

Down-flow unit Offer

Down-flow unit:

Brand: Stulz
Type: MRD 522 GE
Capacity: 40 kW (approx)
y.o.b. 2000
Pieces: 4
Sizes; 600x850x2000 mm (LxWxH)
Electromotor: 4 kW at 1400 RPM





Typenschild gemäß VBG 20 § 5
type plate / plaque d'appareil

CE

Lieferant
 manufacturer
 vendeur

STULZ GmbH Hamburg
 Holsteiner Chaussee 283, D-22457 Hamburg

Baujahr
 model
 modele

2000

Typ
 type
 type

MRD 522 GE

S.Nr.
 s.-No.
 no. serie

0530000459/01

Kältemittel
 refrigerant
 refrigerant

R 407c

Betriebsspannung
 supply voltage
 tension de service

380-415V/3/50Hz

Max. Betriebsdruck
 max. operation press.
 pression de fonction max.

25 bar

max. Füllgewicht
 max. filling charge
 chargé max.

6,40 kg

Kompressor / compressor / compresseur

Volumenstrom
 displacement
 volume balayé

20,90 m³/h

2900

U.p.m.
 tpm
 t/min

Kompressor-Enddruck
 compressor limiting pressure
 pression limite compresseur

27 bar

Made in Germany

AP ADDA ANTRIEBSTECHNIK GmbH **CE**
 63322 RÖDERMARK

VDE 0530 C41 2MT-4 N° 1176530

MOT.3~

IP 55 / IEC34-5 Hz 50-60 I.Cl. F S

M11398

kW	Δ V: λ	Δ A: λ	cos φ	1/min
4	220/380	15,6/9	0,84	1400
4	245/420	15/8,7	0,79	1420
4	220/380	15,6/9	0,86	1400
4,6	280/480	14,5/8,6		



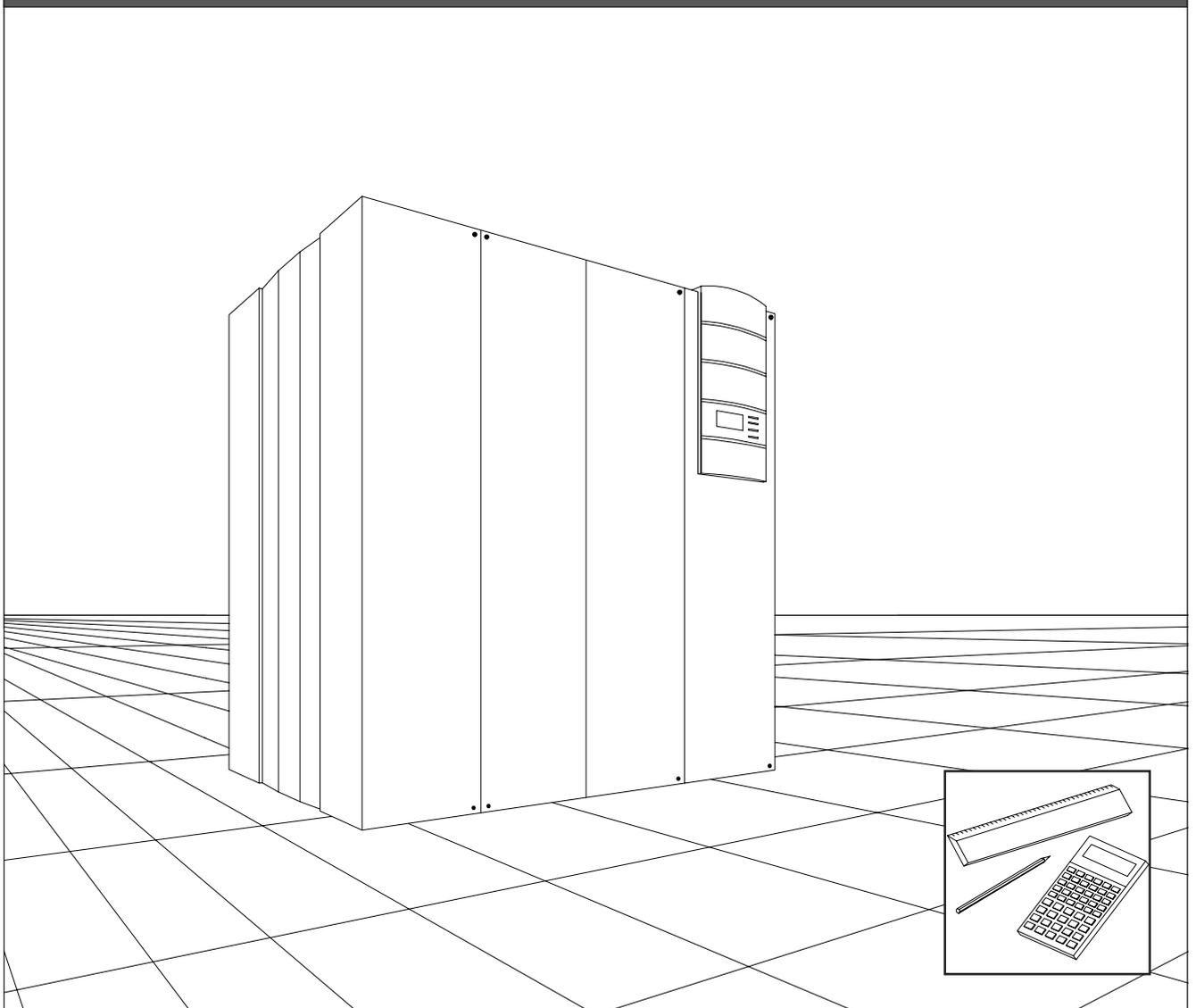
A/C UNITS
MODULAR -LINE DX
380-415/3/50

INDEX 10PL

Issue 10.00

AIR CONDITIONING

PRECISION A/C UNITS

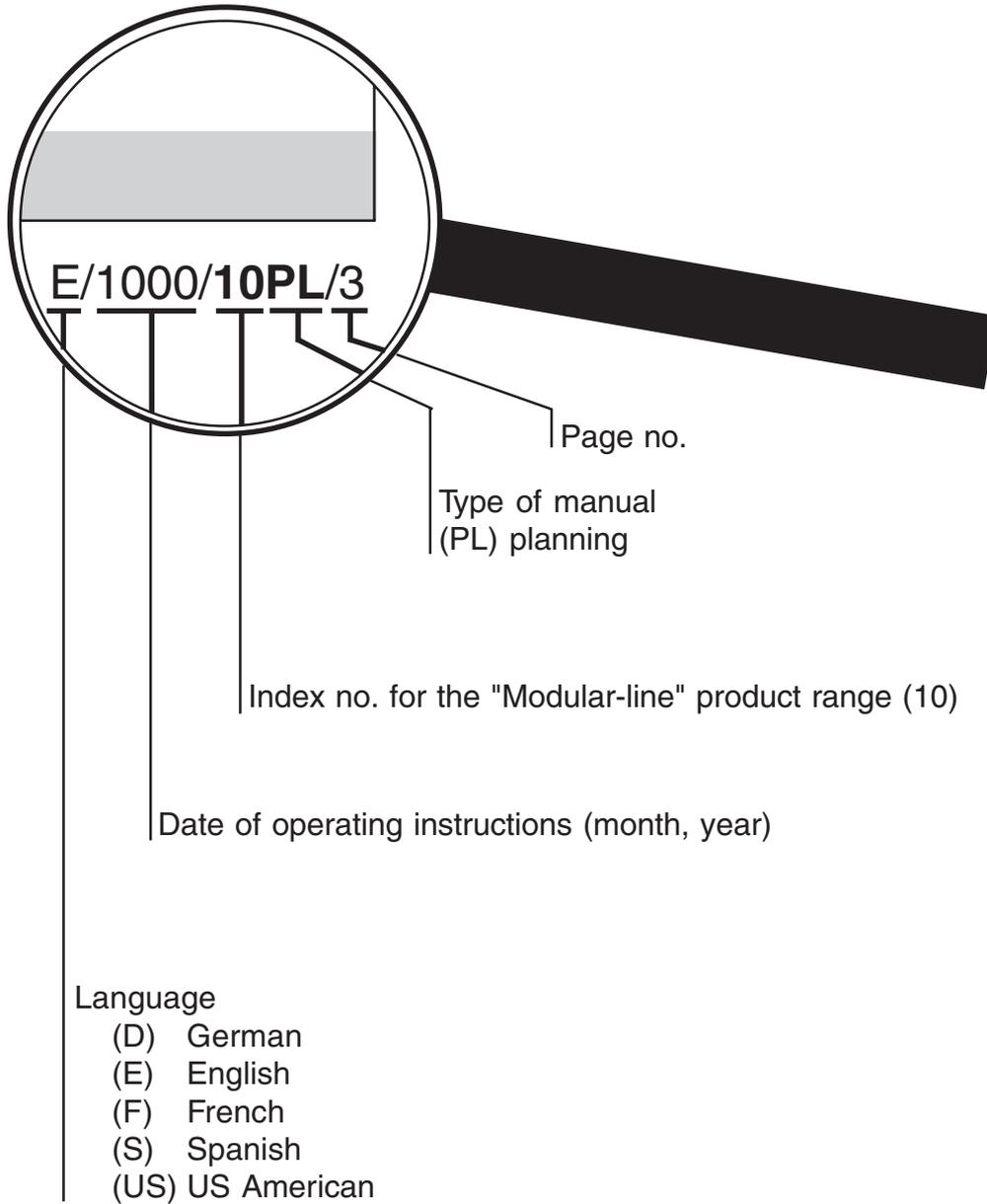


PLANNING MANUAL

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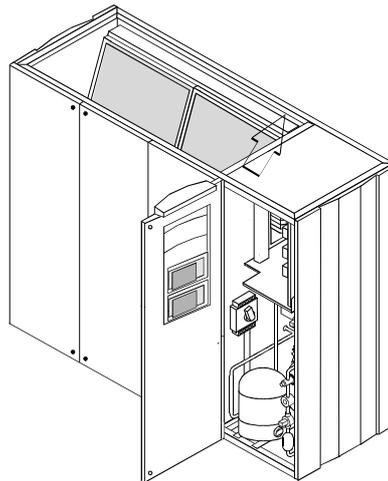
Page code

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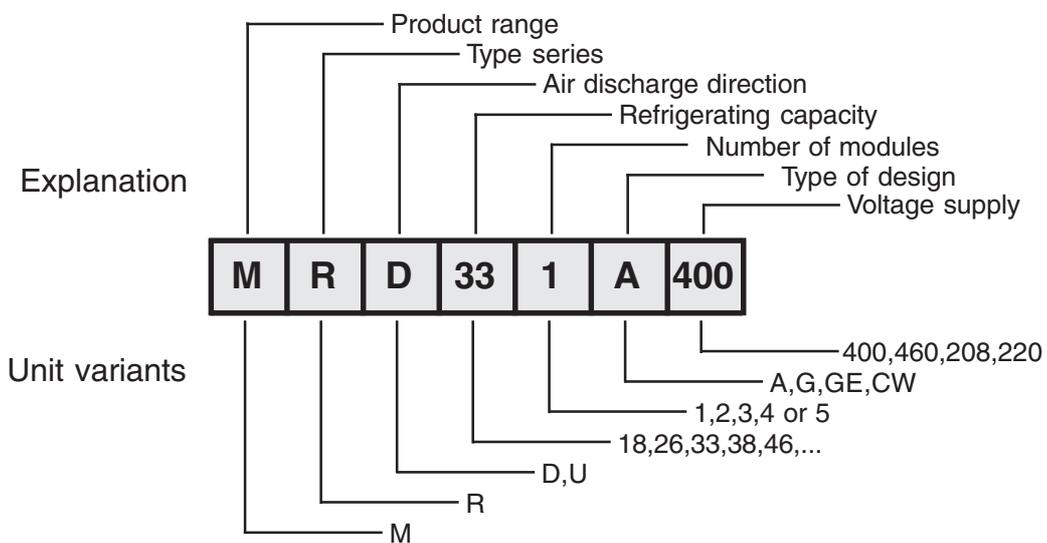


Model code

The model code shows the unit variant of your A/C unit and is located under the rating plate.



The rating plate is located above or below the master switch.



Unit design

The A/C units of the "Modular-Line" product range are designed to meet the particular requirements of customer specifications.

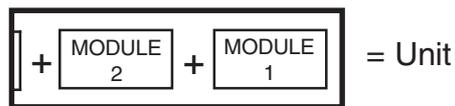
Each individual module or unit of the "Modular-Line" product range can be supplied in a number of variations. The particular attributes of your unit variation can be determined from the model code.

Unit variants

This chapter presents the possible unit variations of the "Modular-Line".

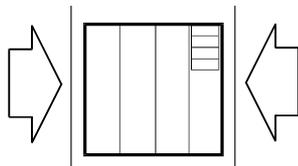
Product range:

Modular-Line (M)



Type series:

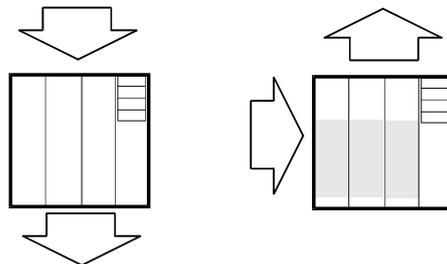
Standard (R)



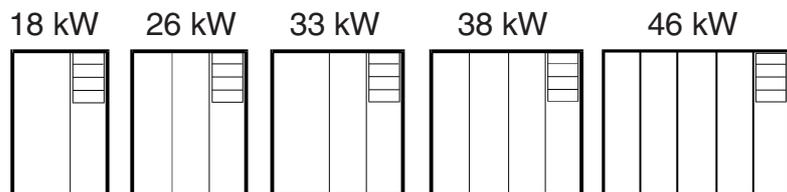
Discharge direction:

Downflow (D)

Upflow (U)

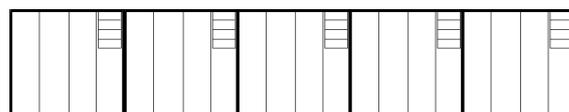


Cooling capacity per module:



The performance can be increased by assembling together several modules of the same cooling capacity.

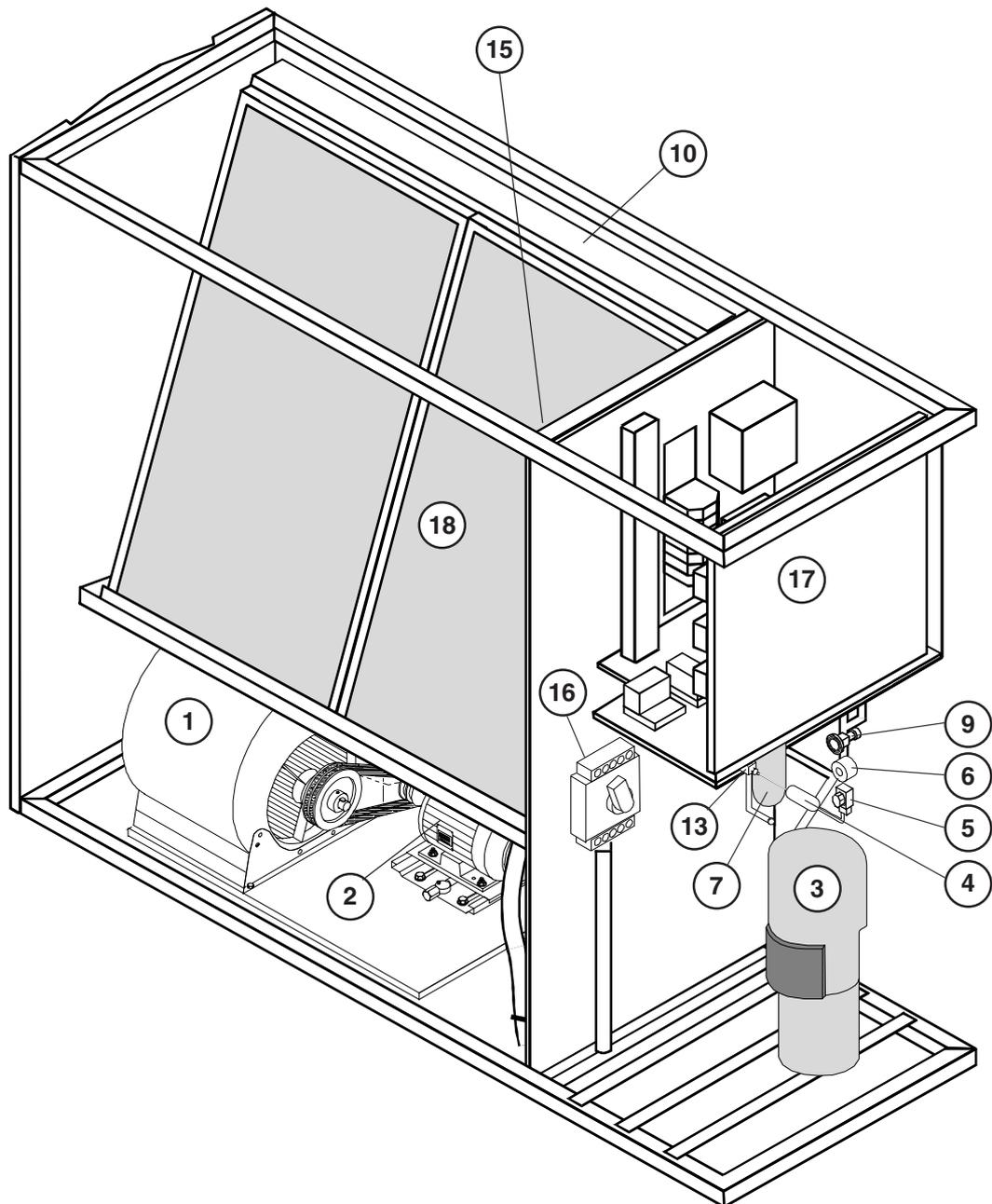
Number of modules:



Up to five modules can be joined together, the individual installation of the modules is also possible.

Design of A-unit

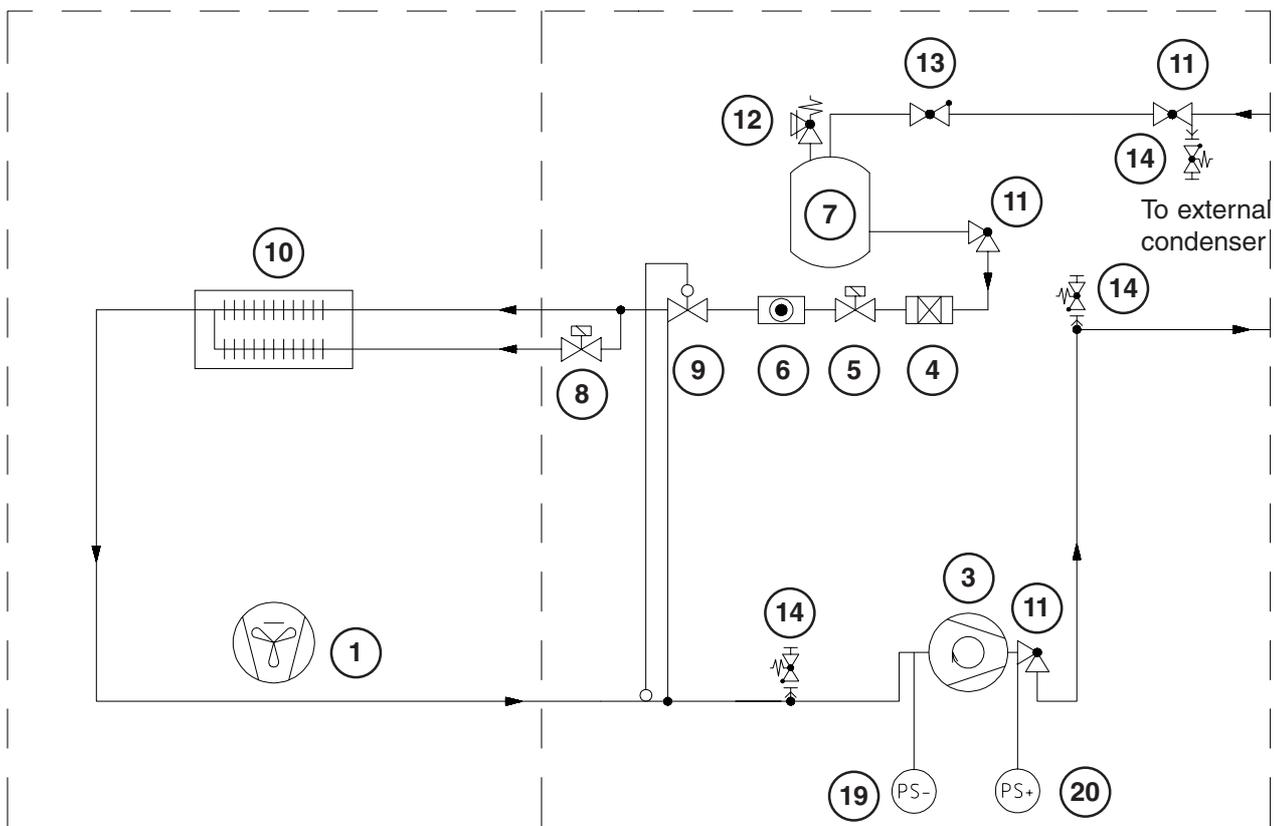
(using the example of MRD 381 A)



Refrigeration diagram - A-unit

Air section

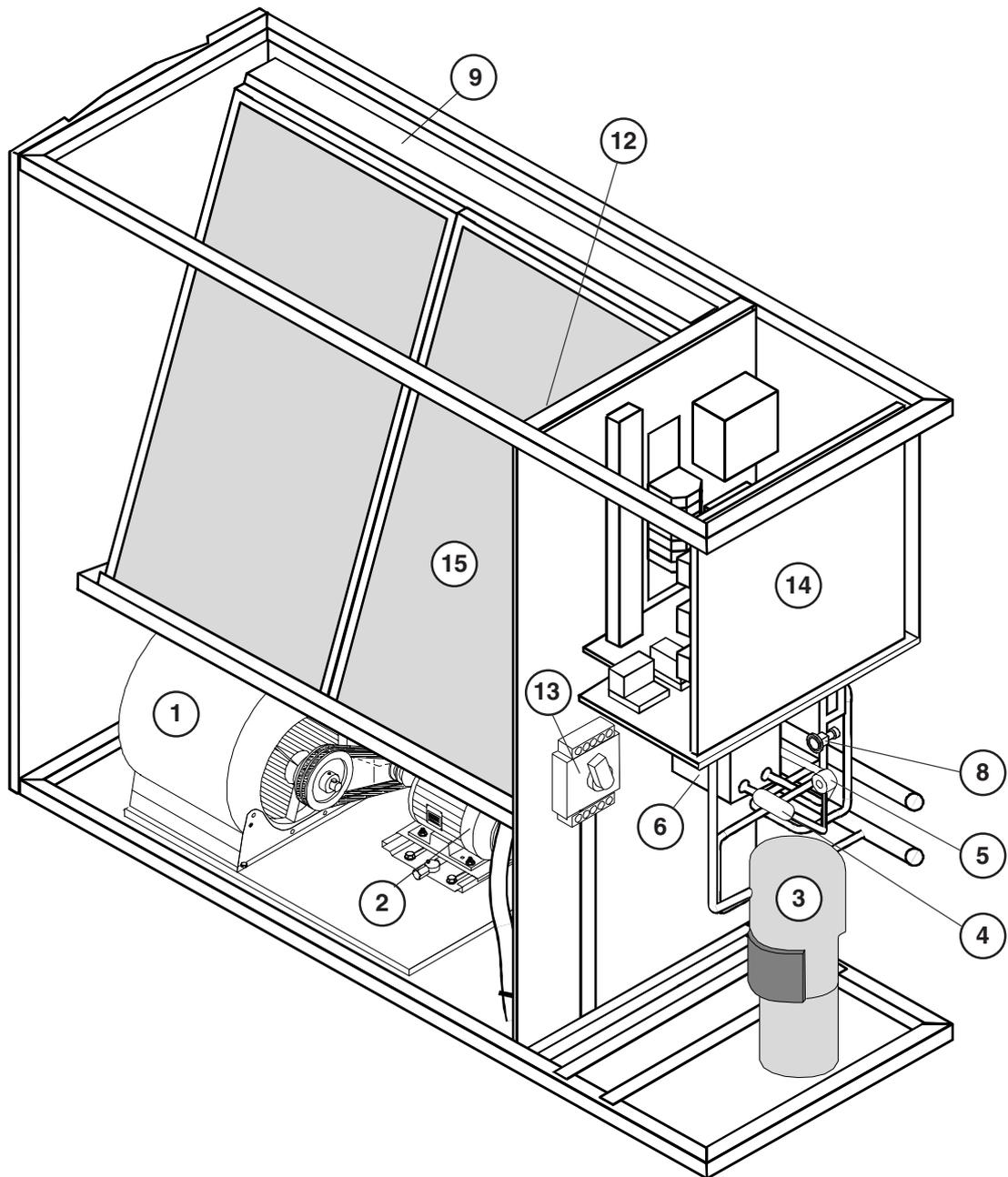
Low temperature section



- | | |
|--------------------------------------|------------------------------------|
| 1. Fan | 11. Shut-off valve |
| 2. Motor | 12. Safety valve |
| 3. Compressor | 13. Non-return valve (liquid line) |
| 4. Filter drier | 14. Schrader valve |
| 5. Solenoid valve in the liquid line | 15. Temp./humidity sensor |
| 6. Sight glass | 16. Master switch |
| 7. Collector | 17. Switch panel |
| 8. Dehumidifier valve | 18. Pre-filter |
| 9. Expansion valve | 19. Low-pressure pressostat |
| 10. Evaporator | 20. High-pressure pressostat |

Design of G unit

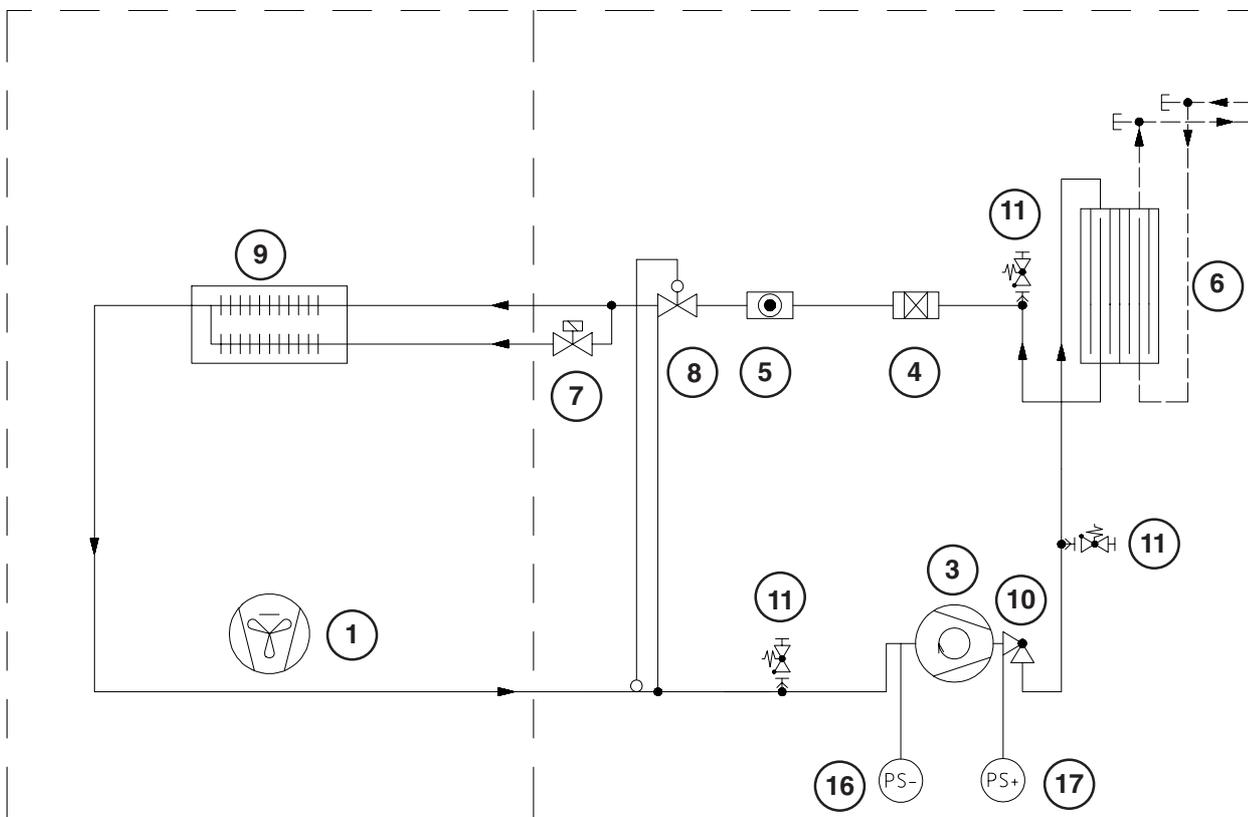
(using the example of MRD 381 G)



Refrigeration diagram G unit

Air section

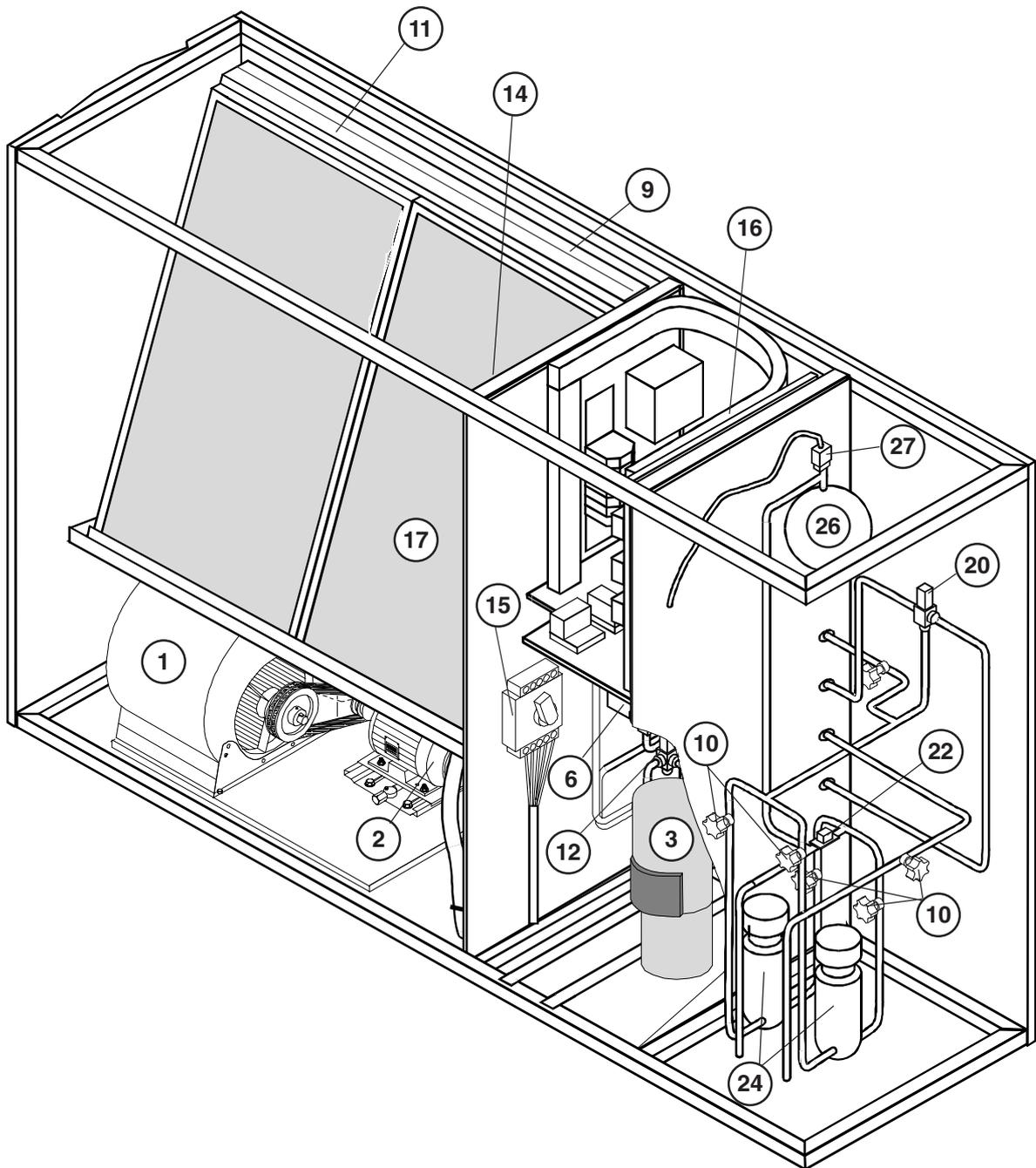
Low temperature section



- | | |
|-----------------------|------------------------------|
| 1. Fan | 11. Schrader valve |
| 2. Motor | 12. Temp./humidity sensor |
| 3. Compressor | 13. Master switch |
| 4. Filter drier | 14. Switch panel |
| 5. Sight glass | 15. Pre-filter |
| 6. Condenser | 16. Low-pressure pressostat |
| 7. Dehumidifier valve | 17. High-pressure pressostat |
| 8. Expansion valve | |
| 9. Evaporator | |
| 10. Shut-off valve | |

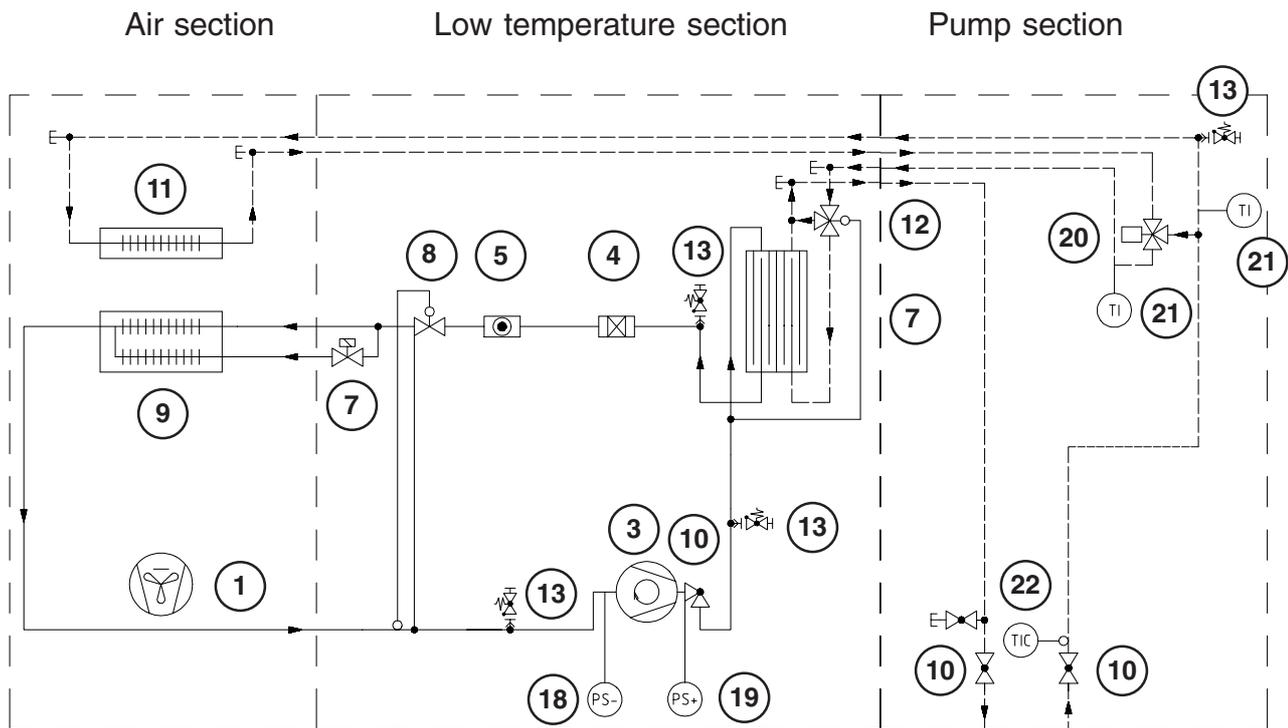
Design of GE unit (Version with two pumps)

(using the example of MRD 381 GE)



Refrigeration diagram GE unit

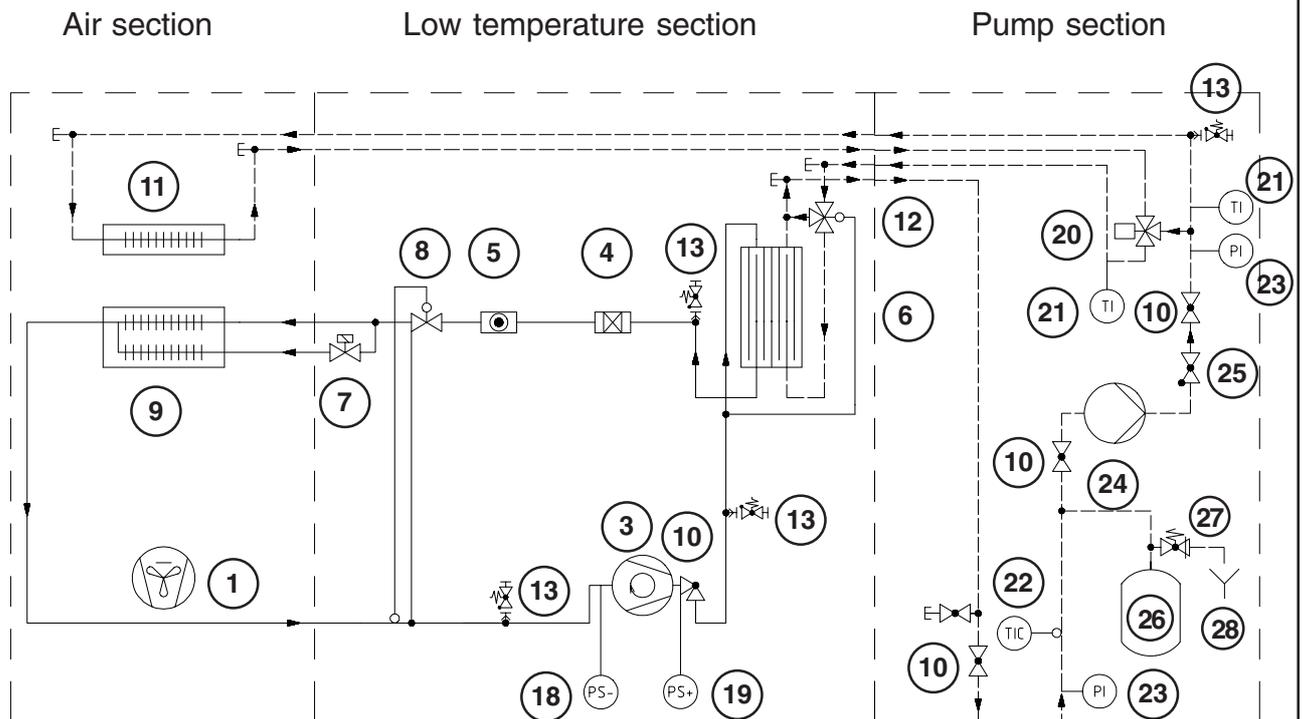
Version without pump



- | | | |
|-----------------------|------------------------------------|------------------------|
| 1. Fan | 11. Direct cooler | 21. Thermometer |
| 2. Motor | 12. 3-way cooling water controller | 22. Water temp. sensor |
| 3. Compressor | 13. Schrader valve | |
| 4. Filter drier | 14. Temp./humidity sensor | |
| 5. Sight glass | 15. Master switch | |
| 6. Condenser | 16. Switch panel | |
| 7. Dehumidifier valve | 17. Pre-filter | |
| 8. Expansion valve | 18. Low-pressure pressostat | |
| 9. Evaporator | 19. High-pressure pressostat | |
| 10. Shut-off valve | 20. 3-way GE valve | |

