New SEC Calculation_Version E

INPUT SECTION	symbol	unit	DUCTED RVUs		NON-DUCTED RVUs	
Select RVU-type	-	-	5.	BVU1 + zonal valves	1.	L-UVU for ES only
			descr.	Whole house Bidirectional Ventilation Unit - extracting from ES and supplying in HS - with zonal controllable valves	descr.	Local Unidirectional Ventilation Unit in ES serving extract space only
In case of BVU: does the unit have constant flow control and are internal leakages ≤3% ?	*c*			yes		no
			x-value			
Select type of motor drive	*x*	-	2	variable speed	2	variable speed
Specify Specific Power Input (acc. EN13142)	*SPI*	*W/m3/h*		0,25		0,10
Specify type of VDC: Ventilation Demand Control VDCs are generally applied at the same level as the controllable valves; lower VDC-levels are beneficial; higher VDC-levels make no sense (for example: RVU with valves in all rooms combined with a central VDC makes no sense).	*VDC*	-		*for ES*: manual *or* any VDC-ES; *for HS*: local VDC-HS; *VDC-HS detect no. of people (and optionally pollutants)*		*for ES*: local VDC-ES; VDC-ES measure pollutant loads typical for ES (RH, VOC)
Control factor	*CTRL*	-		0,45		0,65
Flow sensitivity correction factor	*fs*	-		n.a.		1,10
In case of BVU, specify temperature ratio, corrected for internal and external leakages, indoor outdoor mixing and airflow sensitivity '*v*' (EN13141-series and EN13142)	η_5	%		85,0%		0,0%
In case of BVU: specify humidity ratio (EN13141-7/8)	η_x	%		70,0%		0,0%
In case of BVU: specify type of frost protection stategy	-	-		E4: Electric preheating; stepless variable, controlled by outdoor temperature inlet in ventilation unit and additional temprature or pressure sensor in exhaust air		E4: Electric preheating; stepless variable, controlled by outdoor temperature inlet in ventilation unit and additional temprature or pressure sensor in exhaust air
Specify type of supply filter (if any)	-	-		None		None

New SEC Calculation_Version E

OUTPUT SECTION *Specific energy consumption per m² of heated surface in reference dwelling*		DUCTED RVUs servicing	warm	average	cold	NON-DUCTED RVUs servicing	warm	average	cold
Annual electricity consumption (incl. Q_{defr})	$kWh_{pr}/(m^2 \cdot a)$	dwelling	1,83	1,96	2,80	ES	0,61	0,61	0,61
Space heating energy consumption	$kWh_{pr}/(m^2 \cdot a)$		0,71	2,05	3,58		4,85	20,79	36,24
Total primary energy consumption RVU(s)[1)]	$kWh_{pr}/(m^2 \cdot a)$		**2,55**	**4,02**	**6,38**		**5,46**	**21,70**	**37,16**
Ref. space heating energy consumption nat. ventilation	$kWh_{pr}/(m^2 \cdot a)$		21,45	61,59	107,40		8,60	36,89	64,33
Calculating SEC-value for allocation Energy Label	$kWh_{pr}/(m^2 \cdot a)$	dwelling	-18,90	-57,58	-101,02	ES	-7,83	-25,36	-45,36
Energy Class	-		**B**	**B**	**B**		**F**	**F**	**F**
Ventilation Performance Index	*VPI* -		0,76	0,76	0,76		0,67	0,67	0,67
Ventilation Performance Class	-		**A**	**A**	**A**		**B**	**B**	**B**
Filter Performance Class	-		n.a.	n.a.	n.a.		n.a.	n.a.	n.a.

[1)] Total primary energy consumption for achieving Category II ventilation performance,according to EN16798-1

Ducted RVU-type	
UVU - no valves	1.
UVU + zonal valves	2.
UVU + valves for all rooms	3.
BVU1 - no valves	4.
BVU1 + zonal valves	5.
BVU1 + valves for all rooms	6.
BVU2 - no valves	7.
BVU2 + zonal valves	8.
BVU2 + valves for all rooms	9.

Constant flow control + int.leakage ≤ 3%
no
yes

Non-ducted RVU-type	
L -UVU for ES only	1.
L -UVU for HS only	2.
L -BVU for ES only	3.
L -BVU for HS only	4.
L -UVU-ES for whole house	5.

Motor-drive	*x-value*
on/off & single speed	1
2-speed	1,2
3-speed	1,5
variable speed	2

Vent. Demand Control HS ducted RVUs	
no control	
manual	manual co
clock	clock contr
central VDC-ES	VDC-ES me
central VDC-HS	VDC-HS de
zonal VDC-ES	VDC-ES me

zonal VDC-HS	VDC-HS de
local VDC-ES	VDC-ES me
local VDC-HS	VDC-HS de

Vent. Demand Control HS non-ducted RVUs	
manual	manual co
clock	clock contr
local VDC-ES	VDC-ES me
local VDC-HS	VDC-HS de

Type of supply filters	
None	1
ISO ePM1 ≥ 80% / F9	2
ISO ePM1 ≥ 70% / F8	3
ISO ePM1 ≥ 50% / F7	4
ISO ePM2.5 ≥ 50% / M6	5
ISO ePM10 ≥ 50% / M5	6
ISO Coarse ≥ 60% / G4	7

Whole house Unidirectional Ventilation Unit extracting air from all ES without controllable valves (combined with natural supply in HS)
Whole house Unidirectional Ventilation Unit extracting air from all ES with controllable valves (combined with natural supply in HS)
Whole house Unidirectional Ventilation Unit extracting air flow all ES and HS with controllable valves for all rooms (combined with natural supply in HS)
Whole house Bidirectional Ventilation Unit - extracting from ES and supplying in HS - without controllable valves
Whole house Bidirectional Ventilation Unit - extracting from ES and supplying in HS - with zonal controllable valves
Whole house Bidirectional Ventilation Unit - extracting from ES and supplying in HS - with controllable valves for all rooms
Whole house Bidirectional Ventilation Unit - extracting from all rooms and supplying in connecting spaces - without controllable valves
Whole house Bidirectional Ventilation Unit - extracting from all rooms and supplying in connecting spaces - with zonal controllable valves
Whole house Bidirectional Ventilation Unit - extracting from all rooms and supplying in connecting spaces - with controllable valves for all rooms

constant flow control and internal leakages ≤3%

Local Unidirectional Ventilation Unit in ES serving extract space only
Local Unidirectional Ventilation Unit in HS serving habitable space only (combined with natural supply in HS)
Local Bidirectional Ventilation Unit in ES serving extract space only
Local Bidirectional Ventilation Unit in HS serving habitable space only
Local Unidirectional Ventilation Unit in ES, serving both ES and HS (combined with natural supply in HS)

constant flow control and internal leakages ≤3%

ntrol per valve

ol per valve

easure pollutant loads typical for ES (RH, VOC)

tect no. of people (and optionally pollutants)

