YORK®	YORK YVAM AIR-COOLED MAGNETIC BEARING CENTRIFUGAL CHILLER	
GUIDE SPECIFICATIONS	Supersedes: 160.88-GS1 (0221)	Form 160.88-GS1 (723)

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PART 1 – GENERAL

1.01 GENERAL REQUIREMENTS

The requirements of this Section shall conform to the general provisions of the Contract, including General and Supplementary Conditions, Conditions of the Contract, and Contract Drawings.

1.02 SCOPE

Provide Microprocessor controlled, magnetic bearing centrifugal compressor, air-cooled, liquid chillers of the scheduled capacities as shown and indicated on the Drawings, including but not limited to:

1. Chiller package
2. Charge of refrigerant
3. Electrical power and control connections
4. Chilled liquid connections
5. Manufacturer start-up

1.03 QUALITY ASSURANCE

A. Products shall be Designed, Tested, Rated and Certified in accordance with, and Installed in compliance with applicable sections of the following Standards and Codes:

1. AHRI 550/590 – Water Chilling Packages Using the Vapor Compression Cycle
2. AHRI 370 – Sound Rating of Large Outdoor Refrigerating and Air-Conditioning Equipment
3. ANSI/ASHRAE 15 – Safety Code for Mechanical Refrigeration
4. ANSI/ASHRAE 34 – Number Designation and Safety Classification of Refrigerants
5. ASHRAE 90.1 – Energy Standard for Buildings Except Low-Rise Residential Buildings
6. ANSI/NFPA 70 – National Electrical Code (N.E.C.)
7. ASME Boiler and Pressure Vessel Code, Section VIII, Division 1
8. OSHA – Occupational Safety and Health Act
9. Manufactured in facility registered to ISO 9001
10. Conform to Intertek Testing Services for construction of chillers and provide ETL/cETL Listed Mark

B. Factory Run Test: Chiller shall be pressure-tested, evacuated and fully charged with refrigerant, and shall be factory operational run tested with water flowing through the vessel.

C. Chiller manufacturer shall have a factory trained and supported service organization.

D. Warranty: Manufacturer shall Warrant all equipment and material of its manufacture against defects in workmanship and material for a period of eighteen (18) months from date of shipment or twelve (12) months from date of start-up, whichever occurs first.

1.04 DELIVERY AND HANDLING

A. Unit shall be delivered to job site fully assembled and fully wrapped for shipping with all interconnecting refrigerant piping and internal wiring ready for field installation and charged with refrigerant by the Manufacturer.
B. Provide protective covering over vulnerable components for unit protection during shipment. Fit nozzles and open ends with plastic enclosures.
C. Unit shall be stored and handled per Manufacturer's instructions.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. The design shown on the Drawings is based on YORK model YVAM chiller manufactured by Johnson Controls / YORK. Alternate equipment will be acceptable if the manufacturer's equipment meets the scheduled performance and complies with these specifications. If equipment manufactured by a manufacturer other than that scheduled is utilized, then the Mechanical Contractor shall be responsible for coordinating with the General Contractor and all affected Subcontractors to ensure proper provisions for installation of the furnished unit. This coordination shall include, but not be limited to, the following:

1. Structural supports for units.
2. Piping size and connection/header locations.
3. Electrical power requirements and wire/conduit and overcurrent protection sizes.
4. Chiller physical size on plant layout.
5. Site noise considerations.

B. The Mechanical Contractor shall be responsible for all costs incurred by the General Contractor, Subcontractors, and Consultants to modify the building provisions to accept the furnished alternate equipment.

2.02 GENERAL

A. Description: Furnish, Install, and Commission factory assembled, charged, and operational run tested air-cooled centrifugal compressor chiller as specified herein and shown on the Drawings. Chiller shall include, a complete system with single refrigerant circuit, magnetic bearing centrifugal compressor, tube-in-shell hybrid falling film type evaporator, air-cooled condenser, R-134a or R-1234ze refrigerant, interconnecting wiring, safety and operating controls including capacity controller, control center, motor starting components, and special features as specified herein or required for safe, automatic operation.
B. Operating Characteristics:

1. Provide low and high ambient temperature control options as required to ensure unit is capable of operation from -20°F to 125°F (-28.8°C to 51.6°C) ambient temperature.
2. Provide capacity control system capable of reducing unit capacity to 15% of full load. Compressor shall be capable of starting in an unloaded condition. Application of factory installed hot gas bypass shall be acceptable as required to meet specified minimum load.