Refrigeration diagram GE unit

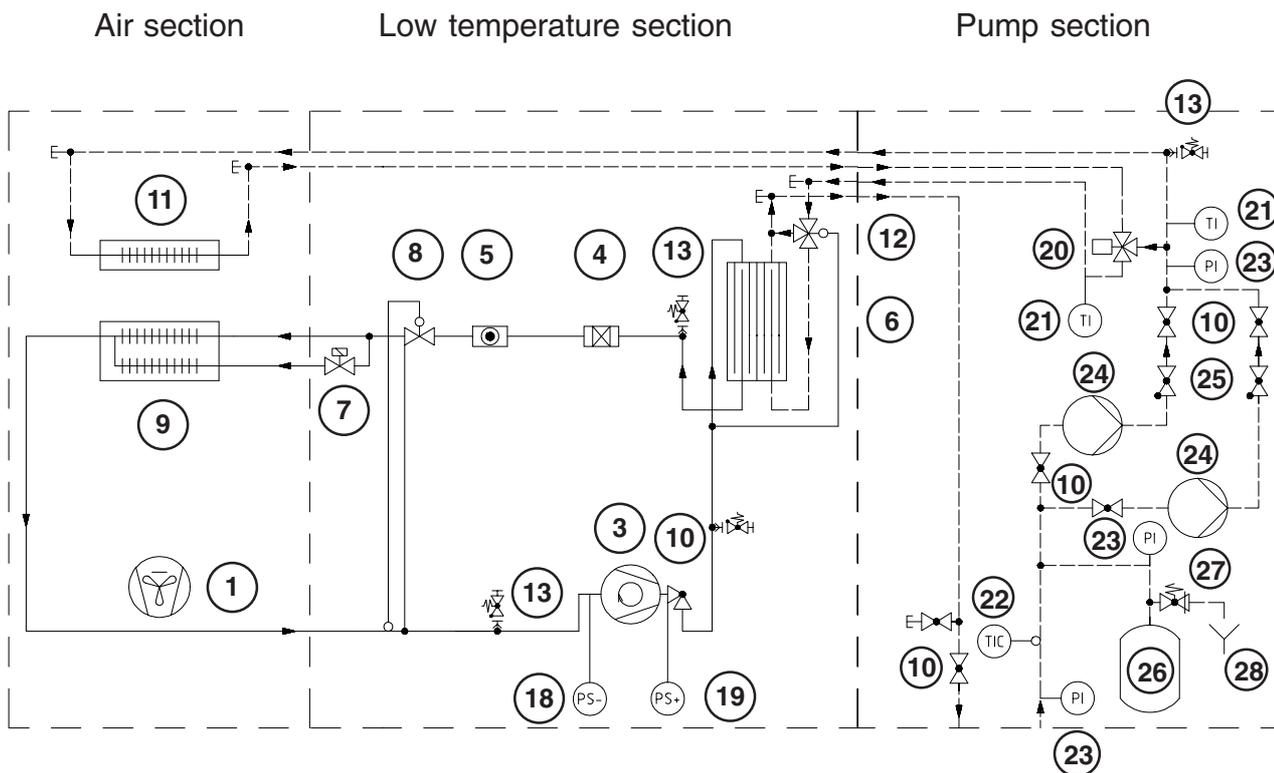
Version with one pump



- | | | |
|-----------------------|------------------------------------|------------------------|
| 1. Fan | 11. Direct cooler | 21. Thermometer |
| 2. Motor | 12. 3-way cooling water controller | 22. Water temp. sensor |
| 3. Compressor | 13. Schrader valve | 23. Pressure gauge |
| 4. Filter drier | 14. Temp./humidity sensor | 24. Pump |
| 5. Sight glass | 15. Master switch | 25. Non-return valve |
| 6. Condenser | 16. Switch panel | 26. Expansion vessel |
| 7. Dehumidifier valve | 17. Pre-filter | 27. Safety valve |
| 8. Expansion valve | 18. Low-pressure pressostat | 28. Tundish |
| 9. Evaporator | 19. High-pressure pressostat | |
| 10. Shut-off valve | 20. 3-way GE valve | |

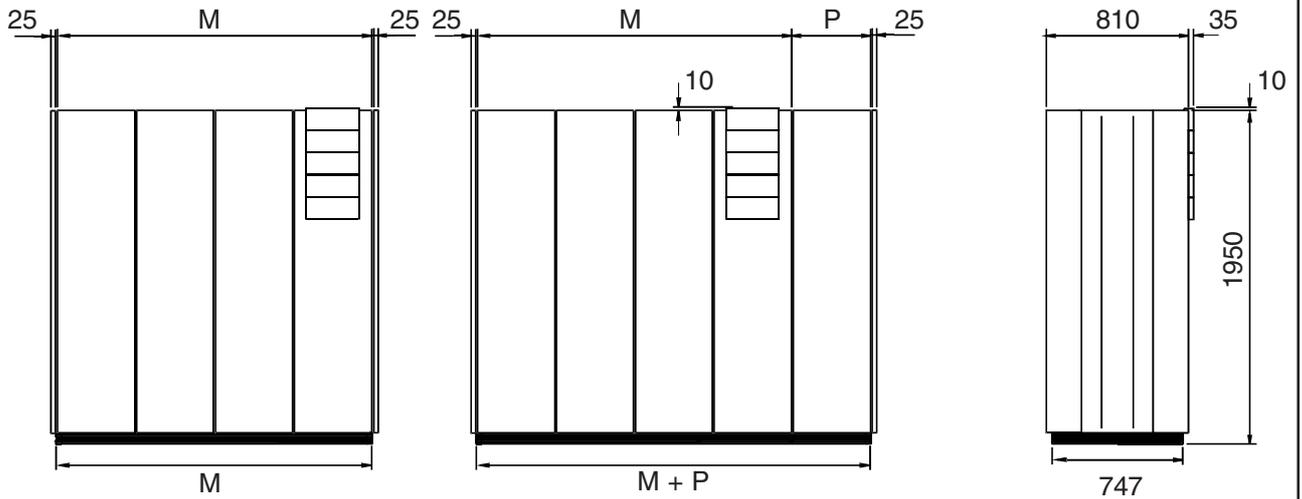
Refrigeration diagram - GE unit

Version with two pumps



- | | | |
|-----------------------|------------------------------------|------------------------|
| 1. Fan | 11. Direct cooler | 21. Thermometer |
| 2. Motor | 12. 3-way cooling water controller | 22. Water temp. sensor |
| 3. Compressor | 13. Schrader valve | 23. Pressure gauge |
| 4. Filter drier | 14. Temp./humidity sensor | 24. Pump |
| 5. Sight glass | 15. Master switch | 25. Non-return valve |
| 6. Condenser | 16. Switch panel | 26. Expansion vessel |
| 7. Dehumidifier valve | 17. Pre-filter | 27. Safety valve |
| 8. Expansion valve | 18. Low-pressure pressostat | 28. Tundish |
| 9. Evaporator | 19. High-pressure pressostat | |
| 10. Shut-off valve | 20. 3-way GE valve | |

Dimensions



Unit size for A, G, GE units

		Module width M
Standard down/upflow	181	1130
	261	1350
	331	1580
	381	1800
	461	2250

Pump section

without or with one pump
with two pumps

Width P

450
680

Example: Three-module, standard, downflow, GE A/C unit comprising 26 kW modules with two pumps in the pump section.

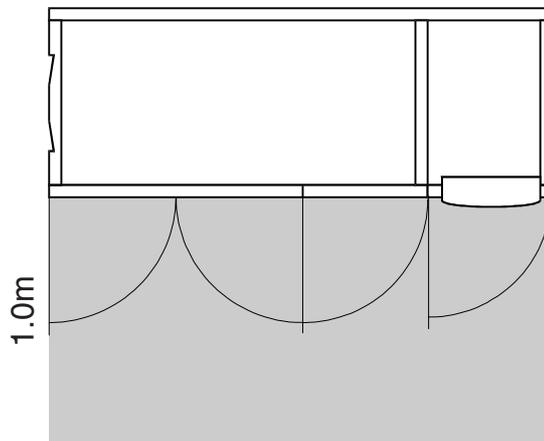
Model designation in accordance with model code: **MRD 783 GE**

Dimensions	3 x module width "M"	= 3 x 1350 =	4050mm
	2 x panel thickness	= 2 x 25 =	50mm
	1 x pump section "P"	= 1 x 680 =	680mm
	Overall length of A/C unit		4780mm

*For dimensions without panels, refer to "duct connections" on page 69

Clearance for maintenance

After completing the installation of the units all assembly and maintenance work may be carried out from the front of the A/C unit. The recommended clearance for maintenance is 1 metre at the front of the unit only for all unit types and variations (see sketch).



Design parameters

air-cooled condenser

Condensing temperature: 48°C
 Air inlet temperature: 32°C

Low pressure hot water reheating:

Water inlet temperature: 60°C
 Water outlet temperature: 40°C
 Temperature at inlet: 12°C

GE register:

(when operating with 30% glycol)
 Coolant inlet temp.: 7°C
 Coolant outlet temp.: 12°C

internal condenser

(when operating with 30% glycol)
 Condensing temperature: 48°C
 Temp. coolant inlet: 39°C
 Temp. coolant outlet: 45°C

(when operating with town water)
 Condensing temperature: 40°C
 Coolant inlet temp.: 15°C
 Coolant outlet temp.: 21°C

Standard		MRD/U 181	MRD/U 261	MRD/U 331	MRD/U 381	MRD/U 461
		A, G, GE				
Evaporator						
Velocity of airflow	[m/s]	2.50	2.68	2.68	2.78	2.54
Low pressure hot water reheater coil						
Water quantity	[kg/s]	0.13	0.2	0.25	0.33	0.37
Pressure loss on the air side	[Pa]	9	11	11	12	8
Pressure loss on water side	[kPa]	7.5	8.5	14	15	14

Technical data, standard, single-module

	MRU/D 181 A, G / GE	MRU/D 261 A, G / GE	MRU/D 331 A, G / GE	MRU/D 381 A, G / GE	MRU/D 461 A, G / GE	
Evaporator refrigerating capacity (total/sensible)						
With return air at 22°C/50% r.H.	kW	15.3/15.3	23.8/23.8	29.6/26.5	36.8/34.1	44.1/39.2
With return air at 24°C/50% r.H.	kW	16.2/15.2	25.3/23.5	31.1/27.1	39.2/35.1	46.7/40.5
Direct cooler refrigerating capacity (total/sensible)						
With return air at 22°C/50% r.H.	kW	15.6/15.6	23.9/23.9	27.0/27.0	32.8/32.8	44.1/44.1
With return air at 24°C/50% r.H.	kW	18.1/16.1	28.7/25.2	33.0/28.3	39.5/36.1	53.2/48.3
Fan (standard)						
Type of drive		Belt	Belt	Belt	Belt	Belt
Number of fans		1	1	1	1	1
Volume flow	m³/h	5000	7500	9000	12000	14000
External pressure	Pa	70	70	70	70	70
Motor nominal output (A, G / GE)	kW	2.2	3.0 / 4.0	2.2 / 3.0	4.0 / 5.5	4.0
Refrigerant circuit						
Refrigerant quantity R407c (only basic quantity A)	kg	4.0	4.0	4.0	4.0	4.0
Refrigerant quantity R407c (G and GE only)	kg	2.4	2.4	2.4	2.4	2.4
Type of compressor		Scroll	Scroll	Scroll	Scroll	Scroll
Compressor speed	rpm	2900	2900	2900	2900	2900
Motor nominal output	kW	3.7	5.5	7.4	9.6	12.0
Condenser output	kW	20.3	31.2	39.5	49.3	57.5
Coolant circuit, condenser (G and GE)						
Water 70%/glycol 30%						
Coolant mass flow	kg/s	0.65	1.20	1.45	1.91	2.52
Coolant filling quantity	dm³	3.8	4.6	6.2	7.1	8.0
Pressure loss, condenser + pipework	kPa	9	27	28	24	34
Pressure loss, 3-W cooling water controller	kPa	25	84	26	30	32
3-way cooling water controller**	DN	3/4"	3/4"	1 1/4"	1 1/2"	1 1/2"
Direct free-cooling coil (GE only)						
Water 70%/glycol 30%						
Coolant mass flow	kg/s	0.65	1.20	1.45	1.91	2.52
Coolant filling quantity	dm³	7.4	9.4	11.1	12.6	14.3
Pressure loss, free-cooling coil	kPa	34	22	35	37	19
Pressure loss, free-cooling coil piping	kPa	5	15	8	10	9
Pressure loss, GE 3-way control valve	kPa	14	19	27	18	14
GE 3-way control valve	DN	3/4"	1"	1"	1 1/4"	1 1/2"
General unit data						
Length of unit	mm	1180	1400	1630	1850	2300
Length of pump cabinets for GE	mm	450/680	450/680	450/680	450/680	450/680
Depth	mm	810	810	810	810	810
Weight A, G / GE (only 3 way valve)	kg	340/420	380/460	410/480	430/520	450/540

* Electrical power consumption of the fan is to include the room load

** 2/3-way cooling water control valve as option for G

Technical Data, standard, single-module, options

		MRU/D 181 A, G / GE	MRU/D 261 A, G / GE	MRU/D 331 A, G / GE	MRU/D 381 A, G / GE	MRU/D 461 A, G / GE
Electrical heating						
Possible number of heating stages		2	2	2	2	2
Heat output in stage 1	kW	6	6/12	6/12	6/12	6/12
Heat output in stage 2	kW	6	6/12	6/12	6/12	6/12
Low pressure hot water reheat heating						
Heat output 80%	kW	8	15	18	24	31
Refrigerant heating						
Hot gas reheat capacity 40%	kW	4	8	13	18	25
Humidifying with steam humidifier						
Humidifier output	kg/h	3-5	8-13	8-13	8-13	8-13
max. el. power consumption	kW	3.6	9.5	9.5	9.5	9.5
Humidifying with ultrasonic humidifier						
Humidifier output	kg/h	2.4	3.6	4.8	4.8	4.8
El. power consumption	kW	0.12	0.18	0.24	0.24	0.24
Return air filter						
Filter media in metal frame EU4		x	x	x	x	x
Pleated filter in cardboard frame EU4		standard	standard	standard	standard	standard
Pleated filter in cardboard frame EU5		x	x	x	x	x
(Option G) 2-way HP control valve	DN	1/2"	1/2"	1/2"	1/2"	1/2"
(Option G) 3-way HP control valve	DN	3/4"	3/4"	1 1/4"	1 1/4"	1 1/2"
Air-cooled condenser						
Sound level at 5m distance (free field)	60 dB (A)	KSV021X151A	KSV036X251A	KSV044X251A	KSV055X251A	KSV055X251A
Sound level at 5m distance (free field)	50 dB (A)	KSV021X251B	KSV036X251B	KSV044X351B	KSV055X351B	KSV055X351B
Sound level at 5m distance (free field)	40 dB (A)	KSV021X251C	KSV036X351C	KSV044X351C	KSV055X351C	KSV055X351C
Quantity		1	1	1	1	1

Technical data, standard, dual-module

		MRU/D 362	MRU/D 522	MRU/D 662	MRU/D 762	MRU/D 922
		A, G / GE				
Evaporator refrigerating capacity (total/sensible)						
With return air at 22°C/50% r.H.	kW	30.6/30.6	47.6/47.6	59.2/53.0	73.6/68.2	88.2/78.4
With return air at 24°C/50% r.H.	kW	32.4/30.4	50.6/47.0	62.2/54.2	78.4/70.2	93.4/81.0
Direct cooler refrigerating capacity (total/sensible)						
With return air at 22°C/50% r.H.	kW	31.2/31.2	47.8/47.8	54.0/54.0	65.6/65.6	88.2/88.2
With return air at 24°C/50% r.H.	kW	36.2/32.2	57.4/50.4	66.0/56.6	79.0/72.2	106.4/96.6
Fan (standard)						
Type of drive		Belt	Belt	Belt	Belt	Belt
Number of fans		2	2	2	2	2
Volume flow	m³/h	10000	15000	18000	24000	28000
External pressure	Pa	70	70	70	70	70
Motor nominal output (A, G / GE)	kW	4.4	6.0/8.0	4.4/6.0	8.0/11.0	4.0
Refrigerant circuit						
Refrigerant quantity R407c (only basic quantity A)	kg	8.0	8.0	8.0	8.0	8.0
Refrigerant quantity R407c (G and GE only)	kg	4.8	4.8	4.8	4.8	4.8
Type of compressor		Scroll	Scroll	Scroll	Scroll	Scroll
Compressor speed	rpm	2900	2900	2900	2900	2900
Motor nominal output	kW	7.4	11.0	14.8	19.2	24.0
Condenser output	kW	40.6	62.4	79.0	98.6	115.0
Coolant circuit, condenser (G and GE)						
Water 70%/glycol 30%						
Coolant mass flow	kg/s	1.30	2.40	2.90	3.82	5.04
Coolant filling quantity	dm³	6.0	7.6	13.7	16.1	18.6
Pressure loss, condenser + pipework	kPa	9	27	28	31	34
Pressure loss, 3-W cooling water controller	kPa	25	84	26	45	32
3-way cooling water controller**	DN	3/4"	3/4"	1 1/4"	1 1/4"	1 1/2"
Direct free-cooling coil (GE only)						
Water 70%/glycol 30%						
Coolant mass flow	kg/s	1.30	2.40	2.90	3.82	5.04
Coolant filling quantity	dm³	9.6	12.5	18.9	22.0	25.5
Pressure loss, free-cooling coil	kPa	34	22	35	37	19
Pressure loss, free-cooling coil piping	kPa	6	15	9	13	9
Pressure loss, GE 3-way control valve	kPa	22	29	42	30	22
GE 3-way control valve	DN	1"	1 1/4"	1 1/4"	1 1/2"	1 1/2"
General unit data						
Length of unit	mm	2310	2750	3210	3650	4550
Length of pump cabinets for GE	mm	450/680	450/680	450/680	450/680	450/680
Depth	mm	810	810	810	810	810
Weight A, G / GE (only 3 way valve)	kg	680/820	760/920	820/1000	860/1060	900/1120

* Electrical power consumption of the fan is to include the room load

** 2/3-way cooling water control valve as option for G

Technical data, standard, dual-module, options

		MRU/D 362 A, G / GE	MRU/D 522 A, G / GE	MRU/D 662 A, G / GE	MRU/D 762 A, G / GE	MRU/D 922 A, G / GE
Electrical heating						
Possible number of heating stages		4	4	4	4	4
Heat output in stage 1 / module	kW	6	6/12	6/12	6/12	6/12
Heat output in stage 2 / module	kW	6	6/12	6/12	6/12	6/12
Low pressure hot water reheat heating						
Heat output 80%	kW	16	30	36	48	62
Refrigerant heating						
Hot gas reheat capacity 40%	kW	8	16	26	36	50
Humidifying with steam humidifier						
Humidifier output	kg/h	3-10	8-26	8-26	8-26	8-26
max. el. power consumption	kW	7.2	19.0	19.0	19.0	19.0
Humidifying with ultrasonic humidifier						
Humidifier output	kg/h	4.8	7.2	9.6	9.6	9.6
El. power consumption	kW	0.24	0.36	0.48	0.48	0.48
Return air filter						
Filter media in metal frame EU4		x	x	x	x	x
Pleated filter in cardboard frame EU4		standard	standard	standard	standard	standard
Pleated filter in cardboard frame EU5		x	x	x	x	x
(Option G) 2-way HP control valve	DN	1/2"	1/2"	1/2"	1/2"	1/2"
(Option G) 3-way HP control valve	DN	3/4"	3/4"	1 1/4"	1 1/4"	1 1/2"
Air-cooled condenser						
Sound level at 5m distance (free field)	60 dB (A)	KSV021X151A	KSV036X251A	KSV044X251A	KSV055X251A	KSV055X251A
Sound level at 5m distance (free field)	50 dB (A)	KSV021X251B	KSV036X251B	KSV044X351B	KSV055X351B	KSV055X351B
Sound level at 5m distance (free field)	40 dB (A)	KSV021X251C	KSV036X351C	KSV044X351C	KSV055X351C	KSV055X351C
Quantity		2	2	2	2	2

Technical data, standard, triple-module

		MRU/D 543	MRU/D 783	MRU/D 993	MRU/D 1143	MRU/D 1383
		A, G / GE	A, G / GE			
Evaporator refrigerating capacity (total/sensible)						
With return air at 22°C/50% r.H.	kW	45.9/45.9	71.4/71.4	88.8/79.5	110.4/102.3	132.3/117.6
With return air at 24°C/50% r.H.	kW	48.6/45.6	75.9/70.5	93.3/81.3	117.6/105.3	140.1/121.5
Direct cooler refrigerating capacity (total/sensible)						
With return air at 22°C/50% r.H.	kW	46.8/46.8	71.7/71.7	81.0/81.0	98.4/98.4	132.3/132.3
With return air at 24°C/50% r.H.	kW	54.3/48.3	86.1/75.6	99.0/84.9	118.5/108.3	159.6/144.9
Fan (standard)						
Type of drive		Belt	Belt	Belt	Belt	Belt
Number of fans		3	3	3	3	3
Volume flow	m³/h	15000	22500	27000	36000	42000
External pressure	Pa	70	70	70	70	70
Motor nominal output (A, G / GE)	kW	6.6	9.0/12.0	6.6/9.0	12.0/16.5	12.0
Refrigerant circuit						
Refrigerant quantity R407c (only basic quantity A)	kg	12.0	12.0	12.0	12.0	12.0
Refrigerant quantity R407c (G and GE only)	kg	7.2	7.2	7.2	7.2	7.2
Type of compressor		Scroll	Scroll	Scroll	Scroll	Scroll
Compressor speed	rpm	2900	2900	2900	2900	2900
Motor nominal output	kW	11.1	16.5	22.2	28.8	36.0
Condenser output	kW	60.9	93.6	118.5	147.9	172.5
Coolant circuit, condenser (G and GE)						
Water 70%/glycol 30%						
Coolant mass flow	kg/s	1.95	3.60	4.35	5.73	7.56
Coolant filling quantity	dm³	10.0	15.6	18.7	17.8	19.8
Pressure loss, condenser + pipework	kPa	9	27	28	31	34
Pressure loss, 3-W cooling water controller	kPa	25	84	26	45	32
3-way cooling water controller**	DN	3/4"	3/4"	1 1/4"	1 1/4"	1 1/2"
Direct free-cooling coil (GE only)						
Water 70%/glycol 30%						
Coolant mass flow	kg/s	1.95	3.60	4.35	5.73	7.56
Coolant filling quantity	dm³	11.8	19.2	24.1	27.1	30.4
Pressure loss, free-cooling coil	kPa	34	22	35	37	19
Pressure loss, free-cooling coil piping	kPa	7	15	10	16	9
Pressure loss, GE 3-way control valve	kPa	48	64	39	66	49
GE 3-way control valve	DN	1"	1 1/4"	1 1/2"	1 1/2"	2"
General unit data						
Length of unit	mm	3440	4100	4790	5450	6800
Length of pump cabinets for GE	mm	450/680	450/680	450/680	450/680	450/680
Depth	mm	810	810	810	810	810
Weight A, G / GE (only 3 way valve)	kg	1020/1220	1140/1370	1230/1490	1290/1580	1350/1670

* Electrical power consumption of the fan is to include the room load

** 2/3-way cooling water control valve as option for G

Technical data, standard, triple-module, options

		MRU/D 543 A, G / GE	MRU/D 783 A, G / GE	MRU/D 993 A, G / GE	MRU/D 1143 A, G / GE	MRU/D 1383 A, G / GE
Electrical heating						
Possible number of heating stages		6	6	6	6	6
Heat output in stage 1 / module	kW	6	6/12	6/12	6/12	6/12
Heat output in stage 2 / module	kW	6	6/12	6/12	6/12	6/12
Low pressure hot water reheat heating						
Heat output 80%	kW	24	45	54	72	93
Refrigerant heating						
Hot gas reheat capacity 40%	kW	12	24	39	54	75
Humidifying with steam humidifier						
Humidifier output	kg/h	3-15	8-39	8-39	8-39	8-39
max el. power consumption	kW	10.8	28.5	28.5	28.5	28.5
Humidifying with ultrasonic humidifier						
Humidifier output	kg/h	7.2	10.8	14.4	14.4	14.4
El. power consumption	kW	0.36	0.54	0.72	0.72	0.72
Return air filter						
Filter media in metal frame EU4		x	x	x	x	x
Pleated filter in cardboard frame EU4		standard	standard	standard	standard	standard
Pleated filter in cardboard frame EU5		x	x	x	x	x
(Option G) 2-way HP control valve	DN	1/2"	1/2"	1/2"	1/2"	1/2"
(Option G) 3-way HP control valve	DN	3/4"	3/4"	1 1/4"	1 1/4"	1 1/2"
Air-cooled condenser						
Sound level at 5m distance (free field)		60 dB (A)	KSV021X151A	KSV036X251A	KSV044X251A	KSV055X251A
Sound level at 5m distance (free field)		50 dB (A)	KSV021X251B	KSV036X251B	KSV044X351B	KSV055X351B
Sound level at 5m distance (free field)		40 dB (A)	KSV021X251C	KSV036X351C	KSV044X351C	KSV055X351C
Quantity		3	3	3	3	3

Technical data, standard, 4-module

	MRU/D 724 A, G / GE	MRU/D 1044 A, G / GE	MRU/D 1324 A, G / GE	MRU/D 1524 A, G / GE	MRU/D 1844 A, G / GE	
Evaporator refrigerating capacity (total/sensible)						
With return air at 22°C/50% r.H.	kW	61.2/61.2	95.2/95.2	118.4/106.0	147.2/136.4	176.4/156.8
With return air at 24°C/50% r.H.	kW	64.8/60.8	101.2/94.0	124.4/108.4	156.8/140.4	186.8/162.0
Direct cooler refrigerating capacity (total/sensible)						
With return air at 22°C/50% r.H.	kW	62.4/62.4	95.6/95.6	108.0/108.0	131.2/131.2	176.4/176.4
With return air at 24°C/50% r.H.	kW	72.4/64.4	114.8/100.8	132.0/113.2	158.0/144.4	212.8/193.2
Fan (standard)						
Type of drive		Belt	Belt	Belt	Belt	Belt
Number of fans		4	4	4	4	4
Volume flow	m³/h	20000	30000	36000	48000	56000
External pressure	Pa	70	70	70	70	70
Motor nominal output (A, G / GE)	kW	8.8	12.0/16.0	8.8/12.0	16.0/22.0	16.0
Refrigerant circuit						
Refrigerant quantity R407c (only basic quantity A)	kg	16.0	16.0	16.0	16.0	16.0
Refrigerant quantity R407c (G and GE only)	kg	9.6	9.6	9.6	9.6	9.6
Type of compressor		Scroll	Scroll	Scroll	Scroll	Scroll
Compressor speed	rpm	2900	2900	2900	2900	2900
Motor nominal output	kW	14.8	22.0	29.6	38.4	48.0
Condenser output	kW	81.2	124.8	158.0	197.2	230.0
Coolant circuit, condenser (G and GE)						
Water 70%/glycol 30%						
Coolant mass flow	kg/s	2.6	4.8	5.8	7.64	10.08
Coolant filling quantity	dm³	14.1	23.6	23.7	26.5	29.6
Pressure loss, condenser coolant + pipework	kPa	9	27	28	31	34
Pressure loss, 3-W cooling water controller	kPa	25	84	26	45	32
3-way cooling water controller**	DN	3/4"	3/4"	1 1/4"	1 1/4"	1 1/2"
Direct free-cooling coil (GE only)						
Water 70%/glycol 30%						
Coolant mass flow	kg/s	2.6	4.8	5.8	7.64	10.08
Coolant filling quantity	dm³	13.0	25.9	29.3	32.2	35.4
Pressure loss, free-cooling coil	kPa	34	22	35	37	19
Pressure loss, free-cooling coil piping	kPa	7	16	11	16	9
Pressure loss, GE 3-way control valve	kPa	34	47	68	57	87
GE 3-way control valve	DN	1 1/4"	1 1/2"	1 1/2"	2"	2"
General unit data						
Length of unit	mm	4570	5450	6370	7250	9050
Length of pump cabinets for GE	mm	450/680	450/680	450/680	450/680	450/680
Depth	mm	810	810	810	810	810
Weight A, G / GE (only 3 way valve)	kg	1360/1620	1520/1820	1640/1980	1720/2100	1800/2220

* Electrical power consumption of the fan is to include the room load

** 2/3-way cooling water control valve as option for G

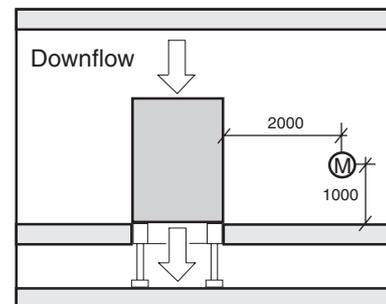
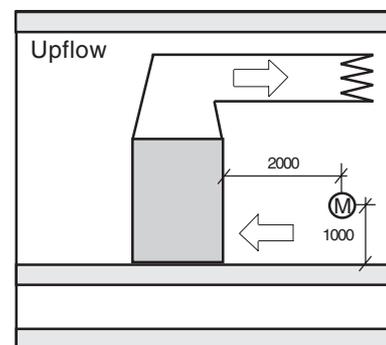
Technical data, standard, 4-module, options

		MRU/D 724 A, G / GE	MRU/D 1044 A, G / GE	MRU/D 1324 A, G / GE	MRU/D 1524 A, G / GE	MRU/D 1844 A, G / GE
Electrical heating						
Possible number of heating stages		8	8	8	8	8
Heat output in stage 1 / module	kW	6	6/12	6/12	6/12	6/12
Heat output in stage 2 / module	kW	6	6/12	6/12	6/12	6/12
Low pressure hot water reheat heating						
Heat output 80%	kW	32	60	72	96	124
Refrigerant heating						
Hot gas reheat capacity 40%	kW	16	32	52	72	100
Humidifying with steam humidifier						
Humidifier output	kg/h	3-20	8-52	8-52	8-52	8-52
max. el. power consumption	kW	14.4	38.0	38.0	38.0	38.0
Humidifying with ultrasonic humidifier						
Humidifier output	kg/h	9.6	14.4	19.2	19.2	19.2
El. power consumption	kW	0.48	0.72	0.96	0.96	0.96
Return air filter						
Filter media in metal frame EU4		x	x	x	x	x
Pleated filter in cardboard frame EU4		standard	standard	standard	standard	standard
Pleated filter in cardboard frame EU5		x	x	x	x	x
(Option G) 2-way HP control valve	DN	1/2"	1/2"	1/2"	1/2"	1/2"
(Option G) 3-way HP control valve	DN	3/4"	3/4"	1 1/4"	1 1/4"	1 1/2"
Air-cooled condenser						
Sound level at 5m distance (free field)	60 dB (A)	KSV021X151A	KSV036X251A	KSV044X251A	KSV055X251A	KSV055X251A
Sound level at 5m distance (free field)	50 dB (A)	KSV021X251B	KSV036X251B	KSV044X351B	KSV055X351B	KSV055X351B
Sound level at 5m distance (free field)	40 dB (A)	KSV021X251C	KSV036X351C	KSV044X351C	KSV055X351C	KSV055X351C
Quantity		4	4	4	4	4

Sound data

Sound level in dB (A)

Unit size	MRU	MRD
181	55	55
261	58	58
331	51	51
381	57	57
461	55	55
362	58	58
522	61	61
662	54	54
762	60	60
922	58	58
543	60	60
783	63	63
993	56	56
1143	62	62
1383	60	60
724	61	61
1044	63	63
1324	58	58
1524	63	63
1844	61	61



The data are valid at a height of 1m and distance of 2m in front of the unit under free field conditions and with nominal data and 70 Pa ext. pressure. The values take into account the effects of all installation and design parts contained in the standard unit. The values for upflow units assume an installed discharge duct.

The sound levels stated can be further reduced by suitable attenuation measures determined by individual site conditions.

Electrical connected loads

at 380-415 V / 3Ph / 50 Hz

Equipment		MRU/D 181 A/G/GE	MRU/D 261 A/G/GE	MRU/D 331 A/G/GE	MRU/D 381 A/G/GE	MRU/D 461 A/G/GE	
		A	6.1	7.6/10.0	6.1/7.6	10.0/12.9	10.0
 		A	15.0	21.1/23.5	23.2/24.7	30.6/33.5	37.0
  		A	23.7	38.4/40.8	40.5/42.0	47.9/50.8	54.3
  		A	22.5	39.1/41.5	41.2/42.7	48.6/51.5	55.0
Electric reheaters							
	6 kW	A	8.7	8.7	8.7	8.7	8.7
 	2 x 6 kW	A	17.3	17.3	17.3	17.3	17.3
	12 kW	A	17.3	17.3	17.3	17.3	17.3
 	2 x 12 kW	A	-	34.6	34.6	34.6	34.6
Steam humidifier							
	3 - 5 kg/h	A	7.5	7.5	7.5	7.5	7.5
	8 - 13 kg/h	A	-	18.0	18.0	18.0	18.0

A/C units with Ultrasonic humidifier are to be treated as A/C units without humidifier due to their low power consumption.

Key:

 Fan

 Compressor

 El. heater

 Steam humidifier

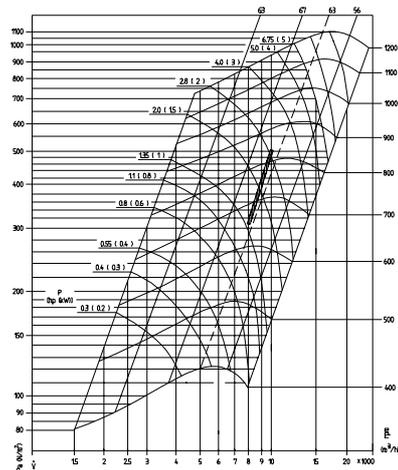
Fan curve

Design example

By means of this example it is explained how the fan speed and power requirement at the shaft are determined from the fan curve for a MRU 331 A A/C unit.

Given: (A) Air volume 8000 m³/h
 (B) p external 70 Pa

Required: (D) Pressure drop of the unit
 (E) Total pressure drop
 (F) Fan speed
 (G) Power requirement at the shaft



PROCEDURE:

Search for the appropriate fan curve for MRU-331 (Page 34).
 Establish the intersection point (C) of the air volume (A) and the unit characteristics:

determined value (D) = 400 Pa

Add the pressure drop of the unit (D) and the external pressure (B):

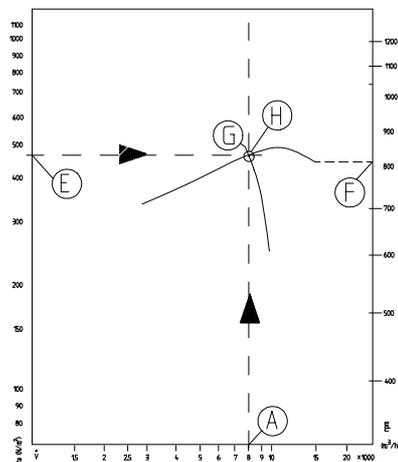
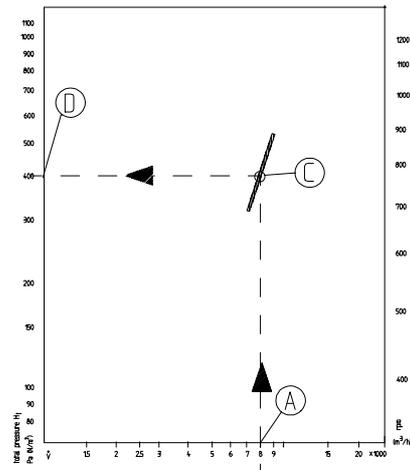
$$(D)+(B)= (E)$$

determined value (E): 400+70=470 Pa

The operating point (H) is at the intersection point of air volume (A) 8000 m³/h and the total pressure drop (E) 470 Pa.

