MULTISTACK®

MTA-F SERIES

# Air Cooled Oil-free Centrifugal Chillers


AHRI CERTIFIED®
www.ahridirectory.org
Water-Cooled Chillers
AHRI Standard 550/590

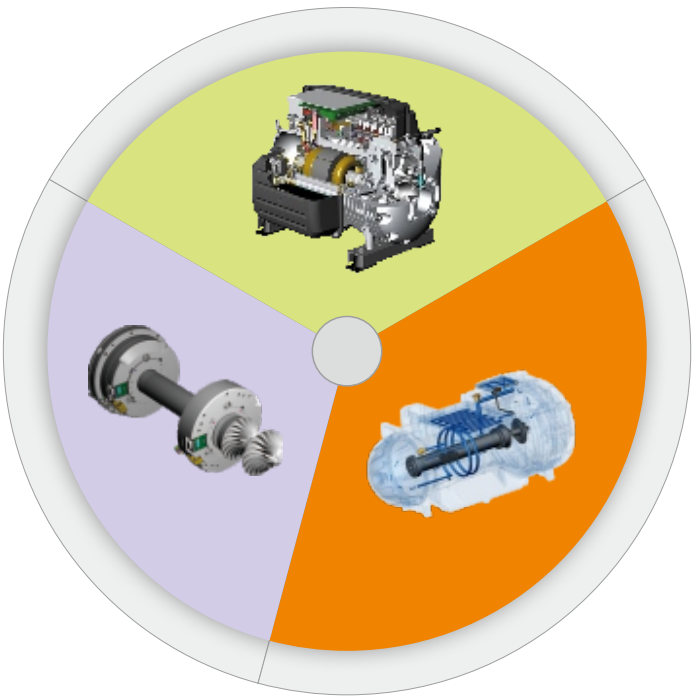
We are the creator and leader of modular chillers,
the pioneer of magnetic levitating technology in refrigeration industry.

# Invention of Oil-free Centrifugal Compressor

Research of oil-free centrifugal refrigerant compressor started in 1993 at the headquarters of MULTISTACK in Melbourne, Australia. It was Dr. Ron Conry, the inventor of MULTISTACK modular chiller, who got the inspiration of oil-free compressor during the process of modular invention and led the technical research.

After Dr. Ron Conry completed the invention of modular chiller, he devoted to its efficiency improvement. In comparison to conventional chillers, modular chillers would have significant advantages of achieving better part load efficiencies and reducing power consumption annually. Some customers, however, were not yet aware of improving part load efficiencies in 1990s. Instead, they were more concerned about full load (100%) efficiency rather than energy saving when purchasing chillers.

Dr. Ron Conry then came up with the idea of inventing a smaller compressor with higher efficiency. With this revolutionary compressor technology, a chiller would have higher efficiencies at part load conditions and equivalent or even better efficiency at full load than a conventional chiller. This is the original concept of oil-free compressor.



# DESIGN FEATURES

## A CUTTING EDGE OIL-FREE CENTRIFUGAL COMPRESSORS

MTA series chiller uses oil-free magnetic levitation centrifugal compressors which represent the cutting edge compressor technology of the 21st Century. Conventional mechanical bearings are replaced by highly-sophisticated magnetic bearings with top aerospace technology. The motor, drive shaft and centrifugal impellers all levitate in the magnetic field without any immediate contacts. Mechanical frictions, efficiency loss, vibration and noise are eliminated. The compressor is free from oil pump, oil supply system and at the same time avoids efficiency loss caused by oil use in heat exchanger.

## B HIGH EFFICIENCY FLOODED EVAPORATOR

Evaporator is shell and tube construction. It is constructed of a single shell, flooded type with refrigerant surrounding the tubes and water passing through the tubes. Tubes are enhanced and rifled. Internal intermediate tube supports, liquid eliminator baffle plate, pressure relief vent, water drains and vents are required. The evaporator has high efficiency of heat exchange and maintains stable operation for convenient maintenance.

## C ELECTRONIC EXPANSION VALVES

Electronic expansion valves (EXVs) are used as the throttling devices for evaporator and economizer. EXVs have accurate flow regulating performance and work with intelligent control system to achieve maximum reliability.

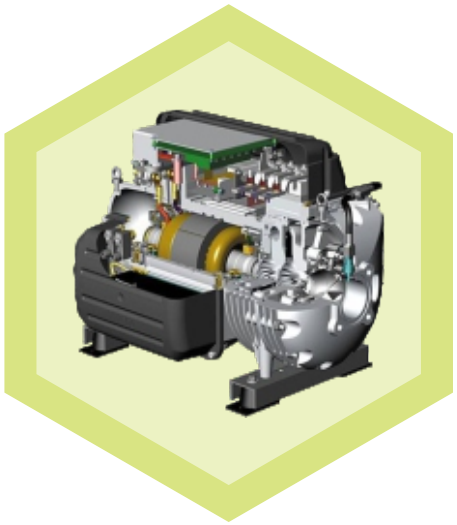
## D RIFLED “V” CONFIGURATION CONDENSER

Condenser is constructed of rifled copper tubes to increase heat exchange surface and disturbance in the flowing of refrigerant, and improve heat exchange rate; flat “V” configuration enhances transmitting of condensed water, lowers risks of ice blockage and improves heat transferring.

## E LOW-SOUND FANS (OPTIONAL)

Air cooled condenser is equipped with high efficiency EC fan motors with permanent magnet. Motors incorporate integrated controller to modulate fan speed. Fan blades are of aluminum construction. Fans are designed to ensure proper acoustical and energy performance.

# DESIGN FEATURES



## CUTTING EDGE PERFORMANCE

- Near water-cooled efficiencies at air cooled conditions with unprecedented part-load performance
- Magnetic levitation technology offers a near-frictionless two-stage variable speed centrifugal compressor for maximum efficiency at all load conditions
- Oil free design eliminates performance degradation and ensures sustainable, documentable performance over the life of the chiller as well as reduced maintenance
- Flooded 2-pass evaporator provides low-flow turndown at extreme efficiency levels

## MS ONE CONTROLS

- Real time chiller optimization with Natural Progression Control
- Robust industrial grade computing hardware
- Standard chilled-water pump control


## SUPER QUIET OPERATION

- Total sound signature of 70 dB(A)
- State-of-the-art EC fans deliver quiet and ultra-efficient operation… the perfect complement to the oil-free centrifugal compressor

# MODEL NUMBER DESIGNATION

| MTA | 080 | F | C | E | A | A | S |
|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |

