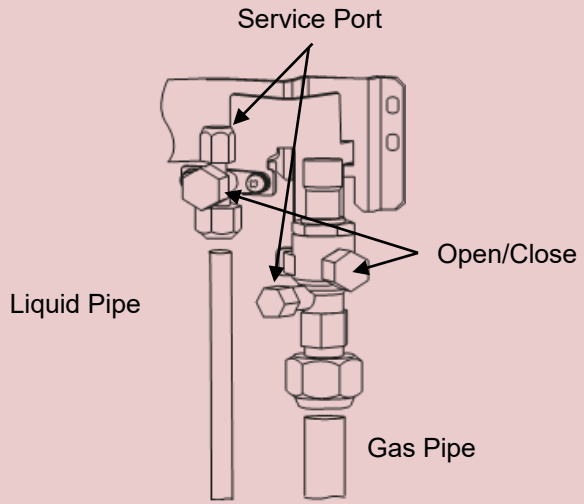
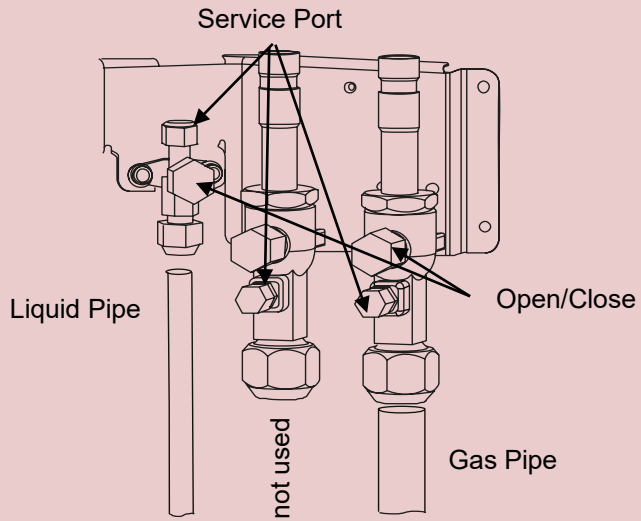
HITACHI

Installation 1

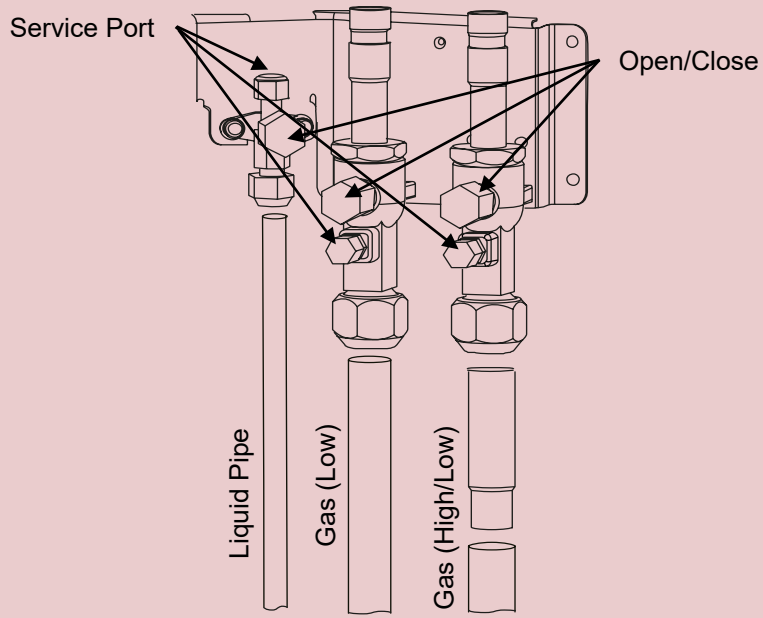
Cooling & Heating

1. OU Pipe Connection
2 Pipes connection Mini SetFree

RAS-4~6FS(V)NME	RAS-8~12FSXNME
	

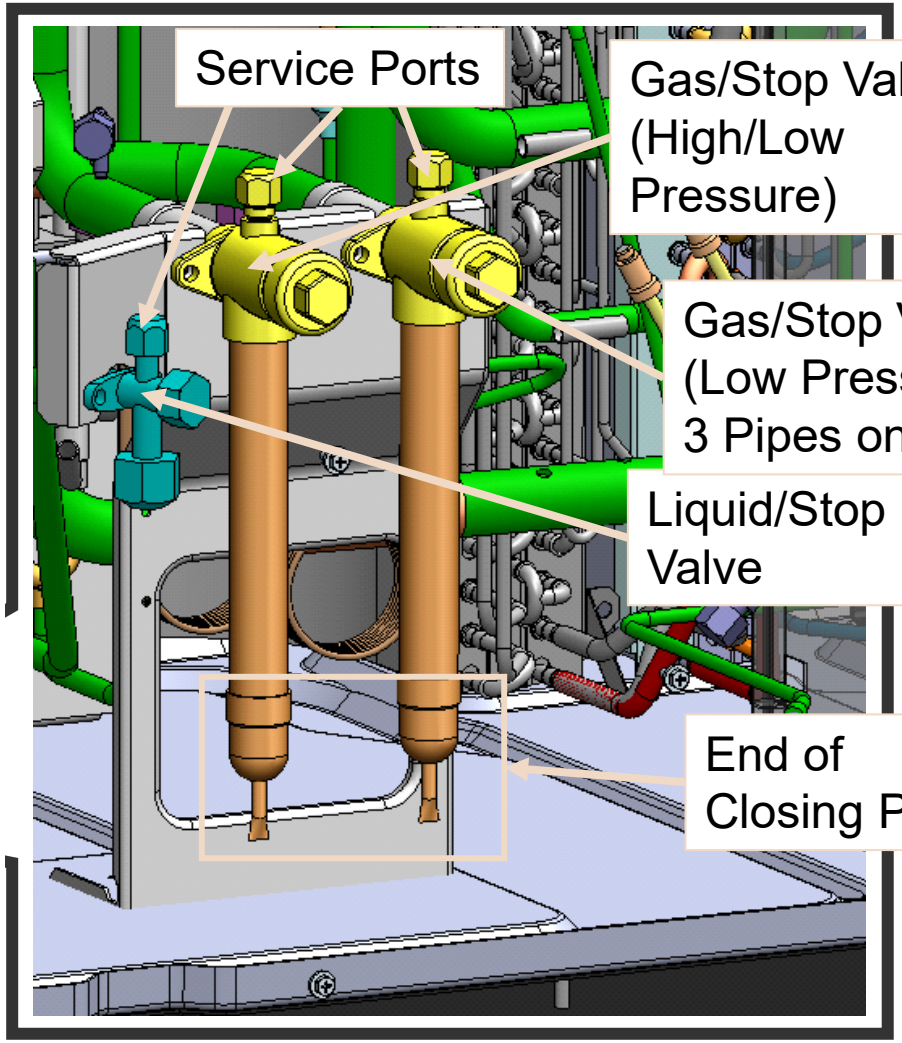
1. OU Pipe Connection
3 Pipes connection Mini SetFree

RAS-8~12FSXNME

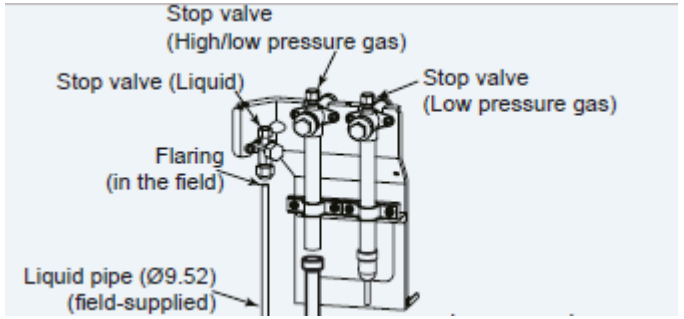


1. OU Pipe Connection

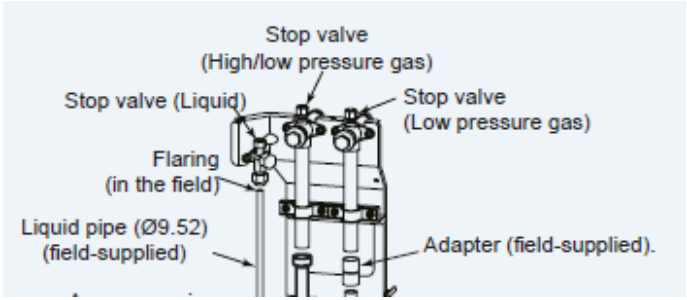
Pipe Connection SetFree Sigma



2 Pipes Connection



3 Pipes Connection



HITACHI

1. Piping Work

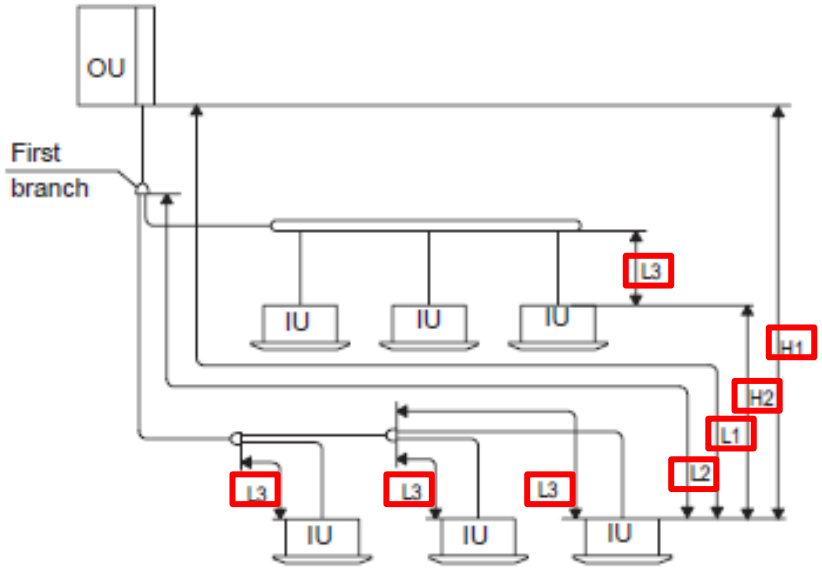
- Piping Specifications
- Piping Distribution
- Piping Diameters
- Outdoor Piping Connection Kit
- Multi-kit
- Header Branch
- Refrigerant Charge Calculation (2 & 3 pipes)

2. Piping Work

Piping Specifications

- RAS-4~6FS(V)NME

Part		Mark	Permited pipe lenght
Total Piping length		Current total liquid pipe length	≤ 180 m
Maximum pipe length	Current	L1	≤ 85 m
	Equivalent		≤ 100 m
Maximum pipe lenght between the multikit of the 1st branch and each IU		L2	≤ 40 m
Maximum pipe length between each multikit and each IU		L3	≤ 15 m
Difference in height between OU and IU	Higher OU	H1	≤ 30 m
	Lower OU		≤ 30 m
Difference in height between IU		H2	≤ 15 m



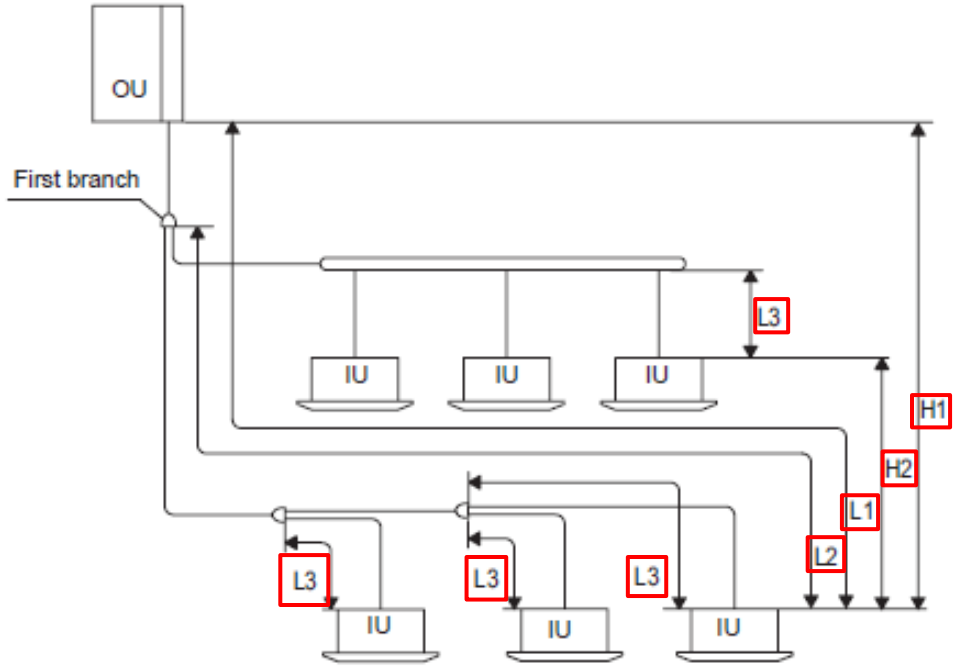
2. Piping Work

Piping Specifications

- RAS-8~12FSXNME

Part		Mark	≤ Recommended number of connected IU	>Recommended number of connected IU
Total Piping length		Current total liquid pipe length	≤ 500 m	≤ 300 m
Maximum pipe length	Current	L1	≤ 125 m	≤ 125 m
	Equivalent		≤ 150 m	≤ 150 m
Maximum pipe lenght between the multikit of the first branch and each IU		L2	≤ 90 m	≤ 40 m
Maximum pipe length between each multikit and each IU		L3	≤ 40 m	≤ 30 m
Difference in height between OU and IU	Higher OU	H1	≤ 50 m	≤ 50 m
	Lower OU		≤ 40 m	≤ 40 m
Difference in height between IU		H2	≤ 15 m	≤ 15 m

- 2 Pipes System



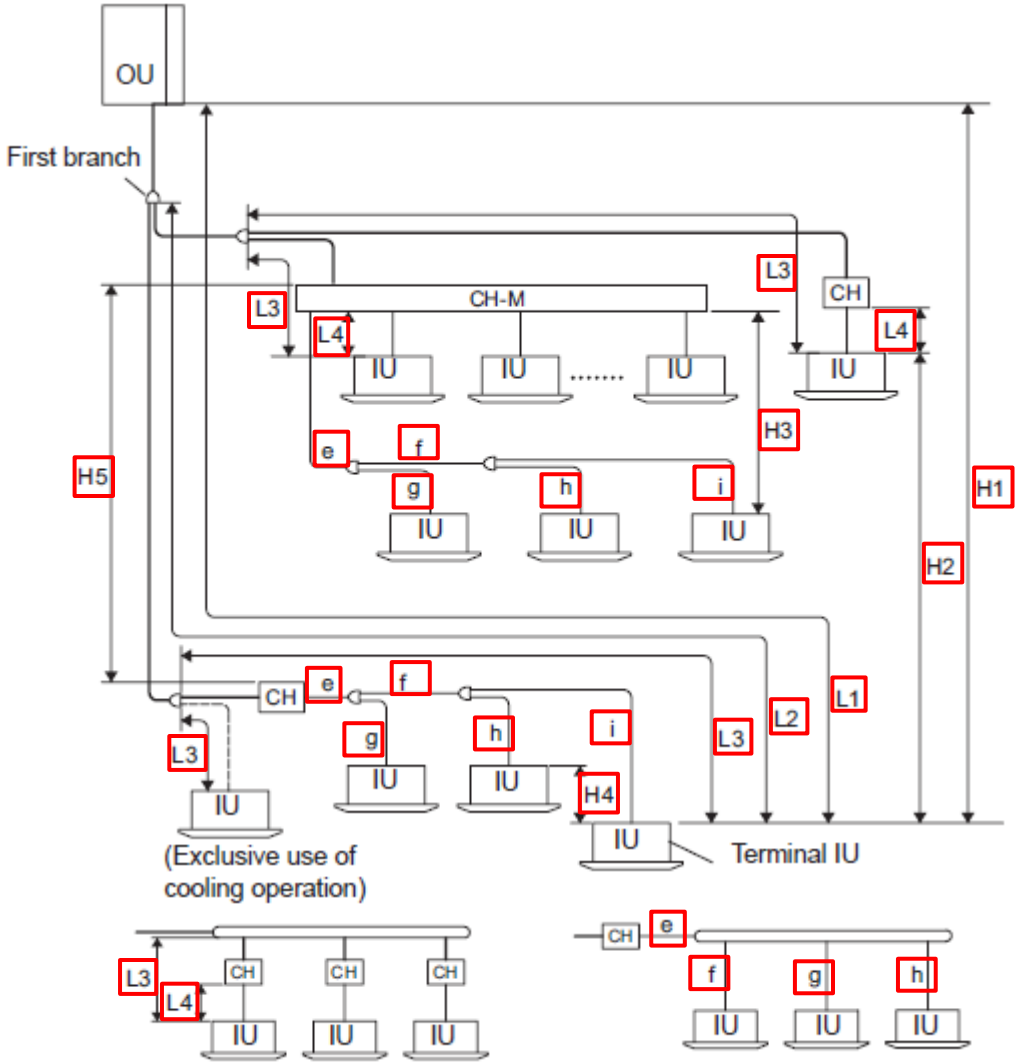
2. Piping Work

Piping Specifications

- RAS-8~12FSXNME

Part		Mark	≤ Recommended number of connected IU	> Recommended number of connected IU
Total Piping length		Current total liquid pipe length	≤ 500 m	≤ 300 m
Maximum pipe length	Current	L1	≤ 125 m	≤ 125 m
	Equivalent		≤ 150 m	≤ 150 m
Maximum pipe lenght between the multikit of the first branch and each IU		L2	≤ 90 m	≤ 40 m
Maximum pipe length between each multikit and each IU		L3	≤ 40 m	≤ 30 m
Total pipe length between the CH unit and each IU		L4 e+f+g+h+i	≤ 40 m	≤ 40 m
Difference in height between OU and IU	Higher OU	H1	≤ 50 m *	≤ 50 m *
	Lower OU		≤ 40 m	≤ 40 m
Difference in height between IU		H2	≤ 15 m	≤ 15 m
Difference in height between CH-Box and IU		H3	≤ 15 m **	≤ 15 m **
Difference in height between indoor units using the same CH unit		H4	≤ 4 m	≤ 4 m
Difference in height between CH units		H5	≤ 15 m	≤ 15 m

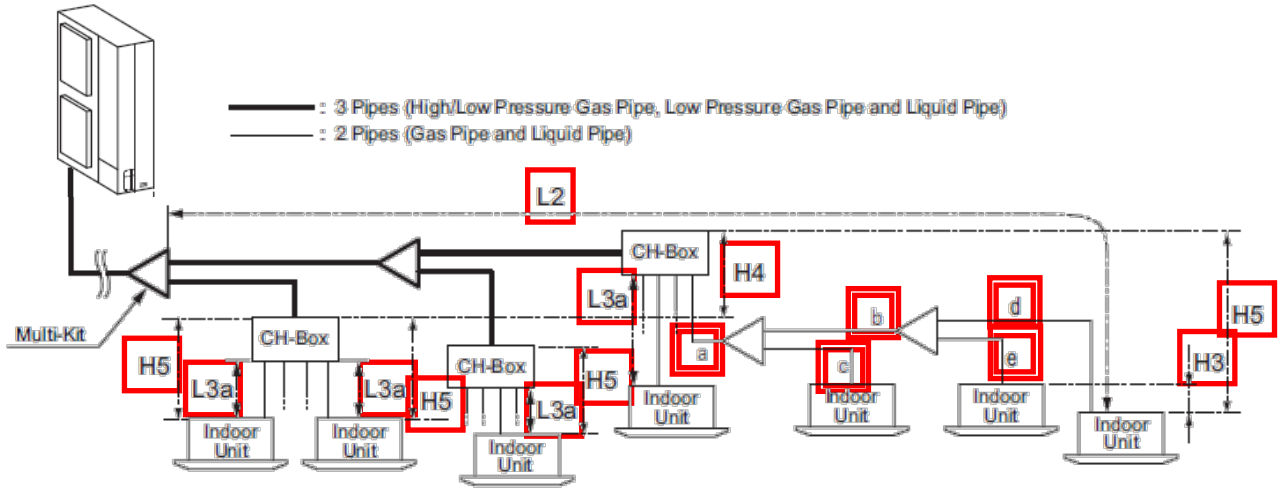
- 3 Pipes System



2. Piping Work

Piping Specifications

- RAS-8~12FSXNME **CH-Single**



Item		Mark	Allowable Piping Length
Piping Length	Maximum piping lenght between Multikit of 1st Branch and Terminal Indoor Unit	L2	≤ 90 m (1)
	Maximum Piping Length between CH-Box and Indoor Unit	L3a, a+b+d, a+b+e or a+c	≤ 40 m (2)
	In Case ther is Branch after CH-Box Total Piping Length from CH-Box to Each Connected Indoor Unit per Branch	a+b+c+d+e	≤ 40 m
Height Difference	In Case there is Branch after CH-Box, Height Difference between Indoor Units Connected to Same Connection Port of CH-Box	H3	≤ 4 m
	Height Difference between CH-Boxes	H4	≤ 15 m
	Height Difference between CH-Box and Indoor Unit	H5	(3)

(1) When piping length L2 > 40m, there are restrictions.