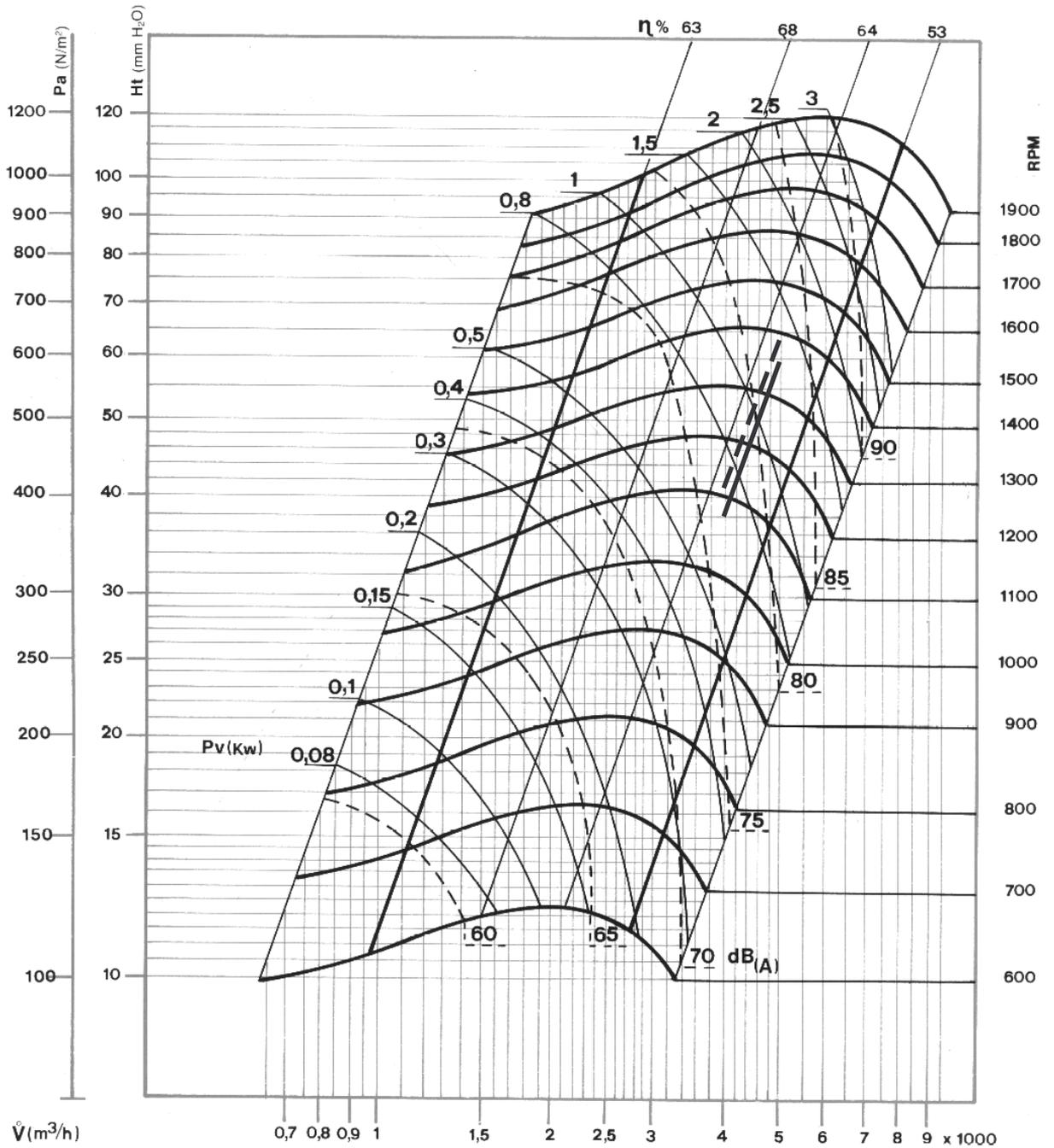
Read off the fan speed (F): 830 rpm

Read off the power requirement at the shaft (G): 1.7 kW



Fan curve for MRD 181 A/G/GE

Fan size: AT 10-8 (BDC270-203)

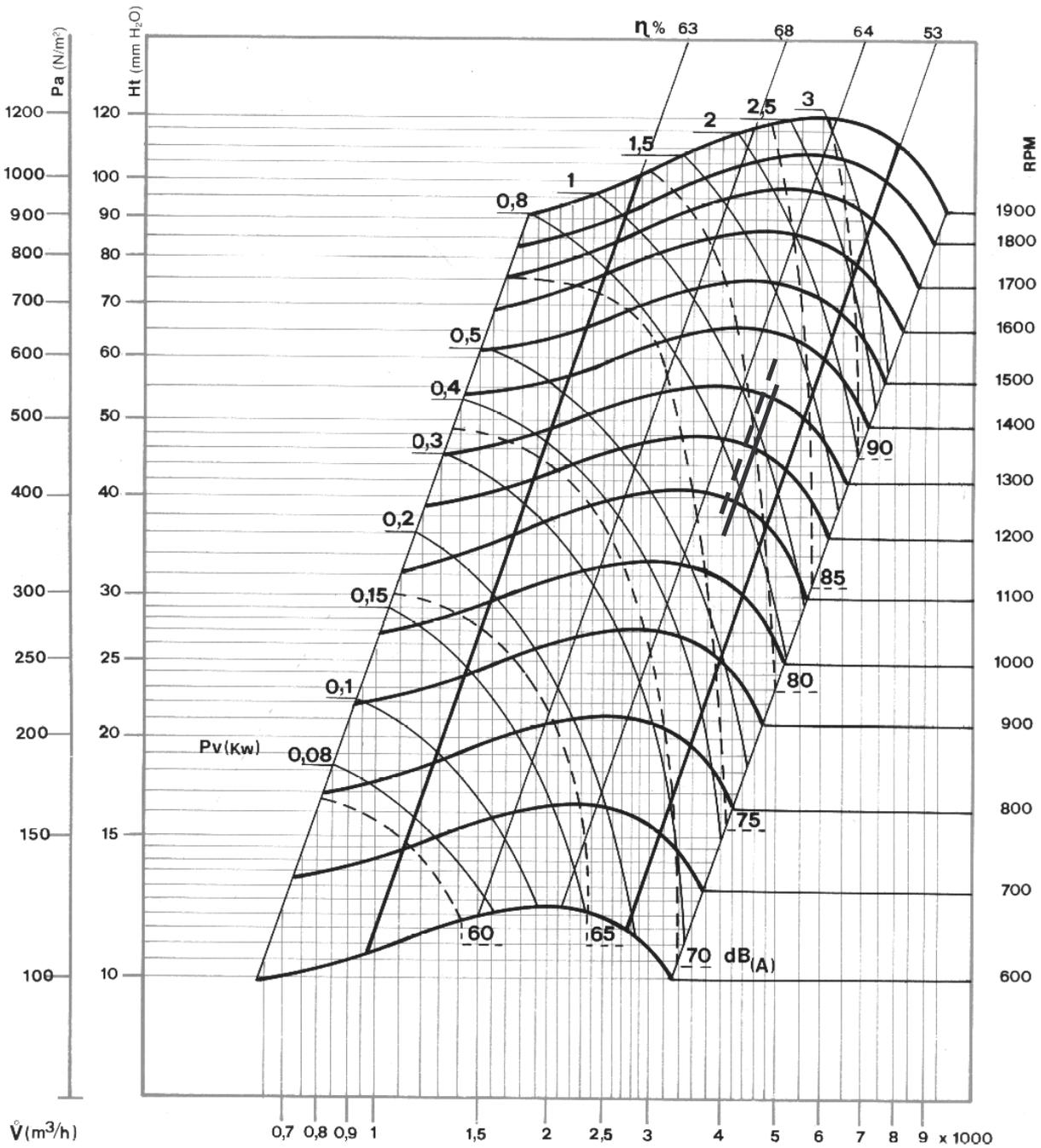


Unit characteristic A/G : ———
 Unit characteristic GE : - - -

Air volume range: 4000 - 5000 m³/h

Fan curve for MRU 181 A/G/GE

Fan size: AT 10-8 (BDC270-203)

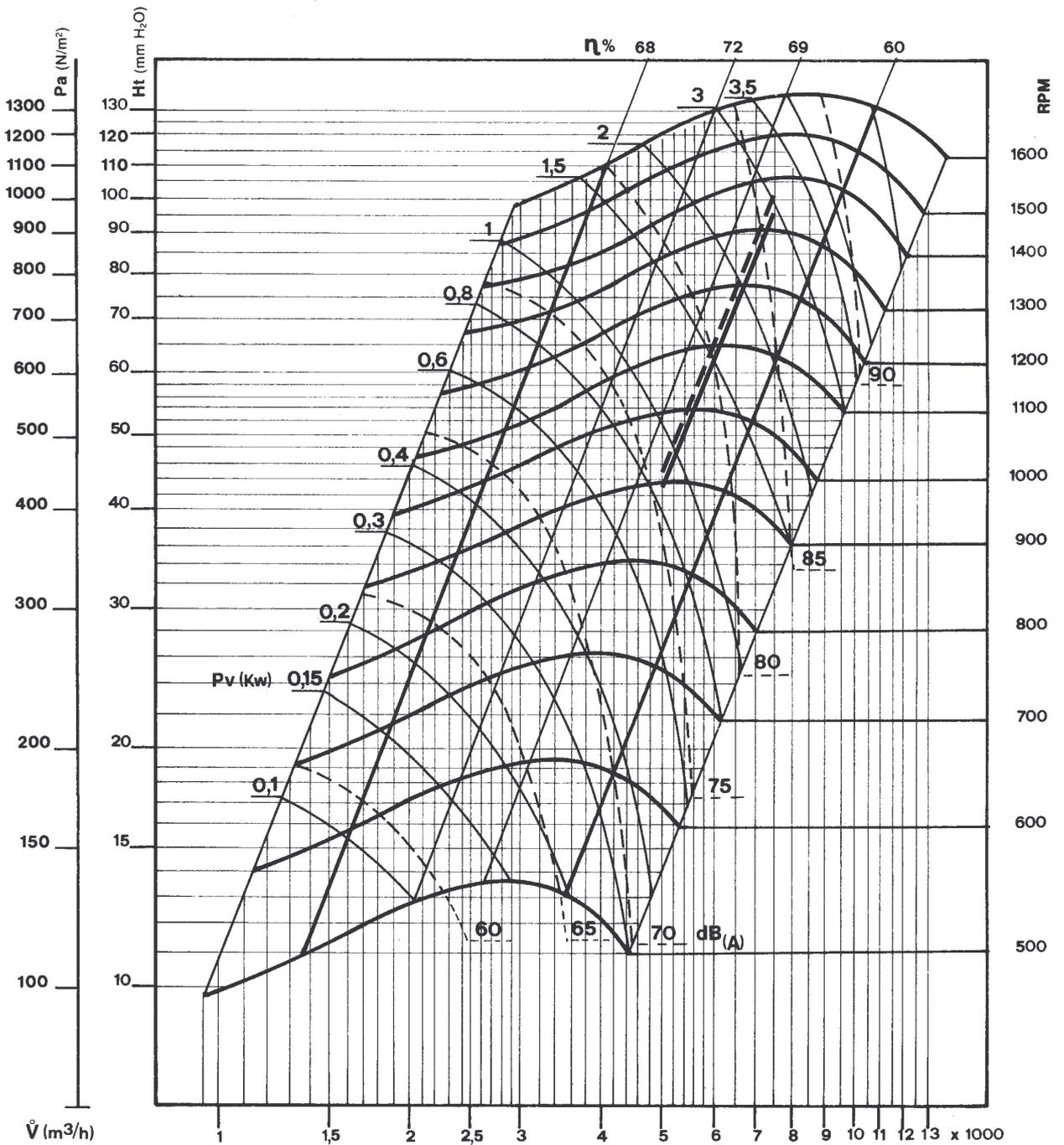


Unit characteristic A/G : ———
 Unit characteristic GE : - - - -

Air volume range: 4000 - 5000 m³/h

Fan curve for MRD 261 A/G/GE

Fan size: AT 12-9 (BDC321-241)

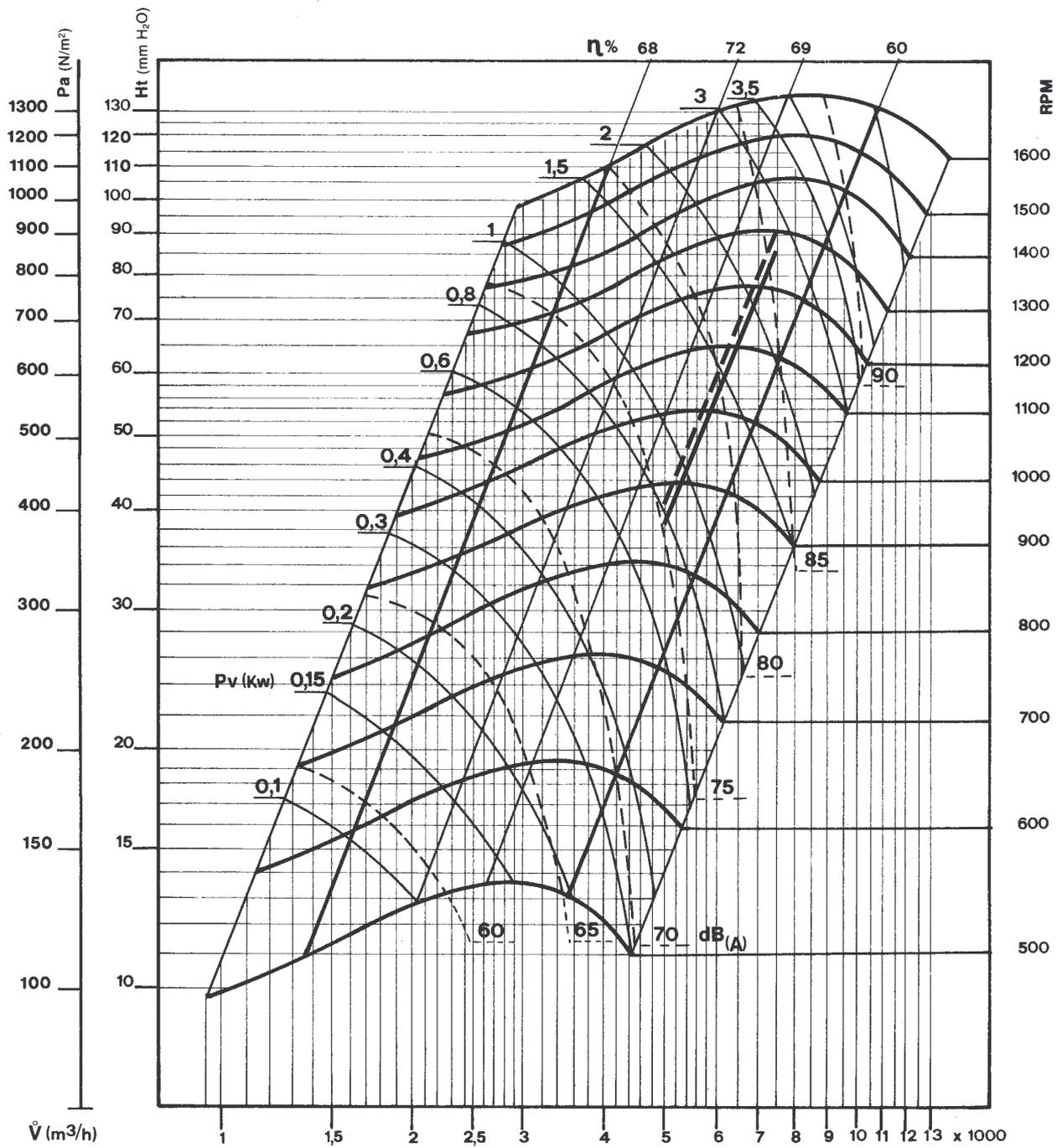


Unit characteristic A/G : ———
 Unit characteristic GE : - - - -

Air volume range: 5000 - 7500 m³/h

Fan curve for MRU 261 A/G/GE

Fan size: AT 12-9 (BDC321-241)

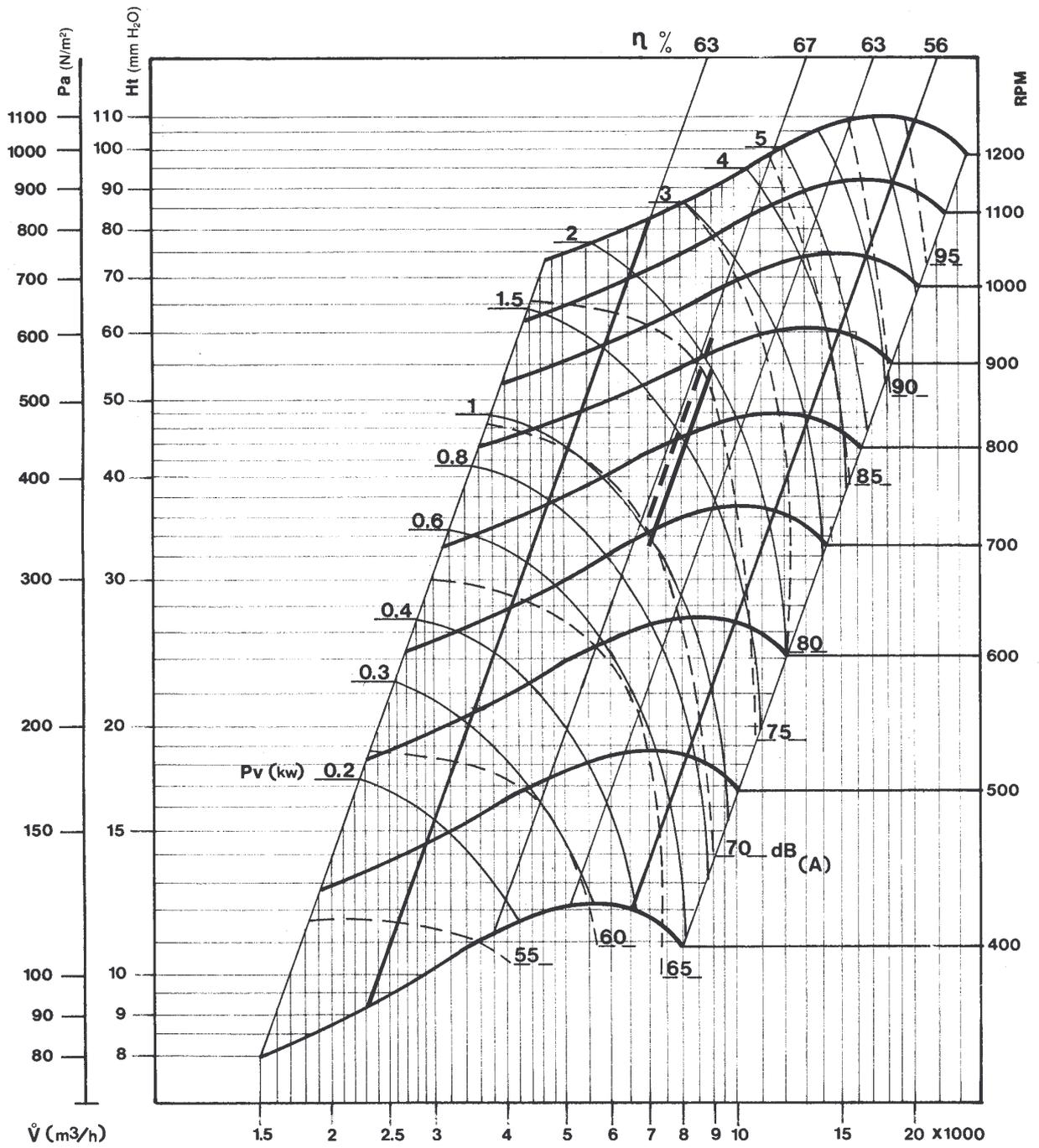


Unit characteristic A/G : ———
 Unit characteristic GE : - - -

Air volume range: 5000 - 7500 m³/h

Fan curve for MRD 331 A/G/GE

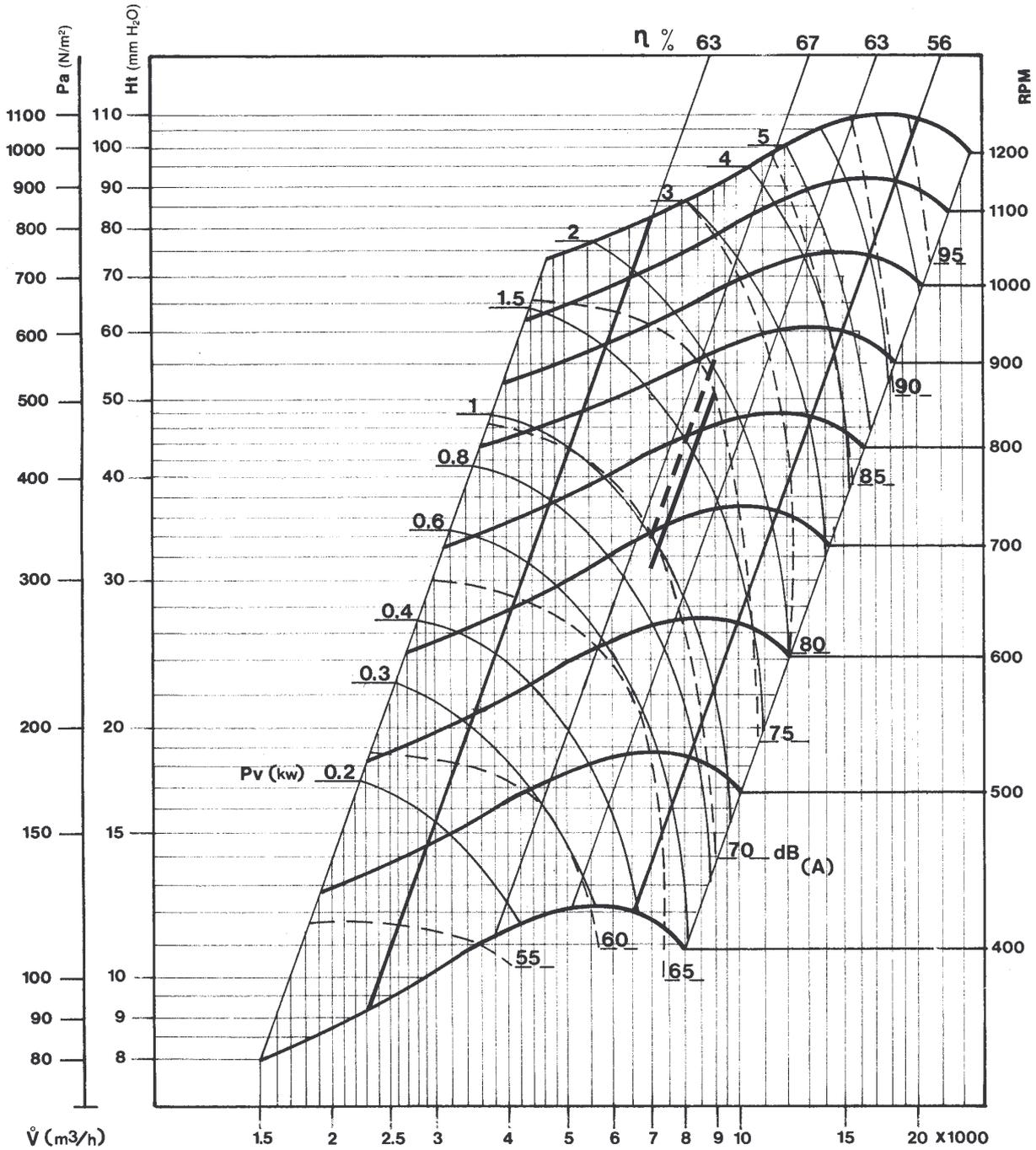
Fan size: AT 15-15 (BDC381-381)



Unit characteristic A/G : ——— Air volume range: 7000 - 9000 m³/h
 Unit characteristic GE : - - - - -

Fan curve for MRU 331 A/G/GE

Fan size: AT 15-15 (BDC381-381)

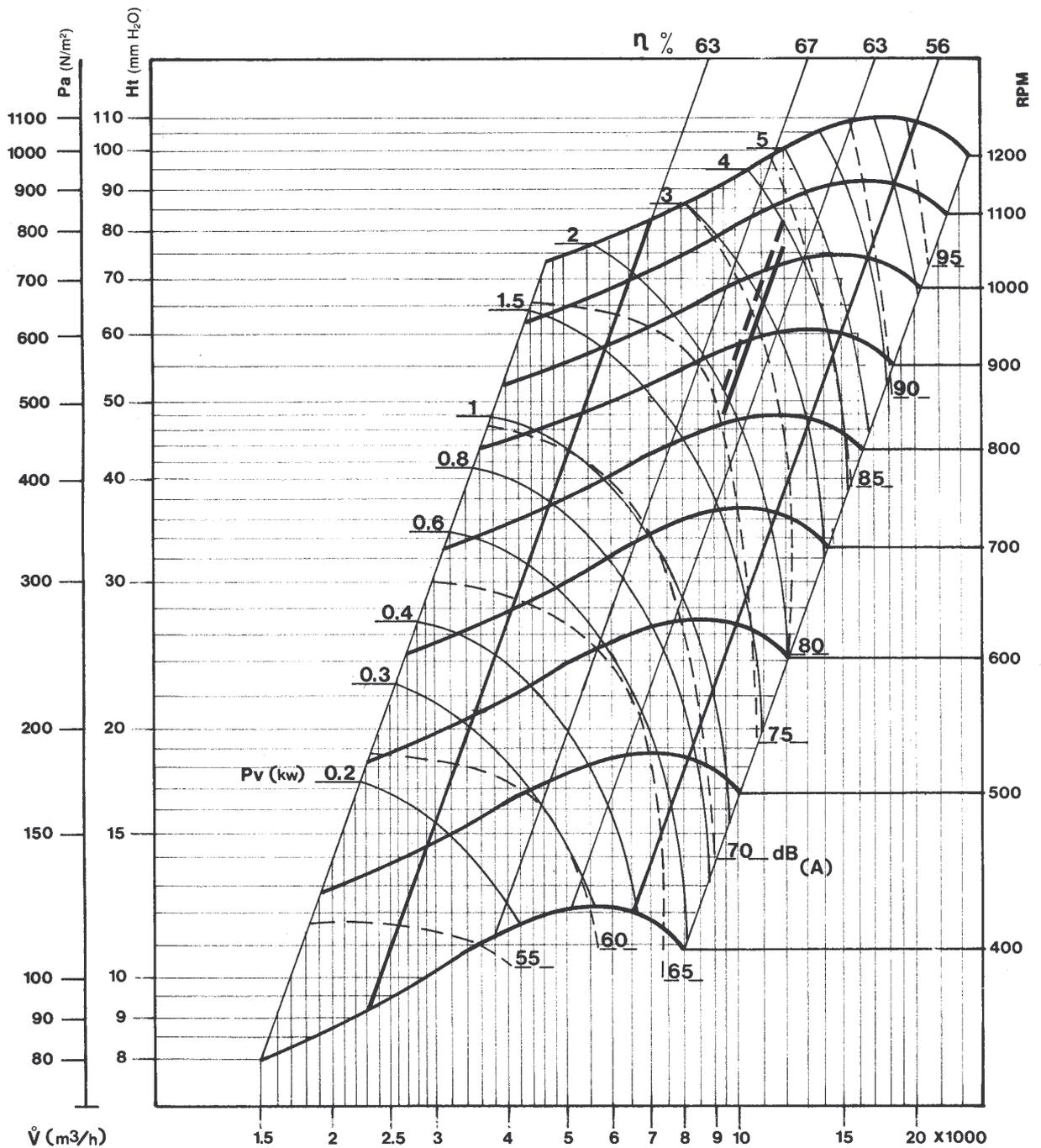


Unit characteristic A/G : ———
 Unit characteristic GE : - - -

Air volume range: 7000 - 9000 m^3/h

Fan curve for MRD 381 A/G/GE

Fan size: AT 15-15 (BDC381-381)

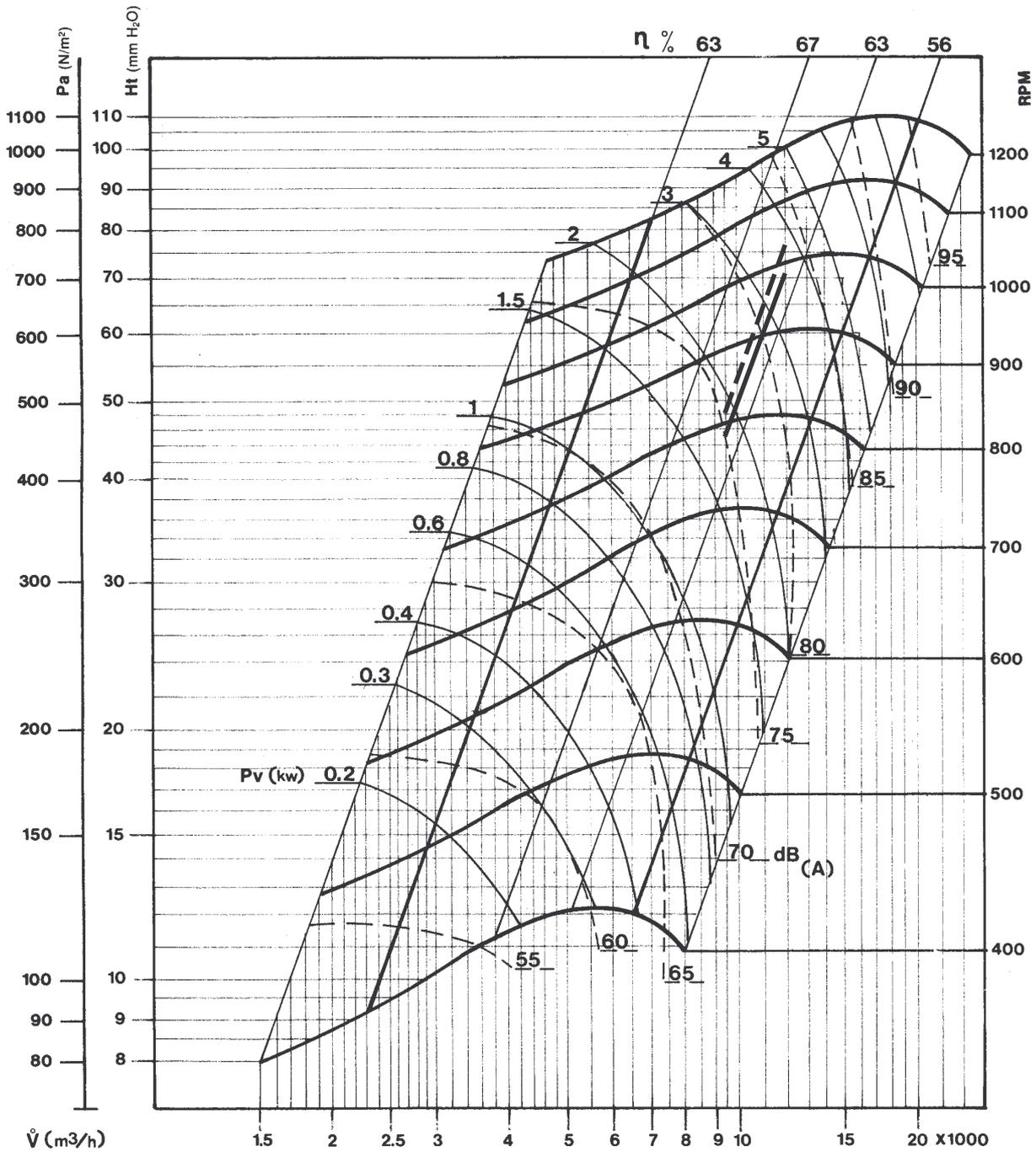


Unit characteristic A/G : ———
 Unit characteristic GE : - - -

Air volume range: 9500 - 12000 m^3/h

Fan curve for MRU 381 A/G/GE

Fan size: AT 15-15 (BDC381-381)

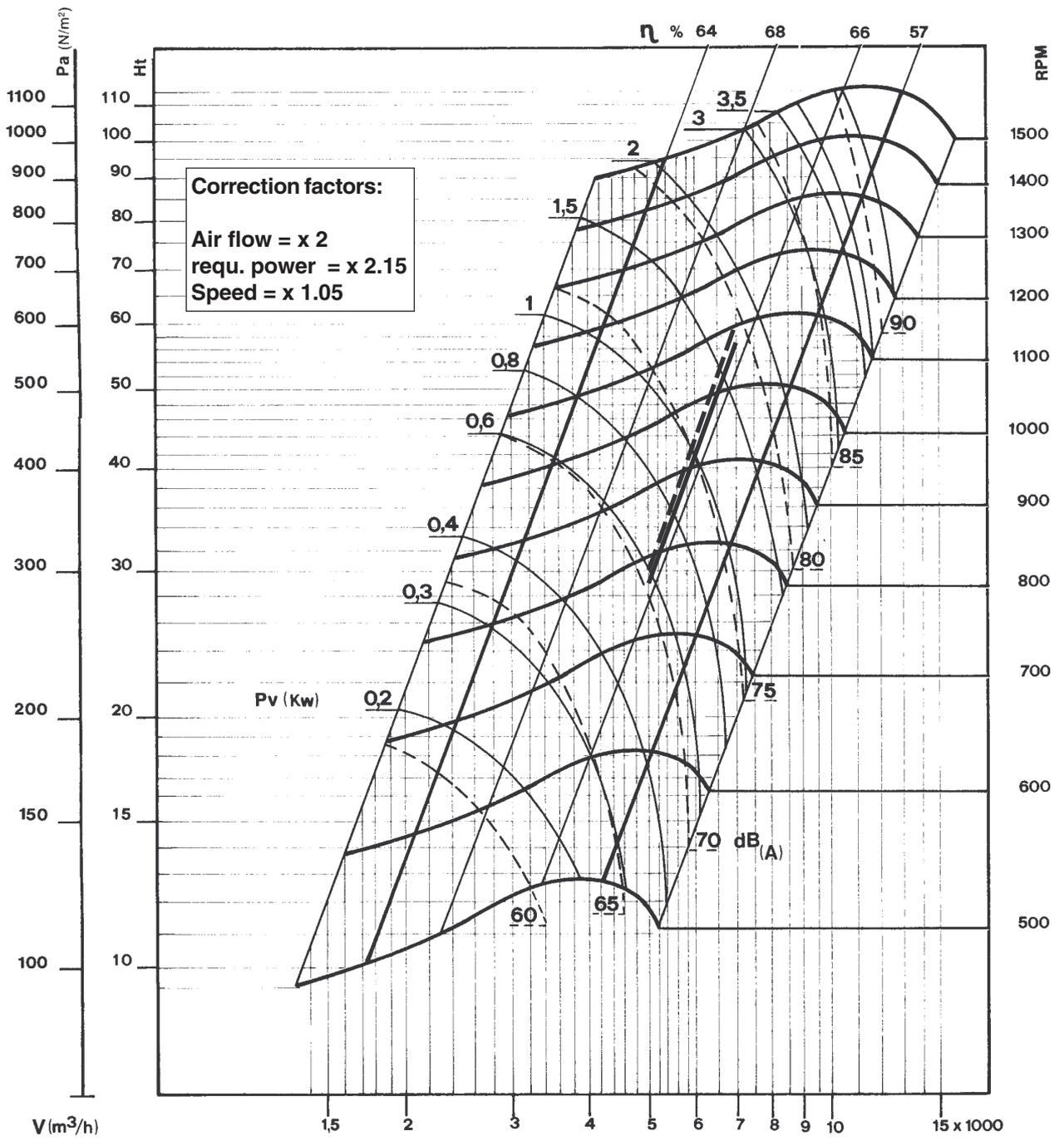


Unit characteristic A/G : ———
 Unit characteristic GE : - - -

Air volume range: 9500 - 12000 m^3/h

Fan curve for MRD 461 A/G/GE

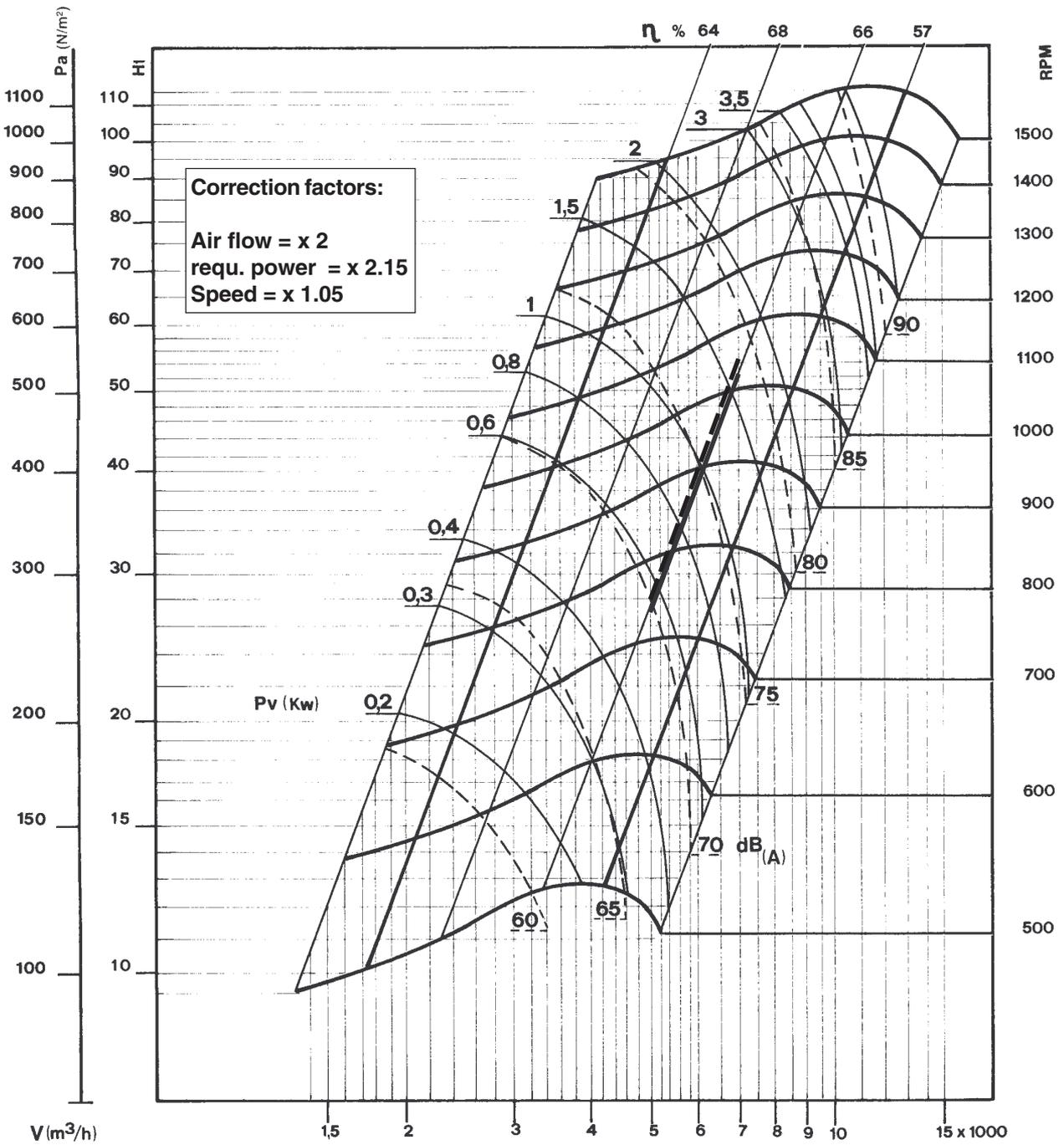
Fan size AT 12-12 twin (BDC321-321)



Unit characteristic A/G : ————
 Unit characteristic GE : - - - -
 Air volume range: 12000 - 14000 m³/h

Fan curve for MRU 461 A/G/GE

Fan size AT 12-12 twin (BDC321-321)



Unit characteristic A/G : ———
 Unit characteristic GE : - - -

Air volume range: 12000 - 14000 m³/h

Supply connections

Downflow units

Module size 181

Module size 261

Module size 331

Module size 381

Module size 461

GE units

Upflow units

Module size 181

Module size 261

Module size 331

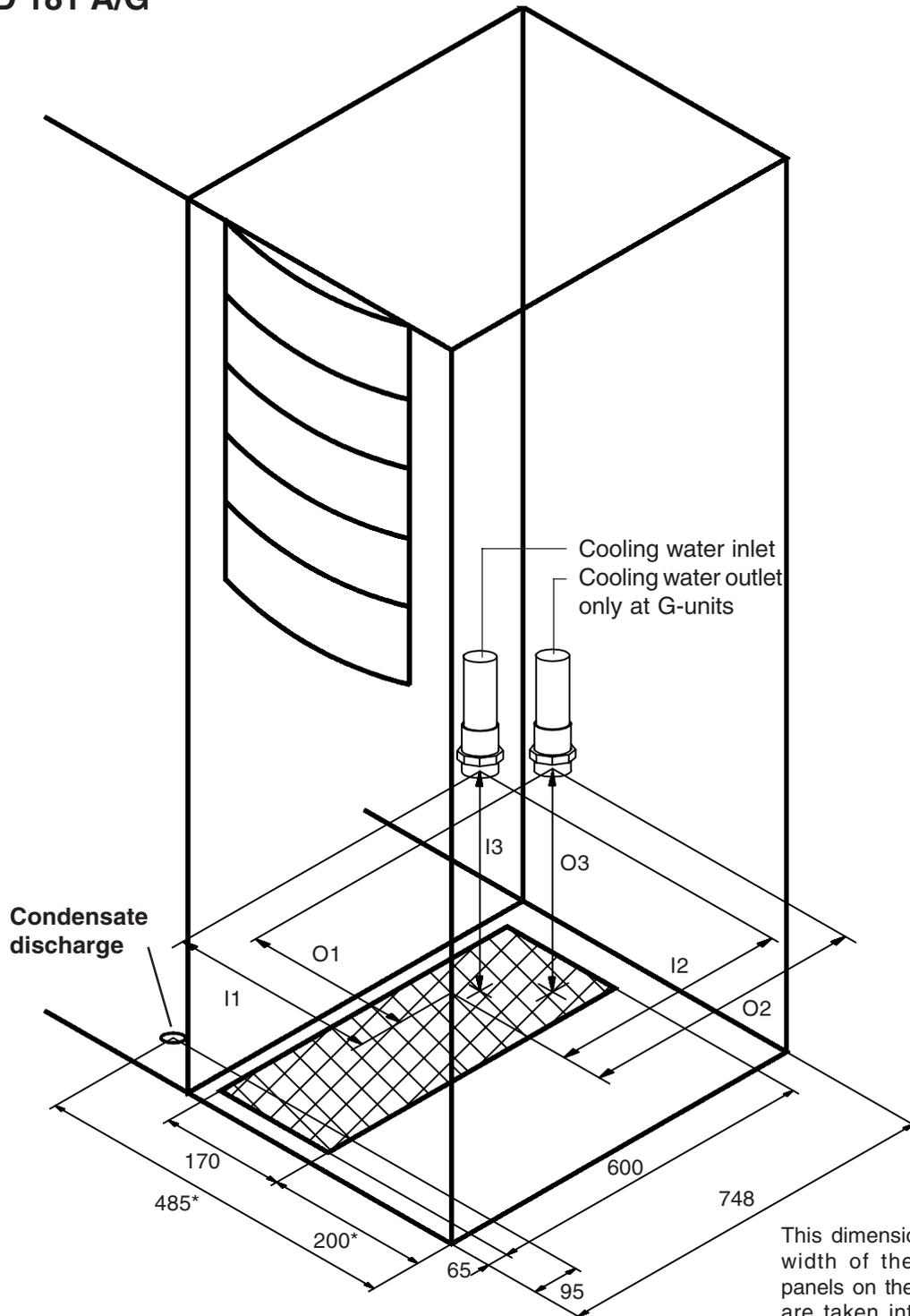
Module size 381

Module size 461

GE units

Supply connections of downflow units

MRD 181 A/G



The dimensions marked with an * increase by 1130 mm for each additional module.