easure pollutant loads typical for ES (RH, VOC)

tect no. of people (and optionally pollutants)

easure pollutant loads typical for ES (RH, VOC)

tect no. of people (and optionally pollutants)

ntrol per unit

ol per unit

easure pollutant loads typical for ES (RH, VOC)

tect no. of people (and optionally pollutants)

n.a.
A
B
C
D
E
F

	no control	manual	clock	central VDC-ES	central VDC-HS	zonal VDC-ES	zonal VDC-HS	local VDC-ES	local VDC-HS
UVU - no valves	1,00	1,00	0,95	0,95	0,90	0,90	0,85	0,85	0,80
UVU + zonal valves	1,00	0,95	0,90	0,95	0,90	0,80	0,75	0,75	0,65
UVU + valves for all rooms	0,95	0,95	0,85	0,95	0,90	0,80	0,75	0,70	0,45
BVU1 - no valves	0,95	0,95	0,90	0,90	0,85	0,85	0,80	0,80	0,65
BVU1 + zonal valves	0,95	0,90	0,85	0,90	0,85	0,75	0,70	0,70	0,60
BVU1 + valves for all rooms	0,95	0,80	0,75	0,90	0,85	0,75	0,70	0,70	0,50
BVU2 - no valves	1,20	1,20	1,10	1,10	1,00	1,00	0,95	0,95	0,80
BVU2 + zonal valves	1,20	1,05	1,00	1,10	1,00	0,95	0,90	0,90	0,75
BVU2 + valves for all rooms	1,20	0,95	0,90	1,10	1,00	0,95	0,90	0,80	0,70
BVU1 - no valves	0,80	0,75	0,70	0,70	0,65	0,65	0,60	0,60	0,50
BVU1 + zonal valves	0,80	0,75	0,65	0,70	0,65	0,60	0,55	0,55	0,45
BVU1 + valves for all rooms	0,80	0,65	0,60	0,70	0,65	0,60	0,55	0,55	0,35
BVU2 - no valves	1,00	1,00	0,90	0,90	0,85	0,85	0,80	0,80	0,65
BVU2 + zonal valves	1,00	0,95	0,85	0,90	0,85	0,80	0,75	0,75	0,60
BVU2 + valves for all rooms	1,00	0,90	0,80	0,90	0,85	0,80	0,75	0,65	0,50
L -UVU for ES only		1,00	0,95					0,65	0,85
L -BVU for ES only		1,00	0,95					0,65	0,85
L -UVU for HS only		0,95	0,85					0,70	0,45
L -BVU for HS only		0,95	0,90					0,80	0,70
L -BVU for ES only		1,00	0,95					0,65	0,85
L -BVU for HS only		0,95	0,80					0,60	0,50

Lower limits energy classes	warm	average	cold
A	-20	-60	-105
B	-17	-52	-93
C	-14	-44	-81
D	-11	-36	-69
E	-8	-28	-57

natural ventilation

ducted UVU + manual control

F	-5	-20	-45
G	-2	-12	-33

UVU, BVU1
L-UVU, L-BVU, BVU2

Energy label ducted RVU average climate				
Lower limit values	<low limit	>high limit		Class
-60	FALSE	TRUE	0	A
-52	TRUE	TRUE	1	B
-44	TRUE	FALSE	0	C
-36	TRUE	FALSE	0	D
-28	TRUE	FALSE	0	E
-20	TRUE	FALSE	0	F
-12	TRUE	FALSE	0	G
	TRUE	FALSE	0	< MEP
			1	B

Energy label ducted RVU warm climate				
Lower limit values	<low limit	>high limit		Class
-20	FALSE	TRUE	0	A
-17	TRUE	TRUE	1	B
-14	TRUE	FALSE	0	C
-11	TRUE	FALSE	0	D
-8	TRUE	FALSE	0	E
-5	TRUE	FALSE	0	F
-2	TRUE	FALSE	0	G
	TRUE	FALSE	0	< MEP
			1	B

Energy label ducted RVU cold climate				
Lower limit values	<low limit	>high limit		Class
-105	FALSE	TRUE	0	A
-93	TRUE	TRUE	1	B
-81	TRUE	FALSE	0	C
-69	TRUE	FALSE	0	D
-57	TRUE	FALSE	0	E
-45	TRUE	FALSE	0	F
-33	TRUE	FALSE	0	G
	TRUE	FALSE	0	< MEP
			1	B

VPI class ducted RVU				
Lower limit values	<low limit	>high limit		Class
0,75	TRUE	TRUE	1	A
0,65	TRUE	FALSE	0	B
0,55	TRUE	FALSE	0	C
0,45	TRUE	FALSE	0	D
0,35	TRUE	FALSE	0	E
0,25	TRUE	FALSE	0	F

0,15	TRUE	FALSE	0	G
	TRUE	TRUE	1	not allowed
			1	A

Allocation share total airflow to ES/HS	
ES (extract spaces)	40%
HS (Habitable spaces)	60%

Default reference airflow rates for reference dwelling in $m^3/h/m^2$ heated surface, while achieving reference Category II ventilation performance (EN16798-1)			
	total	share ES	share HS
q_{ref}	2,50	1,00	1,50
q_{net}	1,97	0,79	1,18

non-ducted UVU + man.ctrl

Minimal airflow rate (i.e. optimized VU) for achieving reference ventilation performance in m3/h/m2 heated surface (Category II ventilation performance acc. EN16798-1)

	total	share ES	share HS
q_{opt}	0,67	0,38	0,29
q_{opt}	1,00	0,38	0,62

Energy label non-ducted RVU average climate				
Lower limit values	<low limit	>high limit		Class
-60	FALSE	TRUE	0	A
-52	FALSE	TRUE	0	B
-44	FALSE	TRUE	0	C
-36	FALSE	TRUE	0	D
-28	FALSE	TRUE	0	E
-20	TRUE	TRUE	1	F
-12	TRUE	FALSE	0	G
	TRUE	FALSE	0	< MEP
			1	F

Energy label non-ducted RVU warm climate				
Lower limit values	<low limit	>high limit		Class
-20	FALSE	TRUE	0	A
-17	FALSE	TRUE	0	B
-14	FALSE	TRUE	0	C
-11	FALSE	TRUE	0	D
-8	FALSE	TRUE	0	E
-5	TRUE	TRUE	1	F
-2	TRUE	FALSE	0	G
	TRUE	FALSE	0	< MEP
			1	F

Energy label non-ducted RVU cold climate				
Lower limit values	<low limit	>high limit		Class
-105	FALSE	TRUE	0	A
-93	FALSE	TRUE	0	B
-81	FALSE	TRUE	0	C
-69	FALSE	TRUE	0	D
-57	FALSE	TRUE	0	E
-45	TRUE	TRUE	1	F
-33	TRUE	FALSE	0	G
	TRUE	FALSE	0	< MEP
			1	F