**1** —MULTISTACK TURBOCOR Air Cooled

**2** —Module Nominal Capacity (080/100/120/160/200/240/250/300 tons; need 3 digits)

**3** —F: Flooded Evaporator

4—Chiller Type

C: Cooling Only H: Heat Recovery

**5** —Refrigerant

E: R134a

**6** —Electrical Specifications

A: AC380 -420 V/50Hz/3Ph

B: AC440-480 V/60Hz/3Ph

**7** —Development Index

Default for Standard

**8** —Fan Configuration

S: Standard, H: High Static, L: Low Sound, V: Other

# TECHNICAL DATA (PER MODULE)

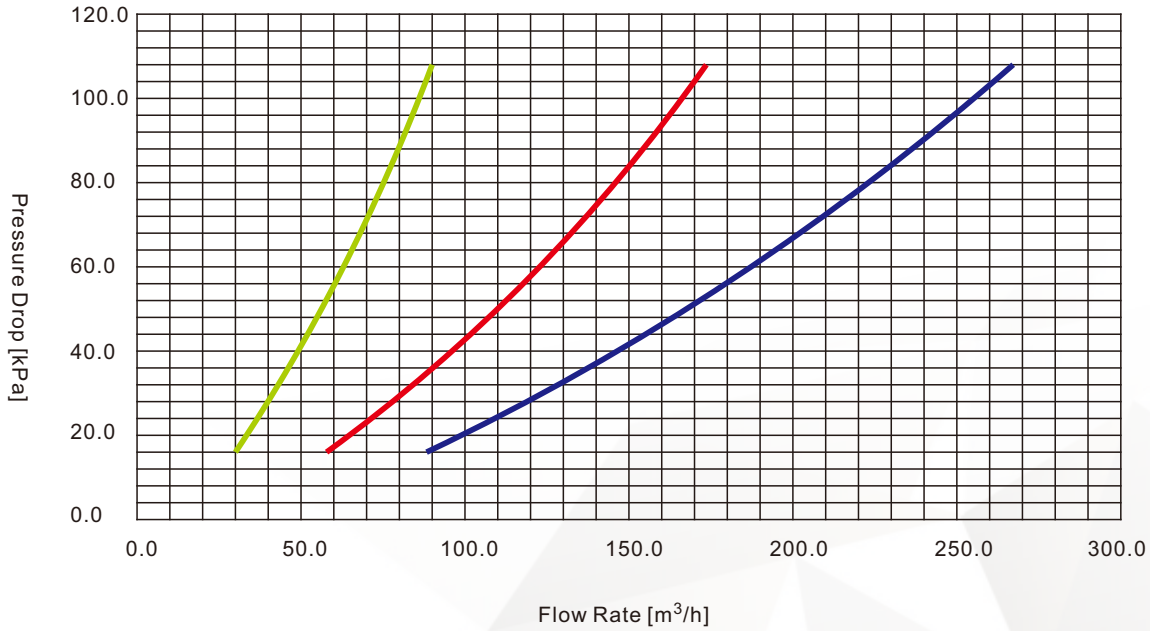
| Model | | Unit | MTA080FCEA | MTA090FCEA | MTA100FCEA | MTA120FCEA | MTA125FCEA | MTA160FCEA |
|---|---|---|---|---|---|---|---|---|
| Nominal Cooling Capacity | | kW | 281 | 317 | 352 | 422 | 440 | 563 |
| Nominal Power | | kW | 79.5 | 86.2 | 95.1 | 115.5 | 114.8 | 159.4 |
| COP | | W/W | 3.53 | 3.68 | 3.7 | 3.65 | 3.83 | 3.53 |
| IPLV | | W/W | 6.28 | 6.65 | 6.39 | 6.57 | 6.71 | 6.39 |
| Control System | | | MS One Controller | | | | | |
| Compressor Type | | | VSD Oil-free Centrifugal | | | | | |
| Capacity Control | | % | 40%-100% | 30%-100% | 40%-100% | 30%-100% | 30%-100% | 20%-100% |
| Power Supply | | | 380-50-30 | | | | | |
| RLA (per compressor) | | A | 135 | 135 | 210 | 210 | 210 | 135 |
| Refrigerant Type | | | R134a | | | | | |
| Refrigerant Charge | | kg | 135 | 165 | 181 | 220 | 250 | 270 |
| Evaporator | Type | | Flooded | | | | | |
| | Chilled water flow rate | $m^3/h$ | 48.3 | 54.5 | 60.5 | 72.6 | 75.7 | 96.8 |
| | Water pressure drop | kPa | 54.8 | 45.6 | 55.1 | 76.6 | 73.1 | 54.9 |
| | Fouling factor | $m^2*K/kW$ | 0.018 | 0.018 | 0.018 | 0.018 | 0.018 | 0.018 |
| | Max. working pressure (water side) | MPa | 1 | | | | | |
| | Passes | | 2 | | | | | |
| | Connection size | | 4" | 5" | 5" | 5" | 5" | 5" |
| Condenser | Type | | Air Cooled Finned Tube Heat Exchanger | | | | | |
| | No. of fan | | 4 | 6 | 6 | 8 | 10 | 8 |
| | Fan power (each) | kW | 1.715 | | | | | |
| | RLA (each) | A | 2.65 | | | | | |
| Physical Dimensions | L | mm | 2600 | 3900 | 3900 | 5200 | 6500 | 5200 |
| | W | mm | 2200 | 2200 | 2200 | 2200 | 2200 | 2200 |
| | H | mm | 2500 | 2500 | 2500 | 2500 | 2500 | 2500 |
| Shipping Weight | | kg | 2500 | 2800 | 2900 | 3500 | 4700 | 5000 |
| Operating Weight | | kg | 2600 | 2900 | 3000 | 3600 | 4800 | 5200 |

1. Nominal cooling conditions: Chilled water entering/leaving temperature 12℃/7℃; ambient 35℃;
2. Chiller designed in conformity with GB/T18430.1-2007 *Vapor Compression Cycle Chiller (Heat Pump) for Commercial, Industrial and Other Similar Uses;*
3. IPLV based on AHRI551/591-2011;
4. Technical data for standard products only. MULTISTACK reserves the right to make changes without prior notice.

# TECHNICAL DATA (PER MODULE)

| Model | | Unit | MTA180FCEA | MTA200FCEA | MTA240FCEA | MTA300FCEA |
|---|---|---|---|---|---|---|
| Nominal Cooling Capacity | | kW | 633 | 703 | 844 | 1055 |
| Nominal Power | | kW | 177.1 | 185.9 | 224.3 | 278.5 |
| COP | | W/W | 3.57 | 3.78 | 3.76 | 3.79 |
| IPLV | | W/W | 6.72 | 6.68 | 6.77 | 6.84 |
| Control System | | | MS One Controller | | | |
| Compressor Type | | | VSD Oil-free Centrifugal | | | |
| Capacity Control | | % | 15%-100% | 20%-100% | 15%-100% | 10%-100% |
| Power Supply | | | 380-50-30 | | | |
| RLA (per compressor) | | A | 135 | 210 | 210 | 210 |
| Refrigerant Type | | | R134a | | | |
| Refrigerant Charge | | kg | 310 | 380 | 490 | 560 |
| Evaporator | Type | | Flooded | | | |
| | Chilled water flow rate | $m^3/h$ | 108.9 | 120.9 | 145.1 | 181.4 |
| | Water pressure drop | kPa | 59.5 | 71.9 | 77.3 | 74.3 |
| | Fouling factor | $m^2*K/kW$ | 0.018 | 0.018 | 0.018 | 0.018 |
| | Max. working pressure (water side) | MPa | 1 | | | |
| | Passes | | 2 | | | |
| | Connection size | | 6" | 6" | 6" | 8" |
| Condenser | Type | | Air Cooled Finned Tube Heat Exchanger | | | |
| | No. of fan | | 10 | 12 | 16 | 18 |
| | Fan power (each) | kW | 1.715 | | | |
| | RLA (each) | A | 2.65 | | | |
| Physical Dimensions | L | mm | 6500 | 7800 | 10400 | 11700 |
| | W | mm | 2200 | 2200 | 2200 | 2200 |
| | H | mm | 2500 | 2500 | 2500 | 2500 |
| Shipping Weight | | kg | 5000 | 6400 | 7800 | 9300 |
| Operating Weight | | kg | 5100 | 6500 | 8000 | 9500 |