This dimension specifies the width of the frame. If the panels on the front and back are taken into account, the familiar width of the unit of 810 mm is obtained.

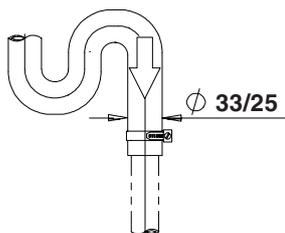
The left drawing shows the cut outs in the base plate, through which the supply lines can be routed. Refrigerant lines exist in A-units only, a connection to the pressure line and to the liquid line has to be made for each module. Cooling water lines exist in G-units only, the connection has to be made in the first module. The trap for the condensate discharge is supplied and installed on site. The connections for the humidifier can be found on page 68.

Dimensions of the cooling water lines

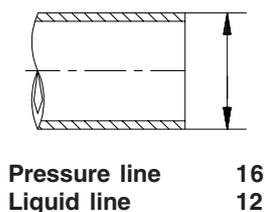
Unit	Inlet			Outlet		
	I1	I2	I3	O1	O2	O3
MRD 181 G	340	450	330	340	660	240
MRD 362 G	210	690	290	340	630	40
MRD 543 G	340	630	40	340	570	190

I1/O1 measured from outer edge of side cover strip
 I2/O2 measured from outer edge of profile
 I3/O3 measured from lower edge of profile

Condensate discharge

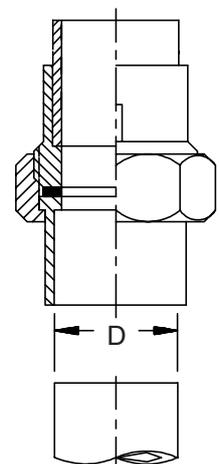


Refrigerant line

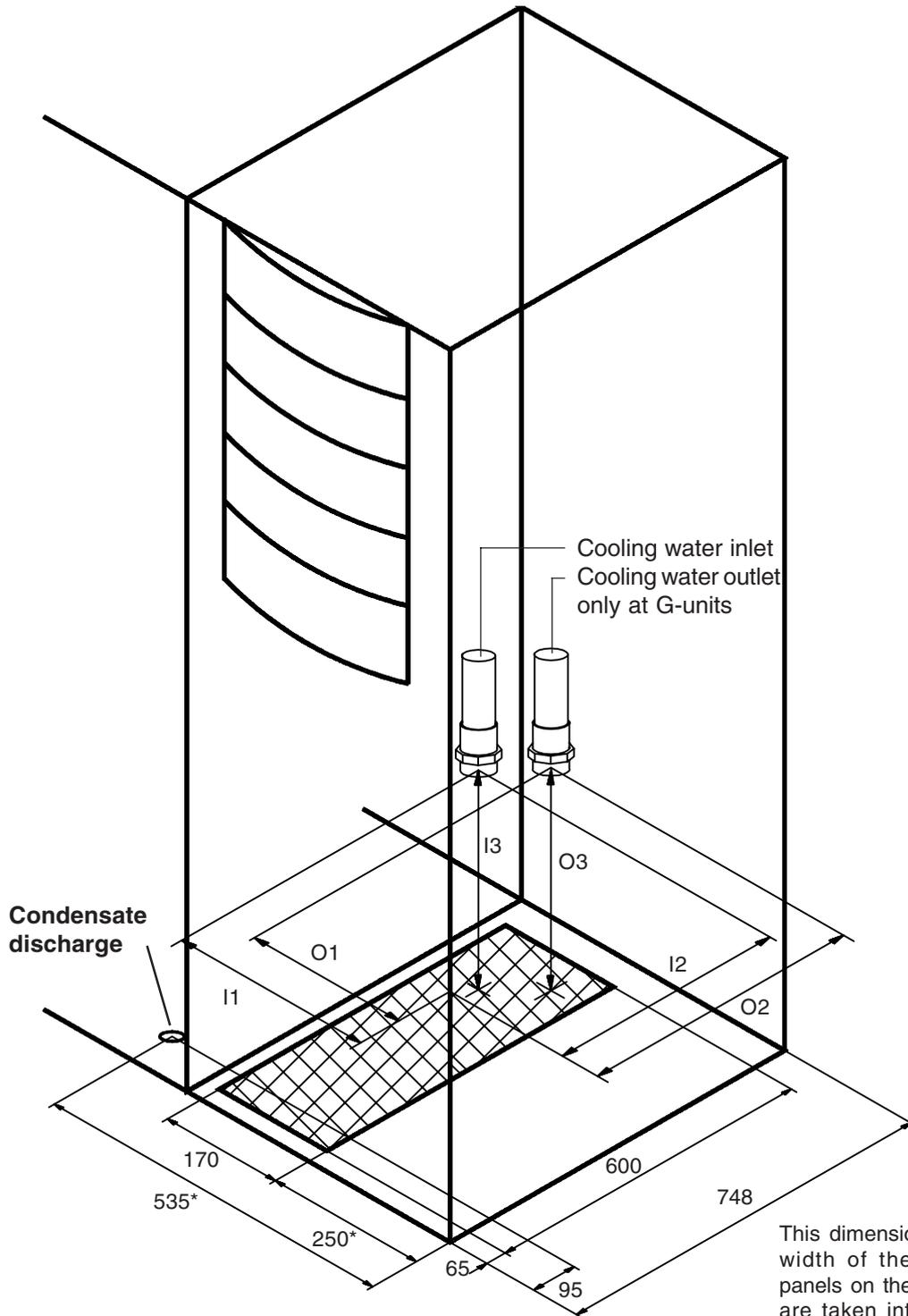


Cooling water line

No. of modules	Dia-meter
1	35
2	42
3	42
4	42



MRD 261 A/G



The dimensions marked with an * increase by 1350 mm for each additional module.

This dimension specifies the width of the frame. If the panels on the front and back are taken into account, the familiar width of the unit of 810 mm is obtained.

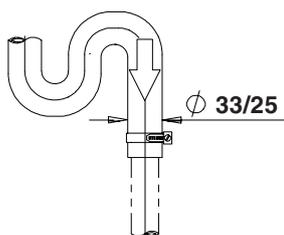
The left drawing shows the cut outs in the base plate, through which the supply lines can be routed. Refrigerant lines exist in A-units only, a connection to the pressure line and to the liquid line has to be made for each module. Cooling water lines exist in G-units only, the connection has to be made in the first module. The trap for the condensate discharge is supplied and installed on site. The connections for the humidifier can be found on page 68.

Dimensions of the cooling water lines

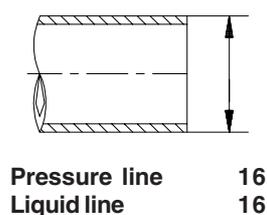
Unit	Inlet			Outlet		
	I1	I2	I3	O1	O2	O3
MRD 261 G	380	650	240	390	440	280
MRD 522 G	370	640	90	370	510	170
MRD 783 G	480	90	290	470	610	250

I1/O1 measured from outer edge of side cover strip
 I2/O2 measured from outer edge of profile
 I3/O3 measured from lower edge of profile

Condensate discharge

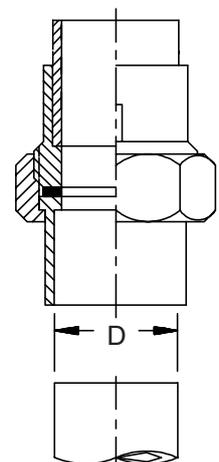


Refrigerant line

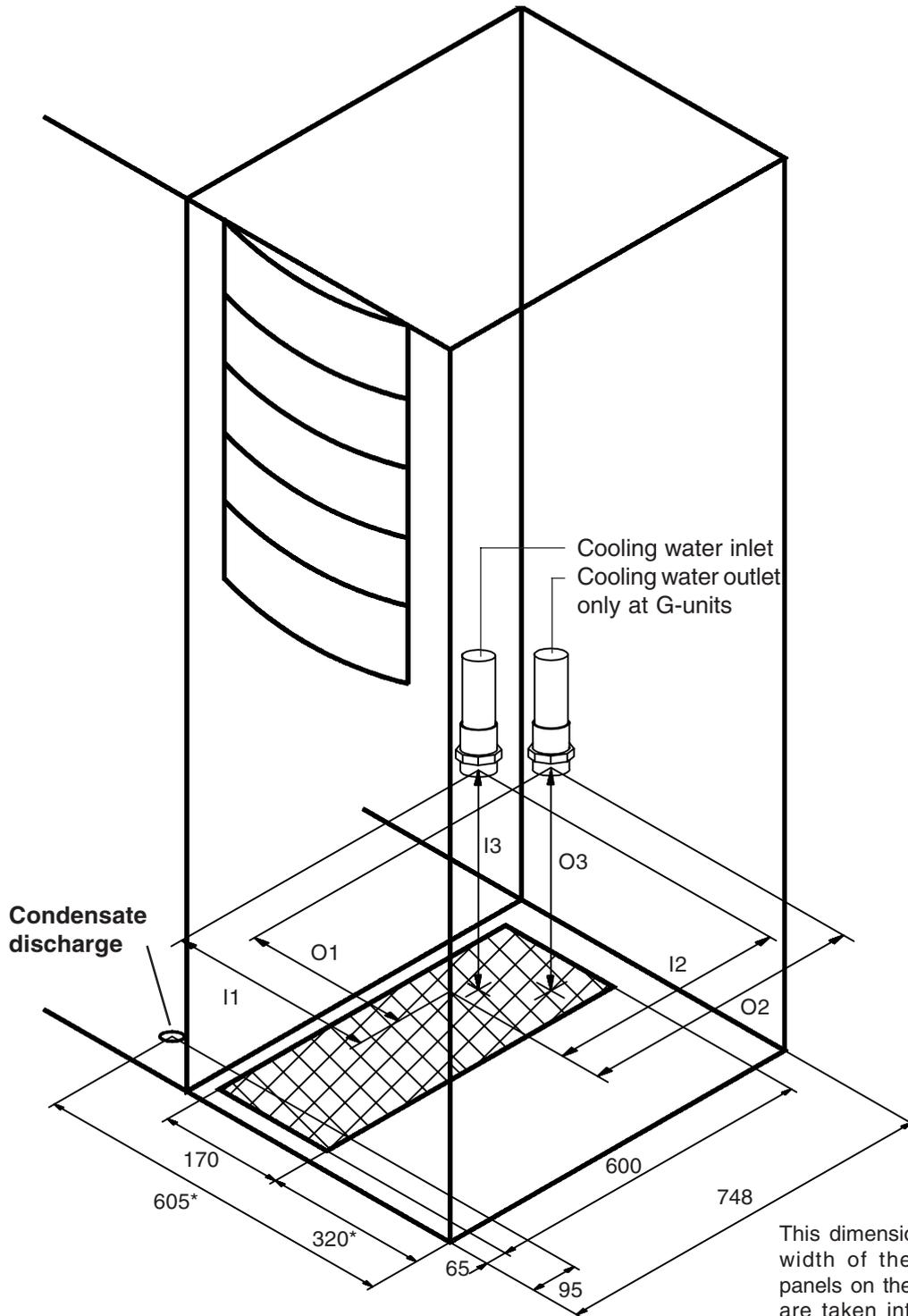


Cooling water line

No. of modules	Dia-meter
1	35
2	42
3	54
4	54



MRD 331 A/G



The dimensions marked with an * increase by 1580 mm for each additional module.

This dimension specifies the width of the frame. If the panels on the front and back are taken into account, the familiar width of the unit of 810 mm is obtained.

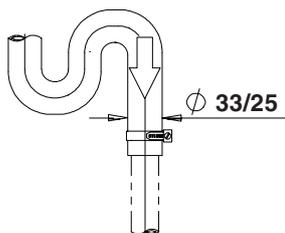
The left drawing shows the cut outs in the base plate, through which the supply lines can be routed. Refrigerant lines exist in A-units only, a connection to the pressure line and to the liquid line has to be made for each module. Cooling water lines exist in G-units only, the connection has to be made in the first module. The trap for the condensate discharge is supplied and installed on site. The connections for the humidifier can be found on page 68.

Dimensions of the cooling water lines

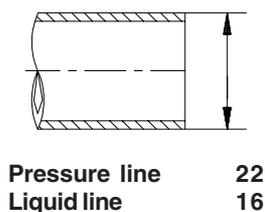
Unit	Inlet			Outlet		
	I1	I2	I3	O1	O2	O3
MRD 331 G	480	490	290	470	610	250
MRD 662 G	470	620	190	470	510	310
MRD 993 G	470	510	310	470	510	310

I1/O1 measured from outer edge of side cover strip
 I2/O2 measured from outer edge of profile
 I3/O3 measured from lower edge of profile

Condensate discharge

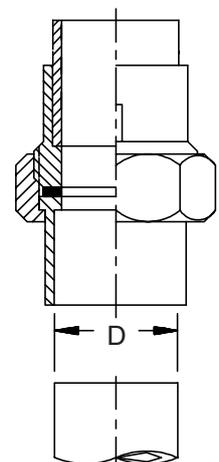


Refrigerant line

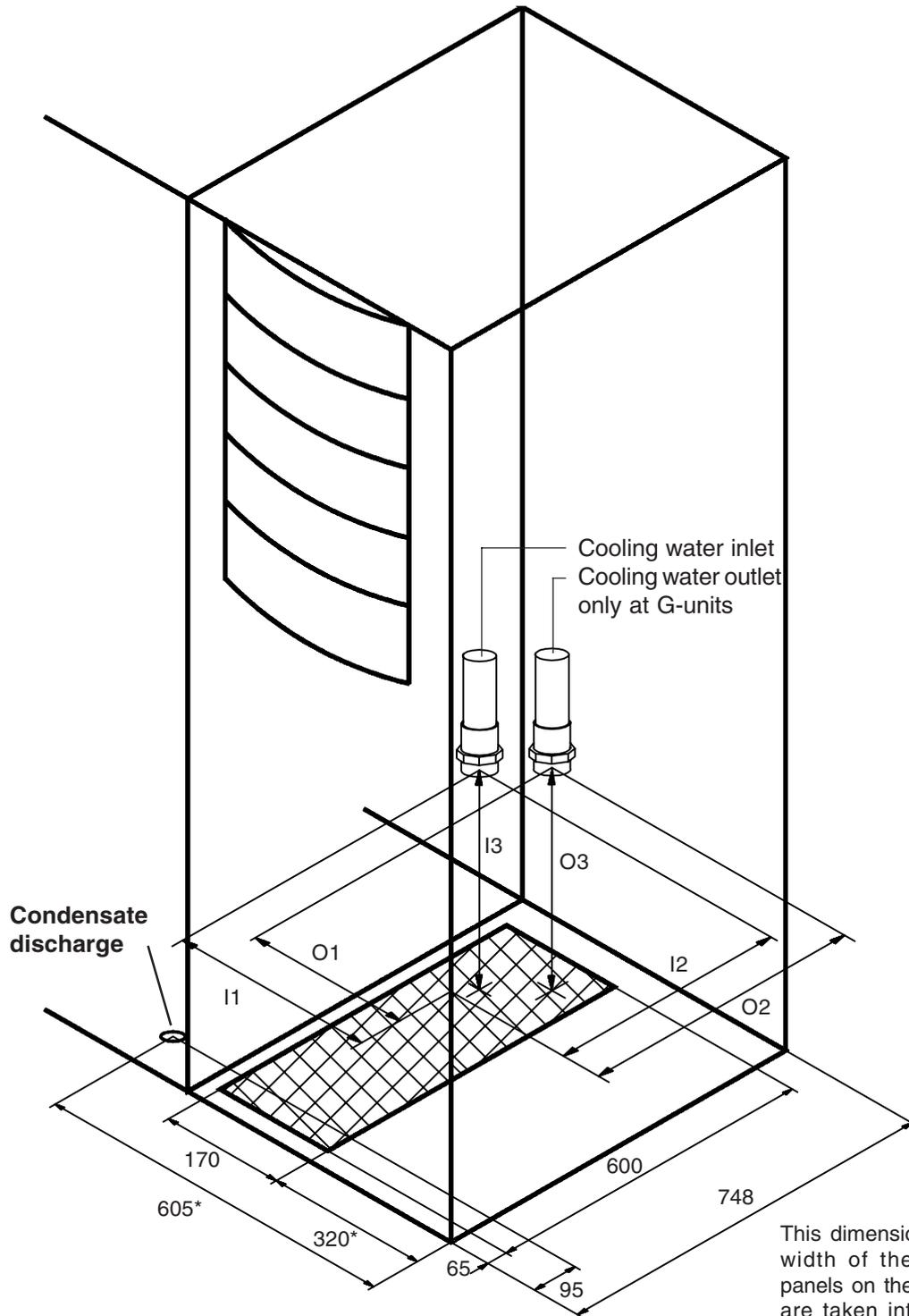


Cooling water line

No. of modules	Dia-meter
1	35
2	54
3	54
4	64



MRD 381 A/G



The dimensions marked with an * increase by 1800 mm for each additional module.

This dimension specifies the width of the frame. If the panels on the front and back are taken into account, the familiar width of the unit of 810 mm is obtained.

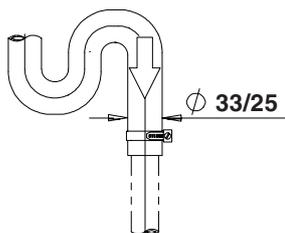
The left drawing shows the cut outs in the base plate, through which the supply lines can be routed. Refrigerant lines exist in A-units only, a connection to the pressure line and to the liquid line has to be made for each module. Cooling water lines exist in G-units only, the connection has to be made in the first module. The trap for the condensate discharge is supplied and installed on site. The connections for the humidifier can be found on page 68.

Dimensions of the cooling water lines

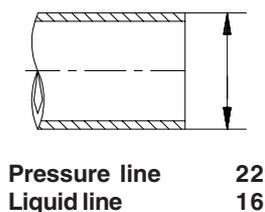
Unit	Inlet			Outlet		
	I1	I2	I3	O1	O2	O3
MRD 381 G	480	490	290	470	610	250
MRD 762 G	470	610	190	470	510	310
MRD 1143 G	470	620	190	470	510	310

I1/O1 measured from outer edge of side cover strip
 I2/O2 measured from outer edge of profile
 I3/O3 measured from lower edge of profile

Condensate discharge

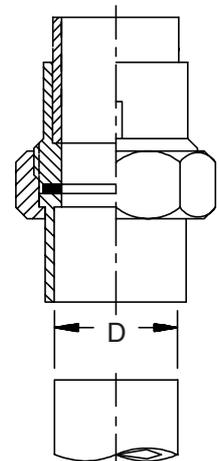


Refrigerant line

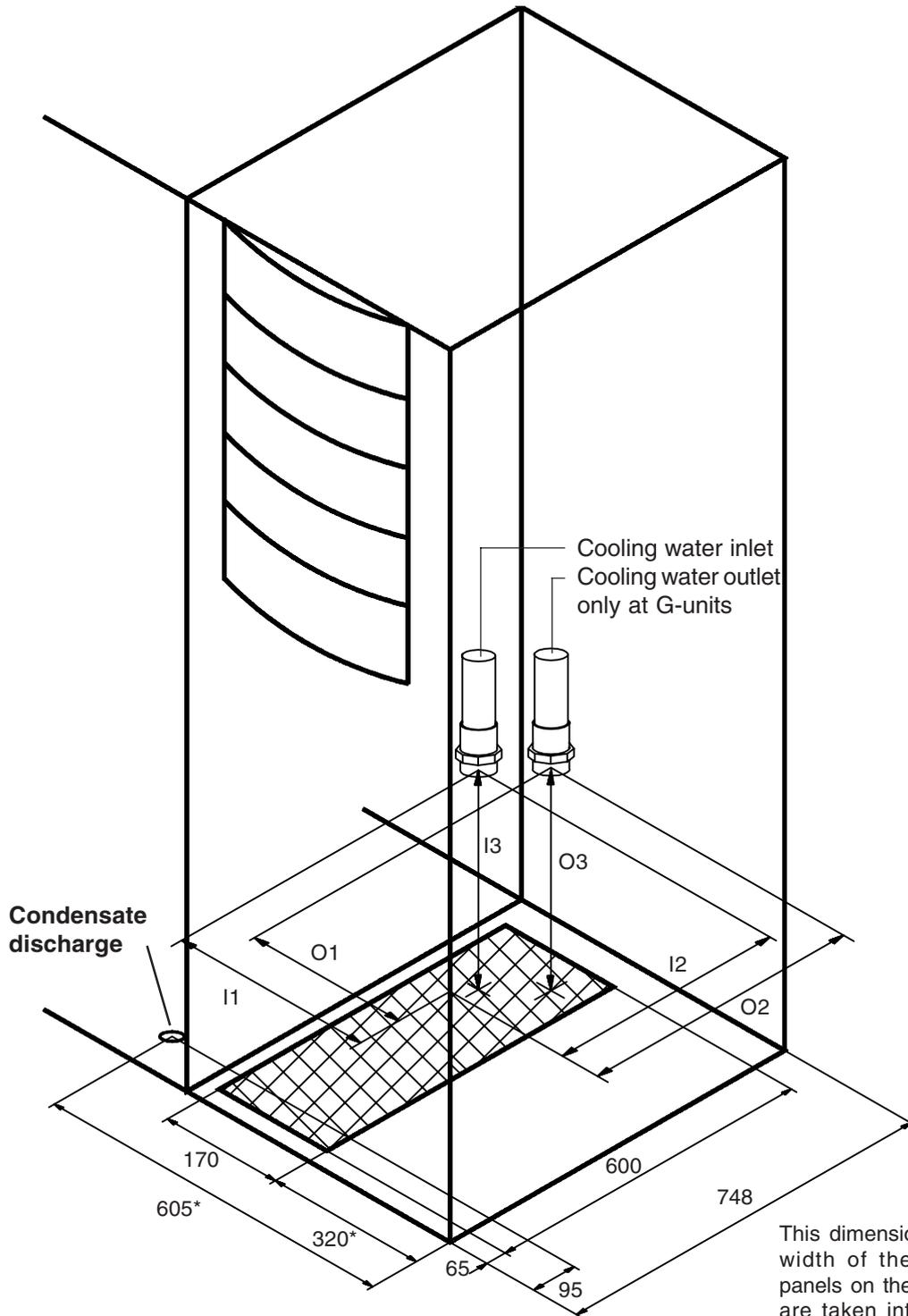


Cooling water line

No. of modules	Dia-meter
1	35
2	54
3	54
4	70



MRD 461 A/G



The dimensions marked with an * increase by 2250 mm for each additional module.

This dimension specifies the width of the frame. If the panels on the front and back are taken into account, the familiar width of the unit of 810 mm is obtained.

The left drawing shows the cut outs in the base plate, through which the supply lines can be routed. Refrigerant lines exist in A-units only, a connection to the pressure line and to the liquid line has to be made for each module. Cooling water lines exist in G-units only, the connection has to be made in the first module. The trap for the condensate discharge is supplied and installed on site. The connections for the humidifier can be found on page 68.

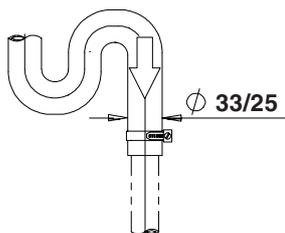
Dimensions of the cooling water lines

Unit	Inlet			Outlet		
	I1	I2	I3	O1	O2	O3
MRD 461 G	373	502	368	373	301	367
MRD 922 G	426	545	241	283	332	374
MRD 1383 G*	140	590	296	340	590	296

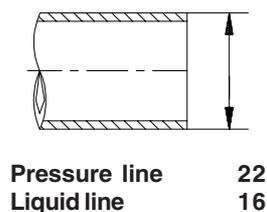
I1/O1 measured from outer edge of side cover strip
 I2/O2 measured from outer edge of profile
 I3/O3 measured from lower edge of profile

*small pump cabinet (450) required.

Condensate discharge

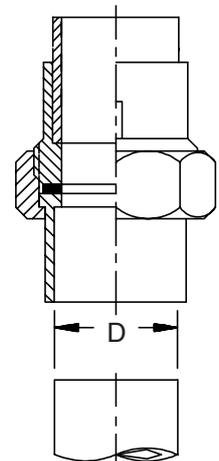


Refrigerant line

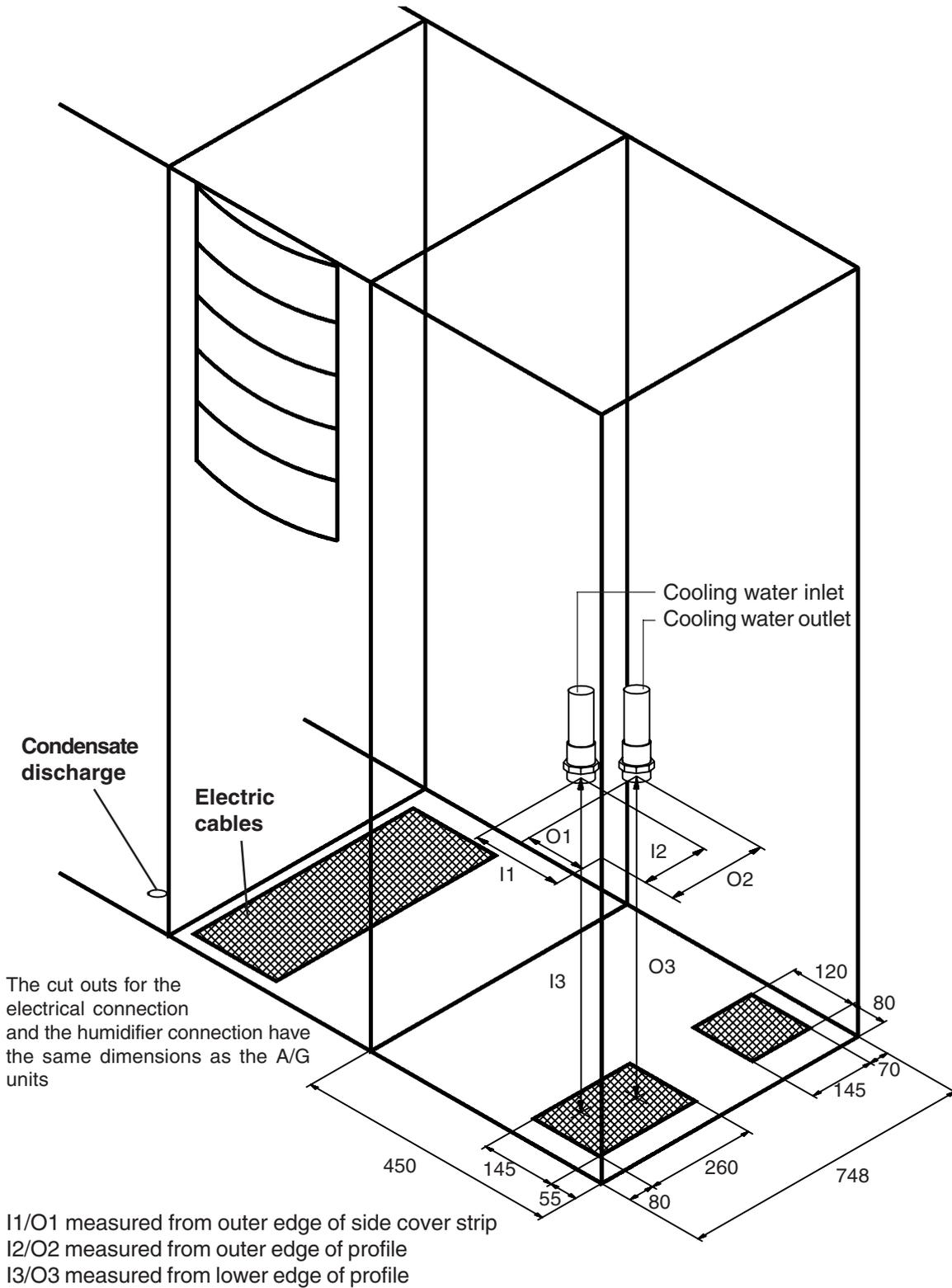


Cooling water line

No. of Dia-
 modules meter
 1 42
 2 54
 3 54
 4 on
 request



GE units with small pump cabinet (version without pump, version with 1 pump)



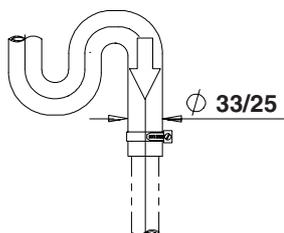
The left drawing shows the cut outs in the base plate, through which the supply lines can be routed. The connection of the cooling water lines has to be made in the pump cabinet. The trap for the condensate discharge is supplied and installed on site. The connections for the humidifier can be found on page 68.

Dimensions of the cooling water lines

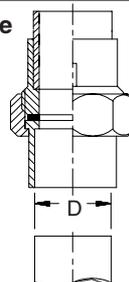
	Unit	Inlet			Outlet		
		I1	I2	I3	O1	O2	O3
Version without pump	MRD 181 GE	140	160	880	140	280	650
	MRD 362 GE	140	160	880	140	280	650
	MRD 543 GE	140	160	880	140	280	650
	MRD 261 GE	140	160	880	140	280	650
	MRD 522 GE	120	140	880	90	300	670
	MRD 783 GE	100	120	860	120	210	610
	MRD 331 GE	140	160	880	140	280	650
	MRD 662 GE	120	100	850	120	210	610
	MRD 993 GE	120	100	850	120	210	610
	MRD 381 GE	120	140	880	120	280	650
	MRD 762 GE	120	100	890	120	210	610
	MRD 1143 GE	120	100	850	120	210	610
	MRD 461 GE	128	180	967	128	419	693
MRD 922 GE	127	205	933	128	419	693	
MRD 1383 GE	358	119	890	284	179	650	
Version with 1 pump	MRD 181 GE	140	160	800	140	280	640
	MRD 362 GE	140	160	800	140	280	640
	MRD 543 GE	120	140	800	120	280	640
	MRD 261 GE	140	160	800	140	280	640
	MRD 522 GE	120	140	800	120	280	640
	MRD 783 GE	120	120	830	120	210	610
	MRD 331 GE	140	160	800	140	280	640
	MRD 662 GE	120	120	830	120	210	610
	MRD 993 GE	120	120	830	120	210	610
	MRD 381 GE	120	140	800	120	280	640
	MRD 762 GE	120	120	830	120	210	610
	MRD 1143 GE	120	120	830	120	210	610
	MRD 461 GE	128	205	917	128	419	693
MRD 922 GE	128	205	917	128	419	693	
MRD 1383 GE*	240	179	650	286	279	527	

* large pump cabinet (680) required.

Condensate discharge



Cooling water line

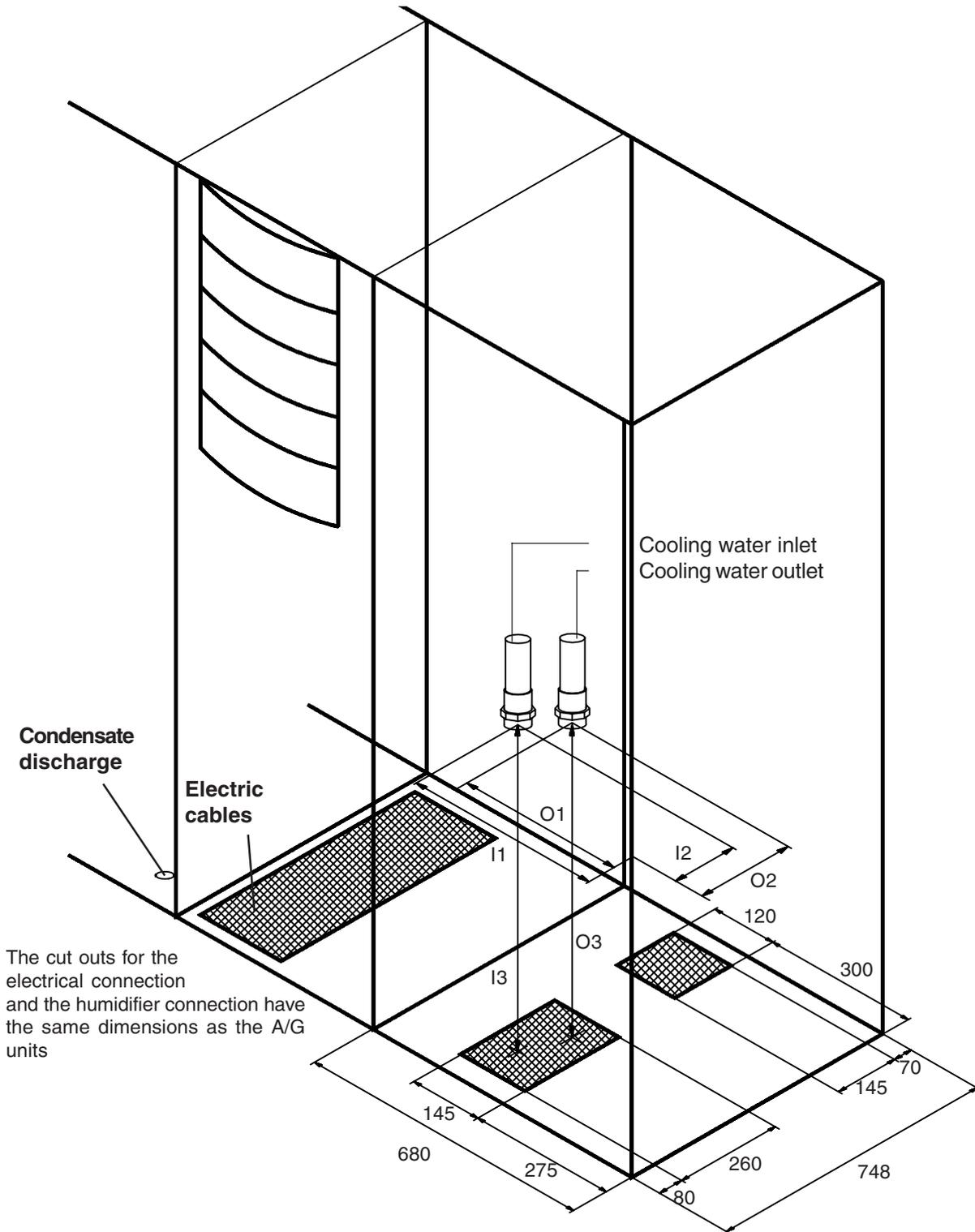


Piping diameter

No. of modules	Size of module				
	181	261	331	381	461
1	42	42	42	42	42
2	42	42	54	54	54
3	42	54	54	54	54
4	42	54	64	76	*

* on request

GE units with large pump cabinet (version with 2 pumps)



The left drawing shows the cut outs in the base plate, through which the supply lines can be routed. The connection of the cooling water lines has to be made in the pump cabinet. The trap for the condensate discharge is supplied and installed on site. The connections for the humidifier can be found on page 68.

Dimensions of the cooling water lines

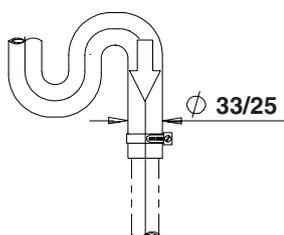
Unit	Inlet			Outlet		
	I1	I2	I3	O1	O2	O3
MRD 181 GE	370	160	800	370	280	640
MRD 362 GE	370	160	800	370	280	640
MRD 543 GE	350	140	800	350	280	640
MRD 261 GE	370	160	800	370	280	640
MRD 522 GE	350	140	800	350	280	640
MRD 783 GE	350	120	830	350	210	610
MRD 331 GE	370	160	800	370	280	640
MRD 662 GE	350	120	830	350	210	610
MRD 993 GE	350	120	830	350	210	610
MRD 381 GE	350	140	800	350	280	640
MRD 762 GE	350	120	830	350	210	610
MRD 1143 GE	350	120	850	350	210	610
MRD 461 GE	358	205	917	358	419	693
MRD 922 GE	358	205	917	358	419	693
MRD 1383 GE*	408	179	650	454	279	527

Version with 2 pumps

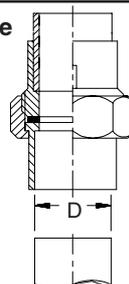
I1/O1 measured from outer edge of side cover strip
 I2/O2 measured from outer edge of profile
 I3/O3 measured from lower edge of profile

* spec. pump cabinet (900) required.

Condensate discharge



Cooling water line



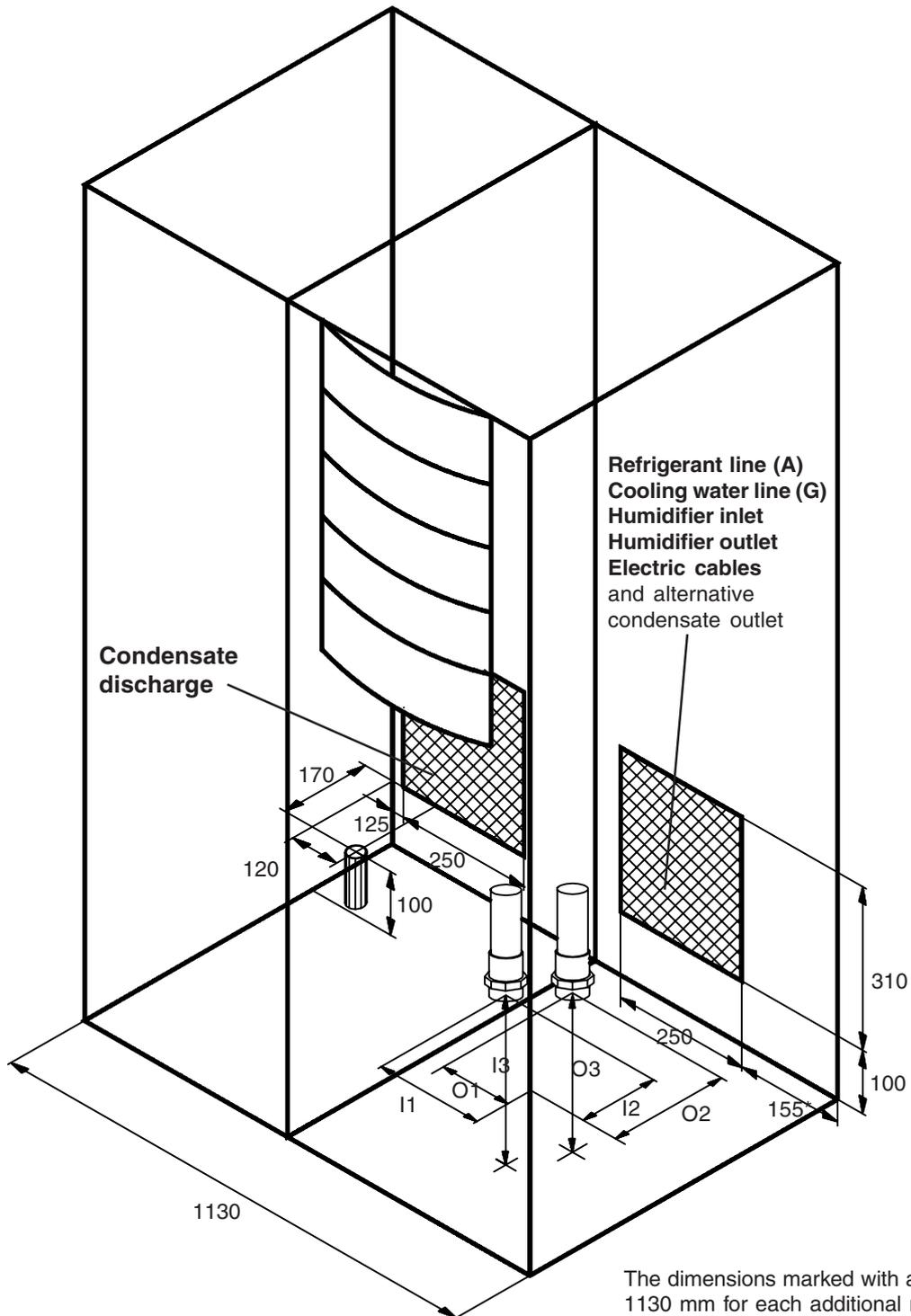
Piping diameter

No. of modules	Size of module				
	181	261	331	381	461
1	42	42	42	42	42
2	42	42	54	54	54
3	42	54	54	54	54
4	42	54	64	76	*

* on request

Supply connections of upflow units

MRU 181 A/G



The dimensions marked with an * increase by 1130 mm for each additional module.

