

SMMS-i compare with DK version 4



SMMS 
SUPER MODULAR MULTI SYSTEM

Comparison important point

1. Energy saving
2. Product line up
3. Technology and feature
4. Installation
5. Service and maintenance
6. SMMS-i features



SMMS-i compare with D version 4

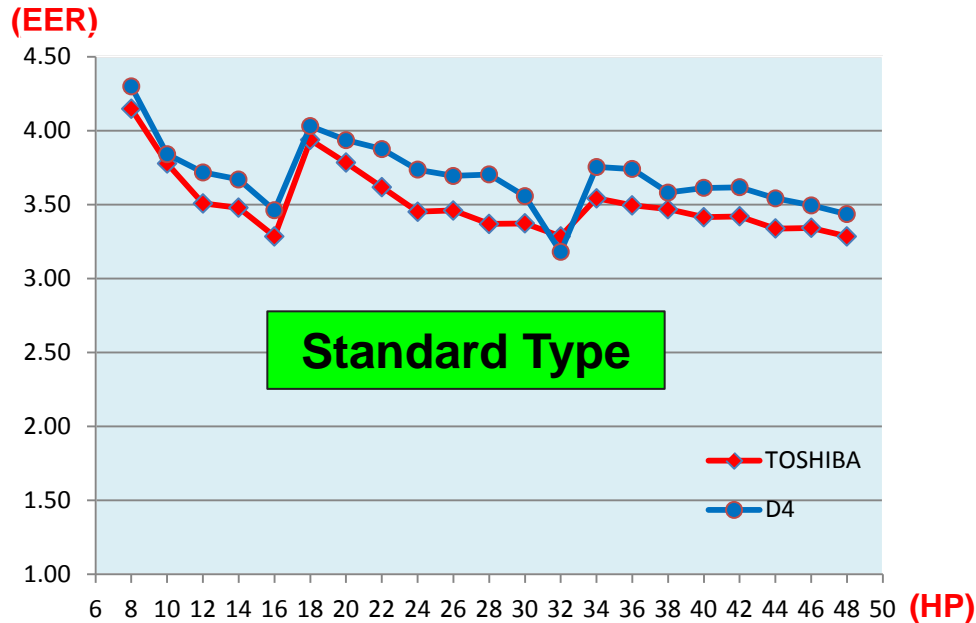
1. Energy Saving comparison

Cooling Efficiency, EER at Full load (100%) (Standard Type)

D almost win for model range but average EER difference only 0.18

Average EER Full load **SMMS-i** = 3.51

Average EER Full load, **D** = 3.69



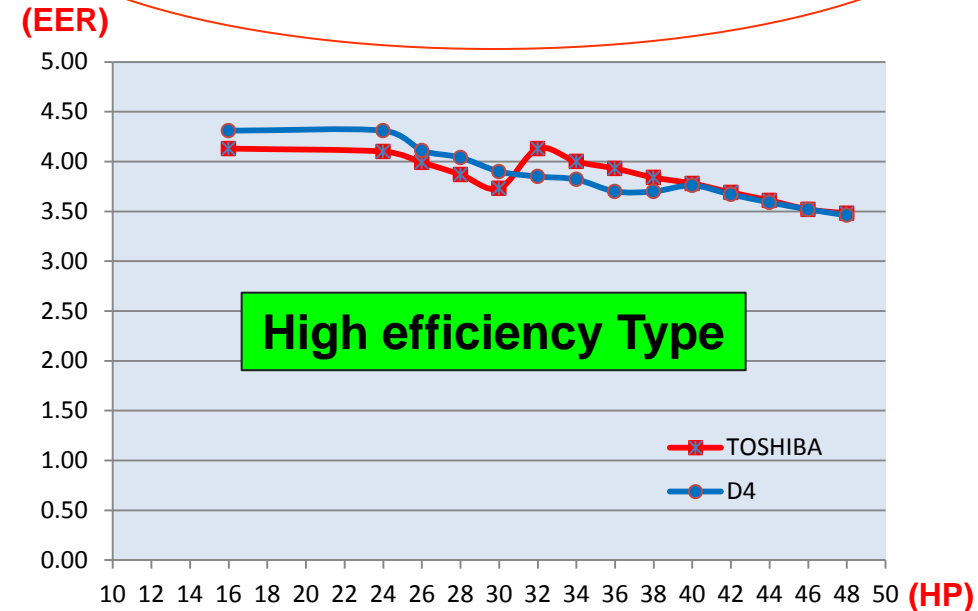
SMMS-i Max ; 4.15@8HP
D4 Max ; 4.30@8HP

Average EER
the both are same

Cooling Efficiency, EER at Full load (100%) (High efficiency Type)

Average EER Full load **SMMS-i** = 3.84

Average EER Full load, **D** = 3.84



SMMS-i Max ; 4.13@16HP,32HP
D4 Max ; 4.31@16HP

$$\text{EER} = \text{Kw(Cooling)} / \text{Kw (Power input)}$$

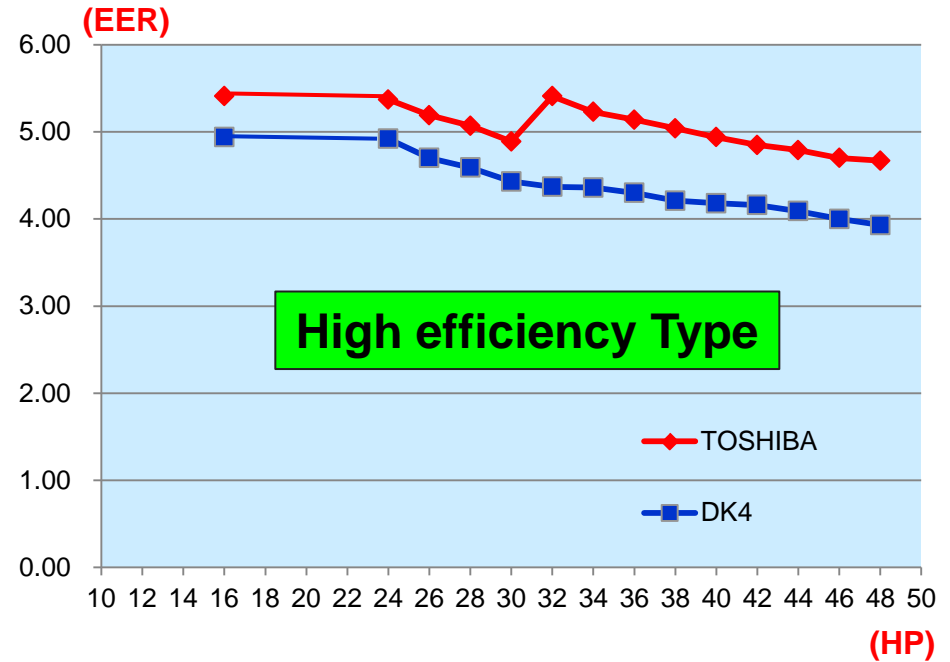
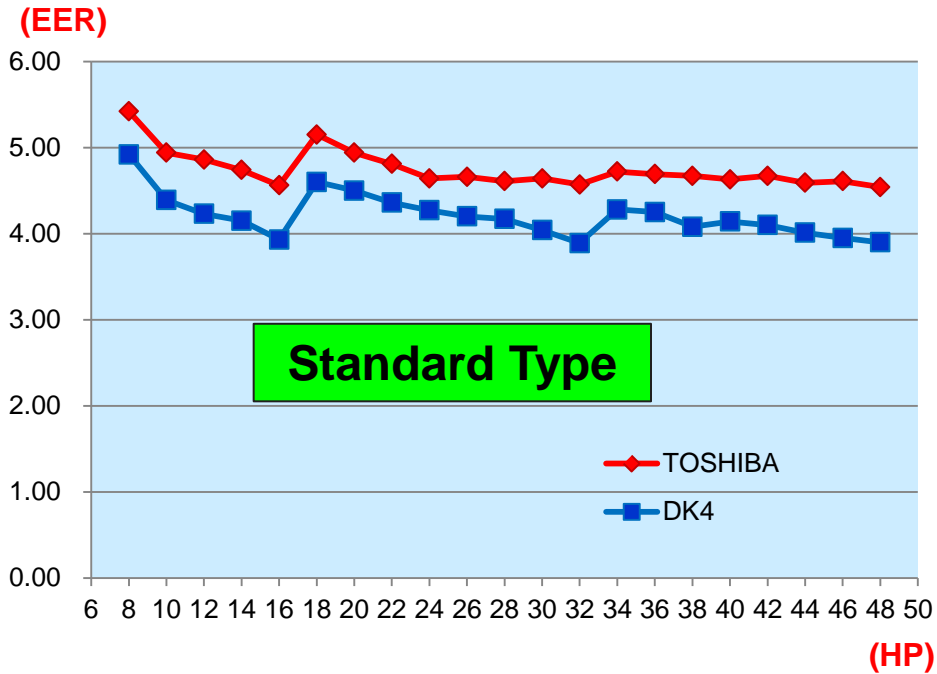
SMMS-i compare with D version 4

1. Energy Saving comparison

Cooling Efficiency, EER at part load comparison

SMMS-i win for all model range (8 to 48HP @ 50 – 90% part load)

Average part load EER(@50-90%part load)



$$\text{EER} = \text{Kw(Cooling)} / \text{Kw (Power input)}$$

SMMS-i compare with D version 4

1. Energy Saving comparison

IEER comparison*

$$\text{IEER} = (0.020 \cdot A) + (0.617 \cdot B) + (0.238 \cdot C) + (0.125 \cdot D)$$

Where as:

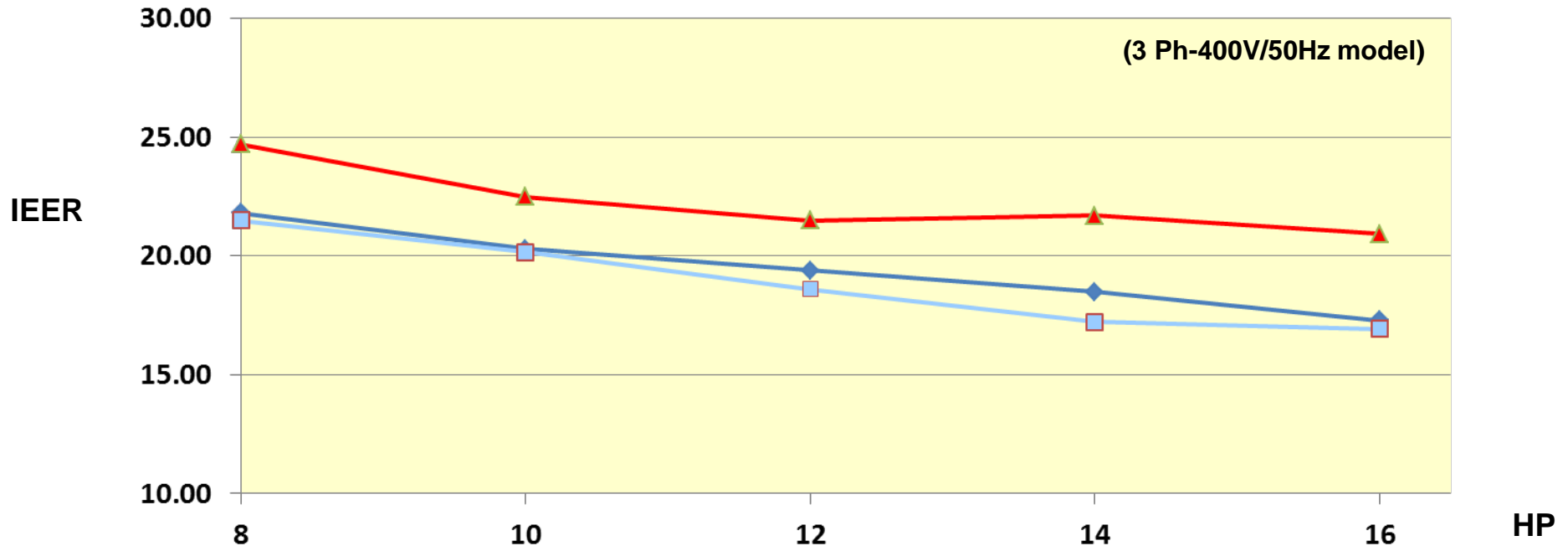
A = EER at 100% net capacity at AHRI standard condition (95 deg F for air-cooled)

B = EER at 75% net capacity and reduced ambient (81.5 deg F for air-cooled)

C = EER at 50% net capacity and reduced ambient (68 deg F for air-cooled)

D = EER at 25% net capacity and reduced ambient (65 deg F for air-cooled)

Indoor condition : 26.7 C°DB, 19.4 C°WB



IEER = Btu/h/w

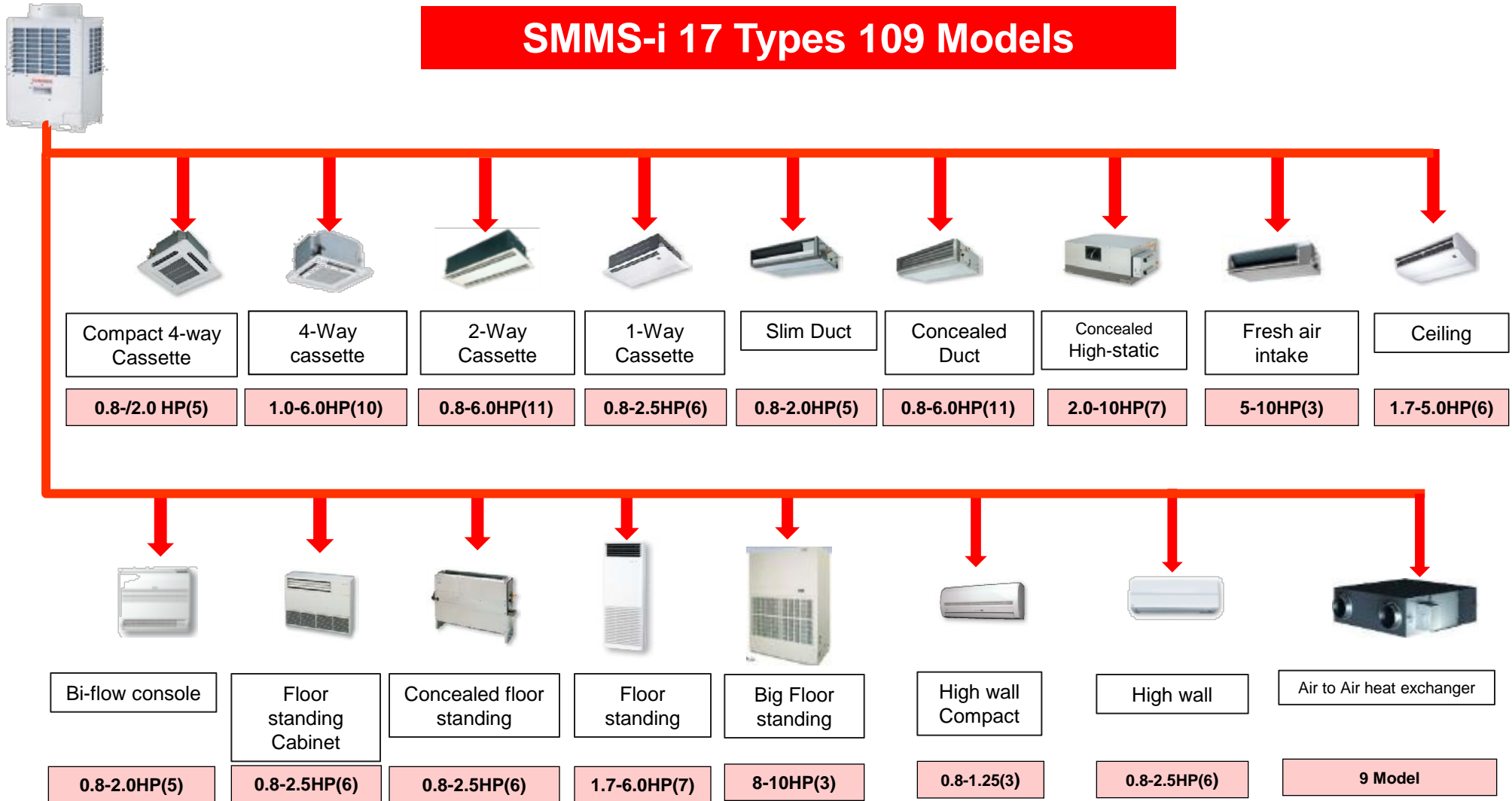
HP	8	10	12	14	16
SMMS-i	24.71	22.50	21.49	21.70	20.93
D 4	21.82	20.31	19.40	18.48	17.29
D 3	21.49	20.16	18.61	17.23	16.93

All IEER value of TOSHIBA Carrier are higher than competitor.

SMMS-i compare with D version 4

2. Product line up

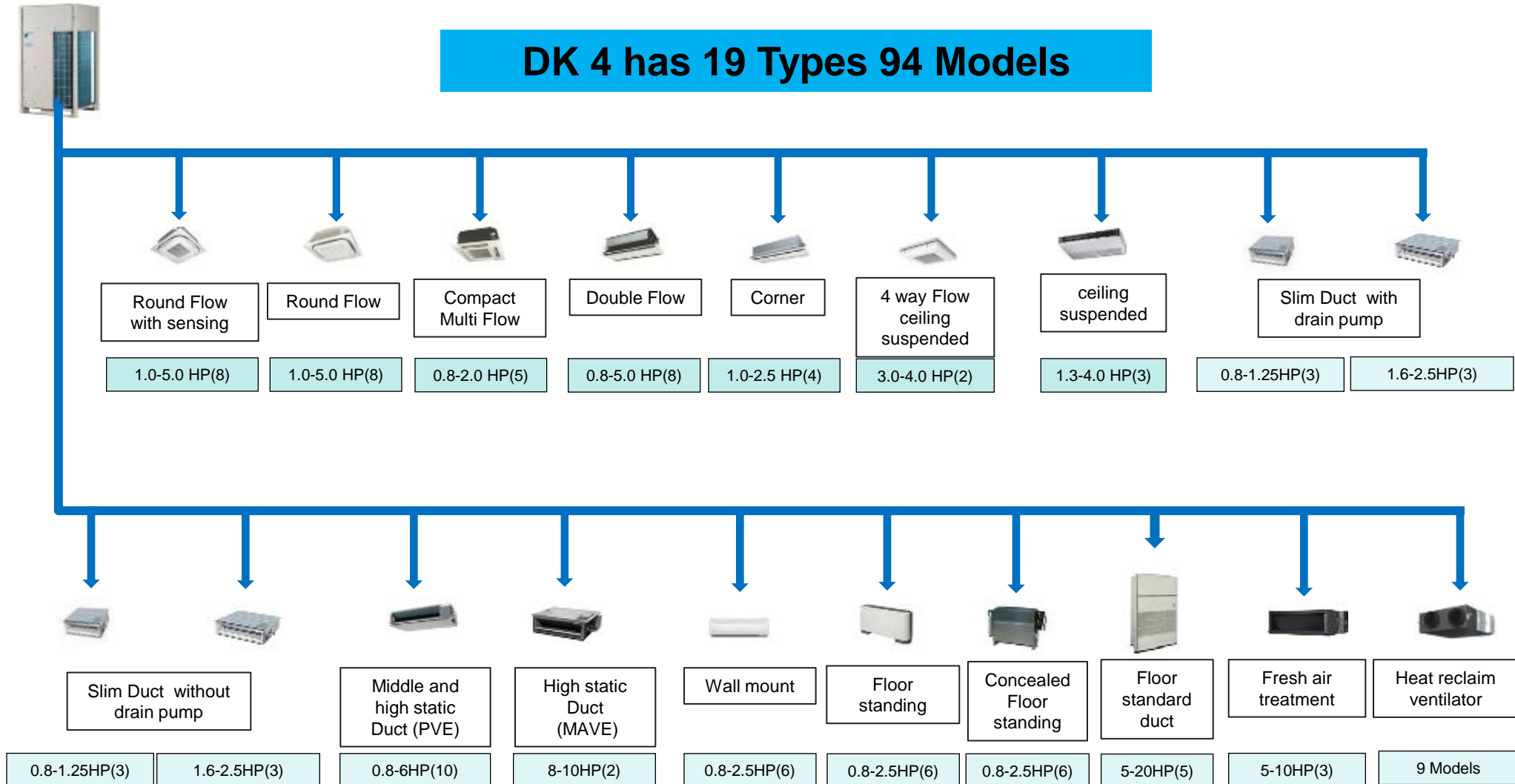
SMMS-i 17 Types 109 Models



SMMS-i compare with D version 4

2. Product line up

DK 4 has 19 Types 94 Models



SMMS-i compare with D version 4

2. Product line up

CDU Line up Comparison

SMMS-i Condensing Line up



HP	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48
HI COP						★				★	★	★	★	★	★	★	★	★	★	★	★	★
STANDARD		★	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★

