

DAIKIN-McQuay AWS *the "Global Chiller"*

SCOPE

- CORPORATE PROFILE
- TECHNICAL INFO OF AWS
- CHILLER CONFIGURATION TO MEET GREEN MARK
- JOB REFERENCES

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Largest AC Manufacturer and No 1 in the world!



Daikin Industries HQ in Japan

Net sales: US$15.23 Billion

Number of employees: 44,110 (consolidated, Mar 2012)

Global Production Facilities

- Europe,China,Asia,Oceania,USA and Japan

Daikin is the ONLY company that manufacture Air Conditioners, Compressors and Chemicals





Air Conditioners

Chemicals

Compressors

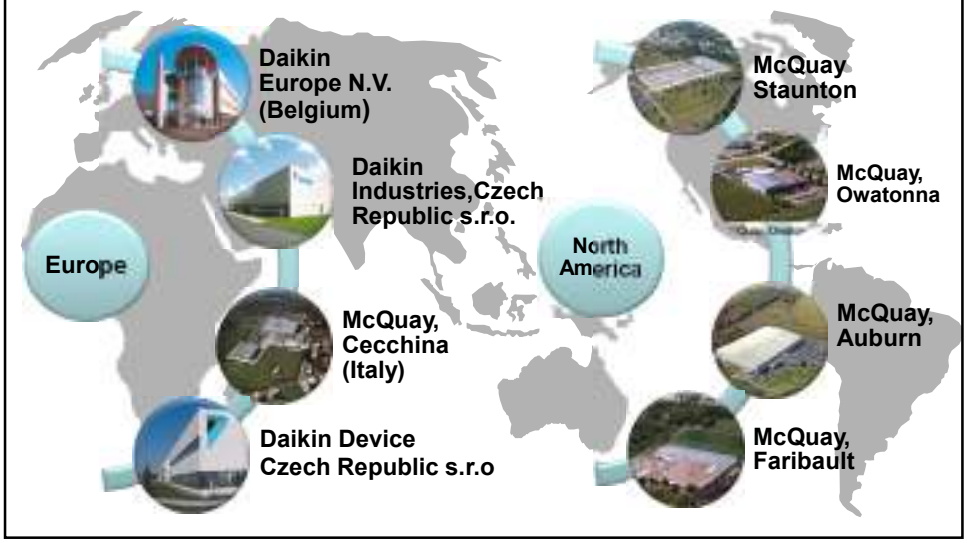
O.Y.L. Industries Bhd. Become Member of Daikin Group