The left drawing shows the cut outs in the panels on the back, through which the supply lines can be routed. Refrigerant lines exist in A-units only, a connection to the pressure line and to the liquid line has to be made for each module. Cooling water lines exist in G-units only, the connection has to be made in the first module. The connections for the humidifier can be found on page 68.

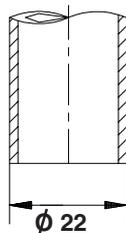
The upflow units are also available with closed rear wall. The openings for the supply lines and the electric cable have to be punched on site.

Dimensions of the cooling water lines

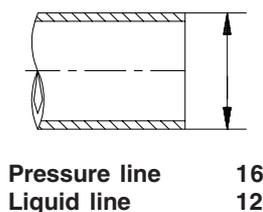
Unit	Inlet			Outlet		
	I1	I2	I3	O1	O2	O3
MRU 181 G	340	450	330	340	660	240
MRU 362 G	210	690	290	340	630	40
MRU 543 G	340	630	40	340	570	190

I1/O1 measured from outer edge of side cover strip
 I2/O2 measured from outer edge of profile
 I3/O3 measured from lower edge of profile

Condensate discharge

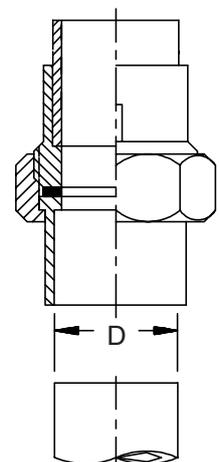


Refrigerant line

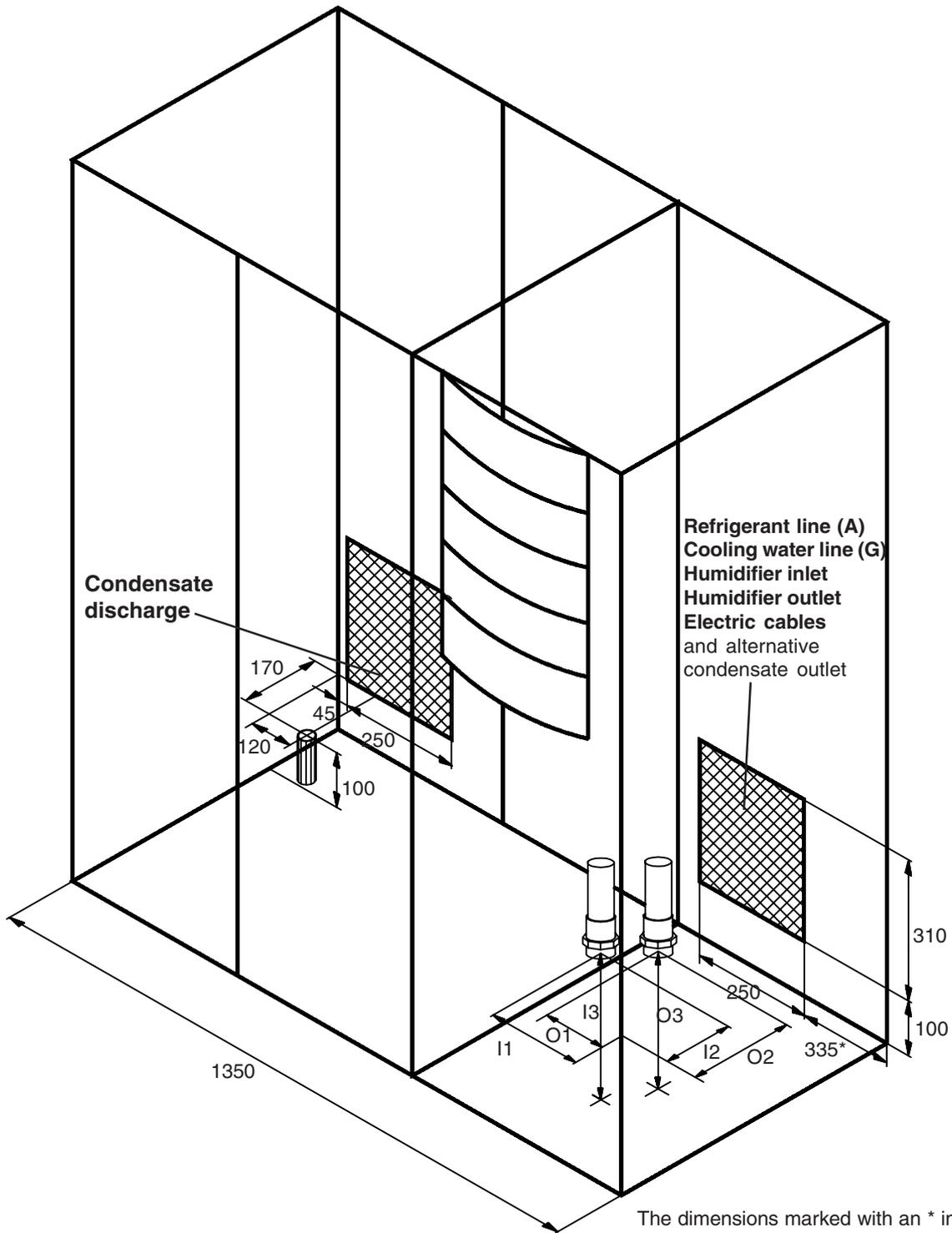


Cooling water line

No. of modules	Dia-meter
1	35
2	42
3	42
4	42



MRU 261 A/G



The dimensions marked with an * increase by 1350 mm for each additional module.

The left drawing shows the cut outs in the panels on the back, through which the supply lines can be routed. Refrigerant lines exist in A-units only, a connection to the pressure line and to the liquid line has to be made for each module. Cooling water lines exist in G-units only, the connection has to be made in the first module. The connections for the humidifier can be found on page 68.

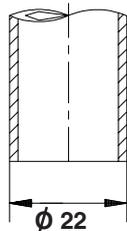
The upflow units are also available with closed rear wall. The openings for the supply lines and the electric cable have to be punched on site.

Dimensions of the cooling water lines

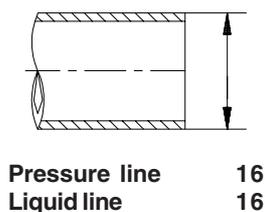
Unit	Inlet			Outlet		
	I1	I2	I3	O1	O2	O3
MRU 261 G	380	650	240	390	440	280
MRU 522 G	370	640	90	370	510	170
MRU 783 G	480	90	290	470	610	250

I1/O1 measured from outer edge of side cover strip
 I2/O2 measured from outer edge of profile
 I3/O3 measured from lower edge of profile

Condensate discharge

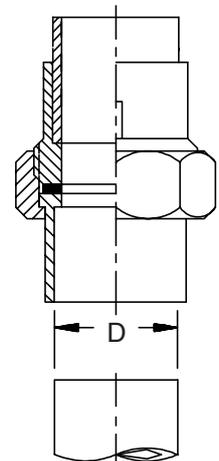


Refrigerant line

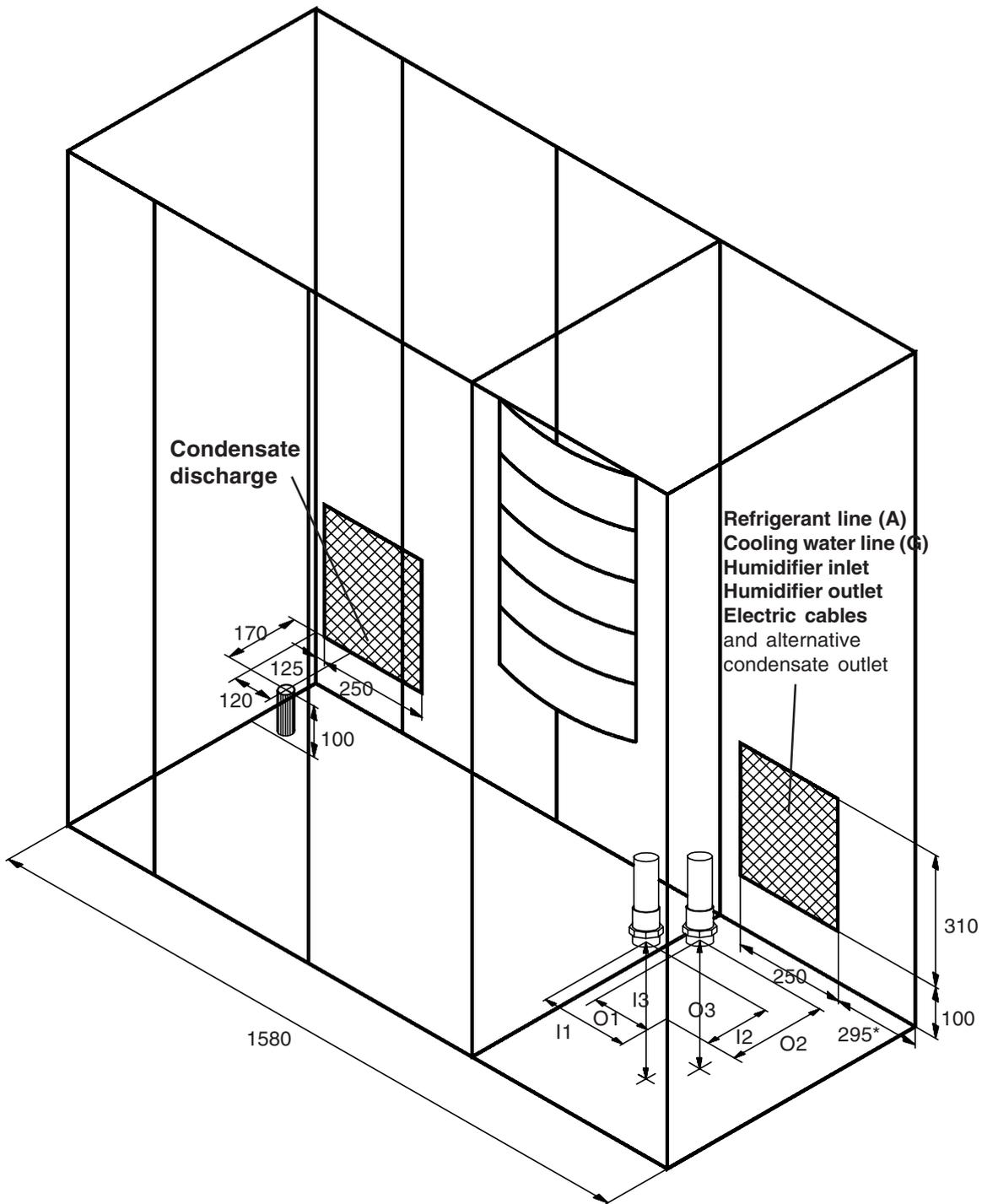


Cooling water line

No. of modules	Dia-meter
1	35
2	42
3	54
4	54



MRU 331 A/G



The dimensions marked with an * increase by 1580 mm for each additional module.

The left drawing shows the cut outs in the panels on the back, through which the supply lines can be routed. Refrigerant lines exist in A-units only, a connection to the pressure line and to the liquid line has to be made for each module. Cooling water lines exist in G-units only, the connection has to be made in the first module. The connections for the humidifier can be found on page 68.

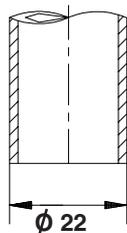
The upflow units are also available with closed rear wall. The openings for the supply lines and the electric cable have to be punched on site.

Dimensions of the cooling water lines

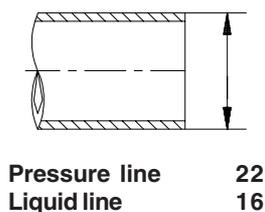
Unit	Inlet			Outlet		
	I1	I2	I3	O1	O2	O3
MRU 331 G	480	490	290	470	610	250
MRU 662 G	470	620	190	470	510	310
MRU 993 G	470	510	310	470	510	310

I1/O1 measured from outer edge of side cover strip
 I2/O2 measured from outer edge of profile
 I3/O3 measured from lower edge of profile

Condensate discharge

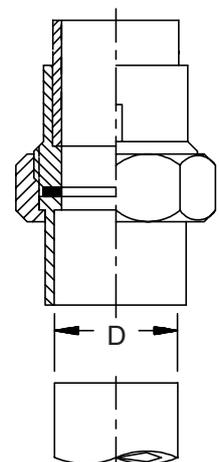


Refrigerant line

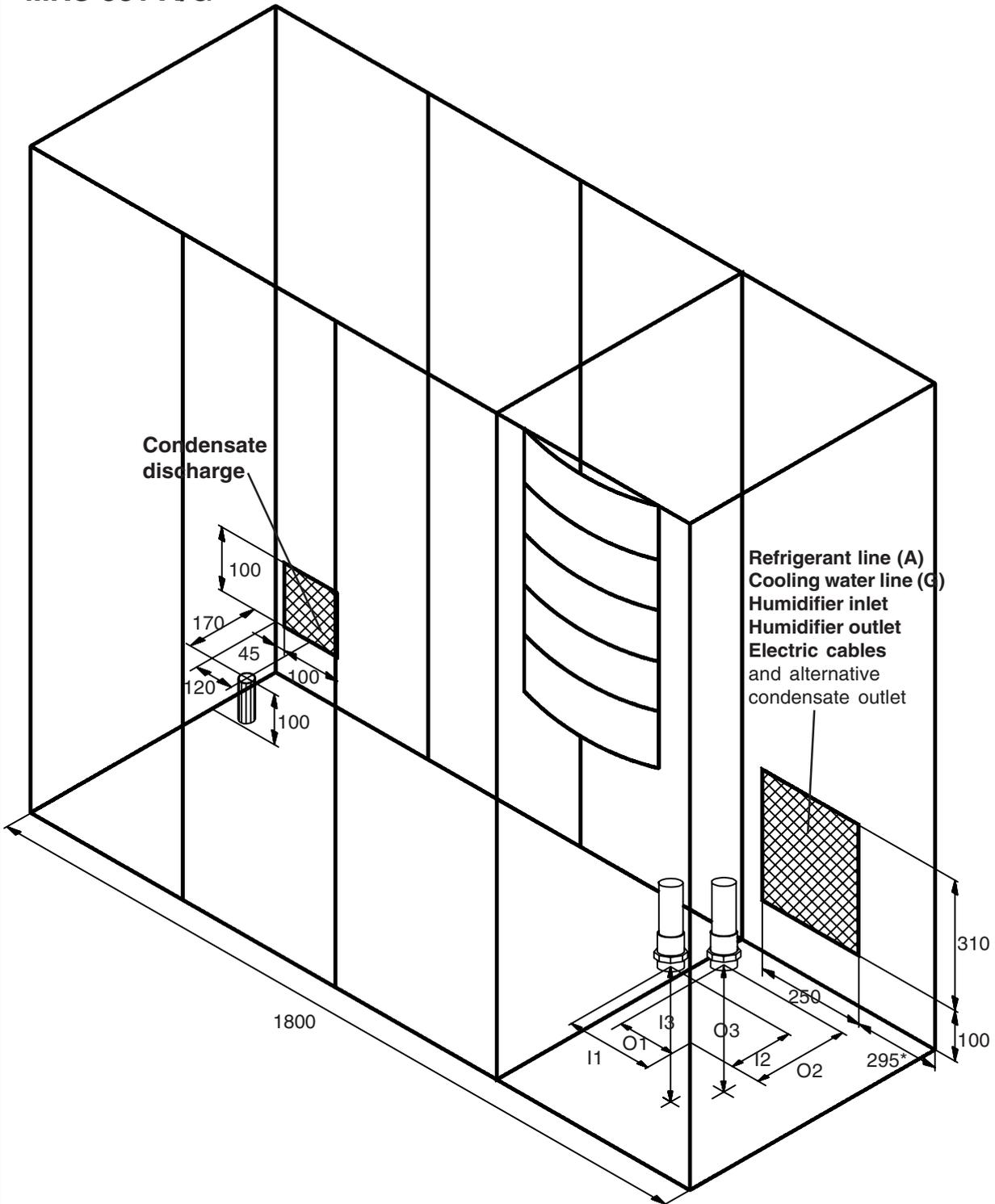


Cooling water line

No. of modules	Dia-meter
1	35
2	54
3	54
4	64



MRU 381 A/G



The dimensions marked with an * increase by 1800 mm for each additional module.

The left drawing shows the cut outs in the panels on the back, through which the supply lines can be routed. Refrigerant lines exist in A-units only, a connection to the pressure line and to the liquid line has to be made for each module. Cooling water lines exist in G-units only, the connection has to be made in the first module. The connections for the humidifier can be found on page 68.

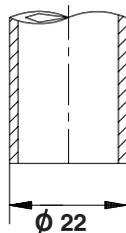
The upflow units are also available with closed rear wall. The openings for the supply lines and the electric cable have to be punched on site.

Dimensions of the cooling water lines

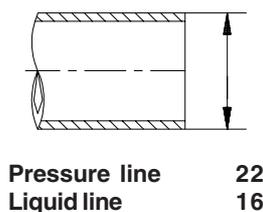
Unit	Inlet			Outlet		
	I1	I2	I3	O1	O2	O3
MRU 381 G	480	490	290	470	610	250
MRU 762 G	470	610	190	470	510	310
MRU 1143 G	470	620	190	470	510	310

I1/O1 measured from outer edge of side cover strip
 I2/O2 measured from outer edge of profile
 I3/O3 measured from lower edge of profile

Condensate discharge

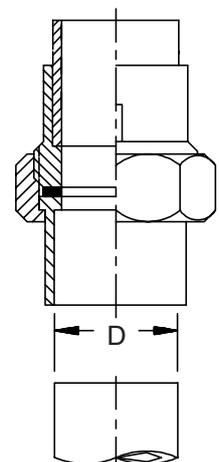


Refrigerant line

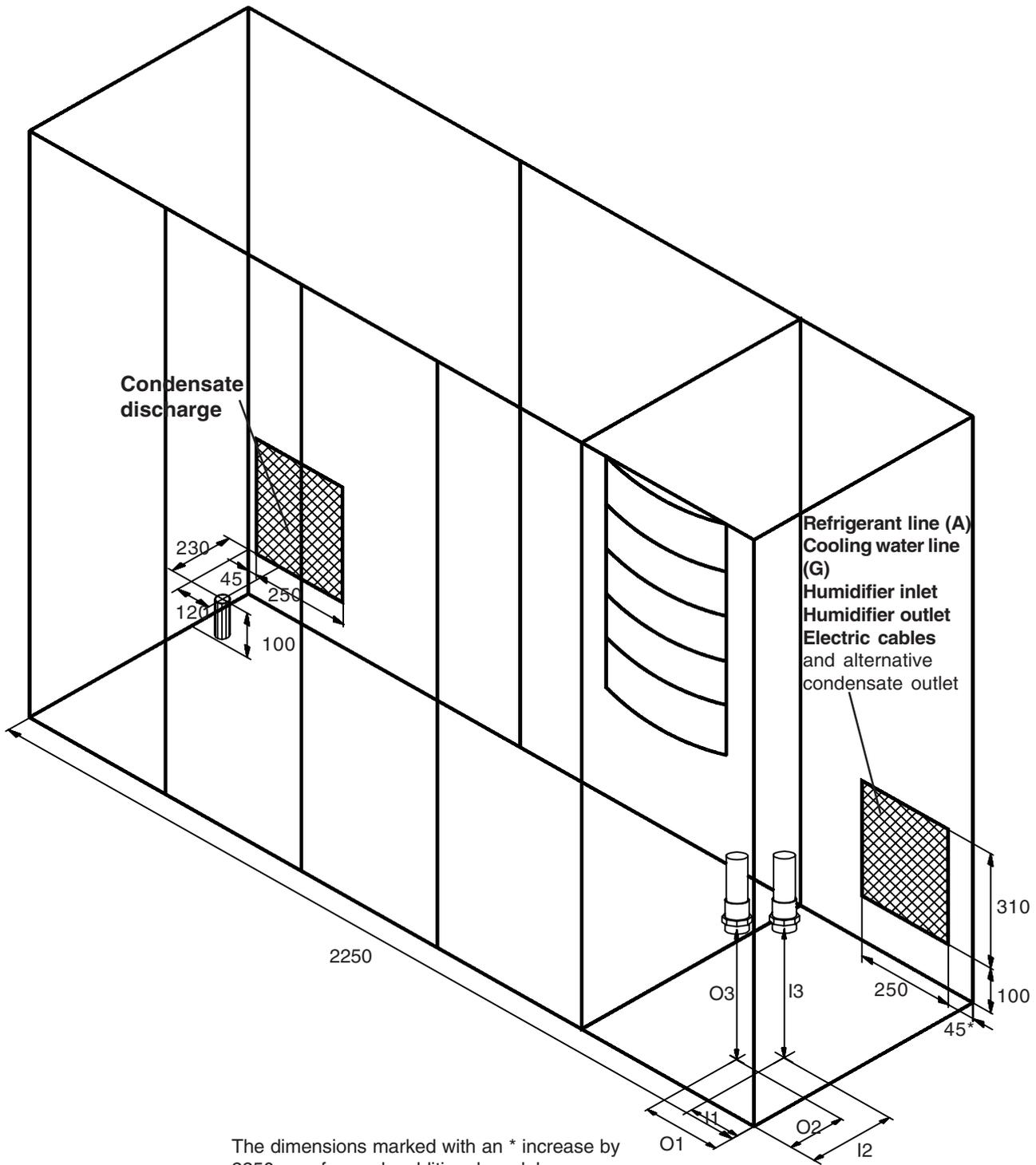


Cooling water line

No. of modules	Dia-meter
1	35
2	54
3	54
4	70



MRU 461 A/G



The dimensions marked with an * increase by 2250 mm for each additional module.

The left drawing shows the cut outs in the panels on the back, through which the supply lines can be routed. Refrigerant lines exist in A-units only, a connection to the pressure line and to the liquid line has to be made for each module. Cooling water lines exist in G-units only, the connection has to be made in the first module. The connections for the humidifier can be found on page 68.

The upflow units are also available with closed rear wall. The openings for the supply lines and the electric cable have to be punched on site.

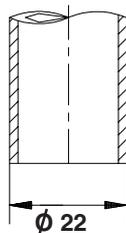
Dimensions of the cooling water lines

Unit	Inlet			Outlet		
	I1	I2	I3	O1	O2	O3
MRU 461 G	373	502	368	373	301	367
MRU 922 G	426	545	241	283	332	374
MRU 1383 G	140	590	296	340	590	296

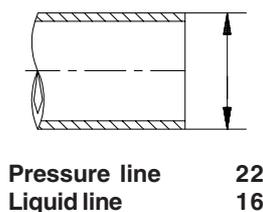
I1/O1 measured from outer edge of side cover strip
 I2/O2 measured from outer edge of profile
 I3/O3 measured from lower edge of profile

*small pump cabinet (450) required.

Condensate discharge

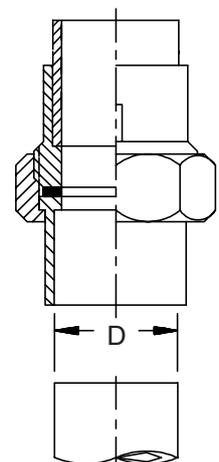


Refrigerant line



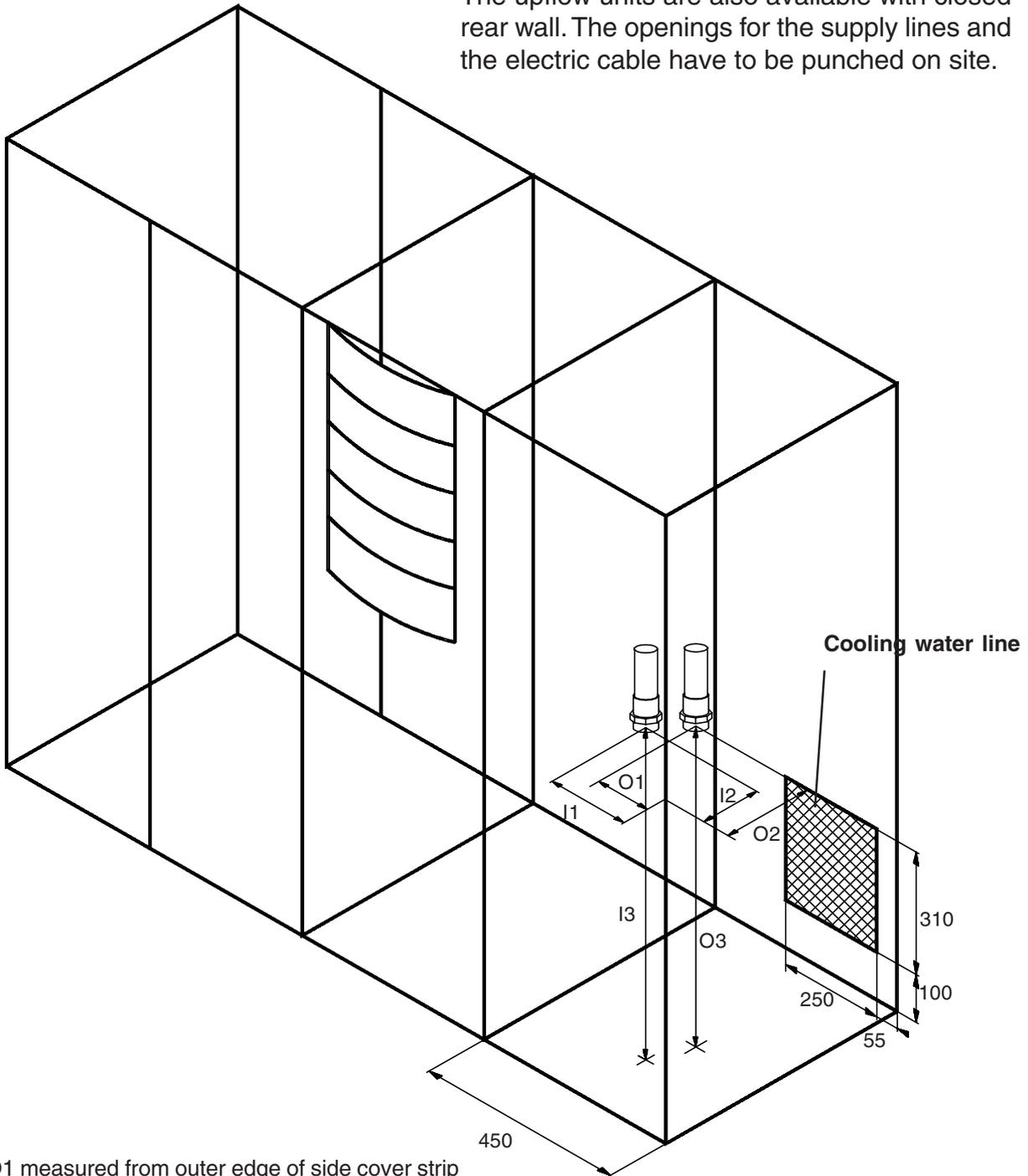
Cooling water line

No. of modules	Dia-meter
1	42
2	54
3	54
4	on request



GE units with small pump cabinet (version without pump, version with 1 pump)

The upflow units are also available with closed rear wall. The openings for the supply lines and the electric cable have to be punched on site.



I1/O1 measured from outer edge of side cover strip
 I2/O2 measured from outer edge of profile
 I3/O3 measured from lower edge of profile

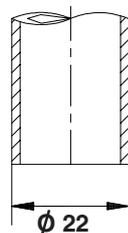
The left drawing shows the cut outs in the panels on the back, through which the supply lines can be routed. The connection of the cooling water lines has to be made in the pump cabinet. All other supply lines are routed as in the A/G units. The connections for the humidifier can be found on page 68.

Dimensions of the cooling water lines

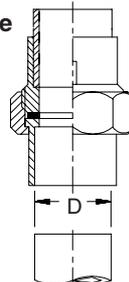
	Unit	Inlet			Outlet		
		I1	I2	I3	O1	O2	O3
Version without pump	MRU 181 GE	140	160	880	140	280	650
	MRU 362 GE	140	160	880	140	280	650
	MRU 543 GE	140	160	880	140	280	650
	MRU 261 GE	140	160	880	140	280	650
	MRU 522 GE	120	140	880	90	300	670
	MRU 783 GE	100	120	860	120	210	610
	MRU 331 GE	140	160	880	140	280	650
	MRU 662 GE	120	100	850	120	210	610
	MRU 993 GE	120	100	850	120	210	610
	MRU 381 GE	120	140	880	120	280	650
	MRU 762 GE	120	100	890	120	210	610
	MRU 1143 GE	120	100	850	120	210	610
Version with 1 pump	MRU 461 GE	128	180	967	128	419	693
	MRU 922 GE	127	205	933	128	419	693
	MRU 1383 GE	358	119	890	284	179	650
	MRU 181 GE	140	160	800	140	280	640
	MRU 362 GE	140	160	800	140	280	640
	MRU 543 GE	120	140	800	120	280	640
	MRU 261 GE	140	160	800	140	280	640
	MRU 522 GE	120	140	800	120	280	640
	MRU 783 GE	120	120	830	120	210	610
	MRU 331 GE	140	160	800	140	280	640
	MRU 662 GE	120	120	830	120	210	610
	MRU 993 GE	120	120	830	120	210	610
MRU 381 GE	120	140	800	120	280	640	
MRU 762 GE	120	120	830	120	210	610	
MRU 1143 GE	120	120	830	120	210	610	
MRU 461 GE	128	205	917	128	419	693	
MRU 922 GE	128	205	917	128	419	693	
MRU 1383 GE*	240	179	650	286	279	527	

* large pump cabinet (680) required.

Condensate discharge



Cooling water line



Piping diameter

No. of modules	Size of module				
	181	261	331	381	461
1	42	42	42	42	42
2	42	42	54	54	54
3	42	54	54	54	54
4	42	54	64	76	*

* on request

The left drawing shows the cut outs in the base plate, through which the supply lines can be routed. The connection of the cooling water lines has to be made in the pump cabinet. All other supply lines are routed as in the A/G units. The connections for the humidifier can be found on page 68.

The upflow units are also available with closed rear wall. The openings for the supply lines and the electric cable have to be punched on site.

Dimensions of the cooling water lines

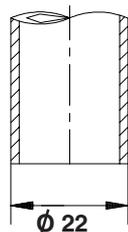
Unit	Inlet			Outlet		
	I1	I2	I3	O1	O2	O3
MRU 181 GE	370	160	800	370	280	640
MRU 362 GE	370	160	800	370	280	640
MRU 543 GE	350	140	800	350	280	640
MRU 261 GE	370	160	800	370	280	640
MRU 522 GE	350	140	800	350	280	640
MRU 783 GE	350	120	830	350	210	610
MRU 331 GE	370	160	800	370	280	640
MRU 662 GE	350	120	830	350	210	610
MRU 993 GE	350	120	830	350	210	610
MRU 381 GE	350	140	800	350	280	640
MRU 762 GE	350	120	830	350	210	610
MRU 1143 GE	350	120	850	350	210	610
MRU 461 GE	358	205	917	358	419	693
MRU 922 GE	358	205	917	358	419	693
MRU 1383 GE*	408	179	650	454	279	527

Version with 2 pumps

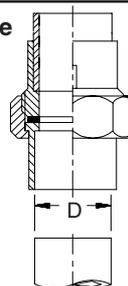
I1/O1 measured from outer edge of side cover strip
 I2/O2 measured from outer edge of profile
 I3/O3 measured from lower edge of profile

* spec. pump cabinet (900) required.

Condensate discharge



Cooling water line



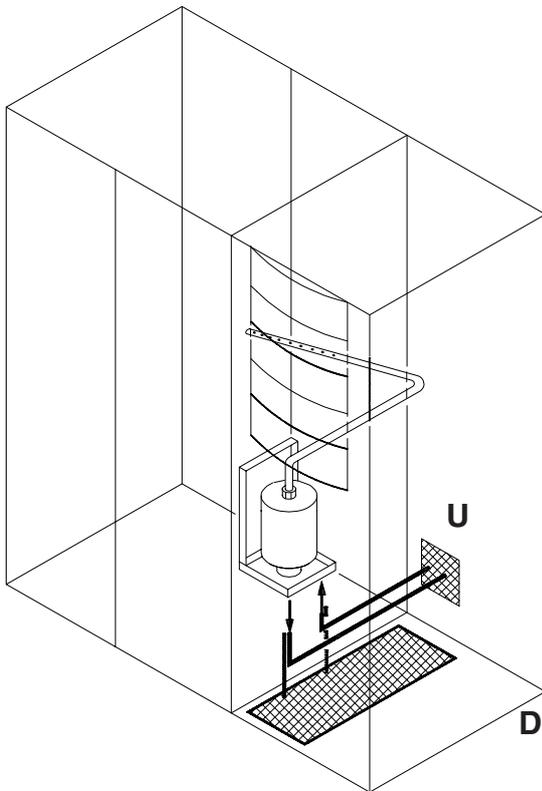
Piping diameter

No. of modules	Size of module				
	181	261	331	381	461
1	42	42	42	42	42
2	42	42	54	54	54
3	42	54	54	54	54
4	42	54	64	76	*

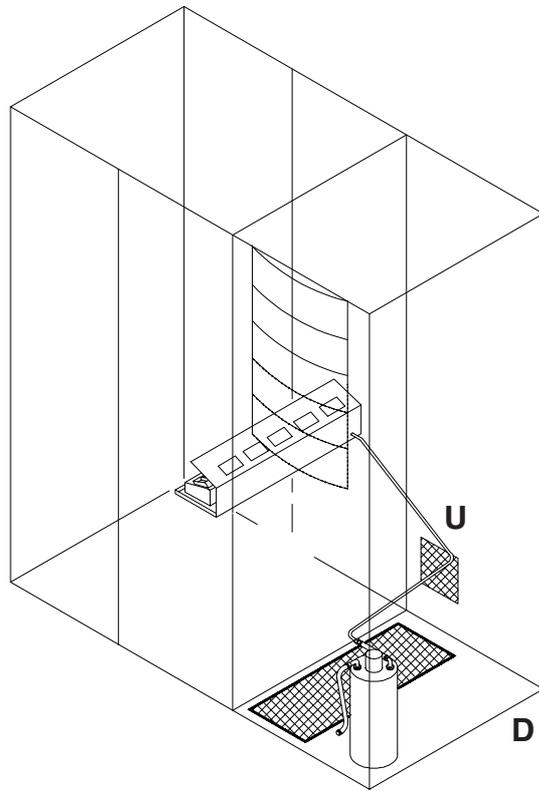
* on request

Supply connections of humidifiers

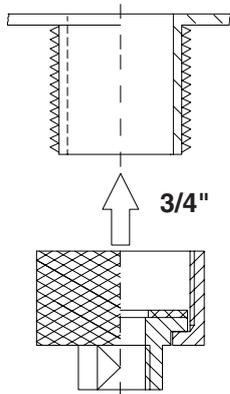
Steam humidifier



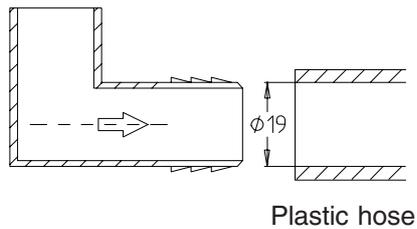
Ultrasonic humidifier



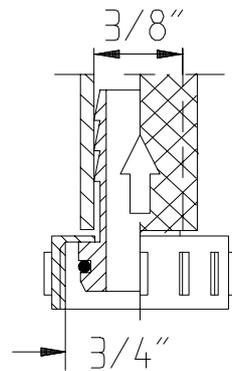
Steam humidifier Inlet



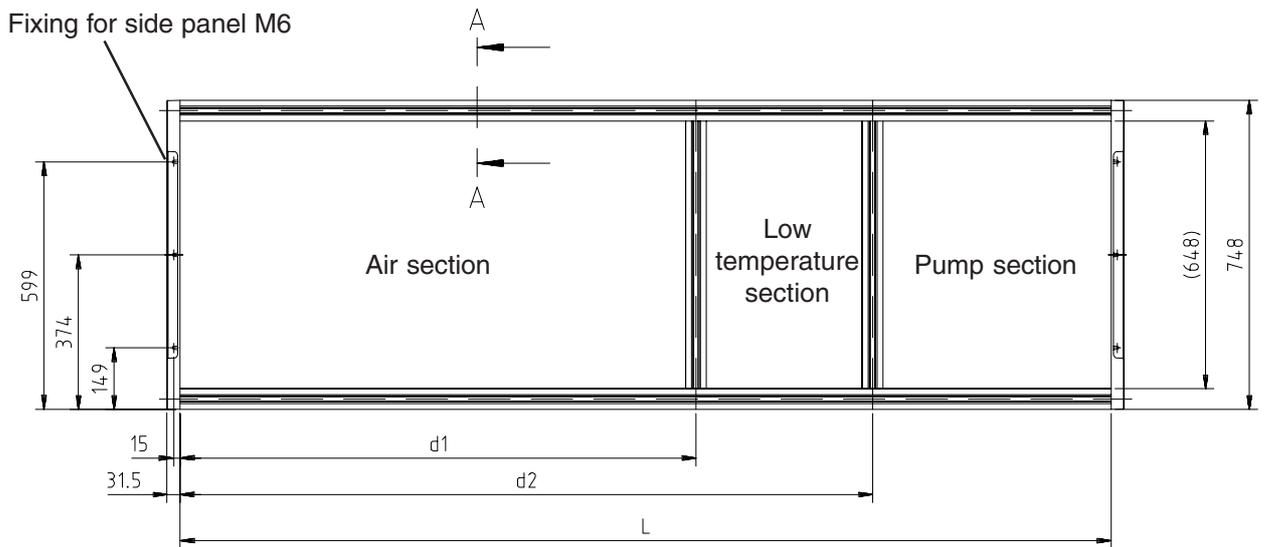
Steam humidifier Outlet



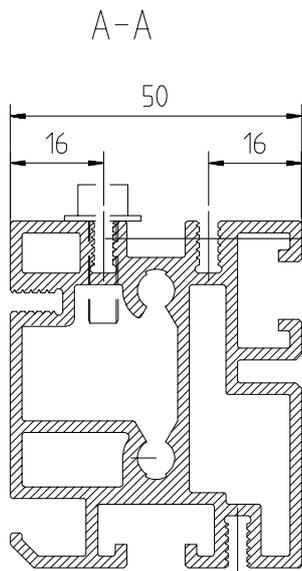
Ultrasonic humidifier Inlet



Duct connections on unit frame, on the top of the unit



		Basic units	Basic units with one pumps	Basic units with two pumps	
	d1	L	L	d2	L
MRD/U 181	688.5	1067	1517	1092	1747
MRD/U 261	858.5	1287	1737	1315	1967
MRD/U 331	1018.5	1517	1967	1545	2197
MRD/U 381	1238.5	1737	2187	1765	2417
MRD/U 461	1688.5	2187	2637	2215	2867



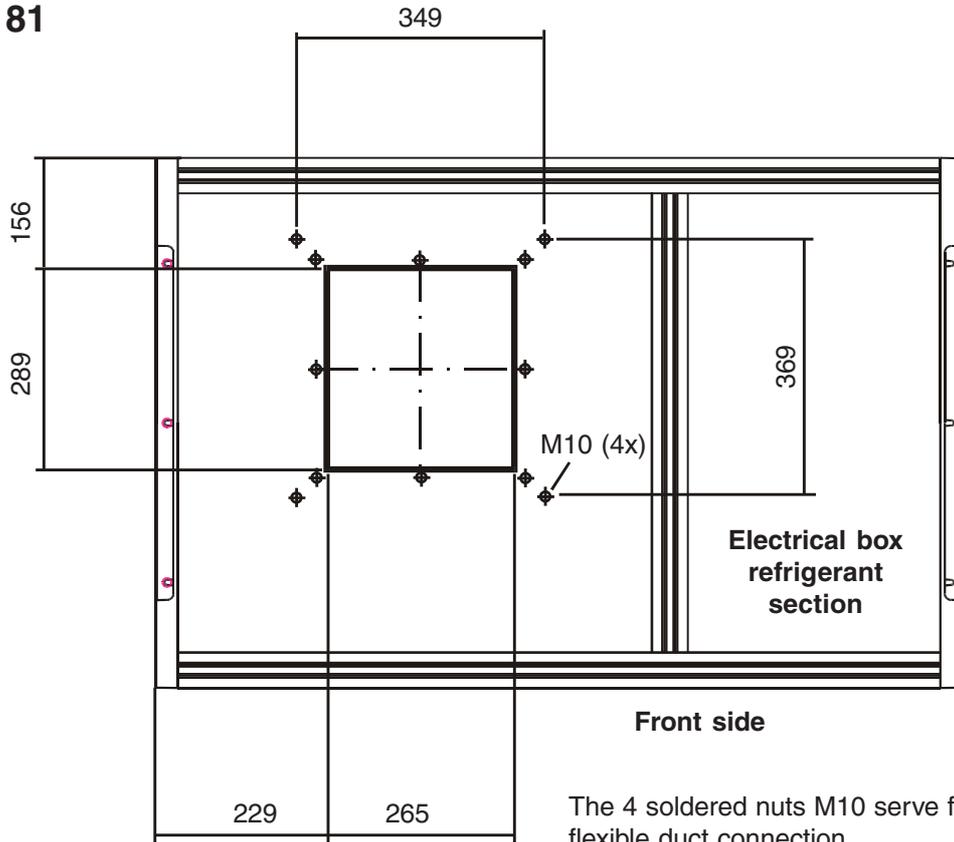
The drawing above shows the dimensions of the aluminium sections to which the air duct is attached using St.4.9. sheet metal screws.