DK 4 Condensing Line up

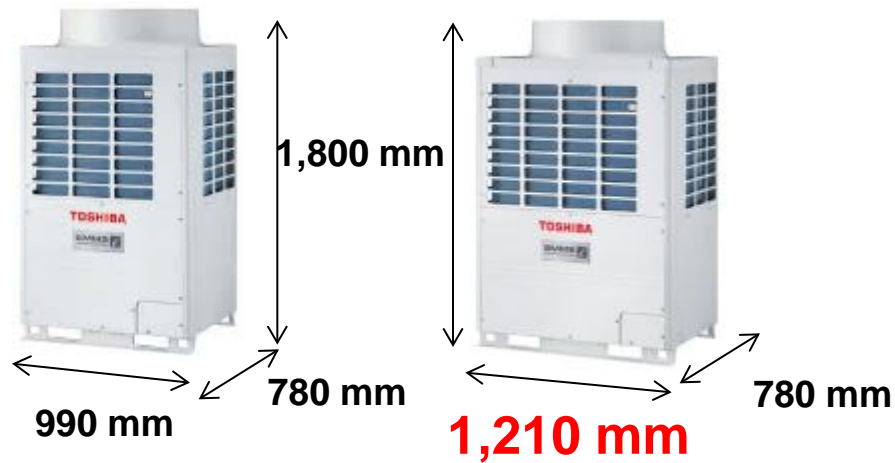


HP	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54
Hi-COP				★	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★			
Standard		★	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★

SMMS-i compare with D version 4

2. Product line up

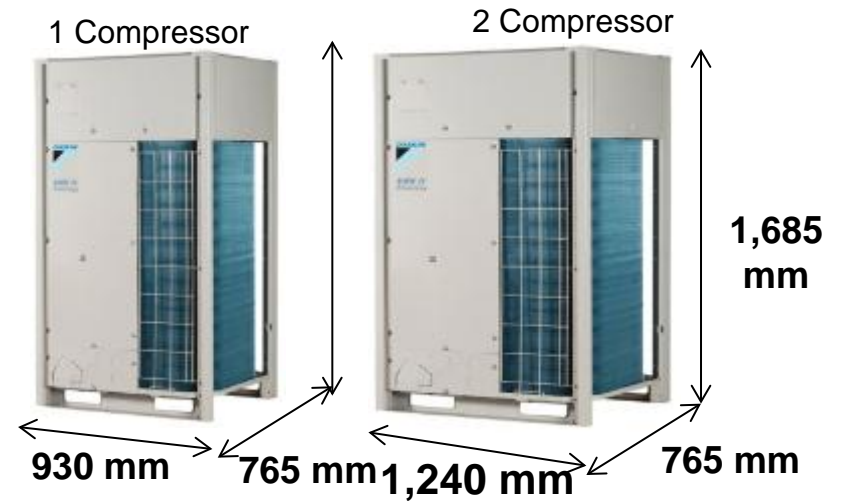
SMMS-i



8-12 HP

14-16 HP

DK 4



8-12 HP

14-20 HP

SMMS-i compare with D version 4

2. Product line up

Machine weight



8-12HP	Dimensions (HxWxD)	
	TC	DK
	(1800x990x780)	(1685x930x765)
8-12HP	Installation space	
	TC	DK
	0.77m ²	0.71m ²

14-16HP	Dimensions (HxWxD)	
	TC	DK
	(1800x1210x780)	(1685x1240x765)
14-16HP	Installation space	
	TC	DK
	0.94m²	0.95m ²

	8HP	10HP	12HP	14HP	16HP	18HP	20HP	22HP	24HP	26HP
TC(STANDARD)	242	242	242	329	329	242+242	242+242	242+242	242+242	329+242
DK(STANDARD)	187	194	194	305	305	314	314	194+194	187+305	194+305

SMMS-i compare with D version 4

2. Product line up

Footprint Comparison

CDU Standard model

HP	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54
SMMS-i	0.77	0.77	0.77	0.94	0.94	1.54	1.54	1.54	1.54	1.72	1.72	1.89	1.89	2.32	2.32	2.49	2.49	2.66	2.66	2.83	2.83			
DK4	0.71	0.71	0.71	0.95	0.95	1.42	1.42	1.66	1.66	1.66	1.90	1.90	1.90	2.13	2.13	2.37	2.37	2.61	2.61	2.85	2.85	2.85	2.85	2.85

CDU High efficiency model

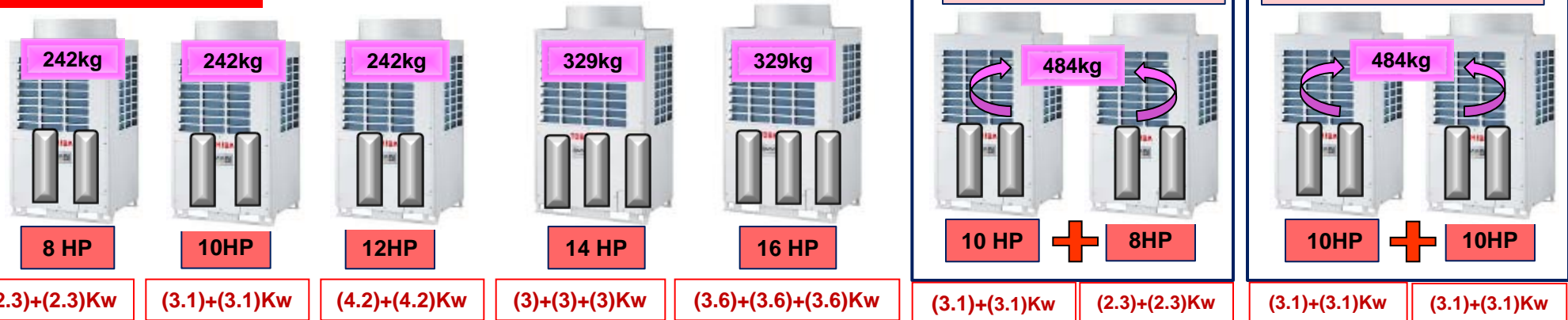
HP	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54
SMMS-i					1.54				2.32	2.32	2.32	2.32	3.09	3.09	3.09	3.09	3.09	3.09	3.09	3.09	3.09			
DK4			1.42	1.42	1.42	2.13	2.13	2.13	2.13	2.13	2.13	2.13	2.13	2.37	2.61	2.37	2.61	2.85	2.85	2.85	2.85	2.85		

SMMS-i CDUs are less footprint than DK on 9 standard model

DK CDUs are almost less footprint than SMMS-i on High efficiency model

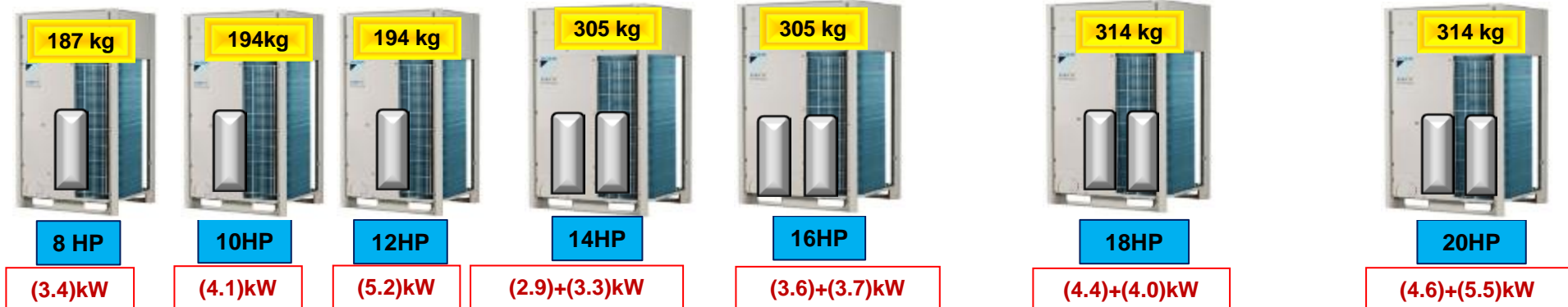
2. Product line up

SMMS-i



SMMS-i is heavy, although it achieves high efficiency and high reliability with multiple compressors!!

DK 4

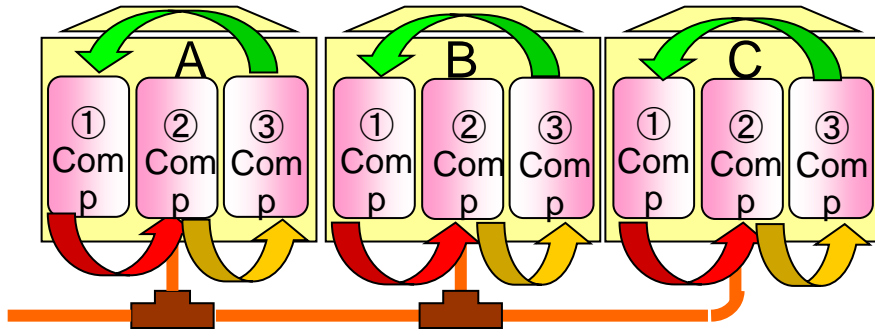


SMMS-i compare with D version 4

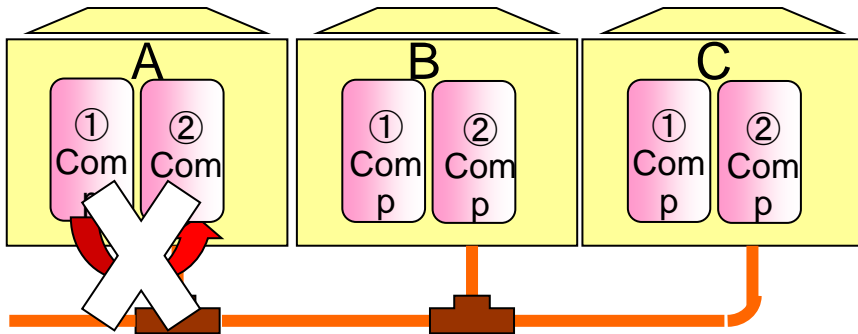
3. Technology and feature

SMMS-i Operation and Rotation

SMMS-i Rotation

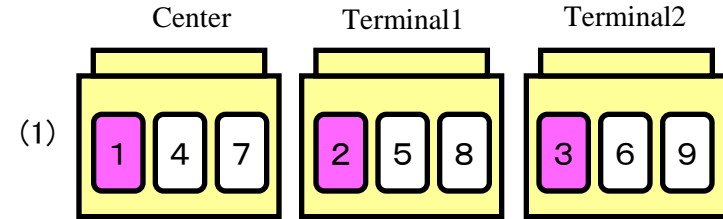


DK 4 Rotation



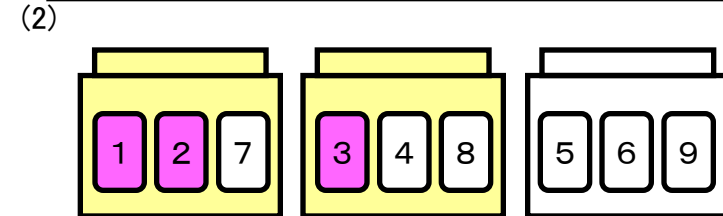
SMMS-i Operation

Example: When 3 Comp. operate at the Cooling mode

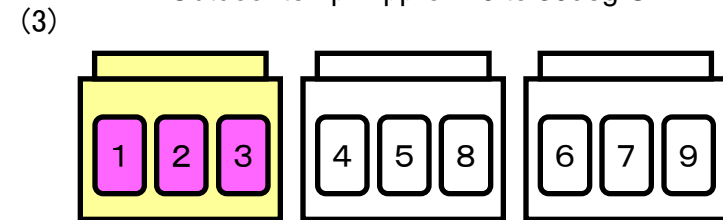


Outdoor temp.: Approx more than 30deg.C

When the outside temperature is high,
Highly efficient and effective use of heat
exchangers



Outdoor temp.: Approx 20 to 30deg.C



At low to med. ambient temperature conditions,
the heat exchanger used to partially, to ensure
reliability.

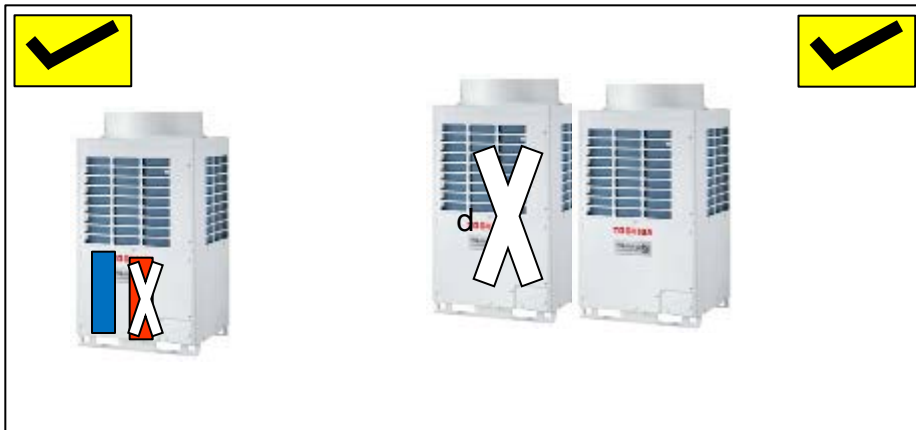
*To ensure proper refrigerant carries

SMMS-i compare with D Version 4

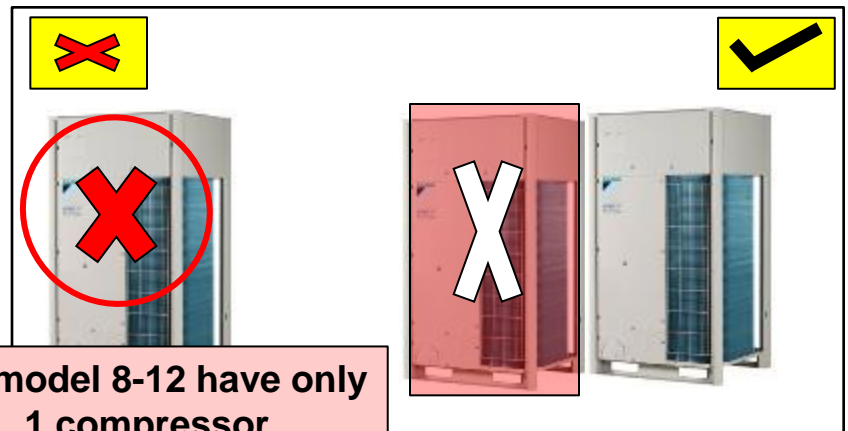
3. Technology and feature

VRF Backup Operation

SMMS-i Backup Operation



DK4 Backup Operation

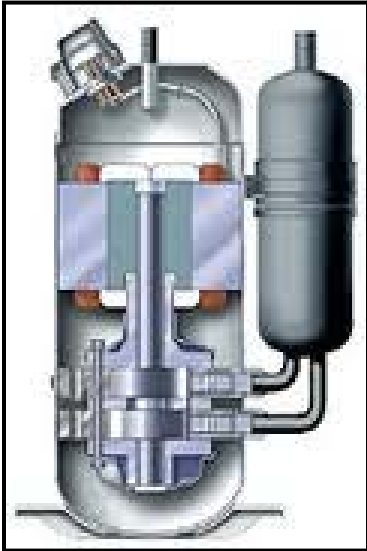


DK model 8-12 have only
1 compressor
Cannot back up

SMMS-i compare with D version 4

3. Technology and feature

Twin Rotary compressor (TC)



Improve motor efficiency in low rpm range.

More precise components

New designed compression part.

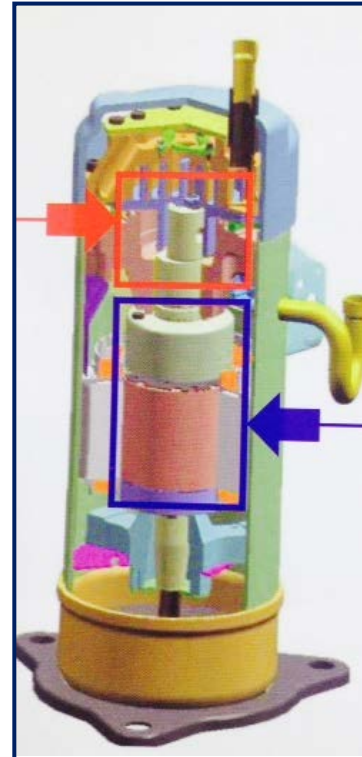
The blade thickness is reduced.

The back side area of blade is reduced.

Reduction of the pressing load.

Reduction of the friction resistance.

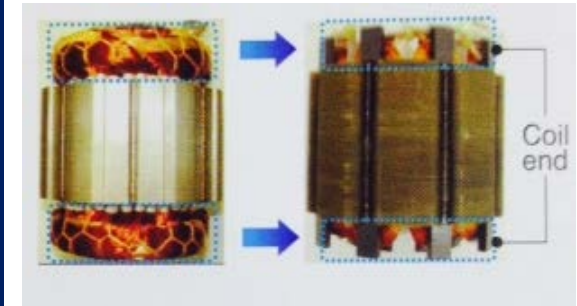
Scroll compressor (D4)



Development of high strength material

Distributed winding motor
(Current 8HP compressor)

Concentrated winding motor
(New 12HP compressor)



Small sizing coil end using concentrated winding, reduce copper loss (winding resistance)

Improve motor efficiency in low rpm range.

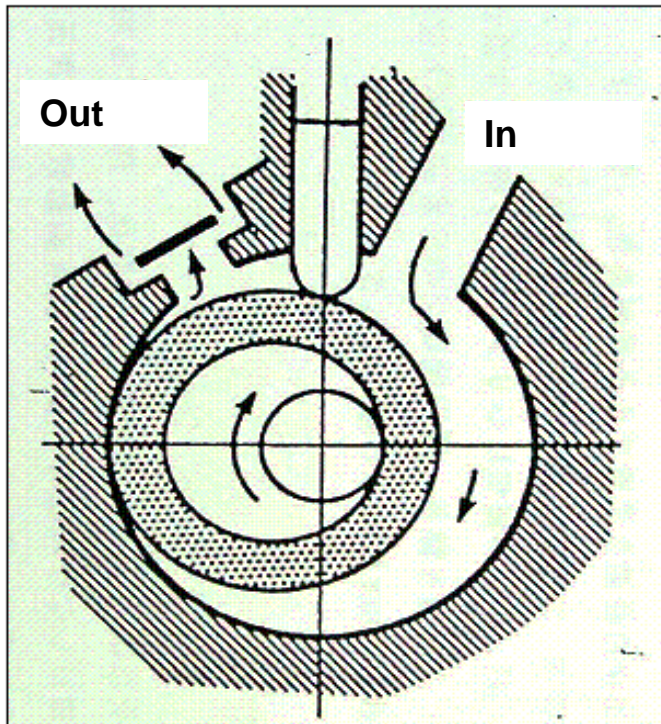
Gives 2.4 times tensile strength compare to conventional material
New Material: 600MPa, Conventional Material: 250MPa
Increase compression chamber volume by using thin spiral design.