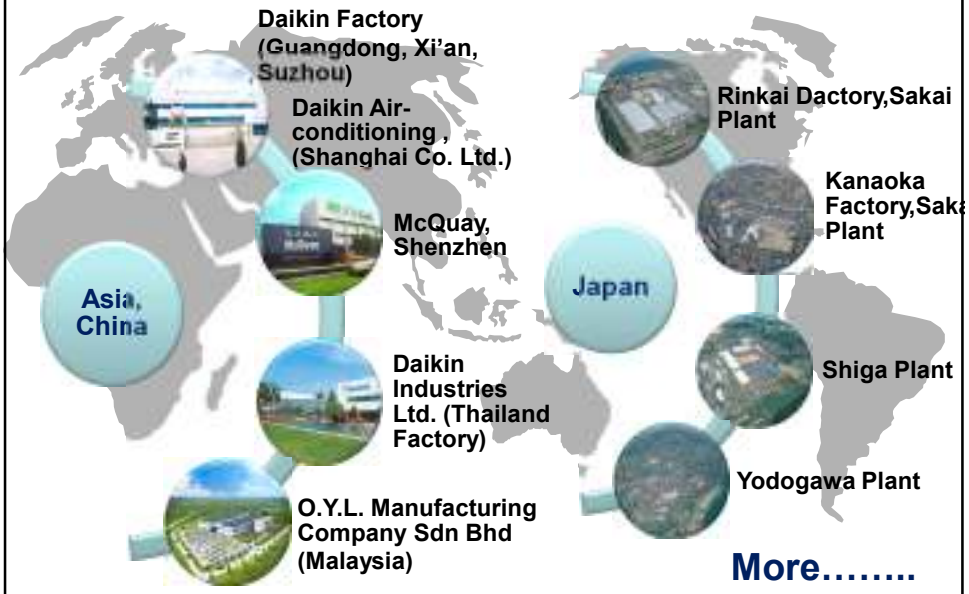


- 100% Acquired by Daikin Industries, Ltd on 18 May 2006
- Offer the Widest & Highest quality product range in the industry
- McQuay factories, sales & service center has worldwide presence
- McQuay has more than 100 years history in HVAC business

Global Production Facilities



Global Production Facilities



Quality Standard

Eurovent Standard

CE Mark

QUALITY SYSTEM

Saudi Arabian Standards

AS : Australia Standard

VDE 0700 Part1/10.95 & Part 500 / 06.98

Turkish Standard EN60335-2-40

ISO 9001: 2000 by JQA

TIS 1155-2536

C Tick Mark EMC Mark for New Zealand

Argentina Standard IEC 60335 -2-40 :1995

ETL

ISO 9001:2000/CNS12681 by BSMI

JRAIA Accredit Calories Meter

China Compulsory mark

Environment Sustainability



Australia
(Energy Efficiency)



India
(Energy Efficiency)



Green Label



The PM's Industry Awards 2004



5 Stars
(Energy Efficiency)



Energy Label
(Singapore)