VPI class non-ducted RVU				
Lower limit values	<low limit	>high limit		Class
0,75	FALSE	TRUE	0	A
0,65	TRUE	TRUE	1	B
0,55	TRUE	FALSE	0	C
0,45	TRUE	FALSE	0	D
0,35	TRUE	FALSE	0	E
0,25	TRUE	FALSE	0	F

0,15	TRUE	FALSE	0	G
	TRUE	TRUE	1	not allowed
			1	B

Default reference airflow rates for non-ducted (local) units in m3/h/m2 heated surface, while achieving reference Category II ventilation performance (EN16798-1); only to be used for VPI-assessment			
	ES	HS	total
q_{net}	0,79	1,60	2,39

	MDE-type	cntrls-ES	cap_{max}	cap_{min}
			[l/s]	[l/s]
VST7-ES	3	all manual	26 - 12 - 12	4 - 2 - 2
			[l/s/m^2 A_{hab}]	[l/s/m^2 A_{hab}]
VST7-HS	3	all manual	1,20	0.45

BVU2 ctrls ES & HS

VST6	3	all manual	1,20	0.45

AER ES	
m3/h	m3/h/m2
73,7	0,79
147,57	1,60

220	2,37

With c

Pos

:alculations of Qdefr according Excel file Prof Huber, modified by VHK to accommodate new SEC-formula)

Descriptioin
Climate
Annual operating hours
Primary energy factor for electric power generation and distribution
Net ventilation rate demand per m^2 heated floor area
~~**General typology of ventilation units**~~
~~Ducted ventilation units~~
Ventilation control factor
CTRL-factor from Table 2, ANNEX VI, ECODESIGN Revised Regulation
Exponent x for non-linearity of motor and drive
variable speed
Specific power input according EN 13142
Total hours heating season
Average difference indoor and outdoor temperature over a heating season
Average space heating efficiency
Specific heat capacity of air at constant pressure and density
Reference natural ventilation rate per m^2 heated floor area
Temperature ratio
Humidity ratio
Energy recovery ratio
Annual operating time in defrosting mode
Average difference between the outdoor temperature and the defrost mode setpoint during the defrosting period
Defrosting strategy
E4: Electric preheating; stepless variable, controlled by outdoor temperature inlet in ventilation unit and additional temprature or pressure sensor in exhaust air
Annual energy consumption for frost protection
Annual electricity consumption per m^2 heated floor area RVU (incl. Qdefr)
Space heating energy consumption per m2 heated floor area RVU
Total primary energy consumption RVU per m2 heated floor area
Referenc space heating energy consumption per m2 heated floor area for natural ventilation
Specific energy (SEC*) for RVU

Average annual primary energy consumption per single unit

	RVU-type	BV
Symbol	unit	Value
-	-	Warm
t_a	h	8760
pef	-	**2,1**
q_{net}	$m^3/(h \cdot m^2)$	**1,97**
~~*MISC*~~	-	~~**1**~~
CTRL	-	0,45
x	-	2
SPI	$W/(m^3/h)$	0,25
t_h	h	3590
ΔT_h	K	5,21
η_h		75%
c_{air}	$kWh/(m^3 \cdot K)$	0,000344
q_{ref}	$m^3/(h.m^2)$	**2,5**
η_5		85,0%
η_x		70,0%
η_e		91%
t_{defr}	h/a	0
ΔT_{defr}	K	0
		E4

Qdefr	$kWh/(m^2 \cdot a)$	0,00

E_{AEC}	$kWh/(m^2 \cdot a)$	1,83
	$kWh/(m^2 \cdot a)$	0,71
	$kWh/(m^2 \cdot a)$	2,55
	$kWh/(m^2 \cdot a)$	21,45
SEC*	**$kWh/(m^2 \cdot a)$**	**-18,90**

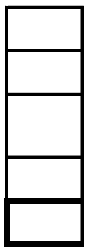
$kWh/(m^2 \cdot a)$	**2,55**

PRO

SEC

SEC (

Pos



1

2

3

4

5

6

7

8

9

10

11

12

13

POSAL SEC FORMULA for Non-ducted RVU for ES

non-ducted RVU-ES =

$$t_a * PEF * q_{net;\,ES} * CTRL^{x}_{ES} * SPI_{ES} \; - \; t_h * \Delta T_h * \eta_e^{-1} * C_{air} * (q_{ref} - q_{net;ES} * CTRL$$

Calculations for non-ducted RVU-ES (reference dwelling with 3 units)

Descriptioin
Climate
Annual operating hours
Primary energy factor for electric power generation and distribution
Reference mechanical ventilation rate for ES per m^2 heated floor area
Reference mechanical ventilation rate for HS per m^2 heated floor area
Total reference mechanical ventilation rate per m^2 heated floor area
~~**General typology of ventilation units**~~
~~NON-Ducted ventilation units~~
Ventilation control factor RVU-ES
CTRL-factor from Table 2, ANNEX VI, ECODESIGN Revised Regulation
flow sensitivity correction factor local RVU
Exponent x for non-linearity of motor and drive RVU-ES
variable speed
Specific power input RVU-ES (according EN 13142)
Total hours heating season
Average difference indoor and outdoor temperature over a heating season
Average space heating efficiency
Specific heat capacity of air at constant pressure and density
Reference natural ventilation rate per m^2 heated floor area
Temperature ratio
Humidity ratio
Energy recovery ratio
Annual operating time in defrosting mode
Average difference between the outdoor temperature and the defrost mode setpoint during the defrosting period
Defrosting strategy ES
E4: Electric preheating; stepless variable, controlled by outdoor temperature inlet in ventilation unit and additional temprature or pressure sensor in exhaust air
Annual energy consumption for defrosting RVU-ES

Annual electricity consumption per m^2 heated floor area RVU-ES (incl. Qdefr)
Space heating energy consumption per m2 heated floor area RVU-ES
Total primary energy consumption RVU-ES per m2 heated floor area
Referenc space heating energy consumption per m2 heated floor area for natural ventilation ES
Specific energy (SEC*) for RVU-ES

Average annual primary energy consumption per single unit

SEC-value per single unit

SEC-value for allocation of related Energy Label (value row 46 divided by 40%)

SOME CALCULATIONS FOR LOCAL RVU-ES

***L*- UVU**, 2 speed, SPI=0.5, manual control (CTRL=1), *fs* = 1.5
***L*- UVU**, 3 speed, SPI=0.3, manual control (CTRL=1), *fs* = 1.3
***L*- UVU**, 3 speed, SPI=0.1, manual control (CTRL=1), *fs* = 1.1
***L*- UVU**, 3 speed, SPI=0.05, clock control (CTRL=0.95), *fs* = 1.1
***L*- UVU**, variable speed, SPI=0.1, RH control (CTRL=0.70), *fs* = 1.3
***L*- UVU**, variable speed, SPI=0.05, CO2-control (CTRL=0.85), *fs* = 1.1
***L*- UVU**, variable speed, SPI=0.05, RH-control (CTRL=0.70), *fs* = 1.0