SMMS-i compare with D version 4

3. Technology and feature

~ Twin rotary compressor operation ~

Twin rotary compressor



The compression ratio in the cylinder is variable

A change of the driving compression ratio of the outer refrigerant cycle



The compression ratio in the cylinder accords with driving compression ratio



Over compression and lack compression are very small in the cylinder



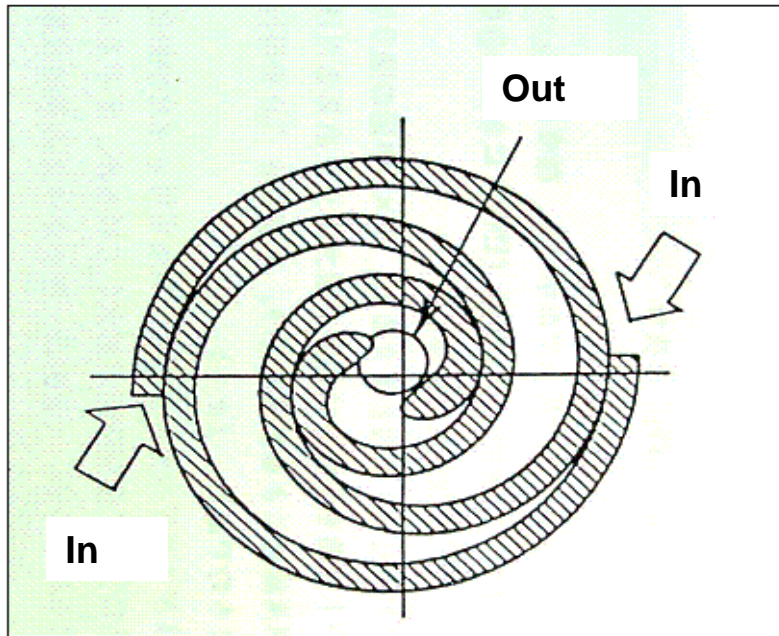
Good efficiency through all range

SMMS-i compare with D version 4

3. Technology and feature

~ Scroll compressor operation ~

Scroll compressor



The compression ratio of the wing inside is constant

A change of the driving compression ratio of the outer refrigerant cycle



A difference occurs between driving compression ratio and compression ratio in the wing



Over compression and lack compression occur in the wing

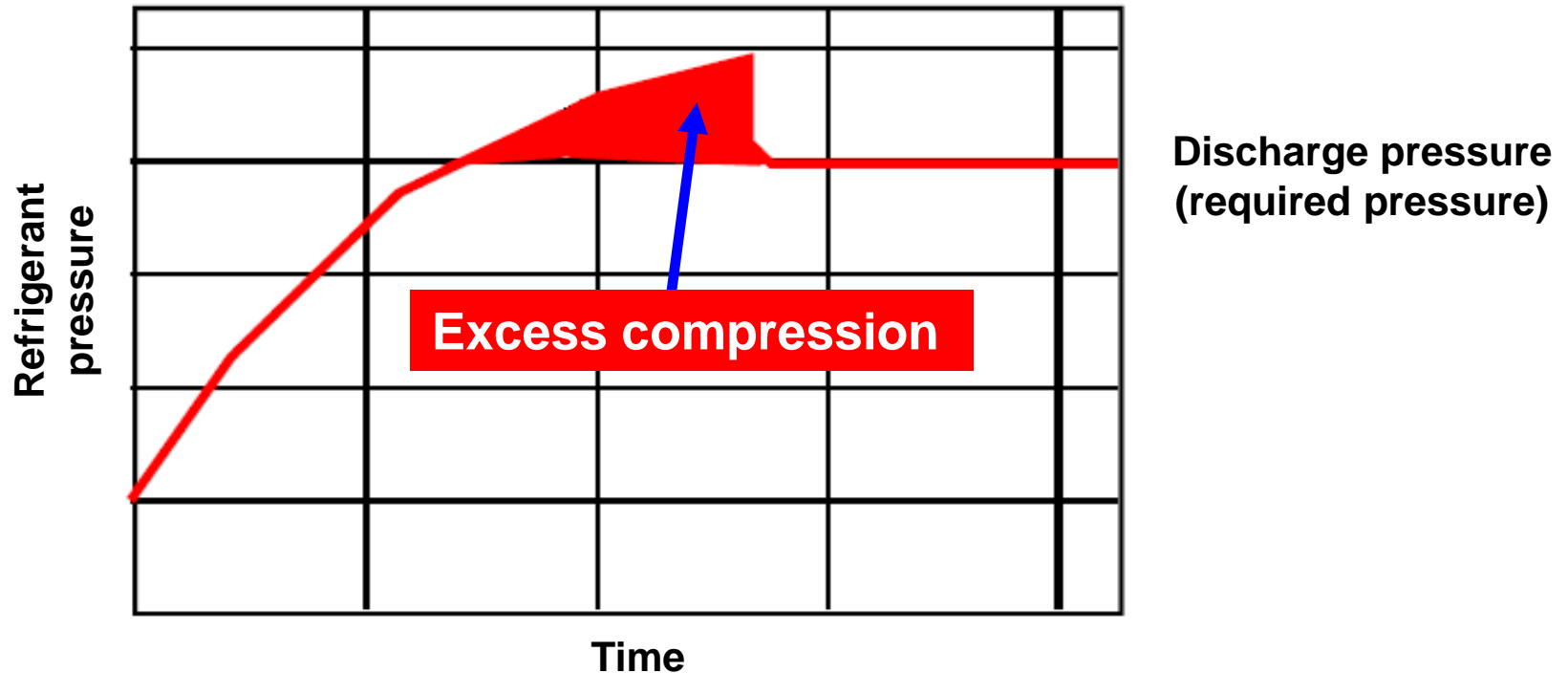


Difficult to keep good efficiency through all range.
Even though high COP in rated point

3. Technology and feature

~ Energy loss ~

Compression process for scroll compressor

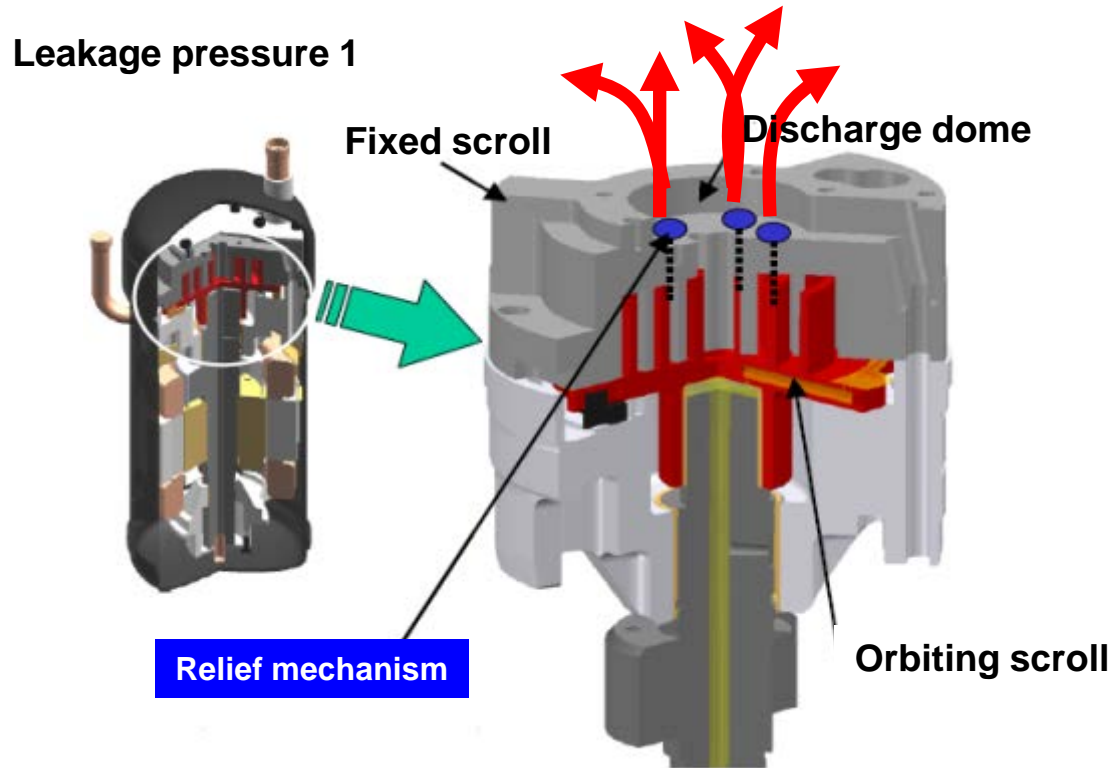


Scroll compressor goes on the excess (or deficiency) compression depending on changes a condition (part load) because of the fixed volume ratio operation. This is energy loss!

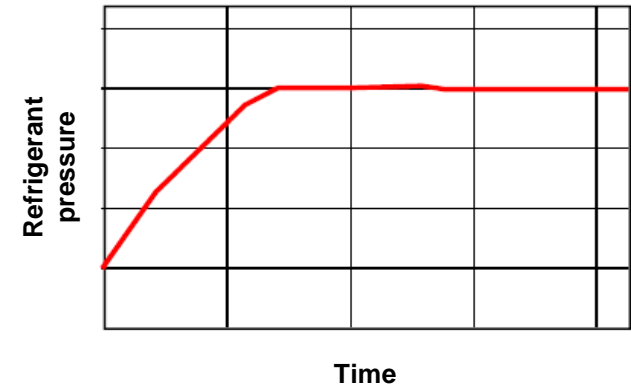
SMMS-i compare with D version 4

3. Technology and feature

~ Energy loss ~



Compression process for scroll compressor



DK scroll compressor adopted the relief mechanism to prevent the excess pressure. These are the holes to discharge the refrigerant pressure, in other words, leakage pressure, and it is wasting the pressed refrigerant gas. This is energy loss too.

SMMS-i compare with D version 4

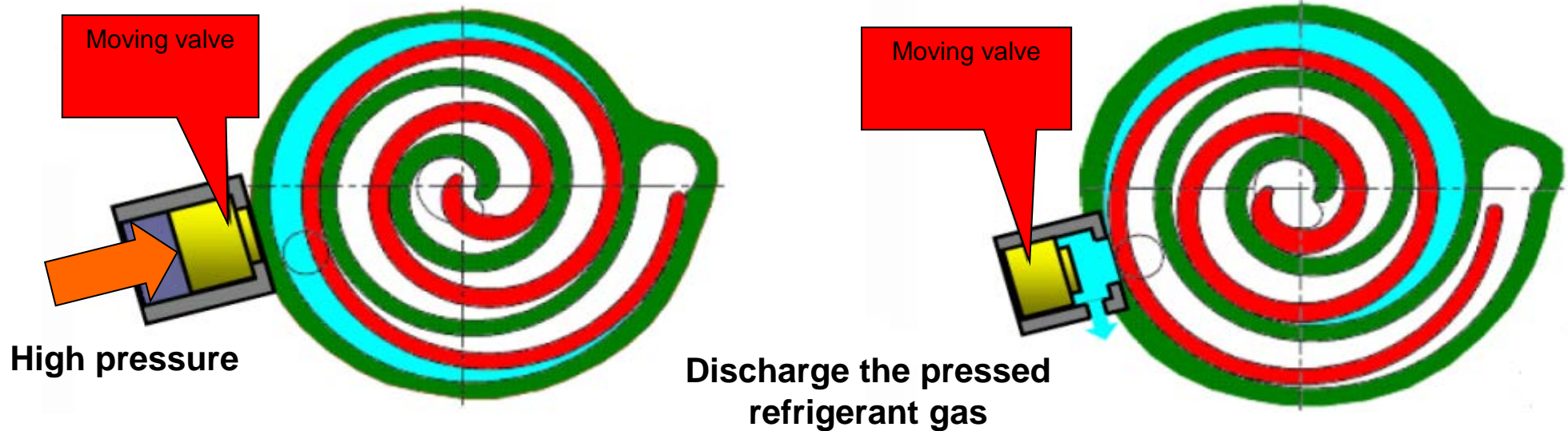
3. Technology and feature

~ Energy loss ~

Leakage pressure 2

High load operation

Low load operation



DK scroll compressor discharges the pressed refrigerant gas to improve the part load at low load.

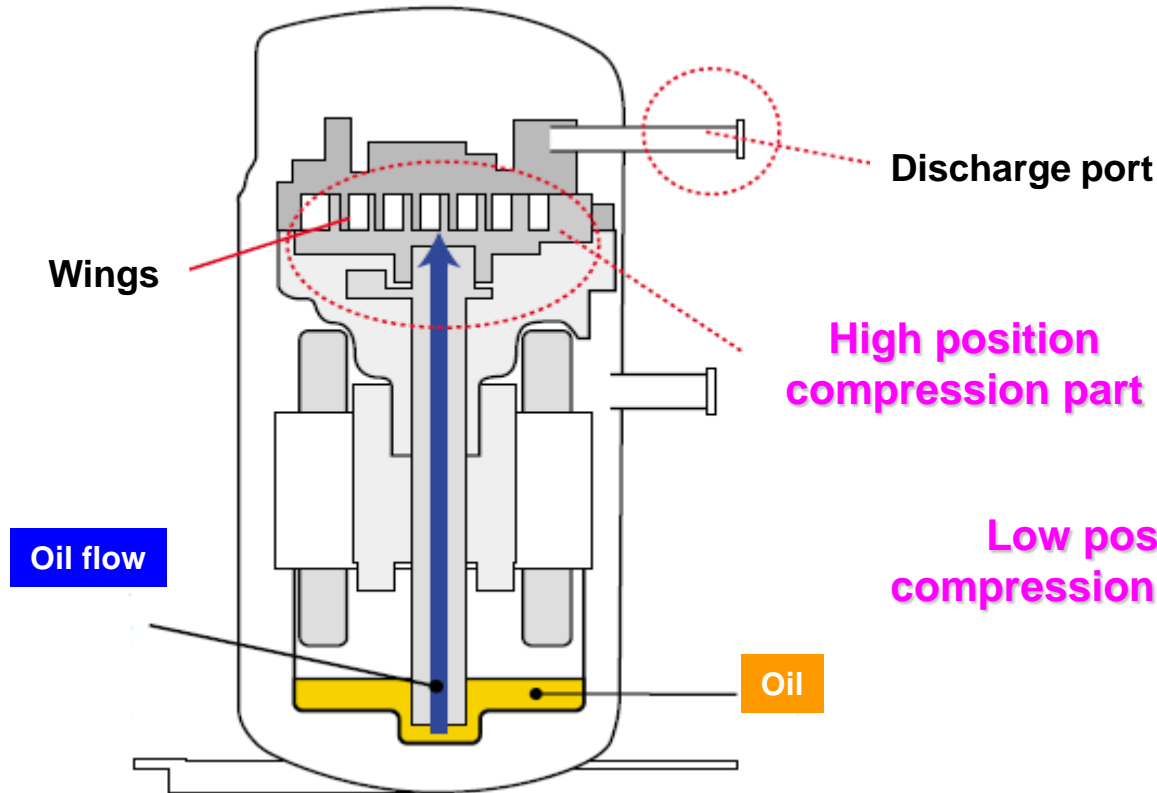
Rotary compressor can change the compression ratio, but scroll compressor cannot change it because of fixed compression ratio. This is energy loss too.

SMMS-i compare with D version 4

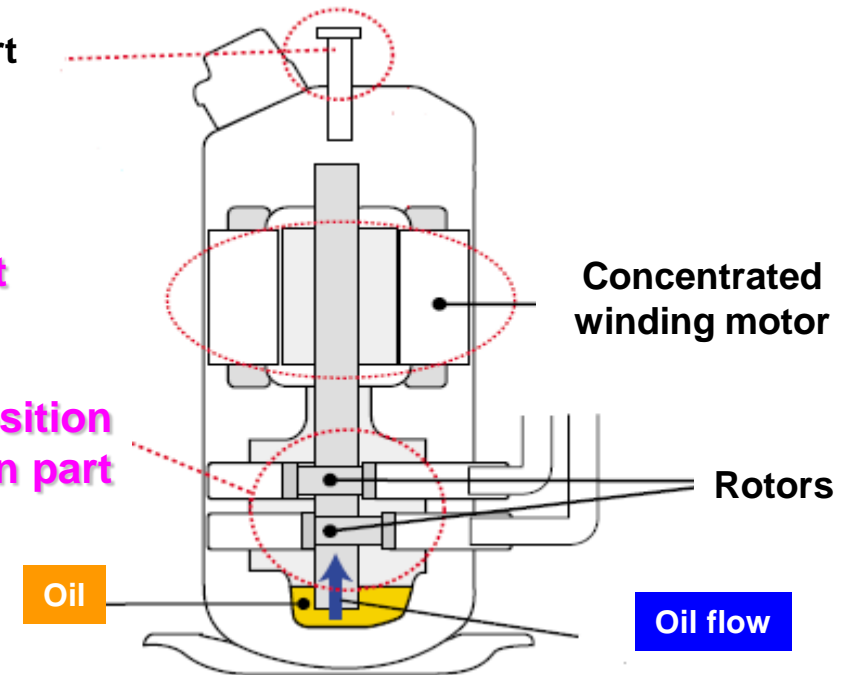
3. Technology and feature

~ Lubricating oil ~

Scroll compressor



Rotary compressor



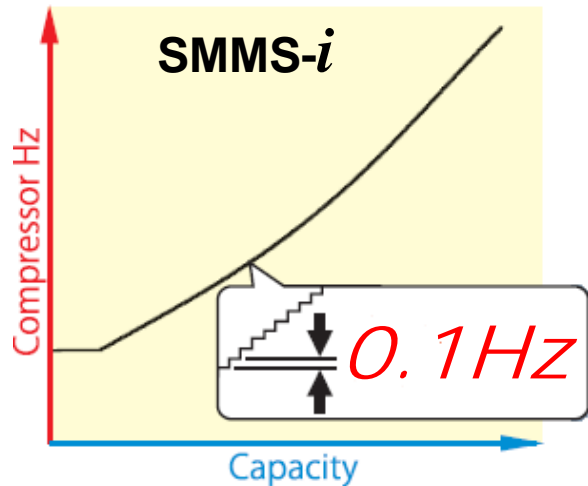
Rotary compressor is easy supplying the lubricating oil to compression part because of low position. And the lubricating oil is easy to flow to the refrigerant cycle because the compression part is near the discharge port.