C. Cabinet: Unit panels, structural elements, control boxes and heavy gauge structural base shall be constructed of painted galvanized steel. All exposed sheet steel shall be coated with baked on powder paint to meet 1,000-hour salt spray test in accordance with the ASTM B117 standard.
D. Shipping: Unit shall ship in one piece and shall require installer to provide only a single evaporator inlet and outlet pipe connection. If providing chiller model that ships in multiple pieces, bid shall include all the material and field labor costs for factory authorized personnel to install a trim kit to connect the pieces as well as all interconnecting piping and wiring.

2.03 COMPRESSOR

A. Single stage

B. Capacity control achieved through variable speed and mechanical capacity control (variable geometry diffuser). If pre-rotation vanes are needed for capacity control, the material shall be cast-manganese-bronze or equivalent. Plastic is not an acceptable material for pre-rotation vanes, PRV assemblies, or other components internal to the compressor.

C. Fully accessible housing with vertical circular joints.

D. Direct drive

E. Magnetic bearings or roller element bearings

1. Levitated shaft position shall be actively controlled and monitored by an X-, Y-, and Z-axis digital position sensor.
2. The compressor shall be capable of coming to a controlled, safe stop in the event of a power failure by diverting stored power to the magnetic bearing control system.

F. Mechanical linkage system that continuously monitors compressor-discharge gas characteristics and optimizes diffuser spacing to minimize impeller gas-flow disruptions.

G. The driveline (compressor and motor) and chiller starter shall be individual unit assemblies allowing for independent inspection, service, and repair/replacement. If an integrated driveline and starter package is utilized which is not fully field repairable, the supplier must provide one spare package with the unit.

H. The chiller shall utilize a single compressor that delivers the specified performance at all load and lift conditions.

2.04 MOTOR

A. Semi-hermetic permanent magnet motor.

B. Electrical connection: Steel terminal box with gasketed front access cover; overload and overcurrent transformers.

2.05 REFRIGERANT CIRCUIT COMPONENTS

A. Refrigerant:

- R-134a. Classified as Safety Group A1 according to ASHRAE 34.
  OR
- R-1234ze. Classified as Safety Group A2L according to ASHRAE 34.

B. Equipment supplied shall comply with LEED Energy & Atmospheric Credit 4, Enhanced Refrigerant Management.

C. Refrigerant circuit shall incorporate all components necessary for the designed operation including- liquid line shut-off valve with charging port, low side pressure relief device, removable core filter-drier and sight glass with moisture indicator.

D. Discharge lines shall be provided with manual compressor shut-off service valves.

E. Liquid pumps for motor cooling shall not be required.

2.06 HEAT EXCHANGERS

A. Evaporator:

1. Evaporator shall be tube-in-shell, hybrid falling film type to optimize efficiency and refrigerant charge. Tubes shall be high-efficiency, internally and externally enhanced type copper tubes with 0.035” (0.89 mm) minimum wall thickness at all intermediate tube supports to provide maximum tube wall thickness at the support area. Each tube shall be roller expanded into the tube sheets providing a leak proof seal and be individually replaceable.
2. Constructed, tested, and stamped in accordance with applicable sections of ASME pressure vessel code for minimum 235 psig (16 barg) refrigerant side design working pressure and 150 psig (10 barg) liquid side design working pressure.