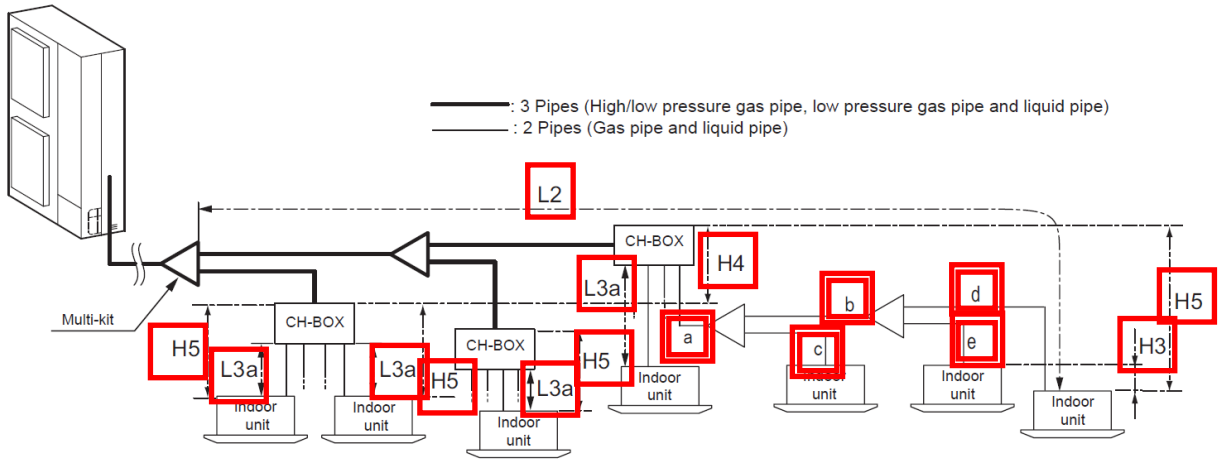
(2) If difference between the different L3a is not equilibrated, refrigerant distribution will be not correct and performance will be not correct.

(3) Recommended height difference between CH-Box and indoor is within 15m. If not it may cause a decrease of operating performance

2. Piping Work

Piping Specifications

- RAS-8~12FSXNME **CH-Multi**



Item		Mark	Allowable Piping Length
Piping Length	Maximum piping lenght between Multikit of 1st Branch and Terminal Indoor Unit	L2	≤ 90 m (1)
	Maximum Piping Length between CH-Box and Indoor Unit	L3a, a+b+d, a+b+e or a+c	≤ 40 m (2)
	In Case ther is Branch after CH-Box Total Piping Length from CH-Box to Each Connected Indoor Unit per Branch	a+b+c+d+e	≤ 40 m
Height Difference	In Case there is Branch after CH-Box, Height Difference between Indoor Units Connected to Same Connection Port of CH-Box	H3	≤ 4 m
	Height Difference between CH-Boxes	H4	≤ 15 m
	Height Difference between CH-Box and Indoor Unit	H5	(3)

(1) When piping length L2 > 40m, there are restrictions.

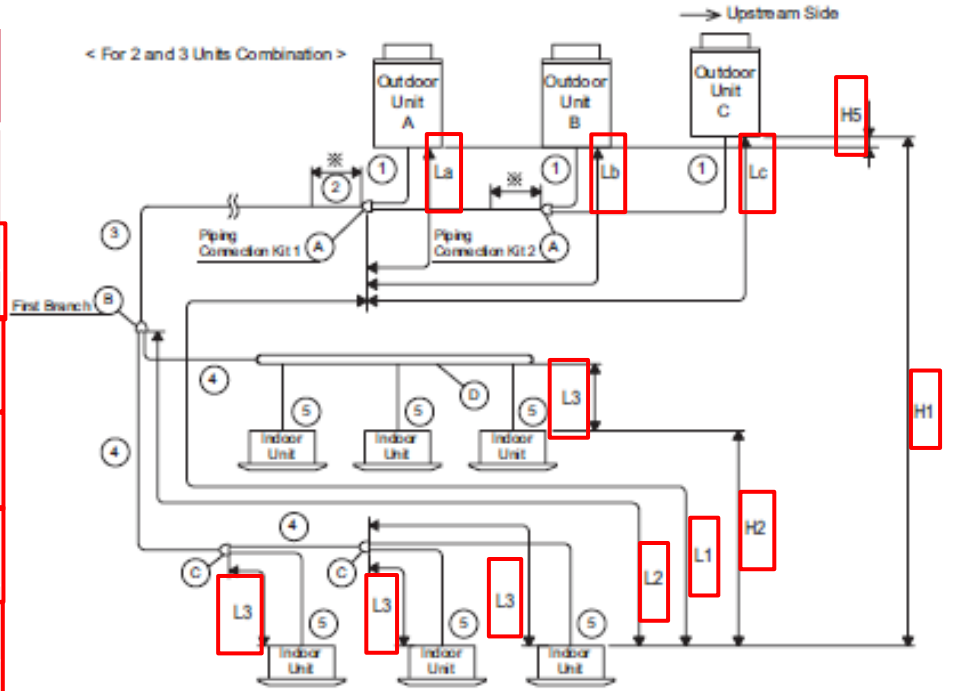
(2) If difference between the different L3a is not equilibrated, refrigerant distribution will be not correct and performance will be not correct.

(3) Recommended height difference between CH-Box and indoor is within 15m. If not it may cause a decrease of operating performance

2. Piping Work
Piping Specifications

- Set Free Sigma 2 Pipes System

Part		Make	≤ Recommended number of connected IU	>Recommended number of connected IU
Total Piping length		Current total liquid pipe length	≤ 1000 m (1)	≤ 300 m
Maximum pipe length	Current	L1	≤ 165 m	≤ 165 m
	Equivalent		≤ 190 m	≤ 190 m
Maximum pipe lenght between the multikit of the first branch and each IU		L2	≤ 90 m	≤ 40 m
Maximum pipe length between each multikit and each IU		L3	≤ 40 m	≤ 30 m
Pipe length between connection kit 1 and each OU		La, Lb, Lc	≤ 10 m	≤ 10 m
Difference in height between OU and IU	Higher OU	H1	≤ 50 m (2)	≤ 50 m (2)
	Lower OU		≤ 40 m	≤ 40 m
Difference in height between IU		H2	≤ 30 m	≤ 30 m
Difference in height between OU		H5	≤ 0.1 m	≤ 0.1 m



(1) The total pipe length permitted must be less than 1000 m due to the maximum additional refrigerant charge limitation

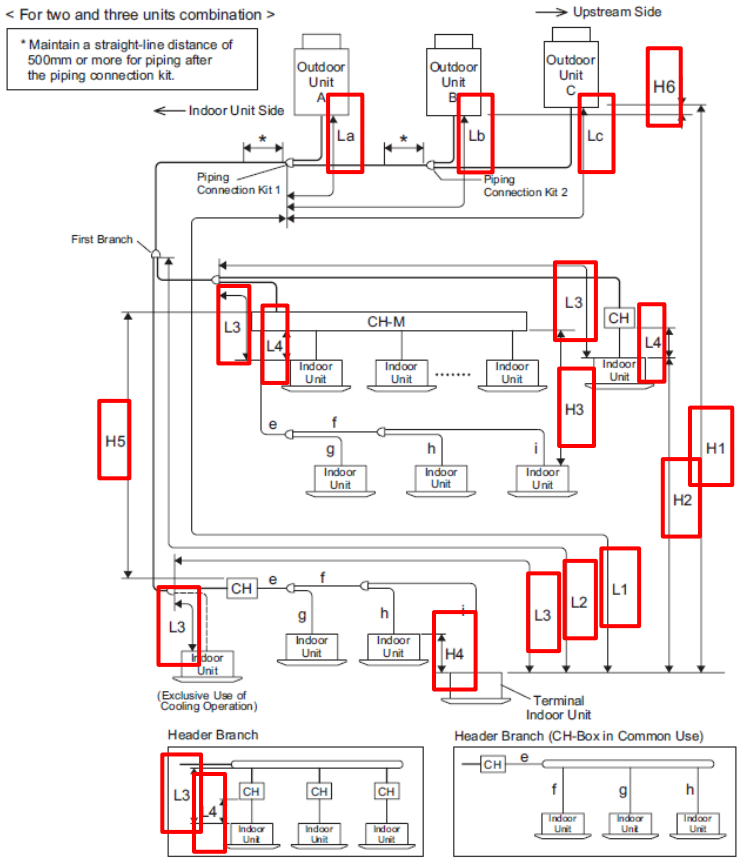
(2) Longer piping (up to 110 m) is available all models.

2. Piping Work

Piping Specifications

- Set Free Sigma 3 Pipes System

Part		Make	≤ Recommended number of connected IU	>Recommended number of connected IU
Total Piping length		Current total liquid pipe length	≤ 1000 m (1)	≤ 300 m
Maximum pipe length	Current	L1	≤ 165 m	≤ 165 m
	Equivalent		≤ 190 m	≤ 190 m
Maximum pipe lenght between the multikit of the first branch and each IU		L2	≤ 90 m	≤ 40 m
Maximum pipe length between each multikit and each IU		L3	≤ 40 m	≤ 30 m
Total pipe length between the CH unit and each IU		L4 e+f+g+h+i	≤ 40 m	≤ 40 m
Pipe length between connection kit 1 and each OU		La, Lb, Lc	≤ 10 m	≤ 10 m
Difference in height between OU and IU	Higher OU	H1	≤ 50 m *	≤ 50 m *
	Lower OU		≤ 40 m	≤ 40 m
Difference in height between IU		H2	≤ 15 m	≤ 15 m
Difference in height between CH-Box and IU		H3	**	
Difference in height between indoor units using the same CH unit		H4	≤ 4 m	≤ 4 m
Difference in height between CH units		H5	≤ 15 m	≤ 15 m
Difference in height between OU		H6	≤ 0.1 m	≤ 0.1 m

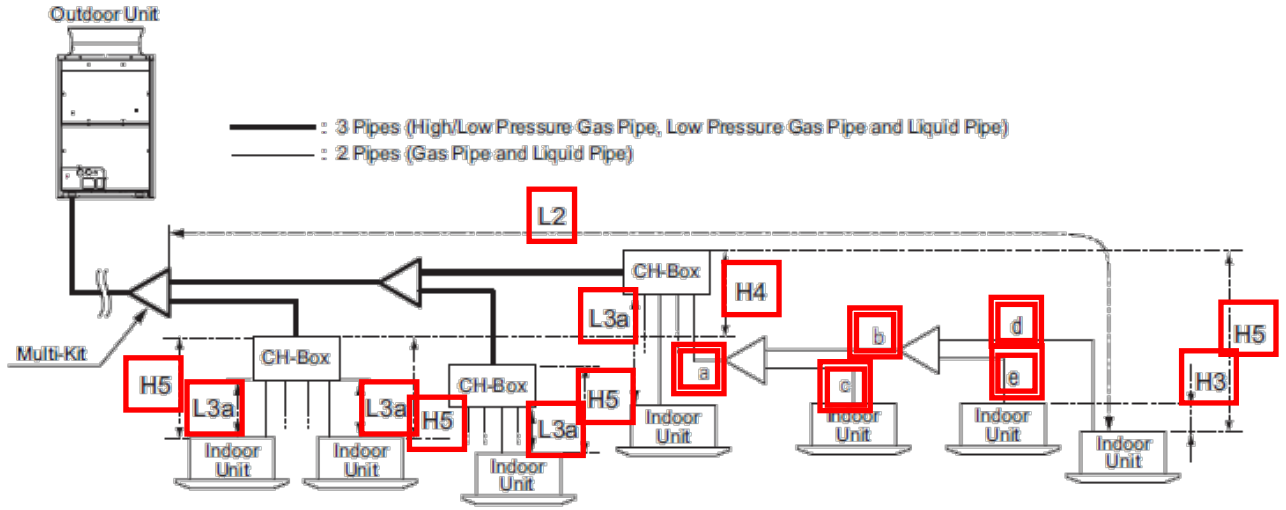


(1) The total pipe length permitted must be less than 1000 m due to the maximum additional refrigerant charge limitation
(*) Longer piping (up to 110m) is available all models
(**) Recommended height difference between CH-Box and indoor unit is within 15m

2. Piping Work

Piping Specifications

- Set Free Sigma 3 Pipes System CH-Multi



Item		Mark	Allowable Piping Length
Piping Length	Maximum piping lenght between Multikit of 1st Branch and Terminal Indoor Unit	L2	≤ 90 m (1)
	Maximum Piping Length between CH-Box and Indoor Unit	L3a, a+b+d, a+b+e or a+c	≤ 40 m (2)
	In Case ther is Branch after CH-Box Total Piping Length from CH-Box to Each Connected Indoor Unit per Branch	a+b+c+d+e	≤ 40 m
Height Difference	In Case there is Branch after CH-Box, Height Difference between Indoor Units Connected to Same Connection Port of CH-Box	H3	≤ 4 m
	Height Difference between CH-Boxes	H4	≤ 15 m
	Height Difference between CH-Box and Indoor Unit	H5	(3)

(1) When piping lenth L2 > 40m, there are restictions.

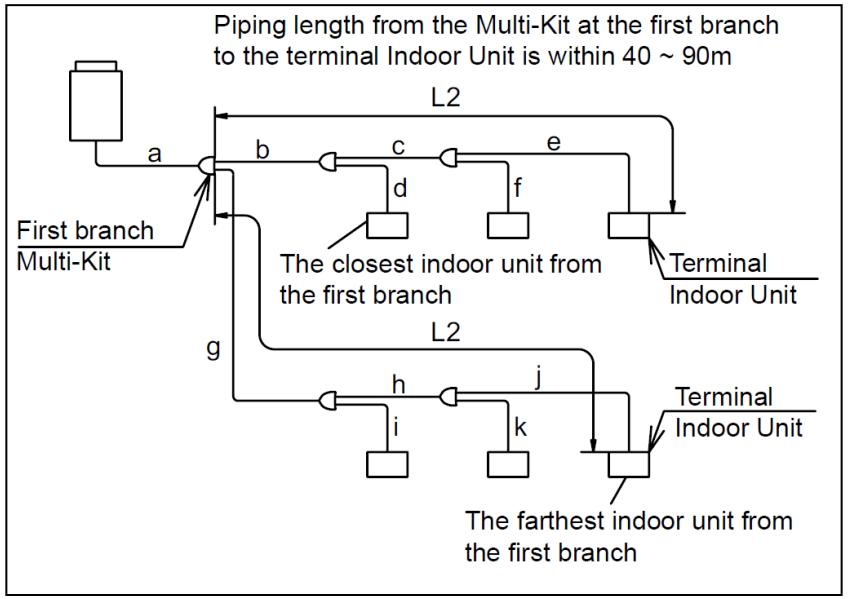
(2) If difference between the different L3a is not equilibrated, refrigerant distribution will be not correct and performance is not correct.