ISO14001 by JQA

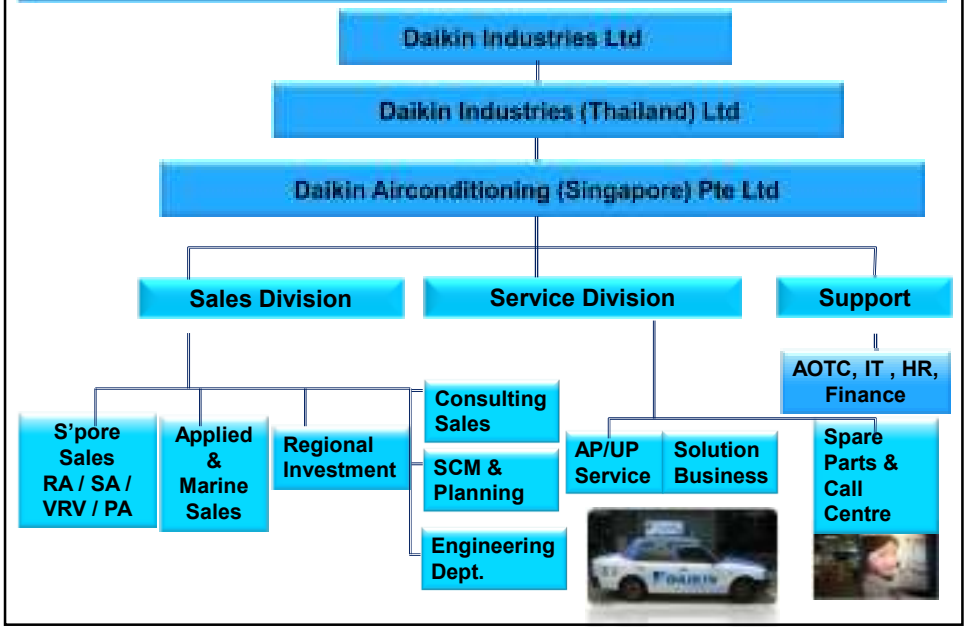




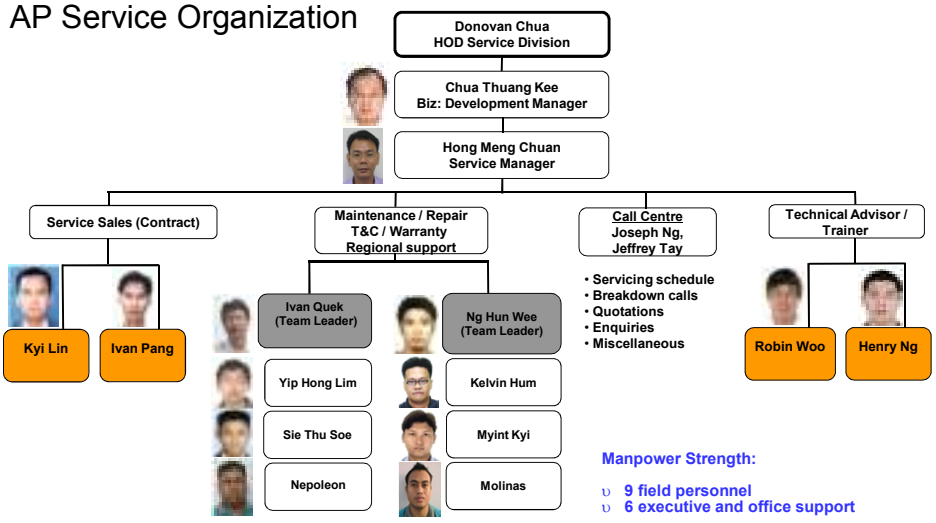
Healthy Workplace

Continue to develop high efficient , good qualities, green & innovative products

Daikin Organization



AP Service Organization



After-Sales Support

- Support our sales network to service the needs of our customers
- Dedicated teams to provide responsive & efficient support
- More than 150 technical staff :
  - ➢ *Call Centre, Technical & Engineering Support Teams & On Site Trade Staff*





Spare Parts Support

DSP warehouse



DAP warehouse



Inventory Status

	DSP	DAP	Overall Total
Total Items	4786	15396	20182
Total Quantity	46308	6005558	6051866
Total Value	S$ 3M	S$ 4M	S$ 7M






Chiller Compressors & Heat Exchangers at DAP warehouse

DAIKIN McQuay



10 Ang Mo Kio Industrial Park 2 Singapore 569501

DSP supports the industry by :

- Upgrade technician skills
- Level-up training









TECHNICAL INFO OF AWS

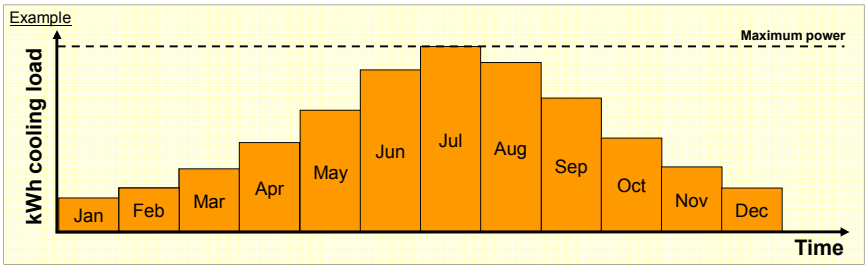
❶ Range overview

Product range	Air-cooled chiller with inverter single screw compressors
Refrigerant	R-134a
Series name	AWS Inverter
Cooling capacity	From 635 Kw (180RT) up to 1.800 kW (511RT) (nominal conditions)
Circuits	2 and 3 truly independent circuits (2 and 3 compressors)
Versions	High efficiency version combinable with 3 sound levels: ST: standard sound (670 ~ 1.800 kW) LN: low sound (670 ~ 1.800 kW) XN: extra low sound (635 ~ 1.710 kW)
Energy efficiency	EER from 2,4 up to 3,1 ESEER from 4,7 up to 5,8



❶ Background

Liquid refrigerators, more commonly called chillers, are usually used at their maximum power for only a limited period of time in a year.



That is why performance and efficiency in partial load conditions are surely a much more representative parameter for the evaluation of unit energy consumption per year.

A number of seasonal efficiency indexes were introduced to make the comparison of annual energy consumption of different units easier.