# PRESSURE DROP CHART



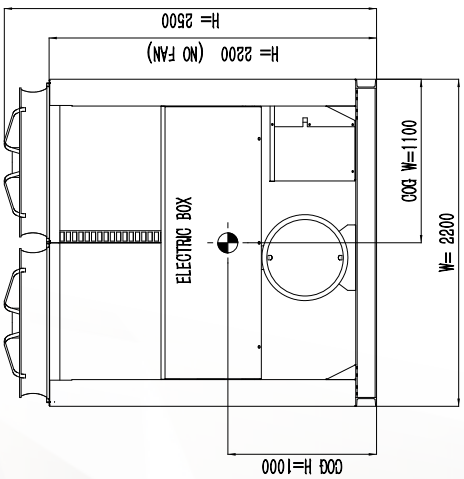

MTA080F/090F/100F/120F/125F

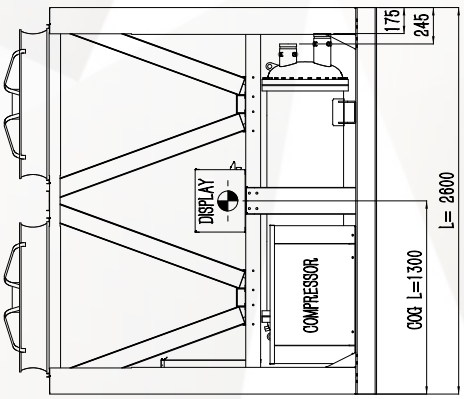
MTA160F/180F/200F/240F

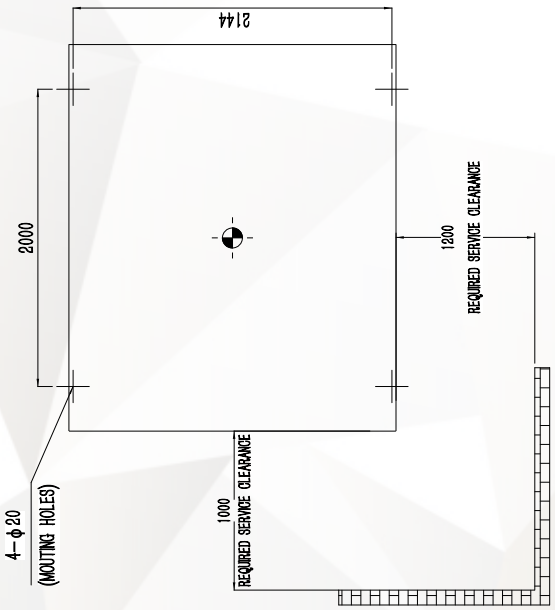
MTA300F

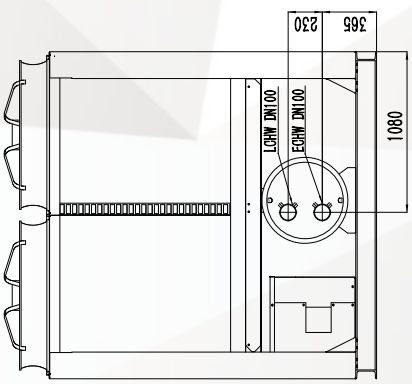
# PHYSICAL DIMENSIONS

MTA080FCEA
( UNIT : mm)



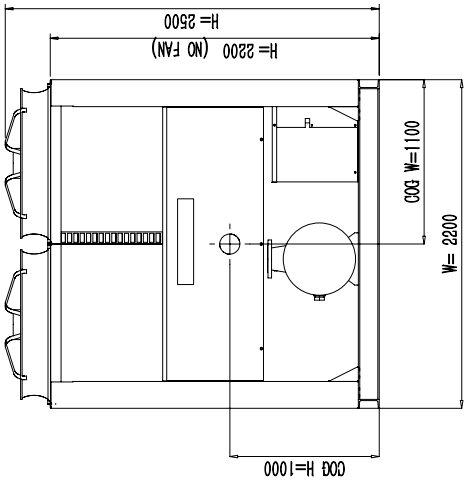



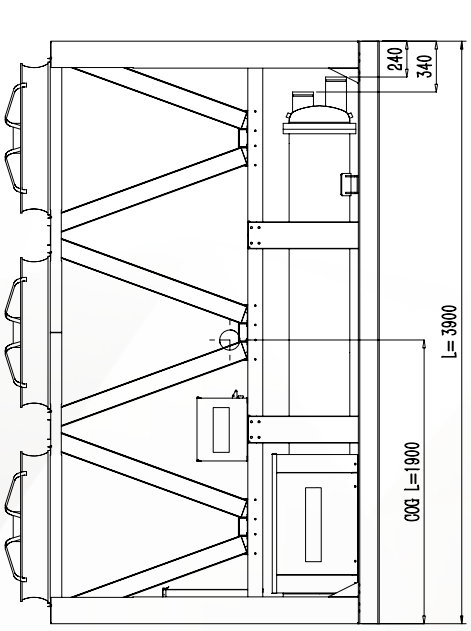



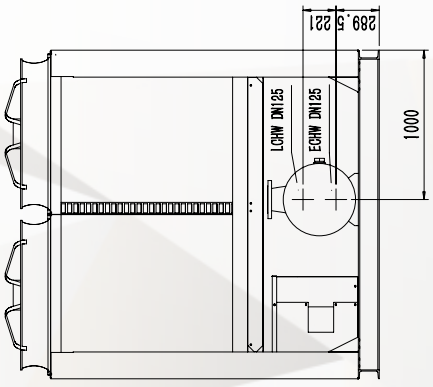



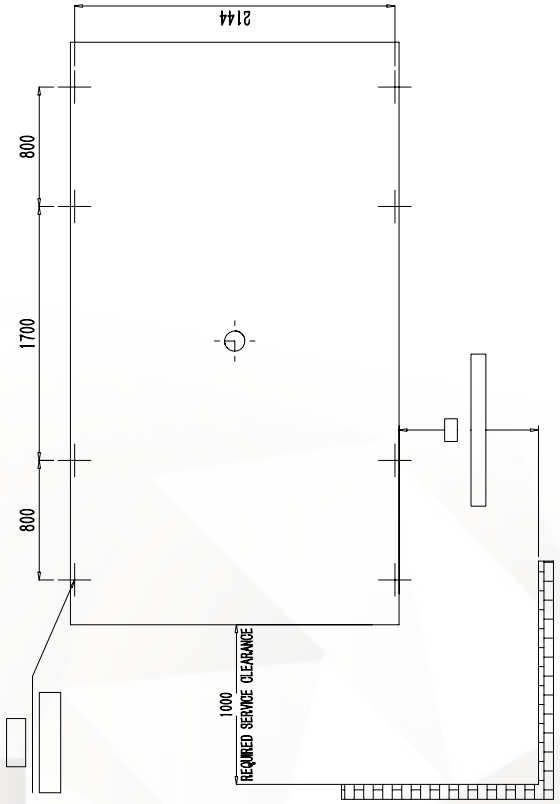
# PHYSICAL DIMENSIONS

MTA090FCEA
( UNIT : mm)