***L*- BVU**, HR=50%, 2 speed, SPI=0.7, manual control (CTRL=1.0), Defr=E2, *fs* = 1.5
***L*- BVU**, HR=60%, 3 speed, SPI=0.7, manual control **(**CTRL=1.0**)**, Defr=E4, *fs* = 1.3
L-BVU, HR=70%, variable speed, SPI=0.35, manual control (CTRL=1.0), Defr=E4, *fs* = 1.3
***L*- BVU**, HR=70%, variable speed, SPI=0.35, clock control (CTRL=0.95), Defr=E4, *fs* = 1.1
***L*- BVU**, HR=80%, variable speed, SPI=0.25, CO2-control (CTRL=0.85), Defr=E4, *fs* = 1.1
***L*- BVU**, HR=90%, variable speed, SPI=0.10, RH-control (CTRL=0.70), Defr=E4, *fs* = 1.0

PROI

SEC I

$_{ES} * fs_{ES} * (1 - \eta_e)) + CTRL * Q_{defr;RVU-ES}$

SEC C

Local RVU in ES for ES-only

Symbol	unit	Value	Value	Value		Pos
-	-	Warm	Average	Cold		
t_a	h	8760	8760	8760		
pef	-	**2,1**	**2,1**	**2,1**		
$q_{net;ES}$	$m^3/(h \cdot m^2)$	**0,79**	**0,79**	**0,79**	**40%**	
$q_{net;HS}$	$m^3/(h \cdot m^2)$	**1,18**	**1,18**	**1,18**	**60%**	
q_{net}	$m^3/(h \cdot m^2)$	**1,97**	**1,97**	**1,97**	**100%**	
~~*MISC*~~	-	**~~1~~**	**~~1~~**	**~~1~~**		
$CTRL_{ES}$	-	0,65	0,65	0,65		
fs_{ES}	-	1,10	1,10	1,10		
x	-	2	2	2		
SPI_{ES}	$W/(m^3/h)$	0,10	0,10	0,10		
t_h	h	3590	4910	6446		
ΔT_h	K	5,21	10,94	14,53		
η_h		75%	75%	75%		
c_{air}	$kWh/(m^3 \cdot K)$	0,000344	0,000344	0,000344		
q_{ref}	$m^3/(h.m^2)$	**2,5**	**2,5**	**2,5**		
η_5		0,0%	0,0%	0,0%		
η_x		0,0%	0,0%	0,0%		
η_e		0,0%	0,0%	0,0%		
t_{defr}	h/a	0	303,5	1434		
ΔT_{defr}	K	0	2,61	5,14		
		E4	E4	E4		

Qdefr	$kWh/(m^2 \cdot a)$	0,00	0,00	0,00	

E_{AEC}	kWh/(m^2 a)	0,61	0,61	0,61	
	kWh/(m^2 a)	4,85	13,92	24,27	
	kWh/(m^2 a)	5,46	14,53	24,88	
	kWh/(m^2 a)	8,60	24,70	43,07	
SEC*	kWh/(m^2 a)	**-3,14**	**-10,17**	**-18,19**	

kWh/(m^2 a)	**1,82**	**4,84**	**8,29**
kWh/(m^2 a)	**-1,05**	**-3,39**	**-6,06**
kWh/(m^2 a)	**-7,83**	**-25,36**	**-45,36**

SEC-values Local RVU-ES

Warm	Average	Cold	
21,80	29,03	37,28	1
11,28	12,25	13,36	2
0,76	-4,53	-10,57	3
-2,09	-9,10	-17,11	4
-5,13	-16,37	-29,20	5
-4,29	-14,75	-26,69	6
-8,64	-26,46	-46,79	7
16,43	2,32	3,97	8
12,58	-9,93	-30,55	9
-2,15	-28,73	-53,99	10
-4,65	-33,67	-61,98	11
-11,62	-44,70	-78,14	12
-18,30	-55,18	-93,72	13

SEC range Energy Label

40,10	84,21	131,01

POSAL SEC FORMULA for Non-ducted RVU for HS

non-ducted RVU-HS =

$$t_a * PEF * q_{net;HS} * CTRL^{x}_{HS} * SPI_{HS} - t_h * \Delta T_h * \eta_e^{-1} * C_{air} * (q_{ref} - q_{net;HS} * CT$$

Calculations for non-ducted RVU-HS (reference dwelling with 3 units)

Descriptioin
Climate
Annual operating hours
Primary energy factor for electric power generation and distribution
Reference mechanical ventilation rate for ES per m^2 heated floor area
Reference mechanical ventilation rate for HS per m^2 heated floor area
Total reference mechanical ventilation rate per m^2 heated floor area
~~**General typology of ventilation units**~~
~~NON-Ducted ventilation units~~
Ventilation control factor RVU-HS
CTRL-factor from Table 2, ANNEX VI, ECODESIGN Revised Regulation
flow sensitivity correction factor local RVU
Exponent x for non-linearity of motor and drive RVU-ES
variable speed
Specific power input RVU-HS (according EN 13142)
Total hours heating season
Average difference indoor and outdoor temperature over a heating season
Average space heating efficiency
Specific heat capacity of air at constant pressure and density
Reference natural ventilation rate per m^2 heated floor area
Temperature ratio
Humidity ratio
Energy recovery ratio
Annual operating time in defrosting mode
Average difference between the outdoor temperature and the defrost mode setpoint during the defrosting period
Defrosting strategy HS
E4: Electric preheating; stepless variable, controlled by outdoor temperature inlet in ventilation unit and additional temprature or pressure sensor in exhaust air

Annual energy consumption for defrosting RVU-HS

Annual electricity consumption per m^2 heated floor area RVU-HS (incl. Qdefr)
Space heating energy consumption per m2 heated floor area RVU-HS
Total primary energy consumption RVU-HS per m2 heated floor area
Referenc space heating energy consumption per m2 heated floor area for natural ventilation HS
Specific energy (SEC*) for RVU-HS

Average annual primary energy consumption per single unit

SEC-value per single unit

SEC-value for allocation of related Energy Label (value row 46 divided by 60%)

SOME CALCULATIONS FOR LOCAL RVU-HS

***L*- UVU**, 2 speed, SPI=0.5, manual control (CTRL=0.95), *fs* = 1.5
***L*- UVU**, 3 speed, SPI=0.3, manual control (CTRL=0.95), *fs* = 1.3
***L*- UVU**, 3 speed, SPI=0.1, manual control (CTRL=0.95), *fs* = 1.1
***L*- UVU**, 3 speed, SPI=0.05, clock control (CTRL=0.85), *fs* = 1.1
***L*- UVU**, variable speed, SPI=0.1, RH control (CTRL=0.70), *fs* = 1.3
***L*- UVU**, variable speed, SPI=0.05, RH-control (CTRL=0.70), *fs* = 1.1
***L*- UVU**, variable speed, SPI=0.05, CO2-control (CTRL=0.45), *fs* = 1.0