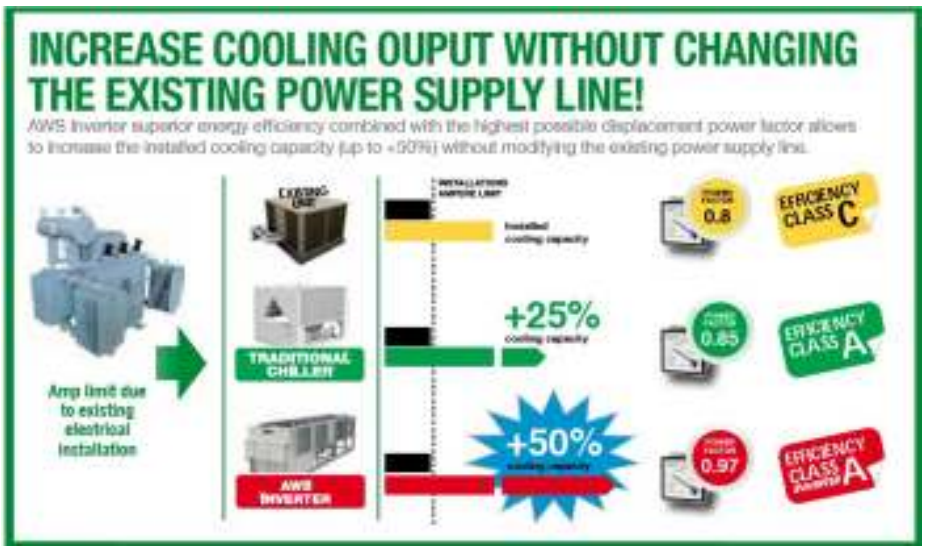
Among these indexes, the most known in Europe is the ESEER – **Seasonal energy efficiency ratio**.

Source: "Seasonal energy efficiency (ESEER) of different installation solutions of chillers using screw compressors for R134a"; University of Studies of Padua, p. 1-2