3. Water boxes shall be removable to permit tube cleaning and replacement. Water boxes shall include liquid nozzle connections suitable for ANSI/AWWA C-606 couplings, welding,or flanges. [OPTIONAL]: 150 psig (10.3 barg) ANSI raised-face weldable flanges. Flanges are field welded by Contractor. Companion flanges, bolts, nuts, and gaskets are not included. [OPTIONAL]: 150 psig (10.3 barg) ANSI raised-face flanges with ANSI/AWWA C-606 couplings. Flanges are field mounted by Contractor. Companion flanges, bolts, nuts, and gaskets are not included. [OPTIONAL]: 150 psig (10.3 barg) ANSI raised-face weldable flanges with companion flanges. Flanges are field welded by Contractor. Bolts, nuts, and gaskets are not included. [OPTIONAL]: 150 psig (10.3 barg) ANSI raised-face flanges with ANSI/AWWA C-606 couplings with companion flanges. Flanges are field mounted by Contractor. Bolts, nuts, and gaskets are not included.
4. Provide vent and drain fittings, and thermo-statically controlled heaters to protect to 0°F (-17.8°C) ambient temperature in off-cycle. [OPTIONAL]: Provide freeze protection down to -20°F (-28°C) ambient temperature. A separate power connection for evaporator heaters is required and shall be provided by the Contractor.
5. Connection location: Chilled liquid inlet and outlet nozzle connections are located at rear (opposite control panel) end of unit. [OPTIONAL] Inlet and outlet nozzle connections located at front end of unit. Available for select configurations. [OPTIONAL] Inlet rear and outlet front nozzle connections available for 3-pass evaporator configurations.

B. Air-cooled Condenser:

1. Condenser coils shall be micro-channel type, parallel flow aluminum alloy tubes metallurgically brazed as one piece to enhanced aluminum alloy fins. Condenser coils shall be made of a single material to avoid galvanic corrosion due to dissimilar metals. Tube and fin type condenser coils are an acceptable alternate when tubes and fins are fabricated of the same metal material to avoid galvanic corrosion due to dissimilar metals. Coils shall be designed for 350 psig (24 barg) or higher working pressure. [OPTIONAL:] Coils shall be post-coated with an electro-deposited and baked flexible epoxy coating that is finished with a polyurethane UV resistant top-coat suitable for highly corrosive applications (“Environment Guard Premium”). [OPTIONAL:] All-aluminum coils only: Coils shall be post-treated with immersion-applied nano-scale conversion coating, suitable for C3 medium/weakly corrosive atmospheres, urban and industrial atmospheres with moderate SO2 contamination, and coastal areas with low salinity (“Environment Guard Basic”).
2. Low Sound Fans: Shall provide vertical air discharge from extended orifices. Fans shall be composed of corrosion resistant aluminum hub and glass-fiber-reinforced polypropylene composite blades molded into a low-noise airfoil section. Fan impeller shall be dynamically balanced for vibration-free operation. Fan guards of heavy gauge, PVC (polyvinyl chloride) coated or galvanized steel. [OPTIONAL]: High Efficiency Fans with Variable Speed EC Motor.
3. Fan Motors: Variable speed, high efficiency, direct drive, 3-phase, insulation class “F”, current protected, Totally Enclosed Air-Over (TEAO), with double sealed, permanently lubricated ball bearings. Open Drip Proof (ODP) fan motors will not be acceptable. [OPTIONAL]: High Efficiency Fans with Variable Speed EC Motor.

2.07 INSULATION

A. Material: Closed-cell, flexible, UV protected, thermal insulation complying with ASTM C 534 Type 2 (Sheet) for preformed flexible elastomeric cellular thermal insulation in sheet and tubular form.

B. Thickness: 3/4” (19mm.)

C. Thermal conductivity: 0.26 (BTU/HR-Ft2-°F/in) maximum at 75°F mean temperature.

D. Factory-applied insulation over cold surfaces of liquid chiller components including evaporator shell, water boxes, and suction line. Liquid nozzles shall be insulated by Contractor after pipe installation.

E. Adhesive: As recommended by insulation manufacturer and applied to 100% of insulation contact surface including all seams and joints.

2.08 ACOUSTICAL DATA

A. Provide acoustical sound power or sound pressure level data in decibels (dB) at the scheduled eight (8) octave band center frequencies. A-weighted sound data alone is not acceptable.
B. Provide all sound power or sound pressure level data at 100%, 75%, 50%, and 25% load.
C. Supplied equipment shall not exceed scheduled sound power or sound pressure level data at any load point. The mechanical Contractor shall be responsible for any additional costs associated with equipment deviation.
D. Acoustical performance ratings shall be in accordance with AHRI Standard 370. [OPTIONAL]: Factory-installed sound reduction package to meet chiller sound levels scheduled at all load points.

