PROmetheus

Magnetic Bearing Variable Speed Centrifugal Chiller

DCLC-M 50/60Hz

Cooling Capacity: 264~3517kW (75~1000RT)

Dunham-Bush Air Conditioning

R134a R513A R1234ze AHRI CERTIFIED ASHRAE 90.1 COMPLIANT

MILESTONE

Dunham-Bush Profile

Dunham-Bush, one of the world's top commercial air conditioning manufacturers, has long been committed to offering creative solutions for the customer's requirements over its 120 years history in the HVAC/R. Dunham-Bush offers a complete range of HVAC/R products such as large chillers, unitary, airside system and thermal energy storages for residences, commercial buildings and industrial facilities. Dunham-Bush is striving to be the leader in the commercialization of green technologies. Today, by utilizing our global network of sales and service offices, Dunham-Bush is offering our value-added products and solutions to all corners of the world.

1894 Built in USA as a professional manufacturer of HVAC/R equipments.

1904 Developed the first air compressor system.

1924 Developed the first reciprocating compressor.

1930 Manufactured the air conditioner.

1935

CHINA

MALAYSIA

Today, and Beyond — Innovations... never ends

2019 — Dunham-Bush built factory in Miami, USA

2014 — Dunham-Bush launched oil free magnetic bearing chiller.

2013 — New compressor R&D center was founded in UK to engage in high tier compressor technology.

2008 — Dunham-Bush launched its new logo to match its new global brand & business strategy.

2007 — Dunham-Bush launched high efficiency dual stage centrifugal chiller.

1998 — Dunham-Bush built factory in Kajang, Malaysia. Later built Global Headquarters there in 2000.

1996 — Hartford Compressors Incorporated was built in USA.

1995 — Dunham-Bush built factory in Yantai, China.

1967 — Patented the technology to use a screw compressor for refrigeration / cooling.

1948 — Dunham-Bush built factory in Connecticut, USA.

Dunham-Bush built factory in Havant, United Kingdom.

first air cooled

DUNHAM-BUSH MALAYSIA

Dunham-Bush Malaysia; founded in 1987, adhered to the innovation system of focusing on customers' demands to drive global research & design, and superior quality manufacturing. Nowadays Dunham-Bush Malaysia are creating innovative cooling solutions appropriate to the individual requirements of commercial building, schools, hospitals, airports, factories and residences. No matter where you are, what we deliver is the same: high performing, highly engineered cooling solutions developed to take on the challenges of the 21st century.

PROmetheus

Magnetic Bearing Variable Speed Centrifugal Chiller

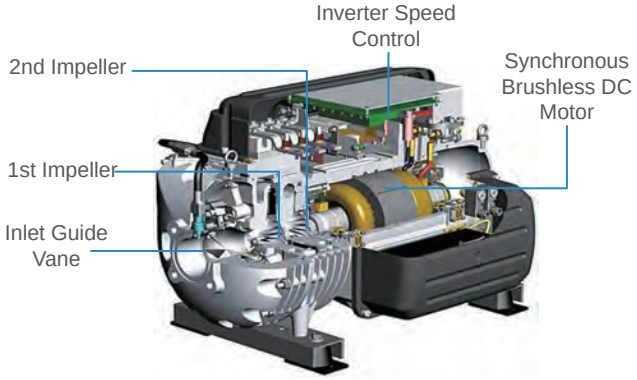
DCLC-M

Dunham-Bush PROmetheus DCLC-M Series Introduction

Dunham-bush DCLC-M Centrifugal chillers with State-Of-The-Art magnetic bearing oil-free compressor offers owner packaged chiller with supreme efficiency, reliability and sustainability.

Features and Benefits

DCLC-M Centrifugal Chillers are designed to exceed ASHRAE Standard 90.1 requirements. The cutting edge magnetic bearing oil-free compressor, superior evaporator and condenser, Electronic Expansion Valve (EEV) and the intelligent chiller controller ensures the DCLC-M performance and stability when operates at both full load and part load conditions.



Nomenclature

DCLC 300 M D D A 333 E Y

- Dunham-Bush Centrifugal Chiller
- Model
- Magnetic Bearing Oil Free Compressor
- Compressor Model
- Compressor Quantity
- Refrigerant Type
  Blank : R134a
  Y : R513A
  Z : R1234ze
- Economizer
  Blank : Non Economizer
  E : With Economizer
- Vessels Model
- Evaporator Type
  H, N : Flooded
  A : Hybrid Falling Film
  Note : Hybrid Falling Film Evaporator available in 2 & 3 compressors design only

FEATURES

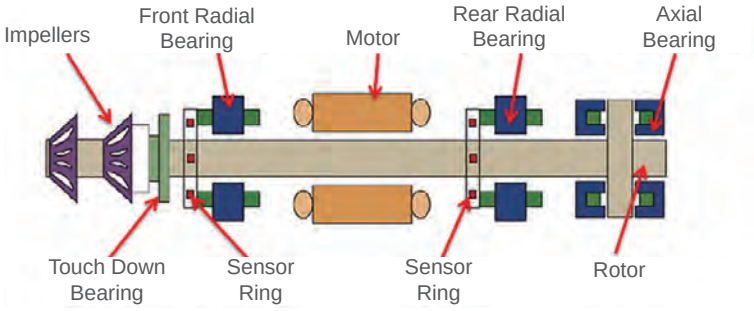


Advanced Technology

Magnetic Bearing

Conventional Bearing with Wear and Tear

Magnetic Bearing, Non-Touching Operation



The axially and radially located magnetic bearings create electromagnetic field which levitates the shaft during rotation and float on the magnetic cushion. This has prevented contact between compressor shaft and other metallic surfaces, and thus, the oil lubrication system is no longer needed. The proximity sensors at bearings sense rotor movements and adjustment are made accordingly in the rate of 6,000,000 times per minute. This ensures precision of rotor position in the magnetic field.