(3) Recommended height difference between CH-Box and indoor is within 15m. If not it may cause a decrease of operationg performance

2. Piping Work

Piping Specifications Sigma and MiniSetFree

Piping length from the multi-kit at the first branch to the terminal Indoor Units is within 40-90 m

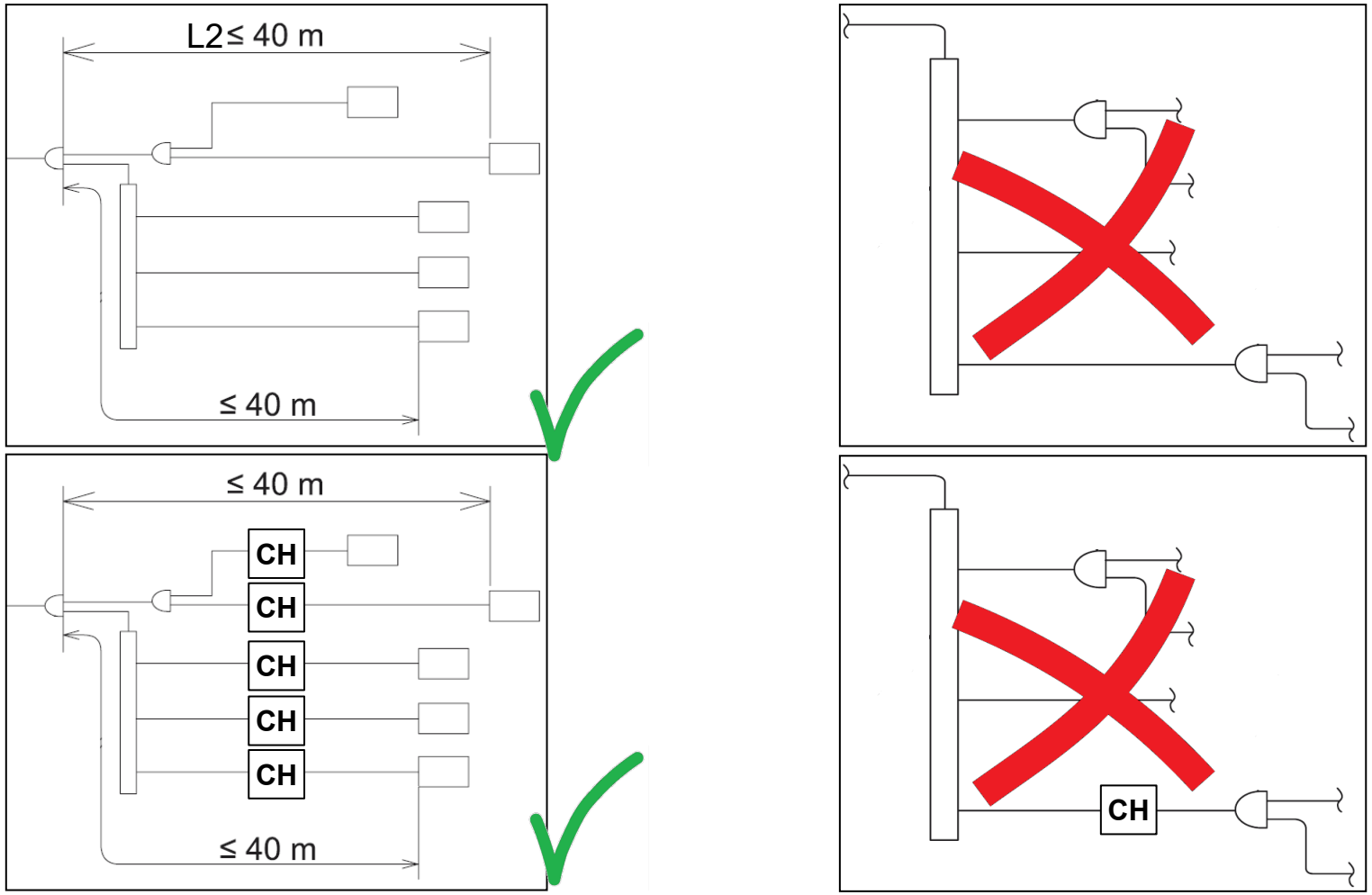


- If L2>40m, the size of gas and liquid lines “b” or “g” should be increased by one size with reducers (field-supplied).
- If (a)<(b, g) after increasing size, increase the size of (a) to the same size as (b, g)
- The difference between the piping length from the first branch to the farthest indoor unit and the piping length from the first branch to the closest indoor unit must be within 40m. -> (g+h+j)-(b+d) ≤ 40m

2. Piping Work

Piping Distribution Sigma and MiniSetFree

Header Braches Restrictions

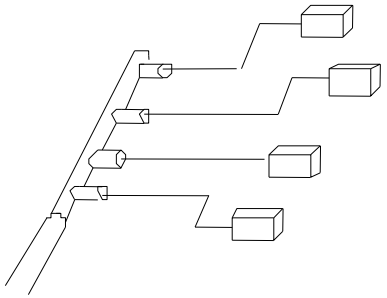


2. Piping Work

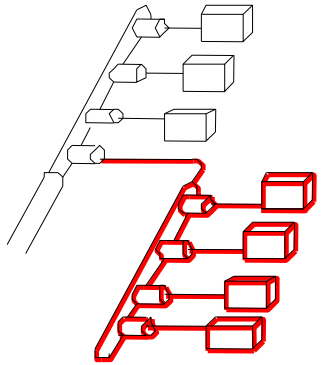
Piping Distribution Sigma and MiniSetFree

- Header distribution limitations
  - Connect two header branches consecutively is not allowed

Correct



Second header is not allowed

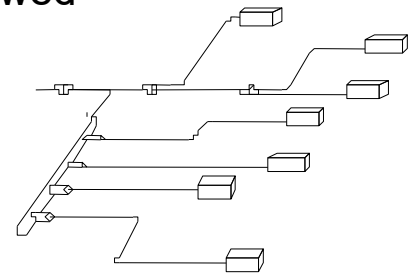


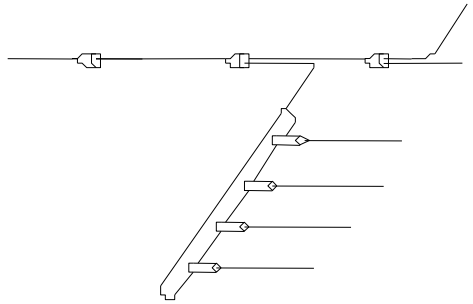
2. Piping Work

Piping Distribution Sigma and MiniSetFree

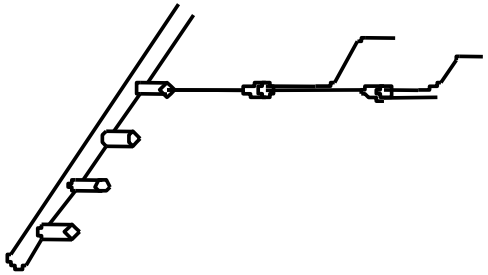
- Multi-Kit and Header distribution limitations
  - The combination of header and line distribution is allowed under certain limitations

Allowed





Not allowed

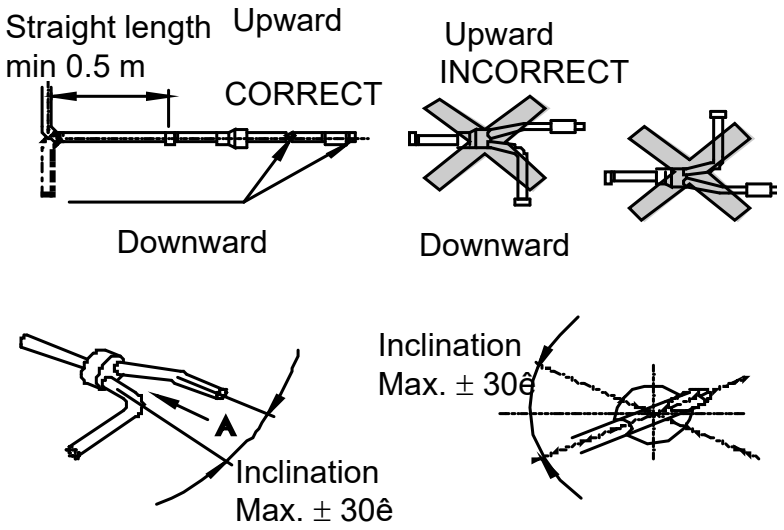


2. Piping Work

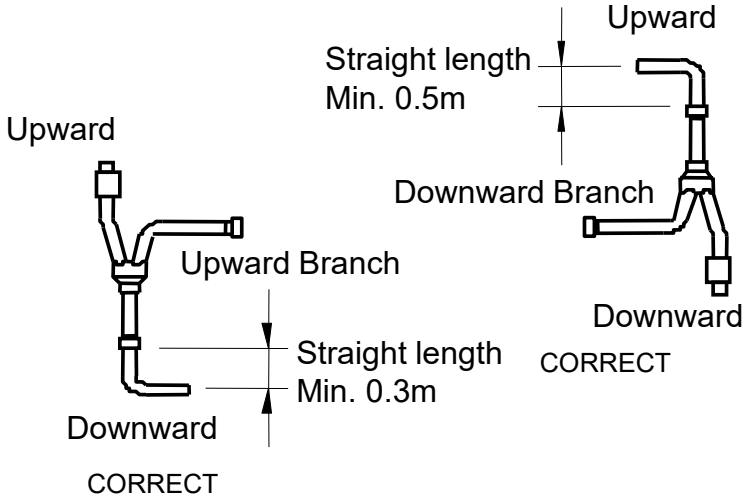
Piping Distribution Sigma and MiniSetFree

- Multi-Kit installation
  - The combination of header and line distribution is allowed under certain limitations

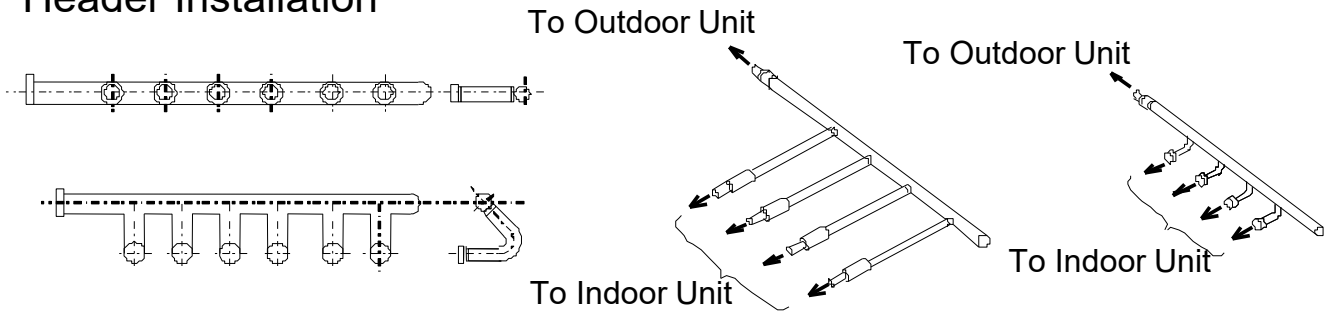
Horizontal Installation



Vertical Installation

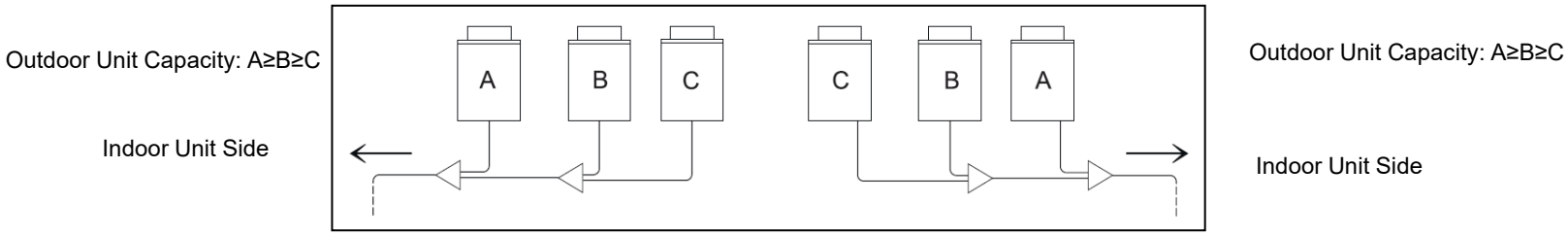


Header Installation

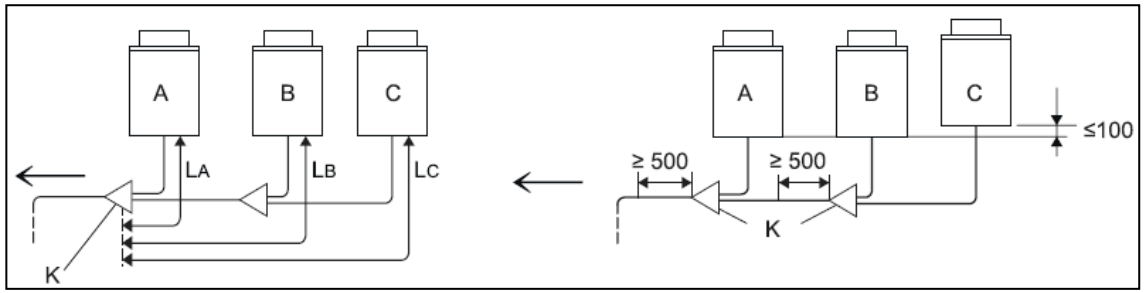


2. Piping Work
Piping Distribution Sigma

- Outdoor Unit Installation
  - Outdoor Unit alignement. Units with bigger capacity nearer to indoor unit side

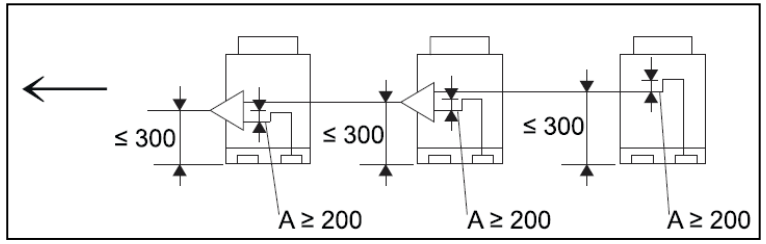


■ Pipping work



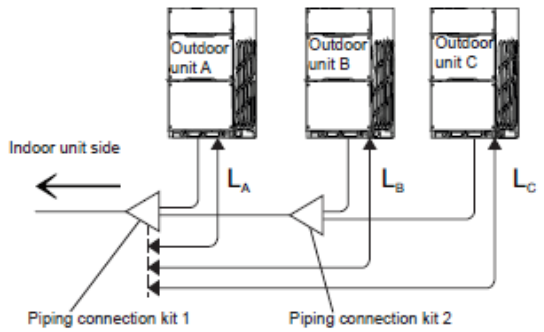
LA ≤ LB ≤ LC ≤ 10 m

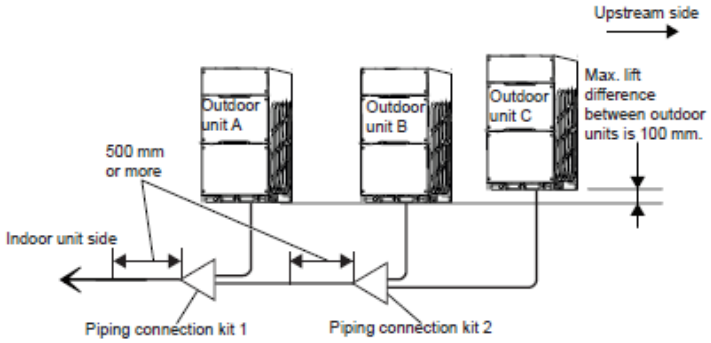
■ Place the connection kit at a lower level than refrigerant pipes of the OU



2. Piping Work
Piping Distribution Sigma
• Outdoor Unit Installation
■ Pipping work

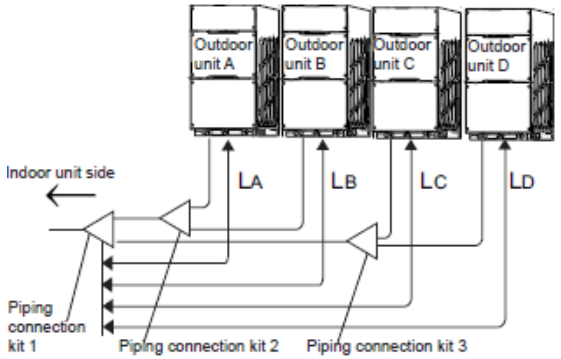
- 2 and 3 Units Combination

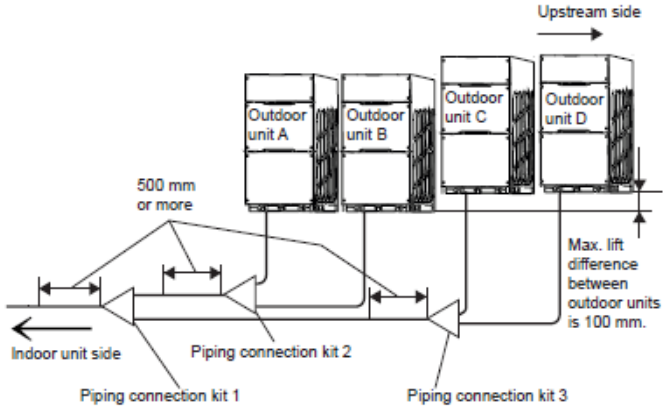




LA ≤ LB ≤ LC ≤ 10 m

- 4 Units Combination





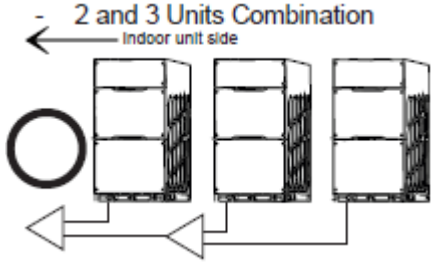
LA ≤ LB ≤ LC ≤ LD ≤ 10 m

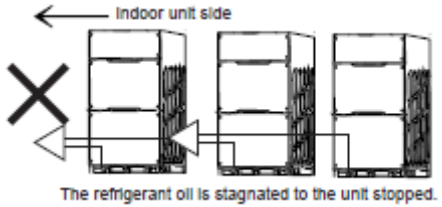
2. Piping Work

Piping Distribution Sigma

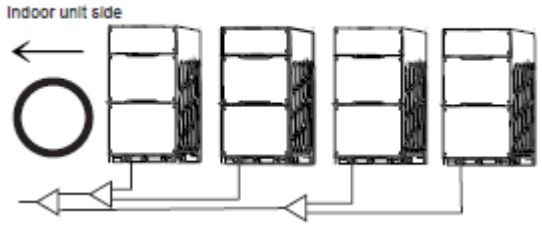
- Outdoor Unit Installation
  - Pipping work
    - Place the connection kit at a lower level than refrigerant pipes of the OU