2.09 POWER AND ELECTRICAL REQUIREMENTS

A. Power/Control Panel:
1. Factory installed and wired NEMA 3R, powder painted steel cabinets with tool lockable, hinged, latched, and gasket sealed outer doors equipped with wind struts for safer servicing. Provide main power connection(s), compressor starters and fan motor variable speed drives, current overloads, and factory wiring.
2. Panel shall include control display access door.

B. Single Point Power:
1. Provide single point power connection to chiller, shall be 3-phase of scheduled voltage.
2. Single Point Circuit Breaker: A unit-mounted Circuit Breaker with external lockable handle shall be supplied to isolate power voltage for servicing. Incoming power wiring must comply with local codes. Circuit breaker shall be sized to provide the motor branch circuit protection, short circuit protection and ground fault protection for the motor branch-circuit conductors, the motor control apparatus and the motors.

C. Control Transformer: Power panel shall be supplied with a factory mounted and wired control transformer that will supply all unit control voltage from the main unit power supply. Transformer shall utilize scheduled line voltage on the primary side and provide 115V/1Ø on secondary.
D. Short Circuit Withstand Rating of the chiller electrical enclosure shall be (460V: 100,000 Amps with Single Point Circuit Breaker) Rating shall be published in accordance with UL508.
E. Motor Starters: Motor starters shall be zero electrical inrush current (Variable Frequency Drives). All non-VSD starters will not be acceptable.
F. All exposed power wiring shall be routed through liquid-tight, UV-stabilized, non-metallic conduit.
G. Supplied equipment shall not exceed scheduled Minimum Circuit Ampacity (MCA). The mechanical Contractor shall be responsible for any additional costs associated with equipment deviation.

2.10 CONTROLS

A. General:
1. Provide automatic control of chiller operation including compressor start/stop and load/unload, condenser fans, evaporator pump, evaporator heater, unit alarm contacts and run signal contacts.
2. Chiller shall be configurable to allow automatic or manual restart after power failure.

3. Unit operating software and field programmed set points shall be stored in non-volatile memory.
4. Alarm contacts shall be provided to remote alert for any unit safety faults.

B. Control Panel, Display, and Keypad:
1. 10.4” (minimum) color liquid crystal display (LCD) mounted on control panel enclosure door. All warning and safety faults shall include a text description. Panels with numerical codes requiring reference manuals for fault codes are not acceptable.
2. Display and keypad shall be accessible through display access door without opening main control/electrical cabinet doors.
3. Display shall provide a minimum of unit setpoints, status, electrical data, temperature data, pressures, safety lockouts and diagnostics without the use of a coded display.
4. Descriptions in English (or available language options), numeric data in English (or Metric) units.
5. Control panel includes push button safety stop switch.

C. System status information: always displayed on screen, including the following as a minimum:
1. System status
2. System details
3. Control source (remote or local)
4. User access level
5. Date and time

D. Status messages: In color according to importance, indicate the following as a minimum:
1. Ready to start / Stopped
2. Cycling shutdown – chiller will automatically restart
3. Safety shutdown – chiller requires manual restart
4. System run
5. Systems coast down
6. Start-inhibit

E. System operating information, including the following as a minimum:
1. Entering and leaving chilled water
2. Evaporator and condenser refrigerant saturation temperatures
3. Sub-cooling refrigerant temperature
4. Evaporator pressure
5. Evaporator tube small temperature difference
6. Compressor discharge temperature
7. Percent input and motor full load current
8. Input power
9. Kilowatt hours
10. Operating hours
11. Refrigerant level
12. Motor winding temperature (each phase)
13. Average motor winding temperature
14. VSD – Output frequency
15. VSD – Output voltage (each phase)
16. VSD – Current (each phase)
17. VSD – Input current limit setpoint
18. VSD – Total Input KVA
19. VSD – Input power factor
20. VSD - Voltage total harmonic distortion (each phase)
21. VSD – Current total demand distortion (each phase)
22. VSD – DC bus voltage
23. VSD – Input and output Peak and RMS voltages and currents (each phase)