SMMS-i compare with D version 4

3. Technology and feature

SMMS-i Inverter Control

*Fast-calculating
vector-controlled inverter*

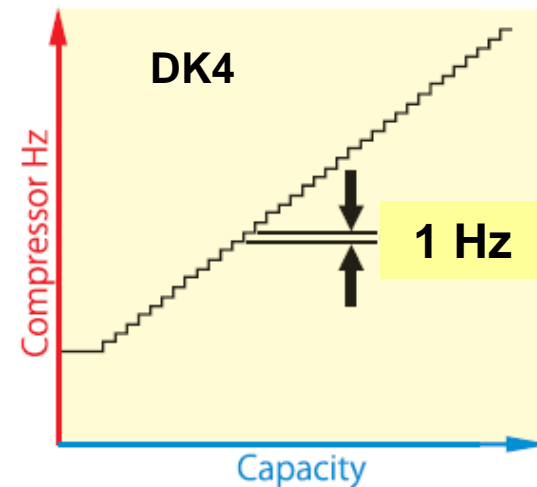


**Ultra-precise 0.1Hz control over
compressor rotation speed**

~ Frequency ~

DK Inverter Control

*DK 4 Inverter control each step 1Hz**



*DK 4 Inverter control each step 1Hz**

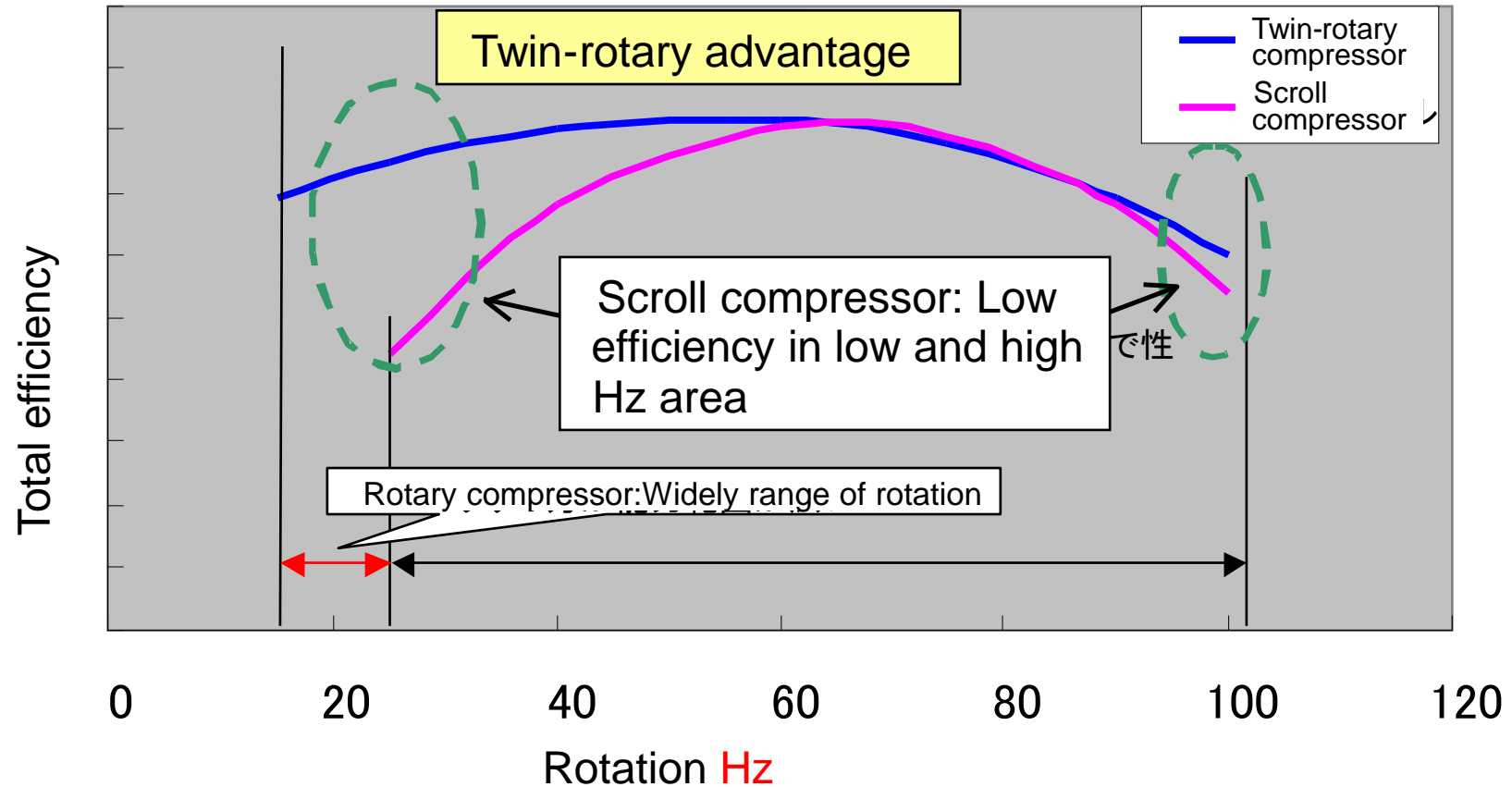
* As of 2014 Japanese model

SMMS-i compare with D version 4

3. Technology and feature

~ Frequency ~

SMMS-i Inverter Control



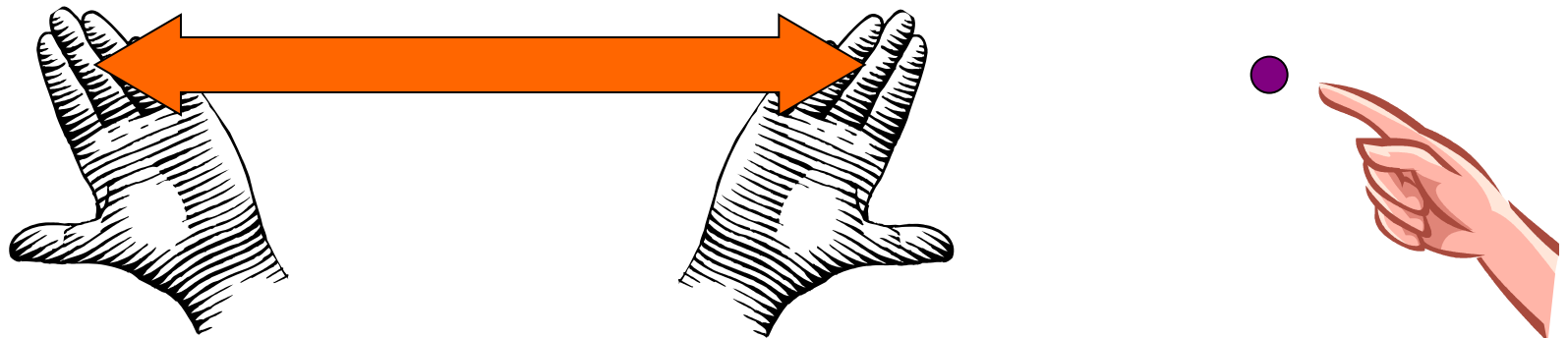
SMMS-i compare with D version 4

3. Technology and feature

~ Frequency ~

Rotary vs. Scroll compressor

	Rotary	Scroll
Energy saving	Through all range	One point only



SMMS-i compare with D version 4

3. Technology and feature

Twin Rotary compressor

VS

Scroll compressor

Motor

DC brushless Motor

DC Motor

Start current

All soft start-up

Inverter soft start-up

Refrigerant pressure

Stable pressure

Fluctuate

Current during normal drive

Smoothly

Loaded->current decrease->Loaded...

Stress on system

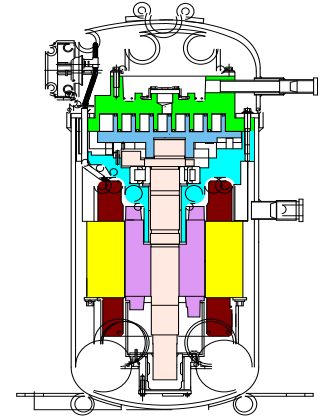
Low

Hard electrical and mechanical stress

Reliability

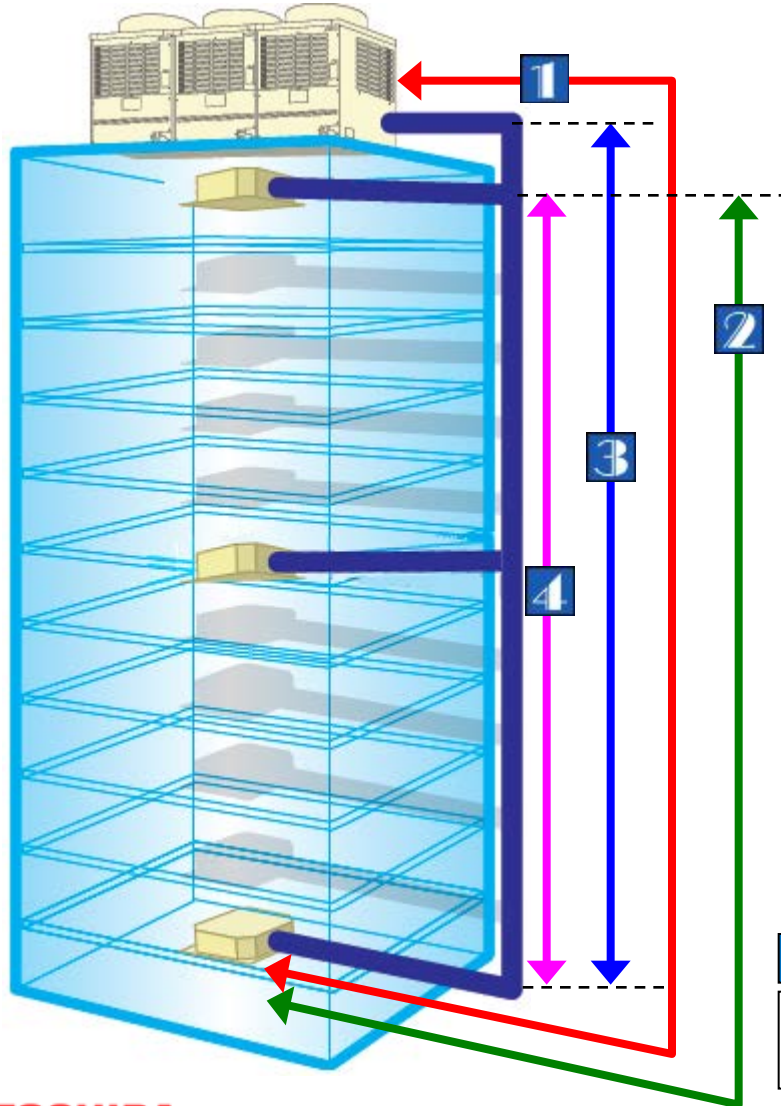
High reliability

Unbalance compressor operation



SMMS-i compare with D version 4

4. VRF Installation



Series name	SMMS-i	DK4
Total length	500m*	1,000m
1 Farthest equivalent length Industry No.1	235m	190m
2 Farthest pipe from 1 st branch	90m**	90m
3 Height between CDU-FCU (outdoor unit above / below)	70m***/ 40m	90m / 40m
4 Height between FCU-FCU Industry No.1	40m	30m

* : Above 34HP combination

** : 65m if the height piping length between CDU and FCU is more than 3m

*** : 50m if piping length between FCU's is more than 3m

DK remark

Flexible combination except recommendation pipe length is limitation
(actual pipe length 135m ← 165m, total pipe length 500m ← 1000m)

SMMS-i compare with D version 4

4. VRF Installation

Allowable piping length/height by restriction

	SMMS-i		DK4	
	Max.	Restriction	Max.	Restriction
Total length	500m	300m	1,000m	500m
Farthest equivalent length	235m	Same as Max.	190m	160m
Farthest pipe from 1 st branch	90m	65m	90m	40m
Height between CDU-FCU (outdoor unit above / below)	70m/40m	50m/30m	90m/40m	50m/40m
Height between FCU-FCU	40m	Same as Max.	30m	Same as Max.

Please refer to the restriction conditions by each engineering book.

SMMS-i compare with D version 4

4. VRF Installation

DK Total piping length = 1000 m, Calculation difference from SMMS-i way

From Engineering data book

*Note 2

Maximum allowable length	Between outdoor (*2) and indoor units	Actual pipe length	Pipe length between outdoor (*2) and indoor units ≤ 165m Example unit [8] : a + b + c + d + e + f + g + p ≤ 165m
		Equivalent length	Equivalent pipe length between outdoor (*2) and indoor units ≤ 190m (as
		Total extension length	Total pipe length from outdoor unit (*2) to all indoor units ≤ 1000m
	Between outdoor unit and Outdoor unit multi connection piping kit (Only for multi system)	Actual pipe length Equivalent length	Pipe length between outdoor unit and Outdoor unit multi connection piping
Allowable height length	Between outdoor and indoor units	Difference in height	Difference in height between outdoor and indoor units (H1) ≤ 50m (Max 4
	Between indoor and indoor units		
	Between outdoor and outdoor units		
Allowable length after the branch			

Peculiar piping calculation

When piping length after first branch is 40m or more, it is necessary

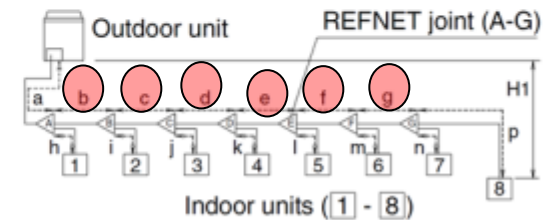
*Note 2

Peculiar piping calculation

When piping length after first branch is 40m or more, it is necessary to increase the piping sizes. In this case, the lengths between each branching pipe are doubled in the piping calculation for total piping length due to the piping size-up. Therefore, it may be a restriction of the total piping length.

Required Conditions	
1. It is necessary to increase the pipe size between the first branch kit and the final branch kit. (Reducers must be procured on site) However, the pipes that are same pipe size with main pipe must not be increased.	
2. For calculation of Total extension length, the actual length of above pipes must be doubled. (except main pipe and the pipes that are not increased)	$a + b \times 2 + c \times 2 + d \times 2 + e \times 2 + f \times 2 + g \times 2 + h + i + j + k + l + m + n + p \leq 1000 \text{ m}$
3. Indoor unit to the nearest branch kit $\leq 40 \text{ m}$	$h, i, j, \dots, p \leq 40 \text{ m}$
4. The difference between [Outdoor unit to the farthest indoor unit] and [Indoor unit to the nearest indoor unit] $\leq 50 \text{ m}$	$a + b \times 2 + c \times 2 + d \times 2 + e \times 2 + f \times 2 + g \times 2 + h + i + j + k + l + m + n + p \leq 1000 \text{ m}$

*If available on the site, use t



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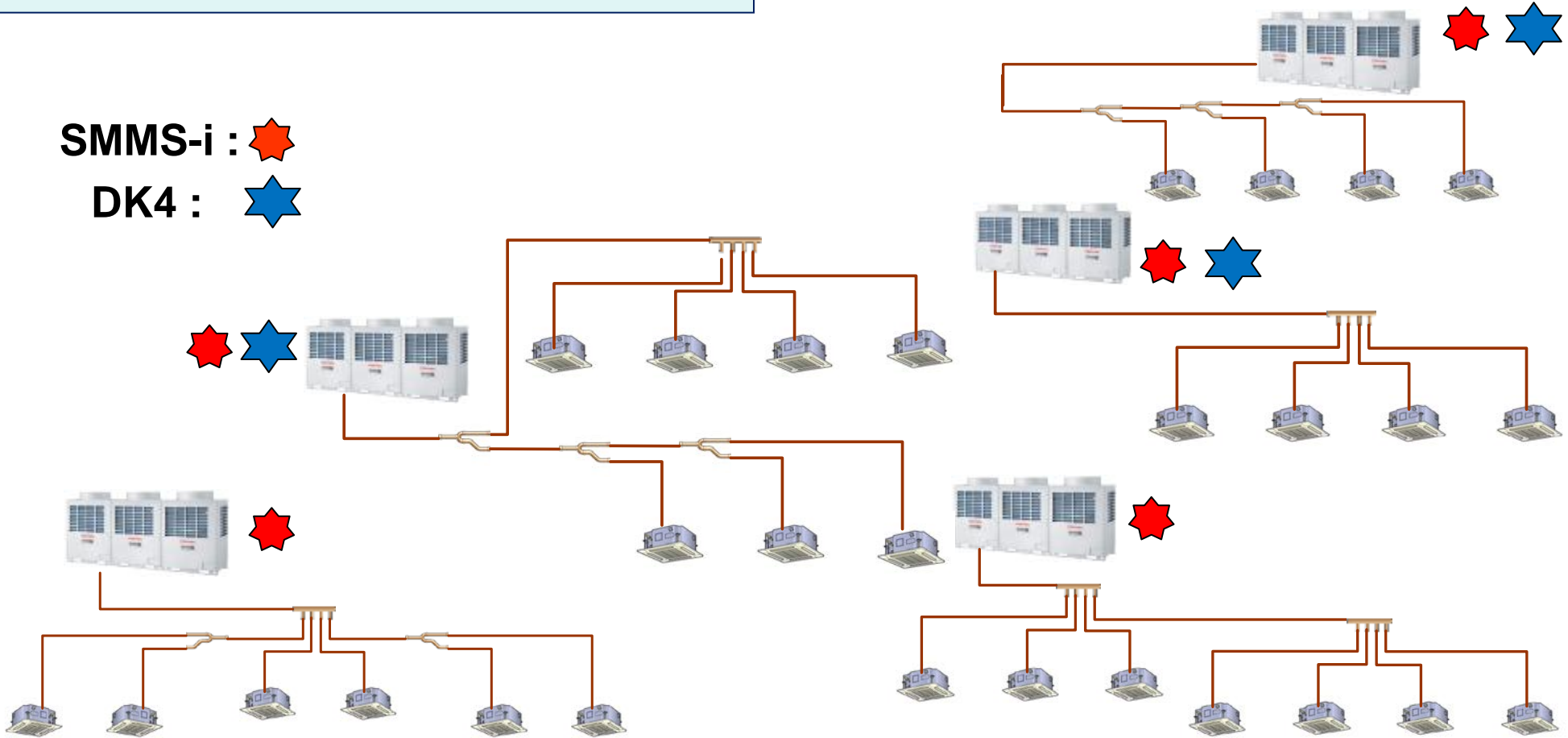
SMMS-i compare with D version 4

Preliminary

4. VRF Installation

SMMS-i : ★

DK4 : ★



Determining the best piping strategy depends on the application and layout of the indoor units and the merits of each branching method *Free branching system!*


SMMS-i compare with D version 4

4. VRF Installation

System Combination

Toshiba SMMS-i	Minimum combination ratio	Max combination ratio
Standard outdoor unit	50%	135%
Hi-COP outdoor unit		

DK 4 - Connection ratio 50%-200%

Applicable indoor unit		Other indoor unit models
Single outdoor unit	200%	200%
Double outdoor unit		160%
Triple outdoor unit		130%

DK
Remark
detail

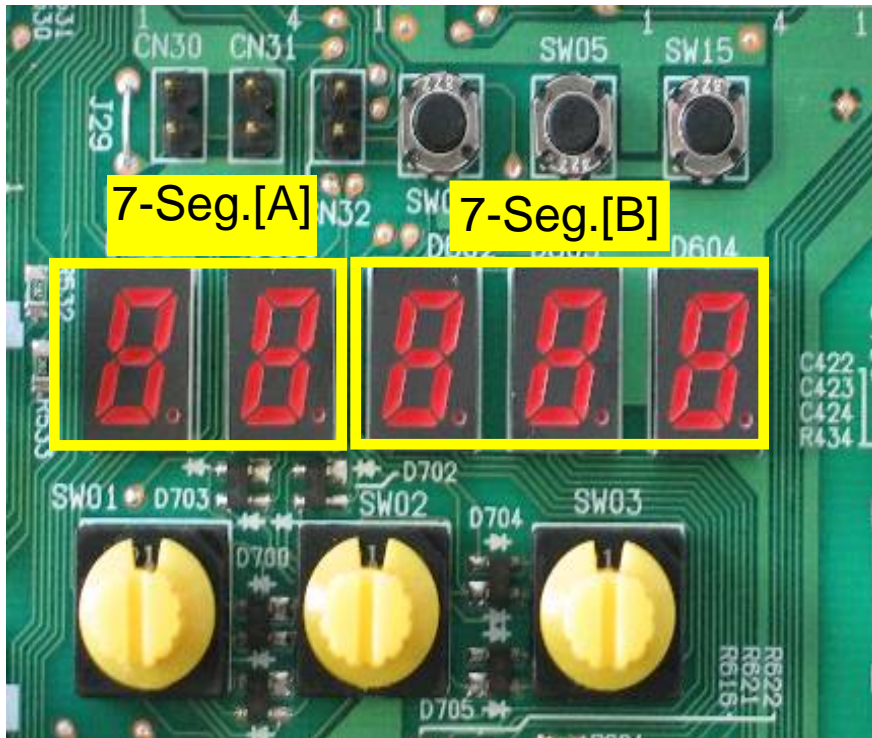
* For the FXFQ25 models, maximum connection ratio is 130% for the entire range of outdoor units.
Notes: • If the operational capacity of indoor units is more than 130%, low airflow operation is enforced in all the indoor units.