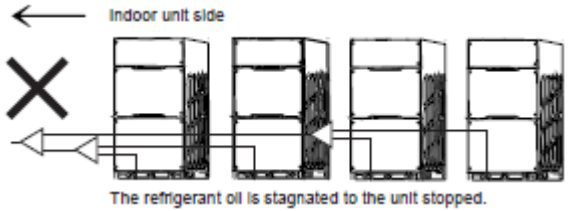
- 2 and 3 Units Combination



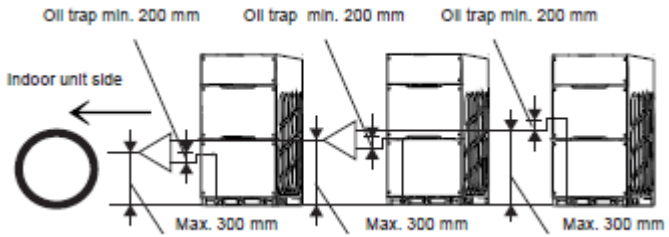


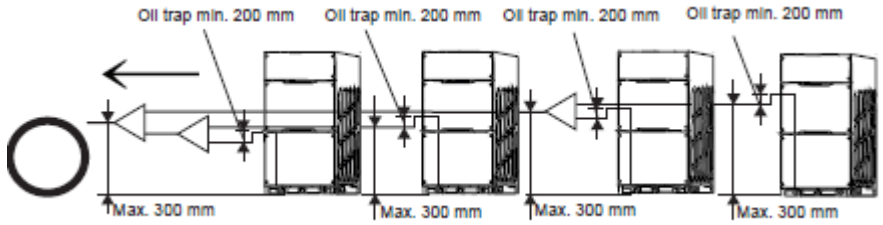
- 4 Units Combination





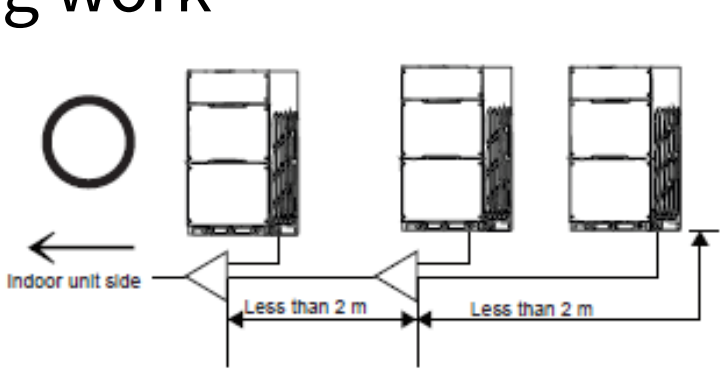
- In case connection kit must be higher



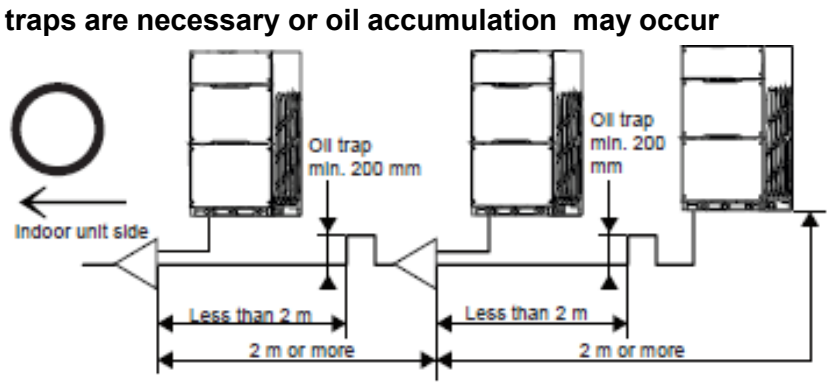


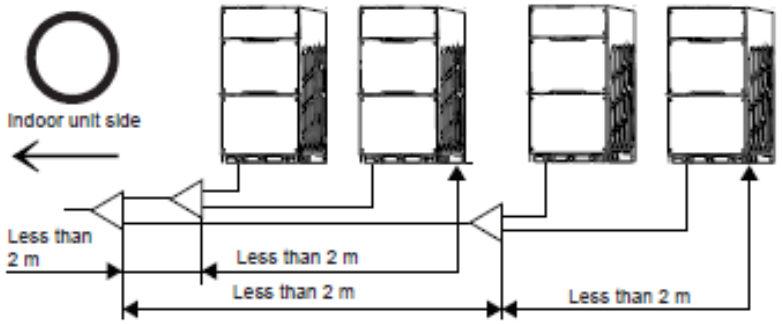
2. Piping Work
Piping Distribution Sigma

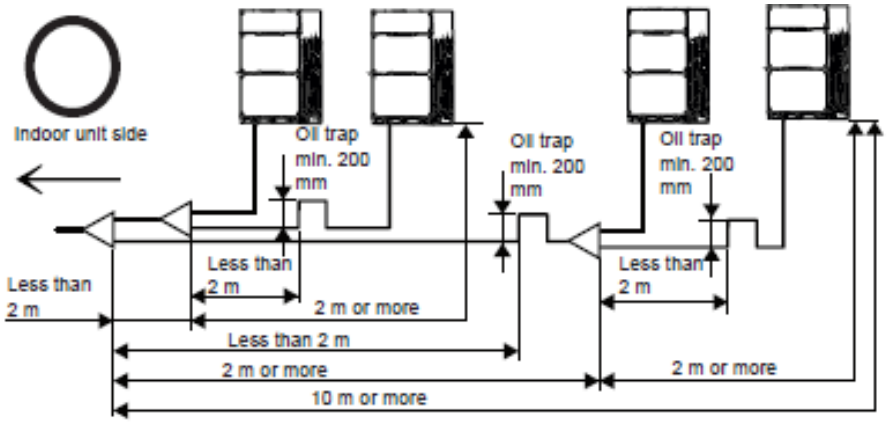
- Pipping work



Oil traps are necessary or oil accumulation may occur

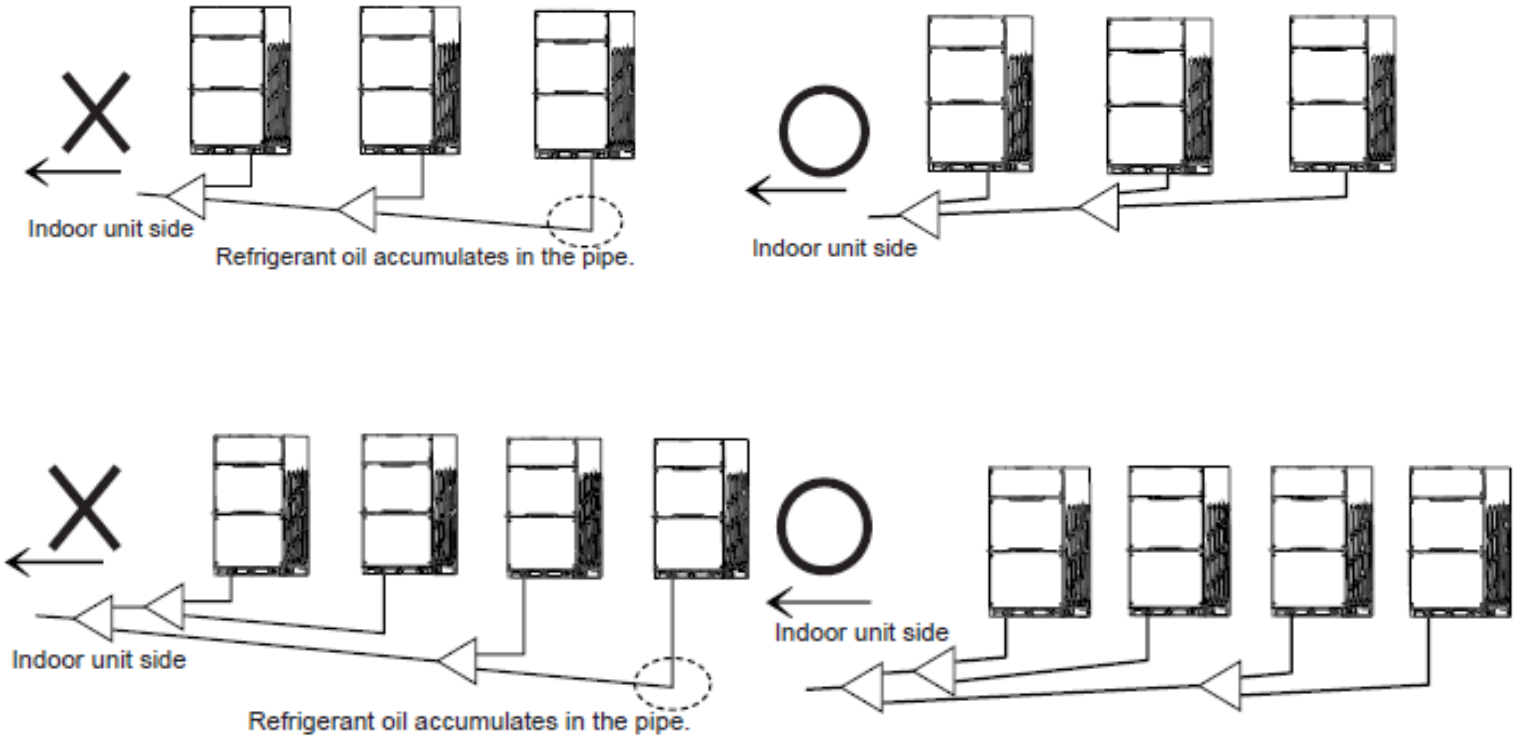






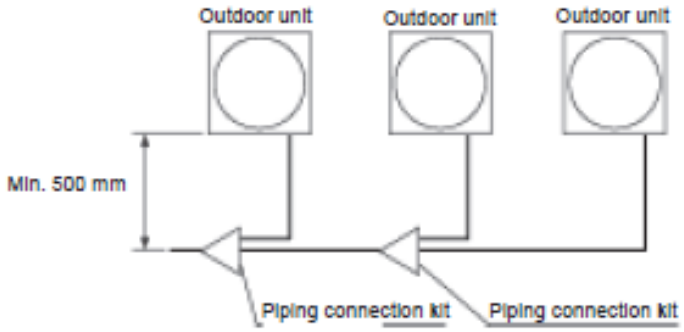
2. Piping Work
Piping Distribution Sigma

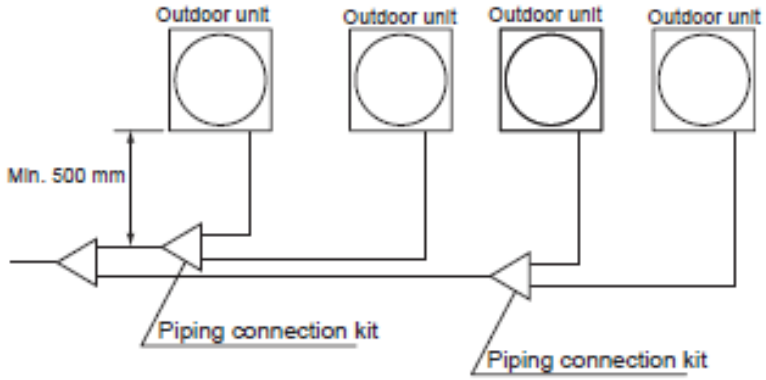
- Pipping work



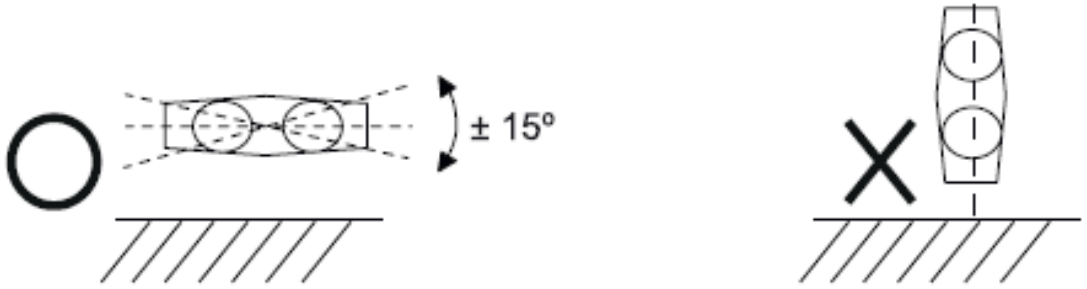
2. Piping Work
Piping Distribution Sigma

- Pipping work





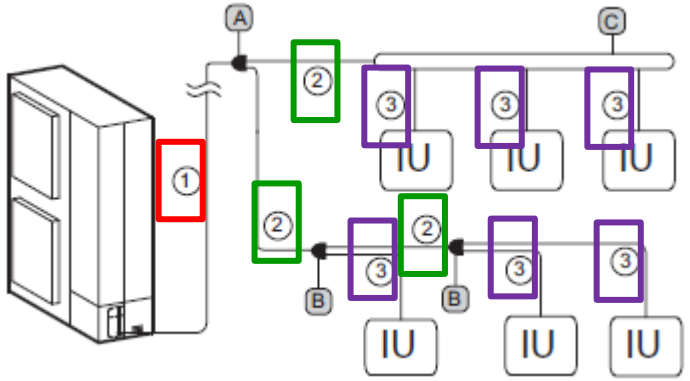
Direction of piping kit



2. Piping Work

Piping Diameters

- Size of pipes (ø mm) and selection of multi-kit (2 pipes)



(A) Outdoor Unit HP	(B) Total Indoor Unit HP	Model
4-10	< 12	E-102SN4
12	12	E-162SN4

Header Branch **(C)**

Total Indoor Unit HP	N° of branches	Model
2-8	4	MH-84AN1
4-10	8	MH-108AN

1. Ø of the main pipe (from the base unit or connection kit 1 to the first branch)

Outdoor unit total HP	Equivalent pipe length (100m)	
	Gas	Liquid
RAS-(4-6)FS(V)NME	Ø15.88	Ø9.52
RAS-8FSXNME	Ø19.05	Ø9.52
10RAS-10FSXNME	Ø22.2	Ø9.52
RAS-12FSXNME	Ø25.4	Ø12.7

2. Pipe diameter after first branch

Indoor unit total HP	Gas	Liquid
<6	Ø15.88	Ø9.52
(6-8.99)	Ø19.05	Ø9.52
(9-11.99)	Ø22.2	Ø9.52
(12-15.99)	Ø25.4	Ø12.7

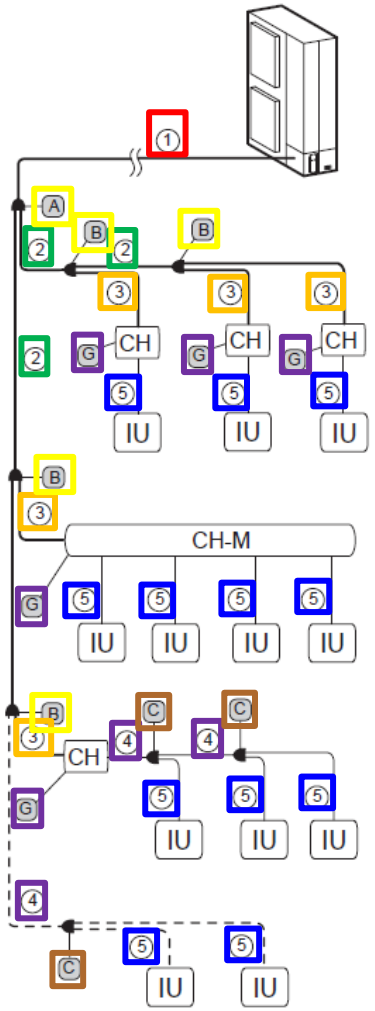
3. Pipe diameter between multi-kit and indoor unit

Indoor unit HP	Gas	Liquid
(0.4-1.5)	Ø12.7	Ø6.35*
2.0	Ø15.88	Ø6.35*
(2.5-6.0)	Ø15.88	Ø9.52
8.0	Ø19.05	Ø9.52
10.0	Ø22.2	Ø9.52

2. Piping Work

Piping Diameters

- Size of pipes (ø mm) and selection of multi-kit (3 pipes)
  - Only RAS-8-12FSXNME



Outdoor Unit	Gas, low pressure	Gas, high/low pressure	Liquid
RAS-8FSXNME	ø19.05	ø15.88	ø9.52
RAS-10FSXNME	ø22.2	ø19.05	ø9.52
RAS-12FSXNME	ø25.4	ø22.2	ø12.7

Total HP Indoor unit after 1st branch	Gas, low pressure	Gas, high/low pressure	Liquid
<6	ø15.88	ø12.7	ø9.52
(6-8.99)	ø19.05	ø15.88	ø9.52
(9-11.99)	ø22.2	ø19.05	ø9.52
(12-15.6)	ø25.4	ø22.2	ø12.7

Indoor unit total HP	Gas, Low pressure	Gas, High/Low pressure	Liquid
<6	ø15.88	ø 12.70	Ø9.52
(6-8.99)	Ø19.05	ø 15.88	Ø9.52
(9-11.99)	ø22.2	ø 19.05	Ø9.52
(12-15.99)	Ø25.4	ø 22.20	Ø12.7

Indoor unit total HP	Gas	Liquid
1.5 or less	ø12.7	Ø6.35
2.0	Ø15.88	Ø6.35
(2.5-6.0)	ø15.88	Ø9.52
8.0	Ø19.05	Ø9.52
10.0	Ø22.2	Ø9.52

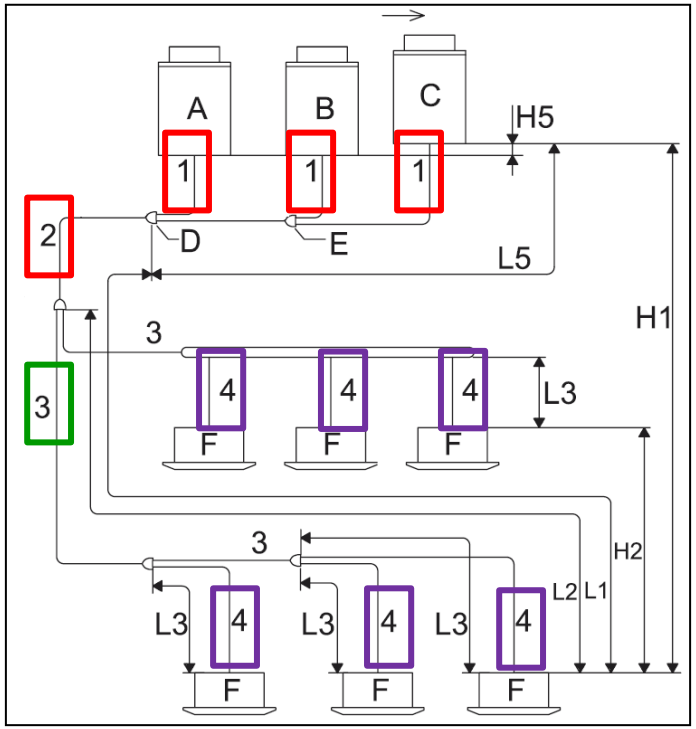
(A) Outdoor Unit HP	(B) Total indoor unit HP	Model
-	<6	E-52XN3
8-10	6-11.99	E-102XN3
12	12-15.6	E-162XN3