24. VSD – Internal ambient temperature
25. UPS Battery voltage
26. VGD Position
27. Discharge Pressure
28. Motor Housing temperature
29. MBC – Positions
30. MBC – Currents
31. MBC – Temperatures
32. MBC – Rotor Elongation
33. MBC – Motor Speed

F. Programmable setpoints including the following, as a minimum:
1. Leaving Chilled liquid temperature setpoint
2. Leaving Chilled liquid temperature cycling offset (shutdown and restart)
3. Input and Motor current limits (%)
4. Pulldown demand (limit and time)

G. Schedule function: Programmable six-week schedule for starting and stopping the chiller, and pumps.

H. Warning messages including the following, as a minimum:
1. Setpoint override
2. Evaporator low pressure limit
3. Excess Surge Detected
4. Motor – High Housing, Rotor, and Winding Temperatures
5. Motor – High Current Limit
6. VSD – DC Bus Active
7. Liquid Level Setpoint Not Achieved
8. Loss of Subcooler Liquid Seal

I. Safety Shutdowns: Trigger a safety shutdown for any of the following, as a minimum:
1. Evaporator – low pressure
2. Auxiliary safety – contacts closed
3. Compressor discharge – high or low refrigerant temperature
4. Control panel – power failure
5. VSD – current imbalance
6. Motor – high housing, winding, and rotor temperatures
7. Evaporator transducer error
8. Transducer – failure or out of range
9. Surge Protection – Excess Surge
10. MBC – internal fault
11. MBC – high bearing temperature or current
12. MBC – startup failure
13. MBC – speed signal fault
14. MBC – overspeed fault
15. MBC – communication
16. MBC – rotor elongation
17. MBC – oscillator fault
18. MBC – rotor contraction
19. MBC – unauthorized rotation
20. MBC – high and low voltage
21. VSD – shutdown, requesting fault data
22. VSD – stop contacts open
23. VSD – 105% motor current overload
24. VSD – input current overload

25. VSD – high phase input and motor baseplate temperatures (each phase)
26. VSD – pre-charge lockout
27. VSD – ground fault
28. VSD – motor current total harmonic distortion (THD) fault
29. VSD – inverter or rectifier program fault
30. VSD – phase motor and input DCCT (each phase)
31. VSD – high total demand distortion
32. VSD – high phase input and motor current (each phase)
33. VSD – line voltage phase rotation
34. VGD Actuator Fault
35. VGD Positioning Fault
36. Safety Stop

J. Safety Shutdowns: For each safety shutdown, indicate the following, as a minimum:
1. System status and details
2. Day and time of shutdown
3. Type of restart required

K. Cycling Shutdowns: For each cycling shutdown, indicate the following, as a minimum:
1. Multiunit cycling – contacts open
2. System cycling – contacts open
3. Control panel – power failure
4. Leaving chilled liquid – low temperature
5. Leaving chilled liquid – flow switch open
6. Control panel – schedule
7. VGD Actuator – serial communications
8. Evaporator – low pressure
9. Control Panel – loss of control voltage
10. MBC – position
11. MBC – low frequency displacement
12. MBC – vibration
13. MBC – speed signal fault
14. MBC – startup failure
15. MBC – serial communications fault
16. VSD shutdown – requesting fault data
17. VSD – fault contacts open
18. VSD – initialization failed
19. VSD – gate driver (indicate phase)
20. VSD – single phase input power
21. VSD – high or low DC bus voltage
22. VSD – pre charge: low DC bus voltage
23. VSD – pre charge: DC bus voltage imbalance
24. VSD – high internal ambient temperature
25. VSD – logic board power supply
26. VSD – low phase input and motor baseplate temperatures (each phase)
27. VSD – logic board processor
28. VSD – run signal
29. VSD – high phase input and motor current (each phase)
30. VSD – DC bus pre-regulation
31. VSD – input DCCT offset (each phase)

L. Security Access: Through ID and password recognition defined by a minimum of three different levels of user capability:
1. View: prevent unauthorized changing of local setpoints.

2. Operator: allows local control of chiller.
3. Service: If advanced diagnostics are necessary for qualified service personnel.