SMMS-i compare with D version 4

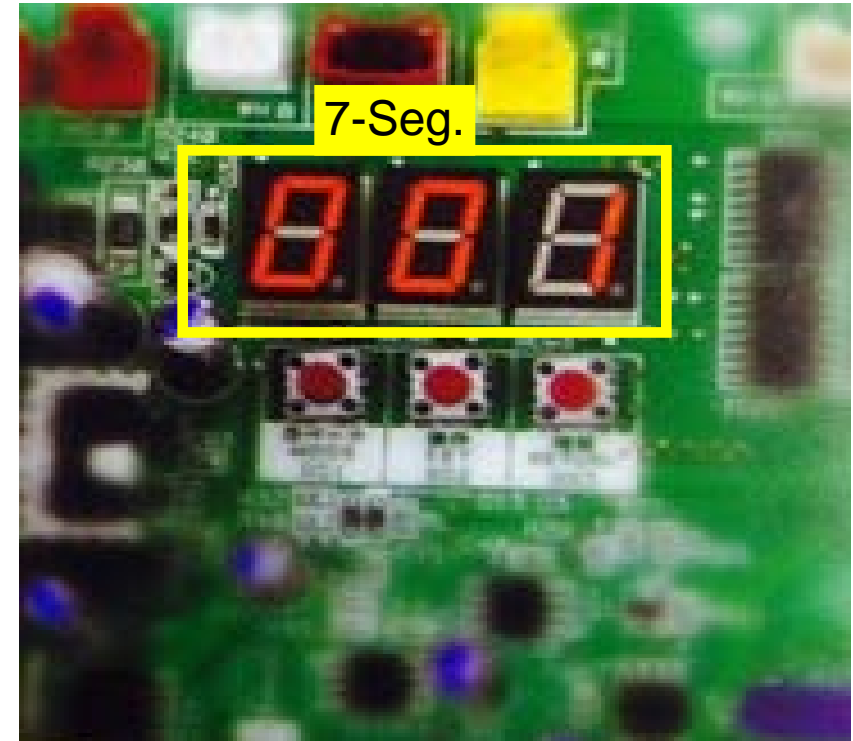
5. VRF Service and maintenance

SMMS-i, 7 segment



SMMS-i can commissioning test, operate, see many system information and clearly error code

DK 4, 7 segment



DK can commissioning test, operate, but for system information and clearly error code less than SMMS-i

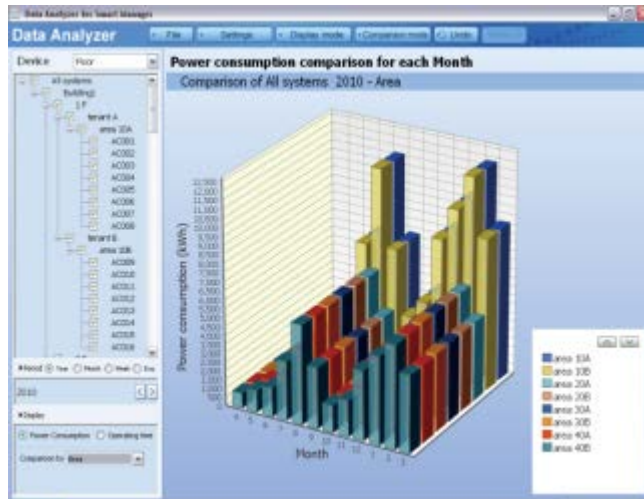
SMMS-i compare with D version 4

6. SMMS-i features

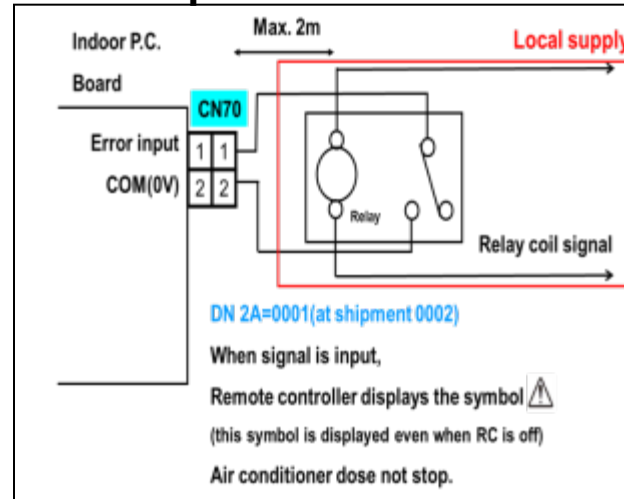
SMMS-i has more special feature in 3 type methods

1. Controller special feature
2. Connector for indoor units special feature
3. Option PCB for Outdoor units special feature

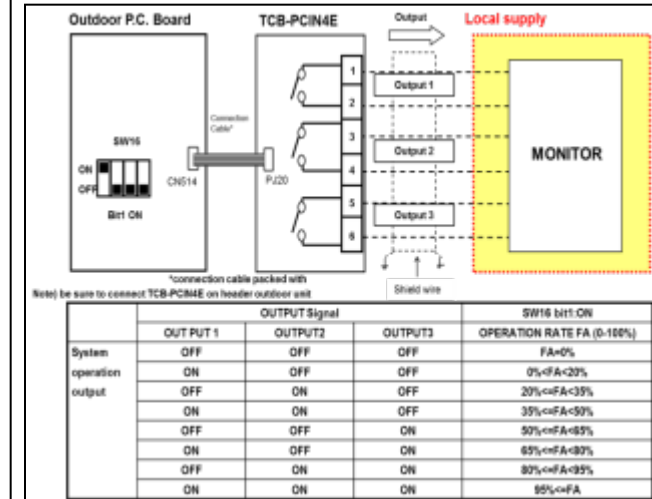
1. Controller special feature



2. Connector indoor units special feature



3. Option PCB for Outdoor units special feature




6. SMMS-i features

1. Controller special feature

Individual remote Controller special feature



- Energy save operation is special saving additional from main system .
- It can set temp and display at more digit 0.5 degree.
- It can display Room name.

			TOSHIBA	DK
Model			RBC-AMS51E-EN/ES	BRC1E62
Appearance			<div><div><div></div><div></div></div><div>Only TOSHIBA fuction Only DAIKIN function</div></div> <div><div>Depth : 20</div></div>	<div><div><div></div><div></div></div><div></div><div>Depth : 19</div></div>
Display	Display method		Full dot	Full dot
	Back light		Available	Available
	Language changeover		Available (11 languages)*2	Available (11 languages)*2
	Name of Room		Available (Only Alphabet)	Not available
Timer	Clock setting		Available	Available
	ON/OFF Timer		Not available	Not available
	Schedule Timer	Setting unit	Clock (per 1min)	Clock (per 1min)
		time per day	8times /day	5times /day
		Holiday setting	Available	Available
	Off reminder timer	Setting unit	10 min	10 min
the setting range		30min ~ 240min	30min ~ 180min	
Energy Save Operation	Save	time per day	Clock (per 10min)	Not available
		pattern / day	4 patterns /day	Not available
		the limited range	0, 50., 50~100 %	Not avaialbe
	Set temp. mode changeover		Not available	Available
	Night operation mode		Available	Not available
Lock function	Key lock		Available (ON/OFF, mode, temp)	Available
Setting temp	Display unit		1degree/0.5 degree (by DN code)	1 degree
	Set temp. limit		Available	Available
	Return back	Setting unit	Available (per 10min)	Available (per 30min)
		Setting range	10~120min	30~120min
	Room temp display		Available	Available
Service mo	Error code display		Available	Available
	Model name display		Available (including serial No)	Available *1
	Service contact Tel. No		Available	Available
Filter sign	Filter Sign		Available	Available
	the rest time until filter sign is lighting		Available	Not available
Others	Quick Cooling/Heating		Not available	Available (30 min)
	Built in backup power		Available (48hours)	Available (48hours)

*1) For some models, model codes are displayed instead of model names

6. SMMS-i features

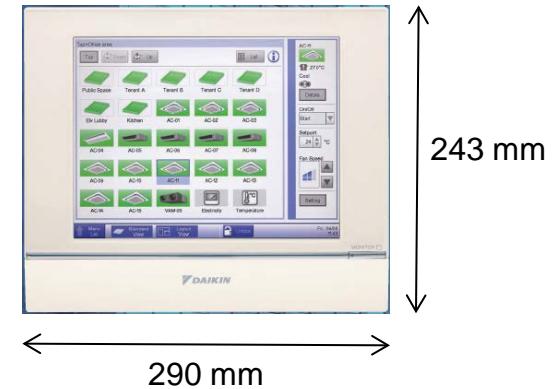
SMMS-i Central Controller



Touch screen controller

- Max. 512 indoor units (Touch Screen Controller)
- Max. 64 indoor units (Relay I/F)
- Operation Mode / Air volume / Louver / Set temperature Control and monitoring
- Room Temperature monitor
- Indoor unit Permit/Prohibit Control
- Operation Schedule
(Daily / Weekly / Monthly)
- Energy Monitoring and Billing

DK 4 Intelligent touch manager



Floor plan and can operate



SMMS-i compare with D version 4

6. SMMS-i features

SMMS-i Central Controller



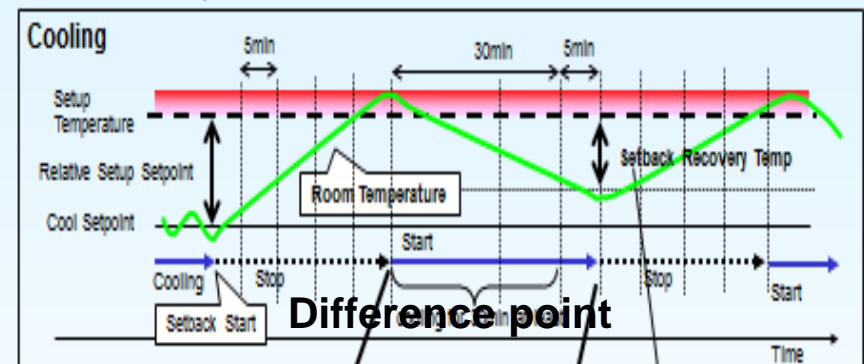
Touch screen controller

- Max. 512 indoor units (Touch Screen Controller)
- Max. 64 indoor units (Relay I/F)
- Operation Mode / Air volume / Louver / Set temperature Control and monitoring
- Room Temperature monitor
- Indoor unit Permit/Prohibit Control
- Operation Schedule
(Daily / Weekly / Monthly)
- Energy Monitoring and Billing

DK 4 Intelligent touch manager

Detail of Setback Control (Cooling)

Setback is start/stop control as follows.



Decision of cooling start

- Decision time is every 5 min
- Condition
Room temperature \geq Setup temperature

Decision of stop

- Decision time is every 5 min after 30 min since cooling start.
- Condition
Room temperature \leq Setup temperature - Setback Recovery Temp



6. SMMS-i features

SMMS-i Application controls Line up

	Application	SMMS-i	Mini-SMMS	DI	SDI
Power peak-cut control (Standard)	TCB-PCDM4E	x	x	-	-
	TCB-PCDM2E	-	x	-	-
Power peak-cut control (Expand)	TCB-PCDM4E	x	x	-	-
	TCB-PCDM2E	-	x	-	-
Error /Operation output control	TCB-PCIN4E	x	x	-	-
	TCB-PCIN2E	-	x	-	-
Compressor operation output	TCB-PCIN4E	x	-	-	-
Operation rate display	TCB-PCIN4E	x	-	-	-
Snowfall fan control	TCB-PCMO4E	x	-	-	-
	TCB-PCMO2E	-	-	-	-
External master ON/OFF control	TCB-PCMO4E	x	x	-	-
	TCB-PCMO2E	-	x	-	-
Night operation (Sound reduction) control	TCB-PCMO4E	x	x	-	-
	TCB-PCMO2E	-	x	-	-
Operation mode selection control	TCB-PCMO4E	x	-	-	-
	TCB-PCMO2E	-	x	-	-
Outdoor fan high static pressure shift	-	x	-	-	-
Cooling priority or Heating priority setting	-	x	x	-	-
PMV-Kit control	-	-	x	-	-
Night operation and demand control /Compressor ON status output	TCB-PCOS1E2 /TCB-KBOS1E				
Night operation and demand control /Compressor ON status output	TCB-PCOS1E2 /TCB-KBOS1E	-	-	x	x
Device of Indoor unit	TCB-IFCB-4E2	x	x	x	x

SMMS-i compare with D version 4

6. SMMS-i features

Option Control for indoor unit

**SMMS-i
has so many solution**

Optional connector specifications of indoor P.C. Board

Function	Connector	Pin No.	Outline
Fan output	CN32	1,2	Ventilation control from Remote controller
Option output	CN60	1,2,3,4,5,6	Operation status signal output (cooling,heating,fan,defrost,thermo-ON)
Operation Input / Output	CN61	1,2,3,4,5,6	External ON/OFF, operation output, alarm output
Option error input	CN70	1,2	Alarm display
Demand input	CN73	1,2	Forced thermo-off control
Outside error input	CN80	1,3	Alarm input(L30)& forced off

SMMS-i compare with D version 4

6. SMMS-i features

Option Control (Ex. Key Card)

Key card solution feature

~ Key Card Solution ~

When customers in the room,

- Set temperature range is adjustable temperature range. (18 to 26 deg)

When customers go out in each room,

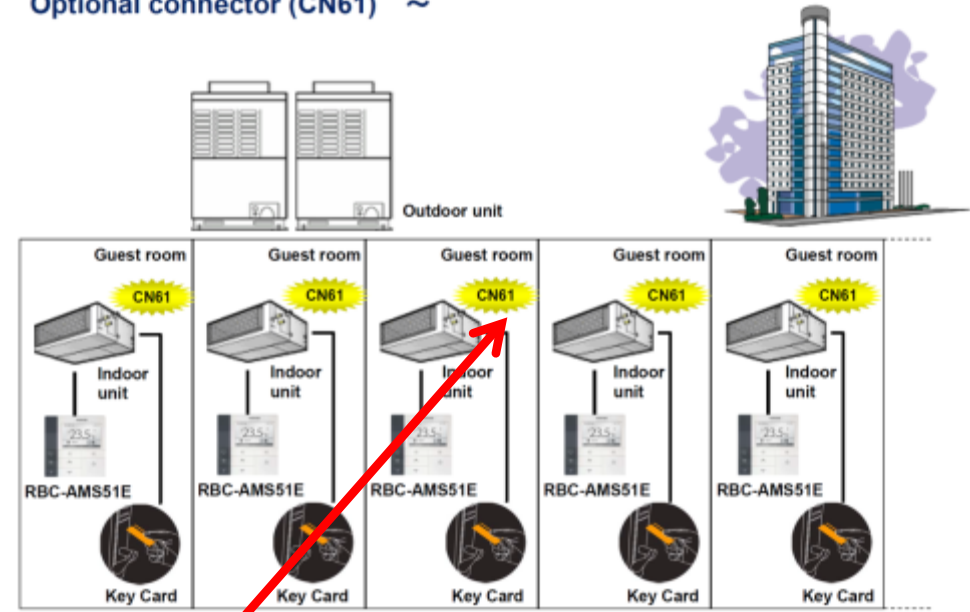
- Keep a constant temperature (26 deg) of the room.
- It is not necessary to install an external thermostat.

Interlock with key card controls can be adopted for energy saving.

Toshiba SMMS-i Solution

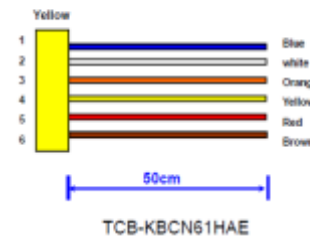
Key Card Solution (System Configuration Proposal 2)

~ Lite-Vision plus Remote Controller (RBC-AMS51E) +
Optional connector (CN61) ~



Optional connector specifications of indoor P.C. Board

Optional connector (CN61)



Connector cost

Toshiba solution

Connector cost around

= 4 USD/unit

D 4 solution

Adaptor cost around

= 145 USD/unit

SMMS-i Solution are official method from factory and lower cost than other

Comparison important point

1. Energy Saving
 - ➡ SMMS-i part load (IEER) better than DK 4 max. around 20%
2. Product line up
 - ➡ SMMS-i has more range of indoor units for more selection
 - ➡ DK 4 has more range of indoor units
1. Technology and feature
 - ➡ SMMS-i has more detail function that can support all need
1. Installation
 - Piping length ➡ SMMS-i can achieve or longer for important length
 - Combination ➡ DK 4 has more flexible for combine but should see detail.
5. Service and maintenance
 - ➡ SMMS-i has more easy to service and more reliability



Standard Type

R-410A

Cooling only



Thank you

Appendix

1. Energy Saving comparison

Standard Type

Normally part load always happen for almost application building and almost the operation time

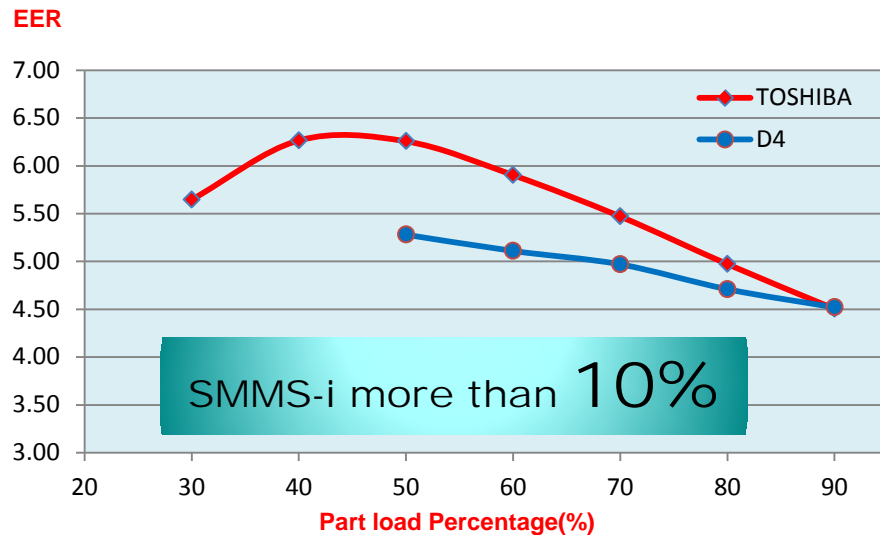
Cooling Efficiency, EER at part load comparison

SMMS-i win for all model range (8 to 48HP @ 50 – 90% part load) SMMS-i more than **13 %**