Total Indoor Unit HP	Model
<12	E-102SN4
12-15,6	E-162SN4

Type	CH-Box Model	Branch	Number of Connectable IU per Branch	Available Combination Of IU Capacity (HP)		Low Pressre Gas	High/Low Pressure Gas	Liquid
				per CH-Box	Per Branch			
Single	CH-AP160SSX	1	1-7	6,0	0,8-4,0	Ø15,8	Ø12,7	Ø9,52
					4,1-6,0	Ø19,05	ø15.8	Ø9,52
	CH-AP160SSX	1	1-8	10,0	6,1-8,0	Ø19,05	ø15.8	Ø9,52
					8,1-10,0	Ø22,2	Ø19,05	Ø9,52
Multiple	CH-AP04MSSX	4	1-6	16,0	6,0 or less	Refer to pipe Diameter after first Branch (3 pipes)		
	CH-AP08MSSX	8	1-6	30,0	6,0 or less			
	CH-AP12MSSX	12	1-6	30,0	6,0 or less			
	CH-AP16MSSX	16	1-6	30,0	6,0 or less			

2. Piping Work
Piping Diameters Sigma

■ Size of pipes (ø mm) and selection of multi-kit (2 pipes)



1. Pipe diameter for the outdoor unit
2. Ø of the main pipe (from the base unit or connection kit 1 to the first branch)

Outdoor unit HP	Equivalent pipe length < 100 m		Outdoor unit HP	Equivalent pipe length < 100 m	
	Gas	Liquid		Gas	Liquid
5	Ø15.88	Ø9.52	16	Ø28.58	Ø12.7
(6/8)	Ø19.05	Ø9.52	(18-24)	Ø28.58	Ø15.88
10	Ø22.2	Ø9.52	(26-34)	Ø31.75	Ø19.05
(12/14)	Ø25.4	Ø12.7	(36-54)	Ø38.1	Ø19.05

3. Pipe diameter after first branch

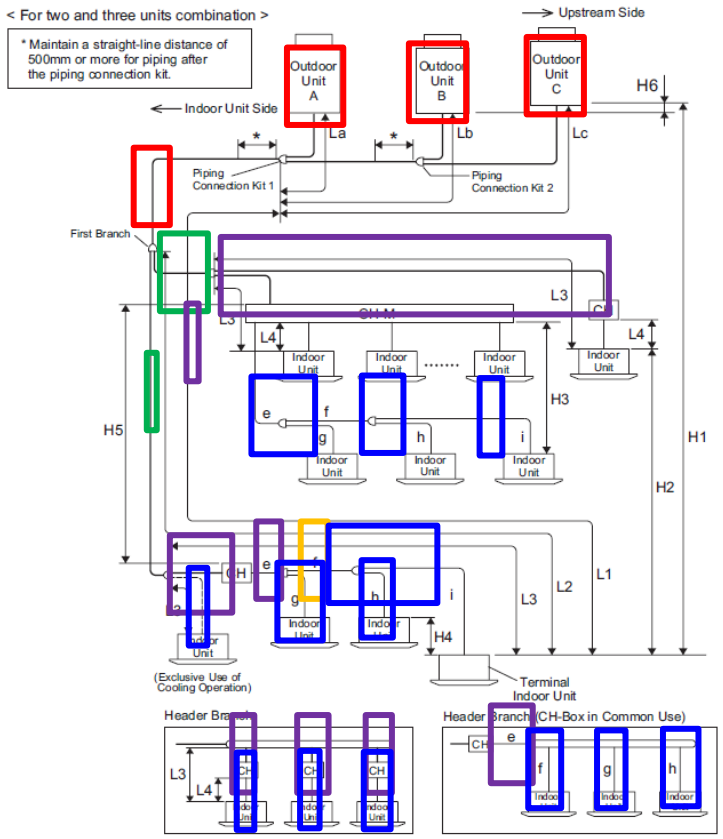
Indoor unit total HP	Gas	Liquid	Indoor unit total HP	Gas	Liquid
<6	Ø15.88	Ø9.52	(16-17.99)	Ø28.6	Ø12.7
(6-8.99)	Ø19.05	Ø9.52	(18-25.99)	Ø28.6	Ø15.88
(9-11.99)	Ø22.2	Ø9.52	(26-35.99)	Ø31.75	Ø19.05
(12-15.99)	Ø25.4	Ø12.7	≥36	Ø38.1	Ø19.05

4. Pipe diameter between multi-kit and indoor unit

Indoor unit HP	Gas	Liquid	Indoor unit HP	Gas	Liquid
(0.4-1.5)	Ø12.7	Ø6.35*	10.0	Ø22.2	Ø9.52
2.0	Ø15.88	Ø6.35*	16.0	Ø28.58	Ø12.7
(2.5-6.0)	Ø15.88	Ø9.52	20	Ø28.58	Ø15.88
8.0	Ø19.05	Ø9.52	-	-	-

2. Piping Work
Piping Diameters Sigma

- Size of pipes (ø mm) and selection of multi-kit (3 pipes)



Outdoor Unit HP	Low Pressure Gas	High/Low Pressure Gas	Liquid	Outdoor Unit HP	Low Pressure Gas	High/Low Pressure Gas	Liquid
5	15.88	12.7	9.52	22 and 24	28.58	25.4	15.88
6 and 8	19.05	15.88	9.52	26	31.75	25.4	19.05
10	22.2	19.05	9.52	28 - 34	31.75	28.58	19.05
12 and 14	25.4	22.2	12.7	36	38.1	28.58	19.05
16	28.58	22.2	12.7	38 - 54	38.1	31.75	19.05
18 and 20	28.58	22.2	15.88				

Total HP Indoor unit	Gas, low pressure	Gas, high/low pressure	Liquid	Total HP indoor unit	Gas, low pressure	Gas, high/low pressure	Liquid
<6	ø15.88	ø12.7	ø9.52	(18-21.99)	ø28.58	ø22.2	ø15.88
(6-8.99)	ø19.05	ø15.88	ø9.52	(22-25.99)	ø28.58	ø25.4	ø15.88
(9-11.99)	ø22.2	ø19.05	ø9.52	(26-35.99)	ø31.75	ø28.58	ø19.05
(12-15.99)	ø25.4	ø22.2	ø12.7	> 36	ø38.1	ø31.75	ø19.05
(16-17.99)	ø28.58	ø22.2	ø12.7	-	-	-	-

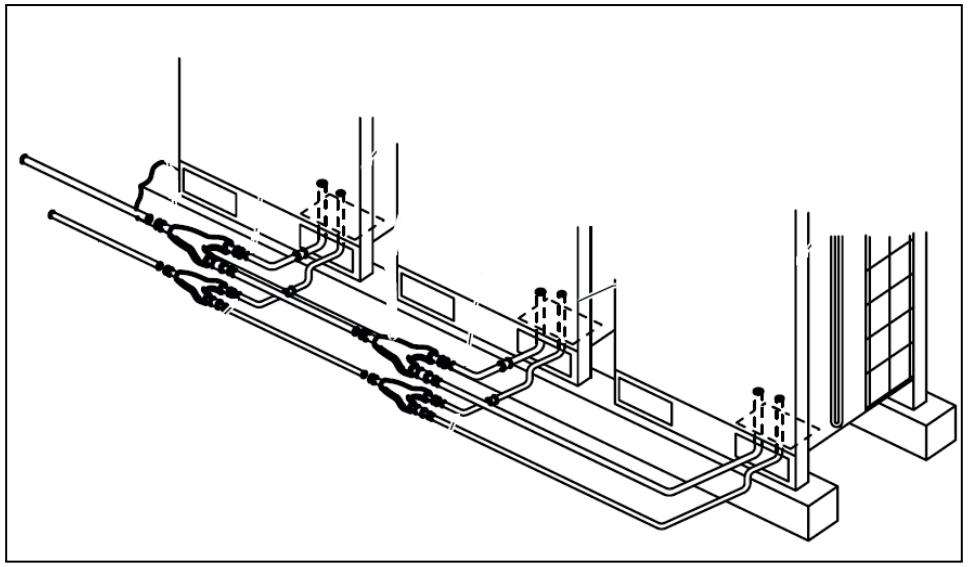
Type	CH-Box Model	Branch	Number of Connectable Indoor Unit per Branch	Available Combination of Indoor Unit Capacity (HP)		Low Pressure Gas	High/Low Pressure Gas	Liquid
				per CH-Box	per Branch			
Single	CH-AP160SSX	1	1 - 7 *1	6.0	0.8 - 4.0	15.88	12.7	9.52
					4.1 - 6.0	19.05	15.88	9.52
	CH-AP280SSX	1	1 - 8 *1	10.0	6.1 - 8.0	19.05	15.88	9.52
					8.1 - 10.0	22.2	19.05	9.52
Multiple	CH-AP04MSSX	4	1 - 6 *2	16.0	6.0 or less	Refer to the ④ [Pipe Diameter after First Branch] (3 Pipes).		
	CH-AP08MSSX	8	1 - 6 *2	30.0	6.0 or less			
	CH-AP12MSSX	12	1 - 6 *2	30.0	6.0 or less			
	CH-AP16MSSX	16	1 - 6 *2	30.0	6.0 or less			

Indoor unit total HP	Gas	Liquid	Indoor unit total HP	Gas	Liquid
<6	ø15.88	Ø9.52	(12-15.99)	Ø25.4	Ø12.7
(6-8.99)	Ø19.05	Ø9.52	(16-17.99)	Ø28.6	Ø12.7
(9-11.99)	ø22.2	Ø9.52	(18-25.99)	Ø28.6	Ø15.88

Indoor unit total HP	Gas	Liquid	Indoor unit total HP	Gas	Liquid
1.5 or less	ø12.7	Ø6.35	10.0	Ø22.2	Ø9.52
2.0	Ø15.88	Ø6.35	16.0	Ø28.58	Ø12.7
(2.5-6.0)	ø15.88	Ø9.52	20.0	Ø28.58	Ø15.88
8.0	Ø19.05	Ø9.52	-	-	-

2. Piping Work
Piping Diameters Sigma

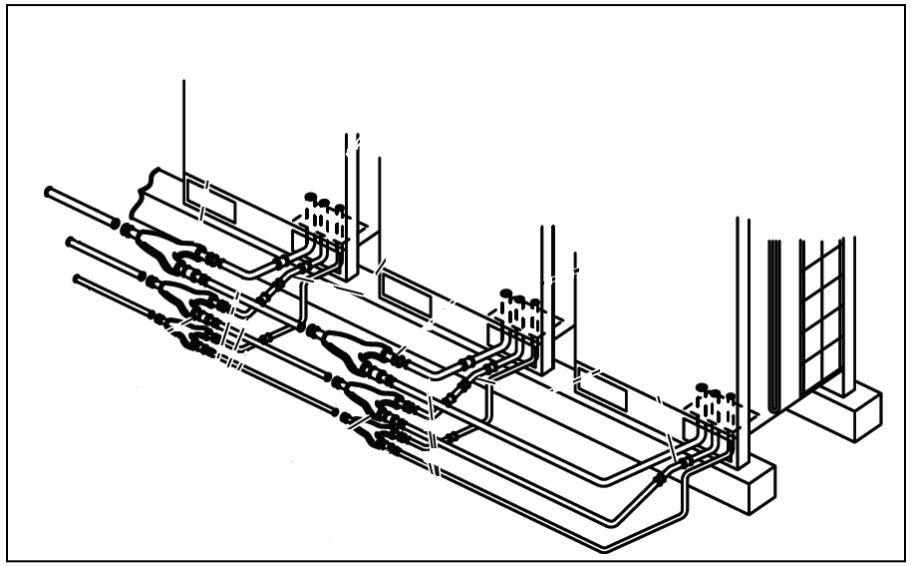
- 2-Pipes



Item	Application in outdoor units			Model	Remarks
	HP		Connectivity Number		
	Standard Type	High Eff. Type			
Pipe Connection Kit	-	20 – 24	2	MC-NP21SA	• Gas: 1 • Liquid: 1
	26 – 48	26 – 36	2	MC-NP21SA	
	50 – 54	38 – 54	3	MC-NP30SA	• Gas: 2 • Liquid: 2

2. Piping Work
Piping Diameters Sigma

- 3-Pipes

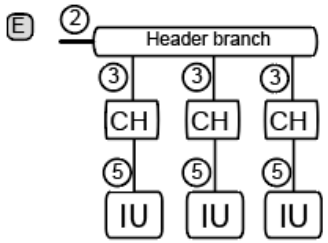


Item	Application in outdoor units			Model	Remarks
	HP		Connectivity Number		
	Standard Type	High Eff. Type			
Pipe Connection Kit	-	20 – 24	2	MC-NP21SX	• L. Gas: 1 • H. Gas: 1 • Liquid: 1
	26 – 48	26 – 36	2	MC-NP21SX	
	50 – 54	38 – 54	3	MC-NP30SX	• L. Gas: 2 • H. Gas: 2 • Liquid: 2

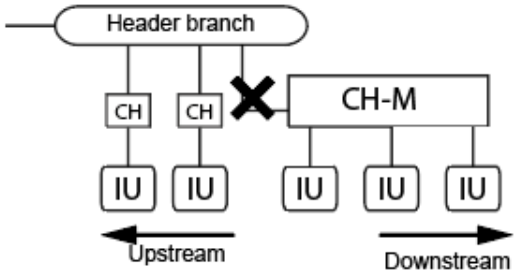
2. Piping Work

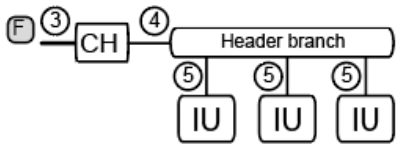
Piping Diameters

- Size of pipes (ø mm) and selection of multi-kit (3 pipes)

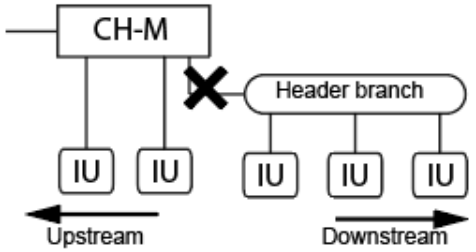


Total Indoor Unit HP	N° of header branches	Model
4-10	8	MH-108XN





Total Indoor Unit HP	N° of header branches	Model
2-8	4	MH-84AN1
4-10	8	MH-108AN



2. Piping Work

Multi-kit

- 2-Pipe Multi-Kit Sigma and MiniSetFree
  - First branch

Outdoor unit HP	Model
5-10	E-102SN4
12-16	E-162SN4
18-24	E-242SN3
26-54	E-302SN3
56-96	MW-NP2682A3

  - After the first branch

Total indoor unit HP	Model
<12	E-102SN4
12-17.99	E-162SN4
18-25.99	E-242SN3
26-55.99	E-302SN3
≥ 56	MW-NP2682A3

2. Piping Work

Multi-kit

- 3-Pipe Multi-Kit Sigma and MiniSetFree 8-12HP
  - First branch

Outdoor unit HP	Model
5	E-52XN3
6-10	E-102XN3
12-16	E-162XN3
18,20	E-202XN3
22, 24	E-242XN3
26-54	E-322XN3

  - After the first branch

Total indoor unit HP	Model
<6	E-52XN3
6-11.99	E-102XN3
12-17.99	E-162XN3
18-21.99	E-202XN3
22-25.99	E-242XN3
≥ 26	E-322XN3

  - After the first branch (2 pipes portion)

Total indoor unit HP	Model
<12	E-102SN4
12-17.99	E-162SN4
18-25.99	E-242SN3
≥ 26	E-302SN3

2. Piping Work

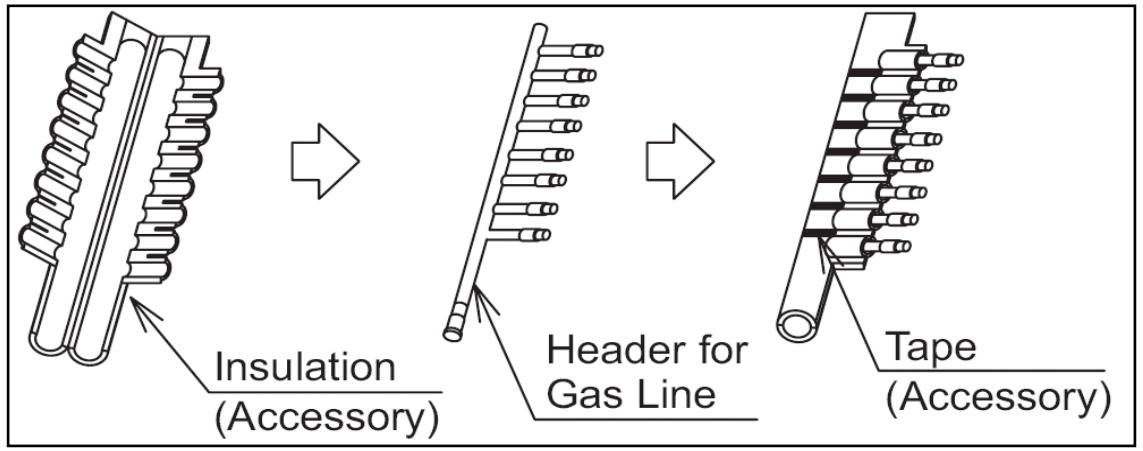
Header Branch

- 2 Pipes System Sigma and MiniSetFree

Total HP of the indoor unit	No. of header branches	Model
5 – 8	4	MH-84AN1
5 – 10	8	MH-108AN

- 3 Pipes System Sigma and MiniSetFree 8-12HP

Total HP of the indoor unit	No. of header branches	Model
5 – 10	8	MH-108XN

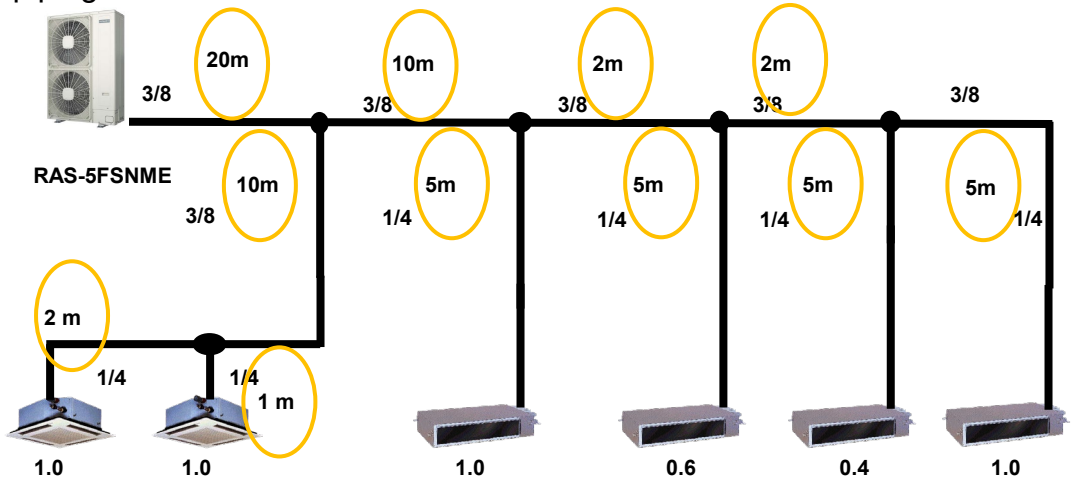


2. Piping Work

Refrigerant Charge Calculation (FS(V)NME 2 pipes)