***L*- BVU**, HR=50%, 2 speed, SPI=0.7, manual control (CTRL=0.95), Defr=E2, *fs* = 1.5
***L*- BVU**, HR=60%, 3 speed, SPI=0.7, manual control **(**CTRL=0.95**)**, Defr=E4, *fs* = 1.3
L-BVU, HR=70%, variable speed, SPI=0.35, manual control (CTRL=0.95), Defr=E4, *fs* = 1.3
***L*- BVU**, HR=70%, variable speed, SPI=0.35, clock control (CTRL=0.90), Defr=E4, *fs* = 1.1
***L*- BVU**, HR=80%, variable speed, SPI=0.25, RH-control (CTRL=0.80), Defr=E4, *fs* = 1.1
***L*- BVU**, HR=90%, variable speed, SPI=0.10, CO2-control (CTRL=0.70), Defr=E4, *fs* = 1.0

***L*- BVU-c TO DO**

$RL_{HS} * fs_{HS} * (1 - \eta_e)) + CTRL * Q_{defr;RVU-HS}$

		Local RVU in HS for HS-only			
Symbol	unit	Value	Value	Value	
-	-	Warm	Average	Cold	
t_a	h	8760	8760	8760	
pef	-	**2,1**	**2,1**	**2,1**	
$q_{net;ES}$	$m^3/(h \cdot m^2)$	**0,79**	**0,79**	**0,79**	**40%**
$q_{net;HS}$	$m^3/(h \cdot m^2)$	**1,18**	**1,18**	**1,18**	**60%**
q_{net}	$m^3/(h \cdot m^2)$	**1,97**	**1,97**	**1,97**	**100%**
~~*MISC*~~	-	~~**1**~~	~~**1**~~	~~**1**~~	
$CTRL_{HS}$	-	0,65	0,65	0,65	
fs_{HS}	-	1,10	1,10	1,10	
x	-	2	2	2	
SPI_{HS}	$W/(m^3/h)$	0,10	0,10	0,10	
t_h	h	3590	4910	6446	
ΔT_h	K	5,21	10,94	14,53	
η_h		75%	75%	75%	
c_{air}	$kWh/(m^3 \cdot K)$	0,000344	0,000344	0,000344	
q_{ref}	$m^3/(h.m^2)$	**2,50**	**2,50**	**2,50**	
η_5		0,0%	0,0%	0,0%	
η_x		0,0%	0,0%	0,0%	
η_e		0,0%	0,0%	0,0%	
t_{defr}	h/a	0	303,5	1434	
ΔT_{defr}	K	0	2,61	5,14	
		E4	E4	E4	
		0,00	0,00	0,00	

0,92	0,92	0,92
7,24	20,79	36,24
8,16	21,70	37,16
12,85	36,89	64,33
-4,69	**-15,19**	**-27,17**

kWh/(m$^{2.}$ a)	**2,72**	**7,23**	**12,39**
kWh/(m$^{2.}$ a)	**-1,56**	**-5,06**	**-9,06**
kWh/(m$^{2.}$ a)	**-7,83**	**-25,36**	**-45,36**

SEC-values Local RVU-HS

Warm	Average	Cold
19,67	24,61	30,24
9,49	8,41	7,19
-0,43	-7,52	-15,60
-4,23	-14,79	-26,85
-4,29	-15,65	-28,61
-7,55	-23,33	-41,35
-13,48	-39,39	-68,95

14,45	-1,10	-1,80
10,39	-13,22	-35,30
-3,74	-31,25	-57,79
-6,15	-36,04	-65,54
-12,67	-46,48	-80,98
-18,49	-55,75	-94,69

SEC range Energy Label

38,16	80,36	124,92

SEC Calculations for non-ducted RVU in ES (serving ES and HS in reference dwelling)

Pos	Descriptioin
	Climate
	Annual operating hours
	Primary energy factor for electric power generation and distribution
	Net ventilation rate demand per m^2 heated floor area

	~~**General typology of ventilation units**~~ ~~Ducted ventilation units~~
	Ventilation control factor CTRL-factor from Table 2, ANNEX VI, ECODESIGN Revised Regulation
	flow sensitivity correction factor local RVU
	Exponent x for non-linearity of motor and drive 0
	Specific power input according EN 13142
	Total hours heating season
	Average difference indoor and outdoor temperature over a heating season
	Average space heating efficiency
	Specific heat capacity of air at constant pressure and density
	Reference natural ventilation rate per m^2 heated floor area
	Temperature ratio
	Humidity ratio
	Energy recovery ratio
	Annual operating time in defrosting mode
	Average difference between the outdoor temperature and the defrost mode setpoint during the defrosting period
	Defrosting strategy
	E4: Electric preheating; stepless variable, controlled by outdoor temperature inlet in ventilation unit and additional temprature or pressure sensor in exhaust air

	Annual energy consumption for frost protection

	Annual electricity consumption per m^2 heated floor area RVU (incl. Qdefr)

	Space heating energy consumption per m2 heated floor area RVU
	Total primary energy consumption RVU per m2 heated floor area
	Referenc space heating energy consumption per m2 heated floor area for natural ventilation
	Specific energy (SEC*) for RVU

Average annual primary energy consumption per single unit

	RVU-type	Local RVU in ES serving ES and HS		
Symbol	unit	Value	Value	Value
-	-	0	0	0
t_a	h	8760	8760	8760
pef	-	**2,1**	**2,1**	**2,1**
q_{net}	$m^3/(h \cdot m^2)$	**1,97**	**1,97**	**1,97**

~~*MISC*~~	-	~~**1**~~	~~**1**~~	~~**1**~~
CTRL	-	0,65	0,65	0,65
fs_{HS}	-	1,10	1,10	1,10
x	-	2	2	2
SPI	$W/(m^3/h)$	0,10	0,10	0,10
t_h	h	3590	4910	6446
ΔT_h	K	5,21	10,94	14,53
η_h		75%	75%	75%
c_{air}	$kWh/(m^3 \cdot K)$	0,000344	0,000344	0,000344
q_{ref}	$m^3/(h.m^2)$	**2,5**	**2,5**	**2,5**
η_5		0,0%	0,0%	0,0%
η_x		0,0%	0,0%	0,0%
η_e		0%	0%	0%
t_{defr}	h/a	0	303,5	1434
ΔT_{defr}	K	0	2,61	5,14
		E4	E4	E4

Qdefr	$kWh/(m^2 \cdot a)$	0,00	0,00	0,00

E_{AEC}	$kWh/(m^2 \cdot a)$	1,53	1,53	1,53

	kWh/($m^{2.}$ a)	10,99	31,55	55,01
	kWh/($m^{2.}$ a)	12,52	33,08	56,54
	kWh/($m^{2.}$ a)	21,45	61,59	107,40
SEC*	**kWh/(m^2 a)**	**-8,93**	**-28,51**	**-50,86**

kWh/($m^{2.}$ a)	**12,52**	**33,08**	**56,54**

Exponent x for non-linearity of motor and drive	*x-value*
on/off & single speed	1
2-speed	1,2
3-speed	1,5
variable speed	2
variable speed	2

Total hours heating season	t_h
Cold	6446
Average	4910
Warm	3590
Warm	3590

Average difference in indoor and outdoor temperature over a heating season	ΔT_h
Cold	14,53
Average	10,94
Warm	5,21
Warm	5,21

Type of defrosting equipment	$\Delta p_{ext,defr}$
Earth to air heat exchangers	20
Electric preheater	10
Water to air preheater	20
Brine to air preheater	40
NA	0
#REF!	#REF!