Graph of EER **8 HP** @ 50-90% part load

Average part load EER **SMMS-i** = 5.42

Average part load EER, **D** = 4.92

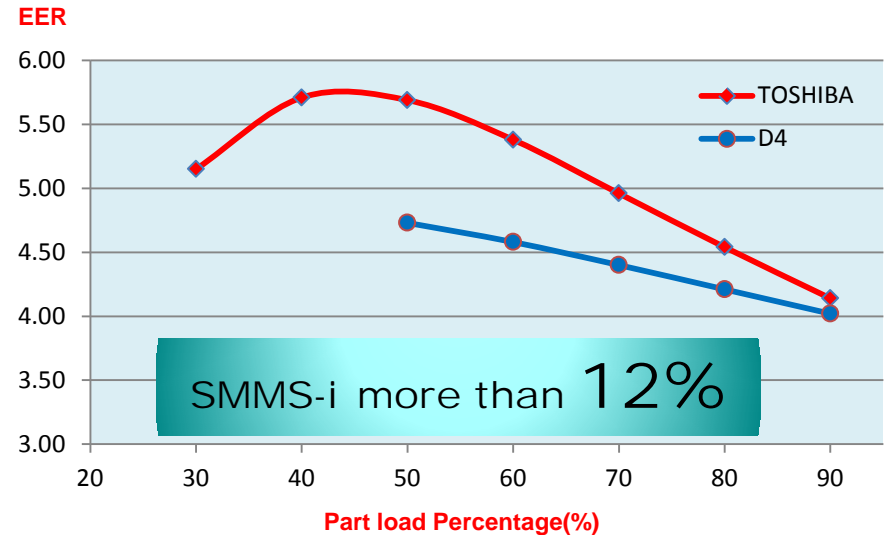


SMMS-i Max : 6.26@50% Part load
D4 Max ; 5.28@50% Part load

Graph of EER **10 HP** @ 50-90% part load

Average part load EER **SMMS-i** = 4.94

Average part load EER, **D** = 4.39



SMMS-i Max : 5.69@50% Part load
D4 Max ; 4.73@50% Part load

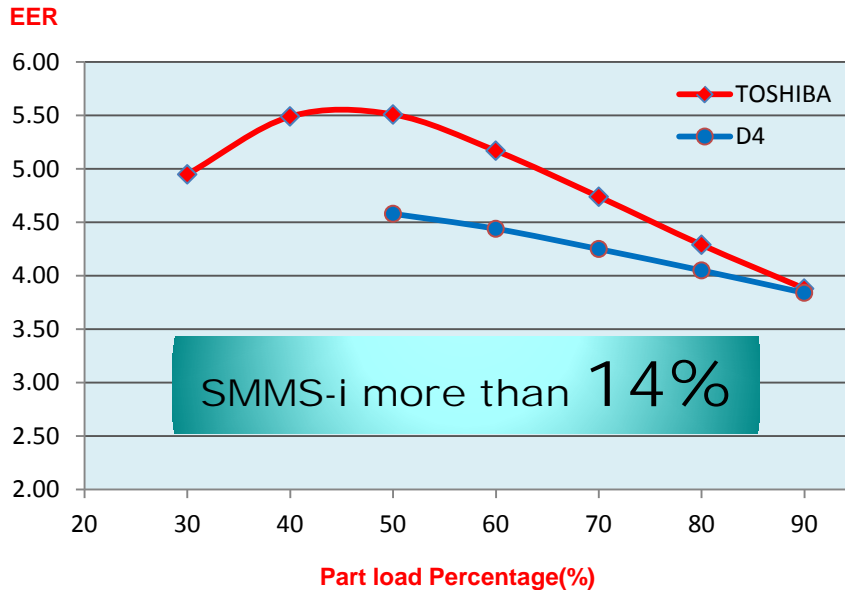
1. Energy Saving comparison

Standard Type

Graph of EER 12 HP @ 50-90% part load

Average part load EER **SMMS-i** = 4.86

Average part load EER, **D** = 4.23

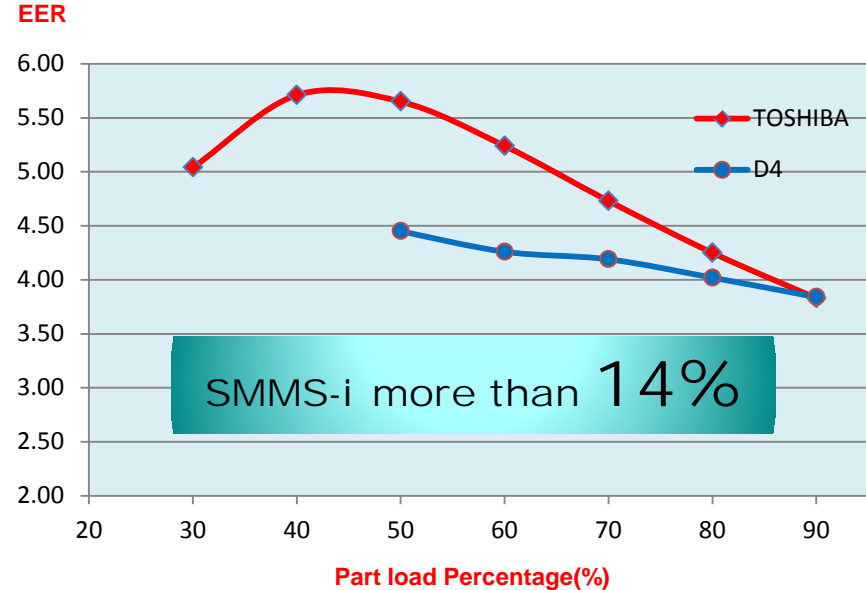


SMMS-i Max : 5.51 @50% Part load
D4 Max ; 4.58 @50% Part load

Graph of EER 14 HP @ 50-90% part load

Average part load EER **SMMS-i** = 4.74

Average part load EER, **D** = 4.15



SMMS-i Max : 5.65 @50% Part load
D4 Max ; 4.45 @50% Part load

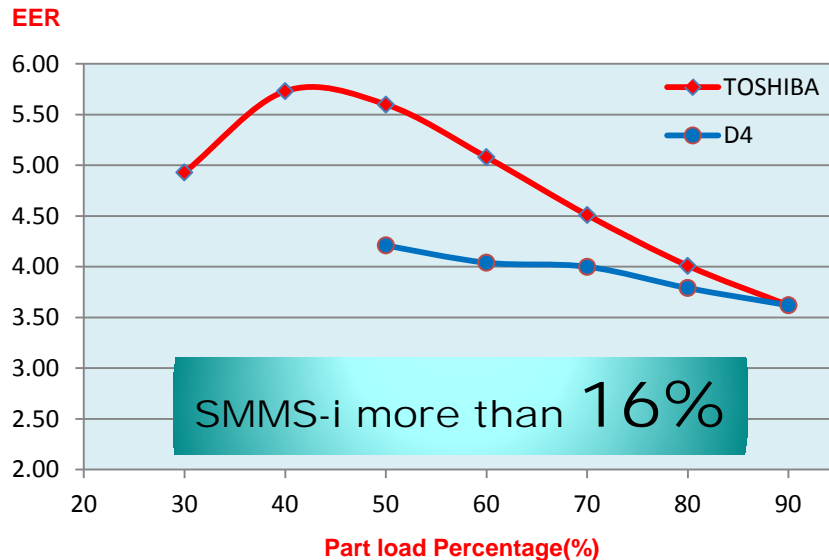
1. Energy Saving comparison

Standard Type

Graph of EER 16 HP @ 50-90% part load

Average part load EER **SMMS-i** = 4.56

Average part load EER, **D** = 3.93

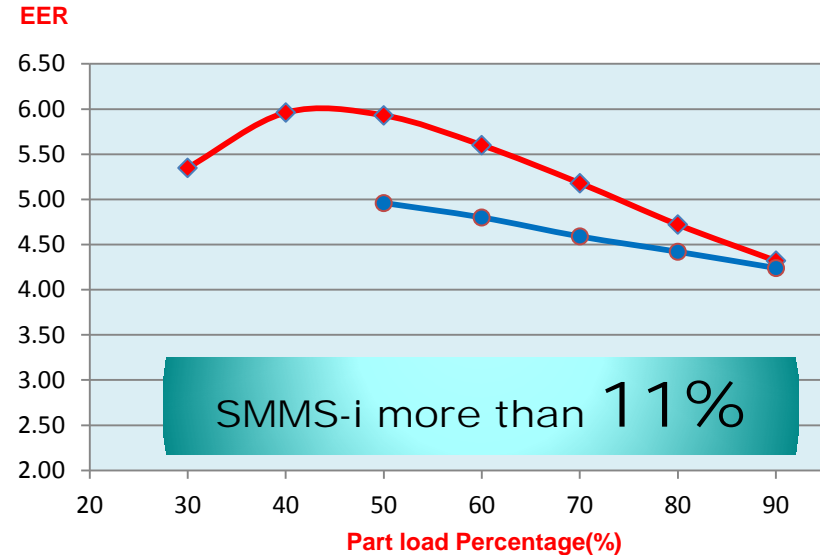


SMMS-i Max : 5.60@50% Part load
D4 Max ; 4.21@50% Part load

Graph of EER 18 HP @ 50-90% part load

Average part load EER **SMMS-i** = 5.15

Average part load EER, **D** = 4.60



SMMS-i Max : 5.93@50% Part load
D4 Max ; 4.96@50% Part load

TC = 10HP+8HP
DK = 8HP+10HP

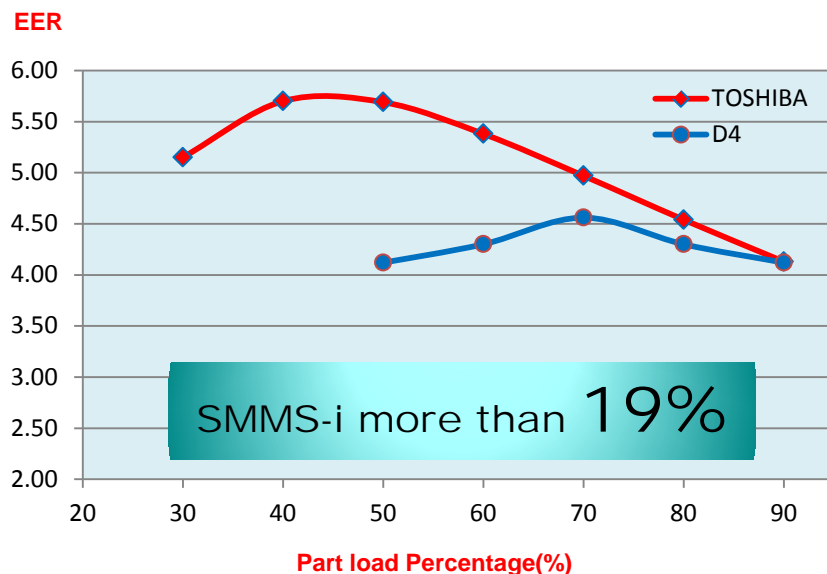
1. Energy Saving comparison

Standard Type

Graph of EER 20 HP @ 50-90% part load

Average part load EER **SMMS-i** = 4.94

Average part load EER, **D** = 4.50



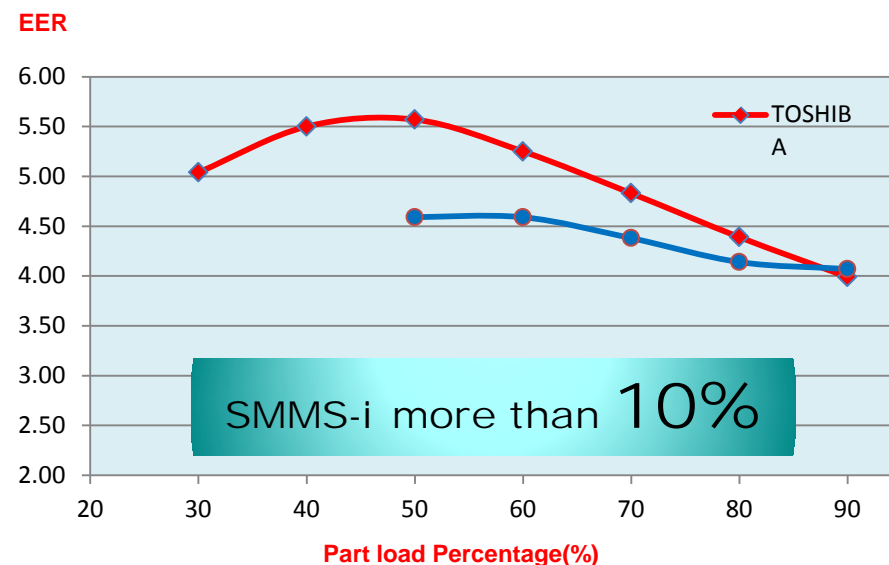
SMMS-i Max : 5.69@50% Part load
D4 Max ; 4.12@50% Part load

TC = 10HP+10HP
DK = 10HP+10HP

Graph of EER 22 HP @ 50-90% part load

Average part load EER **SMMS-i** = 4.81

Average part load EER, **D** = 4.36



SMMS-i Max : 5.57@50% Part load
D4 Max ; 4.59@50% Part load

TC = 12HP+10HP
DK = 8HP+14HP

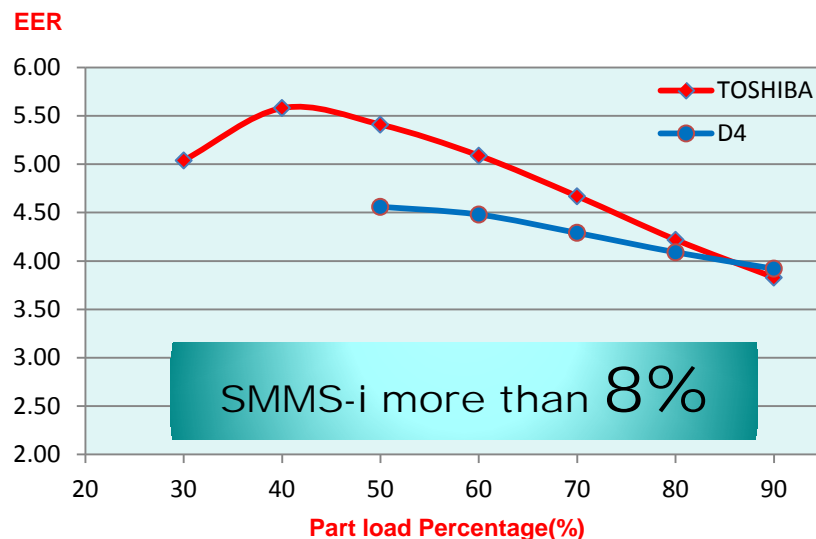
1. Energy Saving comparison

Standard Type

Graph of EER 24 HP @ 50-90% part load

Average part load EER **SMMS-i** = 4.64

Average part load EER, **D** = 4.27



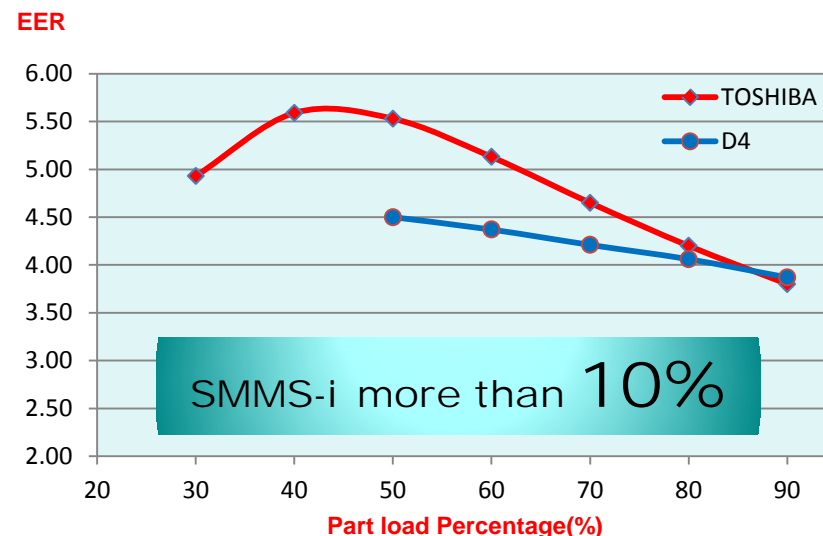
SMMS-i Max : 5.41@50% Part load
D4 Max ; 4.56@50% Part load

TC = 12HP+12HP
DK = 10HP+14HP

Graph of EER 26 HP @ 50-90% part load

Average part load EER **SMMS-i** = 4.66

Average part load EER, **D** = 4.20



SMMS-i Max : 5.53@50% Part load
D4 Max ; 4.50@50% Part load

TC = 16HP+10HP
DK = 12HP+14HP

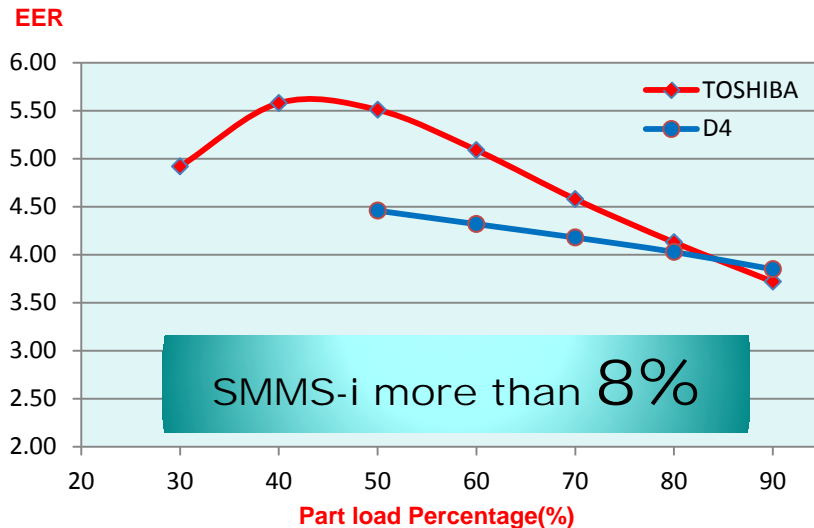
1. Energy Saving comparison

Standard Type

Graph of EER 28 HP @ 50-90% part load

Average part load EER **SMMS-i** = 4.61

Average part load EER, **D** = 4.17



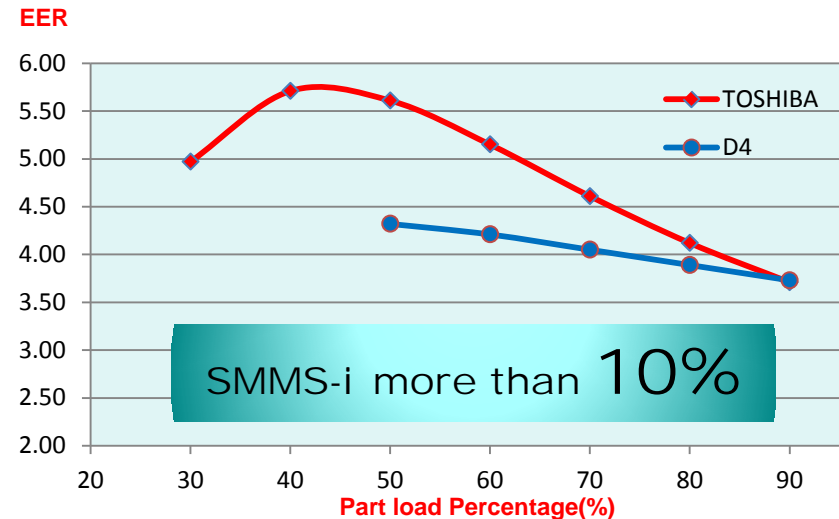
SMMS-i Max : 5.51 @50% Part load
D4 Max ; 4.46 @50% Part load

TC = 16HP+12HP
DK = 14HP+14HP

Graph of EER 30 HP @ 50-90% part load

Average part load EER **SMMS-i** = 4.64

Average part load EER, **D** = 4.04



SMMS-i Max : 5.61 @50% Part load
D4 Max ; 4.32 @50% Part load

TC = 16HP+14HP
DK = 14HP+16HP

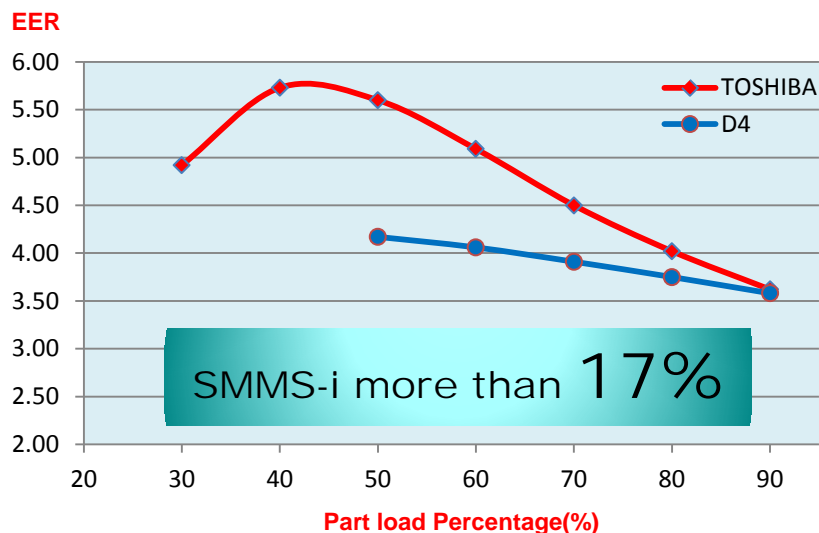
1. Energy Saving comparison

Standard Type

Graph of EER 32 HP @ 50-90% part load

Average part load EER **SMMS-i** = 4.57

Average part load EER, **D** = 3.89



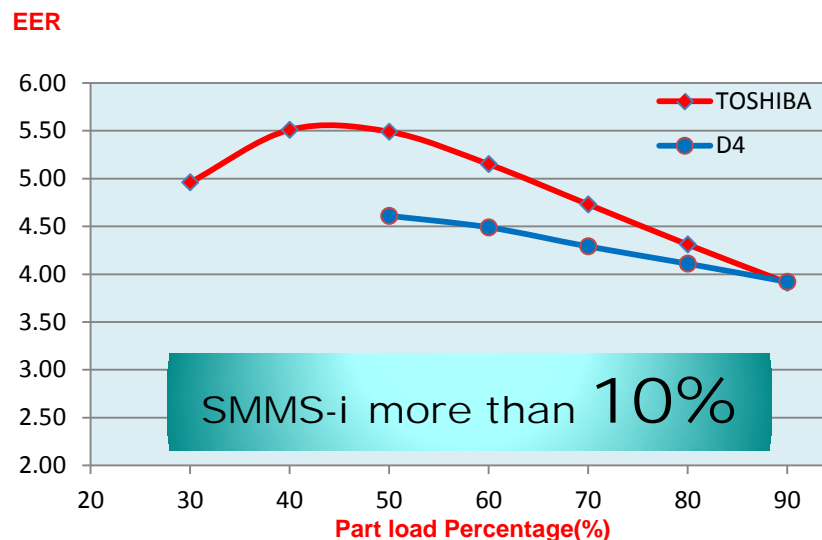
SMMS-i Max : 5.60@50% Part load
D4 Max ; 4.17@50% Part load