The aluminium section is shown in the cross section in the diagram opposite.

Here, a canvas connecting piece or a duct can be secured with M8 bolts. The thread must be cut by hand.

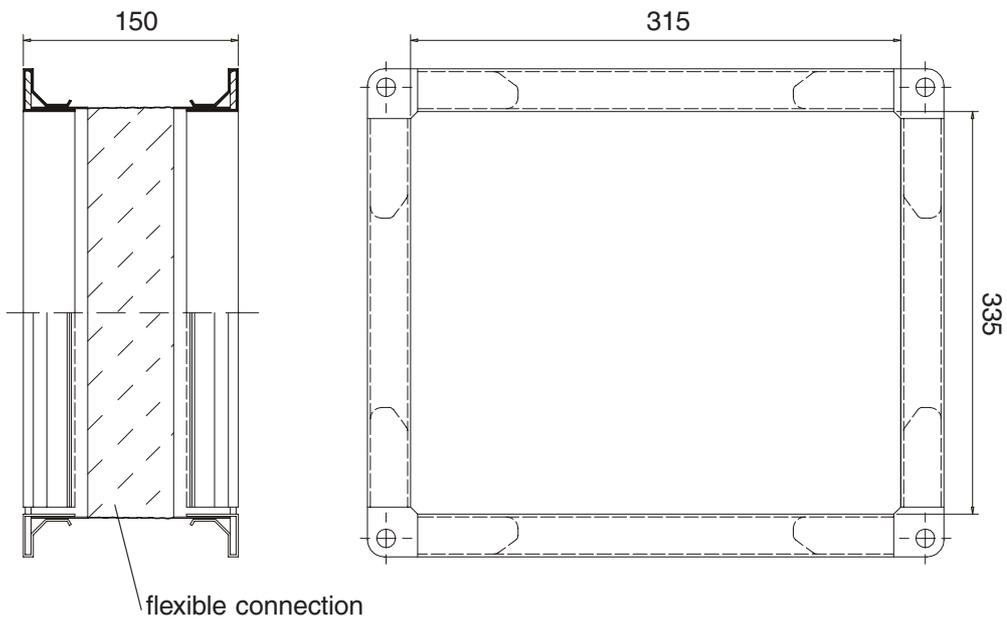
Duct connections on fan - Upflow

MRU 181

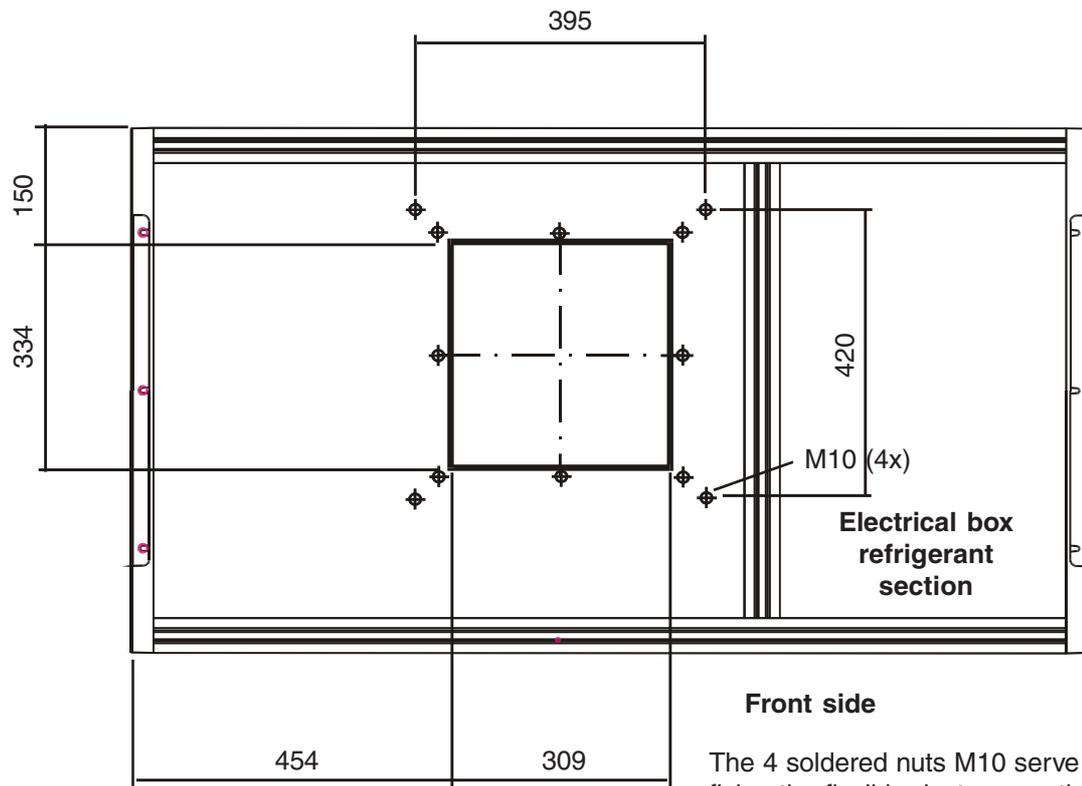


The 4 soldered nuts M10 serve for fixing the flexible duct connection.

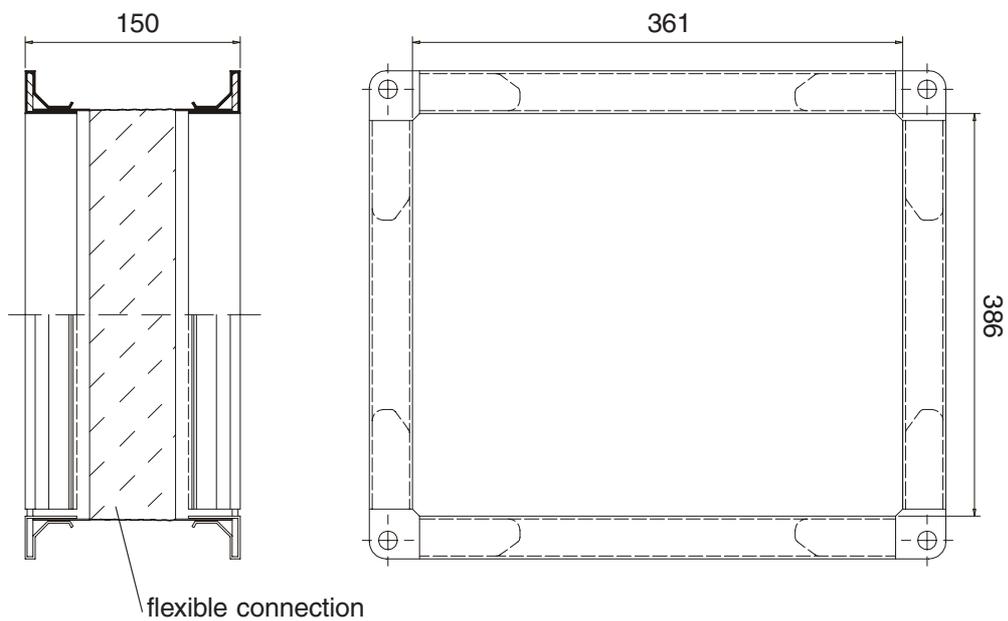
Flexible duct connection:



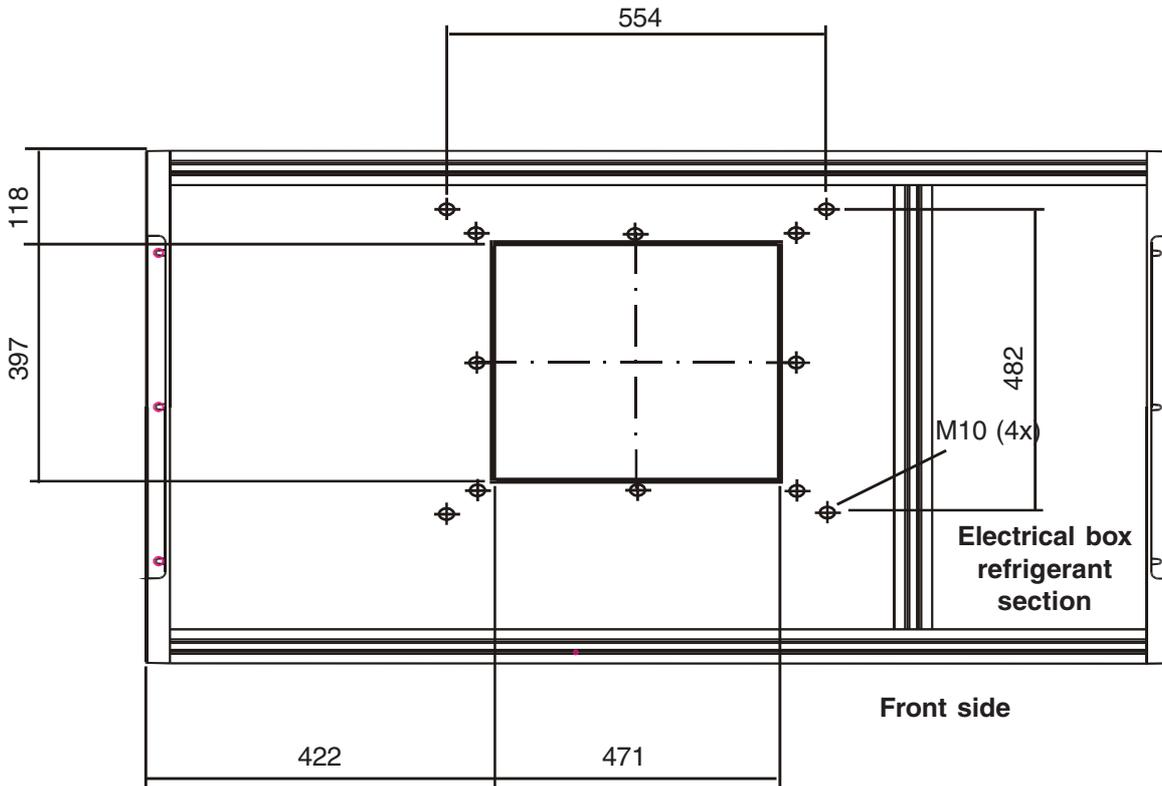
MRU 261



Flexible duct connection:

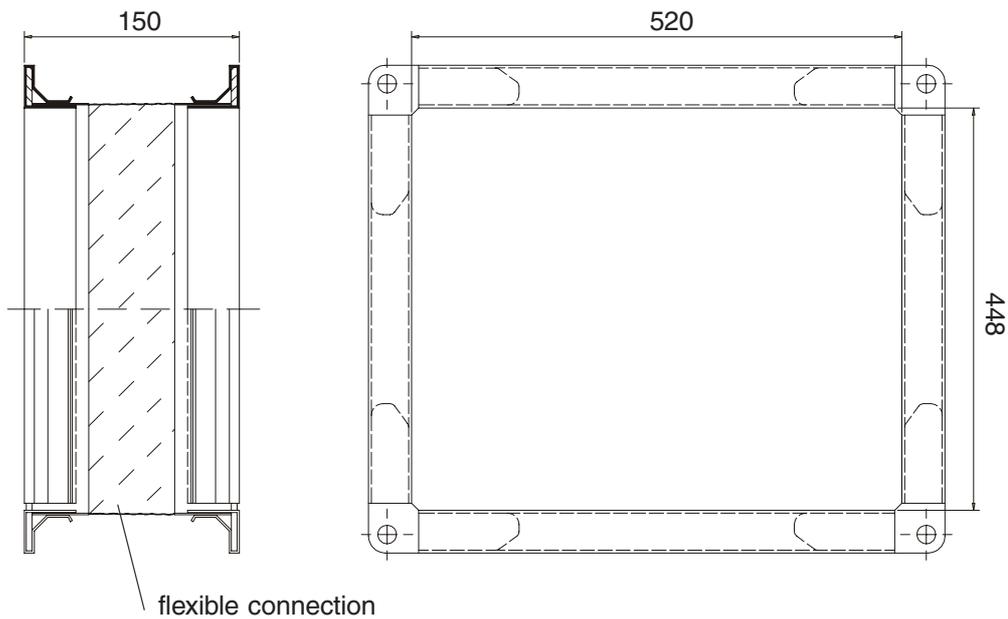


MRU 331

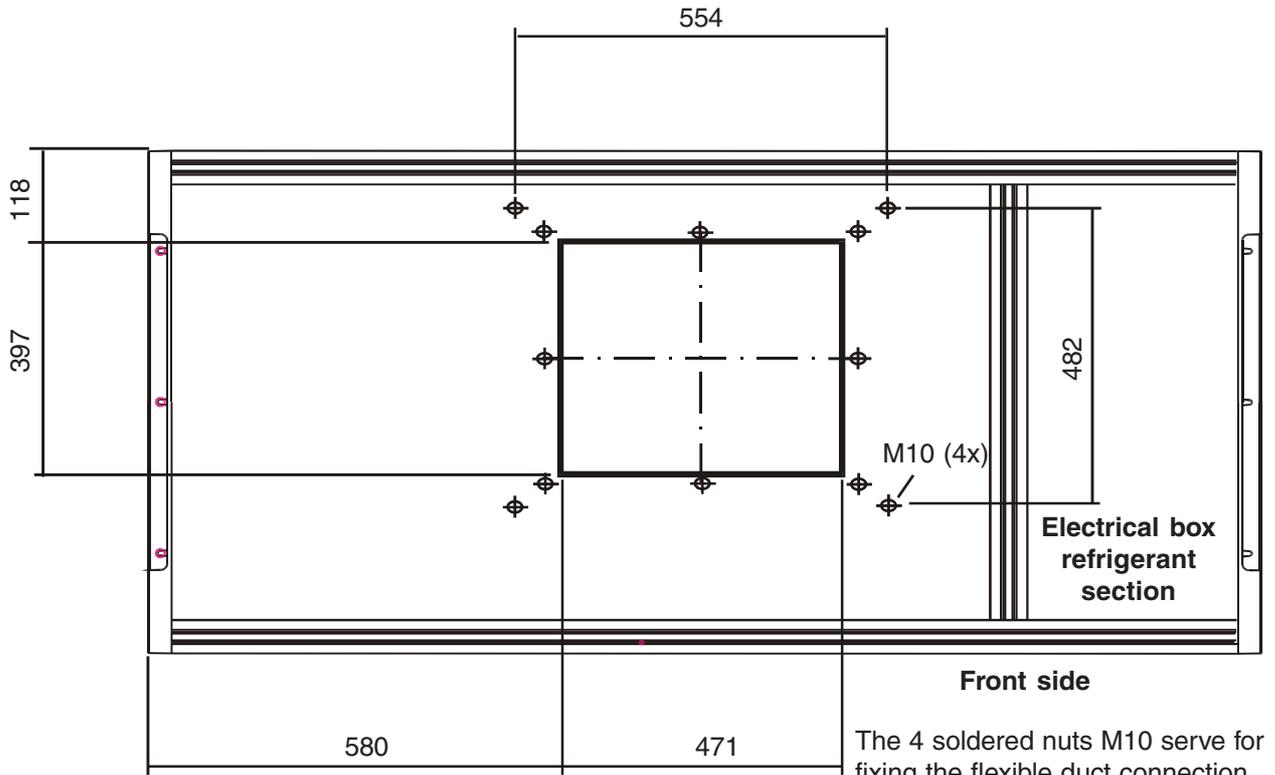


The 4 soldered nuts M10 serve for fixing the flexible duct connection.

Flexible duct connection:

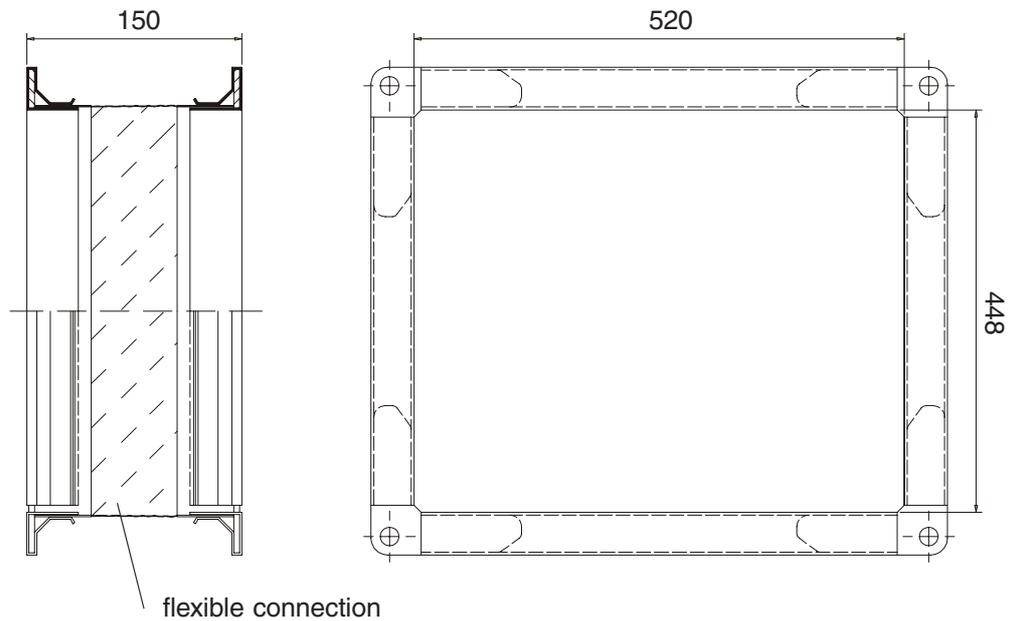


MRU 381

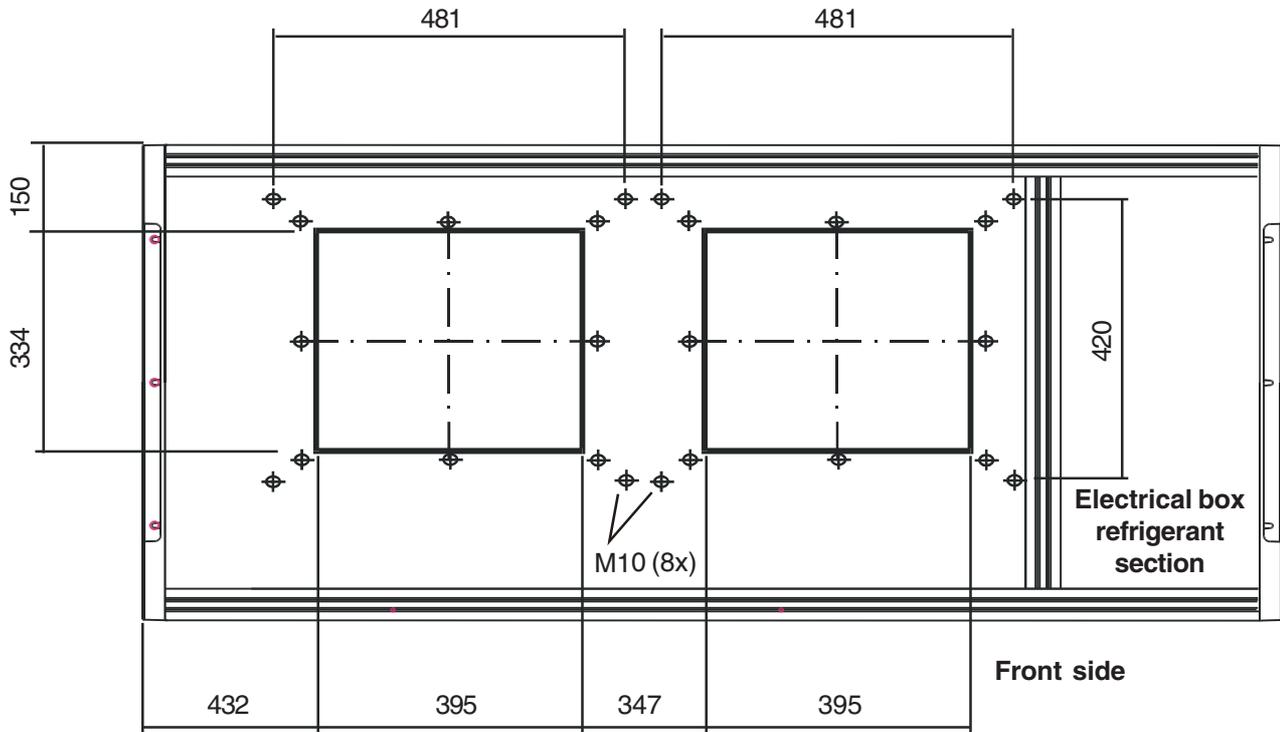


The 4 soldered nuts M10 serve for fixing the flexible duct connection.

Flexible duct connection:

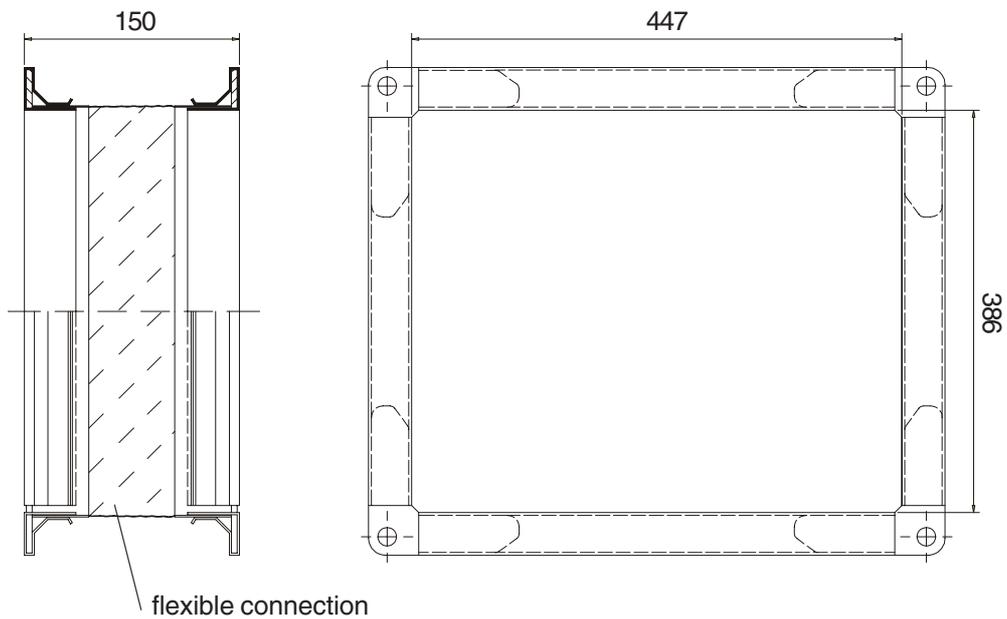


MRU 461



The 4 soldered nuts M10 serve for fixing the flexible duct connection.

Flexible duct connection: 2x

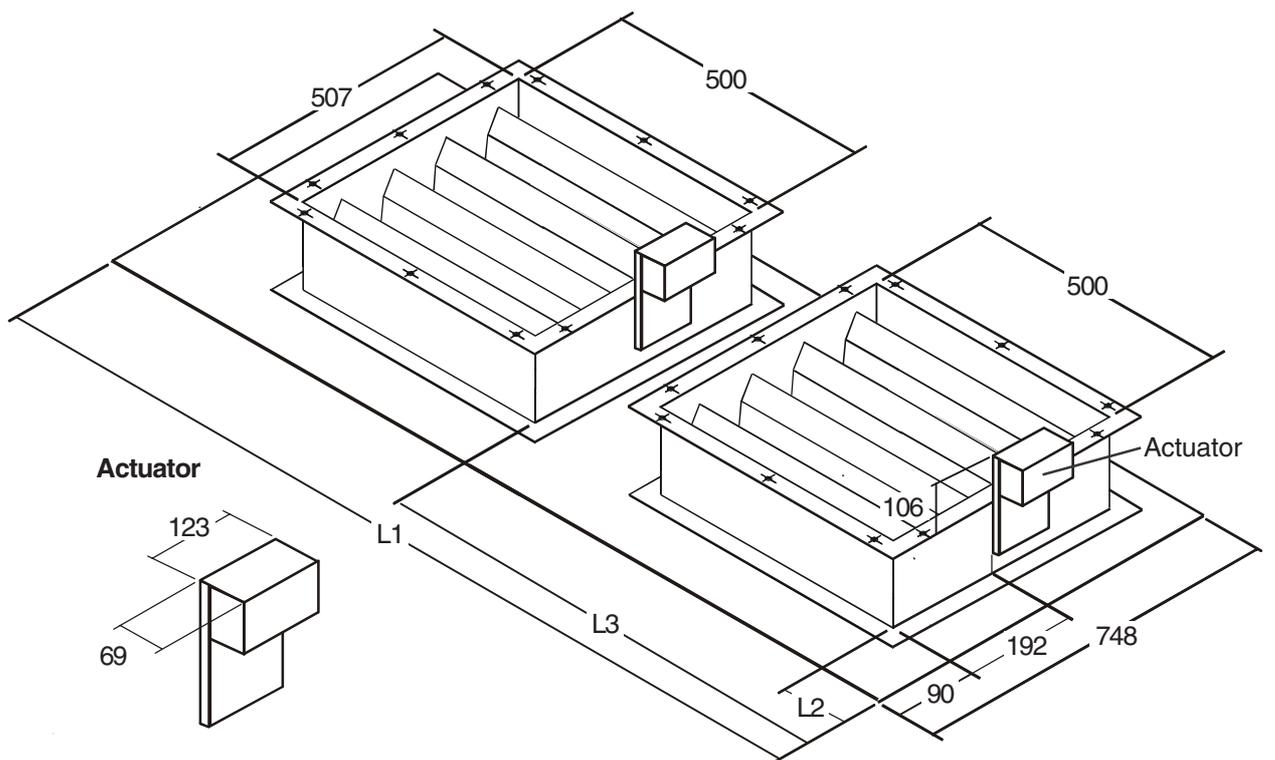
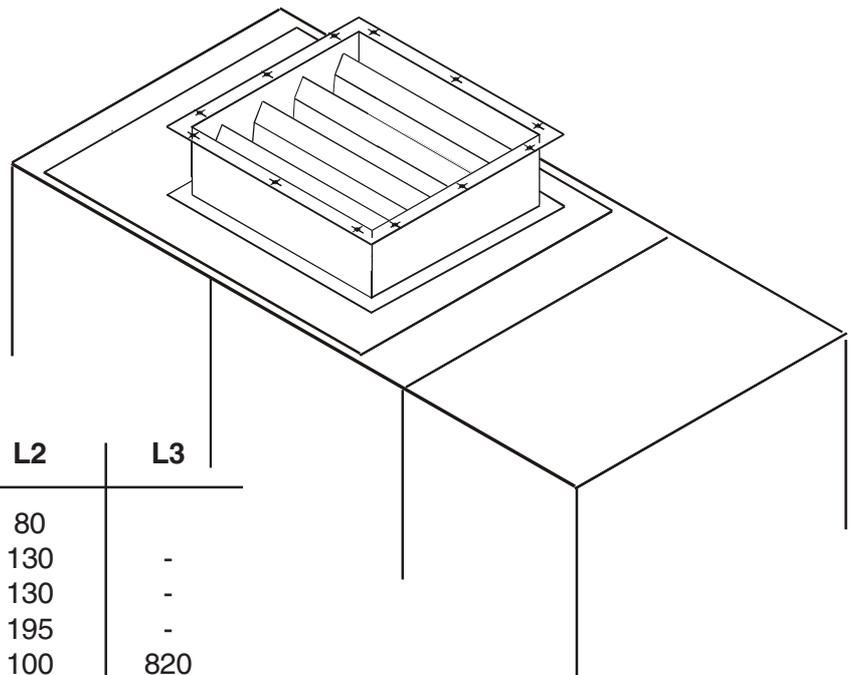


Damper at the discharge - Upflow

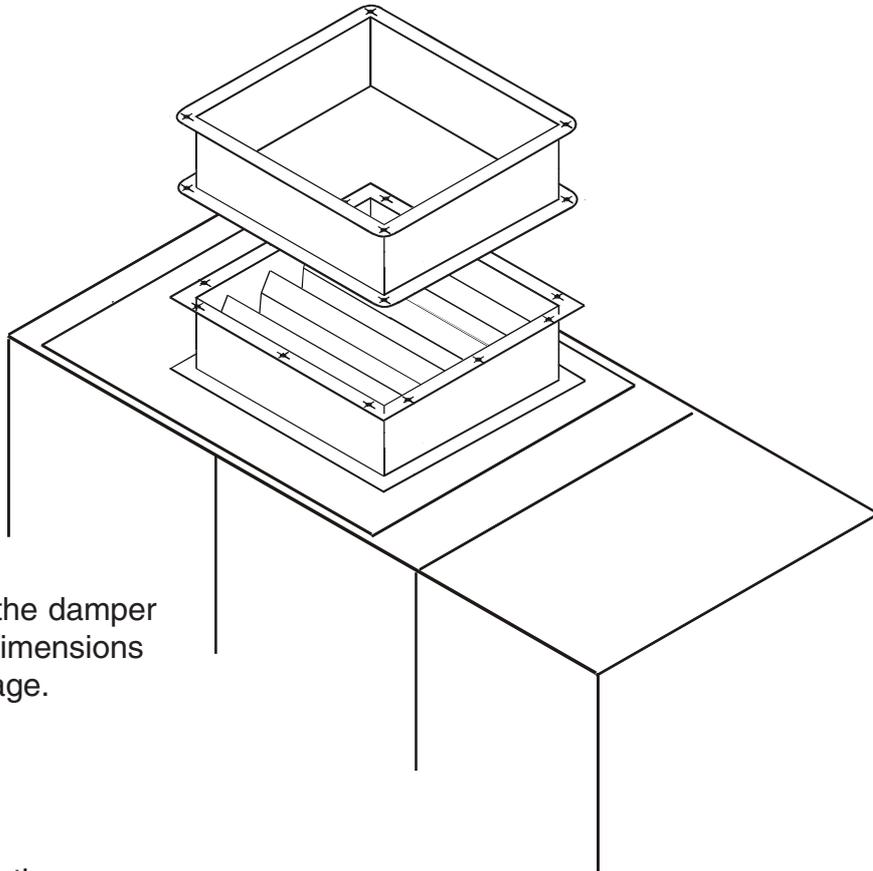
Dimensions

Size for
a single-module
A/C unit

	L1	L2	L3
MRU 181	725	80	-
MRU 261	895	130	-
MRU 331	1055	130	-
MRU 381	1275	195	-
MRU 461	1725	100	820

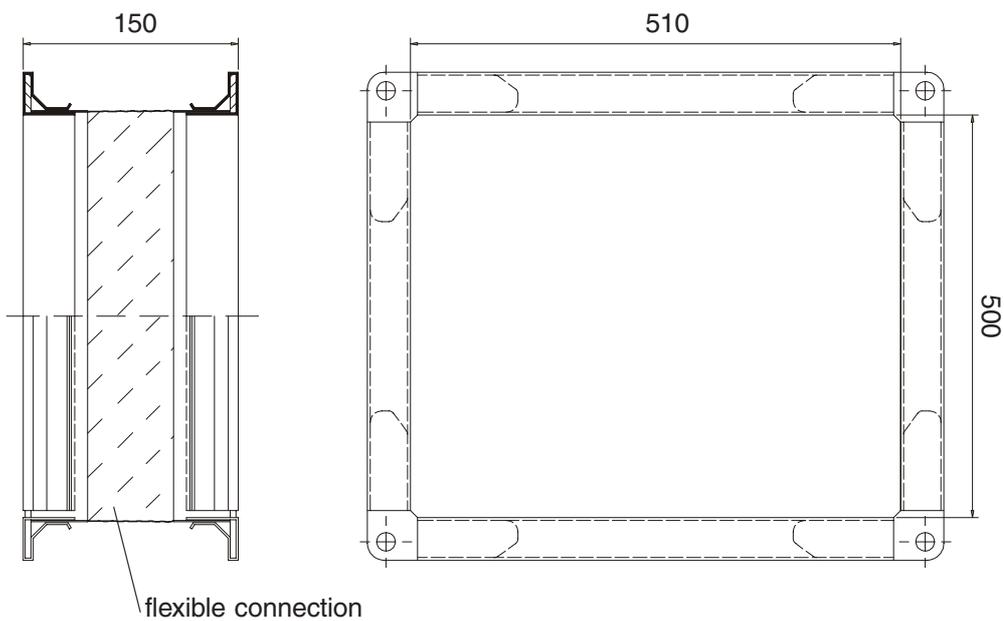


Damper with flexible duct connection at the discharge - Upflow

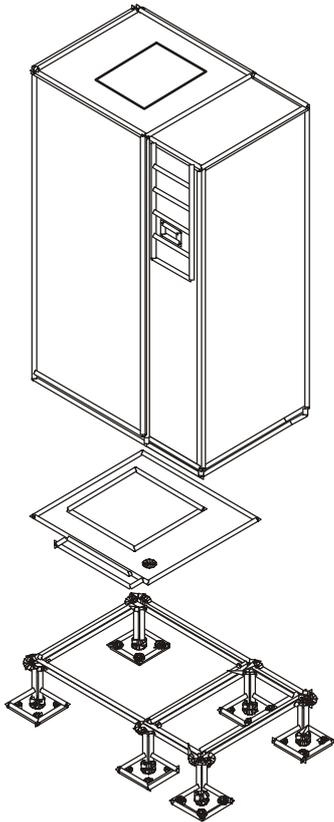


The dimensions of the damper correspond to the dimensions on the preceding page.