W0 Total Additional refrigerant charge for liguid piping

Nominal Diameter	Quantity of refrigerant per meter of pipe (Kg/m)	Total Length (m)	Additional refrigerant charge (Kg)
Ø 12.7,1/2	x0.085	0	0
Ø 9.52, 3/8	x0.050	44	2.2
Ø 6.35,1/4	x0.020	23	0.46
Total			2.66



W0= 2.66 kg

Total Additional Refrigerant Charge (Kg) = 2.66 Kg

Outdoor unMit	Quantity of refrigerant charged in the W0 outdoor unit (kg)
RAS-4FS(V)NME	3.7
RAS-5FS(V)NME	3.7
RAS-6FS(V)NME	4.1

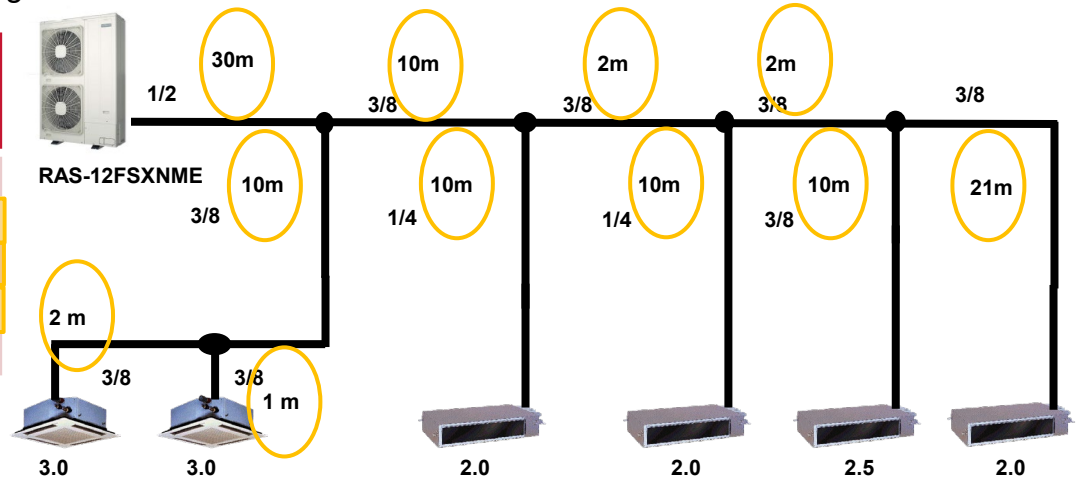
Total Refrig. Charge of this System = 2.66 + 3.7 = 6.36 Kg

2. Piping Work

Refrigerant Charge Calculation (FSXNME 2 pipes)

W1 Additional refrigerant charge for liguid piping

Nominal Diameter	Quantity of refrigerant per meter of pipe (Kg/m)	Total Length (m)	Additional refrigerant charge (Kg)
Ø 15.88, 5/8	x0.17	0	0
Ø 12.7,1/2	x0.11	30	3.3
Ø 9.52, 3/8	x0.056	58	3.248
Ø 6.35,1/4	x0.024	20	0.48
Total			7.028



In case that quantity calculated is less than the mínimum indicated in the table below, adopt the quantity indicated below

Series	FSXNME
Unit Capacity (HP)	8~12
Minimum Additional Ref. Charge of Base Unit (kg)	2.0

W1(7.028 >2.0) = 7.028 kg

2. Piping Work

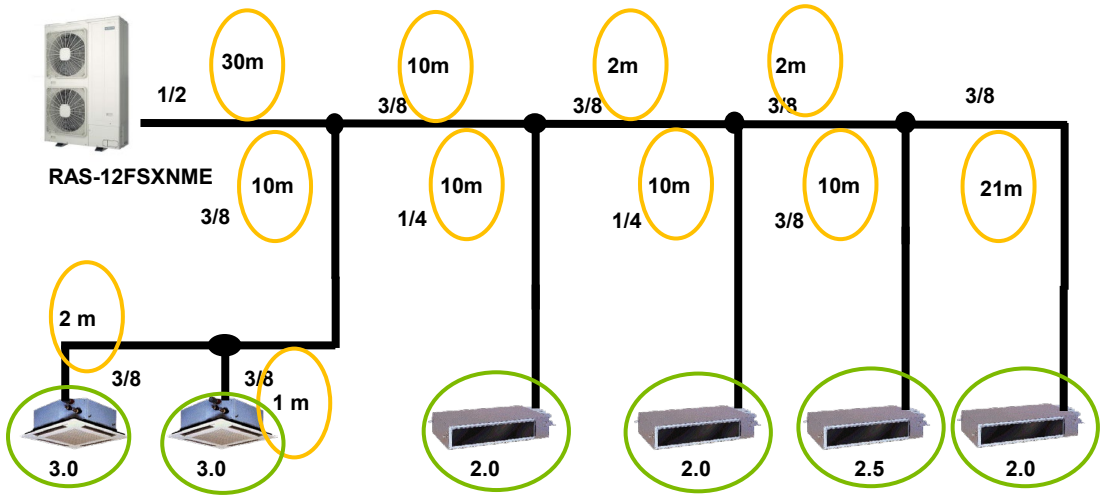
Refrigerant Charge Calculation (FSXNME 2 pipes)

W2 Additional refrigerant charge for IU

Indoor Unit Capacity (HP)	0.4~1.0	1.5~6.0
Additional Ref. Charge (kg)	0.3	0.5

Additional Ref. charge (W2 kg) ≤ 6.0 kg

Indoor Unit Capacity (HP)	0.4~1.0	1.5~6.0
Quantity of IUs per capacity	0	6
Additional Ref. Charge (kg)	0	3



W2 = 3 kg

W3 Additional refrigerant charge for Big IU

Indoor Unit Capacity (HP)	8-10
Additional Ref. Charge (kg)	1

W3 = 0 kg

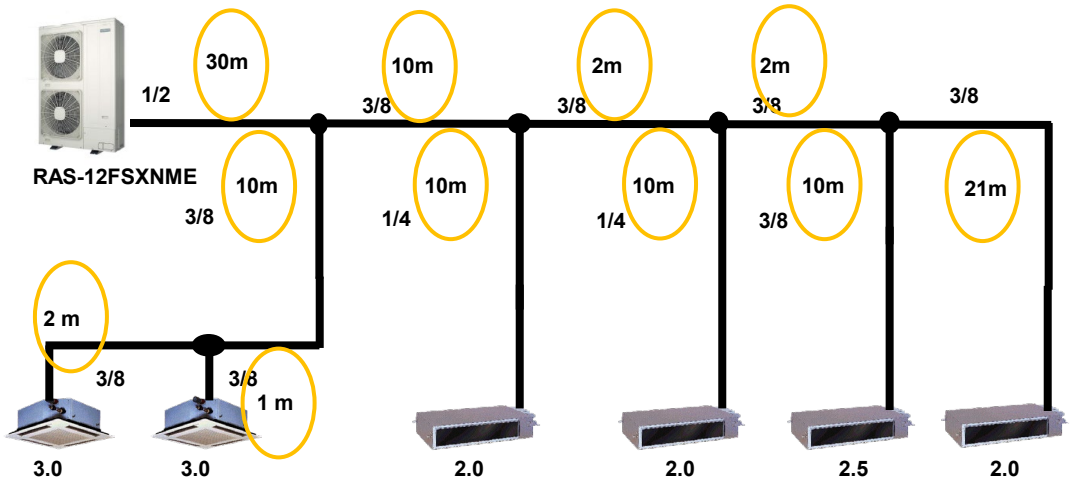
2. Piping Work

Refrigerant Charge Calculation (FSXNME 2 pipes)

W4 Additional refrigerant charge for IU connection ratio

Ratio of Indoor Units	Maximum additional refrigerant charge (kg)
≤100%	0 Kg
>100%	0.5 Kg

W4(120.8%) = 0.5 kg

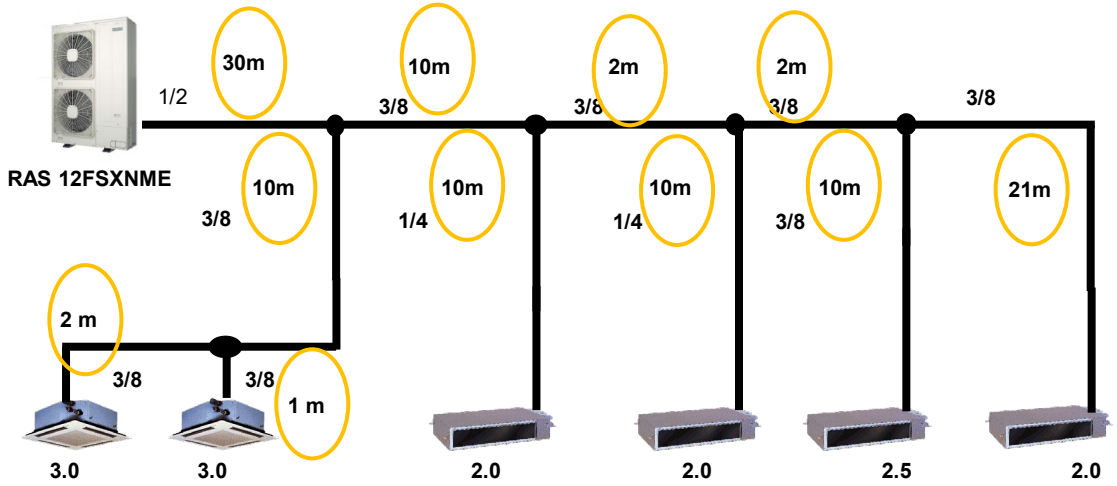


Total Additional Refrigerant Charge (Kg) = W1+W2+W3+W4

Total Additional Refrigerant Charge (Kg) = 7.028+3+0+0.5= 10.528 Kg

2. Piping Work

Refrigerant Charge Calculation (FSXNME 2 pipes)



Outdoor unMit	Quantity of refrigerant charged in the W0 outdoor unit (kg)
RAS-8FSXNE	4,2
RAS-10FSXNME	5.5
RAS-12FSXNME	5,5

Total Additional Refrigerant Charge (Kg) = 10.528 Kg

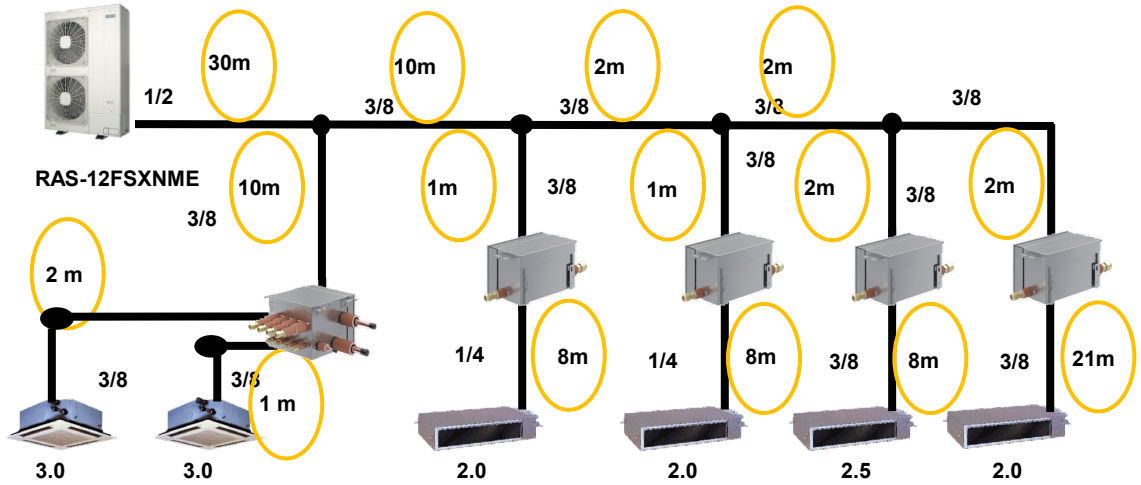
Total Refrig. Charge of this System = 10.528+5.5 = 16.078 Kg

2. Piping Work

Refrigerant Charge Calculation (FSXNME 3 pipes)

W1 Additional refrigerant charge for liguid piping

Nominal Diameter	Quantity of refrigerant per meter of pipe (Kg/m)	Total Length (m)	Additional refrigerant charge (Kg)
Ø 15.88, 5/8	x0.17	0	0
Ø 12.7,1/2	x0.11	30	3.3
Ø 9.52, 3/8	x0.056	62	3.472
Ø 6.35,1/4	x0.024	16	0.384
Total			7.156



In case that quantity calculated is less than the mínimum indicated in the table below, adopt the quantity indicated below

Series	FSXNME
Unit Capacity (HP)	8~12
Minimum Additional Ref. Charge of Base Unit (kg)	2.0

W1(7.156 >2.0) = 7.156 kg

2. Piping Work

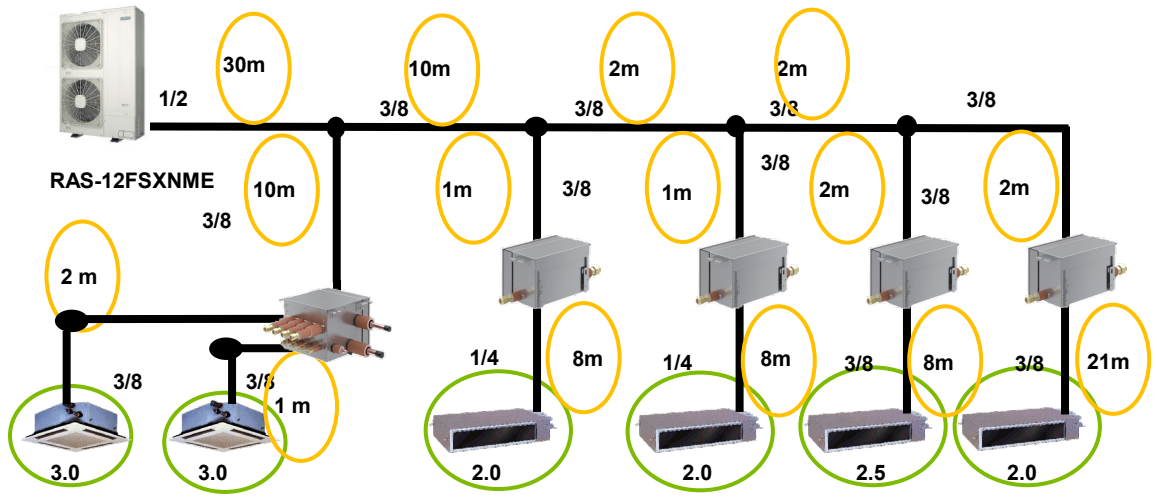
Refrigerant Charge Calculation (FSXNME 3 pipes)

W2 Additional refrigerant charge for IU

Indoor Unit Capacity (HP)	0.4~1.0	1.5~6.0
Additional Ref. Charge (kg)	0.3	0.5

Additional Ref. charge (W2 kg) ≤ 6.0 kg

Indoor Unit Capacity (HP)	0.4~1.0	1.5~6.0
Quantity of IUs per capacity	0	6
Additional Ref. Charge (kg)	0	3



W2 = 3 kg

W3 Additional refrigerant charge for Big IU

Indoor Unit Capacity (HP)	8-10
Additional Ref. Charge (kg)	1

W3 = 0 kg

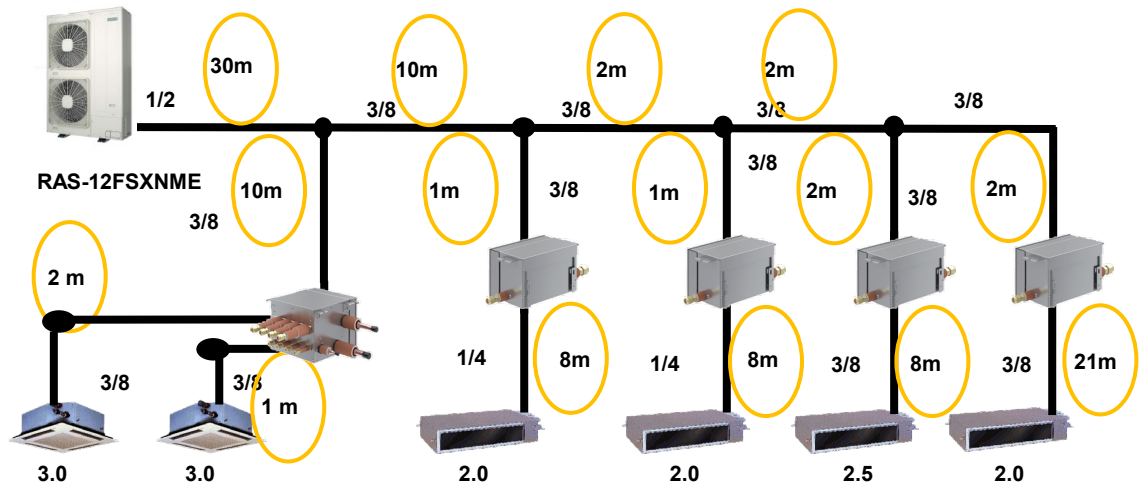
2. Piping Work

Refrigerant Charge Calculation (FSXNME 3 pipes)

W4 Additional refrigerant charge for IU connection ratio

Ratio of Indoor Units	Maximum additional refrigerant charge (kg)
≤100%	0 Kg
>100%	0.5 Kg

W4(120.8%) = 0.5 kg



W5 Additional refrigerant charge for each CH-Box (Multiple)