TC = 16HP+16HP
DK = 14HP+18HP

Graph of EER 34 HP @ 50-90% part load

Average part load EER **SMMS-i** = 4.72

Average part load EER, **D** = 4.28



SMMS-i Max : 5.49@50% Part load
D4 Max ; 4.61@50% Part load

TC = 12HP+12HP+10HP
DK = 10HP+12HP+12HP

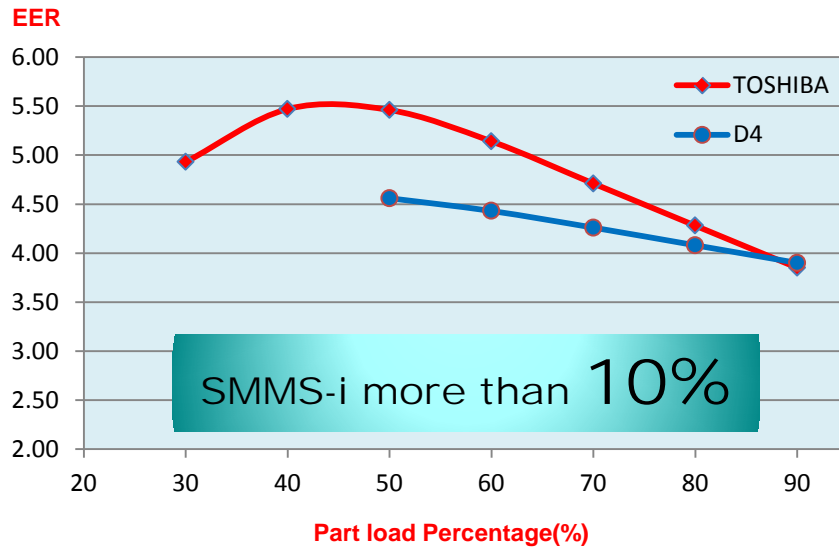
1. Energy Saving comparison

Standard Type

Graph of EER 36 HP @ 50-90% part load

Average part load EER **SMMS-i** = 4.69

Average part load EER, **D** = 4.25



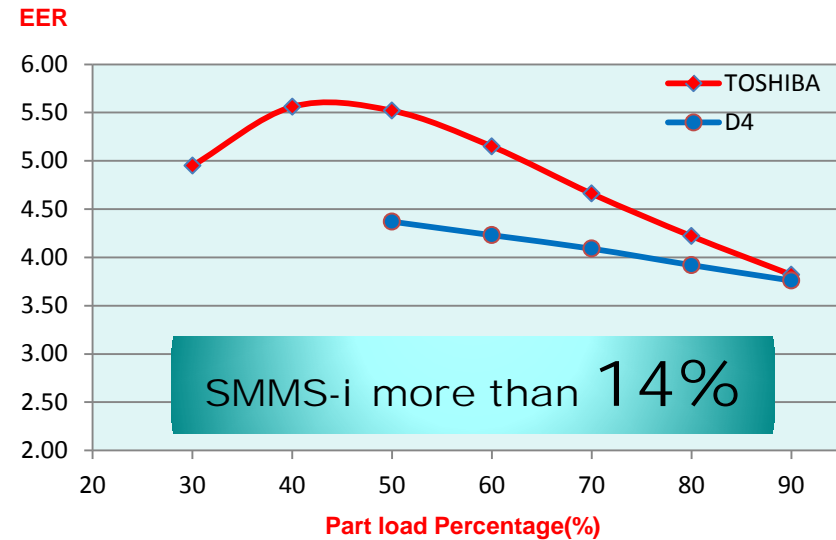
SMMS-i Max : 5.46@50% Part load
D4 Max ; 4.56@50% Part load

TC = 12HP+12HP+12HP
DK = 12HP+12HP+12HP

Graph of EER 38 HP @ 50-90% part load

Average part load EER **SMMS-i** = 4.67

Average part load EER, **D** = 4.08



SMMS-i Max : 5.52@50% Part load
D4 Max ; 4.37@50% Part load

TC = 16HP+12HP+10HP
DK = 8HP+12HP+18HP

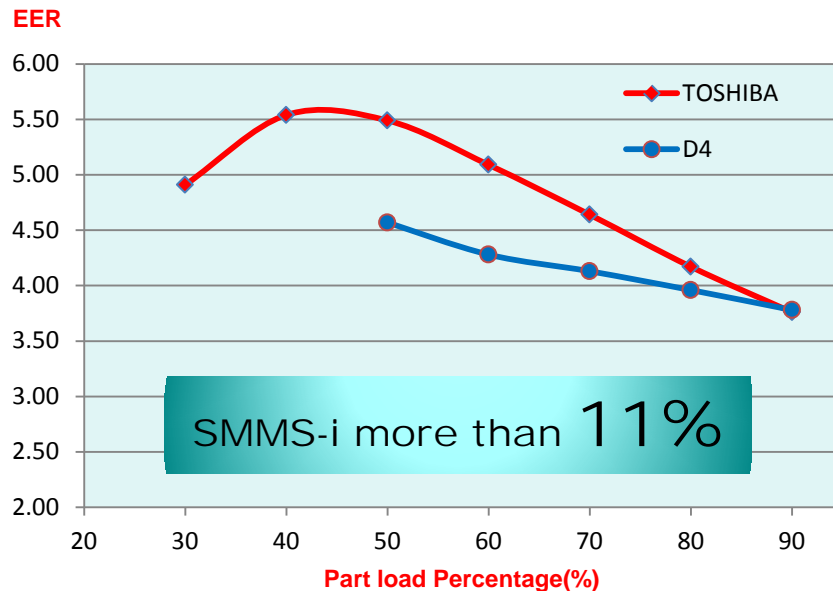
1. Energy Saving comparison

Standard Type

Graph of EER 40 HP @ 50-90% part load

Average part load EER **SMMS-i** = 4.63

Average part load EER, **D** = 4.14



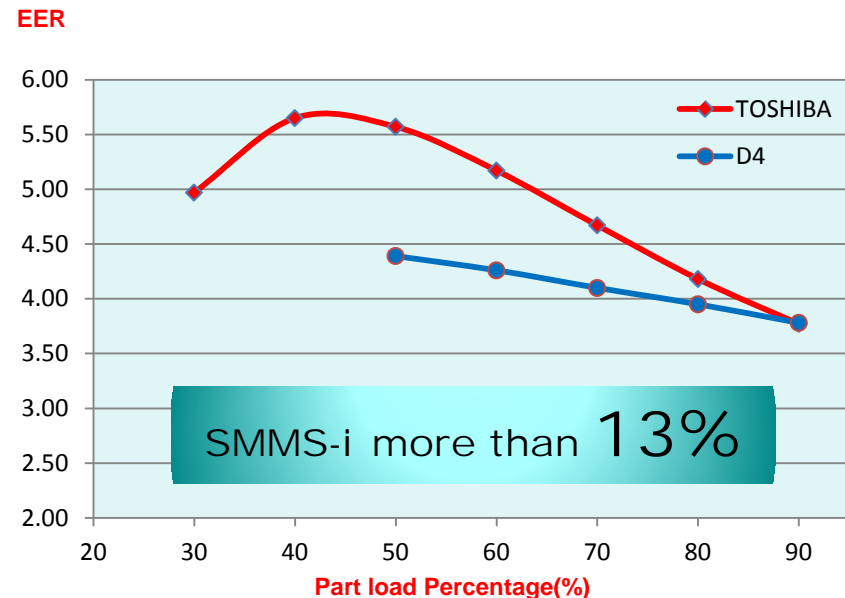
SMMS-i Max : 5.49@50% Part load
D4 Max ; 4.57@50% Part load

TC = 16HP+12HP+12HP
DK = 12HP+12HP+16HP

Graph of EER 42 HP @ 50-90% part load

Average part load EER **SMMS-i** = 4.67

Average part load EER, **D** = 4.10



SMMS-i Max : 5.57@50% Part load
D4 Max ; 4.39@50% Part load

TC = 16HP+14HP+12HP
DK = 12HP+14HP+16HP

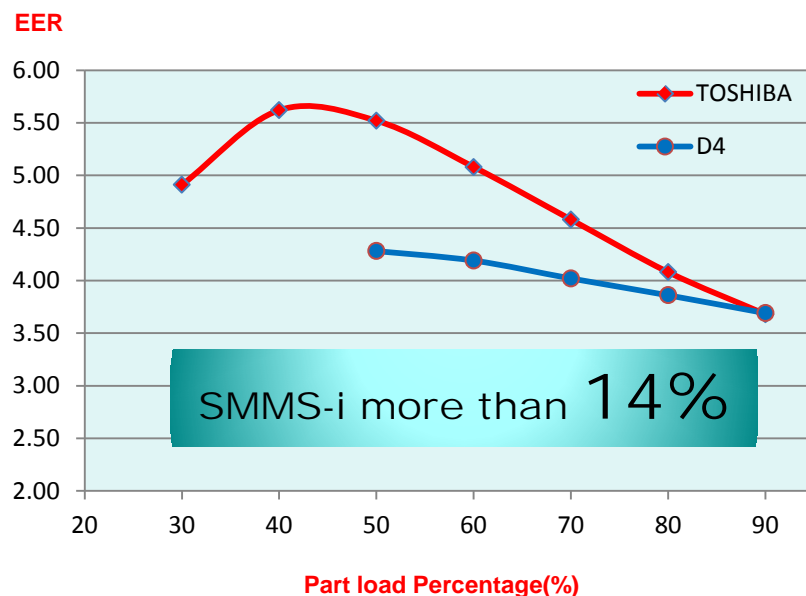
1. Energy Saving comparison

Standard Type

Graph of EER 44 HP @ 50-90% part load

Average part load EER **SMMS-i** = 4.59

Average part load EER, **D** = 4.01



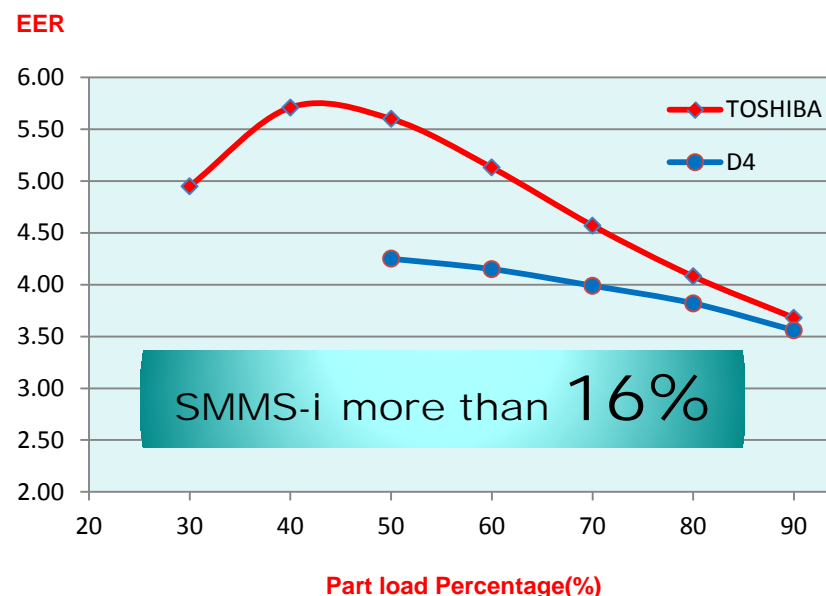
SMMS-i Max : 5.52@50% Part load
D4 Max ; 4.28@50% Part load

TC = 16HP+16HP+12HP
DK = 12HP+16HP+16HP

Graph of EER 46 HP @ 50-90% part load

Average part load EER **SMMS-i** = 4.61

Average part load EER, **D** = 3.95



SMMS-i Max : 5.60@50% Part load
D4 Max ; 4.25@50% Part load

TC = 16HP+16HP+14HP
DK = 14HP+14HP+18HP

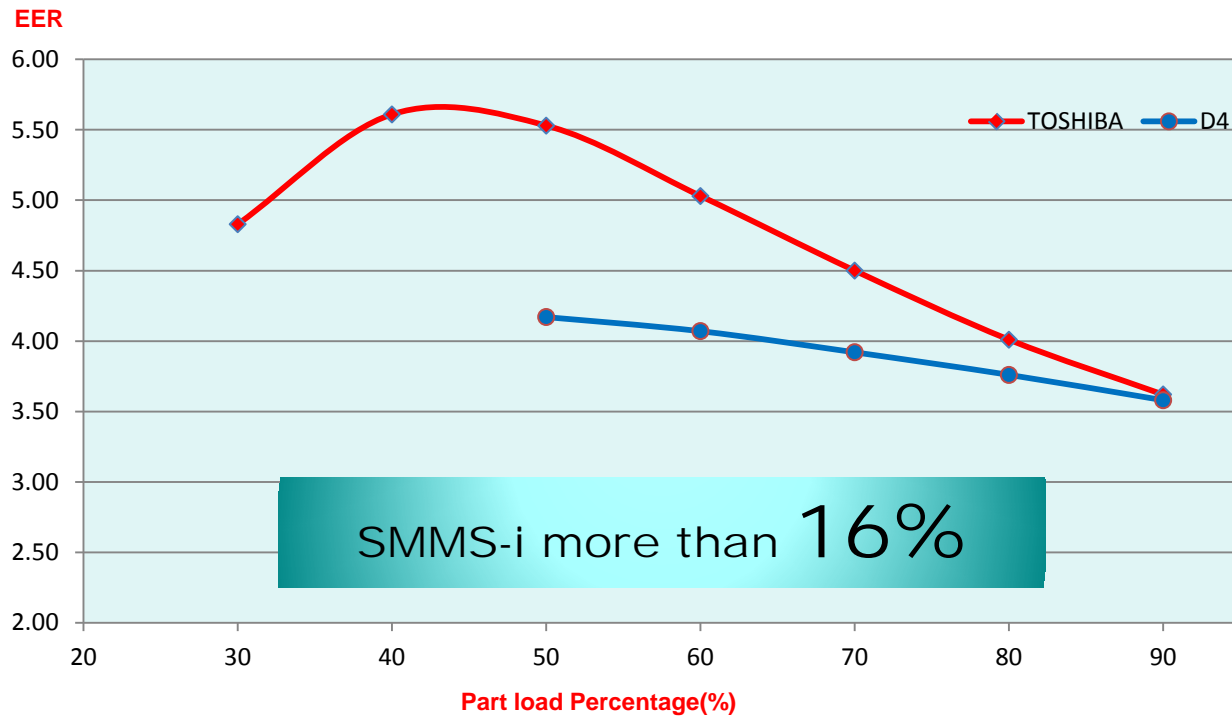
1. Energy Saving comparison

Standard Type

Graph of EER 48 HP @ 50-90% part load

Average part load EER **SMMS-i** = 4.54

Average part load EER, **D** = 3.90



SMMS-i Max : 5.53 @ 50% Part load
D4 Max ; 4.17 @ 50% Part load

TC = 16HP+16HP+16HP
DK = 16HP+16HP+16HP

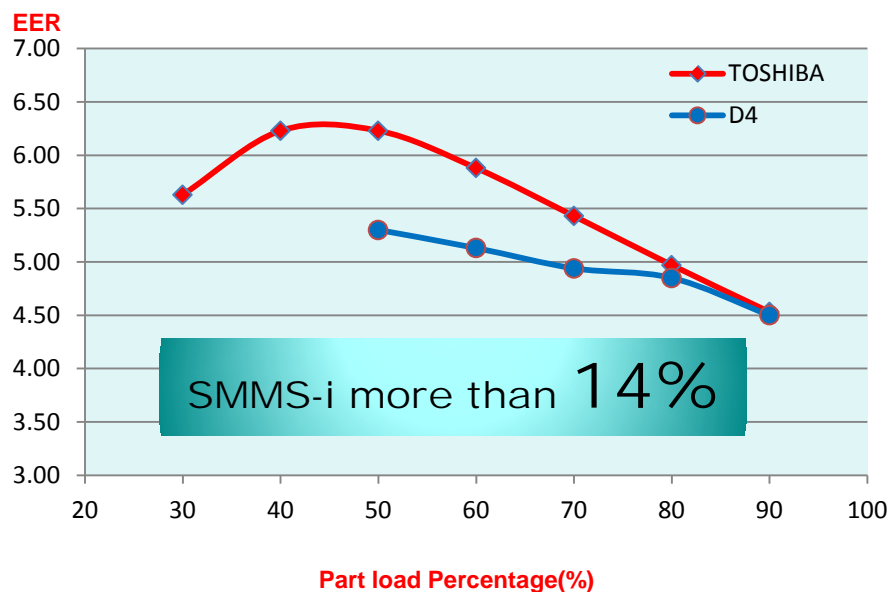
1. Energy Saving comparison

High efficiency Type

Graph of EER 16 HP @ 50-90% part load

Average part load EER **SMMS-i** = 5.41

Average part load EER, **D** = 4.94



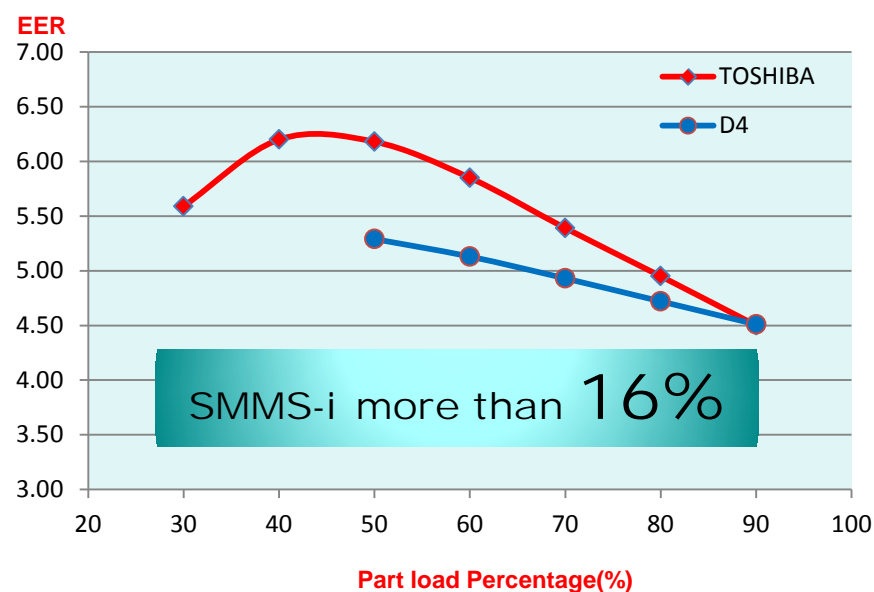
SMMS-i Max : 6.23@50% Part load
D4 Max ; 5.30@50% Part load

TC = 8HP+8HP
DK = 8HP+8HP

Graph of EER 24 HP @ 50-90% part load

Average part load EER **SMMS-i** = 5.37

Average part load EER, **D** = 4.92



SMMS-i Max : 6.18@50% Part load
D4 Max ; 5.29@50% Part load

TC = 8HP+8HP+8HP
DK = 8HP+8HP+8HP

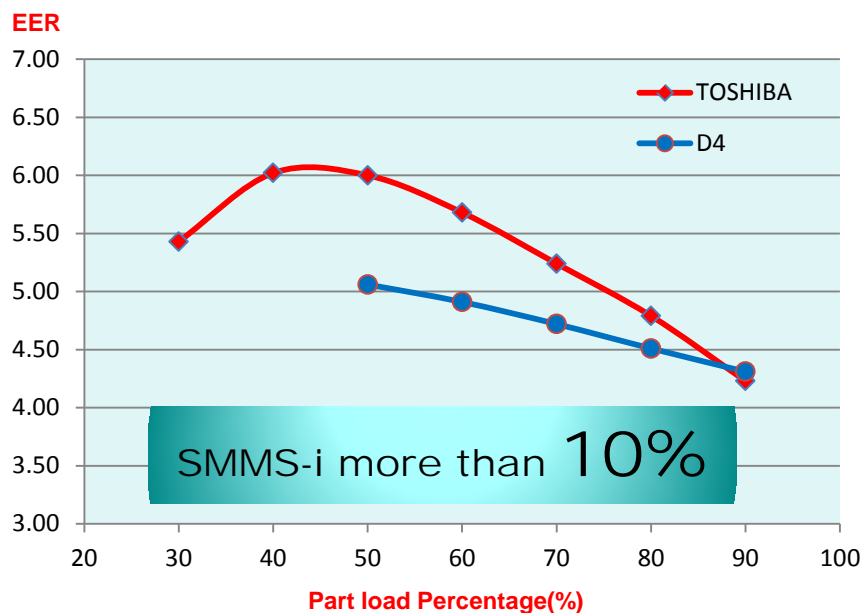
1. Energy Saving comparison

High efficiency Type

Graph of EER 26 HP @ 50-90% part load

Average part load EER **SMMS-i** = 5.19

Average part load EER, **D** = 4.70



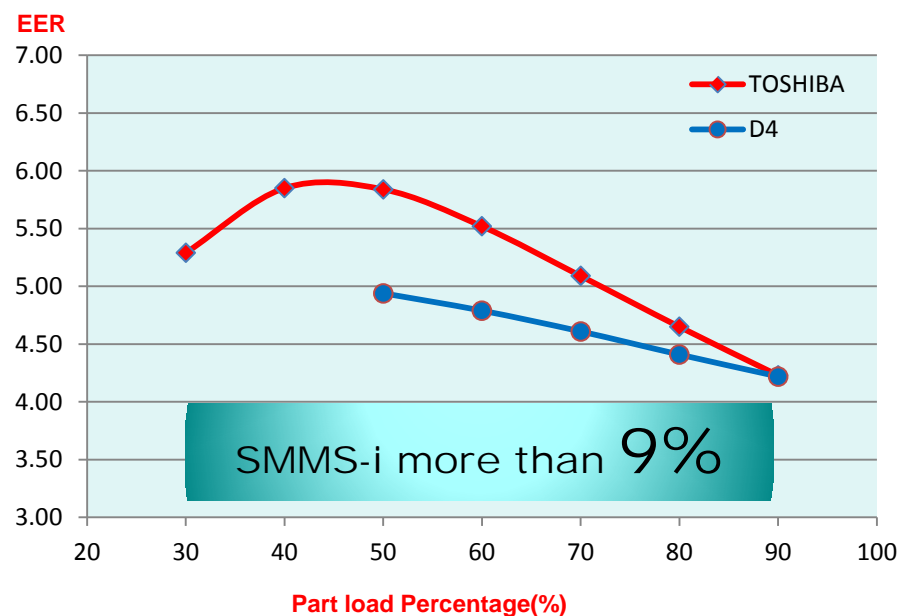
SMMS-i Max : 6.00@50% Part load
D4 Max ; 5.06@50% Part load

