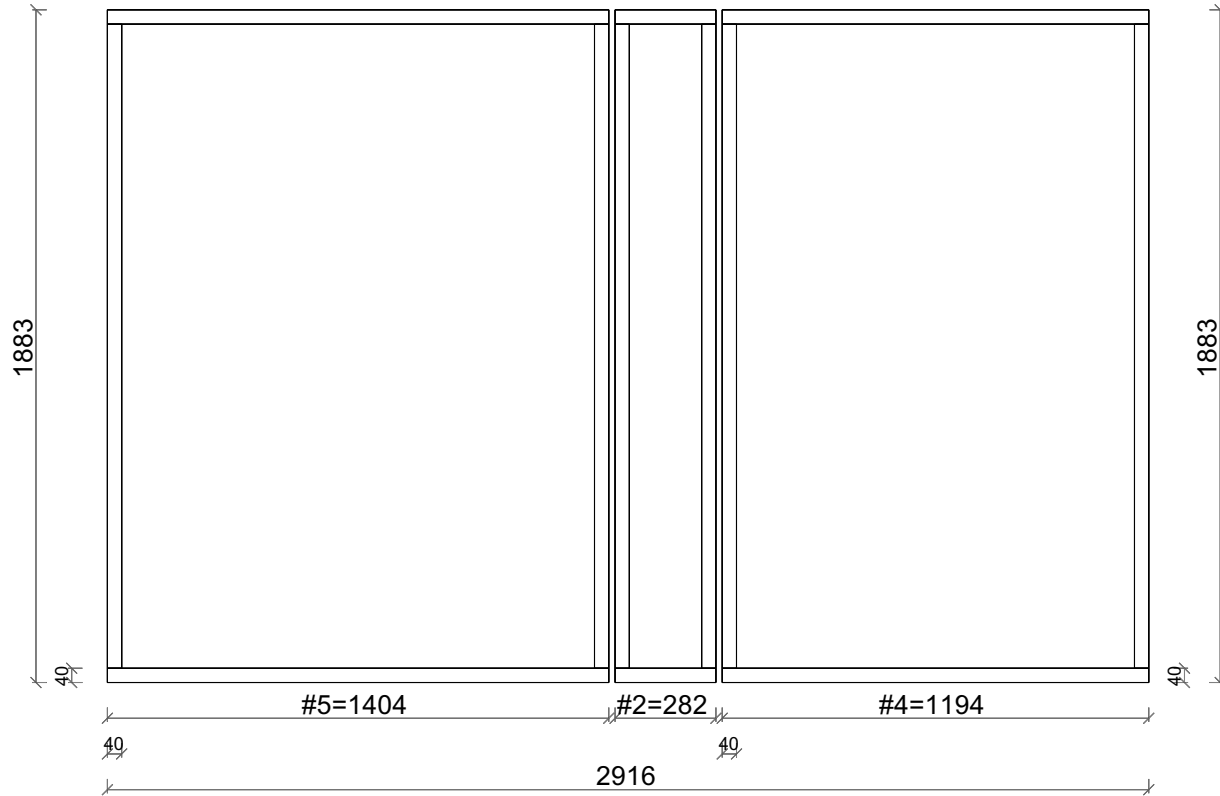
From above



Front, Back



Frame - from above



Control system and components

Factory made design of the electrical set a control

Control system

Control unit Control unit is not delivered

Presets for separate AC motor controllers

Rotary heat exchanger power control - location Indoors installed frequency inverter
 Rotary heat exchanger power control - IP IP21

Fan power control

Fan/s control selection Is not

AHU Control Configuration

Supply fan

Number of parallel fans (pcs) 2
 Type GR50I-ZID.GL.CR
 Fan motor technology (EC/AC) and control EC motor
 Power controller Built-in/integrated with motor
 Power supply 3× 400 V (à 7.4 A)
 Electromotor wiring Motor without cable, with casing grommet
 Isolator switch - loose Is not
 Grommets for pressure sensor (pair) Yes
 MODBUS RTU (RS485) communication Is not
 Bluetooth communication module Is not

Exhaust fan

Number of parallel fans (pcs) 2
 Type GR50I-ZID.GL.CR
 Fan motor technology (EC/AC) and control EC motor
 Power controller Built-in/integrated with motor
 Power supply 3× 400 V (à 7.4 A)
 Electromotor wiring Motor without cable, with casing grommet
 Isolator switch - loose Is not
 Grommets for pressure sensor (pair) Yes
 MODBUS RTU (RS485) communication Is not
 Bluetooth communication module Is not

Rotary heat exchanger

Type SH1-SL-WV-1700-SM-V0-B1-5,W1830,H2100,P75
 Fan motor technology (EC/AC) and control AC (IEC frequency controlled motor)

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Power controller	VLT Micro 230V (FC051 1F0.37)
Motor power supply	3×230 V
Inverter power supply	1×230 V
Inverter input current	6.1 A
Electromotor wiring	Motor without cable, with casing grommet
Isolator switch - loose	Is not
Heat exchanger freezing sensor	Is not
Wheel/rotor rpm sensor	Is not
Pressure sensor - checking the pressure drop limit	Is not

Dampers ODA / EHA

Supply	*****
Damper ODA - installation	Internal
Damper actuator	Yes - with the loose end of cable
Safety (emergency) function	Yes
Actuator - supply and control (type)	24 - 240 V AC / 24 - 125 V DC, on-off (NFA)
Degree of protection	IP54
Exhaust	*****
Damper EHA - installation	Internal
Damper actuator	Yes - with the loose end of cable
Safety (emergency) function	Yes
Actuator - supply and control (type)	24 - 240 V AC / 24 - 125 V DC, on-off (NFA)
Degree of protection	IP54

Filters

Supply	*****
Filter supply 1	BAG-F7-EN779
Supply filter clogging sensor	Yes - on the casing, with hood (P33N 30-500 Pa)
Degree of protection	IP54
Output	Volt-free switch (SPDT)
Max. voltage/ Max. current	230 V AC / 30 V DC 2 A
Exhaust	*****
Filter Extract 1	BAG-F7-EN779
Exhaust filter clogging sensor	Yes - on the casing, with hood (P33N 30-500 Pa)
Degree of protection	IP54
Output	Volt-free switch (SPDT)
Max. voltage/ Max. current	230 V AC / 30 V DC 2 A

Manufacturer

Web page	www.remak.eu
Version of the configurator database	28.7.2022

P.MaR_items

	Type	Quantity	Packaged	P.BelongTo
Damper actuator	NFA	1	Installed	Multipurpose section 1
Pressure difference sensor	P33N 30-500 Pa	1	Installed	Filter section 1
Frequency inverter	FC051 1F0.37	1	Separately	Rotary heat exchanger 1
Pressure difference sensor	P33N 30-500 Pa	1	Installed	Filter section 2
Damper actuator	NFA	1	Installed	Multipurpose section 2