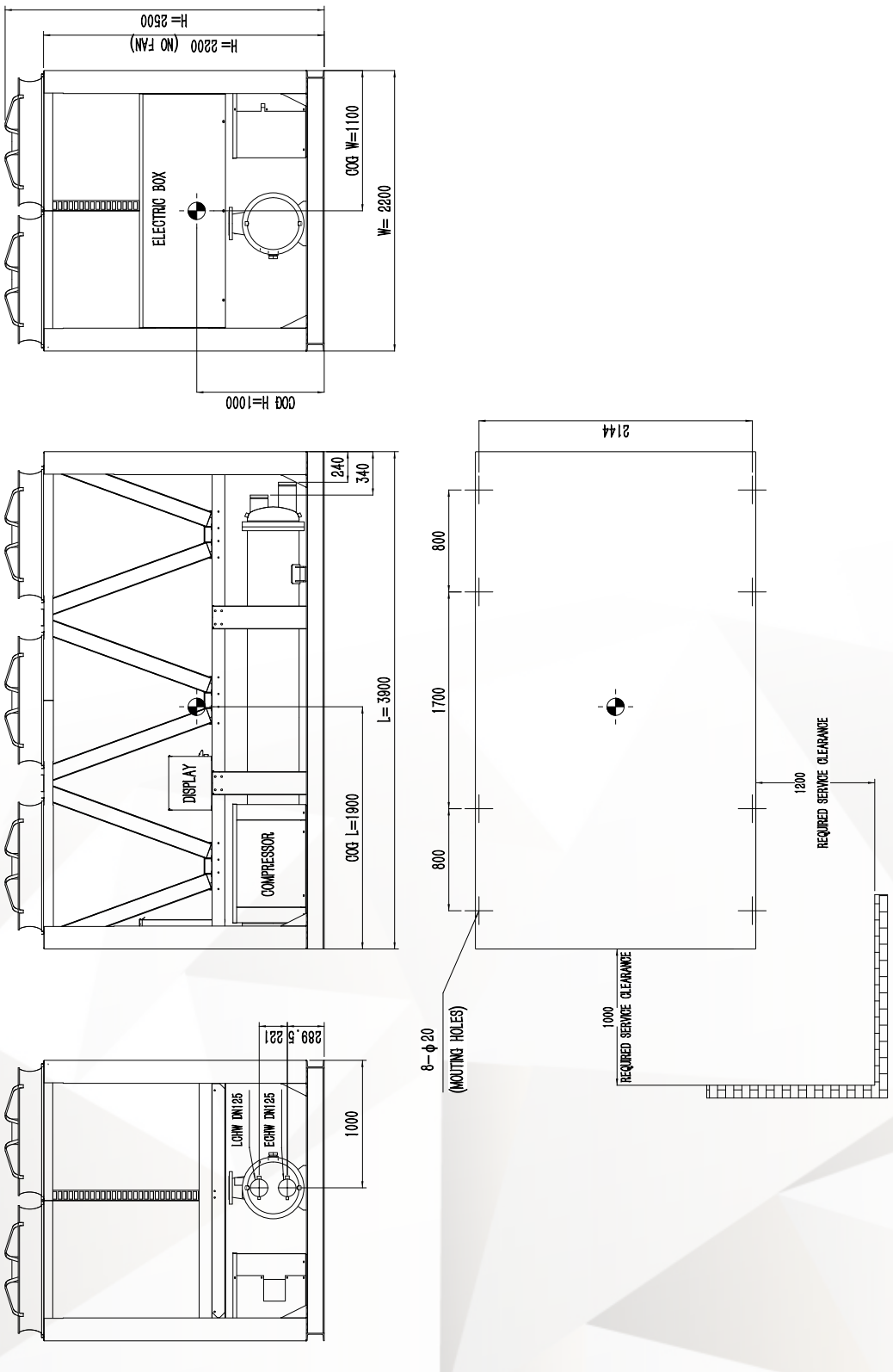



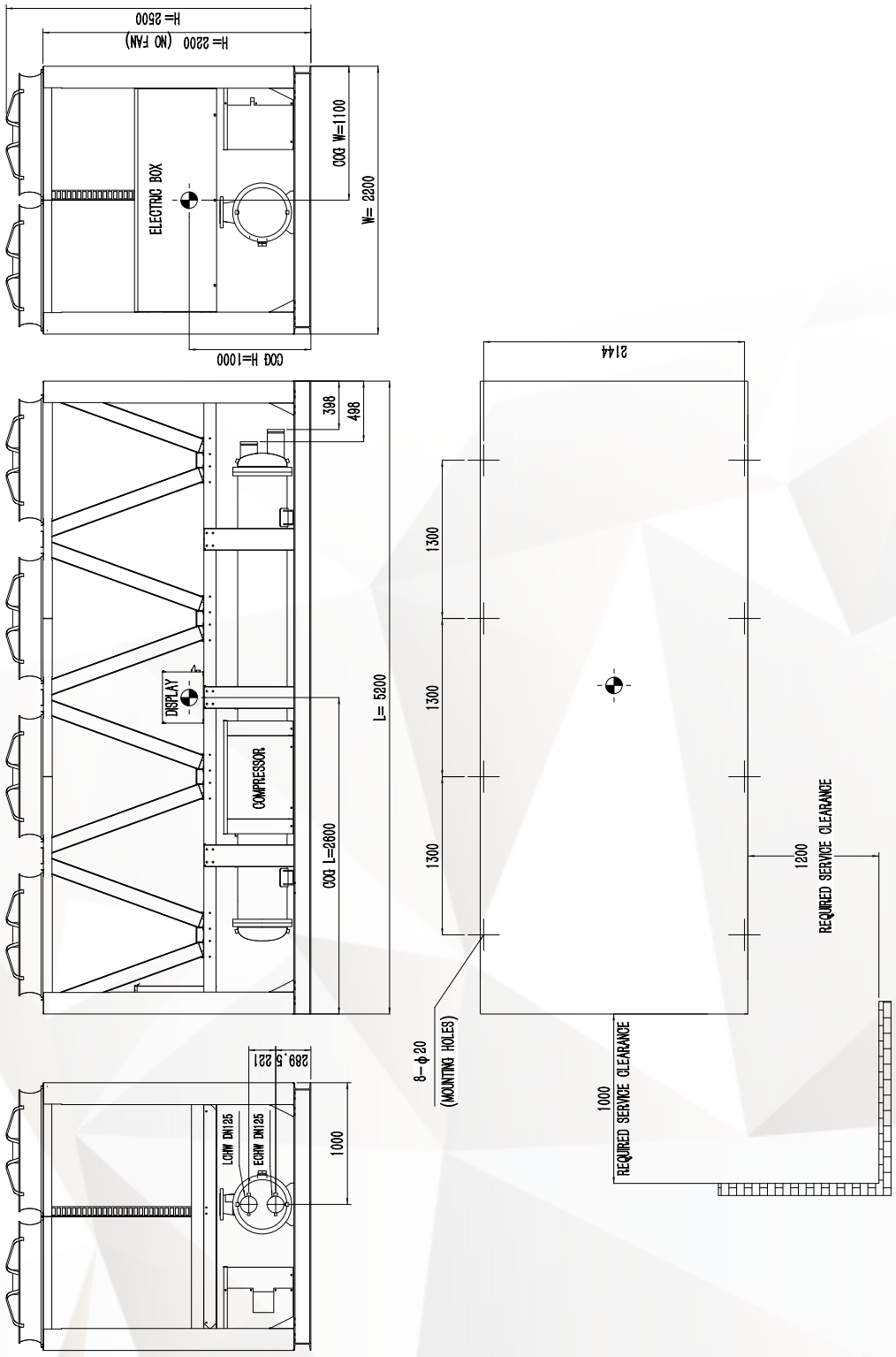
# PHYSICAL DIMENSIONS

MTA100FCEA
( UNIT : mm)



# PHYSICAL DIMENSIONS

MTA120FCEA
( UNIT : mm)