TC = 10HP+8HP+8HP
DK = 8HP+8HP+10HP

Graph of EER 28 HP @ 50-90% part load

Average part load EER **SMMS-i** = 5.07

Average part load EER, **D** = 4.59



SMMS-i Max : 5.84@50% Part load
D4 Max ; 4.94@50% Part load

TC = 10HP+10HP+8HP
DK = 8HP+8HP+12HP

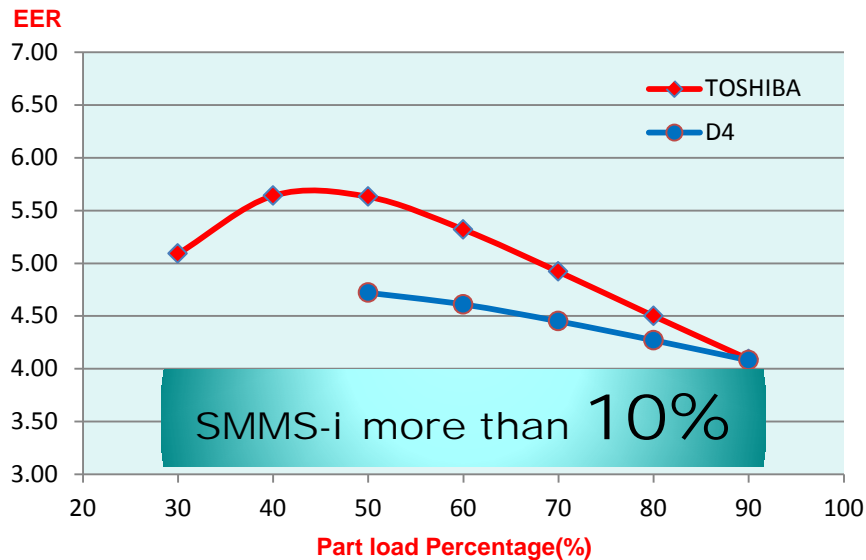
1. Energy Saving comparison

High efficiency Type

Graph of EER 30 HP @ 50-90% part load

Average part load EER **SMMS-i** = 4.89

Average part load EER, **D** = 4.43



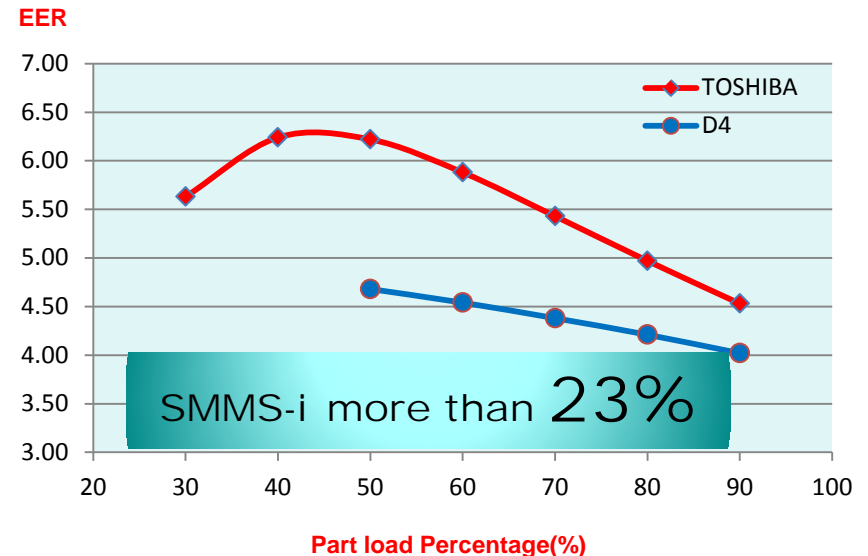
SMMS-i Max : 5.63@50% Part load
D4 Max ; 4.72@50% Part load

TC = 10HP+10HP+10HP
DK = 8HP+10HP+12HP

Graph of EER 32 HP @ 50-90% part load

Average part load EER **SMMS-i** = 5.41

Average part load EER, **D** = 4.37



SMMS-i Max : 6.22@50% Part load
D4 Max ; 4.68@50% Part load

TC = 8HP+8HP+8HP+8HP
DK = 8HP+12HP+12HP

SMMS-i compare with D version 4

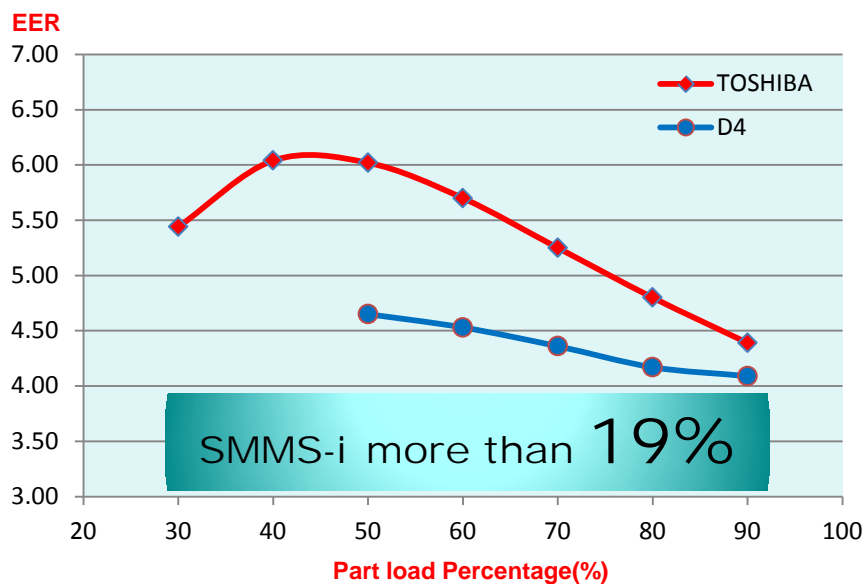
1. Energy Saving comparison

High efficiency Type

Graph of EER 34 HP @ 50-90% part load

Average part load EER **SMMS-i** = 5.23

Average part load EER, **D** = 4.36



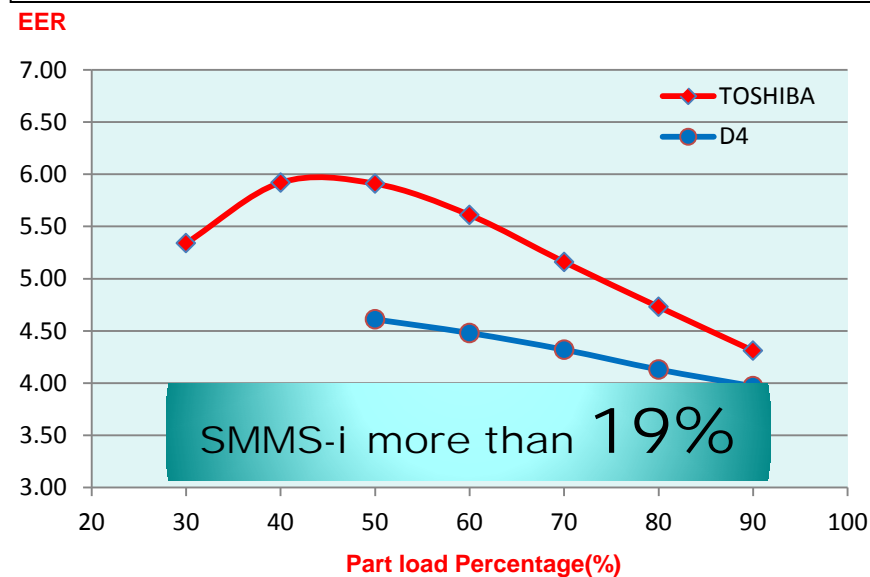
SMMS-i Max : 6.02 @ 50% Part load
D4 Max ; 4.65 @ 50% Part load

TC = 10HP+8HP+8HP+8HP
DK = 8HP+12HP+14HP

Graph of EER 36 HP @ 50-90% part load

Average part load EER **SMMS-i** = 5.14

Average part load EER, **D** = 4.30



SMMS-i Max : 5.91 @ 50% Part load
D4 Max ; 4.61 @ 50% Part load

TC = 10HP+10HP+8HP+8HP
DK = 8HP+14HP+14HP

SMMS-i compare with D version 4

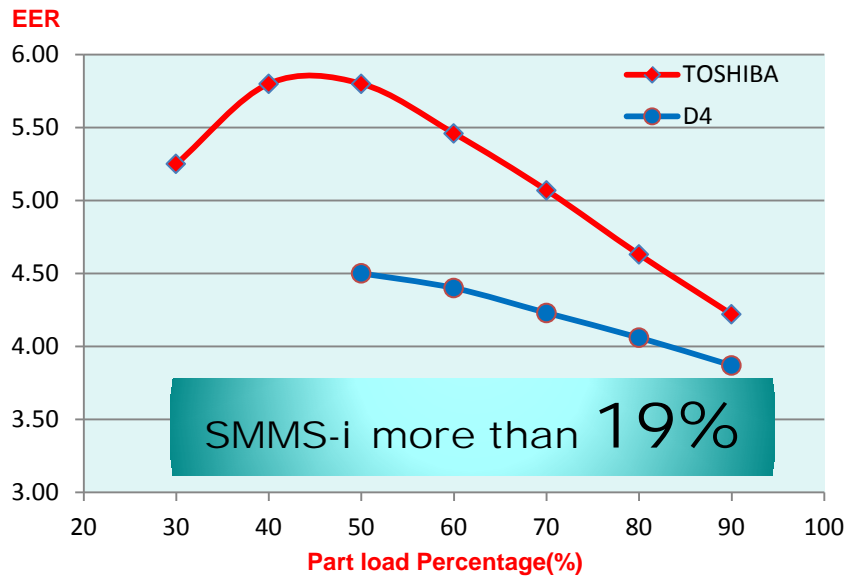
1. Energy Saving comparison

High efficiency Type

Graph of EER 38 HP @ 50-90% part load

Average part load EER **SMMS-i** = 5.04

Average part load EER, **D** = 4.21



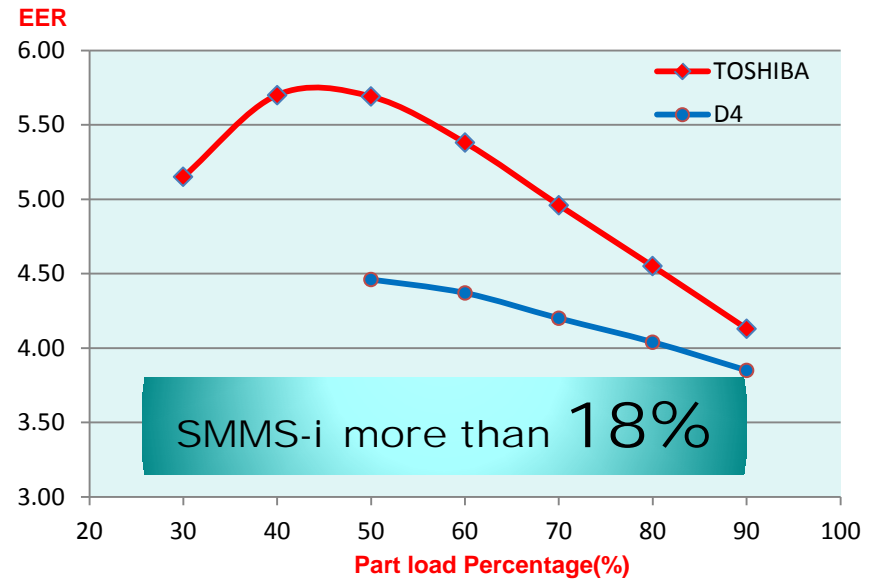
SMMS-i Max : 5.80@50% Part load
D4 Max ; 4.50@50% Part load

TC = HP+HP+HP
DK = HP+HP+HP

Graph of EER 40 HP @ 50-90% part load

Average part load EER **SMMS-i** = 4.94

Average part load EER, **D** = 4.18



SMMS-i Max : 5.69@50% Part load
D4 Max ; 4.46@50% Part load

TC = 10HP+10HP+10HP+10HP
DK = 12HP+14HP+14HP

SMMS-i compare with D version 4

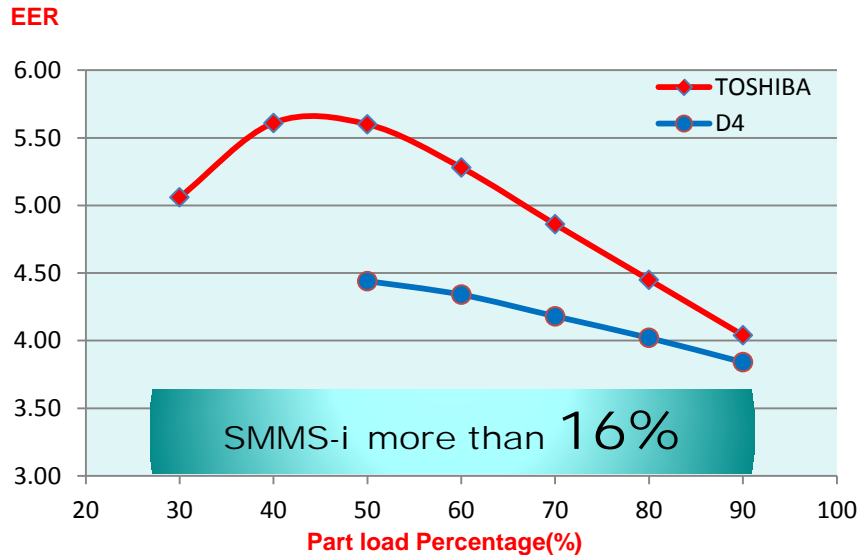
1. Energy Saving comparison

High efficiency Type

Graph of EER 42 HP @ 50-90% part load

Average part load EER **SMMS-i** = 4.85

Average part load EER, **D** = 4.16



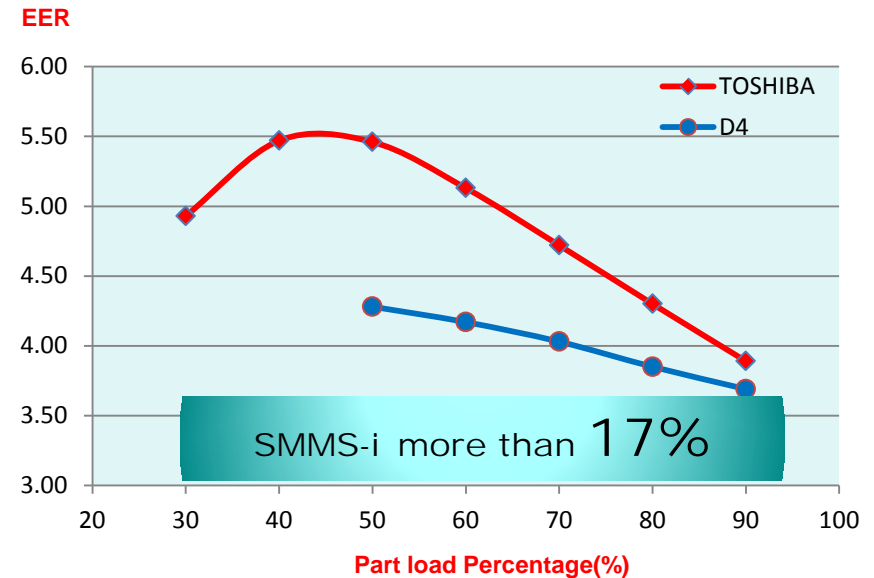
SMMS-i Max : 5.60@50% Part load
D4 Max ; 4.44@50% Part load

TC = 12HP+10HP+10HP+10HP
DK = 14HP+14HP+14HP

Graph of EER 44 HP @ 50-90% part load

Average part load EER **SMMS-i** = 4.79

Average part load EER, **D** = 4.09



SMMS-i Max : 5.46@50% Part load
D4 Max ; 4.28@50% Part load

TC = 12HP+12HP+10HP+10HP
DK = 12HP+12HP+20HP

SMMS-i compare with D version 4

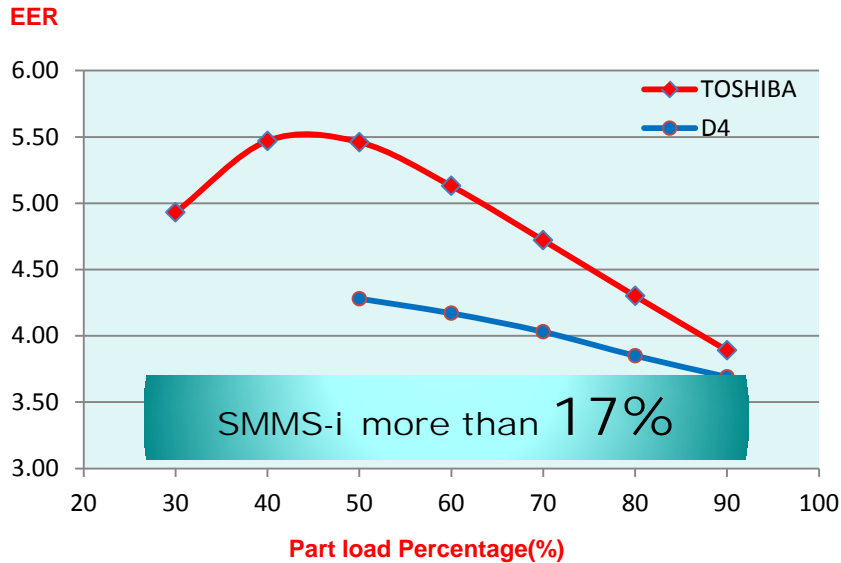
1. Energy Saving comparison

High efficiency Type

Graph of EER 46 HP @ 50-90% part load

Average part load EER **SMMS-i** = 4.70

Average part load EER, **D** = 4.00



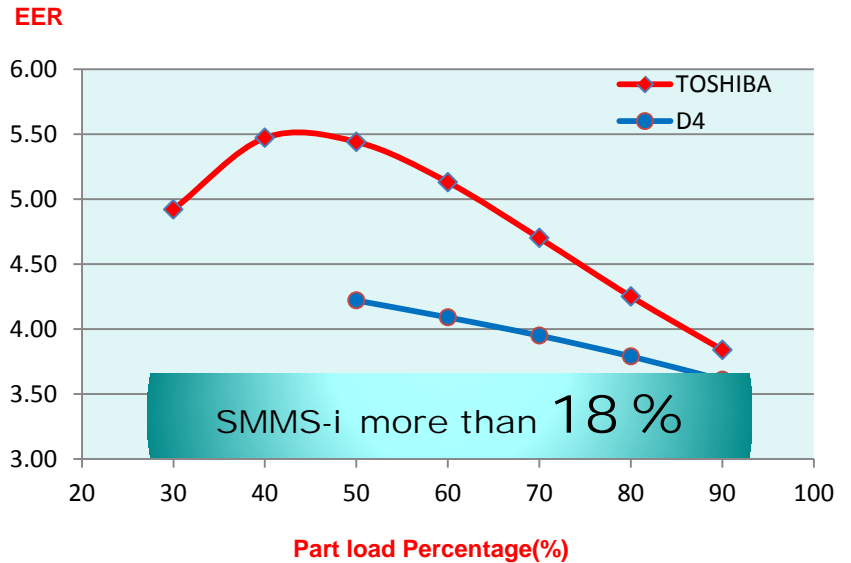
SMMS-i Max : 5.46@50% Part load
D4 Max ; 4.28@50% Part load

TC = 12HP+12HP+12HP+10HP
DK = 14HP+16HP+16HP

Graph of EER 48 HP @ 50-90% part load

Average part load EER **SMMS-i** = 4.67

Average part load EER, **D** = 3.93



SMMS-i Max : 5.44@50% Part load
D4 Max ; 4.22@50% Part load

TC = 12HP+12HP+12HP+12HP
DK = 16HP+16HP+16HP