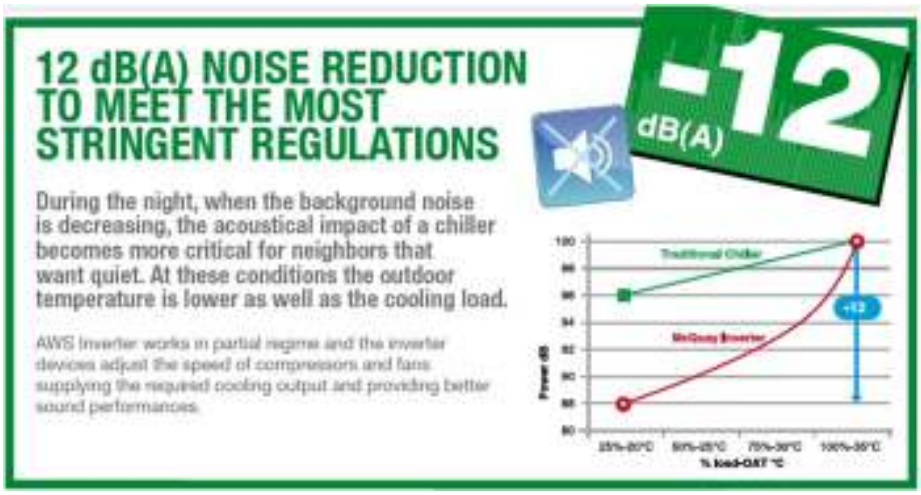
MIN INRUSH CURRENT



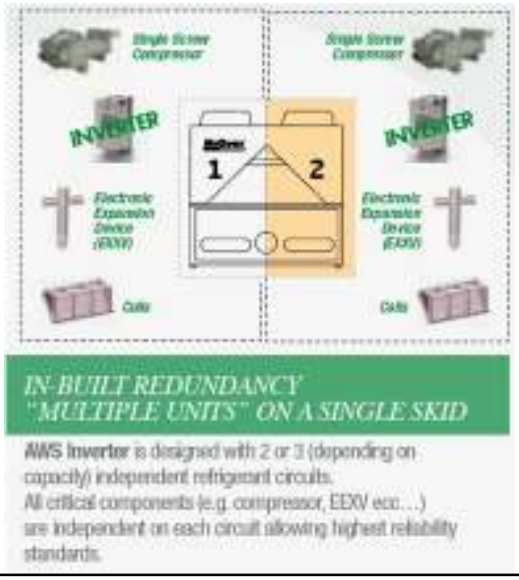
HIGH POWER FACTOR



LOW NOISE LEVEL



IN-BUILT REDUNDANCY



COMPACT FOOTPRINT



EASY COMMUNICATION



❶ Options

A) Standard factory mounted

OPTION DESCRIPTION	CODE	AVAILABILITY
Double setpoint	10	STD
Compressor thermal relays	11	STD
Phase monitor	13	STD
Evaporator victaulic kit	20	STD
20 mm evaporator insulation	29	STD
Evaporator electric heater	57	STD
Electronic expansion device	60	STD
Discharge line shut off valve	61	STD
Ambient temperature sensor and set-point reset	67	STD
Hour run meter	68	STD
General fault contactor	69	STD
Set-point reset, demand limit and alarm	90	STD
Fan circuit breakers	96	STD
Main switch interlock	97	STD
Emergency stop	98	STD

❶ Options

B) Options on request

OPTION DESCRIPTION	CODE	AVAILABILITY
Total heat recovery	01	Option
Partial heat recovery	03	Option
Brine version	08	Option
Under / overvoltage control	15	Option
Ampere volt meter	16	Option
Current limit - display	19	Option
Evaporator flange kit	21	Option
Fan silent mode	34	Option
Speedtrol (fan speed control device)	42	Option
Condenser coil guards	43	Option
Evaporator area guards	44	Option
Cu-cu condenser coil	45	Option
Cu-cu sn condenser coil	46	Option
Alucoat fins coil	49	Option
Evaporator flow switch	58	Option

OPTION DESCRIPTION	CODE	AVAILABILITY
Suction line shut off valve	62	Option
High pressure side manometers	63	Option
Container kit	71	Option
Rubber anti vibration mount	75	Option
Spring anti vibration mount	77	Option
One centrifugal pump	78	Option
Two centrifugal pumps	80	Option
Double pressure relief valve with diverter	91	Option
Compressor circuit breakers	95	Option
Fans speed regulation	99	Option
Refrigerant recovery tank	100	Option
Evaporator right water connection	101	Option
Ground fault relay	102	Option
Rapid restart NEW	(1)	Option

Note: option code for 'Rapid restart' to be confirmed

❶ Options

B) Options on request

What about option 'Rapid restart'…

'It provides peace of mind for facilities that cannot afford to lose cooling'

A short-term power loss can happen during power interruptions or utility switching operations, and could turn into a critical loss of cooling in facilities such as data centers, health care buildings or manufacturing processes.

The 'Rapid restart' option allows the unit to start as fast as 30 seconds after power is restored. With the chiller restarting so quickly, the return to full cooling capacity can happen quickly as well.

'Rapid restart' can solve your biggest power loss concerns:

- Faster return to necessary cooling levels
- Keep heat-sensitive servers on-line
- Maintain patient comfort in critical care areas
- Eliminate downtime in manufacturing processes



Data Centers



Health Care Facilities



Manufacturing Processes

❷ Accessories

MODEL NAME	ACCESSORY DESCRIPTION
129150137-S	McQuay Serial Sequencing Panel
129150136-NEW	McQuay Digital Sequencing Panel
10000109547	ModBus RTU communication module
10000109636	LON communication module
10000109637	BACnet/MSTP communication module
10000109635	BACnet/IP communication module
10000109634	Local/remote Display Human-Machine Interface (HMI)

The MicroTech III controller features:

- Unit controller fully programmed and engineered by McQuay on Siemens hardware
- P.I.D. logic (proportional, integrative, derivative)
- Easy visual interface with 4 rows display and 3 keypads
- Push and roll navigating wheel
- Extendable with additional I/O modules