# PHYSICAL DIMENSIONS

MTA125FCEA
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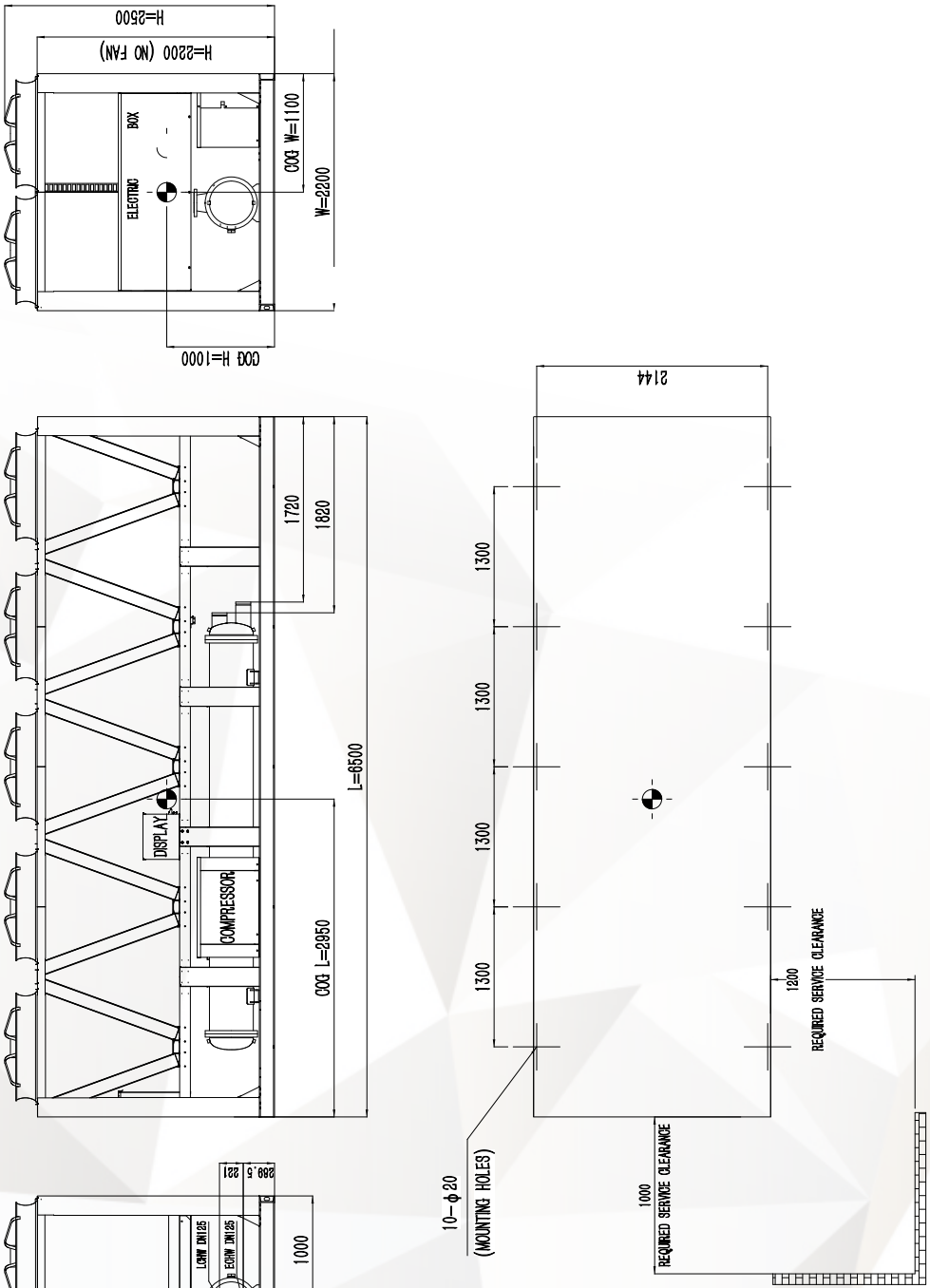
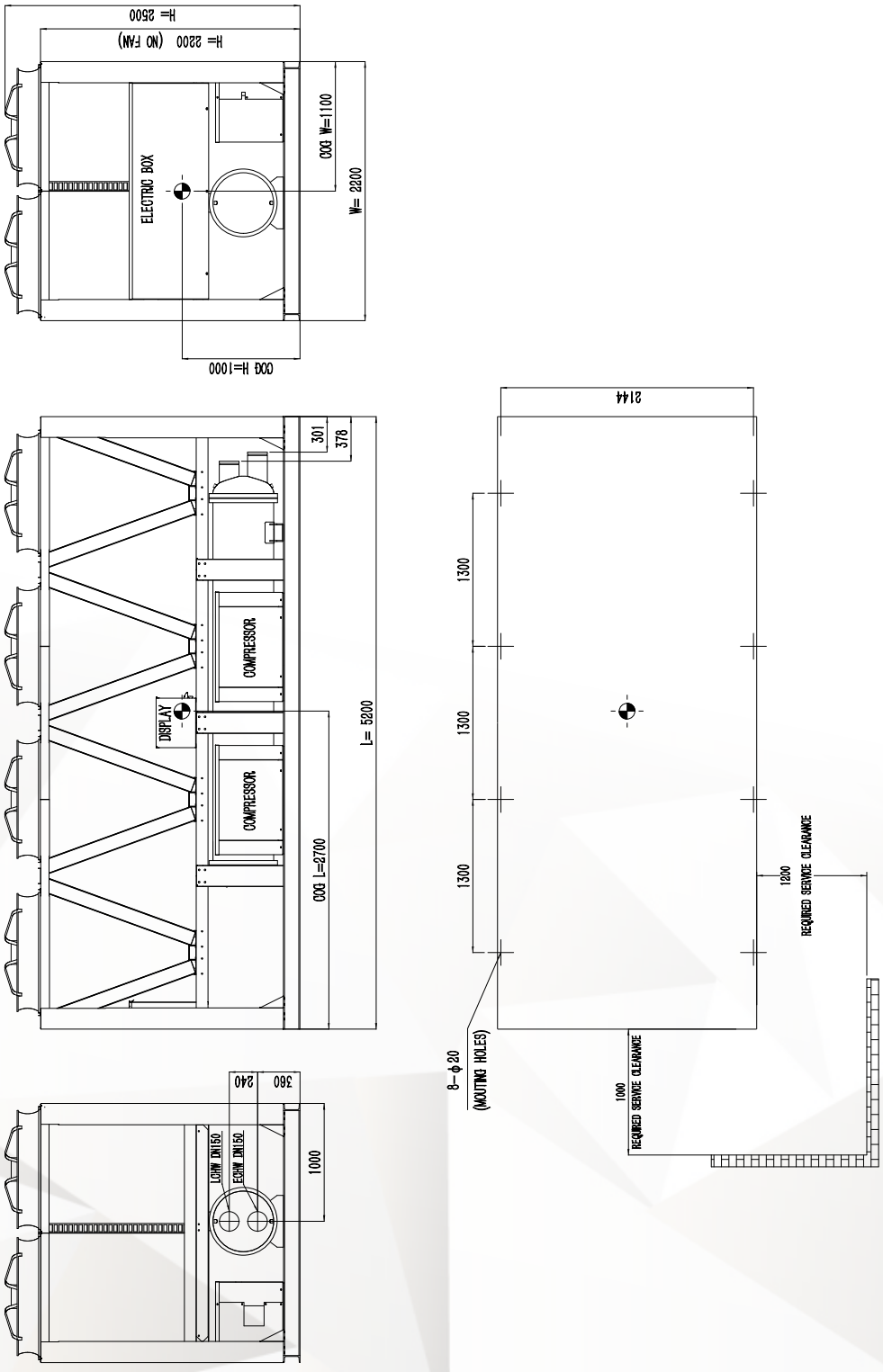