Power Failure Protection

In the case of power failure, the capacitors (4 x 8000μF) provide backup power to bearings to keep the rotor levitated. The rotor will continue to rotate with its rotational inertia, and this will turn the motor into a generator which will then power itself down to a stop.

Inverter Speed Control

The Magnetic Bearing compressor is furnished with built-in inverter speed control and soft-starter, with below advantages:

- No surge current
- Wide operating range, can work at 10% minimum load
- High efficiency throughout the working range
- Auto-tuning on rotation speed to eliminate compressor surging

Direct Drive Rotor & Impeller

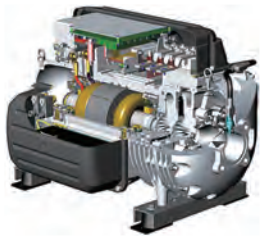
The impellers are keyed directly to the shaft and this is the only major moving compressor component. No transmission device needed and thus, eliminate the transmission losses and the compressor size can be much compact.

As no mechanical contact during the rotation, the unit noise level is greatly reduced.



FEATURES

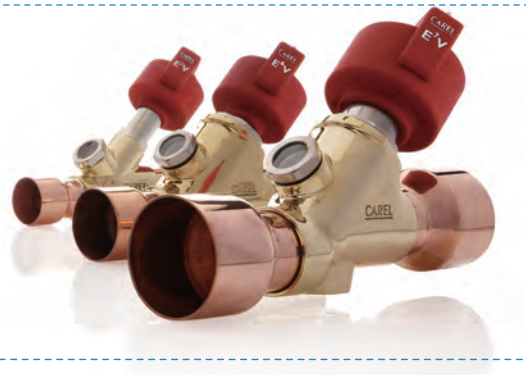
Dual-Stage Compression



DCLC-M compressors are with dual-stage compression design. Compressors with dual-stage compression technology can be operated at higher lift and wider operating range. With the built-in inverter speed control, DCLC-M can be operated stably and efficiently at a wider operating range.

Liquid Refrigerant Control

Electronic Expansion Valve (EEV), can precisely control the liquid refrigerant amount into the evaporator for optimum heat transfer and better capacity control.



Rapid Recovery

Conventional centrifugal chiller needs to ensure oil lubrication at right pressure and temperature before starting the compressor motor. Even with essential power supply to the oil lubrication system, it will easily take more than a minute to restart the compressor motor. Thanks to the oil-free technology, DCLC-M chillers can rapidly recover from a power failure with much shorter restart time. This is a great feature especially for data center and process cooling applications.

Energy Saving

- No Friction Loss – Compressor shaft has no physical contact with other mechanical components
- No Transmission Loss – With direct drive design at compressor shaft, conventional gear transmission is eliminated
- No Lubrication Oil – DCLC-M is Oil-Free. Heat exchanger's de-rating performance due to lubricating oil is prevented.
- High COP – DCLC-M full load COP is up to 6.54 [0.538kW/ton]; IPLV is up to 11.8 [0.298kW/ton], far more efficient than conventional centrifugal chillers.

Below table shows an example to compare annual energy consumed by a 300RT DCLC-M (DCLC-300MD) versus a conventional 300RT centrifugal chiller, with 3000 hours operating time annually.

Model	DCLC300MD	Conventional 300RT
Cooling Capacity (KW)	1055KW	1055KW
IPLV	11.8	6.52
Annual Electricity Consumption (KW.h)	182,482	279,278
Electricity Saving (KW.h)	96,796	

FEATURES



Easy Maintenance

- No Oil Lubrication System-
  Improve unit reliability. Free from lubrication oil related problems, such as low oil level, low oil pressure and etc.

- Direct Drive Impeller-
  Only one major moving part in the compressor, less components, less failure.

- Easy Maintenance-
  Without oil lubrication system, routine maintenance becomes very simple. The compressor is virtually maintenance free.

- No Overhauling-
  Periodic overhauling is not required for DCLC-M chillers.

Maintenance work	Standard Chiller R123	Standard Chiller R134a	PROmetheus DCLCM
Change the lubrication oil	Once a year	Each three year	Not required
Change oil filter core	Once a year	Once a year	Not required
Check oil pump pressure	Once a quarter	Once a quarter	Not required
Check oil quality	Once a week	Once a week	Not required
Check the pressure differential through oil filter	Once a month	Once a month	Not required
Compressor Vibration test	Once a year	Once a year	Not required
Oil pump insulation inspection	Each three year	Each three year	Not required
Oil heater inspection	Each three year	Each three year	Not required
Motor winding inspection	Once a year	Once a year	Not required
Contactor and overload set inspection	Once a year	Once a year	Not required
Refrigerant inspection	Once a week	Not required	Not required
Change refrigerant filter core	Once a quarter	Not required	Not required