M. Chiller information screen including on-screen display of the following, as a minimum:

1. Model number
2. Chiller serial number
3. Manufacturer contract number
4. Design voltage
5. Refrigerant type
6. Starter type
7. Original factory chiller rating information

N. Data tracking and trend display including on-screen graphical display of the following, as a minimum:

1. Parameters selected from a list of a minimum of 50 possibilities
2. Data collected once per second up to once per hour for each parameter
3. Data trend lines displayed for a minimum of 5 parameters at once

O. History: Store last fifty shutdowns with text description and display all system parameters at the time of shutdown.

P. Memory: Non-volatile type containing operating program and setpoints, capable of retention for 10 years without memory loss, despite AC or backup battery power loss.

Q. Terminal strip has to be clearly numbered to accept field interlock wiring.

R. Remote status: Via electrical contacts, control panel capability to indicate the following as a minimum:

1. Ready to start contacts
2. Safety shutdown contacts
3. Cycling shutdown contacts
4. Running contacts

S. Remote control: Via 4-20 mA or 0-10V analog signals, control panel capability to adjust the following as a minimum:

1. Leaving chilled liquid setpoint
2. Current limit setpoint

T. Remote chiller start/stop: Via 120 VAC dry contact

U. Data logging and printing: Via RS-232 or SD Card, control panel capability for exporting at user-programmable intervals:

1. All system operating data
2. Shutdown and cycling messages
3. Operating details of last 50 cycling or safety shutdowns

V. Manufacturer shall provide any controls not listed above, necessary for automatic chiller operation. Mechanical Contractor shall provide field control wiring necessary to interface sensors to the chiller control system.

2.11 COMPRESSOR MOTOR STARTER: VARIABLE SPEED DRIVE

A. General: Variable Speed Drive (VSD) compressor motor starter to start motor and control motor speed by controlling the frequency and voltage of the electrical power supplied to the motor.

B. Drive type: Pulse width modulated (PWM) utilizing insulated gate bipolar transistors (IGBTs).

C. Control Logic: Independently control motor speed and variable geometry diffuser (VGD) position for optimum efficiency and operational stability. Base motor speed and VGD position on a minimum of 4 inputs: leaving chilled water temperature, return chilled water temperature, evaporator refrigerant pressure, condenser refrigerant pressure; Verify motor speed and VGD position and use as inputs to the control logic.

D. Power Factor: At all loads and speeds, provide a minimum of a .95 power factor.

E. Capacitors shall not require scheduled replacement. If capacitors do not meet this requirement, the chiller manufacturer shall provide one spare sets of capacitors per compressor for the building owner's stock.

F. Enclosure: Minimum NEMA-3R type with hinged access door with door interlock, lock and keys, and padlock.

G. Packaging: Factory mounted on chiller, piped to cooling circuit; wired to control panel and compressor motor; entire package shall be UL listed.

H. Cooling: Cool drive pole assembly components and internal ambient air via fluid-cooled, closed loop; all starter components accessible for service and replacement without opening the chiller's main refrigerant circuit.

1. VSD enclosures utilizing fans to circulate ambient air for cooling shall include filters at air vents and openings to prevent dust accumulation on the circuit boards and VSD components.

I. Factory run test: Perform an electrical and mechanical run test of VSD starter prior to shipment to verify proper wiring and phasing.

J. Factory settings: Set starting design current and current overload settings prior to shipment.

K. Harmonic Distortion: Provide a drive and chiller system with integrated harmonic filtration. System must generate harmonic distortion levels less than the following, measured at the input side of the drive:

1. Current: 5% maximum current total demand distortion

L. Inrush amperage: Limited to the design full load amperage of the chiller.

M. Protective devices: provide the following, as a minimum:

1. Electronic current-sensing overloads (1 per phase) – with indicating message on the control panel and reset button; shut down chiller upon detection of operating current exceeding 105% full load amperage.
2. High instantaneous current overload – with indicating message on the control panel and reset button; shut down chiller upon detection of starting current exceeding 115% of design inrush starting current for 1 second.
3. Phase rotation insensitivity
4. Single phase failure protection circuit with indicating light – shut unit down if power loss occurs in any phase at startup.
5. High temperature safety protection system on IGBTs with indicating light and reset button; via thermistors embedded on IGBT heat sinks – shut unit down if IGBT temperature exceeds acceptable limits.
6. Power fault protection for momentary power interruptions – interrupt power to the compressor motor within 4-line cycles upon detection of power interruptions longer than ¾ of a line cycle.
7. High and low line voltage protection.
8. Additional Voltage surge suppression devices if standard design unable to exceed IEEE C62.41.1 recommendations