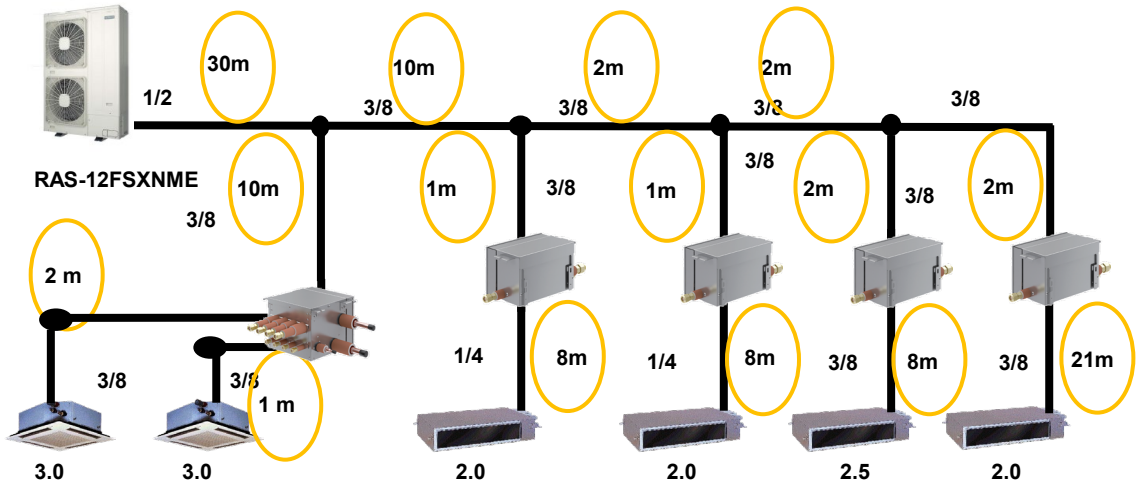
CH-Box Model	CH-04MSSX	CH-08MSSX	CH-12MSSX	CH-16MSSX
Additional Ref. Charge (kg)	0.1	0.2	0.3	0.4

W5 = 0.1 kg

Total Additional Refrigerant Charge (Kg) = W1+W2+W3+W4+W5
Total Additional Refrigerant Charge (Kg) = 7.156+3+0+0.5+0,1= 10.756 Kg

2. Piping Work

Refrigerant Charge Calculation (FSXNME 3 pipes)



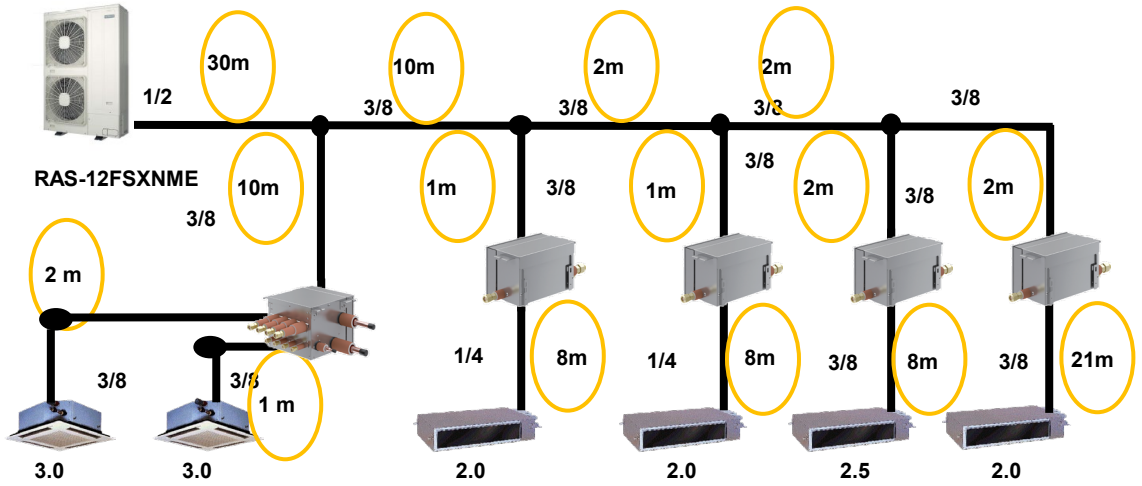
Outdoor unMit	Quantity of refrigerant charged in the W0 outdoor unit (kg)
RAS-8FSXNE	4,2
RAS-10FSXNME	5.5
RAS-12FSXNME	5.5

Total Additional Refrigerant Charge (Kg) = 10.756 Kg

Total Refrig. Charge of this System = 10.756+5.5 = 16.256 Kg

2. Piping Work

Refrigerant Charge Calculation (FS(V)(X)NME)



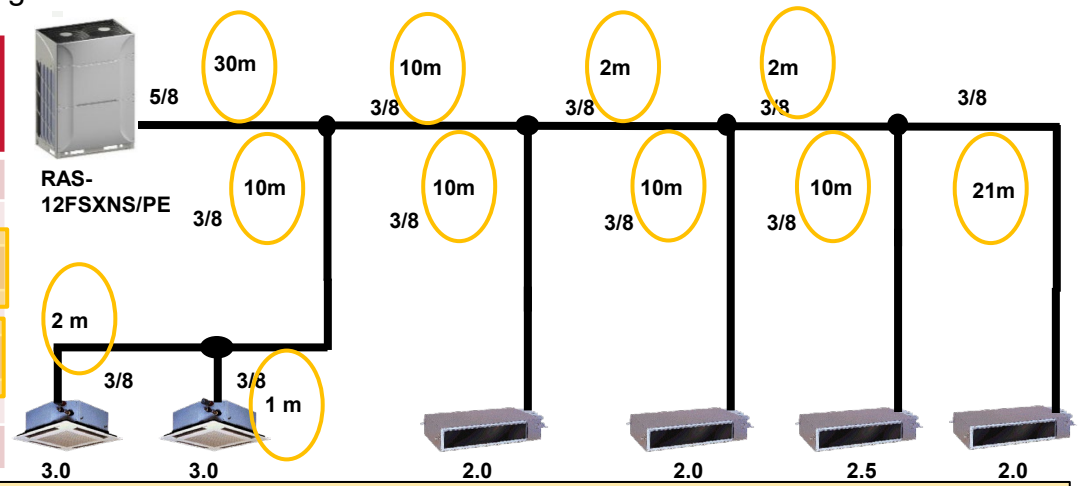
Total additional charge must not exceed the maximum additional charge

Outdoor unMit	Maximum additional charge (kg)
RAS-4FS(V)NME	9.3
RAS-5FS(V)NME	9.3
RAS-6FS(V)NME	8.9
RAS-8FSXNE	26.1
RAS-10FSXNME	26.1
RAS-12FSXNME	26.1

2. Piping Work
Refrigerant Charge Calculation (FSXNS/PE 2 pipes)

W1 Additional refrigerant charge for liguid piping

Nominal Diameter	Quantity of refrigerant per meter of pipe (Kg/m)	Total Length (m)	Additional refrigerant charge (Kg)
Ø 22.2, 7/8	x0.36	0	0
Ø 19.05, 3/4	x0.26	0	0
Ø 15.88, 5/8	x0.17	30	5.10
Ø 12.7,1/2	x0.11	0	0
Ø 9.52, 3/8	x0.056	78	4.37
Ø 6.35,1/4	x0.024	0	0
Total			9.47



In case that quantity calculated is less than the mínimum indicated in the table below, adopt the quantity indicated below

Series	FS(X)NSE						
Unit Capacity (HP)	8-10	12~18	20~24	26~36	38~42	44~48	50~54
Minimum Additional Ref. Charge of Base Unit (kg)	2.0	3.0	4.0	6.0	7.0	8.0	9.0

Series	FS(X)NPE										
Unit Capacity (HP)	5~10	12-14	16~20	22	24-26	28~32	34-36	38~42	44-46	48-50	52-54
Minimum Additional Ref. Charge of Base Unit (kg)	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0

W1(9.47 >3.0) = 9.47 kg

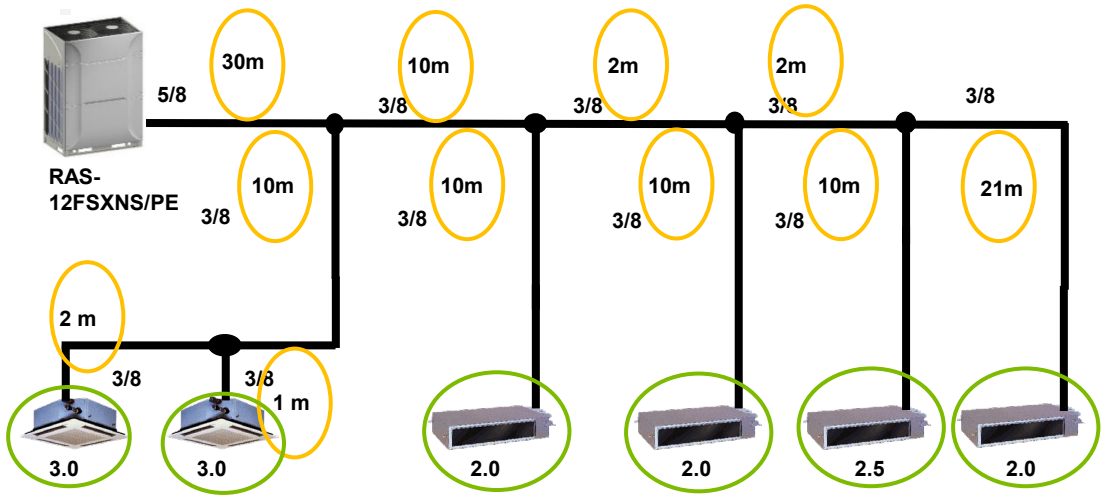
2. Piping Work

Refrigerant Charge Calculation (FSXNS/PE 2 pipes)

W2 Additional refrigerant charge for IU

Indoor Unit Capacity (HP)	0.4~1.0	1.5~6.0
Additional Ref. Charge (kg)	0.3	0.5

Indoor Unit Capacity (HP)	0.4~1.0	1.5~6.0
Quantity of IUs per capacity	0	6
Additional Ref. Charge (kg)	0	3



W2 = 3 kg

W3 Additional refrigerant charge for Big IU

Indoor Unit Capacity (HP)	8-10	16-20
Additional Ref. Charge (kg)	1	2

W3 = 0 kg

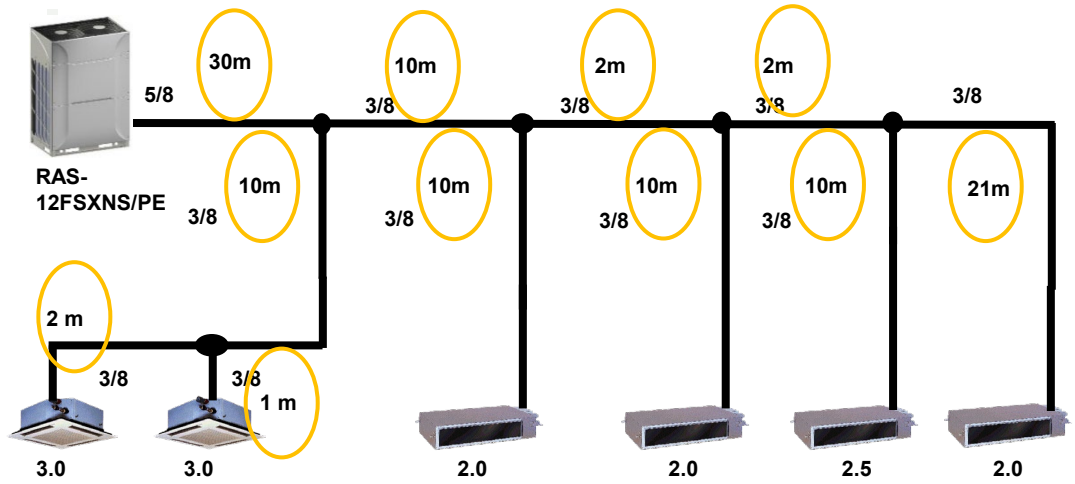
2. Piping Work

Refrigerant Charge Calculation (FSXNS/PE 2 pipes)

W4 Additional refrigerant charge for IU connection ratio

Ratio of Indoor Units	Maximum additional refrigerant charge (kg)
≤100%	0 Kg
>100%	0.5 Kg

W4(120.8%) = 0.5 kg



W5 Additional refrigerant charge for OU combination model

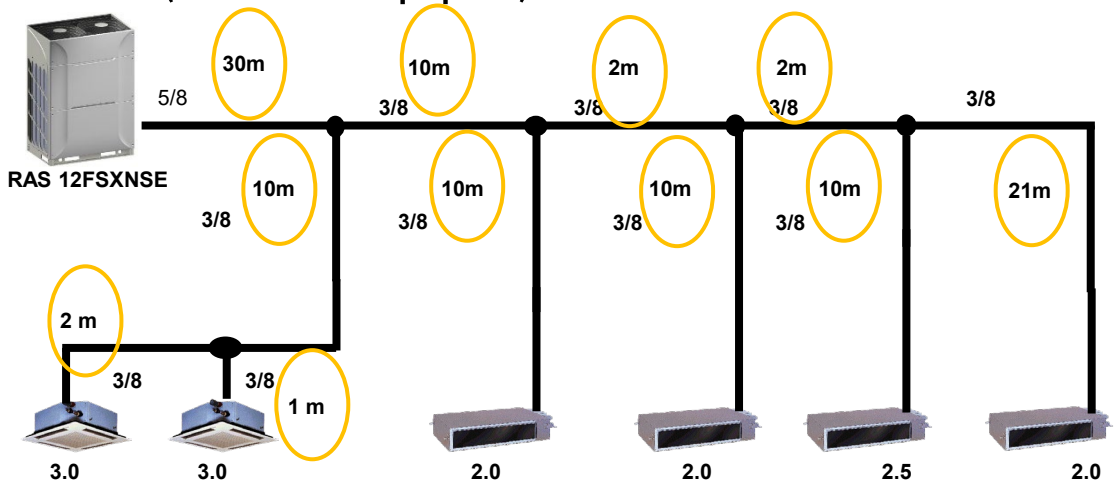
OU Model	RAS-24FSNP/SE	RAS-38FSNP/SE	RAS-42FSNP/SE	RAS-46FSNP/SE	RAS-48FSNP/SE
Additional Ref. Charge (kg)	1	1	1	1	2

W5 = 0 kg

Total Additional Refrigerant Charge (Kg) = W1+W2+W3+W4+W5
Total Additional Refrigerant Charge (Kg) = 9.47+3+0+0.5+0= 12.97

2. Piping Work

Refrigerant Charge Calculation (FSXNSE 2 pipes)



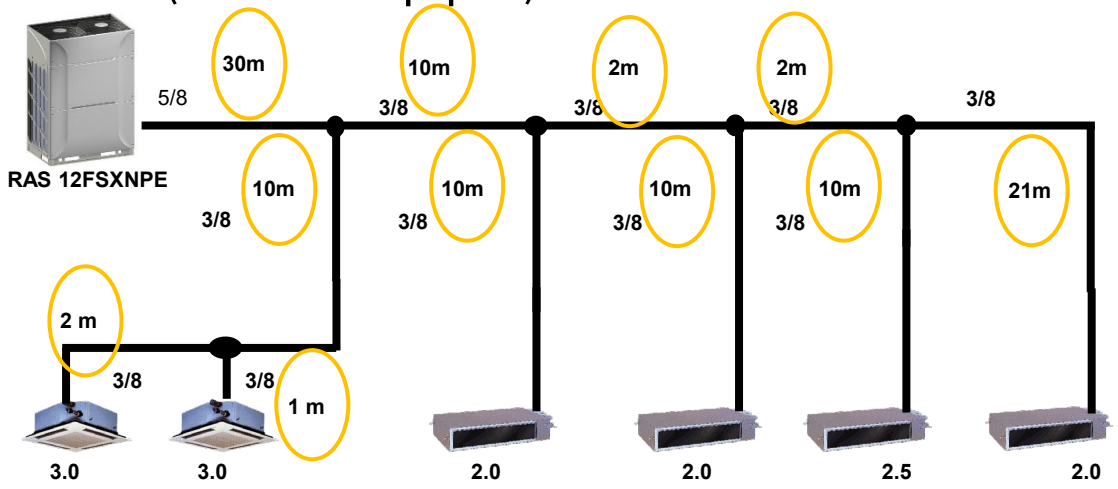
Total Additional Refrigerant Charge (Kg) = 12.97 Kg

Outdoor unit	Quantity of refrigerant charged in the W0 outdoor unit (kg)
RAS-8FSXNSE	5.0
RAS-10FSXNSE	5.0
RAS-12FSXNSE	7.2
RAS-14FSXNSE	8.9
RAS-16FSXNSE	9.9
RAS-18FSXNSE	10.7
RAS-20FSXNSE	11.3
RAS-22FSXNSE	11.3
RAS-24FSXNSE	11.6

Total Refrig. Charge of this System = 12.97+7.2 = 20.17 Kg

2. Piping Work

Refrigerant Charge Calculation (FSXNPE 2 pipes)



Outdoor unit	Quantity of refrigerant charged in the W0 outdoor unit (kg)
RAS-5FSXNPE	4.7
RAS-6FSXNPE	5.0
RAS-8FSXNPE	8.5
RAS-10FSXNPE	8.5
RAS-12FSXNPE	9.3
RAS-14FSXNPE	9.3
RAS-16FSXNPE	10.0
RAS-18FSXNPE	10.6

Total Additional Refrigerant Charge (Kg) = 12.97 Kg

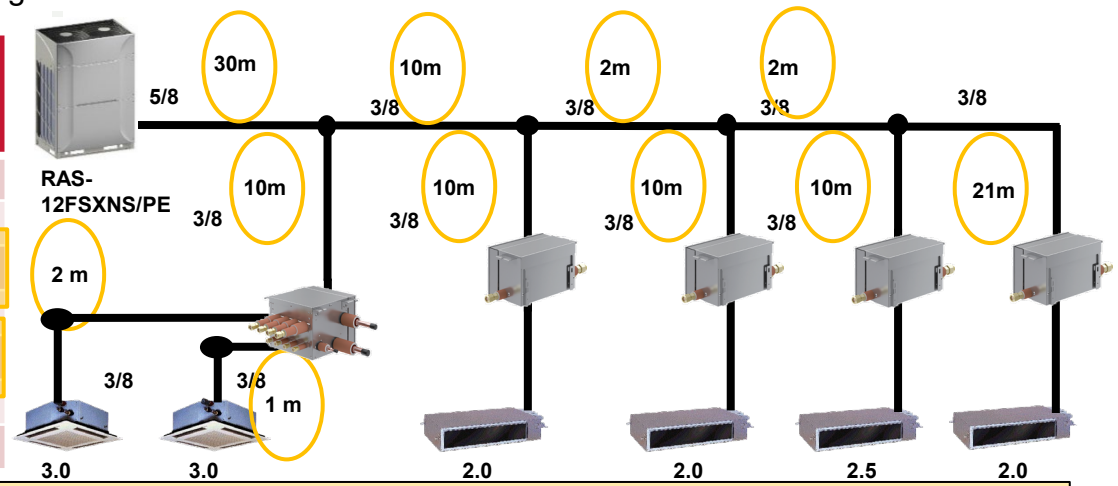
Total Refrig. Charge of this System = 12.97+9.3 = 22.27 Kg