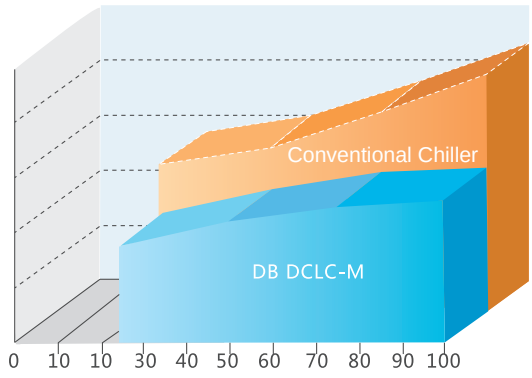


FEATURES

Environmental Protection

- Refrigerant type - Dunham Bush DCLCM chiller is operated with R134a refrigerant, an environmental friendly refrigerant with zero Ozone Depletion Potential (ODP) and no phase out date as per Montreal Protocol. Also compatible with HFO R513A and R1234ze refrigerants, a low GWP substance and zero ODP in promoting environmental sustainability and minimize the global warming effect.
- Refrigerant usage - Pioneering in flooded heat exchanger technology, Dunham Bush takes another step in optimizing the refrigerant usage by introducing a falling film evaporator in the design, that contains a balance of flooded and falling film technology. A special design on the distribution system and the tubes alignment to yield a uniform refrigerant flow for better heat transfer coefficient resulted a greater overall efficiency while maintain the reliable control.
- Low vibration - The rotating impeller and shaft is levitated at the magnetic field cushion, and have no physical contact with other components during the operation. Therefore, the unit structural vibration is virtually zero. With the permanent magnet DC brushless motor, the noise level is further reduced. Dunham-Bush DCLC-M centrifugal chillers will be best solution for installation at sound level sensitive area.

Measured in accordance with AHRI-575



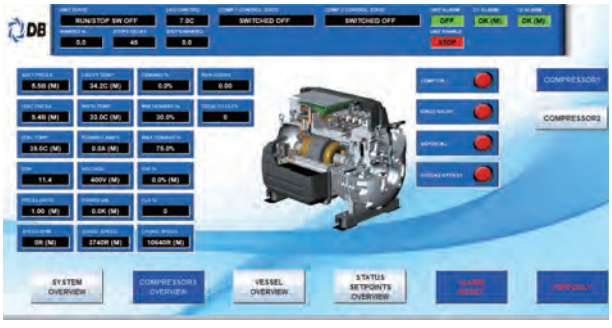
- Low noise - Compressor noise level as low as 73 dB(A). Chiller Plantroom does not required acoustic treatment.

- LEED points - Helps to earn points in Energy and Atmosphere category for LEED certification.

Intelligent Control System

- Low starting current thanks to inverter speed control and softstarter
- High level interface advanced controller
- 10 inch color touch screen panel
- Display unit operating parameters
- Programmable unit operating schedule
- Self diagnosis on alarm. Last 10 alarms are recorded
- Single power point connection
- BMS communication protocol - Modbus, BACnet, Profibus


Vision Controller

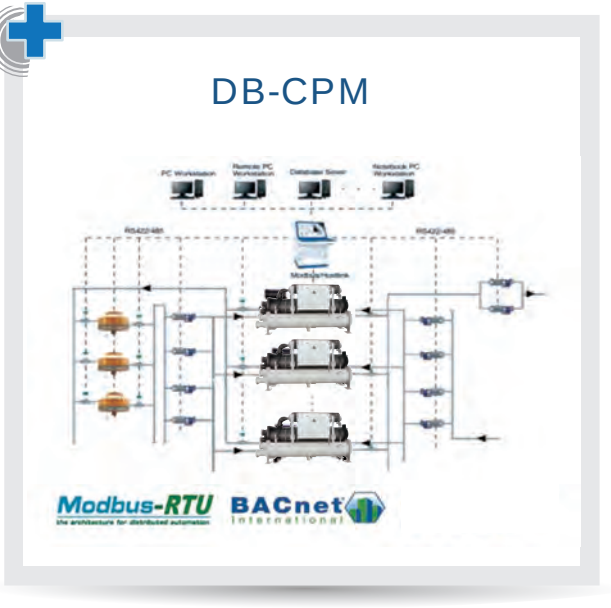

DB Director

FEATURES



BMS Connectivity, Chiller Plantroom Control

- Built-in ModBus RTU RS485 port for direct interfacing of Building Management System (BMS). Profibus RS485 communication protocol is available as option
- DB Chiller Plant Manager, DB-CPM, a trustworthy and headache-free solution for building owners and users on chiller plant control and automation system
- DB-CPM's advanced controllers supervise equipments in chiller plant such as chillers, pumps, cooling towers and variable frequency drives (VFD); and monitor field devices such as, flow meters, energy meters, digital power meters, sensors & transducers.
- NetVisorPRO – Monitoring software of DB-CPM system provides graphical animations on system operation, temperature and energy trend graphs, historical data and alarm history logs.
- Chiller plantroom control and automation by Dunham-Bush DB-CPM provides owners a chiller system with stable and optimized performance in its operation.