MicroTech III

CHILLER CONFIGURATION TO MEET GREEN MARK

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GM CRITERIA

(ii) For Buildings using Air Cooled Chilled-Water Plant or Unitary Air-Conditioners:

Green Mark Rating	Peak Building Cooling Load (RT)	
	< 500	≥ 500
	Minimum Design System Efficiency[1] DSE (kW/RT)	
Certified	0.90	0.80
Gold	0.90	Not applicable[2]
Gold[Plus]	0.85	
Platinum	0.78	

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ARI CONDITIONS (REQ CAP 150RT)

Part load [%]	Te IN [C°]	Te OUT [°C]	Ambient [°C]	Cc [kW]	kw/RT
100	12.2	6.7	33	658	0.87
90	11.65	6.7	33	592	0.80
80	11.1	6.7	33	527	0.76
70	10.55	6.7	33	461	0.74
60	10	6.7	33	395	0.72
50	9.45	6.7	33	329	0.72
40	8.9	6.7	33	263	0.73
30	8.35	6.7	33	197	0.69
21	7.8	6.7	33	135	0.70
20	7.25	6.7	33	134	0.70

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PERFORMANCE @ 7.5/13.5, 33 TO MEET **GM PLATINUM (<500RT)**

Part load [%]	Te IN [C°]	Te OUT [°C]	Ambient [°C]	Cc [kW]	kw/RT
100	13.5	7.5	33	658	0.83
90	13.5	7.5	33	592	0.76
80	13.5	7.5	33	527	***0.73***
70	13.5	7.5	33	461	***0.72***
60	13.5	7.5	33	395	***0.70***
50	12.5	7.5	33	329	***0.71***
40	11.5	7.5	33	263	***0.71***
30	10.5	7.5	33	197	***0.67***
22	9.7	7.5	33	146	***0.67***
22	9.68	7.5	33	144	***0.68***

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PERFORMANCE @ 7/12, 33 TO MEET **GM GOLD+ (<500RT)**

REQUIRED CAPACITY (RT)	MODEL	CHILLER CAPACITY (RT)	LOAD FACTOR	KW/RT @ REQUIRED CAP	KW/RT @ 100%	KW/RT @ 50%	KW/RT @ 30%
150	AWS230-XE-LN	187	80%	0.783	0.837	0.829	0.748
	AWS230-XE-XN	187		0.764	0.864	0.716	0.684
200	AWS280-XE-LN	249	80%	0.797	0.892	0.799	0.748
	AWS280-XE-XN	249		0.792	0.963	0.715	0.699

ARI CONDITIONS (REQ CAP 225RT)

Part load [%]	Te IN [C°]	Te OUT [°C]	Ambient [°C]	Cc [kW]	kw/RT
100	12.2	6.7	33	878	0.90
90	11.65	6.7	33	790	0.84
80	11.1	6.7	33	702	0.81
70	10.55	6.7	33	615	0.79
60	10	6.7	33	527	0.79
50	9.45	6.7	33	439	0.80
40	8.9	6.7	33	351	0.76
30	8.35	6.7	33	263	0.75
20	7.8	6.7	33	176	0.80
19	7.25	6.7	33	165	0.82

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ARI CONDITIONS (REQ CAP 200RT)

Part load [%]	Te IN [C°]	Te OUT [°C]	Ambient [°C]	Cc [kW]	kw/RT
100	12.2	6.7	33	878	0.97
90	11.65	6.7	33	790	0.86
80	11.1	6.7	33	702	0.80
70	10.55	6.7	33	615	0.77
60	10	6.7	33	527	0.74
50	9.45	6.7	33	439	0.72
40	8.9	6.7	33	351	0.77
30	8.35	6.7	33	263	0.70
20	7.8	6.7	33	176	0.68
18	7.25	6.7	33	162	0.70