Ventilator efficiency	η_{vent}
DC or EC motor, forward curved blades	0,26

DC or EC motor, backward curved blades	0,35
#REF!	#REF!

Defrosting mode setpoint in °C	θ_{idefr}
	-2 -3 -4 -5
Deforsting mode setpoint chosen:	#REF!

Climate	-
	Cold Average Warm
Climate chosen:	0

Description	**Symbol**	**Unit**	**Climate**
Operating time in defrosting mode	t_{defr}	h/a	cold average warm
Average difference between the outdoor temperature and defrost mode setpoint during the defrosting period	ΔT_{defr}	K	cold average warm

AVERAGE CLIMATE	**Symbol**	**Symbol**	**Defrosting**
			-2
None	N	$f_{ctrl,defr}$	0,00
Electric preheating E			
1 stage, contolled by outdoor temperature inlet in ventilation unit	E1	$f_{ctrl,defr}$	5,25
2 stage, contolled by outdoor temperature inlet in ventilation unit	E2	$f_{ctrl,defr}$	2,22
Stepless variable, contolled by outdoor temperature inlet in ventilation unit	E3	$f_{ctrl,defr}$	1,00
Stepless variable, contolled by outdoor temperature inlet in ventilation unit and additional temprature or pressure sensor in exhaust air	E4	$f_{ctrl,defr}$	0,8
External forst protection X			
1 stage, contolled by outdoor temperature inlet in ventilation unit	XE1	$f_{ctrl,defr}$	5,25
2 stage, contolled by outdoor temperature inlet in ventilation unit	XE2	$f_{ctrl,defr}$	2,22
Stepless variable, contolled by outdoor temperature inlet in ventilation unit	XE3	$f_{ctrl,defr}$	1,00
Stepless variable, contolled by outdoor temperature inlet in ventilation unit and additional temprature or pressure sensor in exhaust air	XE4	$f_{ctrl,defr}$	0,8
External water based preheater, contolled by outdoor temperature inlet in ventilation unit. Stepless variable controlled pump	XW2	$f_{ctrl,defr}$	0,75
External brine air preheater, contolled by outdoor temperature inlet in ventilation unit. 1-stage pump	XB1	$f_{ctrl,defr}$	1,00
External brine air preheater, contolled by outdoor temperature inlet in ventilation unit. Stepless variable controlled pump	XB2	$f_{ctrl,defr}$	0,75

Description	Symbol	Symbol	Temp
			0,6
Bypass for defrosting B			
Bypass full open	B1	$\Delta\eta_{t,by}$	0,012
Stepless variable, contolled by outdoor temperature inlet in ventilation unit	B2	$\Delta\eta_{t,by}$	0,003
Stepless variable, contolled by outdoor temperature inlet in ventilation unit contolled by outdoor temperature inlet in ventilation unit and additional temprature or pressure sensor in exhaust air	B3	$\Delta\eta_{t,by}$	0,002
Lowering supply air flow rate (or shut off) L			
Ventilator shut off	L1	$\Delta\eta_{t,low}$	0,012
Stepless variable, contolled by outdoor temperature inlet in ventilation unit	L2	$\Delta\eta_{t,low}$	0,003
Stepless variable, contolled by outdoor temperature inlet in ventilation unit contolled by outdoor temperature inlet in ventilation unit and additional temprature or pressure sensor in exhaust air	L3	$\Delta\eta_{t,low}$	0,002
Increasing exhaust air flow rate I			
Ventilator shut off	I1	$\Delta\eta_{t,dec}$	0,012
Stepless variable, contolled by outdoor temperature inlet in ventilation unit	I2	$\Delta\eta_{t,dec}$	0,009
Stepless variable, contolled by outdoor temperature inlet in ventilation unit contolled by outdoor temperature inlet in ventilation unit and additional temprature or pressure sensor in exhaust air	I3	$\Delta\eta_{t,dec}$	0,007

Defrosting strategy	Cat.
N : None	N
E1: Electric preheating; 1 stage, controlled by outdoor temperature inlet in ventilation unit	E1
E2: Electric preheating; 2 stage, controlled by outdoor temperature inlet in ventilation unit	E2
E3: Electric preheating; stepless variable, controlled by outdoor temperature inlet in ventilation unit	E3
E4: Electric preheating; stepless variable, controlled by outdoor temperature inlet in ventilation unit and additional temprature or pressure sensor in exhaust air	E4
L1: Lowering supply air flow rate; ventilator shut off	L1
L2: Lowering supply air flow rate; stepless variable, controlled by outdoor temperature inlet in ventilation unit	L2
L3: Lowering supply air flow rate; stepless variable, controlled by outdoor temperature inlet in ventilation unit and additional temprature or pressure sensor in exhaust air	L3
I1: Increasing exhaust air flow rate; ventilator shut off	I1
I2: Increasing exhaust air flow rate; stepless variable, controlled by outdoor temperature inlet in ventilation unit	I2
I3: Increasing exhaust air flow rate; stepless variable, controlled by outdoor temperature inlet in ventilation unit and additional temprature or pressure sensor in exhaust air	I3

B1: Bypass for defrosting; Bypass full open	B1
B2: Bypass for defrosting; stepless variable, controlled by outdoor temperature inlet in ventilation unit	B2
B3: Bypass for defrosting; stepless variable, controlled by outdoor temperature inlet in ventilation unit and additional temperature or pressure sensor in exhaust air	B3
No freezing risk in warm climate until 0 °C	S1
No freezing risk in average climate until -15 °C	S2
No freezing risk in cold climate until -25 °C	S3
External frost protection; 1 stage, controlled by outdoor temperature inlet in ventilation unit	XE1
External frost protection; 2 stage, controlled by outdoor temperature inlet in ventilation unit	XE2
External frost protection; stepless variable, controlled by outdoor temperature inlet in ventilation unit	XE3
External frost protection; stepless variable, controlled by outdoor temperature inlet in ventilation unit and additional temprature or pressure sensor in exhaust air	XE4
External frost protection; external water based preheater, controlled by outdoor temperature inlet in ventilation unit. Stepless variable controlled pump	XW2
External frost protection; external brine air preheater, controlled by outdoor temperature inlet in ventilation unit. 1-stage pump	XB1
External frost protection; external brine air preheater, controlled by outdoor temperature inlet in ventilation unit. Stepless variable controlled pump	XB2
External frost protection; external earth-to-air heat exchanger	XG
E4: Electric preheating; stepless variable, controlled by outdoor temperature inlet in ventilation unit and additional temprature or pressure sensor in exhaust air	E4