Standard & Optional Features

Item	Standard	Optional
Water Connection	Victaulic groove	Flanged; Marine Waterbox
Design Working Pressure (Vessel-Water Side)	1.0MPa [150psi]	2.1MPa [300psi]
Evaporator Insulation Thickness	25mm [1"]	50mm [2"]
Compressor Service Valve	–	Suction & Discharge
Spring Isolator	–	Neoprene Pad; Spring Isolator
Compressor Main Power Isolation	Main Incoming Isolator	Compressor Circuit Breaker
Main Incoming Options	–	Ground Fault Protection (GFI); Digital Power Meter (DPM); EMI Filter
Communication Protocol	Modbus RS485	BACnet MSTP; LONworks; ModBus TCPIP; BACnet TCPIP
Vessel Code Compliance	–	ASME
Compressor Extended Warranty	1 Year	2 Years; 5 Years

SPECIFICATIONS

DCLC-M Technical Specifications

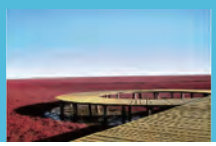
R134a / R513A

Model	Compressor Qty	Unit Dimensions			Unit Weight	
		Length	Width	Height	Operating	Shipping
		mm [inch]	mm [inch]	mm [inch]	kg [lbs]	kg [lbs]
DCLC80MAS	1	2570 [101]	1220 [48]	2010 [79]	1998 [4405]	1722 [3796]
DCLC120MCS	1	2570 [101]	1220 [48]	2010 [79]	2795 [6162]	2371 [5227]
DCLC150MDS	1	2570 [101]	1220 [48]	2010 [79]	2992 [6596]	2495 [5501]
DCLC200MFS	1	3940 [155]	1220 [48]	2010 [79]	3720 [8201]	3042 [6706]
DCLC240MCD	2	3840 [151]	1220 [48]	2010 [79]	4092 [9021]	3362 [7412]
DCLC300MDD	2	3890 [153]	1230 [48]	2070 [81]	5014 [11054]	4139 [9125]
DCLC400MFD	2	4210 [166]	1230 [48]	2070 [81]	6206 [13673]	4991 [11003]
DCLC450MDT	3	4390 [174]	1960 [77]	2200 [87]	8891 [19601]	7065 [15576]
DCLC600MFT	3	4390 [174]	1960 [77]	2200 [87]	8739 [19266]	6768 [14921]
DCLC800MFF	4	4950 [195]	2150 [85]	2180 [86]	11015 [24284]	8413 [18547]
DCLC900MGZ	5	6070 [239]	2210 [87]	2330 [92]	14193 [31290]	10825 [23865]
DCLC1000MFL	5	6070 [239]	2210 [87]	2330 [92]	14650 [32297]	11183 [24654]

R1234ze

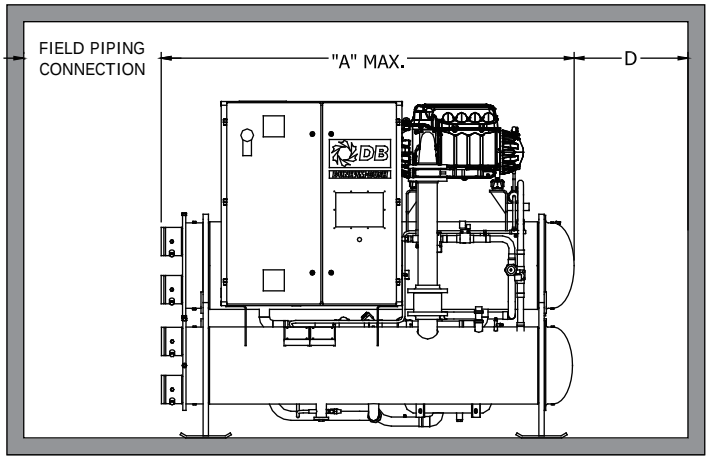
Model	Compressor Qty	Unit Dimensions			Unit Weight	
		Length	Width	Height	Operating	Shipping
		mm [inch]	mm [inch]	mm [inch]	kg [lbs]	kg [lbs]
DCLC95MPS	1	2570 [101]	1220 [48]	2010 [79]	1924 [4241]	1752 [3862]
DCLC120MQS	1	3940 [155]	1220 [48]	2010 [79]	3155 [6956]	2808 [6191]
DCLC150MRS	1	3940 [155]	1220 [48]	2010 [79]	3162 [6972]	2815 [6207]
DCLC190MPD	2	3840 [151]	1220 [48]	2010 [79]	3480 [7672]	3133 [6907]
DCLC240MQD	2	3890 [153]	1230 [48]	2070 [81]	4475 [9865]	4013 [8847]
DCLC285MPT	3	4870 [192]	1900 [75]	2070 [81]	6575 [14496]	5784 [12752]
DCLC300MRD	2	3890 [153]	1230 [48]	2070 [81]	4488 [9895]	4026 [8877]
DCLC360MQT	3	4930 [194]	1960 [77]	2200 [87]	7239 [15960]	6297 [13883]
DCLC450MRT	3	4930 [194]	1960 [77]	2200 [87]	7260 [16005]	6318 [13928]
DCLC480MQF	4	4950 [195]	2150 [85]	2180 [86]	8508 [18757]	7325 [16149]
DCLC600MRF	4	4950 [195]	2150 [85]	2180 [86]	8972 [19780]	7642 [16847]