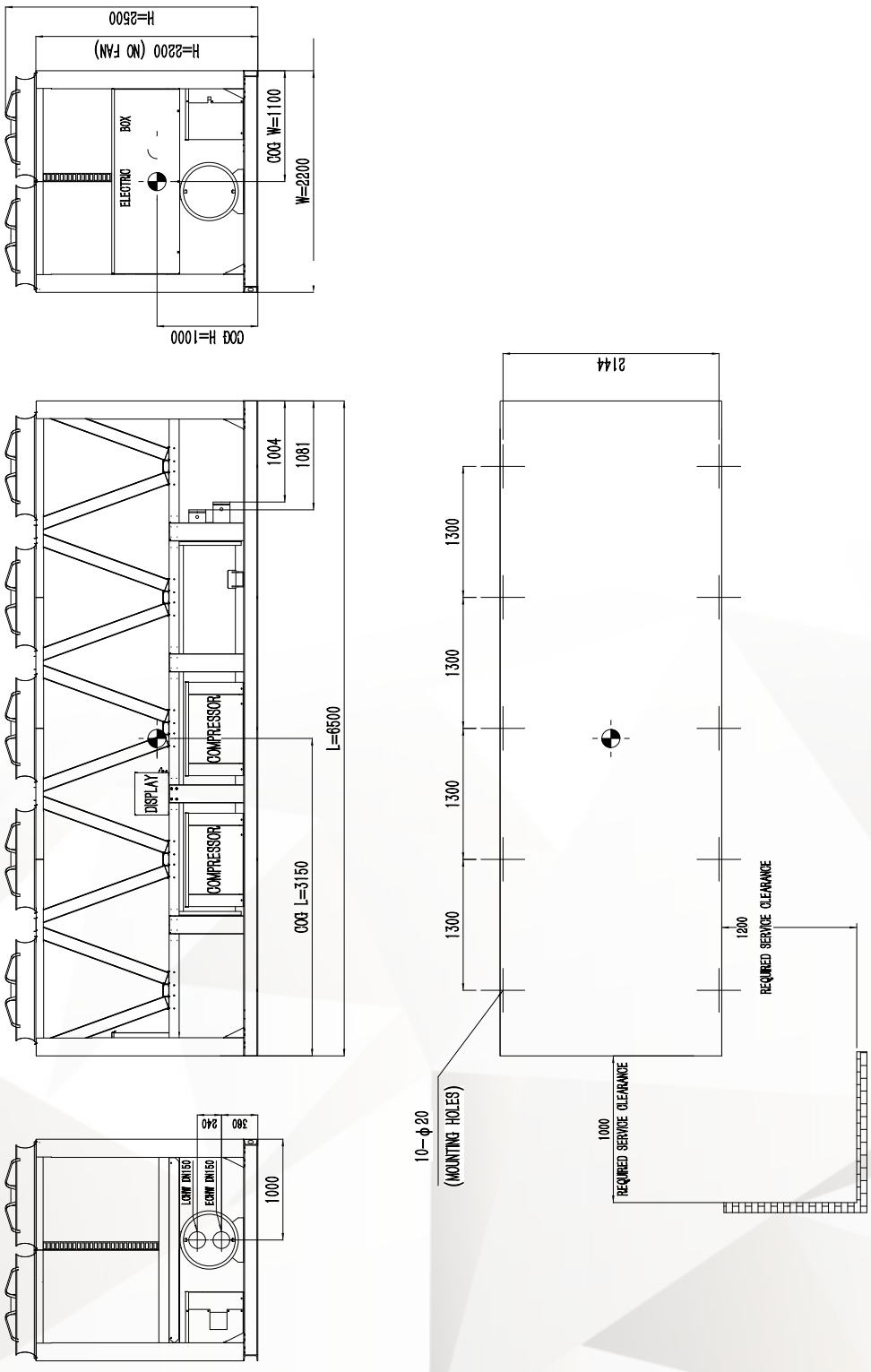
# PHYSICAL DIMENSIONS

MTA160FCEA
( UNIT : mm)



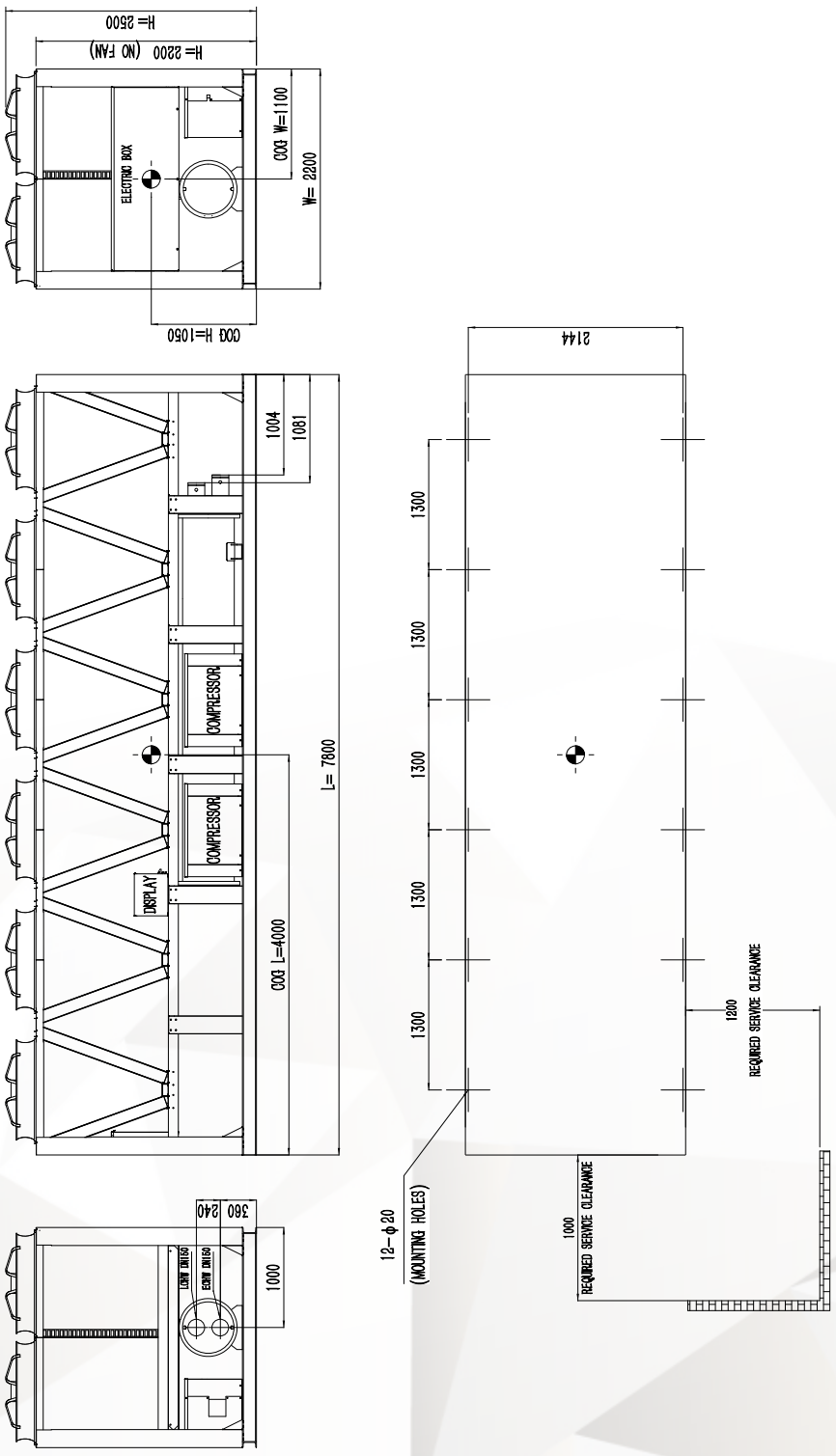
# PHYSICAL DIMENSIONS

MTA180FCEA
( UNIT : mm)