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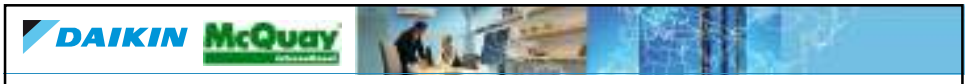


PERFORMANCE @ 7.5/13.5, 33 TO MEET **GM PLATINUM (<500RT)**

REQUIRED CAPACITY (RT)	MODEL	CHILLER CAPACITY (RT)	LOAD FACTOR	KW/RT @ REQUIRED CAP	KW/RT @ 50%	KW/RT @ 30%
150	AWS230-XE-XN	187	80%	0.727	0.712	0.671

PERFORMANCE @ 8/15, 33 TO MEET **GM PLATINUM (<500RT)**

REQUIRED CAPACITY (RT)	MODEL	CHILLER CAPACITY (RT)	LOAD FACTOR	KW/RT @ REQUIRED CAP	KW/RT @ 50%	KW/RT @ 30%
200	AWS280-XE-XN	249	80%	0.733	0.702	0.666



EXAMPLE: PLANTROOM EFFICIENCY OF GM CERTIFIED 0.9KW/RT

CAPACITY RT	KW/RT	Estimated CHWP kw/RT (with affinity law)	Plantroom eff (with affinity law
224	0.84	0.041@90%	0.881
200	0.81	0.032@80%	0.842
175	0.79	0.0245@70%	0.814
150	0.79	0.018@60%	0.808
125	0.80	0.036@60% (limited by chiller min flow)	0.804
100	0.76	0.045@60% (limited by chiller min flow	0.805
75	0.75	0.06@60% (limited by chiller min flow	0.810

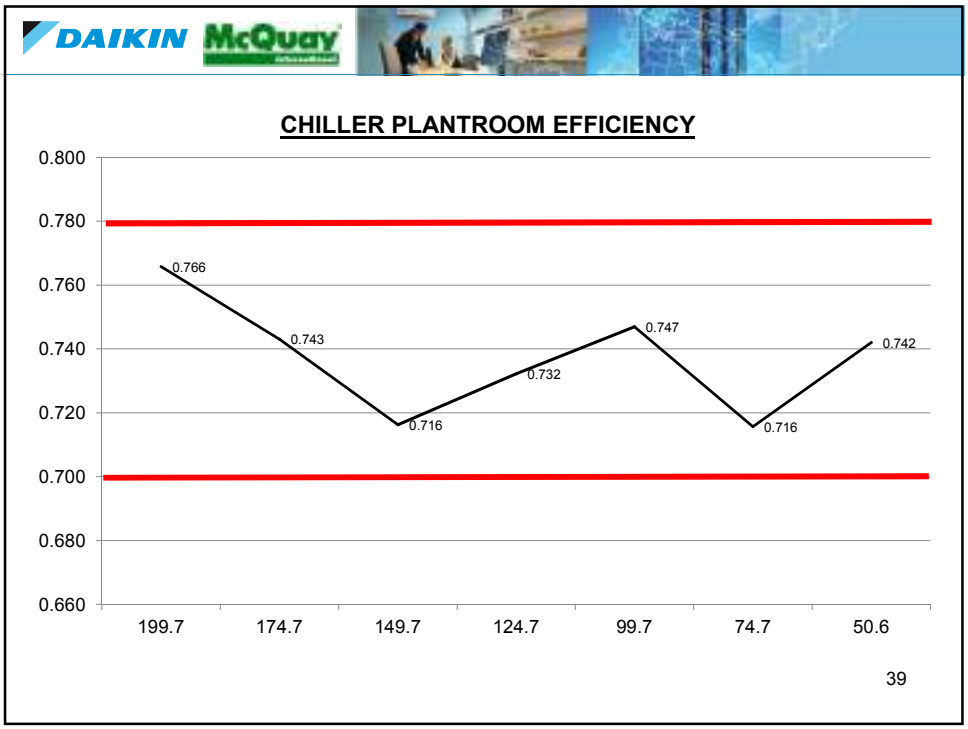
PERFORMANCE @ 8/15, 33 TO MEET **GM PLATINUM (<500RT)**