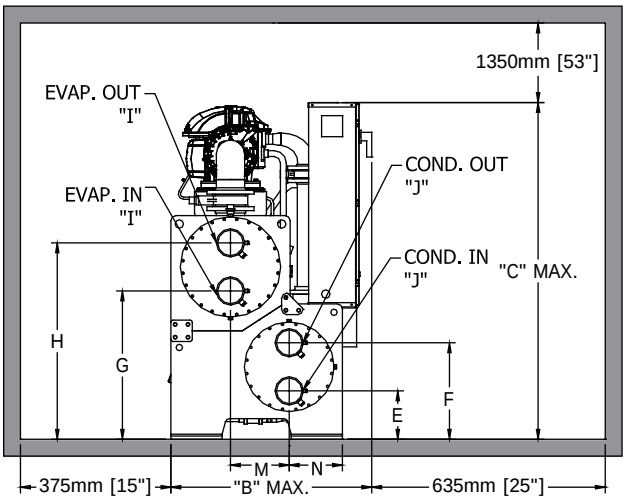
DIMENSIONS


Unit Dimensions

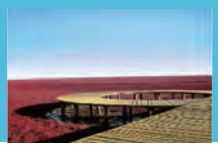
Single Compressor





Model	Length "A"	Width "B"	Height "C"	Clearance For Tube Cleaning "D"	E	F	G	H	M	N	Condenser Water Conn. "J"	Evaporator Water Conn. "I"
	mm [inch]											
R134a / R513A												
DCLC80MAS	2570 [101]	1220 [48]	2010 [79]	2100 [82.7]	278 [11.0]	558 [22.0]	860 [33.9]	1164 [45.8]	349 [13.7]	316 12.4]	5" Victaulic	5" Victaulic
DCLC120MCS	2570 [101]	1220 [48]	2010 [79]	2100 [82.7]	278 [11.0]	558 [22.0]	860 [33.9]	1164 [45.8]	349 [13.7]	316 [12.4]	5" Victaulic	5" Victaulic
DCLC150MDS	2570 [101]	1220 [48]	2010 [79]	2100 [82.7]	278 [11.0]	558 [22.0]	860 [33.9]	1164 [45.8]	349 [13.7]	316 [12.4]	5" Victaulic	5" Victaulic
DCLC200MFS	3940 [155]	1220 [48]	2010 [79]	3500 [137.8]	292 [11.5]	571 [22.5]	854 [33.6]	1197 [47.1]	364 [14.3]	317 [12.5]	5" Victaulic	5" Victaulic
R1234ze												
DCLC95MPS	2570 [101]	1220 [48]	2010 [79]	2100 [82.7]	278 [11.0]	558 [22.0]	860 [33.9]	1164 [45.8]	349 [13.7]	316 [12.4]	5" Victaulic	5" Victaulic
DCLC120MQS	3940 [155]	1220 [48]	2010 [79]	3500 [137.8]	292 [11.5]	571 [22.5]	854 [33.6]	1197 [47.1]	364 [14.3]	317 [12.5]	5" Victaulic	5" Victaulic
DCLC150MRS	3940 [155]	1220 [48]	2010 [79]	3500 [137.8]	292 [11.5]	571 [22.5]	854 [33.6]	1197 [47.1]	364 [14.3]	317 [12.5]	5" Victaulic	5" Victaulic

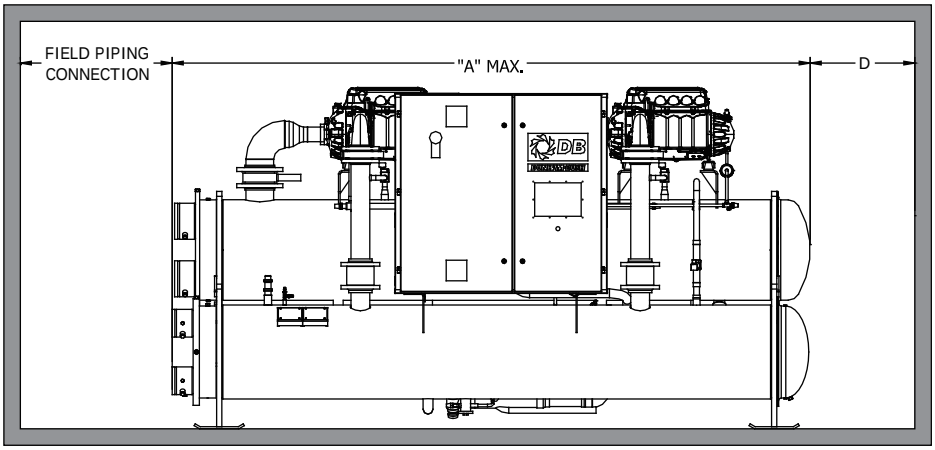
Notes: 1) Above dimensions are based on standard unit, with 3 passes flooded evaporator and condenser, 1.0MPa [150psi] water side service pressure.
2) Unit layout shown are for a reference. Same orientation may vary.
3) Certfied drawings are available upon request.