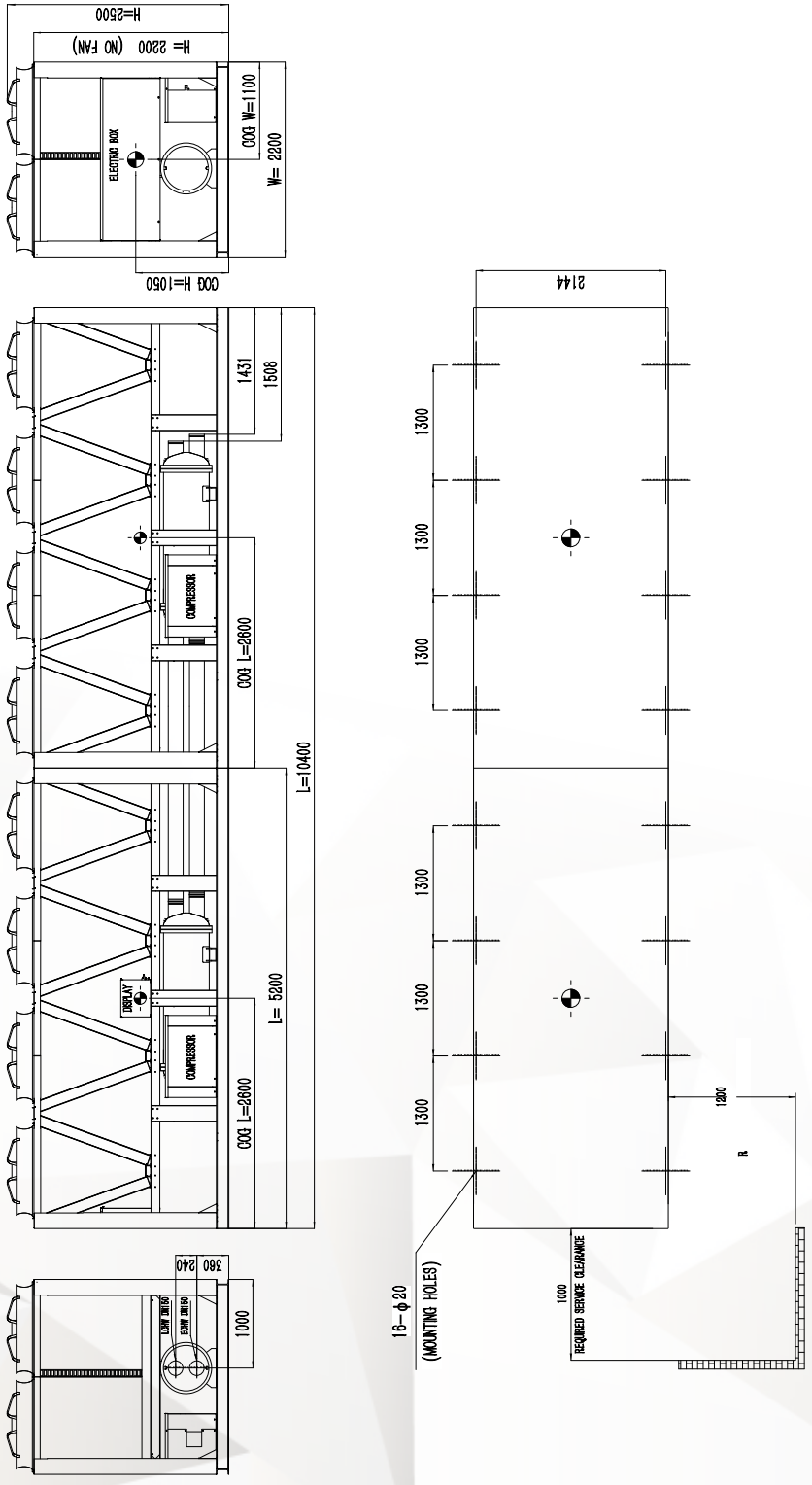
# PHYSICAL DIMENSIONS

MTA200FCEA
( UNIT : mm)



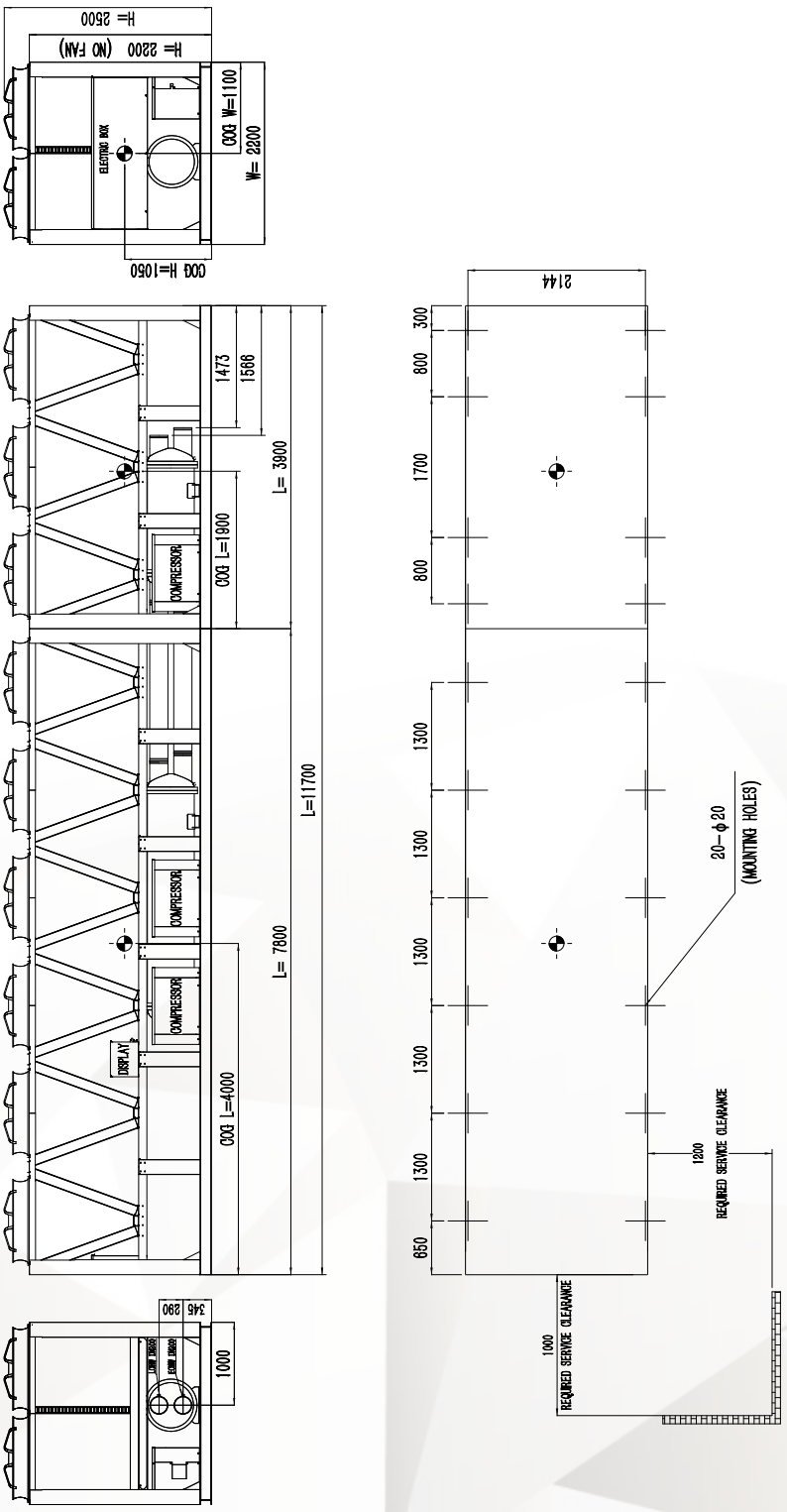
# PHYSICAL DIMENSIONS

MTA240FCEA
( UNIT : mm)