N. Features: Factory mount and wire the following as a minimum:

1. Control transformer: 115 V and sized to power control panel and all unit controls.
2. Electrical lugs: Sized to accept the copper power lines required by the chiller.
3. Single point power: From electrical lugs at starter, power all powered devices on the chiller including control panel, control devices, oil pump (if applicable) and refrigerant purge.
4. Circuit-breaker disconnect: Door interlocked; ground fault protection; minimum 100,000 A short circuit withstand RMS Symmetrical Amperes capacity

O. Control panel readouts: Display on the control panel and provide to BAS via communication port the following as a minimum:

1. Output frequency
2. Output voltage

3. Output current (each phase)
4. Input power (kW)
5. Energy consumption (kWh)
6. Elapsed running time
7. Three phase voltage total harmonic distortion (THD)
8. Three phase current total demand distortion (TDD)
9. Total unit power factor
10. Total supply kVA

2.12 ACCESSORIES AND OPTIONS

Some accessories and options supersede standard product features. All options are factory-mounted unless otherwise noted.

A. CONTROLS OPTIONS:

1. Building Automation System Interface: Chiller to accept 4 to 20 mA or 0 to 10 VDC input from BAS (by others) to reset the leaving chilled liquid temperature or load limit setpoint or both.
2. Gateway: Provides communication for Building Automation Systems, including BACnet (MS/TP), Modbus, N2, and LON. (Field Commissioned by BAS Manufacturer).

B. GENERAL OPTIONS:

1. Factory Mounted Flow Switch: Vapor proof SPDT, NEMA 3R switch, 150 psig (10.3 barg), -20°F to 250°F (-28.9°C to 121.1°C.).
2. [OPTIONAL]: Differential Pressure Switch: 3-45 psig (0.2-3 barg) range with 1/4" NPTE pressure connections. (Field mounted by Contractor).
3. [OPTIONAL]: Chicago Code Relief Valve – Special relief valves per Chicago Code
4. Dual pressure relief valves – Two safety relief valves mounted in parallel; one is always operational.
5. [OPTIONAL]: Special Requirement Documents:
    a. Special Requirement Document Package (SRDP) includes Pressure Vessel Report, Unit Run Test Report, Production System Check Sheet and Final Unit Inspection Check Sheet.
    b. Materials Package includes steel mill material reports for vessels in addition to Pressure Vessel Report, Unit Run Test Report, Production System Check Sheet and Final Unit Inspection Check Sheet.
6. [OPTIONAL]: Vibration Isolation (All Options Field Mounted by Contractor):
    a. Elastomeric Isolators.
    b. 1" Deflection Spring Isolators: Level adjustable, spring and cage type isolators for mounting under the unit base rails.
    c. 2" Deflection Restrained Spring Isolators: Level adjustable, restrained mounts in rugged welded steel housing with vertical and horizontal limit stops. Housings shall be designed to withstand a minimum 1.0g accelerated force in all directions to 2" (50.8 mm.)

PART 3 – EXECUTION

3.01 INSTALLATION

A. General: Rig and Install in full accordance with Manufacturer's requirements, Project drawings, and Contract documents.

B. Location: Locate chiller as indicated on drawings, including cleaning and service maintenance clearance per Manufacturer instructions. Adjust and level chiller on support structure.

C. Components: Installing Contractor shall provide and install all auxiliary devices and accessories for fully operational chiller.
D. Electrical: Coordinate electrical requirements and connections for all power feeds with Electrical Contractor.
E. Controls: Coordinate all control requirements and connections with Controls Contractor.
F. Finish: Installing Contractor shall paint damaged and abraded factory finish with touch-up paint matching factory finish.