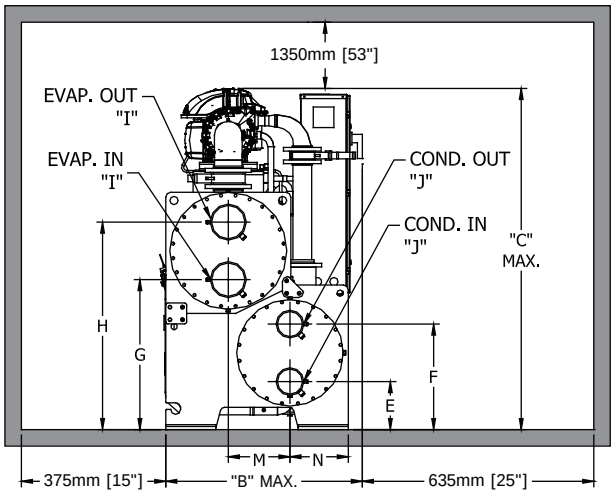




DIMENSIONS

Unit Dimensions

Twin Compressors

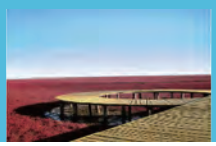




Model	Length "A"	Width "B"	Height "C"	Clearance For Tube Cleaning "D"	E	F	G	H	M	N	Condenser Water Conn. "J"	Evaporator Water Conn. "I"
	mm [inch]											
R134a & R513A												
DCLC240MCD	3840 [151]	1220 [48]	2010 [79]	3500 [137.8]	288 [11.3]	574 [22.6]	851 [33.5]	1201 [47.3]	364 [14.3]	317 [12.5]	6" Victaulic	8" Victaulic
DCLC300MDD	3890 [153]	1230 [48]	2070 [81]	3500 [137.8]	292 [11.5]	641 [25.2]	911 [35.9]	1261 [49.6]	375 [14.8]	355 [14.0]	6" Victaulic	8" Victaulic
DCLC400MFD	4210 [166]	1230 [48]	2070 [81]	3500 [137.8]	292 [11.5]	641 [25.2]	911 [35.9]	1261 [49.6]	375 [14.8]	355 [14.0]	6" Victaulic	8" Victaulic
R1234ze												
DCLC190MPD	3840 [151]	1220 [48]	2010 [79]	3500 [137.8]	288 [11.3]	574 [22.6]	851 [33.5]	1201 [47.3]	364 [14.3]	317 [12.5]	6" Victaulic	8" Victaulic
DCLC240MQD	3890 [153]	1230 [48]	2070 [81]	3500 [137.8]	292 [11.5]	641 [25.2]	911 [35.9]	1261 [49.6]	375 [14.8]	355 [14.0]	6" Victaulic	8" Victaulic
DCLC300MRD	3890 [153]	1230 [48]	2070 [81]	3500 [137.8]	292 [11.5]	641 [25.2]	911 [35.9]	1261 [49.6]	375 [14.8]	355 [14.0]	6" Victaulic	8" Victaulic

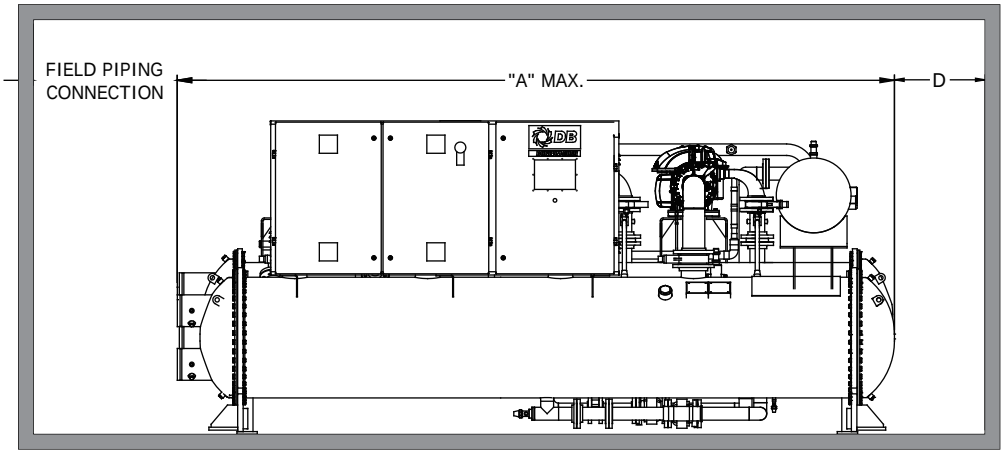
Notes: 1) Above dimensions are based on standard unit, with with 2 passes flooded evaporator and condenser, 1.0MPa [150psi] water side service pressure, left hand side water piping connection (view from control panel).
2) Unit layout shown are for a reference. Same orientation may vary.
3) Certfied drawings are available upon request.