Flexible duct connection:



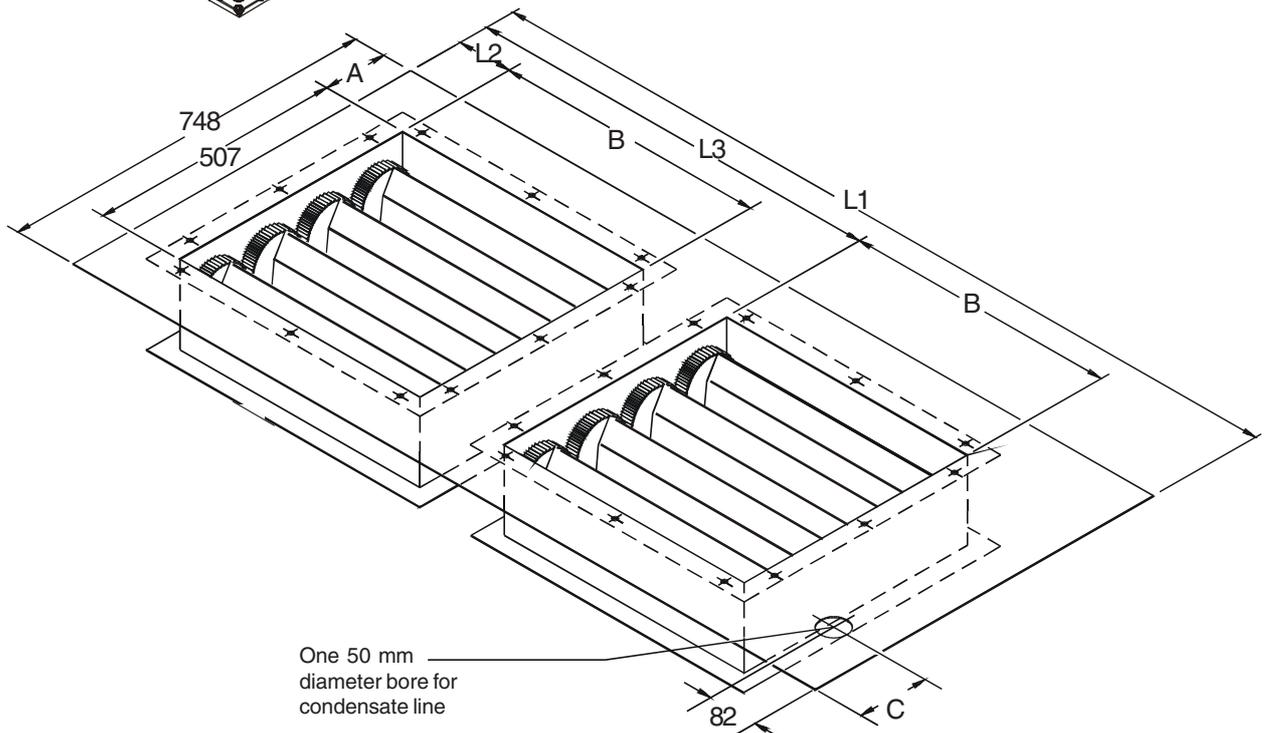
Damper on suction side below the unit - Upflow



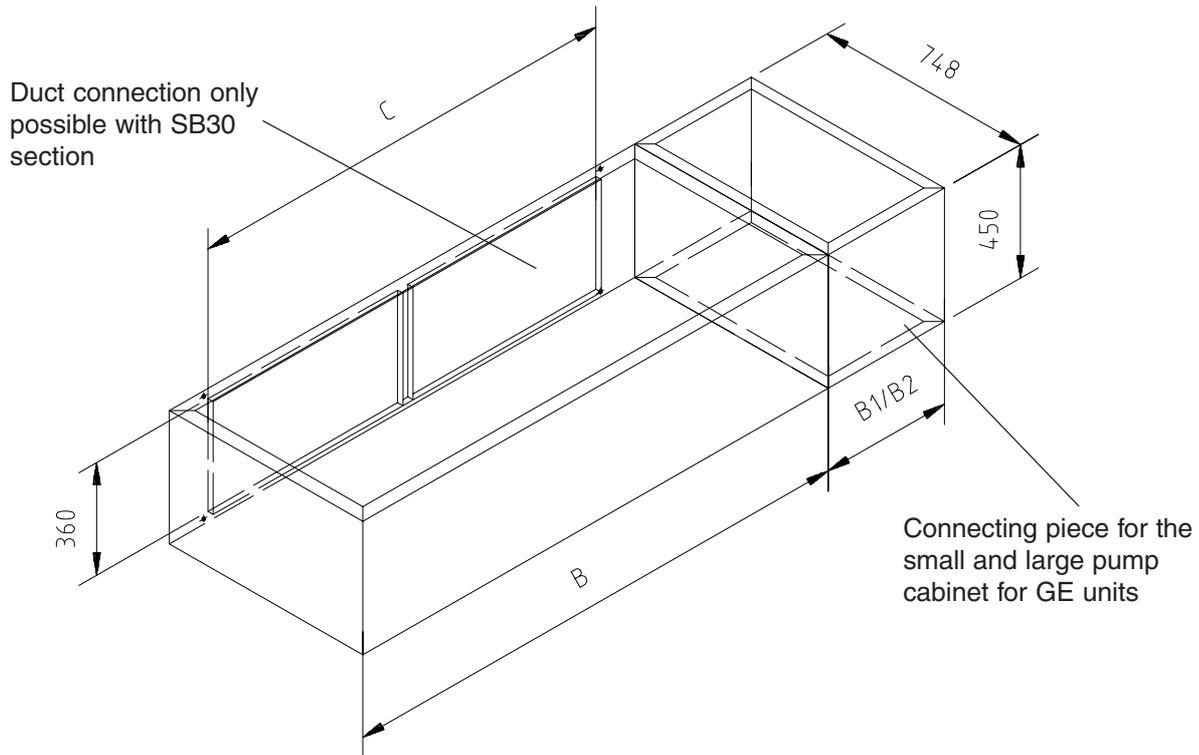
Dimensions

Size for
a single-module
A/C unit

	L1	L2	L3	A	B	C
MRU 181	725	80	-	90	500	97
MRU 261	895	130	-	90	700	82
MRU 331	1055	130	-	90	800	82
MRU 381	1275	195	-	80	1000	82
MRU 461	1725	112.5	831.5	90	600	82



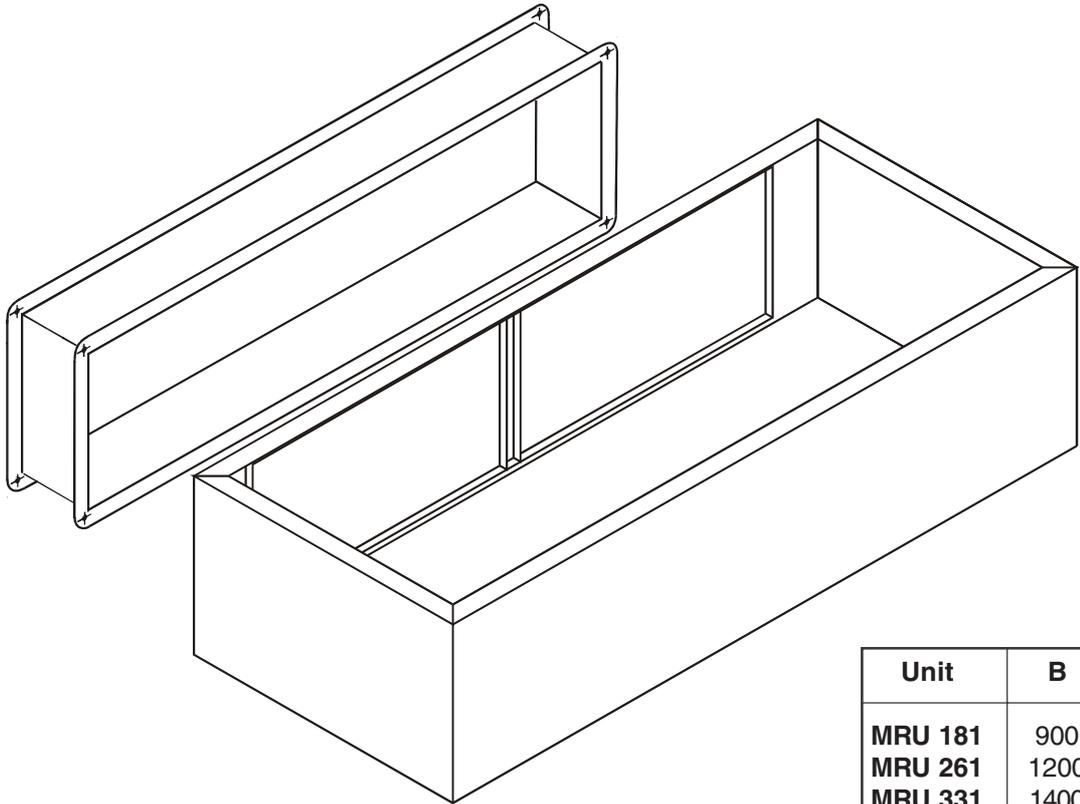
Unit base for return air suction - upflow



Attention ! The base must be bolted to the unit !

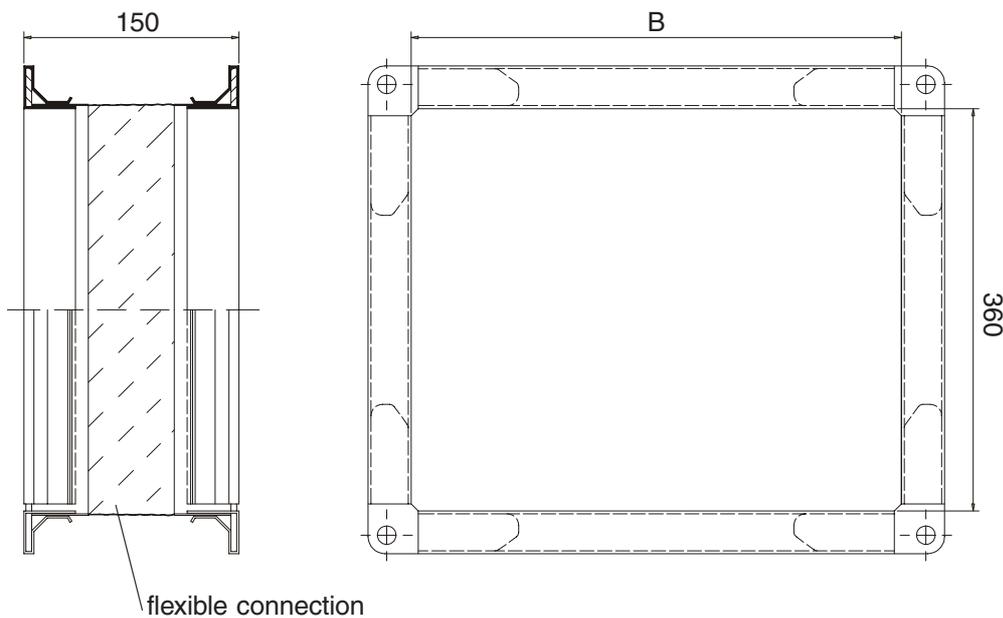
Unit	B	B1 / B2	C
MRU 181	1130	450 / 680	900
MRU 261	1350	450 / 680	1200
MRU 331	1580	450 / 680	1400
MRU 381	1800	450 / 680	1600
MRU 461	2250	450 / 680	1600

Flexible duct connection at the unit base - Upflow

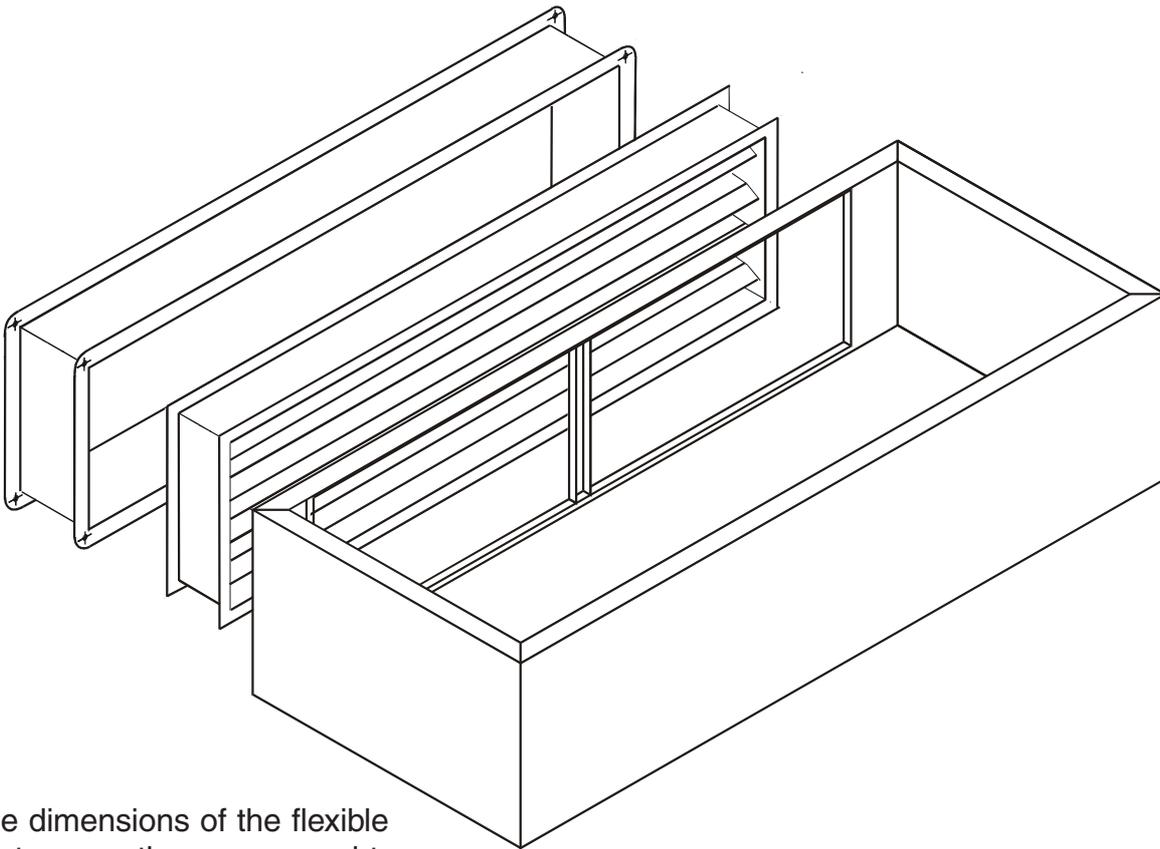


Unit	B
MRU 181	900
MRU 261	1200
MRU 331	1400
MRU 381	1600
MRU 461	1600

Flexible duct connection:

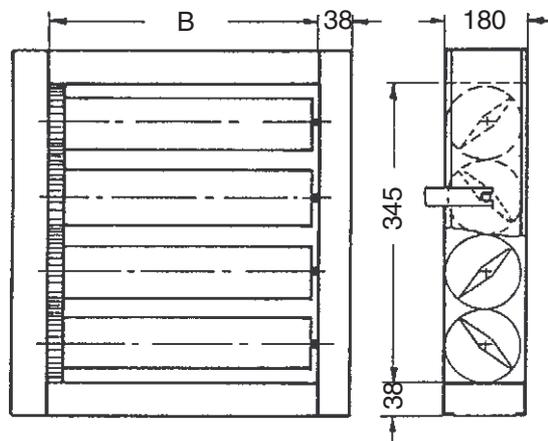


Flexible duct connection and damper at the unit base - Upflow

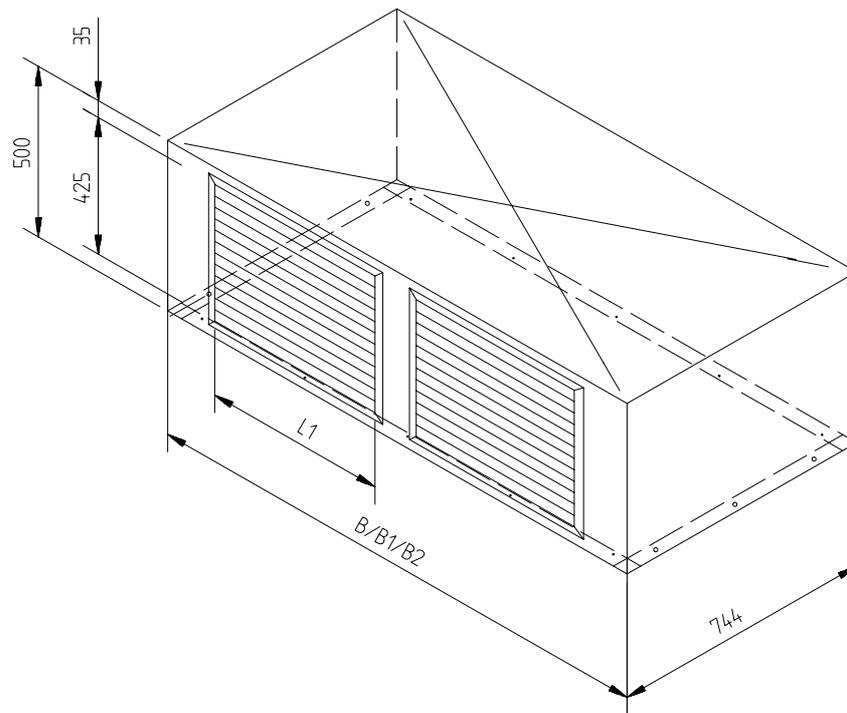


The dimensions of the flexible duct connection correspond to the dimensions on the preceding page.

Unit	B
MRU 181	900
MRU 261	1200
MRU 331	1400
MRU 381	1600
MRU 461	1600



Air discharge plenum - Upflow



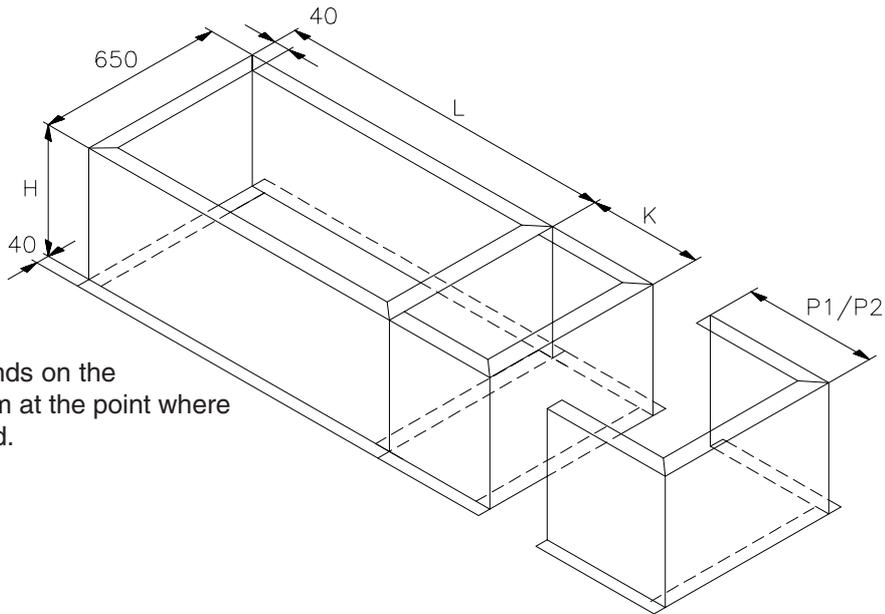
Unit	B	B1	B2	L1 for B/B1/B2
MRU 181	1128	1578	1808	825 / 1225 / 2x825
MRU 261	1348	1798	2028	1225 / 2x825 / 2x825
MRU 331	1578	2028	2258	1225 / 2x825 / 2x1025
MRU 381	1798	2248	2478	2x825 / 2x1025 / 2x1025
MRU 461	2248	2698	2928	2x1025 / 2x1025 / 2x1025

Explanatory notes:

Dimension **B** applies to a unit without a pump cabinet, dimension **B1** applies to a GE unit with a small pump cabinet and correspondingly the dimension **B2** for a GE unit with a large pump cabinet. The length of the grille on the front of the unit is given by the dimension **L1**.

On an MRU 381 GE with a small pump cabinet there is, for example, two front grilles with a length of 1025 and height of 425, which is the same for all models for the front grille and also for the side grille.

Suction duct - downflow / Discharge duct - upflow

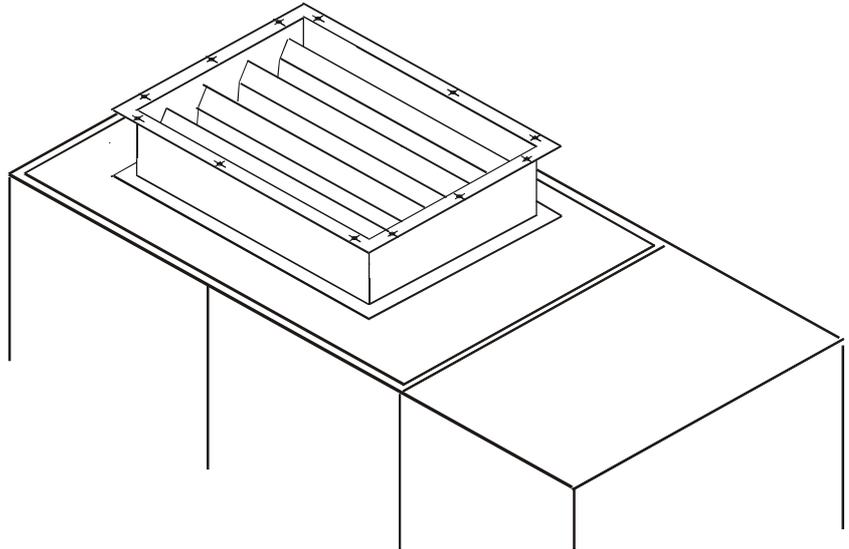


The height depends on the height of the room at the point where the unit is located.

The shoulder piece with the width K covers the low temperature section and the electrical box. The side-mounting piece covers the small (P1) or the large (P2) pump cabinet.

Unit	L	K	P1 / P2
MRD/U 181	745	384	450 / 680
MRD/U 261	915	434	450 / 680
MRD/U 331	1075	504	450 / 680
MRD/U 381	1295	504	450 / 680
MRD/U 461	1745	504	450 / 680

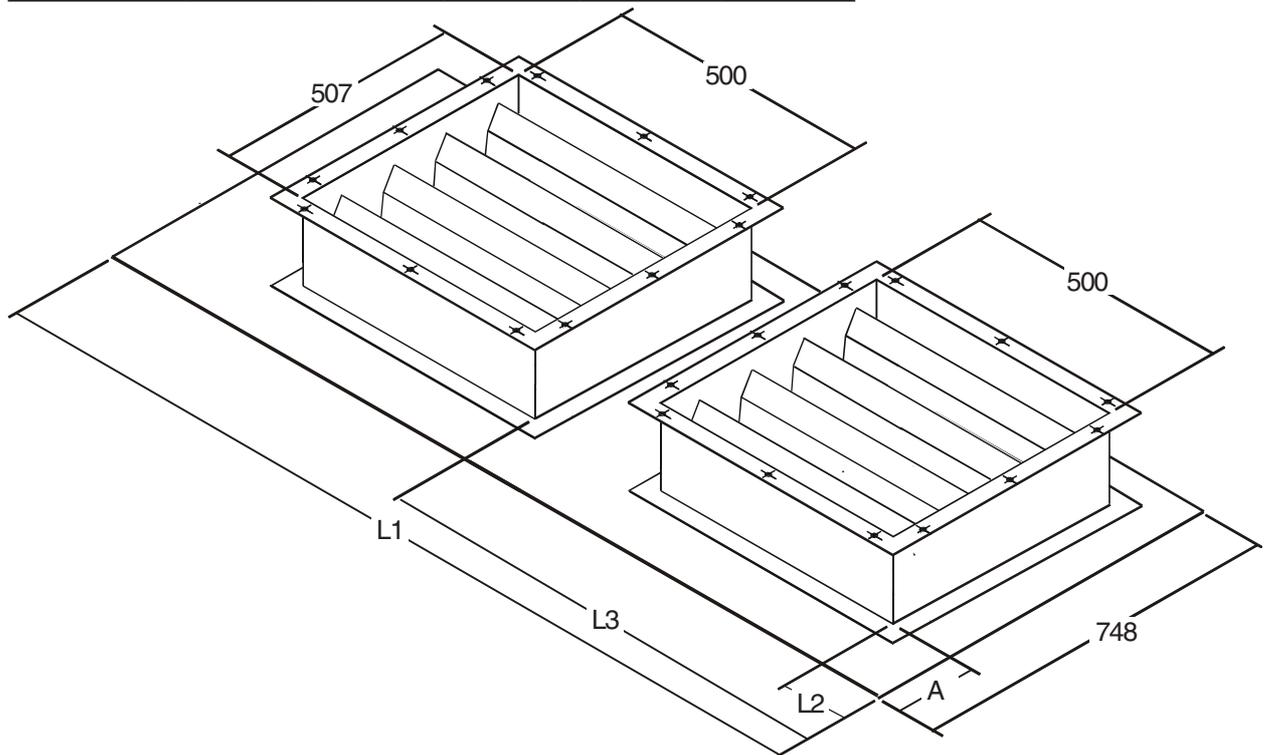
Damper on suction side on the air section - Downflow



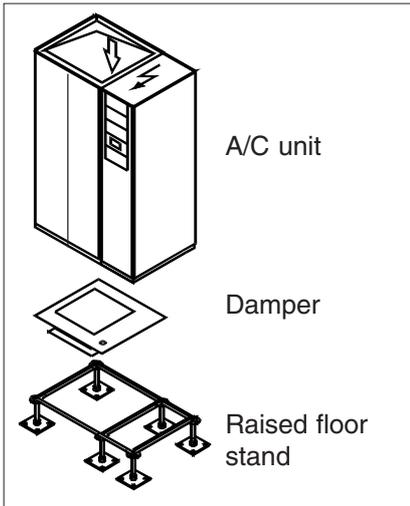
Dimensions

Size for
a single-module
A/C unit

	L1	L2	L3	A	B
MRD 181	725	80	-	90	500
MRD 261	895	130	-	90	700
MRD 331	1055	130	-	90	800
MRD 381	1275	195	-	80	1000
MRD 461	1725	112.5	831.5	90	600



Damper on discharge side below the unit - Downflow



Dimensions

for a single-module A/C unit	L1	L2	L3
MRD 181	725	80	-
MRD 261	895	130	-
MRD 331	1055	130	-
MRD 381	1275	195	-
MRD 461	1725	100	820

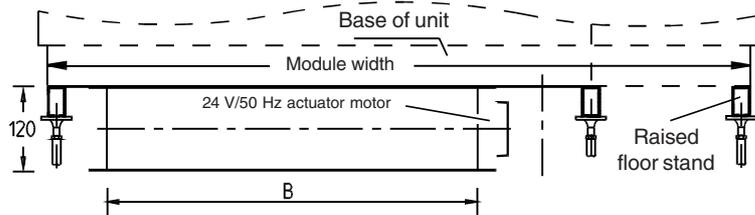
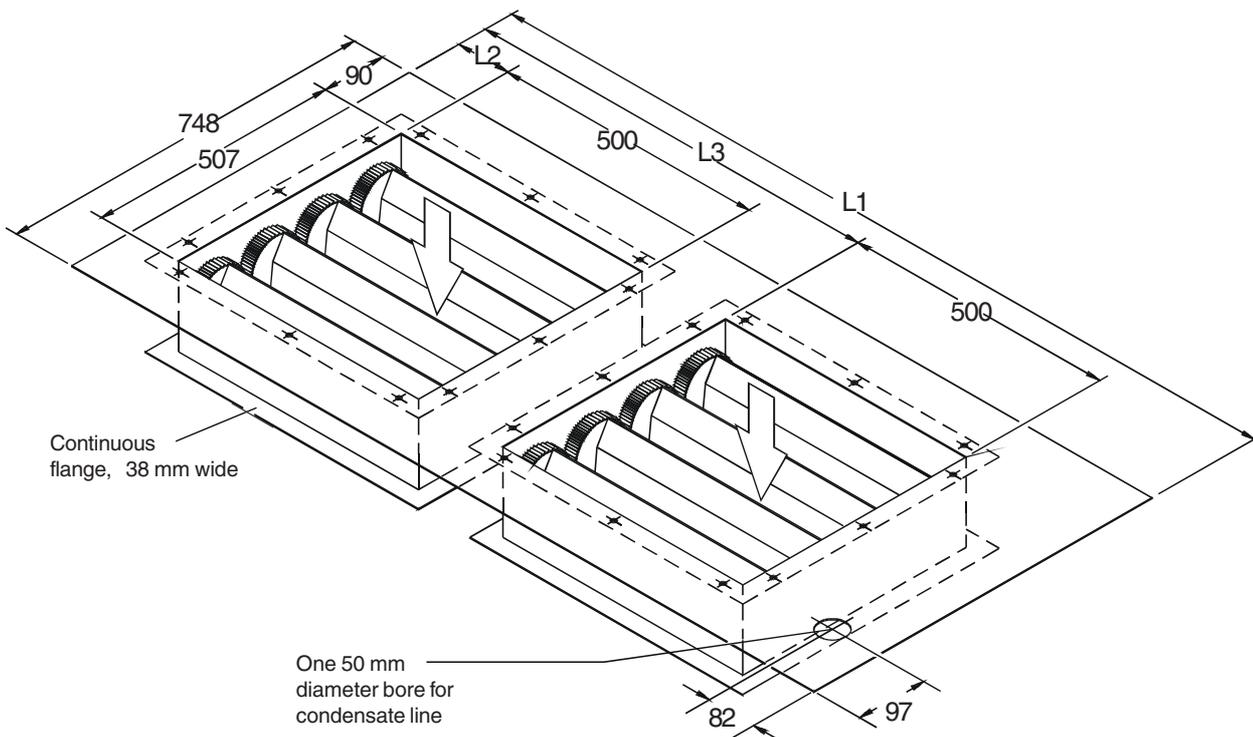


Illustration of a single-module A/C unit without pump section

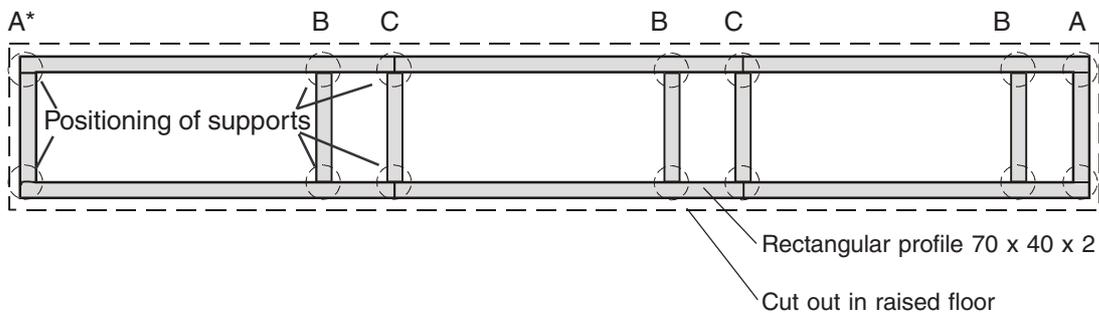


Raised floor stand

The floor stand is used to adjust the height of the A/C unit to the existing raised floor and consists of an encircling rectangular profile of galvanized steel with adjustable screw sockets, which can be shortened on site. Anti vibration compound is recommended between concrete floor and base plate.

Unit	Delivery volume raised floor stand			
	No. profiles	No. supports	No. mafund strips	No. screws M8x30
MRD 181 A/G	5	6	6	12
MRD 261 A/G	5	6	6	12
MRD 331 A/G	5	6	6	12
MRD 381 A/G	5	6	6	12
MRD 461 A/G	5	6	6	12
MRD 362 A/G	9	10	10	22
MRD 522 A/G	9	10	10	22
MRD 662 A/G	9	10	10	22
MRD 761 A/G	9	10	10	22
MRD 922 A/G	9	10	10	22
MRD 543 A/G	13	14	14	32
MRD 783 A/G	13	14	14	32
MRD 993 A/G	13	14	14	32
MRD 1143 A/G	13	14	14	32
MRD 1383 A/G	13	14	14	32

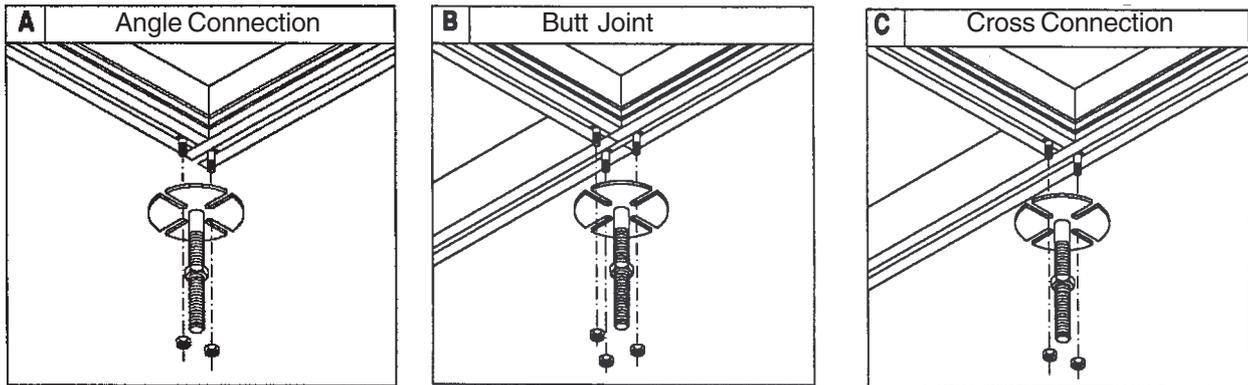
Raised floor stand for a 3-module unit:



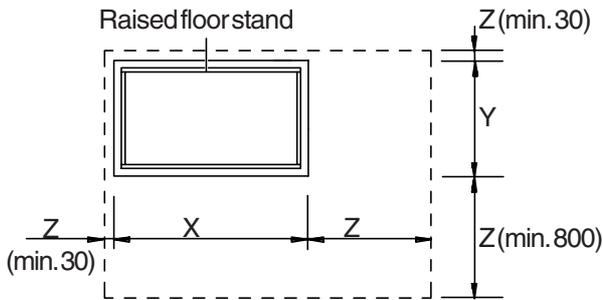
*see next page

Connecting the bars

(View from below)



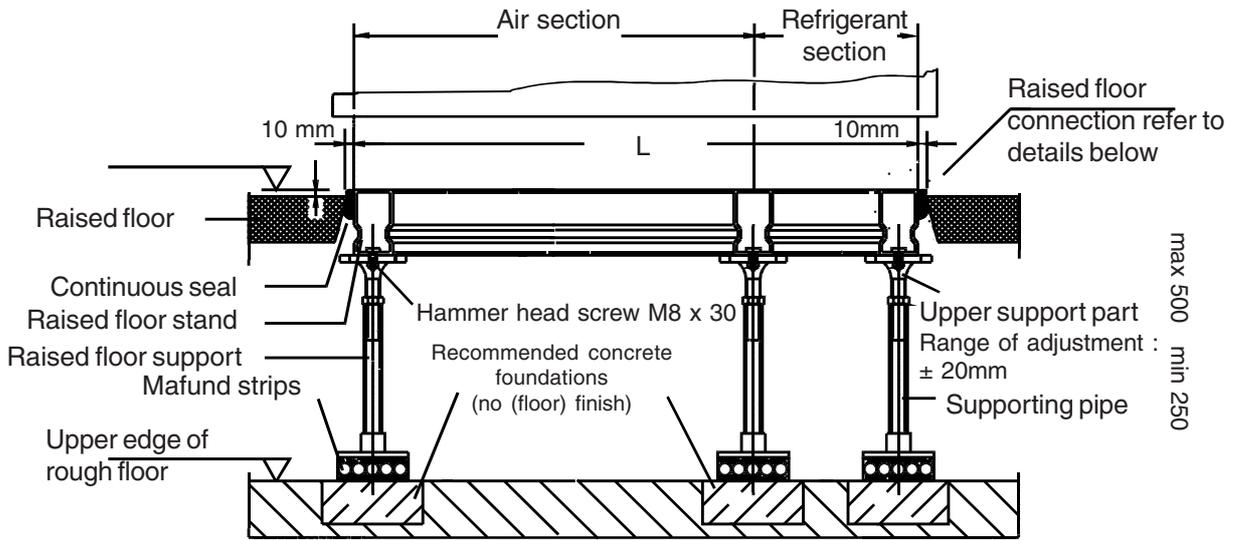
Minimum distances and mounting instructions



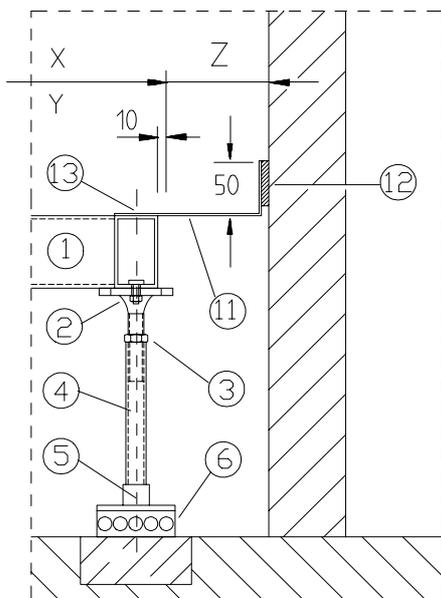
X/Y = Opening in raised floor
Z = Limit of distance

- the raised floor cutting (notch) should at least be 15° and must not have any contact to the raised floor stand, which could result in bone-conduction.
- the dimensions of the openings in the raised floor (X and Y) are 10 mm longer than the raised floor stand. The joint must be closed by customers with a continuous seal.
- a concrete foundation is recommended in the area of the raised floor supports.
- the raised floor supports have to be installed on vibration dampening material (do not screw down the supports!).
- prior to installation of the A/C unit, the raised floor must be installed 7 mm higher than the raised floor plates, as the mafund plates are compressed by the weight of the A/C unit.