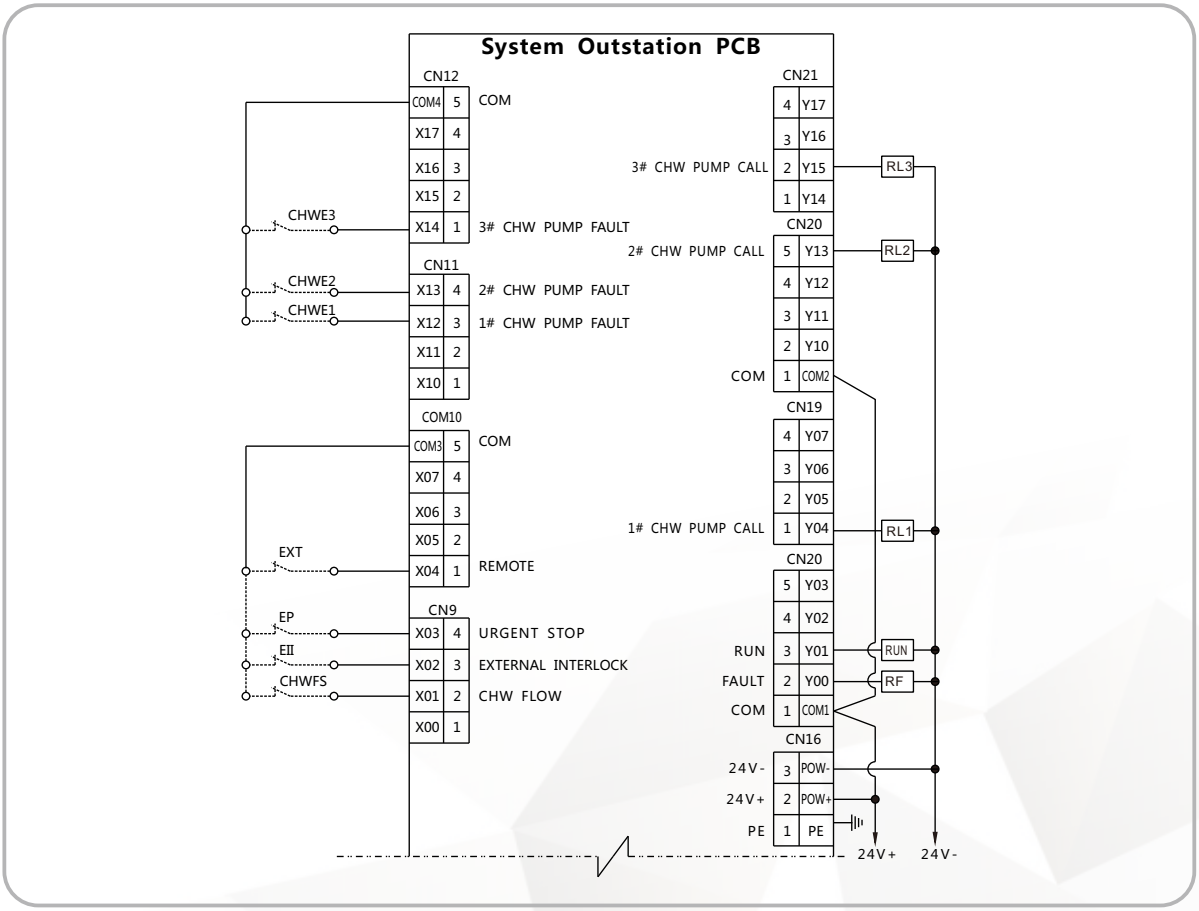


# PHYSICAL DIMENSIONS

MTA300FCEA
( UNIT : mm)



# ELECTRICAL WIRING




## External Interlock Devices:

DPCHW: chilled water differential pressure switch, verifying water flows;

EII: external interlock signal;

EP: external emergency stop input;

EXT: external remote start/stop input;

CHWE1~3: #1 - #3 chilled water pump fault signal;

## Passive Contact Outputs:

System outstation PCB provides 5 passive contact outputs for users:

RF: chiller fault status output;

RUN: chiller running status output;

RL1~3: #1 - #3 chilled water pump running signal output;

## Notes:

— Minimum cross section of control circuit conductor to be 0.75mm$^2$;

— EII, EP, EXT and CHWE1~3 input signals to be bridged at factory. If these signals required to be connected to the system outstation PCB, corresponding jumper wires or jumper bars must be removed as per wiring diagram prior to input signal bridging.

— Maximum current of passive contact to be 5A;

— Flow switch and external interlock devices to be supplied by users or bought from MULTISTACK;

— VWF system to be free of flow switch;

— "—" for factory wiring and "--" for field wiring.

# POWER MAINS CONNECTION

## 1. Electrical Performance Data

| Model | Compressor (Each) | | | Fan (Each) | | Chiller | | | |
|---|---|---|---|---|---|---|---|---|---|
| | R.L.A (A) | F.L.A (A) | M.O.P (kW) | R.L.A (A) | M.O.P (kW) | No.of Compressor | No.of Fan | M.O.P (kW) | F.L.A (A) |
| MTA080F | 118.3 | 135 | 84.9 | 2.65 | 3.2 | 1 | 4 | 97.7 | 155 |
| MTA090F | 130.5 | 135 | 84.9 | 2.65 | 3.2 | 1 | 6 | 104.1 | 165 |
| MTA100F | 155 | 210 | 123.3 | 2.65 | 3.2 | 1 | 6 | 142.5 | 240 |
| MTA120F | 190 | 210 | 123.3 | 2.65 | 3.2 | 1 | 8 | 148.9 | 250 |
| MTA125F | 192 | 210 | 123.3 | 2.65 | 3.2 | 1 | 10 | 155.3 | 260 |
| MTA160F | 118 | 135 | 84.9 | 2.65 | 3.2 | 2 | 8 | 195.4 | 310 |
| MTA180F | 130.8 | 135 | 84.9 | 2.65 | 3.2 | 2 | 10 | 201.8 | 320 |
| MTA200F | 151 | 210 | 123.3 | 2.65 | 3.2 | 2 | 12 | 285 | 480 |
| MTA240F | 184 | 210 | 123.3 | 2.65 | 3.2 | 2 | 16 | 297.8 | 500 |
| MTA300F | 151 | 210 | 123.3 | 2.65 | 3.2 | 3 | 18 | 427.5 | 720 |

R.L.A: Rated Load Amperage M.O.P: Maximum Operating Power F.L.A: Full Load Amperage

Power Supply: AC380V/50Hz/3Ph; Allowable Fluctuation Voltage: ±10%; 3-Phase Voltage Imbalance: 3%

2. When the chiller starts up, the compressor will start stage by stage. Chiller starting current is the sum of total current of operating compressors and starting current of the compressor(s) being actuated.

3. The selection of main cables should base on voltage, allowable voltage drop and local electrical codes. The cables to the chiller should be flexible copper cord.

4. In order to reduce harmonic interference, chiller should be equipped with special input line reactor to restrict the fluctuation of power grid or current surge in system operation. Spike in smooth supply voltage or phase missing resulted from commutation will prevent interference from the grid and reduce impacts on the grid caused by harmonic current of the rectifier unit.

5. Harmonic filter (optional) improves power transmission and utilization, further reducing local parallel harmonic or series resonant and noise created by electrical system, improving system capacity of the transformer, breaker and cables, etc. and ensuring normal functions of safeties and automatic devices. All these configurations comply with GB/T 14549. Total harmonic distortion (THD) is ≤5%. Automatic compensation power factor of the chiller is 0.95.

# NOTICES FOR INSTALLATION AND OPERATION

1. MULTISTACK flooded air cooled oil-free centrifugal chillers can be installed in places with sufficient ventilation and convenience for installation, such as rooftop, balcony or just on the ground, to keep good convection heat transfer. If two or more chillers are installed with induced drafts facing one another, minimum 3 meters spacing is required between the induced drafts;

2. Distances between the flow switch and the upstream/downstream horizontal straight pipe should be at least 5 times pipe diameter to prevent damage on the chiller in the event of insufficient water flow. Flow switch is irreplaceable by differential pressure switch/transmitter on water headers; required setting of the flow switch: open when rated water flow ≤80%;

3. External pipes and valves shall have proper support so that their weights would not land on the chiller and guarantee good sealing of pipe connections.

4. Strainer should be installed in the inlet pipe. Strainer should be of stainless steel and sturdy enough in case that too much water pressure caused by partial blockage may damage the strainer.

5. After the temperature sensors are inserted to the sensor wells, grease lubricant should be applied into the sensor wells to protect temperature probes from being damaged by water accumulation inside the sensor well.

6. Prior to chiller operation, the whole piping system must be thoroughly cleaned and removed of mechanical impurities.

7. All piping components are to be supplied by the users.



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