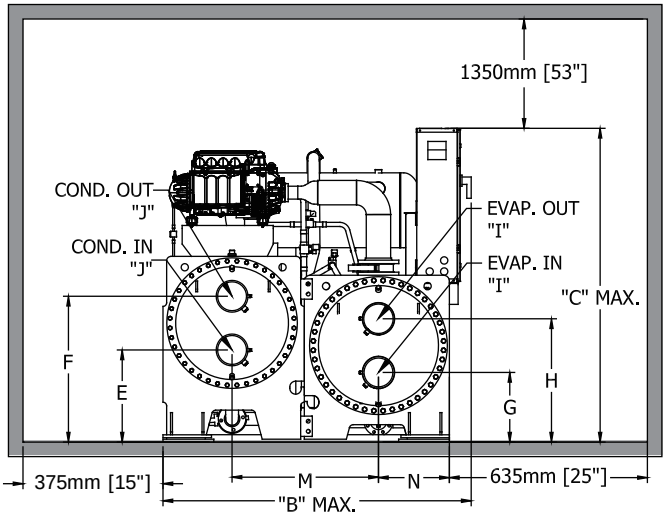
DIMENSIONS


Unit Dimensions

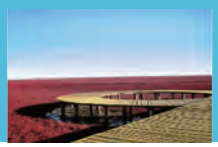
Three & Four Compressors





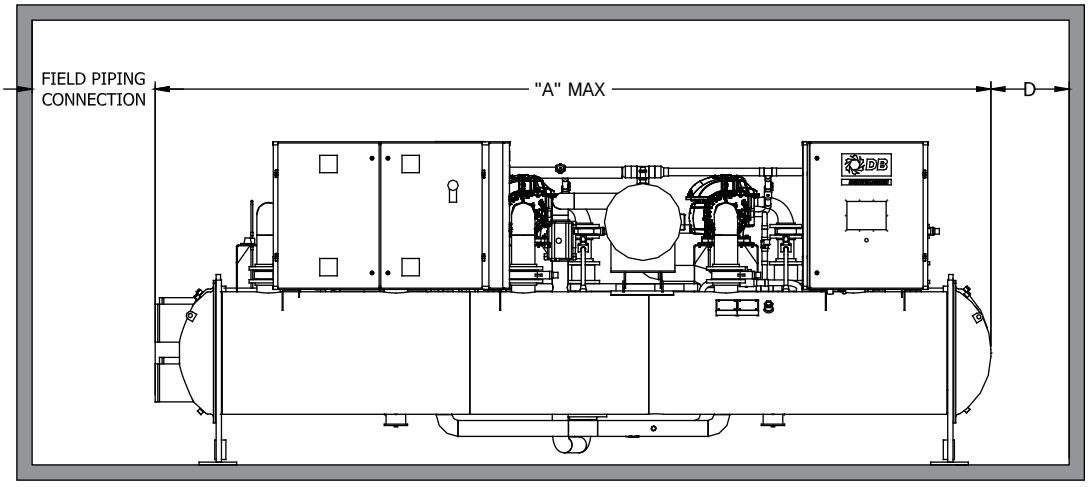
Model		Length "A"	Width "B"	Height "C"	Clearance For Tube Cleaning "D"	E	F	G	H	M	N	Condenser Water Conn. "J"	Evaporator Water Conn. "I"
		mm [inch]											
R134a & R513A													
3 Compressors	DCLC450MDT	4390 [174]	1960 [77]	2200 [87]	3800 [149.6]	535 [21.1]	905 [35.6]	570 [22.4]	940 [37.0]	950 [37.4]	464 [18.3]	8" Victaulic	8" Victaulic
	DCLC600MFT	4390 [174]	1960 [77]	2200 [87]	3800 [149.6]	535 [21.1]	905 [35.6]	570 [22.4]	940 [37.0]	950 [37.4]	464 [18.3]	8" Victaulic	8" Victaulic
4 Compressors	DCLC800MFF	4950 [195]	2150 [85]	2180 [86]	4300 [169.3]	480 [18.9]	850 [33.5]	635 [25.0]	1005 [39.6]	1009 [39.7]	489 [19.3]	8" Victaulic	8" Victaulic
R1234ze													
3 Compressors	DCLC285MPT	4870 [192]	1900 [75]	2070 [81]	4300 [169.3]	435 [17.1]	805 [31.7]	580 [22.8]	930 [36.6]	841 [33.1]	400 [15.7]	8" Victaulic	8" Victaulic
	DCLC360MQT	4930 [194]	1960 [77]	2200 [87]	4300 [169.3]	535 [21.1]	905 [35.6]	570 [22.4]	940 [37.0]	950 [37.4]	464 [18.3]	8" Victaulic	8" Victaulic
	DCLC450MRT	4930 [194]	1960 [77]	2200 [87]	4300 [169.3]	535 [21.1]	905 [35.6]	570 [22.4]	940 [37.0]	950 [37.4]	464 [18.3]	8" Victaulic	8" Victaulic
4 Compressors	DCLC480MQF	4950 [195]	2150 [85]	2180 [86]	4300 [169.3]	480 [18.9]	850 [33.5]	635 [25.0]	1005 [39.6]	1009 [39.7]	489 [19.3]	8" Victaulic	8" Victaulic
	DCLC600MRF	4950 [195]	2150 [85]	2180 [86]	4300 [169.3]	480 [18.9]	850 [33.5]	635 [25.0]	1005 [39.6]	1009 [39.7]	489 [19.3]	8" Victaulic	8" Victaulic

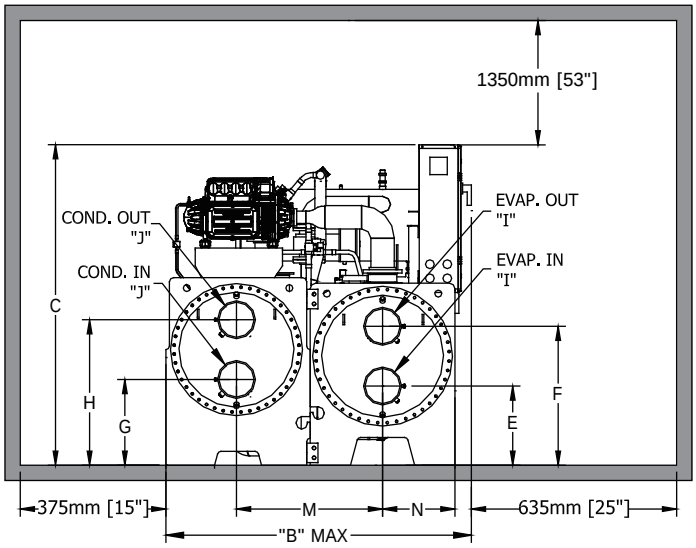
Notes: 1) Above dimensions are based on standard unit, with with 2 passes flooded evaporator and condenser, 1.0MPa [150psi] water side service pressure, left hand side water piping connection (view from control panel).
2) Unit layout shown are for a reference. Same orientation may vary.
3) Certfied drawings are available upon request.