2. Piping Work

Refrigerant Charge Calculation (FSXNS/PE 3 pipes)

W1 Additional refrigerant charge for liguid piping

Nominal Diameter	Quantity of refrigerant per meter of pipe (Kg/m)	Total Length (m)	Additional refrigerant charge (Kg)
Ø 22.2, 7/8	x0.36	0	0
Ø 19.05, 3/4	x0.26	0	0
Ø 15.88, 5/8	x0.17	30	5.10
Ø 12.7,1/2	x0.11	0	0
Ø 9.52, 3/8	x0.056	78	4.37
Ø 6.35,1/4	x0.024	0	0
Total			9.47



In case that quantity calculated is less than the mínimum indicated in the table below, adopt the quantity indicated below

Series	FS(X)NSE						
Unit Capacity (HP)	8-10	12~18	20~24	26~36	38~42	44~48	50~54
Minimum Additional Ref. Charge of Base Unit (kg)	2.0	3.0	4.0	6.0	7.0	8.0	9.0

Series	FS(X)NPE										
Unit Capacity (HP)	5~10	12-14	16~20	22	24-26	28~32	34-36	38~42	44-46	48-50	52-54
Minimum Additional Ref. Charge of Base Unit (kg)	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0

W1(9.47 >3.0) = 9.47 kg

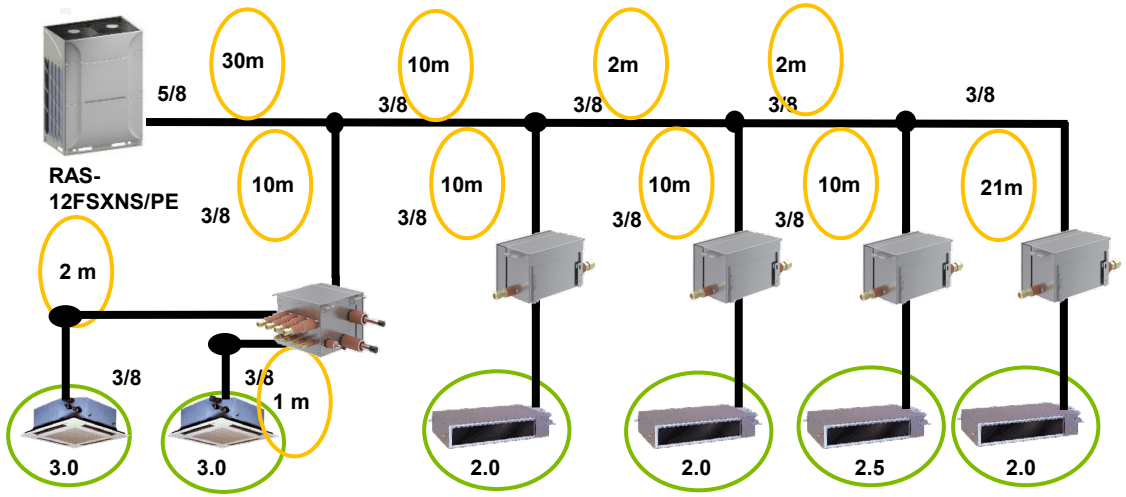
2. Piping Work

Refrigerant Charge Calculation (FSXNS/PE 3 pipes)

W2 Additional refrigerant charge for IU

Indoor Unit Capacity (HP)	0.4~1.0	1.5~6.0
Additional Ref. Charge (kg)	0.3	0.5

Indoor Unit Capacity (HP)	0.4~1.0	1.5~6.0
Quantity of IUs per capacity	0	6
Additional Ref. Charge (kg)	0	3



W2 = 3 kg

Only 3 Pipe System; additional charge must not exceed 6.0kg

W3 Additional refrigerant charge for Big IU

Indoor Unit Capacity (HP)	8-10	16-20
Additional Ref. Charge (kg)	1	2

W3 = 0 kg

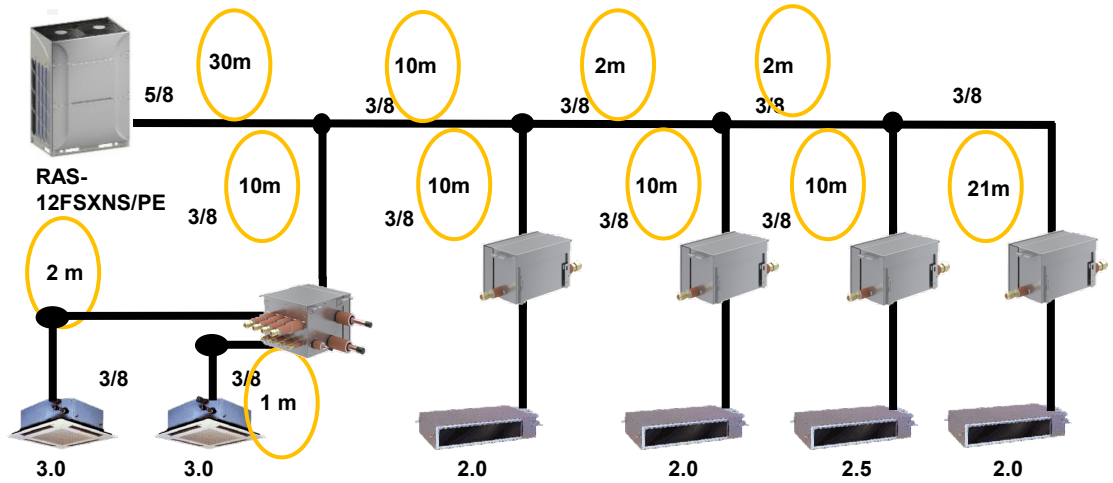
2. Piping Work

Refrigerant Charge Calculation (FSXNS/PE 3 pipes)

W4 Additional refrigerant charge for IU connection ratio

Ratio of Indoor Units	Maximum additional refrigerant charge (kg)
≤100%	0 Kg
>100%	0.5 Kg

W4(120.8%) = 0.5 kg



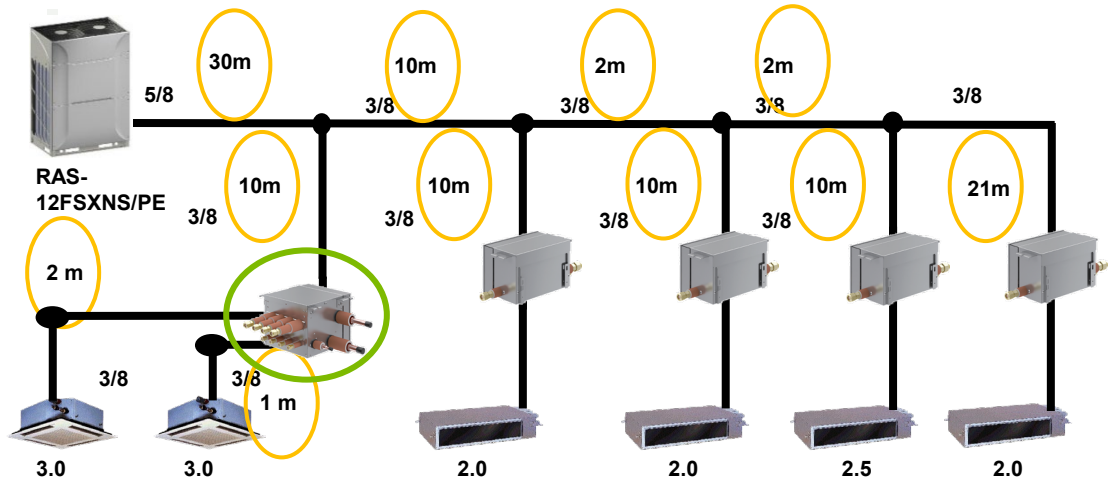
W5 Additional refrigerant charge for OU combination model

OU Model	RAS-24FSXNP/SE	RAS-38FSXNP/SE	RAS-42FSXNP/SE	RAS-46FSXNP/SE	RAS-48FSXNP/SE
Additional Ref. Charge (kg)	1	1	1	1	2

W5 = 0 kg

2. Piping Work

Refrigerant Charge Calculation (FSXNS/PE 3 pipes)



W6 Additional refrigerant charge for each CH-Box (Multiple)

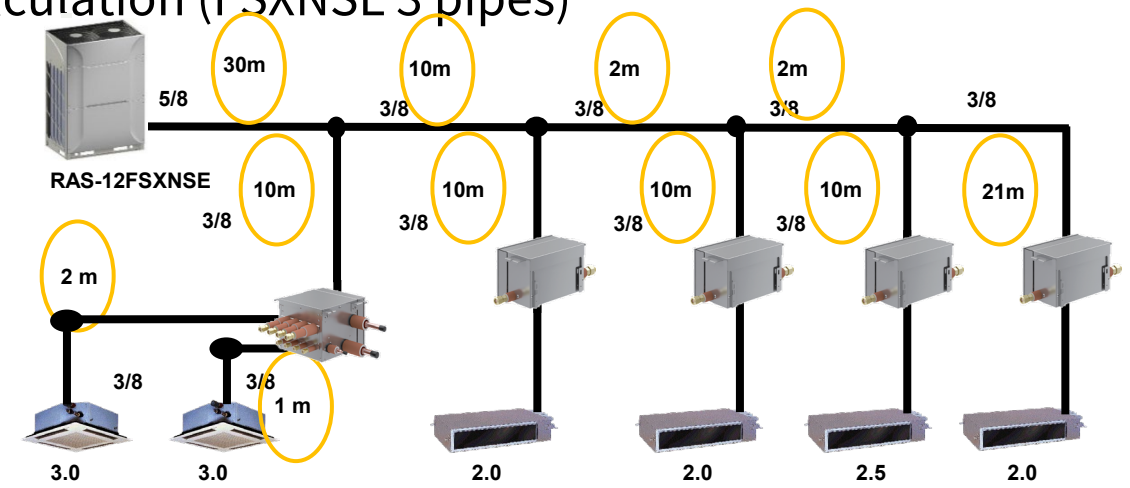
CH-Box Model	CH-04MSSX	CH-08MSSX	CH-12MSSX	CH-16MSSX
Additional Ref. Charge (kg)	0.1	0.2	0.3	0.4

W6 = 0.1 kg

Total Additional Refrigerant Charge (Kg) = W1+W2+W3+W4+W5+W6
Total Additional Refrigerant Charge (Kg) = 9.47+3+0+0.5+0+0.1= 13.07

2. Piping Work

Refrigerant Charge Calculation (FSXNSE 3 pipes)



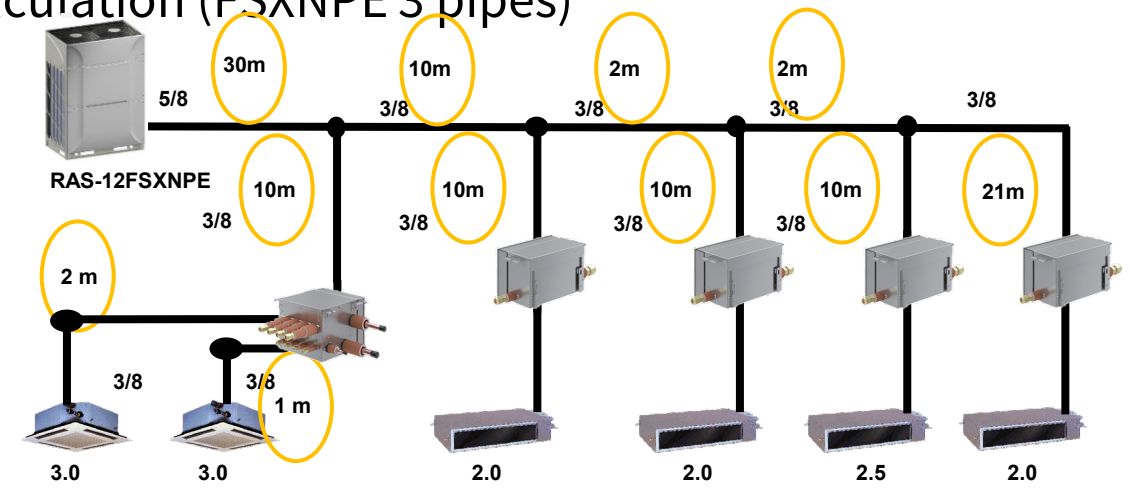
Total Additional Refrigerant Charge (Kg) = W1+W2+W3 = 9.47+1.0+0.5 = 13.07 Kg

Outdoor unit	Quantity of refrigerant charged in the W0 outdoor unit (kg)
RAS-8FSXNSE	5.0
RAS-10FSXNSE	5.0
RAS-12FSXNSE	7.2
RAS-14FSXNSE	8.9
RAS-16FSXNSE	9.9
RAS-18FSXNSE	10.7
RAS-20FSXNSE	11.3
RAS-22FSXNSE	11.3
RAS-24FSXNSE	11.6

Total Refrig. Charge of this System = 13.07+7.2 = 20.27 Kg

2. Piping Work

Refrigerant Charge Calculation (FSXNPE 3 pipes)



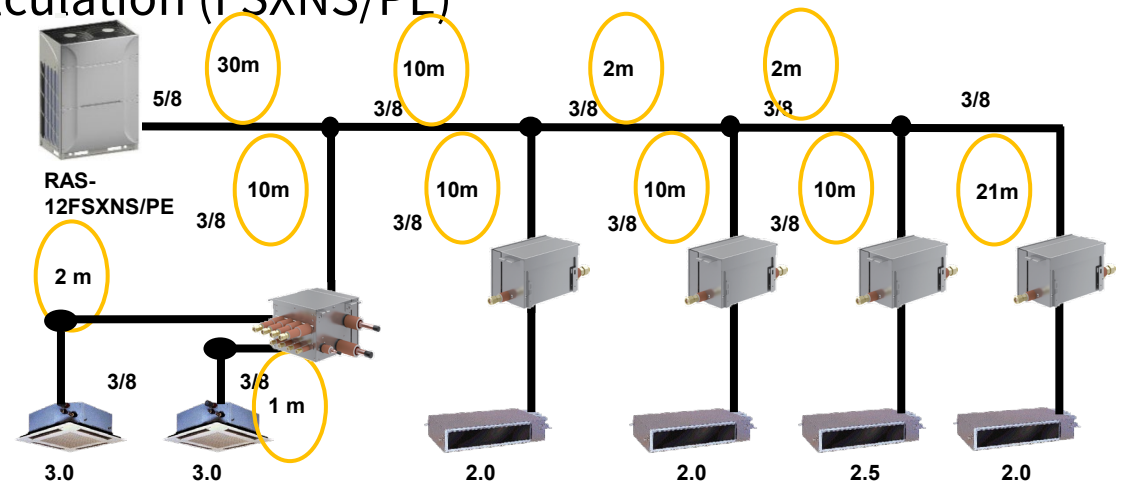
Outdoor unit	Quantity of refrigerant charged in the W0 outdoor unit (kg)
RAS-5FSXNPE	4.7
RAS-6FSXNPE	5.0
RAS-8FSXNPE	8.5
RAS-10FSXNPE	8.5
RAS-12FSXNPE	9.3
RAS-14FSXNPE	9.3
RAS-16FSXNPE	10.0
RAS-18FSXNPE	10.6

Total Additional Refrigerant Charge (Kg) = 13.07 Kg

Total Refrig. Charge of this System = 13.07+9.3= 22.37 Kg

2. Piping Work

Refrigerant Charge Calculation (FSXNS/PE)



Total additional charge must not exceed the maximum additional charge

OU HP	5~10	12	14~18	20-22	24	26-54
Maximum Additional Ref. Charge (kg)	28	36	40	51	52	63

3. Substitution Old Units

- R-22 → Sigma
- R-407 → Sigma
- R-410 → Sigma

3. Substitution old units

R-22 → Sigma

Is not possible to substitute R22 installations with Sigma units

- Oil is not compatible
- Pipe diameters are different
- Working pressure is different
- H-link compatibility (H-link1 – H-link2)
- R-22 is forbidden on European Comunity

3. Substitution old units

R407C → Sigma

Is possible to substitute R407C installations with Sigma units

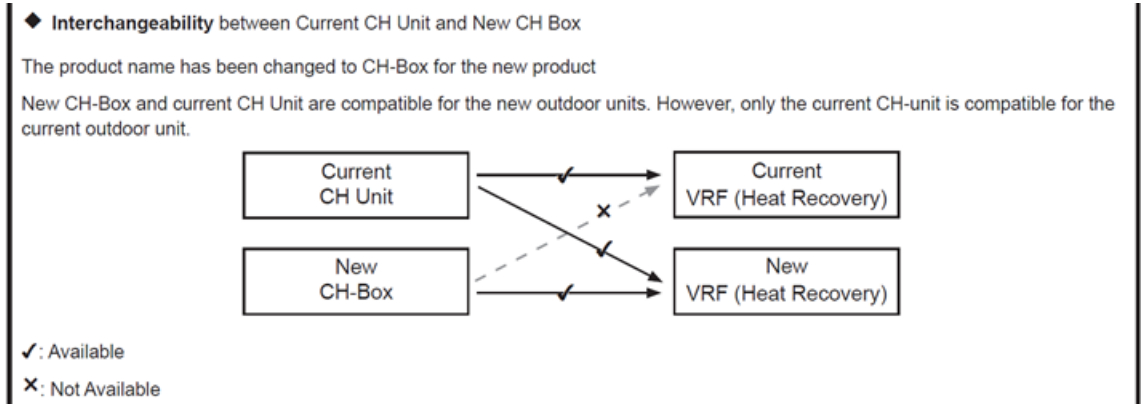
- Oil is compatible. Synthetic oil is highly hidroscopic is recommended a good cleaning with nitrogen
- Pipe diameters are different
- Working pressure is different. This can cause problems with pipes integrity
- H-link compatibility (H-link1 – H-link2)
- Installations with more tha 16 IUs can not communicate correctly
- CH-Box is not compatible
- Not tested compatibility
- Is mandatory to clean the installation and use fiters in order to avoid any posible dirtness in the installation

3. Substitution old units

R410A → Sigma

Is possible to substitute R410A installations with Sigma units

- H-link compatibility H-link2
- Installations with more tha 16 IUs can not communicate correctly
- CH-Box is not completely compatible
- IU software is compatible with Sigma OU
- Tested and confirmed compatibility



HITACHI

Many thanks

Cooling & Heating