Frost protection strategy	Explanation
N	None
E1	Electric preheating; 1 stage, controlled by outdoor temperature inlet in ventilation unit
E2	Electric preheating; 2 stage, controlled by outdoor temperature inlet in ventilation unit
E3	Electric preheating; stepless variable, controlled by outdoor temperature inlet in ventilation unit
E4	Electric preheating; stepless variable, controlled by outdoor temperature inlet in ventilation unit and additional temperature or pressure sensor in exhaust air
L1	Lowering supply air flow rate; ventilator shut off
L2	Lowering supply air flow rate; stepless variable, controlled by outdoor temperature inlet in ventilation unit
L3	Lowering supply air flow rate; stepless variable, controlled by outdoor temperature inlet in ventilation unit and additional temperature or pressure sensor in exhaust air
I1	Increasing exhaust air flow rate; ventilator shut off
I2	Increasing exhaust air flow rate; stepless variable, controlled by outdoor temperature inlet in ventilation unit
I3	Increasing exhaust air flow rate; stepless variable, controlled by outdoor temperature inlet in ventilation unit and additional temperature or pressure sensor in exhaust air
B1	Bypass for defrosting; Bypass full open
B2	Bypass for defrosting; stepless variable, controlled by outdoor temperature inlet in ventilation unit
B3	Bypass for defrosting; stepless variable, controlled by outdoor temperature inlet in ventilation unit and additional temperature or pressure sensor in exhaust air
Climate parameters according to Table 1 are used for calculating default values	
Other default values used for calculating Q_{defr} *:* PEF = 2.1, CTRL = 1, η_t = 0.75, q_{net} =1,	
Enthalpy heat exchangers have a Q_{defr} *of 0*	

Exponent x for non-linearity of motor and drive
on/off & single speed 2-speed 3-speed variable speed
variable speed

Exponent x for non-linearity of motor and drive
on/off & single speed

2-speed
3-speed
variable speed
variable speed

Defrosting mode setpoint θ_{idefr} in °C			
-2	-3	-4	-5
1814	1434	1142	905,5
430,5	303,5	216,5	134
0	0	0	0
5,15	5,14	5,29	5,32
2,94	2,61	2,48	2,49
0	0	0	0

; mode setpoint θ_{idefr} in °C		
-3	-4	-5
0,00	0,00	0,00
5,22	5,34	5,04
2,18	2,44	2,52
1,00	1,00	1,00
0,8	0,8	0,8
5,22	5,34	5,04
2,18	2,44	2,52
1,00	1,00	1,00
0,8	0,8	0,8
0,75	0,75	0,75
1,00	1,00	1,00
0,75	0,75	0,75

COLD CLIMATE
None
Electric preheating E
1 stage, contolled by outdoor temperature inlet in ventilation unit
2 stage, contolled by outdoor temperature inlet in ventilation unit
Stepless variable, contolled by outdoor temperature inlet in ventilation unit
Stepless variable, contolled by outdoor temperature inlet in ventilation unit and additional temprature or pressure sensor in exhaust air
External forst protection X
1 stage, contolled by outdoor temperature inlet in ventilation unit
2 stage, contolled by outdoor temperature inlet in ventilation unit
Stepless variable, contolled by outdoor temperature inlet in ventilation unit
Stepless variable, contolled by outdoor temperature inlet in ventilation unit and additional temprature or pressure sensor in exhaust air
External water based preheater, contolled by outdoor temperature inlet in ventilation unit. Stepless variable controlled pump
External brine air preheater, contolled by outdoor temperature inlet in ventilation unit. 1-stage pump
External brine air preheater, contolled by outdoor temperature inlet in ventilation unit. Stepless variable controlled pump

perature ratio η_t		
0,7	0,8	0,9
0,038	0,057	0,095
0,007	0,013	0,023
0,006	0,011	0,018
0,038	0,057	0,095
0,007	0,013	0,023
0,006	0,011	0,018
0,038	0,057	0,095
0,018	0,031	0,045
0,014	0,025	0,036

Description
Bypass for defrosting B
Bypass full open
Stepless variable, contolled by outdoor temperature inlet in ventilation unit
Stepless variable, contolled by outdoor temperature inlet in ventilation unit contolled by outdoor temperature inlet in ventilation unit and additional temprature or pressure sensor in exhaust air
Lowering supply air flow rate (or shut off) L
Ventilator shut off
Stepless variable, contolled by outdoor temperature inlet in ventilation unit
Stepless variable, contolled by outdoor temperature inlet in ventilation unit contolled by outdoor temperature inlet in ventilation unit and additional temprature or pressure sensor in exhaust air
Increasing exhaust air flow rate I
Ventilator shut off
Stepless variable, contolled by outdoor temperature inlet in ventilation unit
Stepless variable, contolled by outdoor temperature inlet in ventilation unit contolled by outdoor temperature inlet in ventilation unit and additional temprature or pressure sensor in exhaust air

ES-ONLY

Defrosting strategy
N : None
E1: Electric preheating; 1 stage, controlled by outdoor temperature inlet in ventilation unit
E2: Electric preheating; 2 stage, controlled by outdoor temperature inlet in ventilation unit
E3: Electric preheating; stepless variable, controlled by outdoor temperature inlet in ventilation unit
E4: Electric preheating; stepless variable, controlled by outdoor temperature inlet in ventilation unit and additional temprature or pressure sensor in exhaust air
L1: Lowering supply air flow rate; ventilator shut off
L2: Lowering supply air flow rate; stepless variable, controlled by outdoor temperature inlet in ventilation unit
L3: Lowering supply air flow rate; stepless variable, controlled by outdoor temperature inlet in ventilation unit and additional temprature or pressure sensor in exhaust air
I1: Increasing exhaust air flow rate; ventilator shut off
I2: Increasing exhaust air flow rate; stepless variable, controlled by outdoor temperature inlet in ventilation unit
I3: Increasing exhaust air flow rate; stepless variable, controlled by outdoor temperature inlet in ventilation unit and additional temprature or pressure sensor in exhaust air