Unit Dimensions

Five Compressors



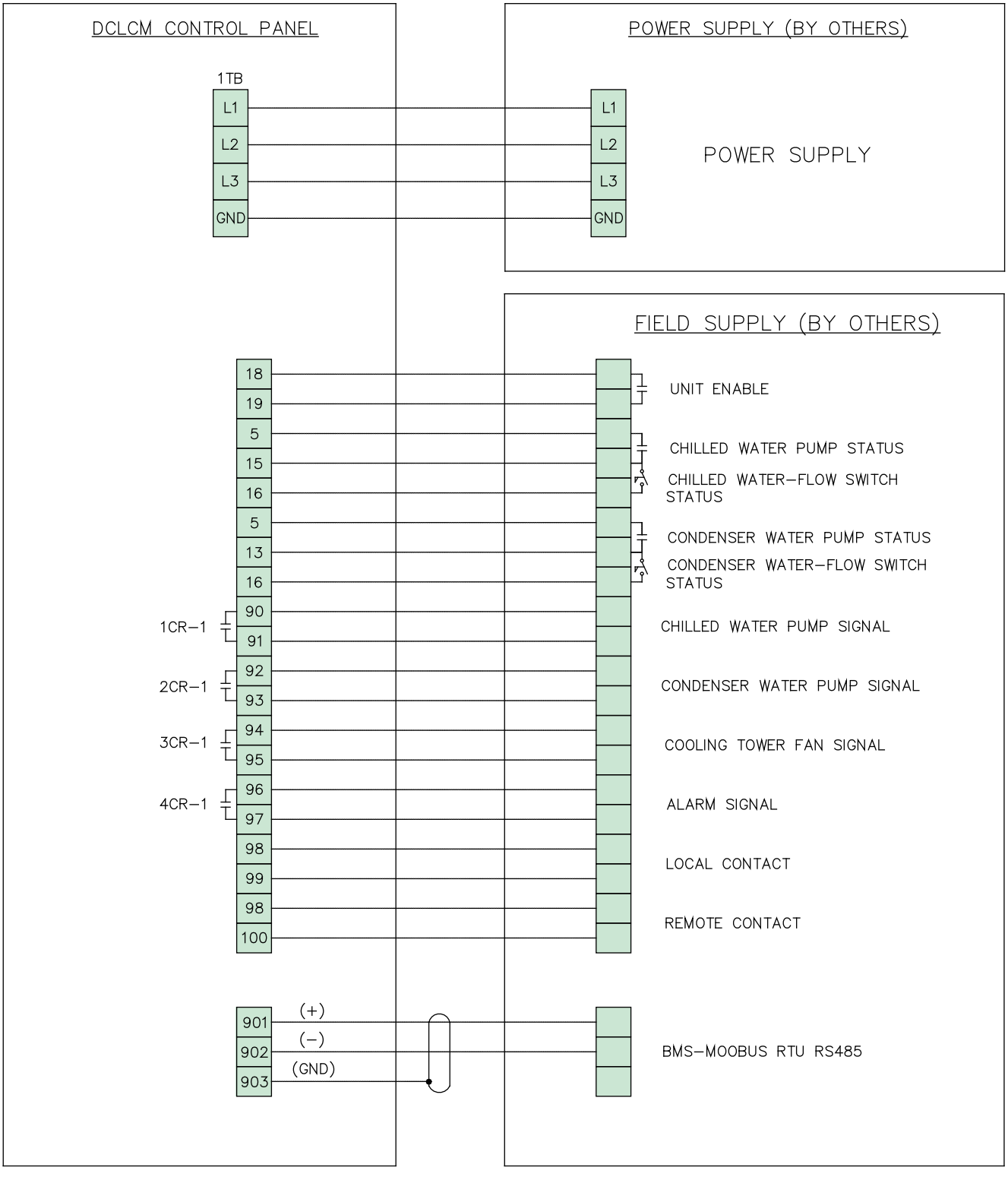


Model	Length "A"	Width "B"	Height "C"	Clearance For Tube Cleaning "D"	E	F	G	H	M	N	Condenser Water Conn. "J"	Evaporator Water Conn. "I"
	mm [inch]											
R134a & R513A												
DCLC900MGZ	6070 [239]	2210 [87]	2330 [92]	5436 [214]	590 [23.2]	1020 [40.2]	637 [25.1]	1067 [42.0]	1051 [41.4]	521 [20.3]	10" Victaulic	10" Victaulic
DCLC1000MFL	6070 [239]	2210 [87]	2330 [92]	5436 [214]	590 [23.2]	1020 [40.2]	637 [25.1]	1067 [42.0]	1051 [41.4]	521 [20.3]	10" Victaulic	10" Victaulic

Notes: 1) Above dimensions are based on standard unit, with with 2 passes flooded evaporator and condenser, 1.0MPa [150psi] water side service pressure, left hand side water piping connection (view from control panel).
2) Unit layout shown are for a reference. Same orientation may vary.
3) Certfied drawings are available upon request.

FIELD WIRING DIAGRAM





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