General design of the raised floor stand

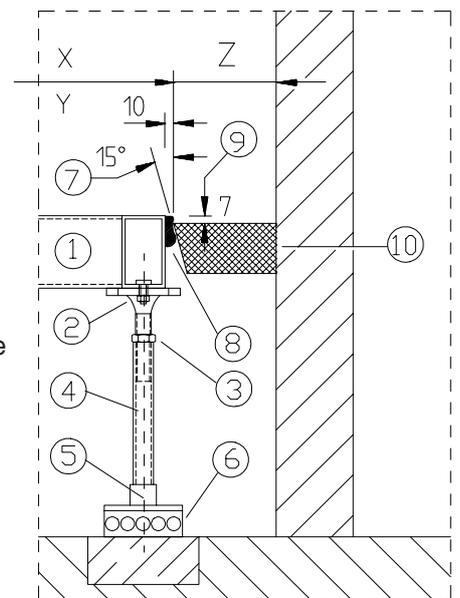


Detail of raised floor connection



Sealing detail
when distance Z < 100 mm

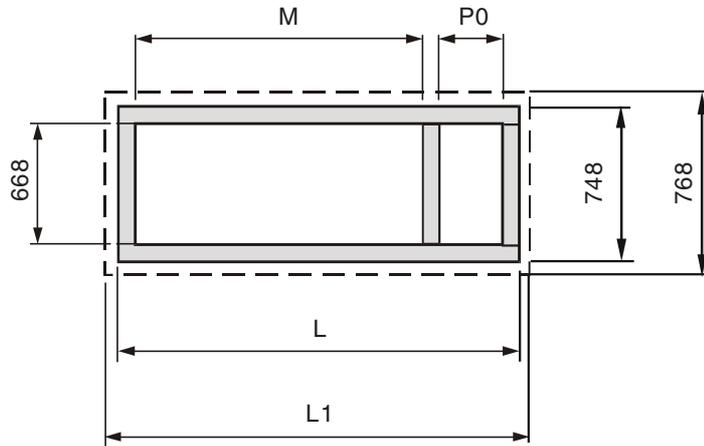
- 1 Raised floor stand
- 2 Adjustable support plate
- 3 Adjusting nut
- 4 Support pipe
- 5 Support base
- 6 Mafund strips
- 7 Raised floor cut out angle
- 8 Continuous seal profile
- 9 Before unit installation
- 10 Raised floor plate
- 11 Angled bracket
- 12 Permanently elastic seal
- 13 Fixing



Sealing detail
when distance Z ≥ 100 mm

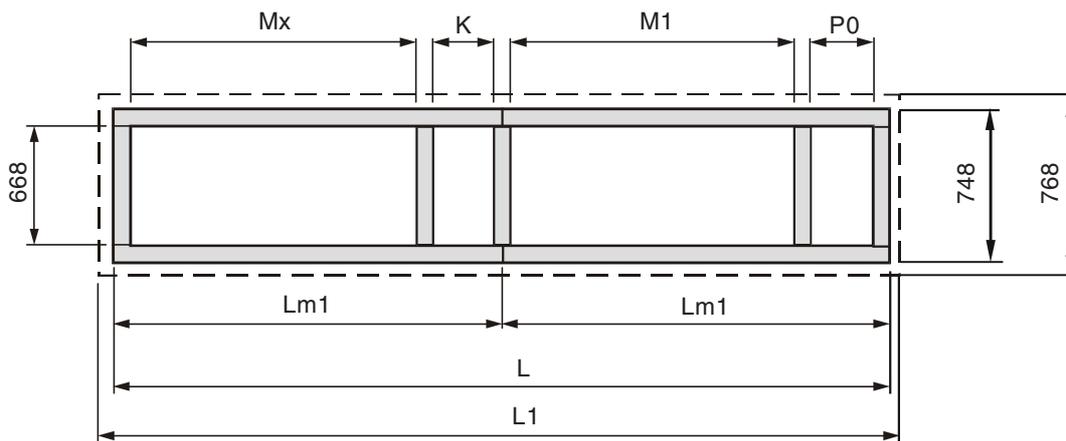
Units without pump cabinet

1 Module



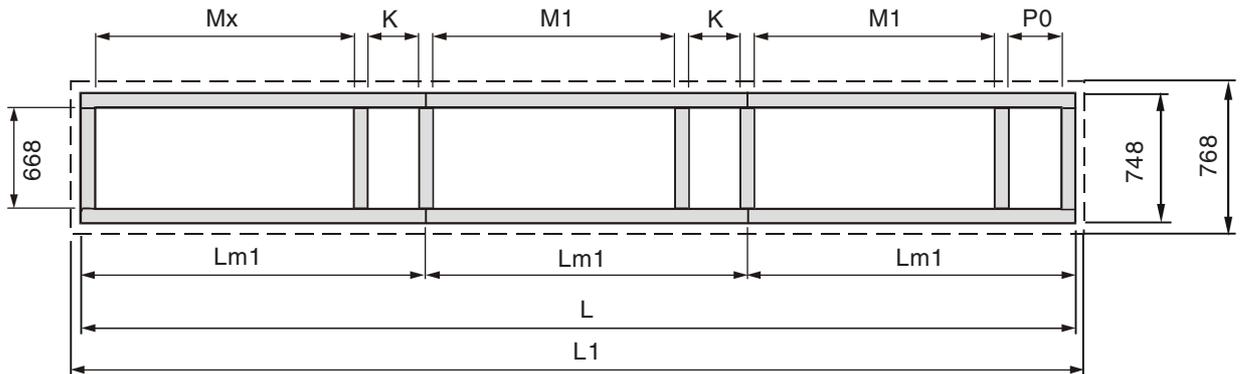
Unit	L	M	P0	L1
MRD 181 A,G,GE	1130	670	340	1150
MRD 261 A,G,GE	1350	840	390	1370
MRD 331 A,G,GE	1580	1000	460	1600
MRD 381 A,G,GE	1800	1220	460	1820
MRD 461 A,G,GE	2250	1670	460	2270

2 Modules



Unit	L	Lm1	Mx	K	M1	P0	L1
MRD 362 A,G,GE	2260	1130	670	360	690	340	2280
MRD 522 A,G,GE	2700	1350	840	410	860	390	2720
MRD 662 A,G,GE	3160	1580	1000	480	1020	460	3180
MRD 761 A,G,GE	3600	1800	1220	480	1240	460	3620
MRD 922 A,G,GE	4500	2250	1670	480	1690	460	4520

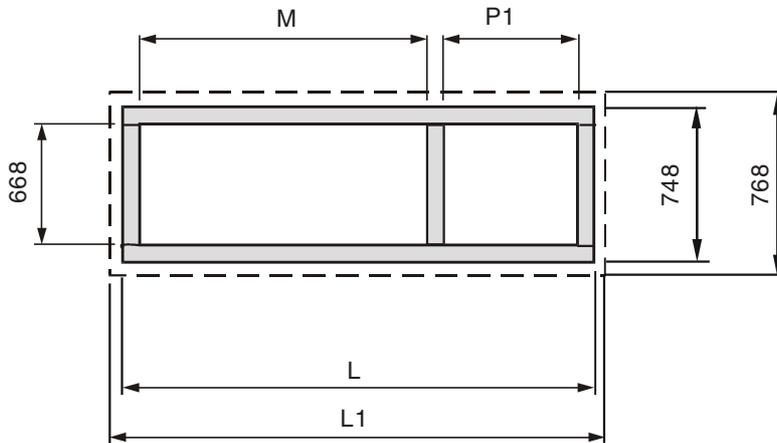
3 Modules



Unit	L	Lm1	Mx	K	M1	P0	L1
MRD 543 A,G,GE	3390	1130	670	360	690	340	3410
MRD 783 A,G,GE	4050	1350	840	410	860	390	4070
MRD 993 A,G,GE	4740	1580	1000	480	1020	460	4760
MRD 1143 A,G,GE	5400	1800	1220	480	1240	460	5420
MRD 1383 A,G,GE	6750	2250	1670	480	1690	460	6770

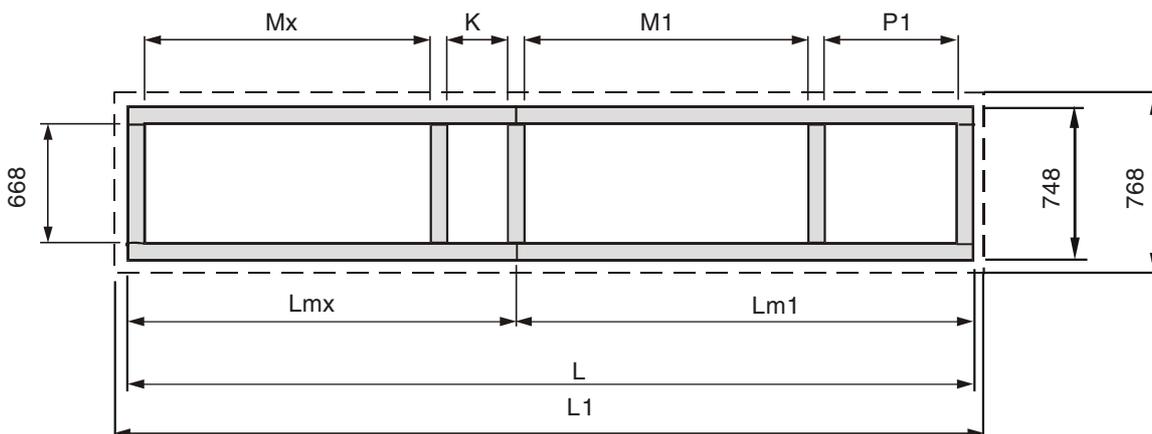
Units with pump cabinet, 450 mm width

1 Module



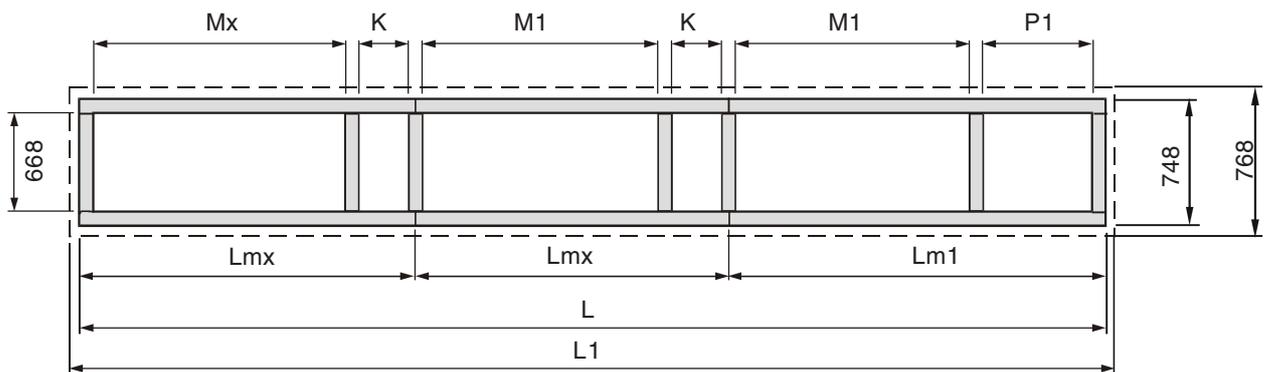
Unit	L	M	P1	L1
MRD 181 GE	1580	670	790	1600
MRD 261 GE	1800	840	840	1820
MRD 331 GE	2030	1000	910	2050
MRD 381 GE	2250	1220	910	2270
MRD 461 GE	2700	1670	910	2720

2 Modules



Unit	L	Lm1	Lmx	Mx	K	M1	P1	L1
MRD 362 GE	2710	1580	1130	670	360	690	790	2730
MRD 522 GE	3150	1800	1350	840	410	860	840	3170
MRD 662 GE	3610	2030	1580	1000	480	1020	910	3630
MRD 761 GE	4050	2250	1800	1220	480	1240	910	4070
MRD 922 GE	4950	2700	2250	1670	480	1690	910	4970

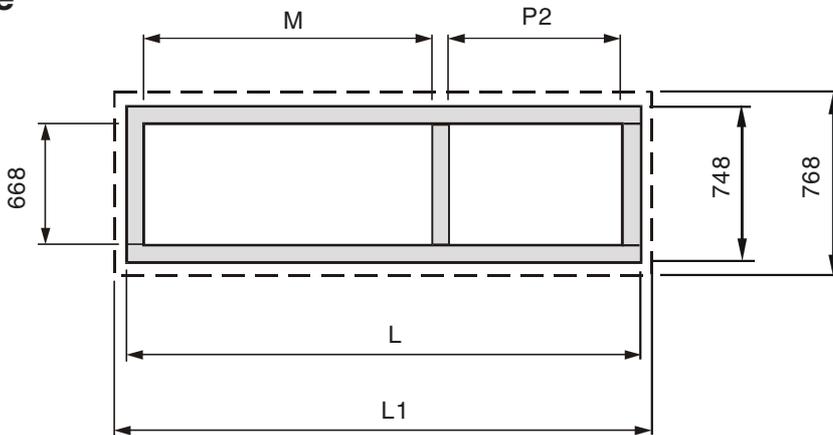
3 Modules



Unit	L	Lm1	Lmx	Mx	K	M1	P1	L1
MRD 543 GE	3840	1580	1130	670	360	690	790	3860
MRD 783 GE	4500	1800	1350	840	410	860	840	4520
MRD 993 GE	5190	2030	1580	1000	480	1020	910	5210
MRD 1143 GE	5850	2250	1800	1220	480	1240	910	5870
MRD 1383 GE	7200	2700	2250	1670	480	1690	910	7220

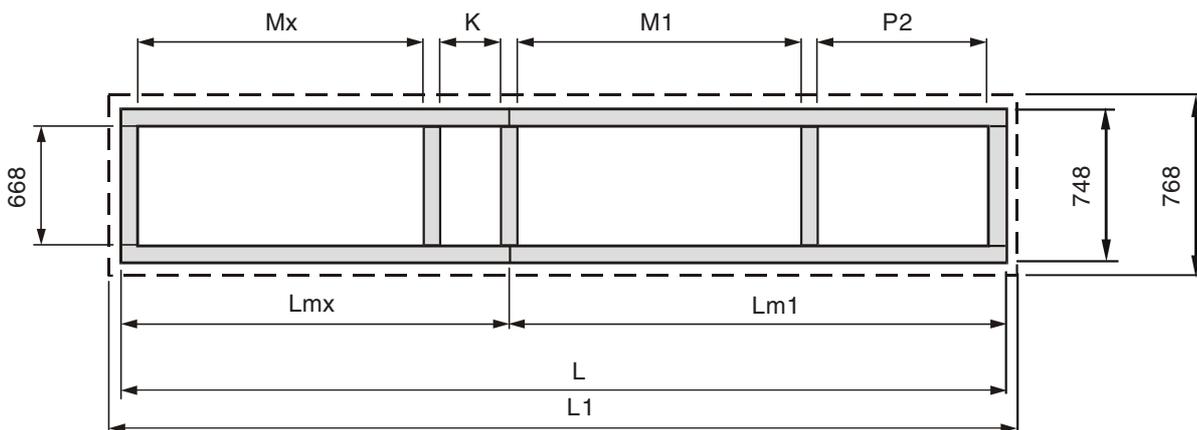
Units with pump cabinet, 680 mm width

1 Module



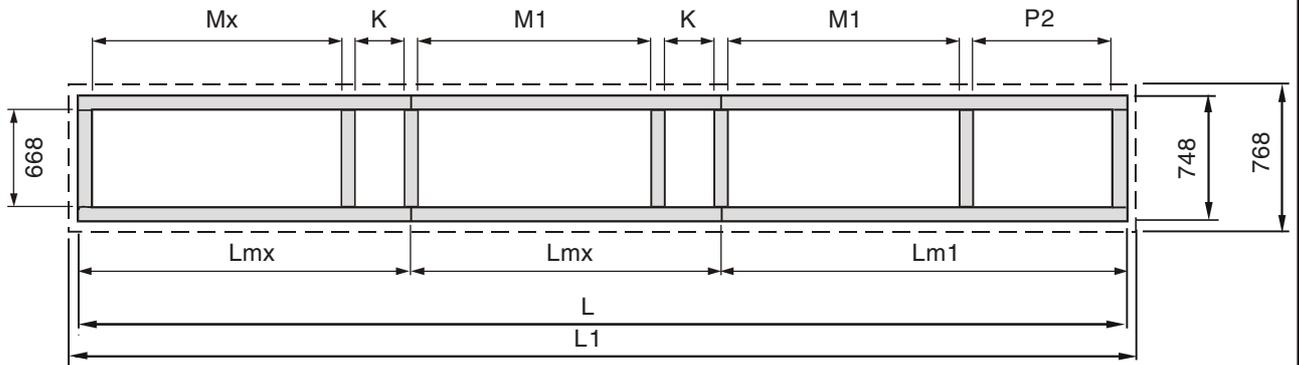
Unit	L	M	P2	L1
MRD 181 GE	1810	670	1020	1830
MRD 261 GE	2030	840	1070	2050
MRD 331 GE	2260	1000	1140	2280
MRD 381 GE	2480	1220	1140	2500
MRD 461 GE	2930	1670	1140	2950

2 Modules



Unit	L	Lm1	Lmx	Mx	K	M1	P2	L1
MRD 362 GE	2940	1810	1130	670	360	690	1020	2960
MRD 522 GE	3380	2030	1350	840	410	860	1070	3400
MRD 662 GE	3840	2260	1580	1000	480	1020	1140	3860
MRD 761 GE	4280	2480	1800	1220	480	1240	1140	4300
MRD 922 GE	5180	2930	2250	1670	480	1690	1140	5200

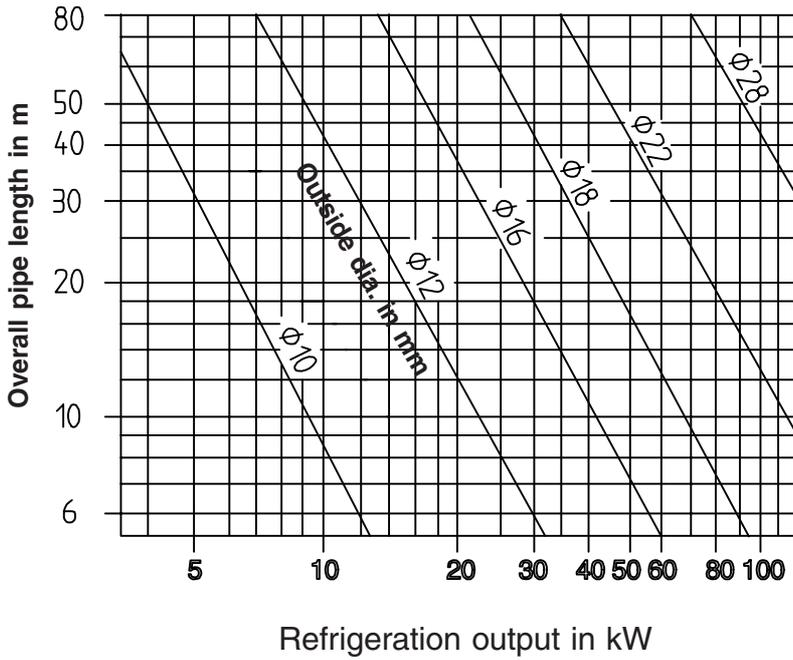
3 Modules



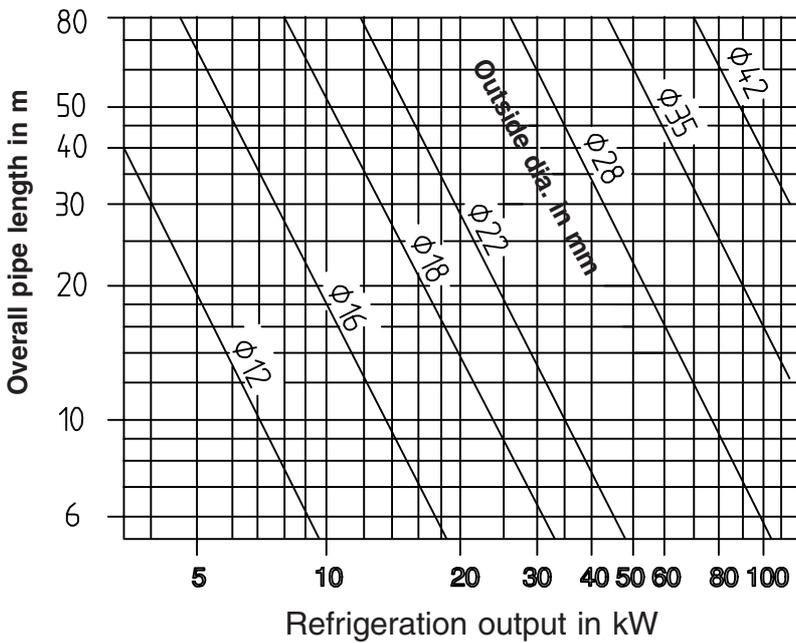
Unit	L	Lm1	Lmx	Mx	K	M1	P2	L1
MRD 543 GE	4070	1810	1130	670	360	690	1020	4090
MRD 783 GE	4730	2030	1350	840	410	860	1070	4750
MRD 993 GE	5420	2260	1580	1000	480	1020	1140	5440
MRD 1143 GE	6080	2480	1800	1220	480	1240	1140	6100
MRD 1383 GE	7430	2930	2250	1670	480	1690	1140	7450

Pipe dimensions

Diagram No. 1: Diagrams for designing the refrigerant lines for R407c/R22



Liquid lines depending on the overall pipe lengths and refrigeration outputs.



Hot gas lines depending on the overall pipe lengths and refrigeration outputs.

Table 1: Pressure drop of pipe fittings/specials in metres for equivalent pipe length

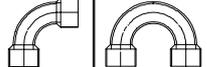
Copper pipe Outside dia. mm					
	45°	90°	180°	90°	T-piece
10	0.16	0.20	0.53	0.32	0.20
12	0.21	0.27	0.70	0.42	0.27
15	0.24	0.30	0.76	0.48	0.30
18	0.26	0.36	0.87	0.54	0.36
22	0.27	0.42	0.98	0.61	0.42
28	0.39	0.51	1.20	0.79	0.51
35	0.51	0.70	1.70	1.00	0.70
42	0.64	0.80	1.90	1.20	0.80

Table 2: Selecting the pipe lines

Minimum refrigeration outputs which are required for oil transportation in rising pipes of hot gas lines for R407c/R22 at t_c (condensation temp.) 48°C.

Pipe diameter \varnothing	15	18	22	28	35	42
Refrigeration output kW	4.41	5.17	7.14	10.0	16.58	25.9

Route horizontal pipes with a slope towards the Condenser.

Position oil traps every 2.5 - 3 m.

Use oil separator for rising pipe longer than 25 m

Alternative ways of combining the options

	Suction throttle	2-point steam humidifier	Constant steam humidifier	2-point ultrasonic ENS	Constant ultrasonic ENS	Phase control	Electrical heating stage 2	Refrigerant heating	Lphw* heating proport. (external)	Remote on/off	Actuation of GE pump	Actuation of drycooler	Sequencing
Suction throttle	■												
2-point steam humidifier		■	■	■	■								
Constant steam humidifier			■	■	■								
2-point ultrasonic ENS				■	■								
Constant ultrasonic ENS					■								
Phase control						■							
Electrical heating stage 2							■	■					
Refrigerant heating								■					
Lphw* heating proport. (external)									■				
Remote on/off										■			
Actuation of GE pump											■		
Actuation of drycooler												■	
Sequencing													■
Extension I/O Board						X				X	X	X	X

■ Combining the options is not possible

X This option always requires an extension-I/O Board

*Lphw heating = Low pressure hot water heating

Tender text MODULAR LINE DX

1. Air Conditioning Unit

Precision air conditioning unit in extendable modular type, suitable for separate installation, for conditioning of....., consisting of module(s). Each module is provided with its own air, electrical and cooling circuit per module. Due to the modularity the air conditioning unit provides for a stand-by function.

The air conditioning unit is equipped with an independent microprocessor control and is a complete modular, extendable control unit.

The design of the unit guarantees complete maintenance access from the front.

The air conditioning unit meets the current regulations and standards, the European Guidelines for Machines and the German safety regulations.

The air conditioning unit is CE certified, it is manufactured in a company certified according to DIN ISO 9001 / EN 29001.

The unit was tested at the manufacturer workshop by regular quality control routines and in test before shipment

Unit type:

A: Air cooled unit, G: Water/glycol cooled unit, GE: Water/glycol cooled unit

Air direction :

The air conditioning unit disposes of the following air directions:

Downflow :	Air intake: top	Upflow :	Air intake: front
	Discharge: bottom		Discharge: top

2. Frame and housing

The unit consists of a frame made of natural-coloured eloxed aluminium extruded profile and inner steel walls serving for air direction for highest stability. The unit with its modern design in tune with office environment, is closed on all sides with removable doors. All parts of the unit housing which are in direct contact with water are made of aluminium and lifetime protected against corrosion.

3. Exterior Panelwork for MRD/U-Units

Panelwork on the front and the rear of the unit is made by hinged doors.

The complete panelwork is assembled to the unit frame with special security fasteners which prevent from unauthorized access to the units.

All panels and doors are isolated from low frequency noise transmissions by special rubber seals.

The panelwork is lined out with a noise absorbing polyester fibre insulation, which is thermally treated. The thickness of the insulation is 35 mm. The insulation is according to DIN 4102 hardly inflammable, the classification is B 1, self distinguishing. Panels are designed to stand a total air pressure difference of 1000 Pascals. Panels are sealed against each other with special joggling teeth. The colour of the panelwork and all the sheet metal work is STULZ-pure-white.

4. Filter

4.1 EU4 Filter

MRD :

In the housing located on the suction side of the coil, with large zig-zag filter surface, in a cardboard frame completely combustible, filter quality EU4.

Changing the filter is possible from the front only.

Differential pressure switch for indication of clogged filter.

MRU :

Filter placed in the housing on the suction side with regenerateable filter mat in metal filter cassette, quality EU4.

Changing the filter is possible from the front only.

Differential pressure switch for indication of clogged filter.

4.2 EU5 Filter (Option)

MRD :

In the housing located on the suction side of the coil, with large zig-zag filter surface, in a cardboard frame completely combustible, filter quality EU5.

Changing the filter is possible from the front only.

Differential pressure switch for indication of clogged filter.

MRU :

Filter placed in the housing on the suction side of the coil, with zig-zag filter surface and metal filter frame, quality EU5.

Changing the filter is possible from the front only.

Differential pressure switch for indication of clogged filter.

5. refrigerant evaporator

A high capacity direct expansion coil per module made of copper tubes with pressed-on, corrugated aluminium fins. Inclined position of the evaporator, aluminium condensate pan and aluminium joint plates guarantee the drain of condensate in dehumidification mode.

The coils are designed in a way that in normal operation no dehumidification takes place, and only sensible cooling capacity is provided.

The direct evaporator is located on suction side of the fan for reducing the air pressure drops by creating a very even, low air velocity and so providing a high efficiency of the heat transferring surface of the coil.

5.1 dehumidification circuit (Option)

dehumidification is achieved by an additional split of the Dx-coil including a second refrigerant injection and a solenoid valve.

In case of dehumidification the solenoid valve is activated by the microprocessor and cuts off approximately one third of the evaporator surface. The remaining two thirds of the evaporator surface are now causing a lower surface temperature due to the reduced coil surface. This effect causes a drop of the air temperature below the dew point and condensates water from the return air. The airflow is not affected in the dehumidification mode.

6. fans

6.1. V-belt drive

One high capacity radial fan per module, with forward curved blades, low revolutions, low noise emission, with maintenance-free bearings, lubricated for lifetime, statically and dynamically balanced, galvanized housing with additional epoxy powder coating as a high quality corrosion protection.

Fan drive by high capacity belts to meet changed customer's requirements, such as air volume flow or higher required external pressure. Belt drives by V-belt pulleys, which are mounted on bushings and therefore quickly interchangeable.

Fan motors: Standard motors, three phase motors mounted on adjustable base enable easy tensioning of the belt drives.

Motor and fan are mounted on a common reinforced framework. High capacity V-belt drive is calculated for low vibration operation and long life cycles. The large calculated V-belt pulleys reduce the necessary tensioning forces to a minimum.

6.2 Flat-belt drive (Option)

Fan drive by flat-belts made of non abrasion material, for adjusting to alternating customer requirements such as air flow or necessary external static pressure belt drives by pulleys, which are mounted on bushings and therefore quickly interchangeable.

Fan motors: standard motor, three phase motors mounted on adjustable base enables tensioning of the belt drives.

Motor and fan are mounted on a common reinforced framework made of stainless steel. High capacity flat belt drive is calculated for low vibration operation and long life cycles. The large calculated flat belt pulleys reduce the needed tensioning forces to a minimum.

7. Scroll compressor

1 hermetic scroll compressor per module with increased EER (energy efficiency ratio), locking device, non return valves in discharge line and crank-case heater are not required, elasticly mounted with anti-vibration dampers on the extruded aluminium profile of the unit housing.

Accessories: compressor and other heat-emitting components located separately from the airstream, filter-dryer, liquid receiver with rotalock valve, sight-glass with humidity indicator, thermostatic expansion-valve, rotalock valves on the compressor discharge line, low pressure switch, high pressure switch TÜV approved with manual reset, check valves in liquid line, 4 schrader-valves per circuit for pressure gauge connection.

- solenoid valve in the liquid line and pressure relief valve (only for unit type A).

8. Technical data of the unit

Unit:

Unittype:

Air direction:

Power supply:

V / Ph / Hz

Airflow:

m³/h

Return air temperature:

°C

Rel. return air humidity:

%

Condensation temperature:

°C

Height:

mm

Depth:

mm

Width:

mm

Weight:

kg

Manufacturer:

STULZ

Model:

MR... ..

Fan:

Fantype:

Nominal power of motor:

kW

Power consumption motor:

kW

Belt type:

P external:

Pa

P total:

Pa

Number of revolutions:

U/min

Cooler: (only GE)

Air discharge temperature:

°C

Rel. humidity air discharge:

%

Total cooling capacity:

kW

Sensible cooling capacity:

kW

Pressure losses:

Pressure loss condenser:

kPa

Pressure loss 3-way head pressure

control valve:

kPa

Pressure loss cooler:

kPa

Pressure loss 3-way control valve:

kPa

Total pressure loss:

kPa

Nominal size 3-way head pressure

control valve:

inch

Nominal size 3-way control valve:

inch

Evaporator:

Air discharge temperature:

°C

Rel. humidity air discharge:

%

Total refrigerant capacity:

kW

Sensible refrigerant capacity:

kW

Compressor:

Nominal power:

kW

Current consumption:

A

Max. operating current:

A

Medium data:

Medium inlet temperature:

°C

Medium outlet temperature:

°C

Percentage of glycol

%

9. condensers

9.1 high-efficiency condenser(s), air cooled (only for unit type A)

1 condenser per module, made of corrosion-resistant aluminium casing, suitable for horizontal or vertical installation.

Coil made of copper tubes and pressed-on aluminium fins.

Standardized axial fan(s) with mounting support(s) including protection against accidental contact, on/off control by pressure switch(es), already completely wired. Terminal box for power input, water protected IP 54.

1 Schrader valve for connecting pressure gauge during adjustment of condenser switch when unit is set-up.

Technical data :

Condenser model :	KS.....
Power supply :	230V / 1Ph / N / 50Hz / PE
Air entering temperature :	° C
Condensing temperature :	° C
Altitude above sea level :	m
Condenser capacity :	kW
Sound pressure level in 5 m distance (free field) :	dB(A)
Number of fan(s) :	piece(s)
Current consumption per fan :	A
Weight :	kg

9.1.1 fan speed controller (only for unit type A) (Option)

Proportional fan speed controller in accordance with condensing temperature and outdoor temperature.

9.2 water/glycol cooled condenser per module (Option) (only for unit type G and GE)

Stainless steel plate fin condenser, compact design, material according to DIN 17440 material no. 1.4571 V4A for excellent heat transferring coefficient, therefore small

temperature difference between water inlet temp. and condensing temp., maximum working pressure 30 bars, completely insulated with armaflex, 14 mm thickness, to prevent condensate on the cold surface of the heat-exchanger.

9.2.1 3 - way head pressure control valve (only for unit type GE) (Option for unit type G)

Cooling water quantity control by one 3 - way head pressure control valve per module, controlled by the refrigerant pressure for adaptation of the cooling water quantity to the actual requirement and for constant condensation temperature.

9.2.2 2 - way head pressure control valve (Option) (only for unit type G)

Cooling water quantity control by one 2 - way head pressure control valve per module, controlled by the refrigerant pressure for adaptation of the cooling water quantity to the actual requirement and for constant condensation temperature.

9.2.3 water temperature sensor (Option) (only for unit type G and GE)

Water temperature sensor to supervise the cooling water, for optical alarm in case of high water temperature and for control of dry cooler fan motor(s).

10. cooling coil for "free cooling" to economise energy (only for unit type GE)

The energy costs for the heat removal are reduced to 50% by the additional heat exchanger.

At outside temperatures below 7 - 9°C (depending on the design) the water coil takes over the cold air production of the unit at 100%. The compressor system is then switched off completely.

In the interseasons like spring and autumn at outside temperature below 19°C the water coil has a pre-cooling function, so that the compressor system has only to deliver a part of the cooling capacity. The run time of the compressors are reduced significantly.

The water coil is designed for a water/glycol mixture of 70/30%.

11. 3-way proportional control valve for controlling the cooling capacity of the coil in energy saving operation (only for unit type GE):

With sinking water temperatures in the dry cooler system, the 3-way control valve controls the water flow through the cooling coil dependent of the room/return air

temperature. The valve is equipped with a proportional actuator with a power supply of 24 VAC and a control voltage of 0-10 VDC.

12. pump cabinet per unit (only for unit type GE)

At the right side of the unit one cabinet is installed for the pumps and the water piping including the 3-way control valve.

The pump cabinet housing consists of a frame made of natural-coloured eloxed aluminium extruded profile and inner steel walls.

The pump cabinet is conform with the unit design. Doors, panels and frame parts are lifetime protected against corrosion by a coating of synthetic material.

The panelwork is lined out at the inside with a noise absorbing insulation, which has a thickness of 35 mm. (classification see exterior panelwork)

Equipment variants of pump cabinet : (optional)

12.1 Standard variant with the following equipment

Stulz 3-way valve with a power supply of 24 VAC and a control voltage of 0-10 VDC for temperature control of the cooling coil for free cooling, 2 thermometers in in- and outlet, 2 shut-off valves for the entire unit, 1 filling and drain valve for the water/glycol circuit.

12.2 Variant with one pump and the following equipment

Stulz 3-way valve with a power supply of 24 VAC and a control voltage of 0-10 VDC for temperature control of the cooling coil for free cooling, 2 thermometers in in- and outlet, 2 shut-off valves for the entire unit, 2 pressure gauges with glycerine filling up- and downstream of the pump, 1 safety valve with pressure gauge, 1 expansion tank with 18 l volume, 1 high pressure centrifugal pump multi-stage with runner and housing of stainless steel, 1 non-return valve.

The control of the pump is realized by the electric cabinet of the unit, the electrical parts like contactors and MCBs of the pump are housed in the electric cabinet of the unit.

12.3 Variant with two pumps and the following equipment

Stulz 3-way valve with a power supply of 24 VAC and a control voltage of 0-10 VDC for temperature control of the cooling coil for free cooling, 2 thermometers in in- and outlet, 2 shut-off valves for the entire unit, 2 pressure gauges with glycerine filling up- and downstream of the pump, 1 safety valve with pressure gauge, 1 expansion tank with 18 l volume, 2 high pressure centrifugal pumps multi-stage with runners and housing of stainless steel, 2 non-return valves downstream of the pumps to prevent inverse flow in case of stand-by operation of one pump.

Long service cycle due to large volume steam cylinder, replaceable within minutes.

Maximized life cycle due to automatic drainage procedure by an electronic water control, independent from various water qualities, minimized water consumption. Start-up by switching on the humidifier without previous water analysis and additional check afterwards.

Steam capacity:	...	kg/h
Power input:	...	KW
Humidifier model:		OEM ...

14.1.1 Proportional control for steam humidifier by a special E-Prom (Option)

14.2 Ultrasonic humidifier installed per module (Option)

for production and discharge of odourless and demineralized mist by ultrasonic waves. Lowest power and water consumption. Germproof humidification, the bacteriological contamination is prevented by ultrasonic waves.

The Ultrasonic humidifier consists of:

Plastic housing

and a modular extension of mist producing transducers, an electronic control part and a module with water inlet solenoid valve, dry-operation protection and a water level control.

Installation kit

made of stainless steel and stainless screws, washers and nuts.

Water drip tray

for additional water leakage protection.

Transformer sec. 48 V, for control cabinet installation

The Ultrasonic humidifier can only be used in accordance with a conductimeter and demineralized water.

Technical data:

Humidifier capacity:	kg/h
Nos. of transducers:	nos.
Nominal capacity:	Watt
Power connection:	48 V / 1 Ph / 50 Hz
Physical dimensions:	
Width/height/depth:	mm
Weight:	kg
Manufacturer:	STULZ
Humidifier model:	ENS

14.2.1 conductimeter incl. sensor (Option)

for water quality control

1. alarm indication (with 5 $\mu\text{S}/\text{cm}$):
pre-alarm, replacement of D/I - bottle, check reverse osmosis
2. alarm indication (with 20 $\mu\text{S}/\text{cm}$):
failure humidifier, switch off humidifier

An indication of the actual status of the water quality can be connected to the electronic control device.

Measurements are taken in Volts (1 Volt = 50 $\mu\text{S}/\text{cm}$)

14.2.2 regenerateable deionized water bottle (D/I- bottle) (Option)

installed per module, consisting of a pressure tested stainless steel bottle for producing mineral-free water.

The bottle is filled with negatively and positively charged material and ready for use.

Technical data:

Capacity at 20 degrees total mineral contents of tap water:	2000 l
max. water temperature:	30°C
max. water working pressure:	6 bar
manufacturer:	STULZ
model:	S 26

15. control cabinets

1 electrical cabinet per module for installation of all high voltage components per module. The cabinet guarantees a full maintenance access from the front. A separate power supply of each module enables a connection to different power supplies or UPS. Due to this concept a complete redundancy of all high voltage components is guaranteed.

The high-voltage components per module are:

- circuit breakers
- contactors
- isolators

mounted on rails in the cabinet.

The components are completely wired with a cable harness and protected by ducts. Terminals, cables and components are identified. I/O-modules of the microprocessor are additionally installed in the control box of the module.

16. microprocessor C5000

For controlling of an air conditioning unit and supervising of room temperature and humidity limits. Equipped with an user-friendly, illuminated, large surface LCD - display. The software is structured in three different levels: Information, Operation and Service which can be operated by a user friendly windows-technique via the display and the keys.

Each module is controlled separately with different control circuits for temperature and humidity. The controller is suitable for return air, room or supply air control. The control logic is a P-logic.

The control system consists of a processor including a display and input keys as well as decentralized I/O-boards located in every module and connected via a bus-wire. The data bus is quick, reliable, standardized CAN-data-bus which is used in the automotive industry.

16.1 modular system control

In case of a stand-by module configuration the stand-by function is sequenced over all present modules.

In case of failure on one of the modules in operation, the automatic switch over activates the stand-by module.

In case of power interruption the unit can be automatically or manually restarted. The time delay of the restart, as well as the time delay for restarting the single components,

is adjustable.

Running hour meter for the unit, running hours of the separate modules and the single components are indicated in the display.

Records of the previous 80 alarms with date and time, alarm delays adjustable, priorities of the alarms adjustable text for auxiliary alarms can be selected individually.

Cyclic self-test of controller, input and parameters are checked on plausibility, sensor failure is checked by the microprocessor.

Record of the previous 80 events like,

- failure of power supply
- start / stop status
- stand-by start
- alarm reset
- all alarms

Calibration of temperature and humidity sensors

Sensors of C 5000 can be calibrated by adjusting indicated values to actual values which are shown by different devices also used in the room.

Maintenance request

The request for service and maintenance work can be indicated by the controller, if previously maintenance intervals are defined and adjusted.

High room load operation

In case of temporary high room heat loads the controller can activate stand-by module for a short period of time to increase the cooling capacity. The stand-by module is switched off automatically when the unregular heat load is removed.

Water temperature control (only for unit type GE)

- only in combination with the water temperature sensor and the outside temperature sensor -

Every 4 hours the dry cooler is switched on for 10 minutes. If the water temperature in this time reaches a temperature of 2 Kelvin below the setpoint for the return air temperature, a changeover is made to winter operation. This happens in the same way, if an outside air temperature is measured (by an additionally installed outside air sensor), which is 8 Kelvin below the setpoint for the return air temperature.

16.2 LCD - graphic display

LCD graphic display for indication of :

- real time
- actual values of temperature and humidity
- symbols for operation modes cooling, reheat, dehumidification and humidification
- simple, user-friendly operation of the controller by modern window technique
- graphic diagrams of temperature and humidity for the last 24 hours
- Room-, supply-, fresh-air- and water-temperature (G and GE only), room- and supply-humidity including indication of set valves and limits
- alarm indications
 - temperature high and low
 - humidity high and low
 - air flow
 - clogged filter
 - high / low pressure refrigerant circuit
 - humidifier failure
 - 8 different, further alarms on customers request
(depend on equipment of unit) :
 - i. e. - failure reheat stage 2
 - i. e. - failure condenser fan
- status indications
 - activated stand-by operation
 - maintenance request
 - activated UPS operation (without humidification and reheat)
- detailed operation status
 - i. e. day / night cycling
 - unit / module and component running times

The graphic display can be switched to various languages and different character sets.

16.3 STULZ-microprocessor-interfaces

For data transmission and communication the following interfaces are provided:

- serial printer interface for failure protocols and intervals of temperature and humidity values (RS232)
- serial PC-interface (RS232) für diagnosis and configuration.

Optional as piggy back:

- BMS-interface (2x RS485, 1x RS232) for systems as
- L&G

- Honeywell
- Trend
- STULZ-Telemonitoring
- Staefa

-8 adjustable analog inputs (0 - 20 mA / 0 - 10 V)

17. raised floor stands (Option)

consisting of an extruded rectangular profile, 72,5 x 40 x 2 mm, made of galvanized steel, with adjustable thread poles. Height, max./min. (500/250 mm):
pole diameter: 26 mm

Base plate for ground installation on an anti - vibration dampening rubber gasket. Connection plate to rectangular profile by hammer head screws. Physical dimensions in accordance with unit dimensions.

18. louvers (Option)

for installation on the discharge side of the unit or in raised floor to avoid short cycle of supply air when modules are operated separately or in case of service or maintenance work.

Frames and fins made of galvanized steel, drives made of aluminium, bearing-hubs made of cadmium - plated steel, bearing-hubs made of special plastics.

Physical dimensions in accordance with unit dimensions per separate module.

18.1 actuators (Option)

Actuator for adjusting of louvers.

The output signal is provided as on/off signal, which can be converted. The control devices are installed in the control box.

Appendix

The following manuals are available for the product ranges:

Product range	Index	Type of manual
MODULAR LINE DX	10	Operating instructions
MODULAR LINE DX	10PL	Planning manual
MODULAR LINE CW	11	Operating instructions
MODULAR LINE CW	11PL	Planning manual
MODULAR LINE CHILLER	40	Operating instructions
MODULAR LINE CHILLER	40PL	Planning manual
MINI-SPACE	20	Operating instructions with planning part
DAU 40 CW	21	Operating instructions
Compact CW	22	Operating instructions
Console STD/U	23	Operating instructions
COM-AIR	24	Operating instructions
WALL-AIR	25	Operating instructions
SAF 101 A (400V)	30	Operating instructions
SAF 101 A (208/220V)	31	Operating instructions
SAD 111 A	32	Operating instructions
C 1002	50	Operating instructions
C 5000	52	Operating instructions
C 5000 - Chiller	53	Operating instructions
C 6000	54	Operating instructions
InCompTrol	60	Operating instructions
Sequencing-Box	61	Operating instructions
TeleCompTrol	62	Operating instructions
NI Stulz	63	Operating instructions
SDC - C4000	64	Operating instructions
Gateway Stulz/Honeywell	65	Operating instructions
SDC - C5000	66	Operating instructions
Landis & Gyr Interface	67	Operating instructions
Modbus	68	Operating instructions
Satchwell	69	Operating instructions
Condensers	80	Technical Data
Internal condensers	81	Operating instructions
Option manual	91	Function description

For further information please contact our marketing department.

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