	B1: Bypass for defrosting; Bypass full open
	B2: Bypass for defrosting; stepless variable, controlled by outdoor temperature inlet in ventilation unit
	B3: Bypass for defrosting; stepless variable, controlled by outdoor temperature inlet in ventilation unit and additional temperature or pressure sensor in exhaust air
	No freezing risk in warm climate until 0 °C
	No freezing risk in average climate until -15 °C
	No freezing risk in cold climate until -25 °C
	External frost protection; 1 stage, controlled by outdoor temperature inlet in ventilation unit
	External frost protection; 2 stage, controlled by outdoor temperature inlet in ventilation unit
	External frost protection; stepless variable, controlled by outdoor temperature inlet in ventilation unit
	External frost protection; stepless variable, controlled by outdoor temperature inlet in ventilation unit and additional temprature or pressure sensor in exhaust air
	External frost protection; external water based preheater, controlled by outdoor temperature inlet in ventilation unit. Stepless variable controlled pump
	External frost protection; external brine air preheater, controlled by outdoor temperature inlet in ventilation unit. 1-stage pump
	External frost protection; external brine air preheater, controlled by outdoor temperature inlet in ventilation unit. Stepless variable controlled pump
	External frost protection; external earth-to-air heat exchanger
ES	E4: Electric preheating; stepless variable, controlled by outdoor temperature inlet in ventilation unit and additional temprature or pressure sensor in exhaust air
HS	E4: Electric preheating; stepless variable, controlled by outdoor temperature inlet in ventilation unit and additional temprature or pressure sensor in exhaust air

Qdefr in kWh/m^2/a		
Cold[1)]	Average	Warm
40,4	4,95	0
40,4	4,95	0
22,57	2,17	0
8,64	1,1	0
7,16	0,96	0
n.a.	2,77	0
n.a.	0,63	0
n.a.	0,58	0
n.a.	2,77	0
n.a.	1,5	0
n.a.	1,26	0
n.a.	2,77	0
n.a.	0,63	0
n.a.	0,58	0

,97 m^3/h/m^2, setpoint = -3°C, x = 2

x-value
1
1,2
1,5
2
2

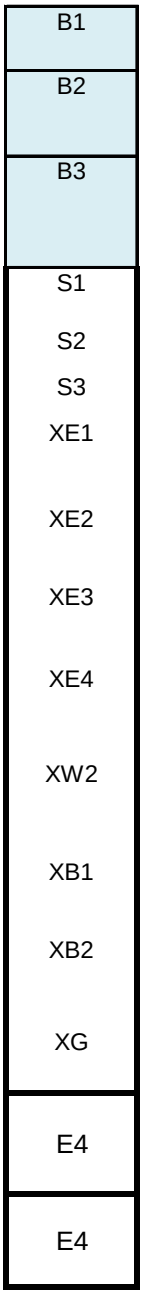
x-value
1

1,2
1,5
2
2

Symbol	Symbol	Defrosting mode setpoint θ_{idefr} in °C			
		-2	-3	-4	-5
N	$f_{ctrl,defr}$	0,00	0,00	0,00	0,00
E1	$f_{ctrl,defr}$	5,04	4,74	4,46	4,16
E2	$f_{ctrl,defr}$	2,69	2,64	2,46	2,37
E3	$f_{ctrl,defr}$	1,00	1,00	1,00	1,00
E4	$f_{ctrl,defr}$	0,8	0,8	0,8	0,8
XE1	$f_{ctrl,defr}$	5,04	4,74	4,46	4,16
XE2	$f_{ctrl,defr}$	2,69	2,64	2,46	2,37
XE3	$f_{ctrl,defr}$	1,00	1,00	1,00	1,00
XE4	$f_{ctrl,defr}$	0,8	0,8	0,8	0,8
XW2	$f_{ctrl,defr}$	0,75	0,75	0,75	0,75
XB1	$f_{ctrl,defr}$	1,00	1,00	1,00	1,00
XB2	$f_{ctrl,defr}$	0,75	0,75	0,75	0,75

Symbol	Symbol	Temperature ratio η_t			
		0,6	0,7	0,8	0,9
B1	$\Delta\eta_{t,by}$	NA	NA	NA	NA
B2	$\Delta\eta_{t,by}$	NA	NA	NA	NA
B3	$\Delta\eta_{t,by}$	NA	NA	NA	NA
L1	$\Delta\eta_{t,low}$	NA	NA	NA	NA
L2	$\Delta\eta_{t,low}$	NA	NA	NA	NA
L3	$\Delta\eta_{t,low}$	NA	NA	NA	NA
I1	$\Delta\eta_{t,dec}$	NA	NA	NA	NA
I2	$\Delta\eta_{t,dec}$	NA	NA	NA	NA
I3	$\Delta\eta_{t,dec}$	NA	NA	NA	NA

Cat.
N
E1
E2
E3
E4
L1
L2
L3
I1
I2
I3


B1
B2
B3
S1
S2
S3
XE1
XE2
XE3
XE4
XW2
XB1
XB2
XG
E4
E4

ES-ONLY

Defrosting strategy	Cat.
None	N
Electric preheating; 1 stage, controlled by outdoor temperature inlet in ventilation unit	E1
Electric preheating; 2 stage, controlled by outdoor temperature inlet in ventilation unit	E2
Electric preheating; stepless variable, controlled by outdoor temperature inlet in ventilation unit	E3
Electric preheating; stepless variable, controlled by outdoor temperature inlet in ventilation unit and additional temprature or pressure sensor in exhaust air	E4
Lowering supply air flow rate; ventilator shut off	L1
Lowering supply air flow rate; stepless variable, controlled by outdoor temperature inlet in ventilation unit	L2
Lowering supply air flow rate; stepless variable, controlled by outdoor temperature inlet in ventilation unit and additional temprature or pressure sensor in exhaust air	L3
Increasing exhaust air flow rate; ventilator shut off	I1
Increasing exhaust air flow rate; stepless variable, controlled by outdoor temperature inlet in ventilation unit	I2
Increasing exhaust air flow rate; stepless variable, controlled by outdoor temperature inlet in ventilation unit and additional temprature or pressure sensor in exhaust air	I3

Bypass for defrosting; Bypass full open	B1
Bypass for defrosting; stepless variable, controlled by outdoor temperature inlet in ventilation unit	B2
Bypass for defrosting; stepless variable, controlled by outdoor temperature inlet in ventilation unit and additional temperature or pressure sensor in exhaust air	B3
No freezing risk in warm climate until 0 °C	S1
No freezing risk in average climate until -15 °C	S2
No freezing risk in cold climate until -25 °C	S3
External frost protection; 1 stage, controlled by outdoor temperature inlet in ventilation unit	XE1
External frost protection; 2 stage, controlled by outdoor temperature inlet in ventilation unit	XE2
External frost protection; stepless variable, controlled by outdoor temperature inlet in ventilation unit	XE3
External frost protection; stepless variable, controlled by outdoor temperature inlet in ventilation unit and additional temprature or pressure sensor in exhaust air	XE4
External frost protection; external water based preheater, controlled by outdoor temperature inlet in ventilation unit. Stepless variable controlled pump	XW2
External frost protection; external brine air preheater, controlled by outdoor temperature inlet in ventilation unit. 1-stage pump	XB1
External frost protection; external brine air preheater, controlled by outdoor temperature inlet in ventilation unit. Stepless variable controlled pump	XB2
External frost protection; external earth-to-air heat exchanger	XG
E4	#N/A
#REF!	#REF!