Part load [%]	Te IN [C°]	Te OUT [°C]	Ambient [°C]	Cc [kW]	kw/RT
100	15	8	33	878	0.87
90	15	8	33	790	0.79
80	15	8	33	703	***0.73***
70	15	8	33	615	***0.72***
60	15	8	33	527	***0.70***
50	13.8	8	33	439	***0.70***
40	12.7	8	33	351	***0.71***
30	11.5	8	33	263	***0.67***
21	10.4	8	33	181	***0.66***
20	10.4	8	33	178	***0.67***

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EXAMPLE: PLANTROOM EFFICIENCY OF GM PLATINUM 0.78KW/RT

CAPACITY RT	KW/RT	Estimated CHWP kw/RT (with affinity law)	Plantroom eff (with affinity law
200	0.733	0.032@80%	0.765
175	0.718	0.0245@70%	0.742
150	0.698	0.018@60%	0.716
125	0.702	0.028@60% (limited by chiller min flow)	0.73
100	0.709	0.036@60% (limited by chiller min flow)	0.745
75	0.668	0.048@60% (limited by chiller min flow	0.716
51	0.672	0.07@60% (limited by chiller min flow	0.742


CHILLER PLANTROOM EFFICIENCY
0.800
0.780
0.760
0.740
0.720
0.700
0.680
0.660
0.766
0.743
0.716
0.732
0.747
0.716
0.742
199.7
174.7
149.7
124.7
99.7
74.7
50.6
39


DIMENSIONS
• AWS 250RT
• 8525L * 2285W * 2540H
• OPERATING WEIGHT: 8,390KG
• AWS 187RT
• 7625L * 2285W * 2540H
• OPERATING WEIGHT: 7,340KG
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Maintenance Contract Package

Package	Basic	Semi-Comprehensive	Comprehensive
1) Monthly / Bi-Monthly	√	√ (Monthly only)	√ (Monthly only)
2) Labour, Parts & Consumables	X	√ (Selected Parts)	√
3) Breakdown Inspection	√ (During office hr only)	√ (During & after office hr)	√ (During & after office hr)
4) 2 hrs Response	√	√	√
5) Compressor Overhaul	Optional	Optional	Optional
6) Annual Shut Down	Optional	√	√
a) Eddy Current Test	Optional	Optional	Optional
b) Vibration Test	Optional	√	√
c) Thermal Scan	Optional	√	√
d) Oil Analysis	Optional	√	√



JOB REFERENCES

Project Name:
Hougang 1@Hougang St 91
Location: Singapore
Application: Shopping Centre
Chiller: AWS 250.2XE ST x 3 unit
Tonnage: 750 RT
Completion: May 2012





Project Name:
TCX Level 5 Hall 2 Tata
Location: Singapore
Application: Data Centre
Chiller: AWS 445.3 XE ST x 1 unit
Tonnage: 445 RT
Completion: Jan 2013

DAIKIN McQuay

OVERSEAS JOB REFERENCES

- Germany, process cooling, Evonik, 1*201RT
- Spain, data centre, Mapfre, 6*312RT, 6*397RT
- UK, data centre, JP Morgan, 4*405RT
- UK, data centre, SPIE Matthew Hall, 6*280RT
- UK, airport, Edinburgh airport, 2*109RT

OVER 25 UNITS INSTALLED

DAIKIN McQuay

AWS is a revolutionary unit….

NEW

Fans

New high efficiency condenser fans
(technology by Daikin-McQuay)







Compressor NEW

New very high efficiency (full and part load) McQuay Single Screw compressor.
(technology by Daikin-McQuay)



Condenser NEW

New condenser coil design
(new V shape design)

Evaporator NEW

New high efficiency shell&tube direct-expansion single pass evaporator



Expansion Valve

Electronic Expansion Valve as standard



Controller NEW

New Microtech III controller (SIEMENS)

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DAIKIN McQuay International



THANK YOU